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THE UPPER PALEOLITHIC OF THE CENTRAL RUSSIAN PLAIN: A STUDY OF FLUCTUATIONAL TRAJECTORIES OF CULTURE CHANGE

City University of New York PH.D. 1984

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THE UPPER PALEOLITHIC OF THE CENTRAL RUSSIAN PLAIN

A study of fluctuational trajectories of culture change

by

OLGA SOFFER-BOBYSHEV

A dissertation submitted to the Graduate Faculty
in Anthropology in partial fulfillment of the
requirements for the degree of Doctor of Philosophy,
The City University of New York.

1984

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1984

This manuscript has been read and accepted for the Graduate Faculty in Anthropology in satisfaction of the dissertation requirement for the degree of Doctor of Philosophy.

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Abstract

THE UPPER PALEOLITHIC OF THE CENTRAL RUSSIAN PLAIN

A study of fluctuational trajectories of culture change

by

Olga Soffer-Bobyshev

Advisers: Professor Eric Delson and Associate Professor Gregory A. Johnson

This work examines prehistoric hunter and gatherer adaptations on the Late Pleistocene Central Russian Plain and offers both a culture history for the area as well as explanations for changes in human adaptations through time. It is an exercise in synthetic processual anthropology, views human adaptation as a multi-component system, and uses insights from both evolutionary cultural ecology and historic materialism to examine and model the functioning of and inter-relationships between the various components of Upper Paleolithic cultures. Biologic, geographic, geologic, and archaeologic data are presented on twenty nine major archaeologic sites found in the study area. This record spans some 14,000 years of occupation from approximately 26,000 B.P. to about 12,000 B.P. Pertinent data are used to model 1) Late Pleistocene environments, and 2) subsistence strategies employed by Upper Paleolithic groups. The results reveal that hunters and gatherers in the area were logistically organized in their subsistence persuits and relied heavily on storage in their economies. A classification of

the archaeological sites and a modeling of the settlement systems indicate that groups on the Central Russian Plain practices seasonal residential mobility. An examination of changes in their subsistence and settlement strategies show 1) a linearization of settlements along the river valleys, 2) an intensification in the procurements and storage of economically important resources, and 3) the rise of specialized exploitation of fur bearers through time. The reconstruction of socio-political integration in the area indicates both that these Late Pleistocene hunters and gatherers were hierarchically organized and that this hierarchization increased through time. Increasing socio-political differentiation was accompanied by 1) a change from nuclear to extended families, 2) increasing specialization in production, 3) the rise of long distance exchange networks, 4) a possible rise in economic inequality, 5) socio-cultural integration of the area, 6) the appearance of monumental architecture, and 7) the development of corporate ritual behavior. Finally, data from the Central Russian Plain show that the patterning of culture change through the Upper Paleolithic period followed a fluctuational rather than a directional trajectory.

To:

Eric Delson

Mikhail Ivanovich Gladkih

Gregory A. Johnson

Andrei Alekseevich Velichko

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CHAPTER I

INTRODUCTION

> ...by studying the external configurations of the existing land and its inhabitants, we may restore in imagination the appearance of the ancient continents which have passed away ... the human mind is not only enabled to number worlds beyond the unassisted ken of mortal eye, but to trace the events of indefinite ages...
>
> (Lyell 1889: 319-320, orig. 1830-1833)

> There are more things in heaven and earth, Horatio, than are dreamt of in your philosophy.
>
> (Shakespeare, Hamlet)

I. INTRODUCTION

Future generations of archaeologists will wonder why we, their predecessors, viewed the Upper Paleolithic prehistory of Europe, a continent over 9,000,000 km^2 in area, primarily as an extension of the prehistory of the Perigord region of France, an area that measures under 10,000 km^2 (White 1980: 37). Yet, as any introductory textbook clearly shows, that is precisely what we have done and continue doing to date. Even when we enlarge this Upper Paleolithic core area, one that is overtly or covertly treated as the center of the Upper Paleolithic oikumene in our literature, to include all of southwestern France (an area under 100,000 km^2 in size per Wobst 1976), and acknowledge the richness of the

archaeological record there--the lack of congruence between the French microcosmos and the European macrocosmos is startling. This Francophile perspective however, one with us since the beginning of prehistoric archaeology, is a direct result of historical and linguistic factors rather than a reflection of prehistoric realities. As Wobst and Keene (1982) point out, this distorted view of the European Upper Paleolithic came into existence because Paleolithic archaeology had the longest history in southwestern France. Since Paleolithic researchers both in Western Europe and in North America were always fairly well versed in the essential Romance and Germanic languages, but not in the Slavic ones, linguistic barriers further enhanced this Francophile orientation.

While I do not intend to argue that southwestern France, most notably in its Perigord region, does have a very rich Late Pleistocene archaeological record, I emphasize that an equally rich record exists on the Russian Plain, well to the east of France. As Gvozdover and Rogachev (1969) noted, by 1969 over 1,000 Paleolithic sites and localities had been discovered in the European portion of the USSR. In this work I will concentrate on one of the sections of the Russian Plain and deal with the Upper Paleolithic archaeological record of the Central Russian Plain, an area of some 180,000 km^2 in size. As Figure 1 indicates, this area is today administratively divided between the Byelorussian, Russian, and Ukranian Soviet Socialist Republics. It is a

region with a rich archaeological record and a long history of research. Figure II-1 depicts the 29 Upper Paleolithic sites that will be discussed in this work.

I selected to focus my research on the Central Russian Plain because the area is rich in sites, has a long history of research, and also has an ambiguous status as an Upper Paleolithic culture area. As Figure I-2 shows, the Central Russian Plain is bracketed on both the eastern and western sides by equally rich archaeological regions with sites. To the east along the Don lie the famed Kostenki-Borschevo sites assigned to various well defined archaeological cultures (see Praslov and Rogachev 1982). To the west, along the Dnestr lie numerous Upper Paleolithic sites assigned to the Molodova culture (see Gvozdover and Rogachev 1969; Doluvhanov 1983; Grigor'ev 1970). While Soviet researchers are far from agreement about the specific cultural assignment of some of the Don and Dnestr sites, all agree that both the Dnestr and Don Upper Paleolithic regions represent distinct cultural areas (see Lazukov et al. 1981; Praslov and Rogachev 1982; Grigor'ev 1983, for example). The archaeological record from the Central Russian Plain, on the other hand, has been far more enigmatic and difficult to assign to specific archaeological cultures. Most Soviet researchers today are in agreement that the sites in this region do exhibit some sort of unity, but have not been able to agree on just what this unity represents. Some, like Shovkoplyas (1965a) see all the sites belonging to a

diachronically evolving Mezin culture. Others, like Grehova (1970) delimit numerous synchronic archaeological cultures, some of which have geneological ties to one another. Gladkih (1973, 1977, 1977a) assigns all of the sites to one techno-economic complex. Grigor'ev (1983) claims that whatever similarities exist between the assemblages found at some of the sites they are not sufficient to assign any of them to either synchronic or diachronic archaeological cultures. In brief, judging by assemblages found at the sites, the Upper Paleolithic archaeological record of the Central Russian Plain is a classic example of a "cultural muddle in the middle".

This situation is clearly interesting and one that merits a closer examination. I focused my research on this region of the Old World Late Pleistocene oikumene in hopes of both offering: 1) a better explanation for the archaeological record there, and 2) an addition to the archaeological record from Upper Paleolithic southwestern France.

II. EXTANT LITERATURE ON AND PAST RESEARCH IN THE STUDY AREA

Western specialists not versed in Russian know the Upper Paleolithic record of the Central Russian Plain only from summarized and descriptive accounts. The sole English language volume on the area is Klein's (1973) brief Ice-Age Hunters of the Ukraine. Some information on the study area was recently offered in two long articles by McBurney (1975)

and Shimkin (1978)--both, unfortunately, contained some errors (see Chapter II on Timonovka I). Bhattacharya's (1977) volume on Paleolithic Europe had some basic, although at times erroneous, information on some of the sites. Earlier work by Golomshtok (1938) included mention of some of the sites. Finally, abstracts of papers presented by Soviet researchers at various INQUA Congresses constitute the sum total of information available in English on the region. All of these sources offer compilatory and summary information, are not inclusive or exhaustive by any means and, most importantly, do not offer quantitative data on the assemblages and features found at the sites.

A vast amount of information on the sites is available in Russian, too often, however, published in difficult to obtain serial publications. In spite of very site-specific focus prevalent in Soviet Paleolithic archaeology, very few of the sites have been published in monograph form. Detailed monographic treatment exists only for Mezin, Mezhirich, and Timonovka II. Large segments of Polikarpovich's (1968) volume were devoted to Eliseevichi and Yudinovo. Other sites, even those excavated relatively recently (e.g. Dobranichevka), are known from a few short articles published in the USSR. Readers interested in a full listing of publications available for each site are referred to Chapter II.

Surprisingly no single volume exists on this archaeological region in Russian. The most complete work,

Boriskovskii's (1953) Paleolit Ukraini, includes only those sites located within the borders of the Ukranian SSR. Polikarpovich's (1968) posthumous monograph only discusses those sites along the Desna, Pripyat', Sozh, and Sudost' that he excavated. Pidoplichko's (1969) book on Upper Paleolithic mammoth-bone dwellings discusses these features at sites within the Ukraine only.

Prior to relatively recent work by Pidoplichko and Velichko and his associates, the focus in Soviet Paleolithic research has been on describing the archaeological features and assemblages found at particular sites. The sum of these works concentrated on describing the behavior of objects either through time or across space. In more recent years joint research by paleogeographers and archaeologists, most notably seen in Velichko et al. (1977a) monograph on Timonovka II, has finally begun focusing on human adaptation--albeit on a scale of a specific site.

In general, extant Russian-language literature on the study area can be characterized as consisting of: 1) site specific publications, 2) publications dealing exclusively with either specific features or objects, and 3) regional compilations of site specific information on discoveries within specific confines of present day administrative regions. In brief, no work either in Russian or any other language exists to date that systematically examines human adaptations on the Central Russian Plain during the Upper Paleolithic period.

III. THE HISTORY OF PALEOLITHIC ARCHAEOLOGY IN RUSSIA AND THE USSR

In a recent paper I argued that archaeology is not an "a-cultural" phenomenon and that both what we see as archaeological problems as well as how we attempt to solve them are profoundly affected by the culture that surrounds us (Soffer 1982, see also Wobst and Keene 1982 on this point). The views of Soviet archaeologists, like those elsewhere, reflect cultural and historic realities. It is, therefore, germaine to briefly examine the history of prehistoric research in Russia and in the USSR.

It is not my objective here to undertake an all-inclusive review of the history of Soviet archaeology. In the subsequent discussion I will focus only on those issues that I see as most relevant to archaeological research in the study area. Readers interested in a fuller treatment of the subject are referred to Bulkin et al. (1982), Davis (1983), Gellner (1975), Howe (1976, 1980), Klejn (1977), Miller (1956), and Thomson's translator's forward in Mongait (1961).

Soviet archaeologists are exceedingly prolific. The literature that their work generates is, however, set within a specific historical and theoretical context which moulds and directs it. Gellner (1975) wrote that the first "culture shock" that Western researchers receive when entering the world of Soviet anthropology--be it physical anthropology, cultural anthropology, or archaeology--is the fact that they are all heavily historical. This historicism, however, is a

relatively recent phenomenon and dates only to the late 1920's. The history of prehistoric archaeology in Russia and the USSR can be divided into three periods which I delimit as the 1) Formative Period, 2) Development Period, and 3) Period of Crisis.

A. The Formative Period: 1873-1928

As both Howe (1976, 1980) and Mongait (1961) showed, in Russia interest in general archaeology blossomed in the last century in response to imperial expansion, and focused on the excavation of gold-laden Scythian barrows and object-rich Greek settlements around the Black Sea. The organization of this research, unlike elsewhere in Europe, was controlled by the state from the very beginning. The supervising agency was the Imperial Archaeological Commission which was a department of state and a part of the Ministry of the Court.

Paleolithic archaeology began in Russia with the discovery of Gontsy on the Central Russian Plain in 1873-1874 (Boriskovskii 1953). From its very inception it was associated with the radical elements of Russian society--the Narodniks. Volkov, the founder of Russian Paleolithic archaeology, was a mathematician, physicist, and ethnologist by training and an ardent evolutionist and Darwinist by persuasion. As Howe (1976, 1980) noted, Volkov radicalized the differences between Paleolithic archaeology, what he called "paleoethnology", and the established historical grounding of traditional or institutionalized archaeology of the Imperial Archaeological Commission. He was also a

political activist who was exiled briefly for his political activities in the 1890's and spent his banishment in France at Broca's School of Anthropology where he became both a student and a follower of de Mortillet.

Volkov's background in natural science was similar to those of other prehistoric researchers at the time: Feofilaktov was a geologist, Hvoika a natural scientist, Kaminsky a geographer and teacher of natural sciences (Boriskovskii 1953). Like Volkov, all were evolutionists.

Volkov's star student was Efimenko--"the father of Soviet Paleolithic archaeology". Efimenko's teaching career was most prolific and most of the Soviet Paleolithic archaeologists working today belong either to the first or second generation of Efimenko's students.

This formative period of Russian and Soviet archaeology lasted until 1928. Throughout this period Paleolithic archaeology was tied to natural sciences. The 1917 Revolution brought with it some organizational changes in the archaeological super-structure. As Thompson noted in Mongait (1961), however, until 1928 these changes did not have serious ideological consequences. Throughout this period Paleolithic archaeology was tied to natural sciences and dichotomized from the classic historical archaeology. Breuil's revision of de Mortillet's classic French scheme for sub-dividing the Paleolithic was accepted and used widely, as was the French methodology of excavation and focus on lithics (Davis 1983; Soffer 1982).

B. Developmental Period: 1928-1950's

Soviet prehistoric archaeology took a different term when the First Five-Year Plan was instituted in 1928. After a large-scale clean-up of institutes, museums, and universities of all non-Marxists and of pre-revolutionary elements, by 1935 Soviet archaeology became fully and dogmatically Marxist (Thompson in Mongait 1961; Miller 1956; Howe 1976, 1980). Paleolithic archaeology became separated from natural sciences and an irrevocable part of history. It fully and vocally accepted the periodizations of history bound in Marx, Marxist philosophy of history was applied wholesale and became scientific dogma in all disciplines.

This presented particular problems for Paleolithic archaeologists because Marx himself did not focus at length on the period of "primitive society". As he wrote in the Grundrisse, people engaged exclusively in hunting and fishing were located beyond the point where real social and economic development began (Marx and Engles 1939, vol. 46, pt. 1, p. 44, orig. 1857-1858). While Marxian texts offered a plethora of theoretical constructs to work with for archaeologists researching later periods, there was relatively little original material for Paleolithic archaeologists. Such typological constructs as "the feudal period" or "the slave owning period" were, as Gellner (1975) noted, quite concrete, while the first one, "primitive society", was not. It was, and to some extent still remains, a sort of grab-bag catch-all category that is held together by the absence of certain

features: classes, states, etc. In a sense, people engaged only in the collection of food produced and reproduced only themselves and not the means of their subsistence--hence, production during this stage remained outside economic and historical criteria.

Theoretical guidelines for prehistoric archaeology were sought in Engel's The Origin of the Family, Private Property, and State (1884). The answers, a sequence of set stages and periods, were based on the unilineal evolutionary schemes of Morgan and Tylor.

Based on this text, firm periodizations and stadiality was worked out for human prehistory by the mid-1930's (see for example Efimenko 1938; Ravdonikas 1939). The scheme saw the primitive and promiscuous herd of the Ancient (Lower) Paleolithic transformed into the matrilineal primitive community in the Late (Upper) Paleolithic. These socio-economic stages or formations of primitive society were both value laden and theory laden constructs. All groups at this level of historical development were expected to share certain traits as well as a certain historical role--to be transformed into the next and higher stage. Biology and tools became linked in a cause and effect relationship and biological evolution was tied to social evolution. No need was felt to discover social laws underlying socio-cultural transformations--economic means were equated with a particular social structure. In brief, it was speculative evolutionism where quantitative changes brought about

qualitative ones.

Since what happened in the past was known, what was needed, in effect, were just illustrations. Inferential machinery was, therefore, left underdeveloped. Typology and classification were, as before, mainly adopted from the French, slightly modified, and not paid much attention to. The focus was on "paleoethnology" and on illustrating the particulars of the known stages.

While the negative features of this focus can be expanded upon, it is also important to note that this focus was responsible for the institution of large-scale horizontal excavations in Paleolithic research. This new methodology, originally developed by Pitt-Rivers, was used by Efimenko in his work at the Kostenki sites. He concentrated on opening Upper Paleolithic living floors and on recognizing features (Boriskovskii 1953). This change from excavating via trenching resulted in the recognition of mammoth-bone dwellings and of storage pits at the sites--features that were previously interpreted as kitchen debris.

Given Efimenko's firm and vocal commitment to evolutionary stages, it is not surprising that he unearthed a "long house" at Kostenki I-1 and Boriskovskii, his student, found one at Pushkari I in the 1930's. They were, after all, exactly the sort of dwellings that matrilineal clans of the Upper Paleolithic stage would be expected to live in. Small round dwellings which dominate the literature of the recent period and represent the majority of Upper Paleolithic

constructions in the study area, did not fit as well into this model--they were either not discovered, or, when found, as in Gagarino on the Don and Malta and Buret in Siberia, their implications were not examined (see, for example, Boriskovskii 1953 for his reconstruction of Mezin and compare with Shovkoplyas 1965a). The discovery of female figurines was taken, ipso facto, as a confirmation of the existence of matrilineal clans, and so on.

Natural sciences continued to play an important role in Paleolithic archaeology during this period in the Ukraine only, where such paleontologists as V. Gromov and Pidoplichko were actively involved in Paleolithic research.

During this period, as Davis (1983) noted, little if any attention was paid to any synchronic variability in the archaeological record. This variability, however, refused to go away, and under its onslaught Paleolithic archaeology in the early 1950's entered its third period.

C. The Period of Crisis: 1950 to 1980's

As Davis (1983) wrote, firm periodization and stadiality, known in the USSR as the "Theory of Stages", by the early 1950's began crumbling under an avalanche of irrefutable synchronic variability in the data base. Rogachev's work at the Kostenki-Borschevo sites, discussed in greater detail in Chapter IV, was instrumental in focusing attention on this synchronic variability. Arguing for the reality and significance of this variability, Rogachev (1957) called for the recognition of synchronic archaeological cultures. He

saw these as material reflections of distinct and bounded ethnographic groupings. This concept, one very similar to the constructs of Bordes (1961) and Sonneville-Bordes (1960), was accepted and widely adopted by Paleolithic archaeologists in the USSR. Archaeological research on the Central Russian Plain began increasingly to focus on delineating the different archaeological cultures reflected in the archaeological record.

This adoption of archaeological culture as an analytic unit and research objective both undermined the validity of previously held mega-theory (i.e. The Theory of Stages) as well as introduced a line of middle-range purely archaeological research--one separated from natural sciences and from paleoethnology.

Not surprisingly, the classic problems of data vs. theory and universality vs. exception that plagued and continue to plague Western archaeologists committed to evolutionary paradigms disturbed our Soviet colleagues as well. The need for revamping mega-theory was most acutely felt and vocally responded to by Soviet cultural anthropologists who in the 1960's began dealing with large-scale theoretical issues on the level of socio-economic formations. While, undoubtedly, more debate was generated for the socio-economic formations of more advanced stages, "primitive society" also received its share of attention. Averkieva (1971 with references) went off to study the Indians of the Northwest Coast and try to square off their slave ownership,

property ownership, and class differences with the classic constructs of "primitive society". Y. Semenov (1979, 1980) attempted to modernize the evolutionary stages in the light of archaeological data--particularly the primitive horde and primitive community stages. Ter-Akopyan (1979) sought to reconcile the diachronic focus of classic Marxian constructs with the synchronic basis of the ethnographic method. Fainberg (1975) focused on reconstructing the origins of clan societies and dissent ideologists.

Paleolithic archaeologists, by and large, did not involve themselves with issues of mega-theory. The one exception to this was Grigor'ev who in the 1972 volume Hunters, Gatherers, Fishermen, an admitted response to the 1968 Man The Hunter volume, used archaeological data to argue for both the existence and importance of the nuclear family in the Upper Paleolithic as a minimal social unit. He argued that the herd stage never existed historically and questioned the validity of the long-held assumptions that the appearance and presence of female figurines indicated high female status and proved the existence of matrilineal clans in the Upper Paleolithic.

In summary, the legacy from this period was one that saw a switch in prehistoric research from illustrating "prehistoric lifeways" during a particular stage of human prehistory to focus on synchronic as well as diachronic archaeological cultures. These cultures, as elsewhere in Europe, were defined on lithic assemblages, and, like elsewhere, in time

presented archaeologists with a set of unresolved problems. The specifics of these problems and how they relate to questions of chronologic controls over the data are discussed in detail in Chapter IV.

The effects of cracking mega-theory were also felt in the excavations done after 1950. It is not accidental that the discovery of a plethora of sites with small round or oval dwellings, definitely not like Iragois long houses envisioned by Efimenko, occurred after 1950.

D. Paleolithic Research Today

The effects of this complex and mixed legacy still influence Paleolithic archaeology in the USSR. On the one hand, although research interests are clearly centered on a level of middle-range issues (i.e. on archaeological cultures and not on stages of culturo-historic evolution), the ghost of the Theory of Stages can still be felt on the level of unstated assumptions. Davis characterized this traditional view today as one that:

> ...focuses specifically on transitions from one stage to another, and highlights the points of transition. At the moment, however, available theory provides no universally accepted transition points to look for within the Paleolithic. (1983:414)

The theoretical turmoil of the 1950's and 1960's, as Klejn (1977) noted, which led some archaeologists to questions of isolating archaeological cultures and interpreting them in ethnic terms, also brought with it problems of attribute selection for defining archaeological cultures, of

finding their ethnographic correlates, and of tracing the existence of them through time (see the work of Zaharuk 1978; Kabo 1979, for example).

In recent years, as Davis (1983) noted, another major analytic cultural concept has been introduced as an explanation for the observed synchronic variability in the archaeological record--the idea of techno-economic, or as Davis terms them, economico-cultural, groupings. Today, some researchers including Shovkoplyas (1965a) and Gladkih (1977, 1977a) see archaeological cultures reflecting past similarities in techno-economic behavior. This interpretation is in marked contrast to Rogachev's idea that archaeological cultures represent historico-cultural groups. As Davis (1983) pointed out, the basic question for Soviet archaeologists today has become both to denote how archaeological assemblages and features reflect these two potential exies of variability as well as how to perceive each in the archaeological record. This ambiguity in how to interpret recognized archaeological cultures has become even more vexing for the study area, where, as noted, no unanimity exists on the demarcation of archaeological cultures.

Perhaps the most significant recent development in Soviet Paleolithic archaeology, however, one of greater significance for this work, is the tenuous but growing cooperation between archaeology and other natural sciences. While paleoenvironmental questions were always prominent in the work of Ukranian researchers such as Pidoplichko (1976),

today, mostly through the efforts of Academician I. P. Gerasimov, Velichko, and Doluhanov, paleogeography and paleoecology have become an important feature of research in the study area. This focus, however, has been either very site specific, as in the work of Velichko and colleagues (see, for example, Velichko et al. 1977a and the discussion in Chapter III0, or on spatial and temporal scales too gross for concrete questions about human adaptations (see, for example, Doluhanov 1979, 1980, 1982).

In summary, Soviet Paleolithic archaeology today lacks overt and concrete mega-theoretical constructs. The use of archaeological culture as an organizing principle for research has inadvertantly led to focusing research on the behavior of objects and/or features. As elsewhere in Europe, this research focus in necessarily site-specific, where the objects are the units of analysis and a particular site the analytic universe. While growing paleoenvironmental interests, centered as they are on man-land relationships, can potentially change this focus to one of regional perspective, they have to date not done so. Interests in paleoecology, by and large, are seen as secondary in importance by many Soviet archaeologists. Because of this, questions about human adaptation have to be asked within the analytic universe delimited by the primary interests of archaeologists--the site and its cultural identity.

Thus, in spite of a rather different history of prehistoric archaeology in Russia and in the USSR, the state of

research there today is not too dissimilar to that in other parts of Europe. I find great similarities between the current state of research in France and in the USSR. The Francophile orientation, present in Russian archaeology since the very beginning of Paleolithic research in the 1870's, still prevails today and presents Soviet researchers with similar problems as faced by their colleagues elsewhere on the European continent.

IV. SOVIET INTERPRETATIONS OF THE DATE FROM THE UPPER PALEOLITHIC CENTRAL RUSSIAN PLAIN

As I noted previously, while today no unanimity exists in the opinions of researchers about the cultural affinity of the sites in the study area, all researchers do distinguish the Central Russian Plain from Upper Paleolithic regions lying to the east and to the west. This regional delimitation did not always exist and was a by-product of the recognition of archaeological cultures elsewhere. Researchers working from the 1870's to the early 1950's in the area treated the sites as illustrations of this or that period or stage of culturo-historic development (see, for example, Boriskovskii 1953; Efimenko 1939; or Polikarpovich 1968). As I note in Chapter IV, during this early period heated debates were heard about the assignment of this or that site either to the Solutrean, or to the Magdalenian, or to some other evolutionary chronological period. With the introduction of archaeological culture as a research focus, archaeologists

began trying to both isolate these cultures on the Central Russian Plain, as well as to connect them to cultures delimited elsewhere (see, for example, the work of Budko 1966, 1967b, 1969).

Their successors attempted to delimit localized archaeological cultures within the study area itself (see, for example, Grehova 1970; Grigor'ev 1970, 1983). With the advent of the techno-economic explanation for observed synchronic variability in the archaeological record, some researchers advocated seeing regional similarities as reflecting similar techno-economic behavior in the past (see Gladkih 1977, 1977a). Today, as noted previously, no consensus exists on the interpretation of the data from the Central Russian Plain. The area is delimited as a distinct region of Upper Paleolithic occupation and no agreement exists on what specifically distinguished it from other areas--historical ethnic differences and/or different economic pursuits.

V. THE OBJECTIVES AND SIGNIFICANCE OF THIS STUDY

The purpose of this work is multifold and the following three objectives can be singled out as the most significant: 1) to present as completely as possible all of the data available on the sites in the study area, including geographic, geologic, biologic, and archaeologic information, 2) to examine both man-land and man-man relationships during the Upper Paleolithic period in the study area and to offer

models for Late Pleistocene hunter-gatherer adaptations, and 3) to examine evidence for change in human adaptation strategies during the 14,000 years of Upper Paleolithic occupation, as well as to delimit the ecological and social variables responsible for these changes.

In selecting to work with the archaeological record of the Central Russian Plain, a region with over a 100 year history of excavations which generated an abundance of data, I also was interested in seeing how archival and published information already on hand can be used to answer questions of interest to archaeologists today. While in the course of my research I did participate in three field seasons of excavation in the area; I was equally interested in using data already available both to explain the archaeological record, as well as to raise new questions and suggest new directions for research.

This work is an exercise in anthropological archaeology, more precisely in synthetic processual anthropology. Marquardt (1983) defined synthetic processual anthropology as an approach that synthesizes insights of evolutionary cultural ecology with those of historical materialism. As such, this work offers contributions to both archaeology and to the general discipline of anthropology. In the first instance, these contributions are pragmatic or empirical, while in the second they are theoretical.

The empirical significance of this research is noted throughout this chapter. This work offers a culture history

of a major portion of the Upper Paleolithic oikumene and does so from the vantage point of human behavior. The data compiled in this work can be used henceforth by other researchers to answer a number of different questions of general antropological interest. The models I offer for the adaptation of Late Pleistocene hunters and gatherers expand our knowledge about the prehistory of both the study region as well as of Upper Paleolithic Europe in general.

Past hunter and gatherer adaptations are also of general anthropological interest. Our knowledge about these adaptations can only come from archaeological research. This work specifically affects two major enthropological concerns: our theoretical constructs about hunger and gatherer adaptations in general, and our evolutionary theories of culture change.

Extant theories about hunter and gatherer adaptations, be they based on economic behavior (Sahlins 1972), social relationships (Service 1962), or on political integration (Fried 1967), are all based on behavior known from ethnographies. Yet, as numerous authors have pointed out, the ethnographic record does not reflect the full range of variability in human adaptation that existed in the past (see Wobst 1978, for example, on "the tyrrany of the ethnographic record"). Thus, archaeology offers us our only chance of documenting this range of variability. This work amply attests to the fact that adaptations extent on the Upper Paleolithic Central Russian Plain have no known ethnographic analogues and that important aspects of Late Pleistocene

subsistence behavior and of socio-political integration were unique to that time. This uniqueness is not absolute--it is only evident when we compare the archaeological record to our ethnographic sample of hunters and gatherers. Human adaptations in the study area, like those of other Late Pleistocene groups in Europe, differed from those we know of ethnographically. An understanding of these differences, available only through archaeology, is, therefore, important for our theoretical constructs in anthropology (see Chapter VIII for a more extensive discussion of this issue).

Archaeological research in general, and this work on Upper Paleolithic groups on the Central Russian Plain in particular, have significance for theories about culture change also. Our theoretical constructs view change in culture through time as directional and accretional increases in complexity. Cultural complexity, after Flannery (1972) is defined as an increase in the number of structural components of a cultural system. In brief, we perceive culture change as accretional, directional, and as one that leads to ever increasing cultural complexity through time.

Our archaeological record, on the other hand, operating on smaller time scales, is filled with evidence to the contrary. We have, for example, numerous cases of early state collapses in the Near East before the state became fully established (Redman 1978). In Europe, we have evidence that greater cultural complexity in the Upper Paleolithic was followed by simpler patterns during the early Mesolithic. In

the New World we have the enigmatic Hopewell phenomenon which did not develop into a more complex cultural entity but simply fell apart in time (Bender 1982). Thus it appears that our theoretical trajectories for general cultural evolution are not congruent with the archaeological record of culture change. This incongruence can, in part, be explained by invoking the classic distinction between "general" and "specific" evolution (see Sahlins and Service 1960). This explanation, however, does not deal with how the two are integrated. We still are left with a general anthropological question of how changes on smaller time scales are related to general trajectories noted on larger ones. This question, again, can only be answered through archaeological research.

In the course of this work, using time scales in thousands of years, I document fluctuations in cultural complexity through time. These fluctuations, however, disappear from view if the temporal scale is increased to hundreds of thousands of years. They would, probably, appear even more pronounced on time scales smaller than employed in this work. I would, therefore, argue that while on one time scale cultural change can indeed be seen as accretional and directional, on another this smooth ascending line in fact consists of a conglomeration of fluctuations. The existence of these fluctuations in cultural complexity during the Upper Paleolithic, like those documented for other parts of the world throughout the Holocene, suggest that much "trial and error" took place before more complex forms of economic and

socio-political integration became fully established. I will address these issues in greater detail in Chapter VIII.

In summary then, this work both provides new empirical information about the prehistory of Europe as well as offers refinements for our theoretical constructs.

VI. METHODOLOGY AND ASSUMPTIONS

A. Assumptions

While my theoretical assumptions can easily be deduced from the objectives guiding this work, it is useful to state them explicitly. First, following White (1949), I understand culture as mans' extrasomatic means of adaptation. Secondly, after Binford (1962) I view the archaeological record as material remains of past human behavior and, therefore, as an entre into past cultural systems. The second assumption necessarily presupposes a certain degree of uniformitarianism in human behavior through time. In brief, it suggests that past behavior, as petrified in the archaeological record, can be understood through analogy with the behavior known from the ethnographic record. I am well aware of the inherent dangers in using analogies of this sort in archaeology, but would argue that they are appropriate when used with due caution (see Chapter VIII for a fuller discussion of this issue). In this work I use analogy as a heuristic or exploratory device to outline possible contours of past behavior but in no way to delimit it.

Lastly, after Flannery (1972) I view culture as a system

composed of numerous inter-related sub-systems. I see past human adaptations, therefore, as products of the interaction of two major components of culture: the ecological (man-land) relationships and the socio-political (man-man relationships). In my analyses and interpretations of the data from the study area I gave no preference to either one of these two components and argue that both were crucial in shaping Upper Paleolithic adaptations on the Central Russian Plain.

B. Problems With the Data

The nature of available data, as will be clearly seen in discussions in ensuing chapters, is both problematic and leaves much to be desired. These shortcomings will be discussed in detail both in Chapter II and Chapter IV. My analytic universe, 29 Upper Paleolithic sites that span some 14,000 years of occupation, clearly is very small. Many problems exist with the accuracy and representativeness of the data at each site. Only a handful of the sites have been completely excavated, the majority are known from very small excavations and limited test treches. Chronological controls are another major source of difficulties with the data. These complex problems, discussed in detail in Chapter IV, show that much work remains to be done before we can state with certainty either that different parts of any one site or different sites were occupied at the same time. Finally, chronometric dating is available for only a few of the sites considered in this work.

Given these problems, some will argue that no research objectives beyond a purely descriptive presentation of the data are warranted at present. In retort I would suggest that while the data are problematic and the models of human adaptation offered in this work are indeed speculative, the models both account for the archaeological record better than had been done heretofore, and indicate the kinds of data needed for future research. In brief, I argue that our only hope for obtaining better data, ones more suitable to questions about human adaptation, lie in making new questions--ones that call for something other than the kind of information which we have on hand. Lastly, I would also posit that available data are not too weak to use for hypothesis formulation. This is precisely how they have been used traditionally--in this work it is only the nature of the questions asked that has changed. Instead of formulating hypotheses about the relationship of objects, I elected to focus on the behavior of the makers and users of these objects. The hypotheses and models offered about man-man and man-land relationships can, in turn, be evaluated in future work using the same traditional media of archaeological research--objects and features.

C. Methodology

The data used in this work were collected through 1) archival and library research, and 2) an examination of extant archaeological and paleontological collections in the pertinent libraries, museums, and institutes in the USSR.

Information was also gathered during three field seasons of excavation at the Upper Paleolithic sites of Mezhirich and Avdeevo, as well as from research visits to Dobranichevka, Gontsy, Novgorod-Severskii, the Pushakri group of sites, Yudinovo, and the Kostenki-Borschevo sites.

The approach used in this work for reconstructing past adaptations can best be characterized as descriptive modeling. I selected this approach rather than the more sophisticated and rigorous one of predictive modeling for a number of reasons that are related both to the nature of the data base as well as to problems of epistomology. As numerous researchers have indicated, predictive modeling is beset by problems of justification for specific behavioral assumptions, methodological difficulties in reconstructing past environments, and scalar problems (see Bettinger 1980; Jochim 1983; Keene 1983; and Yessner 1981). Predictive modeling is, first and foremost, predicated on accurate environmental reconstruction which, at present, is not possible to do for the Late Pleistocene Central Russian Plain. Furthermore, as I argue in Chapter V, modeling constructs erected on ethnographic analogies fail to consider a potential uniqueness of past adaptations. Thus, by limiting ourselves to what we already know from ethnographies as a starting point for our predictive models, we stand in danger of interpreting the archaeological record of the past as just carbon copies of ethnographically known groups.

Because of these operational and theoretical considera-

tions, I elected instead to investigate and model past adaptations using the excavated archaeologic, geologic, and biologic evidence. This approach, likewise, is beset with problems. These difficulties have both been widely discussed in the literature and will be considered in the ensuing chapters. I chose to work directly with the record itself in spite of all the biases distorting it, because the record does, in the case of the study area at least, come closer to past behavioral realities than do modeling constructs erected on recent ethnographic analogies. Thus, the data from the study sites were used in formulating a series of hypotheses about past human behavior. These hypotheses, when possible, were then tested by a set of simple both parametric and non-parametric procedures commonly employed in archaeological research. Particular statistical manipulations used are described in detail in pertinent sections of this work.

As noted before, my analytic universe was the Central Russian Plain and each site served as the unit of analysis. I considered the region rather than a particular site or sites because human adaptations, both in their ecological as well as in socio-political components, can only be comprehended from a regional perspective (see Johnson 1977; Moore 1981; Wobst 1976, 1977). For some questions requiring different spatial scales, I modified this analytic universe to include, in some cases, intra-site variability, and in others to encompass the whole Russian Plain.

Two chronological scales were used in this work. On

one, I considered human adaptation in the area over the entire Upper Paleolithic period of occupation. On the second I divided this span of time into the Early (26,000-20,000 BP) and Late (18,000-12,000 BP) periods. Justification for the use of both of these scales can be found in Chapters II and IV.

After formulating and testing various hypotheses about Late Pleistocene human behavior, I proceeded to model the subsistence practices, settlement systems, and socio-political integration in the area through time. These models are offered not as firm and unequivocal constructions of past realities, but rather as tentative ones which can be evaluated and modified in future research. In sum, they are what Leach (1973:768) has termed "well informed guesses"--and that is, perhaps, the best we can hope for from Paleolithic archaeology.

VII. CONTENT OF THIS WORK

The organization of this volume follows closely the dual purpose of this work. The beginning chapters present pertinent data: Chapter II on the geography and geology of the study area, as well as on the sites themselves. Archaeological inventories and assemblages found at the sites as well as a brief history of research per site are included in Chapter II. Environmental information on the Late Pleistocene Central Russian Plain is offered in Chapter III, as are data on faunal remains found at each site. These data

are used to model environmental conditions and resource distribution in the region during the various periods of occupation, as well as to predict optimal strategies for exploiting these resources. Chapter IV discusses both relative and chronometric dating of the sites.

Ecological man-land relationships and ensuing subsistence strategies are examined in Chapter V. Chapter VI offers a classification of settlement types present in the archaeological record and outlines settlement systems extant on the Upper Paleolithic Central Russian Plain.

Questions of socio-political nature are considered in Chapter VII. Differences observed in socio-political integration through time are examined for their evolutionary significance, and models are offered for the socio-political integration during each period of Upper Paleolithic occupation. The final chapter summarizes conclusions reached in the course of this work and examines the implications that these conclusions have both for the archaeological record of Upper Paleolithic Europe as well as for theoretical issues in archaeology and anthropology.

CHAPTER II

THE GEOGRAPHY, GEOLOGY, AND ARCHAEOLOGICAL PROFILES OF THE UPPER PALEOLITHIC SITES

I. INTRODUCTION

This chapter will discuss the geography and geology of the Central Russian Plain both today and during the last glacial. It will also briefly site the archaeological remains discovered to date. There are two basic goals in writing this chapter which are, to some extent, independent of each other. First it will provide detailed information on the study region as well as on each individual site--information which is very difficult to obtain for non-Russian reading specialists. This is done to make the basic data available to the English language readers.

The chapter will present geological data on the sites that will be subsequently used to date the sites both through various relative biostratigraphic methods (both biological and geological). This geologic information will also serve as a control in chronometric dating. Geographic information presented on the location of the sites will be used to examined for regularities in site placement and to discern patterning in the site distribution across the study area. The archaeological data presented briefly in this chapter will be examined in detail in the subsequent chapters.

I will first discuss the present-day geography and geomorphology of the study region. Then I will consider the Pleistocene geology and geochronology of the region. This discussion will be followed by a detailed description of the sites themselves. In the final segment of the chapter, I will focus on the patterning in the distribution of the sites across the study area as well as on the locational relationships between the sites.

II. THE GEOGRAPHY AND GEOMORPHOLOGY OF THE AREA

A. Introductory Description

The Russian Plain, a vast area occupying the southern half of the European USSR, is the easternmost extension of the East European Plain. It is bordered on the west by the uplands and foothills of the Carpathian Mountains and on the east by the increasing elevations that terminate in the Ural Mountains. The Plain is drained by a number of major river systems which flow from north to south either into the Black Sea or into the Sea of Azov. The majority of the known Upper Paleolithic sites are located in the river valleys and form distinct Upper Paleolithic site cluster regions. These are the Dnestr sites of Molodova and Korman, the Don Kostenki-Borshevo sites, and the Dnepr-Desna sites discussed in this work and illustrated in Figure I -2 (Ivanova 1969; Gvozdover and Rogachev 1969).

The study area where the sites discussed in this work are located covers approximately 180,000 km^2 (see Figure II-2).

This region is drained by the river Dnepr and its main tributaries: Desna, Pripyat', Sozh, and Sudost'. As Figure I -1 shows, the central portion of the Russian Plain today is predominantly located in the Ukrainian SSR, although its northern segment lies within the territories of the Byelorussian SSR and the Russian SFSR.

The midsection of the Russian Plain, called the Central Russian Plain in this work, consists of three contrasting geomorphological units illustrated in Figure II-3. They are: the Polissya Lowlands in the north (located to the west of the Dnepr River), the Dnepr Uplands lying south of the Polissya and west of the Dnepr, and the Dnepr-Donetsk Lowlands to the east of the Dnepr. All three of these units are part of the Russian Platform which is made of crystalline bedrock formed at the beginning of the Devonian period and covered through the subsequent Paleozoic, Mesozoic, and early Cenozoic with sedimentary deposits of clay, sand, marl, and chalk. In the Polissya these sedimentary layers are in turn covered by Dneprovskiye (Riss) terminal moraines. The crystalline bedrock, sedimentary layers, and moraines are overlain by Pleistocene loess deposits (sandy loam, loam, loess-loam) which range in thickness from 30-50 meters in the south to under 10 meters in the north (Geografiya Byelorussii 1977; Soviet Ukraine 1965; Velichko 1961; Voznyachuk et al. 1969b).

The altitudinal differences between the Uplands and the Lowlands are due to the irregularities in the crystalline

foundation of the Russian Platform and are minor in nature. The Dnepro-Donetsk and the Polissya Lowlands lie on the undisturbed portion of the Platform while the Dnepr Uplands are on the uplifted southwestern part of the Platform known as the Ukrainian Shield. The Dnepro-Donetsk Lowlands average 100-130 meters above sea level in the south and 140-160 meters in the north, the Polissya Lowlands are from 100-150 meters above sea level, and the average elevation of the Dnepr Uplands is about 175 meters with a maximum of 220 meters above the sea level (Geografiya Byelorusii 1977; Ukraina 1969).

B. The River Terraces

The main relief-forming factor on the Central Russian Plain is erosion as seen in river valleys and ravines. The Dnepr and its major tributaries are all mature rivers with broad flat valleys which show up to four terraces representing different erosional episodes during the Late Pleistocene. Each was cut during a warm interglacial or interstadial period. An important feature of the river valleys here is their asymmetry. They all have one steep and terraced erosional bank (the right, western or northern one) and one low-lying depositional (the left, eastern or southern one) bank (Ukraina 1969). As Velichko (1961) points out, this asymmetry is due to the Coriolis force and is more pronounced on the rivers which flow diagonally or horizontally across the plain (e.g., parts of the Desna, Pripyat', and Sudost').

The valleys of the Desna and Sudost', extensively investigated by Velichko (1961) over a twenty year period show

this feature of asymmetry most clearly. The Desna and its numerous tributaries all form a large valley lowlands system up to 30–40 km wide. The right or northern banks are steep and terraced while the left or south banks are expansive and low-lying valleys filled with alluvium. The present-day floodplains are wide as well, stretching up to 3–5 kilometers. Today the low-lying left banks of both the Desna and Sudost' are heavily forested and swampy.

The Pripyat' is a more meandering river which shows similar asymmetry in its valley. The Polissya Lowlands through which the Pripyat' flows, were partially covered by ice during the last glaciation, and as Voznyachuk et al. (1969a) point out, the retreat of the Fennoscandian Ice Sheet from this region activated thermocarstic processes and resulted in the formation of hundreds of lakes and extensive swampy areas in the Polissya Lowlands.

The Dnepr Valley has the same asymmetrical construction especially pronounced in its north-eastern section where the river meanders a great deal as well as in the river's middle section where it flows along the Ukrainian Shield (from just south of Kiev to Dnepropetrovsk).

Table II-1 shows the heights of the river terraces along the Dnepr and its main tributaries. The higher and older fourth and third terraces were formed prior to and during the Mikulino (Riss-Würm) Interglacial. These terraces, because of differential erosion, are not seen along all of the rivers. The second terrace, lying approximately 10–25

meters above the present river levels, was formed during an interstadial of the last Valdai glaciation, possibly during or just prior to the Bryansk Interstadial and dates, according to Velichko (1961), to some 25,000-30,000 B.P. Voznyachuk et al. (1969a, 1969b) date the formation of this second terrace somewhat earlier. Their ^{14}C dates for the alluvial deposits on this terrace taken at the locality of Krasnaya Gorka span a period from 30,000-45,000 B.P. The second terrace is important for archaeology as most Upper Paleolithic sites are found either on it or in nearby plateau and slope deposits associated with it.

The first terrace lies up to 10-12 meters above the present river and was formed at the end of the Valdai glacial period, well past the cold maximum. Voznyachuk et al. (1969a, 1969b) state that the alluvium of the first terrace of the Dnepr and Sozh was deposited between the start of the recession of the Fennoscandian Ice Sheet from its terminal moraines and the Allerød or Late Dryas. This would date the alluvium to a period between 15,000 and 12,000 B.P.

It is important to note here that only the terraces of the Desna and Sudost' have been adequately investigated, and terraces of the different segments of the rivers tied to one another. As a result, because of extensive work by Velichko, our best and firmest terrace chronology comes from these river valleys. The history of the terrace formation of other rivers is far less clear. Klein (1973) noted over ten years ago that because of the different erosional,

depositional, and tectonic histories of the different regions of the Russian Plain, terraces along the different rivers are neither in phase with each other nor, in some cases, are the terraces of the different segments of the same river in phase with each other. This last observation is especially true for the longer rivers such as the Dnepr which flows through areas with very different tectonic and glacial histories. In the upper reaches of the Dnepr eustatic uplift occurred during the Late Pleistocene as the Fennoscandian Ice Sheet receded, while in the lower reaches, the fluctuations of sea level created different erosional and depositional sequences.

C. Ravines

As mentioned above, the other relief generating feature found in the Central Russian Plain are ravines. These are erosional features which occur on loess plateaus adjacent to the river valleys as well as on terraces. Ravine formation appears to have gone on throughout the Late Pleistocene along the Dnepr and its tributaries, facilitated by the presence of soft loess matrix. As Velichko (1961) notes, the ravine-indented topography of the river valleys is most clearly seen along the Desna where today some of the older ravines run 5-10 kilometers in length, with 20-40 meter wide bottoms, and 10-12 meter depths. These ravines in places resemble small river valleys. Their importance for archaeology is two fold. First, at many Upper Paleolithic sites, post-depositional ravine formations have either totally eroded

parts of the living floor or eroded and relocated them down the ravine slopes (e.g., Berdyzh, Chulatovo II, Kurovo, Mezin, etc.). Secondly, Late Pleistocene ravines created plateau and terrace promontories over the rivers, and these promontories were preferred locales for Upper Paleolithic sites. Finally, the ravines may have played an important role in mammoth-procurement strategies during the Upper Paleolithic. Figure II-4 depicting the topography of the area of the Pushkari Group of sites, clearly illustrated this nature of the Desna ravines.

III. PLEISTOCENE STRATIGRAPHY AND CHRONOLOGY

A. Introduction

The geological dating of the Upper Paleolithic sites of the Russian Plain has undergone a major revision within the last twenty-five years. Since many of the sites discussed in this work were investigated and published in the 1920s and 1930s, before Soviet geologists and archaeologists accepted the glacial chronology used in the West, it is germane to briefly discuss the state of Pleistocene chronology in the USSR both today and in the recent past. At the onset of this discussion it is important to note that Soviet Paleolithic research has a long history of collaboration between archaeologists and geologists. As the previous chapter showed, Russian and Soviet Paleolithic archaeology was modeled after and grew out of the classical French school of prehistory of de Mortillet--a school heavily committed to geology. This collaboration however, while firmly grounding

archaeological sites in a geologic and stratigraphic context, also produced a number of major difficulties with the chronology of the sites. At the end of the nineteenth century and during the first thirty years of the twentieth century, Russian and Soviet geologists working at such sites as Gontsi, Kirilovskaya, Mezin, and Suponevo accepted and used the classic European Penck and Brückner scheme of Pleistocene glaciations as can be seen in the works of Mirchink (1934, 1937).

This generation of geologists, however, was suceeded by a new breed of "monoglacialists" led by Gromov (1933a, 1933b, 1936). Gromov's major thesis on the Pleistocene chronology and geology of the Paleolithic sites, published only after the war in 1948, was based on a theory that saw the penultimate Dneprovskoye glaciation as the only Pleistocene glaciation. Gromov saw the following Mikulino interglacial and Valdai periods as a post-glacial time devoid of any advances of the ice sheet or climate deterioration. This view was widely accepted and his stratigraphies used by archaeologists as well (e.g. Efimenko 1939). All of this resulted in the assignment of the Upper Paleolithic period to the end of the Mikulino and the beginning of the Valdai period. Gromov, for example, accepted the French subdivision of the Upper Paleolithic cultural sequence, and equated the Aurignacian with the second half of the Riss-Dneprovskoye and the first half of the Eem-Mikulino, the Solutrean with the Eem-Mikulino, and the Magdelenian with the Würm-Valdai

(Velichko 1961).

The existence of a glaciation after the Riss-Dneprovskoye was again advocated in the work of Gerasimov and Markov (1939). Their monograph not only showed evidence for this glaciation on the Russian Plain, but also firmly placed Upper Paleolithic sites of the Russian Plain within the Valdai deposits. It is only with this reacceptance of the European glacial sequence that the Russian Upper Paleolithic sites once again became consistant with West European ones. The 1961 monograph by A. Velichko, Geologicheskii Vozrast Verhnego Paleolita Tsentral'nih Raionov Russkoi Ravnini, firmly established the late Valdai age of the sites and proposed a uniform stratigraphic scheme and chronology for the major river valleys and adjacent plateaus of the Russian Plain. This scheme is currently widely used by Soviet archaeologists and will serve as a basis for the following discussion.

B. Valdai Glaciation

1. Chronology. The Late Pleistocene chronology and climatic oscillations based on the data from the Russian Plain and widely accepted by Soviet scholars are as follows (Velichko 1973; Vigdorchik et al. 1974):

Time (B.P.):	Name
10,000	Holocene
	Valdai Glaciation
70,000	
	Mikulino Interglacial
125,000	
	Dneprovskoye Glaciation

As column 1 in Figure II-2 shows, however, this chronological scheme does not take into account the most recent revisions suggested for the Late Pleistocene chronology based on the work of Woillard (1978, 1979, 1982), and Morner et al. (1974). Briefly, these data indicate that the Eem-Mikulino Interglacial period was a brief episode lasting some 10,000-20,000 years at maximum and that the last glacial period, the Weichsel-Valdai, began much earlier than hitherto accepted--some 105,000-115,000 B.P.

Soviet researchers divide the Valdai period itself into three stages as follows (Doluhanov 1982; Velichko 1973; Vigdorchik et al. 1974):

Late Valdai	25,000- 10,000 B.P.
Middle Valdai	25,000-50/55,000 B.P.
Early Valdai	50/55,000- 70,000 B.P.

This subdivision of the last glacial likewise is somewhat at odds with the current views of such West European researchers as Woillard (1982). The disagreements, however, pertain to the subdivision of the first half of the period as well as to the location of the last interglacial--last

glacial boundary. Woillard (1982), for example, writes that the early Weichsel can be dated from approximately 105,000-115,000 B.P. to about 70,000 B.P., and the middle Weichsel from 70,000-25,000 B.P.

In Soviet literature the early and middle Valdai, was, until recently, seen as a non-glacial part of the last glaciation with a long expanse of time that saw no ice on the Russian Plain (Chebatareva and Makaricheva 1974, Velichko 1973, Vigdorchik et al. 1974, Voznyachuk 1973). It was, however, a period of some warm-cold oscillations. As Klein (1973) pointed out, this long period was not fully recognized or segmented, but was seen as a long "megainterstadial". Recent work by Zarrina et al. (1980) and Doluhanov (1982) has broken down this period of oscillations into the sequence illustrated in Table II-3. In general, it can be concluded that while this long time period was one of fluctuating climate, these fluctuations were not major in nature when compared to those which occurred during late Valdai. It is at present difficult to correlate the fluctuations observed on the Russian Plain with those documented in Western Europe—a tentative correlation is offered in Table II-3.

The end of this middle Valdai period is of particular relevance to this work as three of the Upper Paleolithic sites may date to this time: Berdyzh, Khotylevo II, and Yurovichi. The period between the onset of cooling at 30,000-35,000 B.P. and the Valdai maximum is not that finely delineated on the Russian Plain into clear sequences of

fluctuations (Doluhanov and Pashkevich 1977, Gerasimov 1973). The presence of several relic soils in the Dnestr-Molodova stratigraphy suggests that some fluctuations did occur, but were not major in nature (Ivanova 1977; Polevoi 1974, Figure 4). The overall trend for this ten thousand year period between 35,000-25,000 B.P. was towards decreasing temperature , increasing aridity, and increasing continentality in the area with just minor fluctuations of the ice sheet.

Damper, but still cold interstadial conditions existed at the close of the middle Valdai, about 27,000-24,000 B.P., called the Bryansk Interstadial by Velichko (1973). Chebatareva and Makaricheva (1974) place the Bryansk Interval in a time period between 30,000 and 24,000 B.P. Dates for the humus of the soils formed at this time are: at Bryansk 24,920 $\pm$1800; 24,200 $\pm$1680 at Mezin; and 24,000 $\pm$300 (IGAN) at Arapovichi on the Russian Plain (Velichko et al. 1969b). This interstadial period of soil formation has been correlated with the Paudorf or Stillfried B period of Western Europe (Doluhanov and Pashkerich 1977, Gerasimov 1973, Velichko 1973). Fink (1969), however, warns that it is preferable to use the term Stillfried B for the correlate, as the Paudorf soil is not synchronized all over Europe and this presents a confusing picture for correlation. Austrian Stillfried B is firmly dated to 28,120 $\pm$200 (Gro. 2533) and 27,990 $\pm$300 (Gro. 2523). This same soil layer appears in many stratigraphic sequences of Eastern and Western Europe where it is classified under different terms ranging from the PKI soil of Czechoslovakia

to Paudorf soil.

A number of problems exist, however, in correlating soil profiles not only between sequences separated from each other by long distances but also from those within smaller geographic regions. As Voznyachuk (1978, personal communication) notes, even the Bryansk soil of the Russian Plain is discontinuous, found at different heights in different localities, varies in thickness, and presents too wide a range of dates to be an unquestionable chronological or stratigraphic marker. Veklich (1974) correlated the formation of the Bryansk (in his terminology Vitachevskaya) soil not with the 25,000-30,000 year period but with an earlier interstadial episode dating to 48,000-52,000 B.P. Great difficulties exist when correlations are attempted between more distant locales. Frenzel (1973) rejects the correlation of Stillfried B with the soil level dating from 23,000-24,000 B.P. He suggests that this soil level, found in Arcy-Sur-Cure, Dolni Vestonice, Molodova, and, by extension, at the Central Russian Plain sites, lies above the Stillfried B soil, is younger than it, and in fact reflects a different warming period than the Stillfried B interstade. He suggests that it may possibly correlate with the Tursac interstade.

As Fink (1969) notes, the correlation of Stillfried B-Bryansk soil is problematic also because the Stillfried B horizon is pale brown-grey steppe soil and the Bryansk soil is a chernozem. The correlations offered in this work,

therefore, should be taken only as approximate and tentative and be used only for establishing relative chronologies. The discontinuity of strata formation as well as the fact that erosional and depositional sequences are out of step over large areas all combine to create both spatial and chronological discontinuities in stratigraphy and, therefore, limit the usefulness of specific deposits as time markers.

The chronology of the Late Valdai, a period that Velichko (1973) calls Glacial Valdai, is illustrated in Table II-3. It was during this period that the Fennoscandian Ice Sheet reached its maximal size and covered over 828,000 km^2 of northern latitude Europe including approximately 300,000 km^2 of the USSR (Chebotareva 1969a, Voznyachuk 1973). As Figure II-5 shows, during the Belogoye stage of its maximal spread (18,000-20,000 B.P.) the ice sheet extended down to about the 55th parallel. The massive Fennoscandian Ice Sheet was 3,000 meters thick and extended some 1,200 km south of its center (Chebotareva 1969b). On the Russian Plain the ice sheet was separated into three lobes--the southwestern, southern, and southeastern. The southwestern and southern lobes penetrated furthest onto the Plain (Grichuk et al. 1975). During this Belogoye glacial maximum the ice front was located some 150-200 km north of the northernmost Upper Paleolithic sites.

The occurrence of the Valdai glacial maximum at 20,000-18,000 B.P. can be dated worldwide. Chebotareva (1969a) correlates it with the Brandenburg deposits in Germany. It finds correlates in the Würm III in France, in Mörner's (1972)

data from Sweden, and Mania's German data (Mania 1969). Global sea level and marine isotope curves place the Würm-Valdai-Wisconsin ice volume maximum at 18,000 B.P. (Climap Project Members 1976). The history of the Wisconsin glaciation of North America also shows that the maximal spread of the Laurentian Ice Sheet occurred between 20,000-17,000 years ago (Andrews and Barry 1978; Dreimanis and Goldthwait 1973; Mörner and Dreimanis 1973).

Two important features of the Russian Plain during the Valdai maximum should be noted here. First, on the southern border of the Plain the two bodies of water, the Black Sea and the Sea of Azov, were very different than at present. Chebotareva and Makaricheva (1974) state that there was no Sea of Azov and that the Black Sea was from 87-90 meters lower than today. This drop in the sea level decreased the area of the Black Sea by some 320,000 km^2 and turned it into the New Euxine Basin--a body of fresh water fed glacial meltwater by the enlarged Dnepr and its tributaries (Vigdorchik et al. 1974). The second important feature found on the Russian Plain at Valdai maximum is the presence of glacial lakes at the edges of the Fennoscandian Ice Sheet. Aseev et al. (1973) report that during the Valdai glaciation glacial meltwater in this area drained into large glacial lakes which at peak stadial periods overflowed and the meltwater drained along the interfluves into the rivers of the Russian Plain. This suggests, as Doluhanov (1982) points out, that the nature of both the drainage system and

load carried by the rivers of the Russian Plain were indeed vastly different during the late Würm-Valdai period. Doluhanov (1982:10) writes that in late Würm-Valdai:

> ...the ice-dammed lakes obtained access to the rivers flowing in the southerly direction, towards the Black and Caspian Seas. These rivers became channels which drained the ice-dammed basins, and in many cases turned themselves into chains of lakes.

As he notes, the great majority of Upper Paleolithic sites of the Russian Plain were situated either on the shores of these channels or on the shores of the ice-dammed lakes. The presence of these water bodies profoundly affected the distribution of vegetation on the Russian Plain as well as the distribution of fauna-features which will be discussed in Chapter III in detail.

The second important phase of the late Würm-Valdai glaciation occurred in the late glacial period of 18,000-10,000 B.P.--the period of ice retreat. As elsewhere, the ice retreat did not occur unidirectionally, but rather was spasmodic with a series of readvances followed by greater retreats. The recessional intervals of the Würm-Valdai glaciation on the Russian Plain are illustrated in Figure II-6. This figure shows a series of sequential advances and retreats which resulted in extremely fluctuating climate conditions during this time period. The Erdovo-Frankfurt and Vespovo-Pomeranian stages were major in nature, for then the ice sheet readvanced almost to its previous moraines. As Voznyachuk (1969) notes, the ice sheet was present in

Byelorussia until approximately 14,000 B.P.

The rate of the ice retreat varied greatly, from approximately 190-200 meters per year during the early stages of retreat (ca 15,000 B.P.) to over 400 meters per year in later stages (Chebotareva 1969b). It is important to note that the drainage pattern described above prevailed until approximately 14,000-15,000 B.P., when the ice sheet retreated sufficiently for meltwater to begin draining north into the Baltic Sea (Chebotareva 1969b).

The spasmodic fluctuations in the Fennoscandian Ice Sheet created during this time period a series of alternating stadial-interstadial climatic conditions with the major interstadials being Ula-Somino-Lascaux (?) interstade at 16,260 ±640, Raunis at 13,390 ±500, Bölling at 12,430 ±100-12,260 ±150, and the Allerød at 11,500 ±400 (Chebotareva 1969a, Gerasimov 1969). These will be discussed in detail in Chapter III.

The evidence for the readvances and retreats of the ice sheet on the Russian Plain correlates well with the data collected elsewhere in Europe. Similar patterns are shown by the Frenzel (1973), Leroi-Gourhan (1965), and White (1980) data. Mörner (1969) and Mörner and Dreimanis (1973) report that the Scandinavian, Belgian, German, and British data show the existence of at least two glacial maxima, with the second, Zurich phase, dating to 14,470 ±385 B.P. As Mörner and Dreimanis (1973) show, the presence of three glacial maxima, the major at 20,000-17,000 B.P., and the others at 16,500 to

15,000 and at 14,850 is reflected both in the O-18 curves of the Greenland ice cores and in ocean levels. How worldwide this pattern was and how well synchronized the different readvances and retreats of the different ice lobes of the major ice sheets and mountain glaciers is very difficult to state. Dreimanis and Goldthwait (1973), for example, argue for the worldwide occurrence of them, presenting the Erie Interstade at 15,500 ±500 and Cary-Pt. Huron Interstade at 13,300 ±400 in North America as evidence. Mörner and Dreimanis (1973) write that the New World glacial record shows that the Laurentian Ice Sheet retreated furing the Erie Interstade from its Wisconsin maximum position in central Ohio all the way to the eastern portion of Lake Erie, and then returned back to Ohio during the subsequent stadial phase. Wright (1976) also reports three or more ice lobe fluctuations in the Wolf Creek area between 20,000 and 12,000 B.P. This evidence clearly suggests that the late glacial period was: 1) an extremely fluctuating one, and that 2) some of the oscillations were of major magnitude and continental, if not worldwide, in extent.

2. Stratigraphy. Velichko (1961, 1966, 1973, 1975) and his paleogeographic team from the Institute of Geography of the Academy of Sciences of the USSR have for the past twenty years been developing a Late Pleistocene stratigraphy of the Dnepr and Desna. This stratigraphic scheme will serve as a basis for the discussion below. This section will focus on the deliniation of the middle and late Valdai deposits as

these contain Upper Paleolithic sites. We must briefly, however, mention the fluvio-glacial deposits that date to the penultimate glacial as well as soils formed during the last Mikulino interglacial. These pre-Valdai deposits often find surface exposure along the river banks in the Dnepr and Desna basins.

The penultimate Dneprovskoye glaciation covered a great deal of the Russian Plain with ice which left in its wake the Dneprovskoye terminal moraines. These moraines are present in the northern parts of the study area. As the section on the geomorphology of the Russian Plain showed, these fluvio-glacial deposits overlie Tertiary marls and chalks. The Dneprovskoye moraines are in turn overlaid by the Mikulino chernozem soil which Velichko (1961) calls Mezin soil. Velichko's general Valdai stratigraphy is illustrated in Figure II-7.

Velichko's scheme shows that climatic conditions during interglacials and interstadials favored chemical erosion and soil formation while those during glacial and stadial periods favored the action of wind as the main agent of erosion. These glacial and stadial periods witnessed the deposition of windblown sands, sandy loams, and loams collectively called loess (Velichko 1969b). He describes loess as a dust deposit with characteristic difractional and chemical properties and includes size-graded deposits from loam to silt and to sand, all of which were transported by wind as well as by water. The origin of loess is still a moot point for geologists.

Kukla (1975:105) writes that while it was once widely held that European loess originated in glacial outwash,

> ...It is now believed that the bulk of the sediment was picked up by wind from seasonally dried flood-plains of the intermittent Pleistocene rivers and from the mechanically weathered hard rock outcrops in the neighboring highlands.

The northernmost limit of loess deposits lie some 50 km south of the margin of Valdai ice. They form thick deposits which in the central portion of the Russian Plain range in thickness from 1-2 meters in the northern lying Byelorussia to some 30-50 meters in the southern Ukraine (Ukraina 1969; Voznyachuk et al. 1969). Pleistocene loess deposits are found all along the East European Plain (Kukla 1975). On the Russian Plain they stretch from the Carpathians to the river Don and beyond and can be seen best in undisturbed conditions along the plains and plateaus of the area. On sloped terraines such as old ravines, as well as along the river valleys, alluvial and colluvial processes predominated. As a result the Valdai deposits in the valleys and ravines include fluvio-glacial moraine sands, loess, as well as re-worked loess-colluvium, alluvial sands and clays (Velichko 1969b). In the study area loess deposits are the thinnest and most patchily distributed in the northern part of the Russian Plain in Byelorussia and the Polissye where they appear in patches on morainic hillocks (Velichko 1969b; Voznyachuk 1973).

As Figure II-7 shows, the Valdai loess contains relic soil within it as well as embryonic humic gleyed layers. These gleyed layers are evidence for the early stages of soil formation. The presence of these relic soils and gley layers permit Velichko (1961) to divide the Valdai loess deposits into Loess I, Loess II, and Loess III. Loess I (Khotylevo loess) was formed during Early Valdai. It is 5-6 meters thick in the Desna region and it is separated from Loess II (Desna Loess) by the fossil Bryansk soil. This Bryansk soil is humus poor and divided into two horizons. The ^{14}C date on the humic content of this soil were presented above and are (Velichko et al. 1969b, 1981):

24,000 ± 300 at Arapovichi
24,200 ±1680 at Mezin (Mo 342)
24,300 ± 370 at Mezin (IGAN 88)
24,210 ± 270 at Mezin (IGAN 80)
24,920 ±1800 at Bryansk

As Morozova (1969) and Velichko et al. (1969b) show, the Bryansk soil contains a great deal of permafrost deformation features within it. These include funnel-shaped wedges filled with humus and suggest that periglacial polygon-like nets with 2-3 meter polygons and medallions were present in the soil during the Bryansk interstadial. Morozova (1969) describes this soil as quite unique, having been formed under permafrost conditions, and as having no analogues today. She sees it somewhat similar in micro-structure to the soils found today in Central Yakutia, USSR, where cryogenic processes cause similar periglacial

deformations as seen in the Bryansk soil. Velichko et al. (1969b) suggest that Bryansk soil was formed on permafrost which had a seasonal thaw layer ranging from less than 0.4-0.5 meters around Bryansk to 0.8-1.0 meters in the center of the Russian Plain and as much as 1.0-1.5 meters in the Ukraine. The presence of these periglacial deformations is extremely important for paleoclimatic and paleoenvironmental reconstruction and will be discussed in detail in Chapter III.

The Bryansk soil is topped by the Loess II (Desna loess) deposit. This loess layer does not contain permafrost deformations, although its structure suggests that the bottom of the layer, that part which overlies the Bryansk soil, was formed in a warmer and wetter period than the top of the layer (Morozova 1969). Both Loess II and the overlying Loess III show much swifter rates of deposition than does Loess I. Grichuk (1969b) postulates that Loess I accumulated at the rate of approximately 0.07 mm per year (or less) while Loess II and Loess III were deposited at a rate of 0.6-0.7 mm per year. This observation reinforces Doluhanov and Pashkevich's (1977) and Gerasimov's (1969) views that the Late-middle and Late Valdai periods were characterized by greatly increased aridity, decreased temperatures, and increased continentality which culminated in the Valdai maximum at 20,000-18,000 B.P. Loess II was deposited during the interval between the Bryansk interstadial and the Valdai maximum--i.e., between 24,000 and 18,000 B.P.

Velichko reports that a relatively thin single gleyed layer separates Loess II from Loess III (Altynov loess). It is a layer that ranges in thickness from 0.2-0.3 meters. Velichko et al. (1969b) correlate the deposition of this layer with the occurrence of an interstadial period, possibly the Somino-Ula-Lascaux interstade at approximately 16,000 years before present.

Loess III (Altynov loess) is present in the Desna region in 2-3 meter thick deposits which contain in them 4-5 meter deep ice wedge casts that extend into Loess II. In addition to these casts, other localities such as the village of Timonovka, show the presence of ice wedge polygons along both the river valleys and on the plateaus during the time that Loess III was deposited. The presence of both ice wedge casts and polygons indicate the presence of permafrost conditions during the time that Loess III was deposited. Grichuk (1969b) as well as Chebotareva (1969b) indicate that Loess III continued to be deposited all through the Dryas I and Dryas II periods, terminating only at the onset of the Allerød some 11,500 years ago.

The permafrost phenomena found in Loess III are far more extensive and severe than in the Bryansk soil layer, suggesting much more severe cryogenic processes, and seasonal thaw layers that were from 1.5-2 meters deep in the northern part of the Russian Plain and from 2-3 meters deep in the southern part (Velichko 1969b). Velichko (1975) believes that extensive polygonal nets extended as far down

as the 45th-47th parallel during this time period.

The Valdai stratigraphic column terminates with a layer of relic Timonovskaya soil formed during the Bölling and pre-Boreal periods. This soil is in turn covered by the contemporary soil which began forming at the onset of the Holocene (Velichko and Morozova 1969c).

3. Stratigraphic Problems. As noted before, the working scheme for the periodization of Late Valdai used here is modeled closely on the one offered by Velichko and is based on the loess stratigraphy of the Desna region. However, there are a number of problems with this sequence evident both in the Desna stratigraphy itself as well as in extending this sequence into other river valleys. First, both the Bryansk soil layer and the single gley layer found below Loess III are not found equally well represented in all localities nor at equal depths. This makes the use of either one as chronologic markers quite difficult and presents a number of problems. For example, Velichko (1961) reported that the cultural layer of Pushkari I was found directly above the Bryansk soil and postulated that Pushkari inhabitants walked on this soil surface. Recent re-excavations at Pushkari I now indicate that the cultural layer overlies the gley layer and not the Bryansk soil, as this soil is to be found further down in the deposit (Grigor'ev 1981, personal communication).

The Ukrainian geologist Veklich (1974) working in the Dnepr region also on loess stratigraphy, has outlined a

rather different and more complex scheme which often appears in the Ukrainian literature (see Pashkevich and Dubnyak 1978, for example). Veklich's Late Valdai chronology can, however, be loosely correlated with Velichko's and these correlations are presented in Table II-4.

A different stratigraphic scheme for this same time period is offered by the Byelorussian geologist Voznyachuk (Voznyachuk et al. 1969a). His work, based on the alluvial, colluvial, and morainic deposits of Byelorussia (a region north of the extensive Late Pleistocene loess deposition) suggests also a more complex stratigraphic history than outlined by Velichko. For example, Voznyachuk's scheme suggests the existence of an interstade between the Bryansk interstadial (at 27,000-24,000 B.P.) and the interstadial Velichko associates with the gley layer (at 16,000-17,000 B.P.). Voznyachuk's scheme suggests an interstade prior to the Valdai maximum at 18,000-20,000 B.P.--a period of climatic amelioration occurring some 21,000 B.P.

This amelioration does not find corroboration at present in the Desna or Dnepr loess sequences where the Loess II deposits (laid between 24,000 and 18,000 years ago) appear uninterrupted by any soil formation processes. Kozłowski and Kozłowski (1979) report that the German scholars also find evidence that the Valdai maximum (termed Last Pleniglacial) was divided into two segments: they recognize the existence of an earlier phase of the Pleni-glacial taking place between 24,000 B.P. and approximately

21,000 B.P.; then a warmer interphase or interstade dated at approximately 21,000 B.P., and finally, the Valdai (Pleniglacial) maximum itself at 20,000–18,000 years ago. In brief then, this suggests that the period of 24,000 to 18,000 B.P. which Velichko sees as a period of slow and uniform growth of the Fennoscandian glacier of its maximal size may indeed have been interrupted by a warm fluctuation or interstade at about 21,000 years ago.

Similar problems exist in correlating the Desna Loess III stratigraphy. It will be recalled from a previous discussion that this deposit is dated by Velichko from about 16,000–17,000 B.P. to approximately 12,000 B.P. It terminated with the layer of Timonovka relic soil, the only soil associated with Loess III. Pashkevich and Dubnyak (1978) report the presence of a gley layer (or relic soil layer) at the site of Dobranichevka which seems to lie higher than the gley layer and below the Timonovka soil layer—this layer is not reflected at present in the Desna sequence. Ivanova's (1977) Late Valdai stratigraphy from the Dnestr terraces shows the presence of a layer of humic loam above the Bryansk soil (a correlate of the gley layer in the Desna sequence?) as well as the presence of two gley layers above that in Loess III. All of these observations again point to the difficulties at present in correlating the observed Desna sequence with those of other river valleys in the study area. They suggest that the scheme offered by Velichko may indeed be too simplistic and should be used only

tentatively and only for a first approximation when dating cultural layers of the Upper Paleolithic sites on the Russian Plain. It is used in this work not because of its strict accuracy and comparability with all of the other sequences--but because it is the most extensive and uniform scheme for the study region at the present time and the only one that incorporates a number of the Upper Paleolithic sites considered in this work.

It should be also noted that the stratigraphic scheme for the Desna Late Pleistocene deposits offered by Velichko, problematic though it may be, does find broad agreement in the stratigraphies of Central and Eastern Europe. For example, the Mende exposure in Hungary similarily shows the broad loess subdivisions outlined by Velichko (M. Pecsi, M. Pevzner, and E. Szebenyi 1979). The difficulties in using this scheme for stratigraphic dating of the sites will be discussed in Chapter IV.

IV. THE GEOGRAPHY, GEOLOGY, AND ARCHAEOLOGICAL PROFILES OF THE UPPER PALEOLITHIC SITES

A. Introduction

This section will present the geology and geography of the Upper Paleolithic sites of the Central Russian Plain as well as summarily introduce the archaeological discoveries. First I will briefly describe the location and stratigraphy of each site as well as the nature of its cultural layer or layers. Additional names by which the sites also appear in the literature are indicated in parentheses following the

name used in this work. The sites will be considered in alphabetical order with the exception of the Pushkari Group of sites (i.e., Pushkari I, Pushkari II, Bugorok, and Pogon). These will be discussed as a unit under the heading of the Pushkari Group. As will be shown below, these sites are located less than 400 meters from each other and in some cases their cultural layers partially overlie one another. The small scale of excavations conducted there preclude us from stating with certainty whether they: 1) represent different sites or are all portions of the same site, 2) represent different time periods of occupation, or if 3) all of them are sites (i.e., contain in situ or disturbed living floors) and not just sections of daily surface of the region. I will offer my own analysis and interpretation of the Central Russian Plain sites in Chapters V and VI .

Faunal remains found at the sites will be briefly presented in Chapter III using both estimates of the minimal number of bones (MNB) and minimal number of individuals (MNI) per species. The problems involved with these estimates as well as the rationale for using these figures will be discussed in detail in Chapter III. Similarily, large above-ground constructions of mammoth-bone termed mammoth-bone dwellings in both Soviet and Western literature will be listed in this chapter as dwellings . I will explain in detail these constructions in subsequent chapters.

Following the presentation of the sites, I will outline some general principles of site selection which appear to

have influenced the settlement preferences of the Late Pleistocene hunters and gatherers. Finally, in the conclusion of this section, I will address questions of general site patterning and distribution of the sites on the Central Russian Plain in an attempt to tentatively sketch the settlement system that existed there in Late Valdai.

Table II-5 presents the summarized locational and geologic data on the sites as well as data on their cultural layers. Geographic information on the oblast' and raion assignment of the sites, their location on the plateaus or on river terraces, the present day altitudes of the sites above the rivers, stratigraphic information on the cultural layers, areas excavated, as well as postulated site areas are all derived from the literature cited in Table II-5. Data on the exact geographic location of the sites (longitudinal and latitudinal measurements) are never given in Soviet archaeological publications and, therefore, I derived them from the locations of the nearest villages listed in the Official Standard Names Gazeteer No. 42 (2nd edition). In some cases where the villages were not listed, I estimated locational measurements from maps. Because the locational measurements had to be extrapolated in this manner they should be taken as close estimates of the true site locations and not their absolute coordinates.

Similarily, some of the measurements listed in in Table II-5 (distances of the sites from the river) were estimated from sketch maps provided in the literature. They,

likewise, should be taken as approximate and not absolute measures. The most approximate measures are those listed for distances of the sites to their nearest neighbor sites (Table II-5, Tables II-10 through 12). They represent the shortest linear measurements between the two sites across a flat and undifferentiated landscape and were taken from contemporary maps of the region. The problems and errors involved in using raw linear distance measurements in settlement system studies have been discussed in the literature (see Johnson 1977, for example). I present them in this work because no alternatives are presently available. To date Soviet researchers have focused solely on the sites themselves and not on the distribution of the sites across the Late Pleistocene landscape. In the case of the Late Pleistocene Central Russian Plain, the most obvious problems with raw linear distance measures is that in many cases they involve crossing large bodies of water (e.g., Dobranichevka and Mezhirich are located across the Dnepr from each other). As I have shown in the beginning of this chapter and will further demonstrate in Chapter III, Late Valdai rivers of the Central Russian Plain were much larger and more powerful than their present day counterparts. Today, for example, the widest river, Dnepr, is less than two kilometers in width at its widest point in the study area (Sovetskaya Ukarina 1965). In the past, however, the rivers of the Central Russian Plain carried glacial run-off and meltwater and were greatly enlarged. Boriskovskii (1953) postulates

that the Dnepr at the latitude of Kiev may have been quite a bit wider than ten kilometers. Aseev et al. (1973) as well as Doluhanov (1982) and Voznyachuk et al. (1969a) postulate great widths for the other rivers in the study area as well. Late Pleistocene hunters and gatherers, therefore, could have crossed the rivers in one of two ways: 1) in warm weather months using boats, and/or 2) in cold weather months by walking across the frozen surface of the rivers. At present there is no evidence for the use of boats on the Central Russian Plain during this period, therefore, I assume in this discussion that rivers could have been crossed only in cold weather months after freeze-up and before the spring break-up of ice.

Finally, there are a few sites and/or localities mentioned in the Soviet literature that are not considered in this work (Karachizh, Kladbischenskaya Balka and Podluzhye III). I do not include them in this work because their status is most unclear. In some cases, such as Karachizh and Kladbischenskaya Balka, it is unclear if they were sites or just locales where some worked flint was found. In other cases, such as Podluzhye III, the existence of the site/locality is in question (Kaletchitz 1978, personal communication).

B. Description of the Sites

1. Berdyzh (52°50'N; 30°58'E). The site is located on the right or eastern banks of the river Sozh, some 500 meters south of the village of Podluzhye (3 km south of the village

of Berdyzh). The site was discovered by Polikarpovich in 1926. Polikarpovich and Zamyatnin excavated small and often discontinuous sections of Berdyzh from 1927 through 1954 (Polikarpovich 1968). Budko continued excavating Berdyzh from 1965 to 1970.

The geography and geology of the site have been described by Budko et al. (1971), Budko and Voznyachuk (1969a, 1969b), Gromov (1948), and Voznyachuk and Budko (1969) and are illustrated in Figure II-8a and b. The site was found on the promontory of an 8-10 meter deep ravine that cut through the high and steep plateau and terrace deposits. The ravine in which the site was located was in turn cut through by a younger ravine that partially disturbed and dislocated the cultural layer. Voznyachuk and Budko (1969) suggested that the location of the site was associated with the second terrace of the Sozh. Isaenko (1968) reports that the site was in a ravine which cut through the first Sozh terrace. Today the site is located some 60-70 meters from the river and at 6-12 meters above it.

In total some 350 m^2 of the site have been investigated to date. The cultural layer, varying in thickness from 1 to 30-40 cm was found at depths ranging from 1.5 to 10 meters below the present day soil surface in green-grey deluvial loam and loess-loam. Both Polikarpovich (1968) and Gromov (1948) interpreted the different depths of the cultural remains as well as the presence of periglacial deformations associated with it to imply that the cultural

remains were not in situ but redeposited down the slope of a ravine. Budko (1966), Budko and Voznyachuk (1969a), and Voznyachuk and Budko (1969b) on the other hand, stated that parts of the site were in situ. They also postulated that two cultural layers were present at Berdyzh and claimed that, at present, it was impossible to determine if 1) two different sites were represented, 2) the cultural layers at different depths and locations represented two locales of the same site, or if 3) one of the two observed layers was a redeposited section of the other layer. To date the site is known from a handful of very brief articles and has not been adequately studies either archaeologically or geologically. This precludes me from reaching firm conclusions about either its precise stratigraphy or the possible areal extent of the site. As mentioned above, at least parts of the cultural layer have been disturbed by erosion, solifluction, as well as by periglacial deformations such as ice wedge casts, tundra hillocks, and involutions (Kaletchitz 1972).

Although the original excavator of the site, Polikarpovich, did not recognize the presence of any features at Berdyzh, subsequent excavations and reconstructions have revealed that the site contained at least two mammoth--bone dwellings, interior hearths as well as both interior and exterior storage pits. Features found at the site are listed in Table II-6, archaeological inventiries in Tables II-7,8, and faunal remains in Table III-3.

The site is the northernmost Upper Paleolithic site found to date in the study area, and as Table II-5 shows, its nearest neighbor is the site or locality of Novo-Bobovichi located some 55 kilometers to the southeast of Berdyzh.

2. Chulatovo I (Kreidyanoi Maidan) (51°50'N; 33°07'E). The site is located on the right or northern bank of the Desna some 500 meters from the site of Chulatovo II. It was discovered in 1935 by Zaharchenko and excavated by Pidoplicho in 1935 and by Voevodskii in 1937 (Boriskovskii 1953). Cultural remains were discovered in a chalk quarry in the process of quarrying and the site was subsequently destroyed by quarrying operations. The geography and geology of the site is illustrated in Figure II-9.

Gromov (1948) and Velichko (1961) wrote that the cultural layer was located some 50-70 meters away from the river in the mouth of an old ravine that cut through the high right bank of the Desna. At the time of their discovery the cultural remains were located some 19-25 meters above the river. The geomorphology of this part of the Desna is such that the right or northern bank consists of some 40 meter high interfluve plateau that comes right to the river and is cut by deep ravines. Velichko (1961) writes that man settled close to the Desna floodplain here, possibly at the foot of a ravine.

The cultural remains were found from 4.2-4.5 meters below the present day surface and were in a layer up to 25

cm in thickness. Velichko (1961) states that the cultural remains were not in situ but had been redeposited by erosion and possibly solifluction from a location higher in the ravine or possibly from the edge of the plateau itself. Boriskovskii (1953) and Pidoplichko (1947a), however, report that some 20 m^2 of the site held an in situ cultural layer. They wrote that it was a single layer up to 25 cm thick. In light of this it is impossible to state with any certainty where the exact location of the original site was, but it appears to have been both in the ravine and close to the floodplain.

A major part of the cultural remains was destroyed by the quarry prior to their investigation and only some 390 m^2 have been excavated. As Table II-6 indicates, faint remains of from 1 to 3 hearths are the only features found at Chulatovo I. The faunal materials from the site are listed in Table III-3 while Chulatovo I lithic and bone inventory is presented in Tables II-7 and 8.

The site's nearest neighbor, as noted, is Chulatovo II. The next nearest neighbor is Novgorod-Severskii located some 7 km north from Chulatovo I.

3. Chulatovo II (Rabochij Rov) (51° 50'N; 33° 07'E).

The site was located on the right banks of the Desna some 500 meters downstream (south) of Chulatovo I. It was discovered in 1935 by Pidoplichko and Galich and was excavated by them in 1936 (Boriskovskii 1953). In 1937 and

1938 more extensive excavations at Chulatovo II were conducted by Voevodskii (1952a). The geography and geology of the site have been described by Gromov (1948) and Velichko (1961) and are illustrated in Figure II-10a and b.

The cultural layer was found on a back part of an old ravine which cut through the 37-40 meter high interfluve plateau that abutted the river. The formation of the ravine took place after the site was occupied and the subsequent ravine erosion destroyed approximately half of the site. Cultural remains were found some 35-37 meters above the river and some 100-125 meters from the steep shore. Velichko et al. (1977a) postulated that the height of the Desna in Late Valdai was 15-20 meters higher than it is today which would suggest that the site was located at the edge of the plateau some 15-25 meters over the river and its floodplain in Late Valdai.

The cultural layer was found, as Figure II-10b illustrates, in the upper part of a loess-loam 2.0-2.5 meters below present-day surface. Below the cultural layer at the depth of approximately 2.5 meters, Velichko (1961) reported finding traces of the humic layer which he identified as remnants of a badly eroded Bryansk soil.

Voevodskii (1952a) excavated approximately 1,000 m^2 of the site by opening up large contiguous areas of 50-200 m^2. He stated that the excavated area represented approximately half of the area originally occupied by the site. One cultural layer was found at the site—a very thin one

ranging from 1.5-2.0 cm in thickness at most. It was spread discontinuously over the excavated area and found concentrated in three locations. As Table II-6 shows, seven hearths and a number of small pits were excavated at Chulatovo II and Leonova (1977) has delineated the presence of at least three work areas on the living floor. While no estimates for the MNB found at the site are available, the MNI per species were depicted in Table III-3. The lithic and bone inventory of the site is listed in Table II-7 and 8.

The sites nearest neighbor is Chulatovo I some 500 meters away. The next nearest neighbor is Novgorod-Severskii located 7 km northeast (upstream).

4. Dobranichevka (50°02'N; 32°40'E). The site of Dobranichevka was discovered in 1952 in the course of road construction and excavated through 1953, 1967, 1969, 1973, and 1975 by Shovkoplyas. Data on the site has been only partially published by Shovkoplyas (1971, 1972, 1974, 1976) and Shovkoplyas et al. (1981). Four dwellings, hearth, work areas, and pit complexes have been found at the site, two of which have been partially described, the third was transported in blocks to the Periyaslov-Hmelnitsky Museum, while the fourth was left open but unexcavated and is now a part of the Dobranichevka Site museum.

The geography and geology of the site have been studied by Pidoplichko (1968), Pashkevich and Dubnyak (1978), and Shovkoplyas et al. (1981) and are illustrated in Figure II-11. The site is located on a left bank prom ntory formed by the

second terrace of the river Tashanka as the river enters the valley of the river Supoi. Supoi itself is a left (eastern) tributary of the Dnepr. The site today is less than 100 meters from Tashanka. The promontory on which man settled is some 16-17 meters above the river today. At the time of occupation the promontory had a gentle northeast to southwest slope and the site was, therefore, open to the south and protected from the north.

The cultural layer was found in the Loess III deposits and overlay a thin (0.2-0.5 m) layer of embryonic soil. As noted previously, the stratigraphy of the Dnepr and its tributaries has been studied far less extensively than that of the Desna and it is, therefore, difficult to say at present if this layer of fossil soil is contemporaneous with the gley layer of the Desna sequence. It is also possible, as Doluhanov and Pashkevich (1977) and Pashkevich and Dubnyak (1978) suggest, that this layer accumulated during a younger warm episode than that which resulted in the formation of the gley layer in the Desna sequence. I will return to this question in the next chapter when I consider the paleoenvironment of the Central Russian Plain in Late Valdai.

Dobranichevka is one of the two sites in the study area that has been totally excavated. Shovkoplyas (1972) and Shovkoplyas et al. (1981) report that the site was some 5,500 m^2 in area--but only about 2,000 m^2 have been carefully investigated. A single cultural layer, ranging in thickness

from 10-12 cm was present at the site and was found at the depth of 1.5-2.5 meters below the present-day surface. The cultural layer was in situ but parts of the site were destroyed by road building prior to archaeological excavations. Since only a part of the site was investigated thoroughly the faunal and lithic assemblages from Dobranichevka (listed in Tables III-3 and II-7 and 8 respectively) represent only a portion of the total found. The features, enumerated in Table II-6, include four mammoth-bone dwellings with two interior hearths and seven large exterior hearths in addition to 12 storage pits and five exterior work area.

The sites nearest neighbors are Gontsy and Mezhirich located some 70 km away.

5. Eliseevichi (Yeliseevichi, Eliseyevichi) (53°08'N; 33°37'E). The site of Eliseevichi was discovered in 1930 by Polikarpovich. It was subsequently excavated by Polikarpovich, Voevodskii, and Zavernyaev in 1935, 1936, 1946, and 1948. Budko excavated parts of the site from 1963 to 1967. From 1970-1978 Grehova had been excavating the site, since 1972 with Velichko and his staff. The geography and geology of the site have been reported by Gromov (1948), Polikarpovich (1968), Velichko (1961), and Velichko et al. (1977c) and are illustrated in Figure II-12a and b.

The site is located on the right (northern) bank promontory of the second terrace formed by the terrace and two ravines that delimit the promontory in the north and

south. The promontory is some 150 meters long and 50 meters wide and today found some 11-12 meters above the Sudost'. The site is bounded on the north by a steep river bank and on the west rises gradually into the interfluve plateau. Velichko (1961) postulated that at the time of occupation the site was located on the floodplain. Today the river is no more than 10-15 meters away from the site.

Velichko et al. (1977c) report that the cultural remains are associated with a faint fossil soil layer than was formed during a warm Late Valdai espisode. It is not clear if this layer is to be equated with the gley layer of the Desna sequence or if it represents another warming episode.

To date approximately 623 m^2 of the area have been excavated and are illustrated in Figure II-12b. Polikarpovich (1968) supposed that the original site may have been as large as 5,000 m^2. Parts of the site have been eroded by the river and the cultural layer itself has been severely disturbed in parts by such periglacial phenomenon as ice wedge casts and, possibly, solifluction. In 1965, Budko (1978, personal communication) excavated a section of the site located some 20-50 meters to the northeast of the main excavations, behind the northern ravine next to the river. He suggests that this locale, which he calls Eliseevichi II, is a different complex and perhaps a different site from Eliseevichi. Grehova (1981) reports excavating an area some 200 meters northeast of the previous

excavations (in the area of Budko's 1965 excavation?) and finding a very disturbed cultural layer of old Eliseevichi. She suggests that this is another site and calls it Eliseevichi II. The justification for claiming that either of these two finds represent yet another site seem unclear. Budko seems to assume that the location of the remains behind the ravine justify this, while Grehova offers as proof the observation that cultural remains at Eliseevichi II are found at an elevation of 6.7 m above those of Eliseevichi I (old Eliseevichi). The question of whether one or two (or more) sites are represented in this locality cannot be answered until extensive geological investigations are done to determine, among other things, the stratigraphies involved and the age of the north ravine. This difficulty is compounded by the fact that only the excavations done prior to 1948 have been published, more recent excavations are known from one brief article by Velichko et al. (1977c). In addition, the presence of severe periglacial disturbances at Eliseevichi have only recently been recognized (see Velichko et al. 1977 for discussion)--they were taken by both Polikarpovich and Budko to represent human cultural practices. Because of this I will only discuss the materials found at the main Eliseevichi location in this work and will assume, until proven otherwise, that both the 1965 excavation and the 1980 excavation unearthed other portions of the site. In light of this it seems highly possible that the maximal areal extent for Eliseevichi suggested by

Polikarpovich (5,000 m^2) are way too small.

The cultural layer of the site was found in the lower part of the loess deposit some 1-2 meters above the alluvial floodplain deposits of the second terrace. The layer is found at depths from 1.2-1.9 meters below the present day surface of the area, and is from 10-12 cm in thickness. Grehova (1981) reports that the cultural layer of Eliseevichi II is, likewise, from 10-15 cm in thickness and found at depths of from 0.3-1.0 meters below the surface. As mentioned before, the cultural layer, in both localities is severely disturbed by periglacial phenomena, erosion, redeposition and, at Eliseevichi II, by plowing and construction as well.

Polikarpovich, and Budko after him, as noted above, mistook some of the periglacial deformations of the cultural layer at Eliseevichi for features. This gave rise to reports in the literature of the presence of a "mammoth-bone corridor" at the site. Currently while no agreement exists as to the exact number and nature of the features found here, it is believed, as Table II-6 illustrates, that at least two mammoth bone dwellings were present at Eliseevichi as well as a number of exterior and possibly interior storage pits and at least two exterior work areas. The absence of hearths at the site is not surprising if one takes into account the severe periglacial deformations found there. Archaeological assemblages from Eliseevichi can be found in Tables II-6 and 7, while fauna is listed in Table III-3.

The site's nearest neighbors are Kositsa and Korshevo I and II located some 30 kilometers northeast of Eliseevichi.

6. Fastov (50°05'N; 29°55'E). Fastov was found in 1954 by Shovkoplyas on the second terrace of the river Unava, a tributary of the Irpen', which in turn is a tributary of the Dnepr. The site is known from just one six-page article by Shovkoplyas (1956) and is summarized in the Boriskovskii and Praslov volume (1964). To the best of my knowledge no geological investigation was done there and no stratigraphic schemes are available for the site.

Shovkoplyas (1956) and Gladkih (1973) report that the site was located on the right (southern) slope of a ravine somehow associated with the second terrace of the Unava. Shovkoplyas postulates that man settled here on a ravine promontory above a stream or brook that flowed at the bottom of the ravine. The cultural layer was found in loess-like loam some 12 meters above the river at the depth of 3.2 meters below the present day surface. The site is currently less than ten meters from the river. It seems reasonable to assume that both Unava and Irpen' flowed at much higher elevations during the Late Valdai (see previous discussion about the history of the Desna), and were, like the Desna, found at elevations of at least ten meters above their present-day levels. This in turn suggests that man settled at Fastov in a ravine on or very near the floodplain.

Shovkoplyas excavated 220 m^2 of the site and found only one thin cultural layer. The cultural layer, apparently, was in situ. He does not report the thickness of the layer

and just states that the maximal thickness of cultural deposits was found in one of the hearths and was to 10 cm thick. I presume, therefore, and state in Column L of Figure II-5, that the cultural layer of Fastov was under 10 cm in thickness. Boriskovskii and Praslov (1964) equate Fastov 's cultural layer with that found at Chulatovo II and at Zhuravka--this implies that at Fastov the layer was probably no more than 2-5 cm in thickness. The layer appears to have been in situ and undisturbed.

Fastov is considered by Shovkoplyas as a short-term site, and as Table II-6 shows, the only features present are six work areas each up to about one meter in diameter and two hearths. Faunal remains from Fastov are listed in Table III-3, archaeological assemblages, consisting of lithics only are in Table II-6 and 7.

Fastov 's nearest neighbor is Kirillovskaya located approximately 60 km to the west of Fastovo.

7. Gontsy (Hontsy) (50°10'N; 32°49'E). Gontsy was the first Upper Paleolithic site found on the Central Russian Plain. It was discovered in 1871 when a local landowner found mammoth bone washing out of the deposits and reported it to the local school teacher, Kaminskii. Both Boriskovskii (1953) and Pidoplichko (1968) report that the site underwent sporadic and unsystematic excavations from 1873 to 1914. First planned excavations there were conducted in 1914-1915 by Schervakivskii and Gorodtsov. The site was subsequently further investigated in 1935 by Levitskii (1947). The

results of these excavations have been published in a handful of articles and no monograph exists on this site (see Boriskovskii 1953; Levitskii 1947;and Pidoplichko 1969). Sergin began working again at the site in 1976 and has continued to conduct small scale excavations ever since, primarily focusing on reexcavating areas opened prior to 1935 (Sergin 1978, 1979a, 1981a, 1981b).

Gontsy is located on the right (southern) promontory formed by the second terrace of the river Udai, which is a tributary of the Sula. Sula, in turn, is a left bank (eastern) tributary of the Dnepr. The geology and geography of the site have been described by Pidoplichko (1969) and Gromov (1948) and are illustrated in Figure II-13a and b. The cultural remains were found some 7-8 meters above today's river height in a layer of varved loam underlain by laminated sand. Gromov (1948) reported that the cultural layer was within the alluvium of the second terrace. The remains are found at depths ranging from 2.0 to 3.8 meters below the present day soil surface. The promontory on which the site is found faces south and is bordered on two sides by ravines and by the present-day floodplain. Today the site is located some 1.2 kilometers from the river.

The stratigraphy of the site led both Gromov (1948) and Pidoplichko (1969) to conclude that man settled here on the floodplain of the Late Valdai Udai in an area between two ravines, and that the site was regularly flooded.

Some 820 m^2 of the site have been excavated to 1976--no

information is available on the area excavated by Sergin since 1976. Likewise, no estimates exist on the possible total size of the site.

Different accounts exist in the literature on how many cultural layers have been found at Gontsy. Levitskii (1947) reported five layers overlying one another. Boriskovskii (1953) reviewed the geology and archaeology of Gontsy and concluded that only two layers were present. Pidoplichko (1969) in his reconstruction of past excavations at Gontsy concluded that only one layer existed. These discrepancies arise in part because insufficient geological work was done at Gontsy in the past and no clear picture exists of the taphonomy of the site. Periodic flooding of the site postulated both by Gromov and Pidoplichko undoubtedly disturbed sections of the site and possibly redeposited some of the cultural remains. In addition, fortuitous discovery of the site through erosion also indicates that some segment of the site eroded away as well.

As Sergin (1981b) notes, excavators working at Gontsy through the 1930s consistently mistook mammoth-bone accumulations they found for remains of kitchen middens and therefore, it is impossible today to be certain about just how many dwellings and/or pits were present at the site. Sergin working with less than clear archival materials, states that at least two dwellings and at least five to six exterior storage pits with large mammoth bones were present. As Table II-6 shows, a number of interior pits may also have

been present as well as a number of exterior and possibly interior hearths. The archaeological assemblage from Gontsy is listed in Table II-6 and II-7 while faunal remains can be found in Table III-3.

Gontsy's nearest neighbor is Zhuravka located 40 kilometers west-northwest of Gontsy.

8. Khotylevo II (53°20'N; 34°07'E). Khotylevo II was discovered by Zavernyaev in 1967 and has been continuously under excavation by Zavernyaev and Velichko and his staff since then. Velichko et al. (1977d, 1981a) report that the site is located on the right (northern) bank of the Desna on a promontory formed on two sides by the interfluve plateau and the river. It will be recalled from a previous discussion that the right or northern bank of the Desna is a steep one, rising abruptly to the interfluve plateau and lacking any clear terraces. The cultural remains are found some 17 meters above the present day river level. The interfluve plateau promontory on which man settled, measuring some 300 meters in width, is bordered on the two other sides by ravines which today are some 15-16 meters deep and existed at the time that man settled on the promontory. Today the site is less than 10 meters away from the river. Velichko et al. (1977d) postulate that at the time of occupation the river was as close to the site as today but that the site was closer to the river altitudinally--some five to seven meters above it.

The stratigraphy of the site is illustrated in Figure

II-14. The figure shows that the cultural layer lies at the depth of from 4.0-4.5 meters below the present day surface in a layer(#7) of laminated sandy loam. Below this sandy loam layer is a humic layer that Velichko (1977d) sees similar to the Bryansk soil. The cultural layer is in situ but disturbed by ice wedge casts and other periglacial phenomena.

To date somewhat over 500 m^2 have been excavated there (Zavernyaev 1978). The extent of the site is still unknown. Velichko et al. (1981) report finding a cultural layer in test trenches some 200 meters up the plateau, further away from the river. All reports to date indicate that only one cultural layer has been found at Khotylevo II which ranges in thickness from 20-40 cm.

Khotylevo II is still undergoing excavation and little information on the features and lithic and faunal assemblages found at the site has appeared in print. As Table II-6 indicates, while no mammoth-bone dwellings have been reported at the site, some storage pits with mammoth bone, an unquantified number of hearths as well as work areas appear to be present on the living floor. What information is available on the Khotylevo II fauna is presented in Table III-3 while archaeological assemblages are depicted in Tables II-7 and II-8.

Khotylevo II's nearest neighbors are the sites of Korshevo I and II and Kositsa, which for lack of other information, I estimate as being about 12 kilometers north-

northwest of Khotylevo II.

9. Kirillovskaya (Kievo-Kirillovskaya) (50°26'N; 30°31'E). The site was discovered and excavated fully from 1893 to 1902 by Hvoiko (Boriskovskii 1953; Pidoplichko 1969). It was located in the city of Kiev itself on a promontory formed by the Dnepr shore and two ravines. The site was less than 100 meters from the river. The geology and geography of the site have been reconstructed by both Gromov (1948) and Pidoplichko (1969) primarily from unpublished archival holdings—they are presented in Figure II-15a and b.

Both Gromov and Pidoplichko agreed that the west to east running ravines which delimited the site at the time of excavation, formed after the site was occupied and abandoned. Both stated that at the time of occupation, man settled on a gently sloping Dnepr floodplain—but interpreted the stratigraphy of the site somewhat differently. Pidoplichko (1969) believed that man settled here on the second terrace of the Dnepr when that terrace was a floodplain, and, that the cultural remains were found in alluvium. Gromov (1948) wrote that in the 1940s it was impossible to reconstruct the exact stratigraphy of the site. He entertained the geological interpretation presented by Pidoplichko, but also stated that the cultural remains could have been in colluvial ravine deposits. Gromov tended to favor the first interpretation, but warned that the second one would not be totally discounted. Both agreed that man did settle on the floodplain itself and that the site had an orientation to

the east.

Cultural remains at Kirillovskaya were found at depths ranging from 13 meters to 22 meters. No information exists about the thickness of the cultural layer there. The different depths at which the different sections of the site were found led some investigators to speculate that a number of cultural layers were present at the site. As Gromov (1948) and Boriskovskii (1953) reported, Hvoiko saw two layers present, Gorodtsov believed that three layers were present, while Gromov himself felt that as many as eight layers were excavated. More recent reconstructions of the site by Boriskovskii (1953) and Pidoplichko (1969) have narrowed down this range--Boriskovskii to two layers while Pidoplichko convincingly argued that Kirillovskaya, like most other Upper Paleolithic sites on the Central Russian Plain, contained only one cultural layer. Pidoplichko's arguments were based on modeling the surface relief of the site at the time of occupation. The large size of the site (approximately 7,840-10,000 m^2) appears to support Pidoplichko's argument that man settled here on a large sloping surface which dipped towards the river and that the altitudinal differences between the different cultural remains just reflected the relief of the surface of the area during Late Valdai. All accounts report that the cultural layer was in situ--that conclusion, however, should only be tentatively accepted since both the projected slope of the site as well as possible seasonal

flooding would have favored some modification of at least parts of the site.

Some confusion exists in the literature about the exact size of the area excavated at Kilillovskaya as well. Pidoplichko (1969) discussed these discrepancies found in the original accounts--they ranged from some 7,840 m^2 to over 10,000 m^2. In this work I will use the figure of 7,840 m^2 offered by Pidoplichko as the excavated area that he could document securely through archival sources. Both Boriskovskii and Pidoplichko wrote that the site was fully excavated.

The contents of Kirillovskaya's living floor is known very patchily because apparently no inventories were kept at the time of excavation. Therefore both the faunal list presented in Table III-3 and archaeological assemblage from this site in Table II-7 and II-8 represent just a fraction of what was probably unearthed. Similarily, the mammoth-bone dwellings and hearths reported for the site in Table II-6 represent "guess-timates" calculated for the site by Pidoplichko in his 1969 publication.

Kirillovskaya's nearest neighbor is Fastovo located some 60 kilometers to the southeast.

10. Klyusy (52°05'N; 36°56'E). The site was discovered in 1964 and excavated in 1966 by Shovkoplyas (1967a). No work has been done at the site since then and, to the best of my knowledge, no additional analyses were performed on the cultural remains found. The brief three-page notices

by Shovkoplyas only offer most sketchy details about the geography and geology of the site--they are presented in Figure II-16a. The site was located on a south-facing left (north) promontory of a large old ravine which entered into the valley of the river Tsat. Tsat is a right (western) tributary of Snov, in turn a right (northwestern) tributary of the Desna.

The cultural remains were found at heights from eight to ten meters above the bottom of the ravine and at unspecified and varying depths from the contemporary soil surface.

Shovkoplyas excavated about 1,300 m^2 of the site, but suggests that the site may have been originally much larger than that (over 2 hectares--20,000 m^2). He did not indicate the thickness of the cultural layer at Klyusy, but wrote that the thickness also varied depending on the state of preservation of the different areas of the site, and the depth at which the layer was found. He reports that at least parts of the site were in situ and undisturbed. The predominance of lithics among the cultural remains, the absence of any features, and the exclusive presence of highly fragmented mammoth bone at the site has led other researchers to see the Klyusy cultural layer as totally redeposited (Grigor 'ev 1982, personal communication). This question obviously cannot be resolved without additional geologic research at the site.

Klyusy, as best as I can surmise, appears to be a short-term special purpose site where, as Table II-6

indicates no features of any kind have been found. The presence of a sizeable lithic assemblage there (approximately 10,500 pieces, see table II-7) together with the absence of any features and faunal remains strongly suggests that: 1) the cultural layer may have indeed been redeposited, and 2) that the locus was used primarily for lithic production.

Klyusy's nearest neighbor sites are both Novo-Bobovichi and the Pushkari Group of sites located some 55 km away. Novo-Bobovichi is due north of Klyusy, and the Pushkari sites lie due east.

11 and 12. Korshevo I, II (approximately 53°21'N; 34°09'E). The discovery of the sites of Korshevo I and Korshevo II has just recently been reported in the literature and the sites are known from less than page-long articles (Tarasov 1976, 1977, 1981). The two sites, along with Kositsa (#13) were discovered in the mid-1970s in the process of investigating the environs of a Mousterian site of Betovo. To date no maps or stratigraphic diagrams on the sites have appeared and neither have the exact geographic locations of the sites. According to Tarasov (1976), Korshevo I and II are located on the southern outskirts of the village of Betovo, not far from the town of Bryansk. The cultural remains were found on a promontory facing a small river, Betovka, a right (western) tributary of the Desna.

Both Korshevo I and Korshevo II are multi-layer sites in which the middle Upper Paleolithic layer is found between

a deeper-lying Mousterian one and an overlying Neolithic layer. At both sites the Upper Paleolithic layers are separated from the Mousterian and Neolithic ones by sterile strata.

Twenty-five square meters have been excavated at Korshevo I and approximately 60 m^2 at Korshevo II. No information exists on the thicknesses of these layers--from Tarasov's accounts it would appear that they are quite thin (less than 10 cm). As noted, Korshevo I and II have just been discovered recently and no information exists to date either on features or assemblages found there.

The distance between Korshevo I and Korshevo II is unknown at present, as is the distance to their nearest neighbor Kositsa. I interpret Tarasov's descriptions to indicate that Korshevo I and II are less than 1,000 meters from each other, and that Kositsa is, at the most a few kilometers away. Khotylevo II, located by my estimates some 12 kilometers southwest of the sites, is the first quantifiable nearest neighbor to Korshevo I, Korshevo II and to Kositsa.

13. Kositsa (approximately 53°21'N; 34°09'E). Kositsa was discovered in 1972 by Tarasov (1981) who began excavating it from 1976 on. The site is known presently from two brief notices and one six-page article (Tarasov 1976, 1977, 1981). It is located in the vicinity of Korshevo I and II on the southern outskirts of the village of Betovo. The cultural layer was found on a left-bank slope of a

promontory bordered on two sides by brooks that flow into a small river, Betovka. Betovka is a left tributary of the Desna.

As Table II-6 shows, Tarasov has not found any clear features to date at the site. What data have been published on the archaeological inventories found at Kositsa (lithics only) are listed in Table II-7. From these data it appears that Kositsa may have been a special purpose short-term site at which activities related to lithic manufacturing took place.

As with Korshevo I and II, no geographic or geological diagrams or maps exist that show the exact stratigraphy and location of the site. I have constructed a tentative stratigraphy for Kositsa in Figure II-16b based on the description in Tarasov (1981). As this figure shows, the cultural layer was found some 10-15 cm below the present-day soil surface in a loam stratum that overlies loess (Loess III?). The cultural layer appears to have been partially in situ. Tarasov (1981) wrote that the central section of the layer (approximately 20 m^2) was undisturbed while the remaining 105 m^2 of the excavated cultural layer showed varying degrees of erosion. The Upper Paleolithic layer of Kositsa was found stratified between two other cultural layers--a Mousterian one below it and a Neolithic layer above it. The Upper Paleolithic remains are separated from the others by sterile strata. In total, Tarasov has excavated approximately 125 m^2 of Kositsa.

Kositsa's first quantifiable nearest neighbor is Khotylevo II located some 12 kilometers down the Desna (southeast) of the site.

14. Kurovo (52°32'N; 33°17'E). The site was discovered in 1930 and excavated in 1930, 1936, and 1947 by Polikarpovich (1968). It is known from a sole three-page chapter in Polikarpovich (1968). The geography and geology of the site were never studied and the reconstructions modeled by Gromov (1948) from Polikarpovich's observations are diagramed in Figure II-17. The cultural remains were found at the outskirts of the village of Kurovo on the right (northwest) bank of Sudost'. They were located some 200 meters from the river on a sloping second terrace of Sudost', apparently some 10-12 meters above the river.

As Gromov (supra) indicated, the date provided by Polikarpovich were insufficient to reconstruct the paleo-geography of the area at the time the site was occupied. Polikarpovich (1968) mentioned a possibility that the promontory on which man settled was located next to a ravine--in fact, it is uncertain from his writing if the promontory with the cultural remains was in the ravine or just adjacent to it. What can be concluded at this point is that man probably settled here either on a floodplain itself or on a ravine promontory very close to the floodplain.

Two hundred forty-eight square meters were excavated at Kurovo in discontinuous blocks and no estimates exist on the possible total area of the site. According to

Polikarpovich, the cultural layer was found at depths from 1.1 to 1.4 meters from the present-day soil surface. Gromov, however, indicates that cultural remains come from greater depths (see Figure II-17 for Gromov's estimates). No information exists on the thickness of the cultural deposits but both Gromov and Polikarpovich indicate that the remains were probably not in situ.

Fauna found at Kurovo is listed in Table III-3. Polikarpovich did not report finding any features at this site and as Table II-7 indicates, Kurovo's lithic collection contains approximately 25 pieces of flint, only two of which have been classified as tools.

Kurovo's nearest neighbor site is the Pushkari Group of sites located approximately 25 kilomenters southeast.

15. Mezhirich (49°38'N; 31°24'E). The site of Mezhirich was discovered in 1965 as a result of local cellar diggings. It was excavated from 1966 through 1974 by I.G. Pidoplichko and from 1978 through 1981 by N.L. Kornietz and M.I. Gladkih. In 1978 and 1979, I participated in the Mezhirich excavations and was responsible for the faunal analysis there. The geology and geography of the site is given by Pidoplichko (1969, 1976) and Kornietz et al. (1981) and presented in Figure II-19a and b. As Figure II-19 shows, the site is located on the north-facing promontory overlying the valleys of Ros' and Rosava rivers at the point where the two merge. In the north, the promontory is bordered by the river, in the east and west by

ravines. Ros' and Rosava are right (western) tributaries of the Dnepr and flow into the Dnepr today some 18 km to the east of Mezhirich.

As was discussed at the beginning of this chapter, this area of the Ukraine is located on the Cenozoic Kanev dislocation which makes the right or western banks of the rivers high and fairly steep and cut by a number of ravines. The promontory on which Mezhirich is located (southern in Pidoplichko's description) today lies some nine to ten meters above the level of Rosava. Pidoplichko (1976) wrote that at the time man settled here it was no more than one to two meters above the river. Today the site is found approximately 200 meters from the river.

Some disagreement exists in the literature about the exact geologic history of the site. Pidoplichko (1976) wrote that the cultural layer was located in diluvial laminated loess-loam on a promontory between two ravines. Kornietz et al. (1981) state that the cultural remains were found in laminated loess-loam diluvial fan deposits which resulted from massive ravine erosion. They see the formation of this ravine cone deposit occurring at the same time as the alluvial deposition of the second terrace of the Dnepr and of its tributaries.

The area of the Mezhirich promontory is some 10,000 m^2, of which 508 m^2 have been excavated to date. No estimates exist as to the possible total size of the site. Pidoplichko (supra) reported finding cultural remains in

cores taken on the adjacent northern promontory, some 200-300 meters away. Kornietz (1979, personal communication) likewise reports finding cultural remains in cores taken from the southern promontory as much as 100 meters away from the present-day excavations. Both observations suggest that the site is much larger than the segment excavated to date.

Cultural remains at Mezhirich were found at depths ranging from about 2.7 meters to 3.1 meters below the present-day surface. The differences in depth are because of the original southwest to northeast slope of the promontory itself towards the river. The site was oriented to the south. Pidoplichko wrote that only one cultural layer up to 15 cm in thickness was present at the site. Kornietz and Gladkih, however, state that two cultural layers are present at some parts of the site (Kornietz et al. 1981). The bottom one (10-15 cm thick) is associated with the foundation of the mammoth bone construction (#4) while a much thinner upper one (thickness not specified) is associated with the middle and upper level of the construction. The two are separated by a sterile layer up to 12 cm in thickness. The presence of these two layers is difficult to interpret at present until a clear taphonomic history of the site is reconstructed. It may well indicate that at least parts of the site underwent two separate periods of utilization or, that the presence of two layers on parts of the site is a result of erosional episodes

associated with the past relief of the promontory, and that the thinner upper layer may indeed have been redeposited from higher up slope. Both Kornietz et al. (1981) and Pidoplichko (1976) report that the cultural remains are in situ. It should be noted, however, that the loess above the cultural layer shows the extensive presence of rodent burrows.

Since Mezhirich is the latest of the elaborate Upper Paleolithic sites of the Central Russian Plain to have been discovered, it has yielded to date the most complete archaeological record. Four large and elaborate mammoth-bone dwellings have been found at the site in addition to exterior storage pits filled with mammoth bone, and interior and exterior hearths and work area. Features found at Mezhirich are listed in Table II-6. Mezhirich fauna is presented in Table III-3. The rich and varied lithic and organic archaeological assemblages found here are enumerated in Tables II-7 and II-8. Soviet researchers classify this site, as they do other elaborate Upper Paleolithic sites with dwellings , storage pits, and rich inventories as a permanently occupied base camp or settlement.

Mezhirich's nearest neighbor site is Dobranichevka, located approximately 70 kilometers east-northeast across the Dnepr.

16. Mezin (51°45'N; 33°05'E). The site was discovered in 1906 when as a result of local cellar diggings many

mammoth bones were found. It was excavated beginning in 1908, through 1909, 1912-1916, 1930, 1932, and 1940 by a number of archaeologists and geologists including Efimenko, Rudenko, Voevodskii, and Volkov. Shovkoplyas returned to the site in 1954 and through 1961 excavated all of the cultural remains there as well as reopened areas that had been previously excavated from 1909 through 1940 (Boriskovskii 1953; Shovkoplyas 1965). The geography and geology of the site has been described by numerous authors including Boriskovskii (1953), Gromov (1948), Pidoplichko (1969), and Shovkoplyas (1965). The stratigraphy and geography of the site is illustrated in Figure II-18a and b.

The Mezin cultural layers were located on the left bank promontory of an old ravine that cut through the interfluve deposits. The ravine was located on the north (right) bank of the river in an area where the interfluve plateau first gently descends to the river and then abuts the river in steep 40-70 meter tall cliffs. The ravine promontory on which the cultural layers were deposited is today some 10-12 meters above the river, approximately 300 meters up the ravine from its entrance into the Desna. A difference of opinion exists on the height of the site above the river at the time of occupation. Gromov (1948) assumes a similar height as today for the promontory during Late Valdai. Velichko et al. (1977), on the other hand, postulate that the Desna in Late Valdai was from 15-20 meters above its present level which would place the Late Valdai settle-

ment fairly close to the floodplain. The site is open to the south and protected by the plateau to the north.

Cultural remains were found in deluvial loess deposits which are laminated with sandy and clayey layers (Pidoplichko 1969, Figure II-18). The daily surface on which man settled, as can be judged from the cultural layer, sloped in two directions: 1) a 40°-45° northwest to southwest decline towards the river as well as a 20°-25° north to south slope towards the ravine itself. Because of this dual slope of the daily living surface in Late Valdai, cultural deposits at Mezin were found lying from 1-1.5 meters below present-day surface in the southern part of the site to depths of up to 7-8 meters below present-day surface in the northern part of the site. Maximal slope of 15°-20° degrees for some parts of the living floor is reported both by Boriskovskii (1953) and Shovkoplyas (1965). Thus the cultural layer at the time of excavation lay from 6-16 meters above the Desna.

Shovkoplyas (1965) reports excavating and sampling 1,200 m^2 of the site and considers this area as reflecting the total size of the site. He writes that the cultural layer was mostly in situ with some minor redeposition down slope in some parts of the site. One cultural layer, averaging some 10 cm in thickness is reported for the site although Shovkoplyas also reports finding five bone storage pits up to 0.6 meters below hearths outside dwelling No. 1. The hearths are part of the cultural layer, overly the

storage pits, and are separated from then by a sterile layer of diluvial loess. The lack of a second cultural layer (one contemporary to the storage pits) Shovkoplyas (1965) explains by the action of rapid downslope erosion (running water) that washed down the cultural remains either into the pits themselves or off the promontory on which man settled. Man abandoned the site during this period of rapid downslope erosion (spring thaw?) and returned after it had ceased (fall?). The thickness of the deposits separating the storage pits from the hearths (0.6 m), Shovkoplyas sees as resulting from accumulation lasting a few years. Kukla (1975) reports that during a particularily rainy spring day in Czechoslovakia in May of 1960 up to 25 cm of loess were deposited in one day alone. This suggests that thicknesses of up to 0.6 meters observed by Shovkoplyas may have accumulated much quicker, possibly during just one particularily rainy spring-summer season.

The archaeology of Mezin is complex at best. Since Shovkoplyas actually excavated only one of the complexes there (which included a mammoth-bone dwelling plus surrounding hearths atop storage pits) and reconstructed the other features from archival data of previous excavations, numerous serious questions still exist about the nature and quantity of the various features found at Mezin. While Shovkoplyas in his 1965 monograph stated that five dwellings of mammoth bone were found there, Boriskovskii in 1953 offered a radically different reconstruction of the

Mezin living floor with the absence of bone dwellings and the presence of numerous storage and dwelling pits (?) ala Kostenki I-1. While, as I indicated in the introductory chapter, investigators working prior to the 1950s tended not to find small-sized round or oval dwellings and favored seeing the presence of "long houses"--still the discrepancies between Shovkoplyas' and Boriskovskii's reconstructions of the Mezin living floor are sizable. Since the site is no longer in existence, future work cannot resolve these discrepancies. I have, therefore, selected to list in Table II-6 features reported for the site by these two investigators as a range. As Table II-6 shows, Mezin probably contained from two to five dwellings of mammoth bone, numerous storage pits with large bones, some interior and exterior hearths and about four exterior work areas. The archaeological assemblage is a very rich and varied one, and as Tables II-7 and II-8 show included both lithic and faunal implements, art and objects of personal adornment as well as a sizable amount of nonlocal materials such as amber and fossil marine shells. Mezin fauna is presented in Figure III-3.

Mezin's nearest neighbor sites are Chulatovo I and Chulatovo II, located some 18 kilometers northeast (up the Desna).

17. Novgorod-Severskii (Novgorod-Severskaya; Novgorod-Severskij) (52°00'N; 33°16'E). The site was discovered in 1933 as a result of sandstone and quartzite quarrying on the

outskirts of the town of Novgorod-Severskii on the northwest (right) banks of the Desna. It was excavated by Pidoplichko (1947b) from 1936 through 1939. The geography and geology of the site were studied and described by Boriskovskii (1953), Gromov (1948), Pidoplichko (1947b), and Velichko (1961). They are presented in Figure II-20.

Cultural remains consisting of redeposited flint and bone assemblages were found on a promontory on the left slope of a northern ravine which runs into the Desna. The ravine cuts into a steep interfluve plateau that abuts the Desna. Cultural material was discovered lying some 30 meters above the present-day level of the river and lay at the depths of from 6-7 meters from the soil surface. The site at the time of excavation was less than a kilometer from the river. Both Gromov (1948) and Velichko (1961) indicated that the geology and geomorphology of this locality was poorly understood. Figure II-20 illustrates Pidoplichko's stratigraphic reconstructions and shows that the cultural materials were found in boulder gravels with admixtures of both sand and loam. Velichko (1961) associated the cultural remains with the base of the loess-like loam. He reported that some bone and flint remains were found in the underlying boulder loam as well.

Pidoplichko and Gromov speculated that man settled here in sandstone rock shelters that were open to the river to the northwest. Such rock shelters are found in the area today. After man abandoned the rock shelters, erosion

caused the collapse of the shelters and buried the cultural remains below quartzite and sandstone debris. This interpretation suggests that much of the material at Novgorod-Severskii was found in situ. Velichko rejects this paleogeographic reconstruction and points out that the cultural remains have been clearly redeposited.

Pidoplichko excavated approximately 238 m^2 of the site and noted that the cultural remains were not evenly spread across but found in clusters both underneath and in-between the sandstone and quartzite slabs. He did not indicate the average thickness of these clusters. The small number of both lithic and faunal remains found suggest that the clusters were no thicker than 10 cm at most.

Being a redeposited or at least severely disturbed site, Novgorod-Severskii yielded no features. Fauna recovered at the site consists of the ubiquitous mix of species found at most of the Central Russian Plain Upper Paleolithic sites but also contains a large number of fish remains--all are listed in Table III-3. No bone tools or ornaments were recovered at the site and the small size of the lithic assemblage (Table II-7) likewise does not permit secure interpretations of the nature of this site.

While it is impossible today to reconstruct the paleogeography of the area and to determine the locale where man settled in Late Valdai with full certainty, both the presence of rock shelters in the area as well as the geologic context in which the cultural remains were found do favor the

interpretation suggested by Gromov and Pidoplichko. This makes Novgorod-Severskii the only site in the study area to be associated with rock shelters.

Chulatovo I and II are the nearest neighbor sites to Novgorod-Severskii. They are located approximately seven kilometers down river from the site.

18. Novo-Bobovichi (52°38'N; 31°45'E). Novo-Bobovichi was discovered in 1927 when mammoth bone accumulations were found in local earthworks. It was excavated from 1951 through 1953 and is known in the literature from a handful of brief notices—the most extensive of which is a five page article by Polikarpovich (1968). The geology and geography of the site were described by Gromov (1948) and Polikarpovich (1968) and are presented in Figure II-21.

The site was located at the outskirts of the village of the same name on the right (western) banks of the river Irput', a left (eastern) tributary of the Sozh. Sozh, in turn, is a left (eastern) tributary of the Dnepr.

Cultural remains at Novo-Bobovichi were found at depths of approximately 5.4 meters below the floor of a five meter deep ravine that cuts into the upper (second?—ten meter) terrace of the Irput'. The bottom of the ravine at the time of excavation was five meters above the level of the river—thus the cultural remains themselves were some 0.36 meters below the water level of Irput'.

The remains consisted mostly of mammoth bones (Table III-3). No features were found at Novo-Bobovichi and

Polikarpovich (1968) reported finding a single flint tool with the mammoth bones. Both he and Gromov (1948) wrote that the cultural remains were redeposited. Gromov listed a number of possible erosional episodes that could have placed the remains at the bottom of the ravine and favored massive soil creep or mud flow as the most likely of them. Polikarpovich, on the other hand, thought that down-slope erosion associated with ravine formation may have redeposited the remains from a terrace promontory some ten meters above the river. Both of these views are clearly speculative and cannot be accepted or rejected until additional studies are conducted at the site.

There is no indication in the literature on the total area excavated. What I surmise from Polikarpovich's descriptions is that less than 100 m^2 were excavated via discontinuous trenches. No information exists on the thickness of the cultural remains. Polikarpovich (1968) did note, however, that the remains were found at varying depths and that excavation (trench) No. 2 showed a 1.75-2.0 meter dip in the cultural layer over a distance of approximately six meters. This observation is in agreement with the stated interpretation of the taphonomy of the cultural remains at the site--namely that some downslope displacement had occurred.

Novo-Bobovichi's nearest neighbor site is Klyusy, located 55 km due south of the site.

The Pushkari Group of Sites

The existence of a number of Upper Paleolithic sites in

the vicinity of the village of Pushkari was first reported by Rudinsky in 1932 (Boriskovskii 1953). Throughout the 1930s additional sites/localities were discovered in the area. Today at least 10 Upper Paleolithic sites are known from this area--all found within an area of approximately 1 km^2. They are known collectively as the Pushkari Group of sites (52 51'N; 33 14'E). They are all located on the right (western) banks of the Desna on the Pogon promontory formed by the interfluve plateau, ravines, and the river. The height of the plateau here is some 40 meters above the river. As discussed previously, the geomorphology of the right or western bank of the Desna is such that the interfluve plateau directly abuts the river itself, river terraces are absent due to river erosion, and the plateau hangs some 40 meters above the river, separated from it by steep cliffs at angles of 40°-50°. The geography and geology of the Pushkari Group of sites is illustrated in figures II-4, II-22a and b.

As Figures II-22a and b show, the various sites found in this locality are all located on a promontory formed by the Desna river to the east and the large Maslov ravine to the south. Additional smaller ravines run perpendicularily from the promontory both into the Maslov ravine as well as into the Desna. Of the 10-11 Upper Paleolithic sites found on this promentory, four have been described in the literature in some detail and will be considered in this work: Bugorok, Pogon, Pushkari I, and Pushkari II. The others, as Boriskovskii (1953) pointed out, are known either from very

small test trenches or from surface collections only. It should be pointed out that: 1) the geology of the promontory is imperfectly known; 2) the sites themselves are known from very small excavations (e.g., the largest excavation at Pushkari I was 400 m^2 in area); and 3) the proximity of some sites to each other (see Tables II-5 and II-10) all preclude us from stating with any certainty that: a) all of the sites are independent sites occupied at different periods; b) some of the sites are not redeposited sections of other sites; and c) all of the sites are indeed sites and not just remnants of the daily surface of the promontory in Late Valdai. Soviet researchers assigned the different locales status of independent sites based on stylistic differences observed in the lithic assemblages. It may well be that this promontory contains remnants of both in situ sites, and redeposited layers, as well as having a highly utilized Late Valdai surface covered with lithic and faunal scatters that have been subsequently interpreted as sites.

In many ways this region is reminiscent of the Kostenki-Borschevo region of Upper Paleolithic sites on the Don where a number of sites are found within a short distance of each other. Our understanding of the Pushkari Group of sites is much poorer, however, because of the limited amount of work done there to date (see Boriskovskii 1953 and Gromov 1948, for example). The four sites are all less than 200 meters from each other--their nearest neighbor is Novgorod-Severskii located approximately 20 kilometers down the Desna, south of

the sites.

19. Bugorok. The cultural layer of Bugorok was discovered by Voevodskii in 1940 and excavated by him and Gvozdover (Gvozdover 1947, Voevodskii 1952b) As Figures II-22a and b show, it was located at the point of highest elevation of the Pogon promontory near the center of the promontory, some 50 meters above the Desna. If we assume that in Late Valdai the Desna was some 15-20 meters higher than today (see previous discussion on river heights), this would place Bugorok some 30-35 meters above the river at the time of occupation.

Although Gvozdover (1947) and Voevodskii (1952b) excavated only 13 m^2 of Bugorok, they test-trenched the area and conclude that at the time of occupation the site may have been as large as 13,000 m^2. The cultural layer, some 20 to 30 cm in thickness, was found at depths from 0.3-0.5 meters from the present day soil surface. The layer, as Figure II-22 shows, was in loess which Velichko (1961) characterizes as Loess III. The cultural layer was in situ in some sections, while showing signs of severe redeposition in other sections. In addition, Voevodskii (1952b) reported that the cultural layer was also disturbed by ice wedge casts.

No features were found at Bugorok and only lithics composed the archaeological assemblage. The site, as all Upper Paleolithic sites on the Central Russian Plain without elaborate mammoth-bone constructions or bone accumulations, has received very little attention in the Soviet literature--

so much so that it is impossible to even discern what sort of site Soviet researchers consider Bugorok to be. In fact, as I will discuss in detail in Chpater V, Soviet specialists in the area still continue not to type these sites.

20. Pogon (Pyatii Metr). The cultural layer of Pogon was discovered in 1940 and excavated in 1940 and 1946 by Voevodskii (1949). It was located over a large area in the center of the Pogon promontory (see Figure II-22a and b). Voevodskii estimated that at the time of occupation the site may have been as large as 40,000 m^2. As Figure II-22 shows, Pogon cultural layer was found in the lower layer of loess that Velichko (1961) classified as Loess III. The layer was found in situ, some five meters below the Bugorok cultural layer in the center of the promontory, but lay on the surface some 200 meters to the northwest in the vicinity of the Pushkari I excavations. At Pushkari I the Pogon cultural layer lay above the layer of Pushkari I. Voevodskii and Velichko ascribed the different depths at which the cultural layer was found to the differential erosion of the different parts of the promontory. A paleosoil which Velichko equated with the Bryansk soil (but see subsequent discussion on the geology of Pushkari I) lies below the loess bearing the Pogon cultural remains.

As the above discussion indicates, part of the cultural layer of Pogon (center, under the Bugorok layer) were in situ while the vast periphery of the site showed signs of redeposition and erosion.

Voevodskii excavated approximately 63.3 m^2 of the site and estimated that the original site was upto 40,000 m^2. This estimate was based on test trenches and surface collections. Pogon, like Bugorok, has yielded an unquantified number of highly fragmented bones, no features, and a small (671 pieces) lithic assemblage (see Tables II-6, II-7, II-8, and III-3).

21. Pushkari I (Paseka). The site of Pushkari I was the first one discovered on the Pogon promontory. It was found in 1932 by Rudinsky who excavated it in 1932 and 1933. Boriskovskii (1953) excavated the site in 1937 and 1939. The excavations at Pushkari I, as Figure II-22a shows, were conducted in three discontinuous localities of the site.

Pushkari I was located on the northern part of the Pogon promontory some 32-35 meters above the level of the Desna. Velichko (1961) wrote that the site was some 300 meters west of the river at the time of excavation. At the time of occupation the site would have been some 12-20 meters above the river. As all the other sites in the Pushkari Group, Pushkari I is located on the interfluve plateau.

The cultural layer of Pushkari I was found at depths ranging from 0.5 to 1.1 meters below the soil surface. It was, on the average, 10 cm thick and was found in loess.

Velichko (1961) identified the faintly humic layer below the culture-bearing loess stratum as Bryansk soil and concluded that the Pushkari I cultural remains were, therefore, found in Loess II. Belyaeva returned to Pushkari I

in 1981 to continue excavating the as yet unopened sections of the site and reports that the cultural layer is found in loess above the gley layer and not above the Bryansk soil (Belyaeva 1981, personal communication). This suggests that Pushkari I layer is in Loess III and not Loess II as Velichko thought. This new information puts into question the stratigraphic location of Pushkari shown in Figure II-22b, as well as the stratigraphic dating of the site (for a discussion of this, see Chapter IV).

Approximately 400 m^2 of Pushkari I have been excavated to date (Boriskovskii et al. 1981). Test trenching of the site led Boriskovskii (1953) to suggest that the site may have been approximately 30,000 m^2 in area. This suggestion, however, cannot be fully accepted until further archaeological and geological work is done on the Pogon promontory.

Boriskovskii (1953) considered the site to have been a long-term base camp and interpreted the distribution of lithic and faunal remains as representing the remnants of one three-hearth "long house" that measured some four meters in width and 12 meters in length. More recently, Shovkoplyas (1965a)has questioned this reconstruction and argued that it is just as likely that three small round dwellings each containing a single hearth were present at Pushkari I. I have, therefore, listed the site in Table II-6 as containing either one or three mammoth-bone dwellings. In addition to having both interior and exterior hearths, Pushkari I also contained about 50 small pits ranging in diameter from 0.1

to 0.2 meters, upt to 0.1 m deep, some of which Boriskovskii thought may have been post-holes. This makes Pushkari I along with Yudinovo, the only two sites where the presence of post-holes may have been detected. The faunal collection recovered at the site is listed in Table III-3. It is important to note here that tusks composed a large part of mammoth bones recovered and that the MNI estimates of mammoths present at Pushkari I were based on the number of tusks found. The site, as Table II-7 amply documents, has yielded a huge (160,000 pieces) lithic inventory together with a negligible inventory of bone objects (Table II-8).

22. Pushkari II (Anikeev Rov I). The site was discovered in 1933 by Pidoplichko and excavated by him and Voevodskii in 1933, 1937, and 1939 (Voevodskii 1952c). The geography and geology of the site have been described by Gromov (1948) and Voevodskii (1952c) and are presented in Figure II-23. The cultural remains here were found some 400 meters to the southwest of Pushkari I in the upper part of an old ravine where it has been cut through by a younger post Late Valdai ravine. Geologic work in the area conducted by Gromov in 1939 and 1940 showed that man settled at Pushkari II on the banks of a small lake at the spot where a small river entered the lake.

The cultural layer, ranging in thickness to 10 cm, was found on the northeast to southwest sloping surface that lay from 1.7 to 4.4 meters below the present day soil surface. The cultural remains were found in one layer which Voevodskii felt may have been partially redeposited by soil creep or

solifluction down the side of the ravine. Voevodskii excavated 58 m^2 at Pushkari II, no further information exists on the total possible size of the site at the time of occupation.

Voevodskii found no features at the site and a small 85 piece lithic assemblage (see Tables II-6, II-7 and II-8). He postulated that some of the mammoth bones found (see Table III-3) may have been deliberately deposited in the small river or brook that ran by the site at the time of occupation. This is reminiscent of the interpretation offered by Klima (1963) for some of the bone deposits found at Dolni Vestonice.

23. Radomyshl' (50°33'N; 29°14'E). The site was discovered in 1956 in the process of local earthworks. It was excavated by Shovkoplyas in 1957, 1959, and 1963 (Shovkoplyas 1964, 1965a). It was located on the right or western banks of the river Teterev, a right (western) tributary of Pripyat'. The geography and geology of the site have been investigated only very perfunctorally by Shovkoplyas (1965b) and Pidoplichko and Shovkoplyas (1961) and are illustrated in Figures II-24a and b. The stratigraphic column offered in this figure is after the description in Pidoplichko and Shovkoplyas (1961) and differs in minor details from the description in Shovkoplyas (1964).

The geographic location of the site differs somewhat from that of other sites in the study area. It was located in flat and swampy Polissye part of the study region where loess accumulations are absent largely because of past erosion. The area today contains a myriad of swamps, small lakes, and rivers. Cultural remains were found on four small

hillocks that measured from 20-40 meters in diameter, and no more than 2-3 meters in height. Shovkoplyas (1965b) writes that these hillocks were somewhat higher in elevation until recent times when intensive plowing and erosion removed a substantial part of the soil cover. At the time of occupation the area was located on the upper parts of a ravine on its right or northern side--today the ravine has been totally buried. The site was located some three kilometers from the river and judging by Shovkoplyas' description of the topography of the area, it was elevated just a few meters above the present-day level of the river.

As Figure II-24a shows, the cultural remains were found in a stratum of loam some 60-80 cm below the present-day soil level. Lazukov et al. (1981) write that the remains are on terminal moraine deposits of the pennultimate glaciation. No data are given by Shovkoplyas on the thickness of the cultural layer and from the geologic descriptions I presume that it was no thicker than 20 cm at the maximum.

As this figure shows, Shovkoplyas excavated the site via three discontinuous excavations, and opened up in total about 1,500 m^2. Of these some 600 m^2 of Excavation I (Radomyshl' I) have been the most studied and are the only ones described in the literature. Shovkoplyas (1964, 1965b) wrote that a single cultural layer was found in all excavations and that all the hillocks were occupied at the same time--thus implying that the site was far more extensive than the 600 m^2 excavated at Radomyshl' I or the 1,500 m^2 total excavated in the area. He based his conclusions on

the contemporaneity of occupation of all the hillocks on the similarity in the lithic assemblages found. Unfortunately, we simply do not know at present if the cultural remains at the three sampled hillocks do indeed represent parts of one site or different occupational events in the area and, therefore, cannot say anything more about hillocks No. 2 and 4 other than they also contain cultural remains. In this work, therefore, I will restrict myself to just discussing the discoveries made at Radomyshl' I.

Shovkoplyas interpreted the materials and features found at Radomyshl' I as representing the remains of a permanently occupied settlement. The sparce data on the site published to date leave many unresolved problems. Among these, as Table II-6 shows, is the question of exactly how many mammoth bone dwellings were found there, if some of these dwellings may have been storage pits instead, as well as the number and size of hearths present. The surprisingly small number of mammoths represented (47 individuals--see Table III-3) for a site with five to six dwellings has been explained by invoking taphonomic factors (see Kornietz 1962, for example). Using lithic stylistic criteria, Shovkoplyas (1965b) has proposed that Radomyshl' may be the oldest Upper Paleolithic site on the Central Russian Plain. I will address the question of dating of the sites in detail in Chapter IV.

The site's nearest neighbor is Fastov located approximately 64 kilometers due southwest of Radomyshl'.

24. Suponevo (53°19'N; 34°20'E). Suponevo was excavated by Efimenko and Zhukov from 1925 to 1927. The materials from those years of excavation were never either analyzed or published and in the 1950s Shovkoplyas (1950, 1951) published brief summaries of these excavations along with his reinterpretation of the features found at Suponevo. The geology and geography of the site have been described both by Gromov (1948) and Velichko (1961) and are illustrated in Figures II-25a and b.

Suponevo was located on the right (western) bank of the Desna on a promontory some 70-80 meters wide that lay 20-25 meters above the present-day Desna. A disagreement exists in the literature on the exact geomorphology of the promontory which the site occupied. Earlier investigators (Gromov and Mirchink in particular) felt that the site lay on the second terrace of the Desna. Thus, Gromov (1948) wrote that man settled here on the second terrace after that terrace had already been formed and the soil forming processes above the alluvium had already taken place. Velichko (1961), however, convincingly argued that the Suponevo promontory represented an old hanging bottom of a ravine which in Late Valdai cut through the interfluve plateau that abutted the Desna. Man, in Velichko's scheme, settled on the bottom of this ravine when the ravine was on the floodplain.

At the time of excavation the site was located 80-100 meters away from the river. The ravine in which man settled

was subsequently filled in and cut through by a much younger ravine. As best can be surmised from the scanty literature on Suponevo, the site was oriented to the river located due east. Velichko (supra) equates the position of this promontory with the second terrace of the Desna and assigns the time of occupation of Suponevo to a period right after the second terrace had formed and Loess III deposited.

Shovkoplyas (1950) reported that some 200 m^2 of the site were excavated in the 1920s by a series of discontinuous large trenches. No estimates exist on the possible size of the site. A single cultural layer up to 30 cm in thickness and apparently undisturbed was found at the depths from 0.7 to 0.9 meters below the soil surface. According to Velichko (see Figure II-25b) the cultural remains lay in laminated loam and sandy loam which were diluvial in origin.

Suponevo was excavated via trenching and accumulations of mammoth bone found were interpreted at the time of discovery as kitchen debris. Subsequently various researchers recognized that at least some of these "bone heaps" probably represented mammoth-bone constructions as well as possibly storage pits. These attempts at posthumous reconstruction of the living floor features has led researchers to very divergent conclusions. Shovkoplyas (1964, 1965a), for example, discerned the presence of both short-term tent-like structures as well as long-term mammoth-bone dwellings, while Sergin (1979b) stated that only one mammoth-bone dwelling was unearthed at the site. As Table II-6 shows,

it is similarily impossible to state with precision the number and size of hearths and storage pits found at the site. Similarily, faunal remains reported for Suponevo (Table III-3) represent just a fraction of the bone found, as do the archaeological assemblages. What appears to have been an important and elaborate site with numerous mammoth-bone constructions, rich and varied lithic and bone assemblages and art is known from a handful of short articles and the remaining collections from the site and sparce archival materials still await a study.

Suponevo's nearest neighbor sites are Timonovka I and II located two to three kilometers up the Desna due north of Suponevo.

25. Timonovka I (53°20'N; 34°20'E). The site was discovered in 1927 by Voevodskii and excavated by Gorodtsov from 1928 through 1933 (Gorodtsov 1935a and b). In 1955 it was excavated by Rogachev, Krainov, and Velichko. Both Timonovka I and Timonovka II are located on the same high promontory on the right (western) bank of the Desna. The geography and geology of the site has been thoroughly presented in the literature by Velichko (1961) and Velichko et al. (1977a, 1981b) and are illustrated in Figures II-26a and b. The narrow (80-100 meter wide) and long promontory on which both sites are found was formed by the erosional action of the Desna in the east and southeast and by a south-west to northeast running large old ravine. Today the promontory is 38 to 40 meters above the Desna, and as the

Desna today is 15-20 meters below its Late Valdai level, the promontory at the time of occupation was some 15-23 meters above the river. As noted before, man settled here on a promontory of the interfluve plateau. The surface of the plateau was at a slight (1 -3) dip, sloping towards the northeast (towards the Desna).

As was the case with Suponevo, geologists working in the 1920s and 1930s interpreted the geography of Timonovka somewhat differently. Gromov (1948) after Mirchink, stated that Timonvka I, like Suponevo, was located on the second terrace of the Desna. This work will follow the fuller and more exhaustive geologic study of the sites done by Velichko (presented in both the text and Figures II-26a and b).

The site of Timonovka I lies some 240 meters northeast of Timonovka II, slightly downslope from it and closer to the Desna. At the time of excavation it was located approximately 200 meters from the river. Gorodtsov (cited in Gromov 1948) test trenched an area of approximately 18,378 m^2 of the site (an oval measuring 90 m x 260 m) and felt that this represented the maximal area of the site. He excavated 1,178 m^2 of this area. Velichko et al. (1977a) in reviewing Gorodtov's excavations felt that his areal estimates for the site were greatly exaggerated and that the site probably was about 3,200 m^2 in size.

A single cultural layer was found at Timonovka I which ranged in thickness from 7-15 cm and lay from 0.25 to 0.5 m

below the present-day soil surface. According to Velichko et al. (1977a and 1981b) the cultural layer was found in humified loam associated with both profile B of the relic Timonovka soil and the very top of Loess III.

Both Gorodtsov (1935a, 1935b) and Krainov (1956) thought that the cultural layer was in situ. Extensive work at the site by Velichko clearly showed that the layer was severely disturbed by various periglacial phenomenon including numerous ice wedges and solifluction. Apparently man settled on the Timonovka promontory on top of an extensive ice wedge polygon system which melted after man abandoned the site and severely disturbed the cultural remains. Unfortunately, these periglacial features were not recognized as such at the time of excavation. Both Gorodtsov (supra) and Krainov (1956) interpreted them as remnants of past cultural practices and described them as subterranean mid-dwellings or earth lodges. This erroneous interpretation can still be found in contemporary second-hand English language literature (see Shimkin 1978, for example).

Because of this, it is impossible at present to state with any certainty whether any mammoth-bone "dwellings" were found at the site and to ennumerate the site's features. Grehova (Velichko et al. 1977) hypothesized that there may have been two to three bone constructions present. Since, however, both Eliseevichi, Timonovka II and possibly Yudinovo have yielded storage pits with some above-ground structural elements of mammoth bone in the form of disjointed

borders, the constructions Grehova thinks were possibly mammoth-bone dwellings could have just as likely been storage pits. I have listed Timonovka I features in Table II-6 very tenuously and will treat the site in this work as one with storage pits but no dwellings . The site's fauna, found in Table III-3, shows a surprisingly small number of mammoths for a site with mammoth-bone dwellings , and contains the usual mix of Late Pleistocene species. The extensive lithic assemblage found at the site is made primarily of locally available materials but also shows the possible presence of some exotic lithics (see Table II-7).

Timonovka I's nearest neighbor, after Timonovka II, is Suponevo. Suponevo is located two to three kilometers to the south of the site.

26. Timonovka II (53°20'N; 34°20'E). Timonovka II was discovered in 1965 and excavated in 1965 to 1968 by Grehova. The site is located 240 meters southwest of Timonovka I on the same promontory. The geology and geography of the site have been described by Velichko et al. (1977a, 1981b) and are illustrated in Figure II-26a and b. The geology and geography of the site are the same as of Timonovka I and, will, therefore, not be repeated. Timonovka II was located slightly upslope from Timonovka I, was found 40 meters above the level of the Desna, and approximately 500 meters from the river.

Grehova excavated 163 m^2 of the site. Test trenching in the area of the site indicated that it may have been as

large as 500 m^2. A single cultural layer was found lying in humic loam at depths of 0.6-0.8 meters below the contemporary soil surface. As Figure II-26b shows, Velichko associates the deposition of the cultural layer with both the top of Loess II and the B horizon of the relic Timonovka soil. The cultural layer of Timonovka II was from 5-15 cm in thickness and not found evenly spread over the entire excavated area but concentrated in a few sections of the excavation. The layer was in situ but severely disturbed by various periglacial phenomena such as ice wedge casts and solifluction. Test trenching between Timonovka I and Timonovka II showed no cultural layer present and Velichko et al. (1977), therefore, considered Timonovka I and II as two separate sites that reflect two slightly different times of occupation. Man settled at Timonovka II on top of an already extant polygon network of ice wedges which melted after the site was abandoned and disturbed the cultural layer.

The site contained three large storage pits filled with mammoth bone as well as remnants of some hearths, work areas, and accumulations of mammoth bone. The archaeological assemblage found at the site is listed in Tables II-6 and II-7, and the faunal remains in Table III-3. Based on the stylistic criteria of the lithic inventories found at Timonovka I and Timonovka II, Grehova (Velichko et al. 1977) has worked out an occupational sequence for the Timonovka promontory that sees first the occupation of a part of

Timonovka I and all of Timonovka II and a second reoccupation (or continuation of occupation at a slightly later time) of other sections of Timonovka I.

The site's nearest neighbor, after Timonovka I, is Suponevo located approximately two to three kilometers south of Timonovka II.

27. Yudinovo (52°40'N; 33°17'E). Mammoth bone was discovered in Yudinovo as a result of local earthworks in 1933. The site was first investigated and test trenched in 1934 by Polikarpovich who returned in 1947 to conduct excavations and to lay additional test trenches in the area. Yudinovo remains today the least explored major Upper Paleolithic site in the study area--one that is known in print from a handful of short articles and one-page notices. The most extensive description of the site is to be found in Polikarpovich (1968). This publication only describes the 1947 excavations at the site. Since then the site has undergone sporatic small scale trenchings and excavations by Abramova and Grehova in 1980 (Abramova and Grehova 1981), Budko from 1961-1966 (1966, 1967a, 1969), and by Sergin (1977, 1981c) in 1976 and 1980.

Yudinovo is located on the right (northern) banks of the Sudost' on a promontory formed by the river terrace and a buried ravine. The geography and geology of the site have been described by Kaletchitz (1972), Polikarpovich (1968), and Velichko (1961) and are illustrated in Figure II-27a and b. As those figures show, the promontory itself lies from

9-11 meters above the summer level of Sudost', is horizontal for the most part with a slight dip towards the river to the east. Today three small lakes are present in the vicinity of the site; similar lakes are thought to have existed in the area during the Late Valdai as well.

A major disagreement exists in the literature about the number of the river terrace on which the site was found. Velichko (1961) and Budko (1969a) after him wrote that the site was on the first terrace and that man settled here on the floodplain itself late in Late Valdai. Kaletchitz (1972), Polikarpovich (1968), and Vereschagin and Kuzmina (1977) wrote that the promontory is part of the second Sudost' terrace. These differences of opinion put under question the stratigraphic dating of the site and will be discussed in Chapter III.

A single cultural layer reported at Yudinovo has been found, as Figure II-27b shows, in alluvial loess-like sandy loam at depths ranging from 2.35 meters to 2.75 meters from the present-day soil surface. The layer ranged in depth from a few centimeters to a maximum of 20-40 centimeters. From all the accounts, the layer appears in situ although Polikarpovich (1968) noted that mammoth bone had been eroding into the nearby Sudost' for a long time. This suggests that parts of the site may have been destroyed in the past.

Today it is still unclear if all the cultural remains found at Yudinovo come from a single site or a number of

nearby sites. In his 1947 work on the Yudinovo promontory, Polikarpovich confined his excavations to the southeastern section of the promontory and called this area the Yudinovo site. His test trenches, located up to 500 meters to the north and west of the excavated area, revealed the presence of thick cultural layers as well. The similarity of the cultural remains and their analogous stratigraphic positions led Polikarpvich to conclude that all these discoveries probably came from a single very large site which may have occupied as much as 13,500 m^2 to 18,000 m^2 in area. In 1975 and again in 1979, Sergin test trenched an area of the promontory some 150 meters away from Polikarpovich's 1947 excavation and called the two spots where he found cultural remains Yudinovo II and Yudinovo III. Sergin considered these remains, especially at Yudinovo III, to be a part of a different and independent site. Unfortunately Sergin published his observations in two half-page articles in Arheologicheskiye Otkritiya 1975 Goda and Arheologicheskiye Otkritiya 1979 Goda with neither maps to show where he conduced his excavations nor a clear explanation why he considered the materials recovered at Yudinovo II and III sufficiently different from those found at Yudinovo (Yudinovo I in Sergin's nomenclature) to warrant considering them parts of different sites.

In total, and as best as I can estimate, approximately 500 m^2 have been excavated at Yudinovo beginning with 1934 and up to and including the Abramova and Grehova excavations

in 1980. This figure does not include the numerous test trenches laid from 1947 on.

The materials excavated at Yudinovo after 1947 have never been either studied or described, in fact, many of them are still to be found in their original field crates scattered between the Institute of History of the Byelorussian SSR and the Byelorussian Historical Museum in Minsk. Much confusion exists in the literature, both Soviet and Western, about the nature and number of features found at Yudinovo. As best as I can estimate from both the Soviet literature and archival materials shown to me by Dr. Budko of the Institute of History of the Academy of Sciences of the BSSR in Minsk in 1978, three mammoth-bone dwellings were found at Yudinovo prior to the most recent (1980-1982) excavations. Two of these as Table II-6 shows, were small round to oval constructions while the third may have been a much larger oval construction perhaps measuring as much as 10 m x 17 m along the outside perimeters. This last construction is a most complex one and the dimensions cited above reflect the accumulations of bone concentrated in one part of the site. It appears from the literature that this bone concentration included both remains of a smaller dwelling as well as a surrounding bone wall or fence that went around at least half of the dwelling and was located approximately one meter from the outside walls of the dwelling . Therefore, after both Sergin (1979b) and Rogachev (1970), I interpret this large bone accumulation not as

representing the remains of one large dwelling but rather an architectural complex of dwelling and surrounding wall. Excavations at Yudinovo during the 1981 field season appear to have unearthed a fourth dwelling --a small round or oval construction (Grigor'ev 1982, personal communication). I have listed this new discovery which has not been reported in print in Table II-6.

As Table II-6 shows, in addition to the constructions of bone, Yudinovo also contained an unspecified number of large bone storage pits as well as about 11 small interior pits in one of the dwellings which Budko (1966, 1967) interpreted as remains of postholes. Both exterior and interior hearths were found at the site but again their exact number and dimensions remain uncertain. The faunal remains listed in Table III-3 reflect just a part of the fauna found at the site--the remains that were taken back from the field from the excavations conducted by Polikarpovich and Budko. The archaeological assemblages (lithic and organic) found at Yudinovo have never been fully studied or published and the figures given in Tables II-7 and II-8 are the best "estimates" I could derive from the sparce literature. Since, however, all of the literature comments on the paucity of lithic remains, the estimated figure of approximately 12,500 in the table may not be too inaccurate. The lithic inventory, as at Eliseevichi, appears to consist of nonlocal flint, but the exact source of this material is not specified. Lastly, Yudinovo, like Mezin and Eliseevichi, has yielded a sizeable collection of fossil marine shells used as decorations which

originated at least 600 km to the south of the site. I will consider the presence of nonlocal materials at the Upper Paleolithic sites of the Central Russian Plain in subsequent chapters of this work.

Yudinovo's nearest neighbor is Kurovo some 40 kilometers to the southwest of the site.

28. Yurovichi (Yurevichi) (53°47'N; 28°41'E). This site was found in 1929 and excavated from 1929 to 1931 by Polikarpovich (1968). Budko (1967b) excavated the site in 1959 and 1960. Ksensov et al. (1977) returned and conducted two small excavations there in 1976. The site is located on the high (30-40 meters) left (northeastern) bank of Pripyat' on the southern slope of an northeast to southwest running ravine. The geology and geography of the site are reported in the literature by Budko (1967), Gromov (1948), Karetchitz (1972), Mirchink (1934), and Polikarpovich (1968). They are illustrated in Figure II-28a and b.

According to most of these sources the site was found on the second (middle) terrace of Pripyat at heights ranging from 15-30 meters over the present day summer level of the river. Gromov (1948), however, wrote that the exact geomorphology of the area is insufficiently clear to determine with certainty that the site was indeed on the second terrace. He admits the possibility that it may have also been located either on a promontory or on the side of a ravine that cut into the interfluve plateau.

To the best of my estimates to date less than 300 m^2

of the site have been excavated--no estimates exist about the possible total area of the site. As Figure II-28b indicates, cultural remains were found in alluvial and deluvial laminated sand and sandy loam deposits which also contained some gravel. The remains were found at depths ranging from 1.6 meters to approximately 10 meters below the present day surface.

Much confusion exists in the literature about the nature of the cultural remains at Yurovichi. Both Gromov and Polikarpovich reported the presence of only one layer at the site--a layer that was redeposited down the slope of a ravine. Budko, on the other hand, in his publications claimed that the remains were in situ and represented at least two separate cultural layers. Recent work at Yurovichi by Ksensov and the geologist Voznyachuk have demonstrated that the original views of Gromov and Polikarpovich were correct (Ksensov et al. 1977). Only one redeposited layer is present at Yurovichi and the different depths at which cultural remains were found just reflect the post-depositional taphonomic processes that eroded and redeposited the cultural remains.

Budko (1967) reported finding one hearth at Yurovichi--the existence of which now, after Ksensov and Voznyachuk's restudy of the site, is highly suspect. The lithic and organic inventory found at Yurovichi has never been fully published, and as Tables II-7 and II-8 show, no quantification of it is possible. Faunal remains from the site are presented in Table III-3.

Yurovichi's nearest neighbor sites are Berdyzh and Kirillovskaya, both located approximately 140 kilometers from the site.

29. Zhuravka (50°39'N; 32°36'E). Zhuravka was discovered in 1927 and excavated by Rudinskii and Voronov from 1927 to 1930. It was located on the left (eastern) bank of a very meandering river, Udai, a left or eastern tributary of Sula. The geology and geography of the site have been amply described in the literature by Rudinskii (1928, 1929, 1930), and subsequently summarized in Boriskovskii (1953), Boriskovskii and Praslov (1964), and Gromov (1948). They are illustrated in Figure II-29a and b.

Cultural remains at Zhuravka were found on a river terrace promontory some 12 meters above the summer level of the Udai. This terrace is some two to three kilometers wide in the Zhuravka area and cultural remains were found on the edge of the terrace closest to the river. At the time the site was excavated, it was located approximately 250 meters away from the river. Strong disagreement exists in the literature on the geomorphology of this area and on whether the site was found on the first or second terrace of the Udai. Gromov (1948) discussed these differences of opinion in detail. They can be summarized by saying that the earlier geologists and archaeologists who excavated Zhuravka believed that it was located on the second terrace (e.g., Pidoplichko, Reznichenko, Rudinskii, and Voronov) while researchers of more recent times, working with both published

and archival materials from Zhuravka, place the site on the first terrace of the Udai (e.g., Boriskovskii 1953, Gladkih 1973). The disagreement stems, in part, from nongeological data--specifically the nature of the flint inventories found there have led some investigators to see the site as the youngest in the study area. I will return to this point when I consider the dating of the sites in Chapter IV. Together with Gromov, however, I favor the older views that the site was located on the second terrace.

Gromov wrote that man settled here in Late Valdai on the floodplain itself after that floodplain was formed and was undergoing steady erosion. The presence of laminated sand layers in the strate near the cultural remains suggest that the site was periodically flooded by the Udai. This repeated flooding eroded away parts of the cultural layer and subjected the rest to some erosion and redeposition.

A single cultural layer found at the site lay from 3.5 to 4.3 meters below the present day soil surface. The differences of depth at which the cultural remains were found reflect the Late Valdai surface of the promontory which sloped towards the southwest, in the direction of the river. The cultural layer itself was quite thin, up to 5-6 cm thick at maximum. Rudinskii excavated a total of 330 m^2 at Zhuravka. No estimates exist on the possible total size of the site.

Zhuravka's thin cultural layer contained the remains of three work areas each of which had a small hearth (Table II-6).

The small lithic inventory appears to have been made of both locally available cobble flint as well as from a superior nonlocal block flint. Soviet specialists, following Rudinskii's early interpretation of the site, see it as reflecting the remains of a temporary camp occupied by a small group for a short time period. No figures are available for the MNB found per species at Zhuravka--the MNI estimates are presented in Figure III-3. Much disagreement exists in the literature on the dating of this site, with opinions ranging from the early Upper Paleolithic period all the way to the Mesolithic. I will examine these disagreements in detail in Chapter IV and will show that insufficient evidence exists to exclude the site from the Late Pleistocene period of occupation.

Zhuravka's nearest neighbor site is Gontsy, located 40 kilometers to the west of the site.

V. THE LOCATION OF THE SITES — MICROGEOGRAPHIC VARIABLES

As I have pointed out previously, the Upper Paleolithic sites on the Russian Plain are not evenly distributed across the area but found in specific regions associated with particular river valleys. As Figure II-2 shows, the sites on the Central Russian Plain are found between the latitudes of 49°30'N and 53°21'N, and longitudes of 29°14'E and 34°20'E. The total area of the Central Russian Plain in which the sites are located, as shown in Figure II-2, is approximately 180,000 km^2. Within this area the sites are all found associated with the river valleys.

A. River Valleys

Although very little work has been done by Soviet researchers on regional patterns of settlement location in Late Valdai, all literature to date indicates the presence of the sites in or near river valleys and assumes that proximity to water and subsistence resources of the river valleys was an important criteria in site location in the Late Valdai. Romanchuk (1974), for example, lists the proximity to water, abundance of river valleys floral and faunal resources, and availability of lithic outcrops as being the main site selection criteria in Upper Paleolithic settlement systems as evidenced in the location of all the sites in or near the river valleys.

Column G of Table II-5 lists the distances of the sites to the nearest river for the 27 sites where distance measures exist or could be estimated. The mean distance to the river is 388 meters with a range from 5-10 meters to 3,000 meters. Only three sites (11%) of the 27 are located further than 1,000 meters from the river. These measurements reflect present-day distances. Probably they were somewhat different in Late Valdai at the time of occupation of the sites, but it is expected that they fluctuated within the ranges observed today and that present day distances broadly reflect past conditions as well.

The location of the sites in or near the river valleys as opposed to the interfluve plateaus away from the rivers, quite obviously does not only reflect site selection

criteria of Late Valdai hunter and gatherers but archaeological bias as well. No systematic surveys have ever been done in the study area. Past surveys accentuated the riverine bias by surveying only river valleys and their proximities (see Polikarpovich 1968, for example). The majority of the sites were discovered as a result of either river erosion or local earthworks such as road building and cellar diggings. Local earthworks, while being randomly distributed in occurrence across the landscape, still are more likely to occur in greater frequencies closer to the river valleys. This is because population densities in agricultural communities have always tended to be greater closer to the rivers and to decrease away from the rivers. Therefore, we can expect that the distribution of modern populations in the study area likewise contributed a specific bias in favor of discovering sites close to the rivers. Thus, both archaeological and demographic biases combined to favor the discovery of those Upper Paleolithic sites in the area that were located in or near the valleys. Given this strong bias, we can expect that a large proportion of the known sites in the rivers should be found in precisely this sort of locales.

It is argued here, however, that the exclusive presence of river valley sites in the study area is only partially due to these biases. The very exclusivity of this locale for site location suggests that factors beyond the discussed present-day biases have to be considered as well. Specifically,

that river valleys exerted strong locational pulls and created settlement systems that were fairly linearized along the valleys. Similar linearization of settlement systems has been observed elsewhere in the Old World as well during the Late Valdai (late Würm). White (1980), for example, notes this pattern in the location of the Magdalinean sites in southwestern France.

As was discussed previously, the river valleys, especially after the Valdai maximum, carried glacial runoff, drained numerous ice-dammed lakes and were far broader and carried greater loads than their present day equivalents. These huge Late Valdai rivers of the Central Russian Plain hold in their streams numerous chain lakes--creating a series of unique lacustrine and riverine environments along the valleys. And it is these locales, especially along the Desna, Sudost', and Pripyat' that offered preferred locales for Upper Paleolithic settlements. I will return to this point in greater detail in Chapter III.

A second regularity in the location of Upper Paleolithic sites is their exclusive presence only on one side of the river valleys. This can be most clearly seen along the Desna and Sudost' where the sites (N=15) are all located only on the left or northern (northwestern) banks. Velichko (1961) accounted for this regularity of site location by pointing to the asymmetry of the rivers in the area. The left banks as a rule are high while the right ones are flat. The left banks, therefore, offered some elevation and

drainage in the past as well, while the right banks, as today, were low-lying, water logged, and swampy. Some elevation was probably especially important in the warm weather months between river break-up and freeze-up when the rivers presented greatest problems to low-lying settlements.

A third variable that can be discerned from the location of the sites is the preferred placement of the sites on promontories bordered on one side by the river and on one or more of the other sides by ravines. Thus, of the 22 in situ or partially in situ sites listed in Table II-5, 18 or 82% were located on such promontories at the time of occupation. Velichko (1961) explains this locational preference as resulting from better drainage of such locales. Romanchuk (1974) adds such factors as improved visibility and natural protection from predators. He writes that man settled in Late Valdai on either low-lying terraces where these were present or at the edges of the adjacent plateaus (in regions where terraces were absent) near the water. The presence of alluvial deposits both above and below the cultural layers at such sites as Gontsy, Mezhirich, and Zhuravka indicate that the sites were indeed close to the rivers and were periodically flooded. Column in Table II-5 estimates, where possible, the height of the sites above the river at the time of occupation. As this column shows, 9 (47%) of the 19 sites for which this measure could be estimated, were located either on the floodplain itself or one to two meters above it. The others range from 5 meters

to 40 meters above the rivers at the time of occupation.

This discussion has shown that river valleys were heavily favored as locations for Upper Paleolithic settlements. Within the confines of the valleys promontories close to the river were selected for settlement that offered both proximity to water as well as optimal drainage. There were probably a number of reasons for this locale selection—some of which I will examine below. They are: 1) proximity to water, 2) microclimatic and microenvironmental advantages, 3) south facing exposures, 4) proximity to lithic resources, and 5) mammoth procurement strategies.

B. Proximity to Water

Proximity to water was the first advantage offered by river valleys. Water, as has been pointed out by numerous researchers, exerts a strong pull on site location decisions of hunters and gatherers as it is both a necessary resource for man as well as for the survival of faunal resources on which man preys (Binford 1982b; Jochim 1976; White 1980).

C. Microclimate and Microenvironments

In addition to providing water, river valleys today offer specific microclimatic conditions that are on the average milder than those of the surrounding plateau regions. It is expected that these advantages existed in the river valleys in the past as well (Romanchuk 1974; White 1980). These microclimates created a number of diverse microenvironments in the river valleys that were able to support both greater numbers and a greater variety of flora and

fauna than found in the interfluves. I will specifically focus on the questions of paleoenvironmental reconstruction of the study area in Chapter III and show that the river valleys did indeed support a far greater abundance of both floral and faunal resources in Late Valdai. This resource richness is expected to have exerted a very strong pull on the subsistence practices and settlement systems of the Late Valdai hunters and gatherers and resulted in the location of the sites in these regions.

D. South-Facing Slopes and Promontories

Column 12 of Table II-5 lists the orientation of the sites in relation to the cardinal points. Of the 24 site orientations that could be estimated from the literature, 15 (62.5%) face either true south or modified southerly directions (e.g., southeast, southwest). This indicates that after the first condition in site location was met, namely proximity to the river or lake, preferred site location was on the south-facing slopes or promontories. The climatic advantages of settlement on southern slopes is well known in the literature. As White (1980) reports, extensive ecological studies have shown that south-facing slopes receive considerably more solar radiation (2.5 times more in winter) than north-facing slopes. This implies that warmer and more favorable microclimate was to be found on the south-facing slopes of the Central Russian Plain in Late Valdai as well, and that these advantages were taken into account by hunters and gatherers when selecting their

site location.

White (1981) goes on to show how these microclimatic differences affected the distribution of biotic communities in Late Pleistocene southwestern France—lusher and more varied vegetation and greater overall numbers as well as variety of fauna existed on these south-facing slopes than on their northern equivalents. The lack of specific studies of north vs. south-facing slopes in the study area preclude me from examining further the added subsistence-oriented advantages of south-facing slopes. It seems clear to me, however, that all other things being equal, Late Valdai hunters and gatherers in the area did selectively locate their settlements on warmer and more hospitable southern river valleys.

E. Lithic Resources

The presence of numerous flint outcrops in specific regions of the river valleys exerted an additional locational pull on the settlement systems. This is especially true for the Desna sites, which, as numerous authors have pointed out, are located near outcrops of good quality flint (Boriskovskii 1953; Romanchuk 1974; Velichko 1961; Voevodskii 1952). Unfortunately no systematic work has been done by Soviet archaeologists to date to determine the exact locations of flint outcrops along the rivers in the study area. Observations on the proximity of Desna sites to good lithic sources are unquantified and ancedotal in nature at present and preclude me from considering the pull that

abundant availability of lithic raw material may have played in the settlement location. All that can be said at the present is that the Desna sites are found near such lithic sources and that this co-occurrence is probably not accidental.

F. Mammoth Procurement Strategies

Table III-3 presents the faunal assemblages found in the Upper Paleolithic sites of the Central Russian Plain. The variables, problems and assumptions in these tables will be discussed at length in Chapter III. These tables show that mammoths are represented in large numbers in minimal number of individuals (MNI), minimal number of bones (MNB), and in percentages at most of the sites in the study area. Numerous debates exist in the literature on both the exact role that this species played in the subsistence practices as well as whether all of the mammoths found at the sites represent prey taken by hunters or if some mammoth bones were scavanged from natural death sites. These questions will also be discussed at length in Chapter III. For the purposes of this discussion, I want to focus only on the specifics of the distribution of the sites with large numbers of mammoths across the study area.

Column 19 in Table II-5 lists the MNI mammoths found at the different sites in the study area. These estimates could be calculated for 21 of the 28 sites listed. Column18 in Table II-5 indicates the sites where mammoth bone constructions interpreted by Soviet researchers as dwellings

have been found (see Chapter VI for discussion of mammoth-bone constructions-- dwellings). This column shows that of the 21 sites with quantifiable MNI of mammoths, 11 have mammoth-bone dwellings . A comparison of these two columns (18and19) clearly shows that sites containing large numbers of mammoths are also those that have mammoth-bone dwellings . The Difference of Means Test conducted on the MNI estimates of mammoths between the sites with dwellings and those without dwellings shows that the mean numbers are very different and that these differences are significant at the 0.0001 level ($z = 5.26$; see Table II-6).

Sites with mammoth-bone dwellings in addition to containing much greater numbers of mammoths are also found in very specific geographic locales that differ from the locales utilized for sites without mammoth-bone dwellings . Column C in Table II-5 lists geographic specifics of each site location--whether the site was on a terrace (T) or on a plateau (P), and if it was on a promontory (M) or in a ravine (R). Column 9 presents estimates for the altitudinal location of the sites at the time of occupation. Of the 21 sites for which estimates could be listed in these two columns, 15 were found in association with both floodplains and/or ravines and 6 not on floodplains and not associated with ravines. Table II-5 presents these estimates and shows that of the 15 sites associated with ravines and/or floodplains, 9 are sites with mammoth-bone dwellings and 6 sites without them. Of the six sites located away from the

floodplains and/or ravines, four had no "dwellings" and two had mammoth-bone dwellings.

A Chi Square Test comparing the location of sites with dwellings with the location of sites without dwellings is presented in Table II-7. It shows a difference (Chi^2 of 41.05, df 1) between these groups of sites that is significant at the 0.0001 level. By rejecting the null hypothesis (that there is no difference in the location of sites with and without large numbers of mammoths and dwellings) this test confirms that there is a significant association of sites with large numbers of mammoths and dwellings and floodplain-ravine location.

The preferential location of sites with large numbers of mammoths and mammoth-bone dwellings on the floodplains and/or near ravines is probably associated with mammoth procurement strategies. Even though, as a subsequent discussion in Chapter III indicates, the exact strategies used in procuring mammoths is still unclear--any strategy, be it active hunting or foraging of mammoth carcasses would have taken place in or near floodplains and ravines. If active hunting strategies were responsible for the large accumulations found at the sites and these, as some researchers believe, included mass drives and kills, these strategies could be best accomplished by driving herds off the precipices into the ravines (see Kornietz 1962, Saunders 1980, for example). Mass drives are widely known in the literature for both the Late Pleistocene (e.g., horses at

Solutre, France; bison at Amvrosievka, USSR) and Holocene (e.g., bison drives in the New World). It seems, therefore, possible that this strategy may have been also employed by Late Pleistocene hunters and gatherers in exploiting mammoths.

On the other hand, if, as both Gromov (1948) and Vereschagin (1971, 1979) believed, some mammoths found at the sites were procured by scavenging mammoth cemeteries which accumulated as a result of natural attrition, the location of these cemeteries would have also been on the floodplains and/or ravines (for a discussion of the location of mammoth bone cemeteries in the USSR see Vereschagin 1979). Data on hand at present are equivocal as a subsequent discussion in Chapter III will show, factors of equifinality favor similar demographic compositions of mammoth remains regardless of the causes of death. I will return to this important question in some detail in Chapter VI as well.

At present, it is clear, however, that the association of sites with large numbers of mammoth bones and ravines is related to mammoth procurement strategies. Of the 11 sites with large numbers of mammoths, 9 (82%) were located close to the ravines and only two (18%) were found in different locales.

VI. THE DISTRIBUTION OF THE SITES— MACROGEOGRAPHIC FEATURES

The previous section has discussed the location of the Upper Paleolithic sites in the study region and shown that they are: 1) all in the river valleys, and 2) differentially

distributed within these valleys. I have suggested that this microgeographic patterning resulted from considerations of proximity to water, microclimatic advantages, proximity to lithic resources, and mammoth procurement strategies. In this section I will focus on the macrogeographic patterning of site distribution in the area and show that the sites are neither randomly nor evenly distributed across the study area.

The first macrogeographic patterning--the association of sites with river valleys--has been noted already. This patterning has produced the linearized distribution of sites. As Figure II-1 shows, however, this linearization is not uniform across the area and sites are aggregated in specific parts of the area. It has been also suggested in a previous discussion that one of the possible factors producing such aggregation was the distribution of lithic resources in the valleys. To discern and identify possible aggregations of sites I performed a series of Dimensional Analysis of Variance Tests on the site locations. This test has been described in the literature by Whallon (1973). It is designed to isolate and specify both the nature and location of point clusters across a given area. These tests are presented in Figures II-30 to II-33.

The first test was performed on the distribution of all the sites in the area. It is presented in Figure II-31a and b. As the resulting graph shows, first order clustering of the sites occurs in both the northeast (#2) and the southwest (#3) quadrants (see Figure II-31a for the

location of the particular quadrants). These quadrants are "block size 4"--meaning they measure 3.75 cm x 3.75 cm. One centimeter in Figure II-31a is approximately equal to 56.6 kilometers, and "block size 4" quadrants in which the sites cluster are approximately 45,000 km^2 in area each. I interpret the results of this test to indicate that two groups of site clusters are present in the area, one in the northeast part and the other in the southwest part of the region.

A. The Distribution of Sites Without Dwellings

Since the discussion in the previous section has shown that distinct differences exist between the locations of sites with mammoth-bone dwellings (i.e., with large numbers of mammoths) and those without them, I also examined the distribution of these two groups of sites separately.

The Dimensional Analysis of Variance was performed on the distribution of the sites with no mammoth-bone dwellings and the resulting graph can be seen in Figure II-32c. As this graph suggests, first order clustering of these sites occurs in the northeast quadrant #2 (see Figure II-32a for the location of the quadrant). This quadrant is "block size 4" also and measures approximately 45,000 km^2 in area. Geographically the area of first order clustering of non-dwelling sites is along the upper half of the Desna and Sudost'.

Second order clustering, as shown in Figure II-32b, occurs in quadrants #4 and #7 among "block size 16". These

quadrants measure 1.86 cm x 1.86 cm and cover an area of 11,250 km^2 each. The strong second order clustering shown in this figure occurs because of the linearization of clustering--as a result of the location of the sites in river valleys. The second order clustering is also found in the northeast part of the study area and is associated with the Desna and Sudost'.

From these analyses, I conclude that the sites with no mammoth-bone dwellings are not randomly or evenly distributed along all the river valleys but are clustered in the northeastern section. I will return to this hypothesis both in the concluding section of this chapter as well as in Chapter VI where I will consider the nature of these sites. It will be shown that these sites are all special purpose sites utilized for such tasks as hunting and/or tool manufacturing. The location of these sites was conditioned by the distribution of the residential camps.

B. Distribution of Sites with Mammoth-Bone Dwellings

Dimensional Analysis of Variance was performed on the distribution of sites with mammoth-bone dwellings and the resulting graph is presented in Figure II-33c. This graph suggests that first order clustering occurs in quadrants 2 and 3. These quadrants are also "block size 4"--as in the previous test they measure approximately 45,000 km^2 in area.

The presence of clustering in two quadrants diagonally placed in relationship to each other is like that observed for the distribution of all the sites in the area and is

different than the pattern of clustering observed among the sites without dwellings . Here clustering of dwelling sites occurs in both the northeast and the southwest quadrants while sites without dwellings' only cluster in the northeast region of the study area.

Second order clustering, as shown in Table II-33b, occurs in quadrants #4 and #14 among "block size 16" quadrants. These quadrants, as before, measure 1.86 cm x 1.86 cm and cover an area of 11,250 km^2. These second-order clusters in the case of sites without dwellings occur in two noncontiguous blocks, again placed on a northeast to southwest diagonal line. While the patterning of first order clustering among the sites with mammoth-bone dwellings suggests a continuation of the linearized pattern of site distribution observed in the case of the distribution of sites without dwellings , the clear separation of second-order cluster quadrants with sites with dwellings suggest a different pattern. I interpret this pattern to reflect the existence of two separate regions of settlement for dwelling sites. One of these is located in the north-eastern part of the area and is associated with the Desna and Sudost'. The second group is located in the southwest of the area and associated with the Dnepr and Sula.

From these analyses I conclude that the sites with dwellings cluster in a very different manner from those without dwellings and that this clustering is probably a result of two different settlement systems and social units

in the two regions. I will return to these hypotheses in detail in Chapter VI. I also conclude that, just as the different location of the clusters suggests the existence of at least two separate settlement systems, the co-occurrence of two clusters with very similar types show that the two groups were not fully segregated from each other but rather possibly formed a part of a unified system with similar subsistence practices and settlement patterns. This hypothesis will be both developed in fuller detail and tested in the subsequent sections of this work.

C. Proximal Associations

I have shown that specific clustering of sites is present on the Central Russian Plain and that the sites with mammoth-bone dwellings and those without the dwellings cluster in different sections of the study area. In this section I will demonstrate that greater regularities exist in the spacing of the sites with dwellings across the study area than exists in the spacing of the non-dwelling sites. I will conclude by considering some of the factors responsible for these observed differences.

Table II-10 lists the distances of the sites to their nearest neighbors. These distances are listed for all the sites with the exception of Korshevo I, II and Kositsa since, as noted previously, no information exists on the exact location of these three sites. I have, therefore, decided to treat them as one site here which is listed as Kositsa in Table II-10. Table II-10 lists all the distances between

all the sites, Table II-11 the distances between the sites with mammoth-bone dwellings , and Table II-12 the distances between sites without the dwellings . I have again separated the sites into two groups--those with and those without the mammoth-bone dwellings .

A comparison of the nearest neighbor distances of the sites with dwellings to those without dwellings shows that the mean nearest neighbor distance of the sites with dwellings to other sites with dwellings is 66.45 km with a range from 38 to 160 km and a corrected standard deviation of 32.28 km (N=11). Because of the small sample sizes in all calculations in this section, Bussel's corrections were applied to all the estimates of the variance and of standard deviation.

Sites without dwellings are an average of 37.55 km (mean) from each other, range in distance from each other from 200 meters to 145 kilometers, with a corrected standard deviation of 54.55 km (N=16). These figures show that a much greater range exists in the distance of sites without the dwellings to each other than exists between sites with the dwellings . A Difference of Means Test conducted between these groups of sites is presented in Table II-9. It shows that the differences in nearest neighbor distances are very significant (Z=3.01, probability of the null hypothesis 0.0001).

1. Sites with Mammoth-bone Dwellings . I also calculated the Difference of Means Tests between the two groups

of sites taking into consideration the observed geographic variability in the distribution of those sites derived from the Dimensional Analysis of Variance Tests discussed in the previous section. In calculating the Difference of Means statistics for the sites with dwellings, I divided the sites into those found in the north of the study area (N=6, quadrants 1 and 2 of "block size 4") and in the south (N=5, quadrants 3 and 4 of "block size 4"). The enlargement of the quadrants for this calculation from those that showed maximal clustering in previous calculations was done so as to include all of the sites and offer the maximal number of sites for the calculation of this statistic. As Table II-9 shows, there is no significant difference between the distances of these sites to their nearest neighbors located in the north and in the south of the study area (Z=0.029; 97.6% chance that the differences of this magnitude are due to chance alone). I conclude, therefore, that sites with dwellings in both the north and the south of the study area show a regularity of spacing across the landscape and are located approximately 70 km from each other.

The one exception to this is the site of Berdyzh which is found 160 km away from its nearest neighbor. This large distance, well outside the expected range suggested by the standard deviation of 41.83 for the northern sites, may have resulted both from archaeological bias and from possible chronological differences between the sites. As I noted previously, the Desna region has undergone the most extensive

archaeological investigation and a large number of the known Upper Paleolithic sites are in that region. The Sozh, on the other hand, as well as the area between Sozh and Pripyat', have been investigated far less extensively. Locational analyses presented here strongly suggest that one or more Upper Paleolithic sites with dwellings were located between the Berdyzh area of Sozh and Pripyat' and Desna.

The chronological differences between the sites will be considered in Chapter IV. Since Berdyzh may be one of the oldest sites in the study area, the observed deviation of its distance to its nearest neighbor may also reflect chronological differences in the settlement systems. I will consider these possible differences in detail in Chapter IV.

2. Sites Without Mammoth-bone Dwellings. The Difference of Means Test conducted on the nearest neighbor distances of sites without dwellings located in the northern half and in the southern half of the study area (same quadrants as used in the previous test) reveal additional differences. Specifically, sites without dwellings located in the north have a mean distance of 22.38 km from each other with a corrected standard deviation of 40.25 km (N=14). Those in the south are far fewer in number (N=2) and more distant from each other (mean distance = 145 km, with standard deviation = 0). The clustering of sites without dwellings in the northeastern quadrants of the study area has been discussed previously. It is reflected in these calculations as well as in the differences of both overall numbers and in

mean distances between the nearest neighbor sites. The observed differences between the distribution of these sites in the north and in the south I interpret as primarily reflecting archaeological bias. The Desna and Sudost' regions are the best known and it is, therefore, not surprising to find a large number of these "less visible" sites concentrated in the Desna area. I will examine these differences in detail in Chapter VI. For the purposes of the present discussion they are offered merely to show locational regularities in the distribution of the sites across the study area.

VII. SUMMARY

This section of the chapter has focused on the distribution of the Upper Paleolithic sites on the Central Russian Plain. It has shown the following regularities to exist in the distribution:

1. The sites are linearly distributed across the study area and found in the river valleys.
2. Within the river valleys the sites are preferentially located on promontories close to water.
3. The sites were located in regions of the river valleys where good lithic resources were available.
4. The sites with large numbers of mammoths, (i.e., with mammoth-bone dwellings) are

preferentially located clode to both the floodplain and ravines. It is presumed that this location reflect past procurement practices employed in obtaining mammoths. I also presume that such location favor the hypothesis that some of the mammoth present at the sites reflect active hunting of the species.

5. Sites with mammoth-bone dwellings are found in two noncontiguous sections of the study area. I presume that this reflects the presence of two separate social groups and different settlement systems in the area--one in the north and another one in the south. The occurrence of similar sites in both regions suggest the presence of regular interaction between the two regions.
6. The distribution of sites with mammoth-bone dwellings shows a regular pattern across the study area with these sites being mainly found from 50-70 kilometers from each other.
7. Sites without mammoth-bone dwellings do not show the regularity of distribution across the landscape shown by the sites.

with dwellings . These sites are clustered in the northeast section of the study area. I suggest that their distribution across the Late Valdai landscape was conditioned by factors other than those responsible for producing the more regular distribution of the sites with dwellings .

VIII. CONCLUSION

This chapter has presented the geology and the geography of the study area both today and in the Late Valdai. After describing the overall geography and geomorphology of the area, information was presented on each of the sites. The concluding section of the chapter considered the regularities in the distribution of the sites across the study area. The overall pattern that has emerged from this locational analysis is one that shows both the presence of a linearized settlement system in the area as well as clear differences between sites located in the northern half and in the southern half of this linearized system. The Dimensional Analysis of Variance Tests conducted on the distribution of the sites in the region have shown that the linearization present runs roughly along the south-west to north-east diagonal.

The observed patterning in the distribution of the Upper Paleolithic sites across the study area resulted from a number of decisions that were conditioned by numerous logistical considerations. The patterning of site locations

results from repetitive behavior as a specific kind. Binford (1982b:6) writes that:

> The processes which cause site patterning are long-term repetative patterns in the "positioning" of adaptive systems in geographic space.

The positioning of adaptive systems in space is, likewise, conditioned by a number of variables--for hunters and gatherers it is first and foremost determined by the distribution of resources across that space. Jochim notes that for hunters and gatherers:

> The duration and location of settlements are certainly influenced by many considerations, but the primary factors seem to be related to subsistence (Jochim 1976:47; underlining mine).

Similar views are widely present in the literature of ethnographically known hunters and gatherers as well (Heffley 1981; Helm 1968; Steward 1955).

The location of sites within a region then, is first and foremost shaped by economic considerations--and these operate within a specific environment. The key, therefore, to understanding the major portion of the observed patterning discussed in this chapter lies in understanding the environment of the study area in the Late Valdai. This understanding requires both paleoenvironmental reconstruction and some paleoenvironmental modeling and will be undertaken in the next chapter.

As numerous authors have pointed out, hunters and gatherers' adaptive systems are not exclusively conditioned by

economic or subsistence considerations alone--social, ideological, and demographic factors all form a necessary part of these systems (Heffley 1981; Jochim 1976; Yessner 1981). These factors, however, do not appear to be the prime movers that produce a particular settlement system--rather, they appear to act like modifiers which differentiate systems. In this work they will be considered in Chapter VI.

Recently Binford (1982b) has advanced some interesting ethnographically derived locational models for investigating past regional social systems archaeologically. They are based on the locational analysis of site distribution within a specific region and offer a number of patterns for hunters and gatherers' settlement systems. Binford distinguishes the settlement patterns produced by more mobile foraging groups and those of logistically organized hunters and gatherers. His models can offer some new and interesting insights into the patterns observed in the study area. The observed pattern there appears to reflect his "point-to-point" model. Binford describes this settlement pattern as characteristic for logistically organized hunters and gatherers. The application of this model to the Central Russian Plain data, however, is premature at this point, and will be addressed after the subsistence system has been considered and site occupations synchronized.

Lastly, one more very important problem remains to be solved before I can consider the significance of the observed

patterning of site locations--chronology. This chapter has treated all of the sites as if they were a synchronic unit. In reality the sites span a period of some 15,000 years of occupation. I will discuss the dating of the sites in Chapter IV. As that discussion will demonstrate, a number of major unsolved problems exist that preclude us from being able to firmly date many of the sites either through chronometric or relative methods. Both extant dating schemes and the scheme to be offered in Chapter IV are controversial. Because of this, I had decided to consider the locational relationships between the sites first without regard to chronological considerations. This approach has yielded clear evidence of patterning as well as probably a good deal of "noise" generated by chronological differences between the sites. I will return to this patterning after establishing tentative chronological controls, and will examine possible changes in this patterning through time.

CHAPTER III

THE ENVIRONMENT OF THE CENTRAL RUSSIAN PLAIN

I. INTRODUCTION

Recent work by Doluhanov and Pashkevich (1976, 1977), Grichuk (1969, 1975), Levkovksaya (1974), Velichko (1961, 1969a, 1969b, 1969c, 1973, 1974), and Velichko et al. (1975, 1977, 1981) has brought out much new geological, paleobotanical and paleontological information to the fore that permits us with some certainty to reconstruct the climate, flora, and fauna of the Central Russian Plain during the period of 25,000-10,000 years ago. In this chapter, I will first describe the present day environment and then review its reconstruction for the Late Valdai interval, paying special attention to the data utilized for this reconstruction.

The importance and germaneness of the environment for archaeological studies is self-evident today. The role of the Pleistocene environment in the lives of the hunters and gatherers of the Central Russian Plains was no more deterministic than is the role of the present day environment. As Steward (1955) and his numerous successors have pointed out, the environment limits the subsistence options open to a group in a given environment but in no way forces them to

exploit this or that set of resources.

The purpose of this chapter then is to examine the "environmental given" confronting the Late Paleolithic groups so that we can better understand their use of that "given", as that use is revealed to us in the archaeological record. It is believed that such an approach will shed an important new light on the archaeological record of the Late Valdai Central Russian Plain.

II. PRESENT DAY ENVIRONMENT AND ECOLOGY OF THE CENTRAL RUSSIAN PLAIN

A. Climate

The general climate of the central part of the Russian Plain can best be characterized as moderately warm with continentality from west to east (Soviet Ukraine 1965). Average annual temperatures, precipitation, and number of frost-free days are listed in Table III-1. The most prominent feature of the climate in this area is an almost latitudinal N-NE to S-SW zonation in the distribution of temperature, precipitation, and humidity with maximal temperatures being found in the southeastern part of the Plain. Precipitation and humidity grade from a maximum in the west to minimal in the eastern part.

The Central Russian Plain is an area where two large atmospheric pressure systems meet; the moisture bearing Atlantic air and the southern air mass which is hot and dry. The interaction of these air masses throughout the year results in the predominance of mostly southwesterly and

westerly winds in the winter and northwesterly and westerly ones in the summer. As Table III-1 shows, maximal precipitation in the form of rain, falls in the warm weather months (July and August). The thickness of the snow cover varies greatly on the Russian Plain, but can also be said to exhibit a gradation from west to east with the thickest snow cover being found in the vicinity of the Carpathians (20-30 cm per year) and the lightest snow cover in the steppe region (5-10 cm per year) (Ukraina 1969).

B. Vegetation

The central part of the Russian Plain is composed of three distinct ecological zones: 1) the northern mixed forest belt of the Polissya region extending approximately as far south as the city of Kiev (50°26'N-30 31'E latitude); 2) the broad forest-steppe zone from Kiev to approximately Kharkov (50°00'N latitude); and 3) the steppe zone south of Kharkov (Ukraina 1969). The Upper Paleolithic sites discussed in this work are all found in today's mixed forest and forest-steppe zones. The steppe zone, therefore, will be omitted from this discussion as it lies further south than these sites.

The Polissya mixed forest belt is a sub-province of the East European deciduous forest province, and in the past was far more heavily forested than today. This low-lying area of the Russian Plain was most affected by the degradation of the Fennoscandian Ice Sheet and today is a forest and swamp biotope. The forest mix is approximately 62% conifer (pine

and spruce) and 38% deciduous (oak, birch, aspen, and alder) (Geografiya Byelorussii 1977). Non-arboreal meadow grasses occur primarily along the river valleys.

The forest-steppe zone lies to the south of the Polissya and today has only about 11% of its territory covered by forest. This is a broadleaf forest with a mixture of oak, hornbeam, maple, and linden and a thick undergrowth of hazel (Ukraina 1969). Arboreal vegetation today predominates on higher elevations and on the right banks of the rivers. Grasslands are classified as meadow-steppe, increasing in territory to the south where they grade off into the true steppe.

C. Fauna

Much of the fauna as well as the flora indigenous to the Dnepr-Desna area in the past has disappeared as a result of man's agricultural activities in the last two centuries. However, many of the species which played a role in the subsistence practices of Upper Paleolithic hunters and gatherers, existed in the area until the recent past. Kirikov (1979) in his work on the tenth to the sixteenth century A.D. fauna of the East European forest-steppe, lists the following germane species present:

ORDER	FAMILY	SPECIES - COMMON NAME
Carnivora	Felidae	Lynx lynx - lynx
	Mustelidae	Gulo gulo - wolverine Lutra lutra - otter Meles meles - badger
	Canidae	Canis lupus - wolf Vulpes corsac - corsac fox Vulpes vulpes - red fox
	Ursidae	Ursus arctos - brown bear
Perissodactyla	Equidae	Equus caballus - horse
Artiodactyla	Suidae	Sus scrofa - wild boar
	Cerviadae	Alces alces - moose Capreolus capreolus - roe deer Cervus elaphus - red deer
	Bovidae	Bison priscus - bison Bos sp. - cattle Saiga tatarica - saiga antilope
Rodentia	Scuiridae	Marmota bobac - steppe marmot
	Castoridae	Castor fiber - beaver
Lagomorpha	Leporidae	Lepus europaeus - European hare

The avifauna of the Russian Plain is a rich and varied one today. A comparison of the bird remains found at the Upper Paleolithic sites listed by Umanskaya (1972) with those currently present in the area (Voitenko 1965) shows that the following migratory water fowl exploited by Upper Paleolithic hunters and gatherers still exist in the region today:

ORDER	FAMILY	SPECIES - COMMON NAME
Anseriformes	Anatidae	Anas sp. - duck Anser sp. - geese Cygnus sp. - swan
Charadriiformes	Laridae	Larus sp. - gull

Fish present in the Dnepr and Desna rivers today and in their tributaries represent both local river varieties as well as a decreasing number of anadromous fish that come up to spawn from the Black Sea (Sovetskaya Ukraina 1965). Lebedev (1944, 1952) gives the following list of fish still extant in the rivers today that were exploited by Upper Paleolithic groups:

ORDER	FAMILY	SPECIES - COMMON NAME
Protacanthepterygii	Essocidae	Esox lucious - pike
Cypriniformes	Cyprinidae	Abramis sp. - bream Luciscus sp. - ide fish Rutilus rutilus - roach fish
Saluriformes	Saluridae	Salurius glanis - cat fish
Perciformes	Percoidea	Lucioperca lucioperca - pike-perch Perca fluviatilis - perch

The presence of anadromous fish such as Salmo sp. (salmon) in the Dnepr and Desna rivers in historic times is reported both by Lebedev (1944) and Casteel (1976).

III. SOME PROBLEMS IN PALEOENVIRONMENTAL RECONSTRUCTION

This section will examine the environment of the Central Russian Plain during the fifteen thousand year interval from the Bryansk Interstadial to the onset of the Holocene some 10,000 years ago. The data necessary for the reconstruction of past climate, vegetation, and fauna are geological, paleontological, and paleobotanical. They come from a number of archaeological and geological sites separated both in time and space from each other and, therefore, lacking temporal and spatial continuity. Thus it is impossible to present a continuous environmental record of this period. What I have instead chosen to do is first to briefly generalize the overall trends evident during this period and then to examine specific cases at particular periods in time, focusing on the tripartite division of this period presented earlier: 1) the time of the Bryansk Interstadial at 25,000 B.P.; 2) the period of climatic deterioration between 24,000-20,000 B.P.; 3) the Valdai maximum at 18,000-20,000 B.P.; and 4) the post-maximum period of 18,000-12,000 years ago. I will deal with the environment of the Central Russian Plain until approximately Dryas I. The Dryas II and III cold periods and the Allerød warm period will not be examined in this work.

The nature of the evidence used for paleoenvironmental reconstruction involves a number of major problems. While it is true, as numerous authors have pointed out, that our record of the Pleistocene climate and environment is most complete for Late Pleistocene, and especially for the time

period considered in this work, the evidence itself is problematic. Geological data, for example, come from strata that may either be discontinuous or absent at key localities. The nature of particular deposits is innately connected with highly localized events. Granulometric, morphometric, and chemical analyses of sediments have produced some important though controversial paleoenvironmental information in France, which appear fine-tuned enough for reconstruction of climate on the 10^3 year time scale (cf. Laville et al. 1980, Movius 1977). They have, however, been confined to cave sediments. Similar analyses of sediments on the Central Russian Plain have, to date, not yielded information fine-tuned enough to record the climatic oscillations within the Late Valdai itself (see for example, Velichko et al. 1981a for diagrams and interpretations). It may well be that the scale on which geological processes operate is different from the time scale important to archaeologists.

Paleobotanical evidence has been widely used for paleoenvironmental reconstruction and will form an important component in the following discussion as well. A number of problems exist, however, with this data source. First, as Gubonina (1975) notes, pollen and spores preserve better in relic soils than in loess due to mineralization in the latter. This means that the amount of pollen and spores present in deposits on the Central Russian Plain is inversely related to the thickness of loess cover--increasing from north to south. Another important factor that contributes to possible error

is the differential preservation rates for different plants. Birks (1981) writes:

> Studies of modern pollen deposition in arctic and subarctic areas have shown that several major components of the vegetation are poorly registered in the pollen rain...for example, the abundant lichens, mosses, and low-growing herbs are absent or are barely represented in modern assemblages (1981:338).

Since, as will be shown below, the Late Valdai Central Russian Plain was covered by periglacial forest-steppe vegetation and climatically similar to present day high latitude regions, this factor is an important one to consider in the reconstruction of Late Valdai environment.

A more serious problem in using pollen data for paleo-environmental reconstruction is pointed out by Davis (1976). She notes that plant migration does not occur instantaneously after a climatic change, but that it occurs at varied rates for various species, and, most importantly, is limited by the migration speed of different species.

This means that the sudden arrival of a species, limited as it is by its migration speed, can not be attributed to a change in climate. Nor, by analogy, can the absence of a species be taken as evidence of unfavorable conditions. Davis' work implies that pollen evidence should not be synchronic with the geological evidence—the two sets of data clearly must be out of step with each other. This factor is confirmed by Wright (1976) who reports that the three or more ice lobe

fluctuations in the Wolf Creek area of the New World between 20,000-12,000 B.P. are not matched by systematic change in the pollen profile. He postulates that the reason for this discreptancy may be either that the glacial advances resulted from non-climatic causes or, more likely, that pollen is not sensitive enough to show climatic changes of the magnitude involved in glacial fluctuations.

Paleontological data is likewise fraught with difficulties. Figure III-4 lists the mammalian species found in the archaeological sites of the Central Russian Plain. The species listed are those for which we have information on the environmental requirements and biogeographic distribution today. As the figure shows, the species exploited by man in Late Valdai time and, which presumably were fairly sympatric at the time, today are quite allopatric and found in very different biogeographic zones (e.g., the co-occurance of tundra forms such as Dicrostonyx torquatus with Vulpes corsac or Marmota bobac, both steppe dwellers today). This necessarily points to the existence of a unique environmental condition which has no present day analogues. This table, however, will not be heavily used for paleoenvironmental reconstruction as it reflects not only the environment but more importantly, the economic practices of Upper Paleolithic man who was selectively exploiting particular species. As has been amply noted in the literature, it is less desirable to use species exploited by man for paleoenvironmental reconstruction as the presence of these species in the record

reflects not only "nature" but more importantly "culture" as well (Binford 1981; Butzer 1971; Guilday 1970, Jochim 1976). I will, therefore, use only the microfauna, avifauna, and molluscan fauna found at the sites as paleoenvironmental indicators.

The use of these groups, however, also presents problems. Rodents, although very sensitive to environmental factors, also reflect the unique Late Valdai environment in which they lived and as Table III-5 shows, we see again the co-occurance of widely diverse forms that are today found in very different zones. For example, Dicrostonyx torquatus, a tundra resident, co-occurs with Suslicus rufensis, a steppe dweller. Birds found at the different Late Valdai sites also reflect this unique environmental mix. The avifauna is presented in Table III-6, III-7, III-8, III-9, and III-10. As Umanskaya notes (1972), birds are a less sensitive environmental barometer than rodents and reflect not so much specific temperatures as the presence or absence of arboreal vegetation.

Finally, the molluscan remains are presented in Table III-11. Molluscs first and foremost reflect the physical nature of their environment: terrestrial or aquatic, fresh water or salt (Likhachev and Rammel'meier 1962; Zhadin 1965). Secondarily and less strongly, they reflect the temperature of that environment. Their present day ecology and distribution is such that they can only be divided into two broad categories of warm or cold loving species.

The paleontological data, coming as they do from primary and secondary consumers, necessarily cannot be perfectly synchronized with paleobotanical data. Bones of consumers, by necessity, will appear later than the paleobotanical data that reflects the presence of primary producers. The presence of a particular species in the record cannot signal the onset of a climatic change, but, rather, can only reflect events that have already occurred in the past.

In summary, the above discussion clearly points out that, at present, we cannot document the climatic oscillations of Late Valdai with either great certainty or offer an uninterrupted sequence of Late Valdai climate. All that can be done is to present more or less synchronized glimpses into the paleoenvironment at different points in time during this time period.

IV. GENERAL FEATURES OF LATE VALDAI

A. Climate

The Late Valdai period was a time of climatic degradation that saw the progression of ever increasing cold temperatures coupled with decreasing precipitation. Halcheva's (1975) granulometric and chemical analysis of Valdai loesses and soils shows that the period saw a progressive reduction of the role played by chemical agents in erosion and an increase in the importance of wind erosion. Chebotareva and Makaricheva (1974) document the correlation of Valdai warm episodes with the increased presence of moisture and the co-occurance of cold and dry

periods. This observation is confirmed by Grichuk (1969). Grichuk, using paleobotanical data, has outlined the sequence of Valdai climatic rhythms that show stadial periods begin as cold and wet and in time change to colder and dry.

The aridity and coldness of this period was not restricted to the Central Russian Plain. Evidence for it is found in continental Europe as well as in the New World. Butzer (1976) reports the inverse correlation between temperatures and precipitation all over the continental middle latitudes during the end of the last glaciation. Summer temperatures in mid-latitude regions were depressed by 7°-10°C, winter temperatures by at least 26°C. Warm weather seasons were quite brief in duration, lasting perhaps 3-4 months, while cold weather predominated for 7-8 months. Mean annual temperatures were 15°-18°C colder than today.

The extremely cold temperatures and the presence of permanently frozen ground in the study area is documented by two cryogenic horizons in the deposits. Velichko (1975) notes such periglacial features as ice wedge casts and polygons both in Loess II and Loess III. These features are associated with permanently frozen ground. The extent of the permafrost and the distribution of periglacial features is illustrated in Figure III-1.

The low temperatures in Late Valdai resulted from the maximal advance of the Fennoscandian Ice sheet which not only lowered the overall temperatures but also possibly created temperature inversions. Butzer (1971) writes that, "the

area affected by such an inversion must have extended 1000-1500 km. beyond the major continental glaciers". Such an inversion would have affected the whole of the Central Russian Plain.

The presence of the ice sheet also profoundly affected the atmospheric circulation and resulted in precipitation sequences different than the present day ones. The progressively increasing aridity of this time period is well documented in the literature (see Butzer 1976; Colinvaux 1981; Davis 1976; Peterson et al. 1979; Velichko 1961; Wright 1976). Wright (1976) attributes the reasons for this increasing aridity to the secondary effects of the presence of the huge ice sheets to the north. Butzer (1976) adds the contributing role of cooler ocean surface water, and greater atmospheric stability over the tropics.

Estimated precipitation figures for this time period are presented in Table III-2. They show a reduction in both annual precipitation averages and also a substantial decline in the amount of winter precipitation in the form of snow. Butzer (1971), citing Poser's work, reports that much of the Russian Plain was in a low pressure zone in the summers while Frenzel (1973) writes that the prevailing wind directions during the last glacial were similar to today's. Voznyachuk et al. (1969a) suggest a difference in the wind patterns for this period. They believe that the presence and growth of the ice sheet to the north of the study area would have effectively blocked much of the moisture bearing Atlantic and

oceanic currents. This would result the major period of precipitation occurring in warm weather months. Table III-2 which shows the current precipitation rates and seasonal distribution of precipitation in the area and the precipitation rates for Late Valdai appears to corroborate Voznyachuk's interpretation. The statistics show, for example, present day precipitation of 560 mm per year for the city of Bryansk and a figure of no higher than 400 mm per year for the Bryansk Interstadial period. Figures for snow precipitation are 150 mm per year today for Bryansk and are estimated to have been from 30-120 mm per year during the Late Valdai.

In brief, we can conclude that the bulk of precipitation fell during the warm weather months and that the study area had a light winter snow cover.

B. Flora

The uniqueness of the Late Valdai vegetation has been amply attested to in the literature (Butzer 1971; Colinvaux 1967; Frenzel 1973; Grichuk 1969a, 1975; Lindelius 1976). The Central Russian Plain, which today lies in the forest belt, was during Late Valdai covered by open nonarboreal vegetation which various researchers classify differently. Grichuk (1969a) wrote that it was neither a tundra, a forest nor a steppe, but a unique periglacial floral community and terms the tundra and steppe-like vegetation of the interfluves and loess plains "periglacial steppe". Numerous other terms have appeared in the literature to describe this environment both in the Old and New Worlds and numerous arguments still exist

whether it was more steppe-like or tundra like (Butzer 1971; Colvineux 1967; Frenzel 1973; Grichuk 1969a, 1969b, 1972, 1975). Without going into the specifics of the different arguments made, we can summarize that the Central Russian Plain was covered by a unique tundra-grassland with sparce arboreal vegetation that was most densly distributed along the river valleys in the form of gallery forests. A comparison of pollen diagrams reflecting the vegetation of the area at various times of the Late Valdai (Figures III-4 to III-8) shows the predominance of nonarboreal vegetation at all times after the Bryansk Interstadial. The diagrams, however, also show that some tree growth was always present in the area in the form of Pinus sp., Betula sp., and Larix sp. strands which at times included some deciduous elements such as Quercus sp. As the subsequent discussion will show, warmer periods of the Late Valdai saw an increase in the arboreal vegetation and possibly turned the area into a forest-steppe, while in colder periods tundra-steppe vegetation predominated and reduced the area covered by shrubs, bushes, and trees.

At the beginning of this chapter I showed that the Central Russian Plain today includes three distinct ecological zones: the northern mixed forest, the broad forest-steppe, and the southern steppe. This zonation reflects the distribution of climatic belts in the area. Vastly different climatic conditions during the Late Valdai created a different biogeography in the study area. Velichko (1969c, 1973) has postulated the absence of these broad climatic and

vegetational belts during the Late Valdai. Instead he suggests that the Central Russian Plain was a part of a vast "hyperzone" that existed south of the Fennoscandian Ice Sheet. During this period of periglacial hyperzonality which lasted until the retreat of the ice sheets, there was no vegetational differentiation by latitude as today—rather the whole plain was covered by very similar vegetation which differed north to south in a minor way that is in no way comparable to today's zonation. This hypothesis finds confirmation in Grichuk's paleobotanical research and is in accord with the postulated existence of a cold dome of temperature inversion over the Central Russian Plain.

This cold periglacial steppe was rich in herbacious plants with components of semi-desert or salt tolerant species (Butzer 1976; Grichuk 1972). It supported large numbers of gregarious herbivores of different species. This conclusion is supported by both paleobotanical and paleontological data.

A cautionary note, however, must be sounded at this point about the possible problems in this reconstruction. Many of the arguments presented to support this reconstruction focus on the uniqueness of this environment and various theories have been offered to explain the supposed high productivity of these "low-latitude tundras" (Butzer 1971; Klein 1973; Vereschagin 1979). An important component of these arguments, however, is the presentation of the paleontological evidence which shows that large numbers and a great variety of herbivores

were supported by this environment. Using analogies to present day grasslands and their carrying capacities, the arguments state that a region supporting such a mass of primary consumers must indeed have been a very productive one. A discordant note, however, has been recently sounded by the work of Cwynar and Ritchie (1980) in the Yukon. Working with Late Glacial environments in Alaska, a Pleistocene environment which is considered quite similar to that of periglacial Eurasia, they note that the pollen record does not support the "arctic steppe" concept. Specifically, they suggest that the pollen diagrams from the Late Pleistocene period are not that dissimilar to those of the area today—implying that the environment was not a rich grazing cold steppe capable of supporting teeming multitudes of herbivores, but rather a type of an arctic steppe-tundra. They caution that researchers modeling the environment of the period best concentrate on models of a harsh environment supporting small populations of vertebrates and not use the analogues of species-rich contemporary African savanna. While this work does not totally negate the validity of the paleoenvironmental reconstruction offered above, it does bring into question the widely held assumption that the Pleistocene "periglacial steppe," "arctic steppe," or "low-latitude tundra" was extremely productive and able to support great numbers of vertebrates.

It may well be that part of the problem created by these divergent interpretations of the Late Glacial environments

can be resolved by considering not only the overall numbers of species present but also the distribution of these species across the Pleistocene landscape--a point I will address later in this chapter.

C. Fauna

1. Some Problems and Cautionary Notes. Table III-5 presents the paleontological remains found at the Upper Paleolithic sites of the Central Russian Plain. Before turning to these lists, however, we should consider some of the biases inherent in them. There are no Late Valdai paleontological collections from sites or localities away from the river valleys. This situation imposes additional difficulties for accurate paleoenvironmental reconstruction. As noted in the last chapter, all the archaeological sites are found in or adjacent to the river valleys. Since all paleontological collections come from the archaeological sites, this precludes the possibility of considering possible differences in the spatial distribution of the different species across the Central Russian Plain landscape.

As Guthrie (1968) has shown, differences existed in Pleistocene Alaska between the herbivore communities inhabiting the flood plains and those in the interfluves. Similar differences probably also existed on the Central Russian Plain but at present have neither been recognized nor studied.

The presence of extinct species in the collections creates numerous difficulties for paleoenvironmental reconstruction as well. The ecological requirements for some of the extinct species are still a subject of debate among paleontologists. For example, Mammuthus primigenius is considered by some to have been a grazer (Butzer 1971; Guthrie 1968; Kurten 1973; Vereschagin 1979); others see it as a browser (Pidpolichko 1969, 1976), and still others see it as a mixture of grazers-browsers (Ermolova 1963; Velichko et al. 1977a). Kornietz (1962) reports that the stomach contents of various frozen mammoths found in Siberia are ambiguous--the Indigirka mammoth of Yakutia has remains of Pinus and Picea shoots in his stomach, the Berezvka mammoth stomach held steppe grasses, while the Novosibirskii Island and Taymyr mammoths showed a mixture of both twigs, leaves, and grasses. It appears, therefore, that the woolly mammoth should be considered a mixed browser-grazer whose presence in the assemblages need not necessarily reflect the exclusive presence of either grassland or forest environment. I have placed Mammuthus primigenius, therefore, in a category of species found widely distributed in different vegetational zones.

Even less is known of the ecological requirements of Coelodonta antiquitatis. Opinion in the literature tends to link the distribution of the woolly rhinocerus with that of the mammoths (Butzer 1971; Kurten 1968). Vereschagin (1979), however, believes this species to have been a browser

exclusively. I have also selected to place this species in the category of widely distributed species not suitable as environmental indicators.

There are two other problematic forms in the assemblages--the equids and leporids. I have identified all horses excavated at the Central Russian Plain sites as Equus sp. even though some researchers in the past have classified them as distinct species. For example, the faunal list presented by Shovkoplyas (1965) for Mezin lists the form there as Equus equus. Pidoplichko (1976) identified the equids of Mezhirich also as Equus equus. Vereschagin (1977) lists the Yudinovo equid as Equus caballus, while Gromov (1948) placed all equid remains from the Central Russian Plain into the category Equus sp. Kornietz et al. (1981) have reassigned the Mezhirich equid remains to the species of Equus latipes Gromova. They thus follow Kuzmina (1978), who has examined the remains of the Late Valdai horses from Novgorod-Severskii, Mezin and Kostenki sites hitherto classified variously as Equus equus, Equus caballus latipes or Equus sp. She concludes that they all belong to the same extinct Late Pleistocene species and names it Equus latipes. Azzaroli (1982, personal communication) states, however, that Late Pleistocene horses should be classified as sub-species of Equus caballus. Since Kuzmina has not reexamined all of the equid remains from the Central Russian Plain, and since other classifications exist for them in the literature, I

have decided to place all equid remains into the undifferentiated category of Equus sp. which will have to await further deliniation.

A similar classificatory difficulty exists with the leporids. The literature abounds with different species identifications ranging from Lepus europaeus for Mezhirich (Kornietz et al. 1981) to Lepus sp. for Mezin, Mezhirich and Dobranichevka (Pidoplichko 1969) to Lepus timidus (Velichko et al. 1981). Gureev (1964) has proposed a new species for Late Pleistocene leporids of the Russian Plain--the large and extinct form of Lepus tenaiticus. My own examination of the leporids from Mezhirich, Gontsy, Khotylevo II, Mezin, and Novgorod-Severskii indicates close metric and morphological similarities in the remains. I have, therefore, decided to combine all the fossils into one taxon, Lepus sp. until further reexamination leads to an evaluation of the new Pleistocene species Lepus tenaiticus proposed by Gureev.

Finally, some remarks are warranted about the compilations of the faunal lists presented in this work. As the bibliographies at the bottom of Table III-5 indicate, the faunal lists were taken from the literature. They have, however, also been amended to reflect both my own reexamination of the collections and the archival information available but not considered heretofore in the publications, as well as my examination of remains excavated after the faunal lists were published. This was done for the sites of Dobranichevka, Eliseevichi, Gontsy, Khotylevo II, Timonovka II, and

Yudinovo. In other cases two or more faunal lists published at different times and reflecting different years of collection for the same site were combined and are presented summarily. This was the case for Berdyzh, Eliseevichi, Novgorod-Severskii, Timonovka I, and Yudinovo. In some cases, such as Suponevo, where no collections have been preserved, amendments to the published information were made based on the field notes of the excavator.

The treatment of faunal remains varies greatly in the USSR. In general, these excavations that were conducted either by paleontologists or where paleontologists were present contain the most accurate account of faunal remains. These biases, unfortunately cannot be rectified. Many of the sites were excavated in the 1920s, 1930s and 1940s and their faunal collections no longer exist. In most cases, both in the past and even today, it was and is not the habit of Soviet excavators to bring back complete faunal assemblages from the field. Faunas from the sites currently under excavation--Gontsy, Khotylevo II, Mezhirich, Pushkari I, and Yudinovo vary in their inclusiveness. The Mezhirich fauna has been analyzed and tabulated through the 1980 field season. The Gontsy, Pushkari I and Yudinovo faunal lists do not reflect remains found in recent excavations as these remains were not available for my examination. The Khotylevo II faunal list is quite incomplete. The assemblages found in different years of excavation are located at different institutes in different cities of the European USSR. Some

of these I was unable to examine. Faunal list for Khotylevo II published by Velichko et al. (1981a) lists only those remains housed at the Paleolithic Sector of the Institute of Geography of the Academy of Sciences of the USSR in Moscow. I have added to this list the material excavated at the site during the 1970 field season--a collection I was able to examine at the Zoological Institute of the Ukrainian Academy of Sciences in Kiev. The faunal lists presented in this work should be used only for tentative comparisons and are by no means firm enough for any but the simplest statistical manipulations.

The species presented in Table III-4 are grouped according to the role they played in the paleoeconomies of the Upper Paleolithic hunters and gatherers. The category of economically important species (Shovkoplyas 1965a) Pidoplichko 1976) includes those species whose remains show cultural modification in the form of dismembering, butchering, burning, or use in tool or artifact manufacturing. Species whose remains bear no cultural use markings are listed in the noneconomic category. It is presumed they represent either food debris from nonhuman predators or, in some cases, remains of animals who lived and died at the sites after they were abandoned by man. Subsequent calculations were done for each of the groups separately as well as jointly. Molluscan faunas, avifauna, and microfauna are listed first in the general faunal list (Figure III-5 and III-13) and then separately to allow for some

simple statistical manipulation relevant to specific questions raised in this work.

Because of the differential treatment of faunal remains by different excavators, I have chosen to present the faunal remains both as minimal number of bones present (MNB) per site as well as minimal number of individuals (MNI) per species per site wherever the information permitted. Figures were taken from the literature and archival sources, and in some cases, modified after my own examination. The MNI statistic is the more problematic of the two. Optimal methods for calculating this figure are still widely discussed in the literature (Binford 1978, 1981; Clason 1975, Daly 1969; Gilbert 1980; Grayson 1973, 1974, 1978). Binford (1981) has pointed out some basic problems with the use of this statistic as representing live weight of animals.

Soviet researchers unfortunately very rarely state the methods they used in reaching their MNI figures. Vereschagin (1977) is the only author who mentions that his figures are based on the calculation of the greatest number of specific skeletal elements (e.g., right or left mandibles, etc.). Since no discussion exists in the Soviet literature on the methodologies used to calculate the MNI, I have assumed that all figures were derived by the method used by Vereschagin. This constrained me to use the same method when augmenting and amending the MNI estimates in the extant lists. I added to the MNI statistic only when extant collections contained more of a particular skeletal element than was

accounted for in the MNI statistic of the faunal list. I elected to use this problematic and highly inaccurate method so as to assure some comparability between the lists.

Table III-4 groups various species into specific ecological zones where these species are found today. In the case of species now extinct, those whose ecological requirements are understood have been also included in the lists. The source material used for these assignments are listed at the bottom of the figures. Colloquial names for the species discussed were obtained from Akhmanova (1962), Kurten (1968), Landsborough-Thomson (1964), Van Den Brink (1968), and Walker (1975).

2. Late Valdai Fauna of the Central Russian Plain. The megafauna present in the archaeological sites on the Central Russian Plain reflect a unique mix of species which are today either extinct or found in very different environments. As has been widely noted in the literature, Late Pleistocene faunas of continental mid-latitude regions contained a variety of gregarious herbivores which reflect a mosaic of ecozones. These species reflect a zonal mix. As Table III-4 shows, Late Pleistocene Central Russian Plain contained species today present only in the tundra (e.g., Ovibos moschatus), tundra and boreal forests (e.g., Rangifer tarandus), together with pure steppe forms such as Equus sp. and forest forms such as Cervus elaphus. Smaller herbivores, carnivores, and omnivores also reflect this unique mix. We find such species as Sus scrofa, found in deciduous forests

today, with tundra dwellers such as Alopex lagopus, steppe dwellers like Marmota bobac and Vulpes corsac, and boreal forest dwellers such as Lynx lynx.

Microfauna, listed in Table III-5, also shows this mix of steppe (e.g., Citellus sp.), tundra (e.g., Dicrostonyx torquatus, D. gregalis), and forest (Silvaemus sylvaticus) species.

Remains of birds, listed in Tables III-6-10 are mixed as well and we find such tundra species as Lagopus lagopus and Nyctea scandia together with forest-steppe dwellers like Crex crex, Corvus corax, and Bubo bubo.

The mollusca found on the Central Russian Plain (Table III-11), like the mammalian remains, reflect both the economic pursuits of Late Pleistocene hunters and gatherers as well as the Late Valdai environment. Some marine shells found at the sites were collected as fossils from Karangatian and possibly Sarmatian marine deposits around the Black Sea and Sea of Azov (Motuz 1969; Polikarpovich 1968; Rudenko 1959; Shovkoplyas 1965). Their presence obviously reflects the cultural practices of Upper Paleolithic groups in the region and they are, therefore, omitted from this discussion. The remainder of the mollusca represent a mix of species that today also inhabit very different environments. Zhadin (1965) and Likhachev and Rammel'meier (1962) list the present day distribution of both aquatic and terrestrial mollusca in the USSR. Their listings show that such species as Unio pietorium and Sphaerium

solidum which today prefer warm waters are found in Late Valdai deposits together with such cold loving forms as Anisus contorius and Pupilla muscorum.

The close of the Pleistocene and onset of the Holocene was a time when a number of the listed species became extinct. Vereschagin (1979) reports the following large mammal species of the Central Russian Plain becoming extinct by the end of the Allerod: Mammuthus primigenius, Coelodonta antiquitatis, Bison priscus, and Megaceros sp. Other species, such as Rangifer tarandus, Alopex lagopus and Ovibos moschatus, moved much further north into newly created tundras and boreal forests. Still others, such as Marmota bobac and Vulpes corsac migrated south and southeast into the steppe zone. In brief, the end of Valdai glaciation and the onset of the Holocene saw the creation of climatic zones and the evolution of biogeographic zonation found today (Butzer 1971; Hotynski 1977).

The co-occurance of species that today have widely different ecological requirements during the Late Valdai does support Velichko's concept of environmental hyperzonality. If such climatic and biotic hyperzonality existed on the Central Russian Plain during the Late Valdai, then we should find a mix of species inhabiting such an environment. The data presented in Table III-3 conform broadly to these expectations. As noted in the discussion of the Pleistocene floras, however, all of the paleoenvironmental reconstructions available in the literature

fail to consider the question of the distribution of these species across the landscape. The same criticism can be addressed to the faunal data presented in this section. It too gives the overall presence of a multitude of species but fails to consider the distribution of them. As noted, their occurance together at the sites reflects the cultural practices of Late Pleistocene hunters and gatherers as well as the environment. This important point will be addressed in the final section of this chapter.

D. Summary

We can sum up the general reconstruction of the Late Valdai environment of the Central Russian Plain as one with arid, cold continental climate and cold-tolerant periglacial forest-steppe vegetation where non-arboreal species predominated and sparce tree growth was concentrated in the riverine gallery forests. Some additional tree growth may have occurred in open forest strands creating, in warmer times especially, an open parkland type of a landscape. Soviet researchers have recently used paleobotanical and paleontological data from this region to construct climatograms for this time period (Markova 1975; Velichko, Ed. 1981). They conclude that the closest environmental conditions to the Late Valdai are found today in central Yakutia in Siberia at approximately 62° latitude. The Late Valdai environment with its short warm seasons and long cold seasons, was inhabited by a unique mix of species, some of which are extinct today and others occupy very divergent zones. A

unique feature of this landscape not found in any contemporary analogues was the apparent presence of large numbers of gregarious herbivores. Even though the Central Russian Plain was located close to the ice front, with the Fennoscandian Ice sheet located some 100-300 km north of the northernmost sites, the region may have had a much greater carrying capacity than present day arctic tundras--a factor that Butzer (1971, 1976) attributes to the lower latitudinal position of this region which was thus able to absorb much greater amounts of solar radiation than can present day tundras in high latitudes.

Doluhanov and Pashkevich (1977) refine this overall picture somewhat by suggesting that some minor latitudinal differences did exist across this periglacial landscape. Specifically the northern part of the Central Russian Plain, in the upper reaches of the Dnepr and the Desna valleys, tundra-steppe grassland with a mix of sparce forest growth existed while further south, in the mid-Dnepr basin, the vegetation was more arboreal and should be called periglacial forest steppe.

The Late Valdai period also contained a number of climatic oscillations which had profound effects on the environment. I will now turn to these oscillations and consider the climate and environment during these periods.

V. THE BRYANSK INTERSTADIAL

In this section I will present the paleoenvironmental reconstruction of the Central Russian Plain during the time

period when the Bryansk soil horizon was formed some 24,000-27,000 years ago.

A. Climate

This warm period during the Late Valdai, according to Velichko et al. (1977), had slightly warmer climate and an appreciably greater precipitation than existed later on during Late Valdai. Levkovskaya (1977) also describes this warming period as one with climate warmer than in the subsequent glacial maximal period, but still colder and wetter than found in the area today. A comparison of figures showing the present day precipitation of the Central Russian Plain and those during the Bryansk Interstadial suggests that the annual precipitation at that time was greater than 600 mm per year, of which more than 200 mm per year fell as snow (Table III-2).

Analysis of the Bryansk soil layer itself has led Morozova (1969) to conclude that it was formed under permafrost conditions. She noted that the soil horizon is similar in microstructure to the soils in central Yakutia where cryogenic processes operate today. Translating these observations into climatic implications, Velichko et al. (1977) suggest that the January temperatures may have been as low as found in central Yakutia: -30 to -40 C. The nature of the periglacial deformations found associated with this layer leads Velichko (1969d) to conclude that permafrost was present and had a seasonal thaw layer ranging from 0.4 meters in the north to perhaps as much as 1-1.5 meters in

the south of the study area. The moderate nature of these deformations and the fact that only medallions and not full scale polygon nets are present leads him to conclude that the climate was less severe than in the subsequent periods.

No data exist about the location of atmospheric pressure belts over the region, specifically during this time period. In fact, this information is lacking for all of the subdivisions of the Late Valdai considered in this section. I, therefore, can not deal with any possible changes in broad climates during each of these periods and instead will have to rely on the general climatic picture of the area presented previously.

B. Flora

The vegetational cover of the Central Russian Plain during this time period is fairly well known from extensive pollen samplings and is illustrated in Figure III- 4. Grichuk (1969a, 1969c), working with pollen data from nine geological localities, reconstructed the vegetational cover of the northern portion of the Central Russian Plain as a mixed forest where pollen spectra show at least 45% arboreal vegetation. The forests had a mix of coniferous and deciduous species such as Quercus sp. and Tilia sp. Such warm-loving species as Carpinus betulus and Tilia sp. lead Grichuk to conclude that the climate may have been milder than today--a suggestion clearly at odds with Levkovskaya's (1977). He does write, however, that periglacial hyper-zonality was already present as no changes are detected in the

soil zones over 1,000 km stretches of the Central Russian Plain.

The southern part of the Central Russian Plain, around the middle reaches of the Dnepr, has a more open vegetation. Paskevich and Dubnyak (1978) and Doluhanov and Paskevich (1976) report that a number of pollen profiles from the Ukraine suggest a forest-steppe zone there with a mix of 52% NAP, 44% AP in the profiles from Dobranichevka (see Table III-12 at a depth of 4.2 m). The forest was a mixed one with Pinus silvestris predominating, but remains of Betula sp. and Alnus sp. are also represented, as is the pollen of such broadleaves as Quercus sp., Ulmus sp., Tilia sp., Capriaus sp., and Corylus sp. Grasses are represented by Gramineae, Chenopodiaceae, and Labiatae. These authors reconstruct the landscape of the mid-Dnepr valley as one where the terraces were covered by pine forests, the river valleys and other low-lying regions such as ravines held broadleaf growth including Alnus sp. on especially moist terraines. The interfluves and plateaus were covered with meadow-steppe vegetation. Pashkevich notes that, as today, the regions on the right bank of the Dnepr had probably greater tree cover than those on the left bank where a more open steppe vegetation prevailed.

It is important to note here a caveat offered by Grichuk (1969a) to the accuracy of this pollen-based climatic reconstruction for the period of Bryansk soil formation. The pollen profiles, because of the dis-synchronized nature of

the relationship of climate and vegetation, may well represent the climate of an earlier and warmer part of the Bryansk Interstadial, and therefore, reflect the vegetation that existed earlier than the formation of the dated soil layer. This nonsynchronic relationship also explains the divergent climatic evidence for this period presented by the pollen and soil data. Since soil processes respond quicker to climatic conditions, the pedological evidence presented above probably reflect more accurately the climate of this time period than does the pollen.

C. Fauna

Only one Upper Paleolithic site, Yurevichi has yielded a C-14 date of 26,470±420 (LU 125) which falls within the Bryansk Interstadial time period. As noted earlier in Chapter II, the assemblage found at Yurevichi has been redeposited, the site has been only superficially examined, and the date itself is quite unfirm. Fauna collected at the site is very sparse and contains the ubiquitous Late Pleistocene mix of large herbivores and a single carnivore. The mix in no way can contribute to paleoclimatic reconstruction. Species present can be found today in a wide range of environments from tundra to the steppe. No microfauna, avifauna, ichtyofauna, or molluscs are known from the site.

We lack for this time period large paleontological collections that can contribute additional evidence for climatic and environmental reconstruction. Frenzel (1973)

writes that, in general, faunas dating to the warm periods of the last glacial tend to suggest a tundra environment and as such are out of step with the pollen data. This observation holds true for the microfauna found at key Bryansk soil horizon localities (e.g., Mezin, Arapovichi). Markova (1975) reports the presence of such steppe forms as Citellus sp., Alactaga jaculis, and Lagurus lagurus together with such tundra species as Dicrostonyx torquatus. She reconstructs the climate at this time as severe continental, colder than found in the region today.

D. Conclusions

Keeping in mind the contradictory evidence presented by the paleobotanical and paleontological data, we can reconstruct the environment of the Bryansk Interstadial as follows: 1) it was one with continental climate possibly slightly colder than today; 2) annual precipitation was at least as great as today; and 3) the Central Russian Plain was covered by a mixed forest in the north and a mosaic of mixed forest and meadow-steppe in the south.

VI. ENVIRONMENT BETWEEN 24,000 AND 20,000 B.P.

This section will present the environment of the Central Russian Plain between the Bryansk Interstadial and the Valdai Maximum. As was noted previously, Soviet authors see this period of time as one of steadily deteriorating climatic conditions during which the Fennoscandian Ice sheet gradually reached its maximal size (see Chebotareva and

Makaricheva 1974, for example). They do not delineate any oscillations during this time while evidence from points further west in Europe suggest that there may have indeed been a halt in the growth of the ice and a warm episode at about 21,000 years ago. Two Upper Paleolithic sites discussed in this work have been dated to this time period: Khotylevo II with a C-14 date of 23,660 ±270 (LU 359) and the problematic site of Berdyzh at 23,430 ±180 (LU 104).

A. Climate

This time period is represented by the lower part of the Loess II deposit. It shows a major change in both temperature and precipitation which is in accord with Grichuk's delineation of the climatic sequence of the stadial periods of glaciations. Specifically, the moderately continental and moist conditions of the Bryansk Interstadial became more severe in their continentality and showed a steady decline in annual precipitation. Of these two variables the decrease in the precipitation is seen as the more significant one. Estimated temperatures and precipitation rates for this period are listed in Table III-2. They show that summer temperatures decreased by as much as 5°-7° C for July while mean January temperatures do not appear to differ that much from those of the preceeding Bryansk period. Compared to present day, January temperatures were perhaps as much as 10°-25° C lower than today and the mean year round temperature as much as 4° C lower than today (Velichko et al. 1977a).

Pedological analysis of the bottom of Loess II shows that it was deposited in warmer and wetter time than the top of Loess II (Morozova 1969). It will be recalled that the deposition of Loess II corresponds to the period of the expansion of the Fennoscandian Ice and includes the Valdai maximum. The bottom half of Loess II, corresponding to the time period discussed here, shows also the continuation of cryogenic processes. This indicated that permafrost conditions were present on the Central Russian Plain (Velichko 1973, 1975b; Velichko et al. 1977a).

The increasing aridity of the climate during this time appears to have been continent wide. Peterson et al. (1979) reporta major precipitation change (decline) occurring in continental climates at about 21,000 B.P.

B. Vegetation

A number of pollen profiles exist for this time period. Pollen diagrams and tables from the Upper Paleolithic site of Khotylevo II and Dobranichevka are presented in Figures III-5,6 and Table III-12. Layers yielding samples dating to this time are indicated on the diagrams. In general, they show that the northern part of the Central Russian Plain was covered by a periglacial forest-steppe. Grichuk (1972) notes some lateral differentiation in the distribution of the vegetation--the presence of forest-steppe in the western part of the Central Russian Plain which gradually increased in steppe associations as one moved eastward.

Pollen from Khotylevo II shows that at the time the

cultural layer was deposited the surrounding countryside was covered by a periglacial cold forest-steppe with NAP vegetation represented by 76%-91% of the pollen. The 9%-24% of AP pollen present represents such species as Picea abies, Pinus silvestris, Betula pubescens, B. verrucosa, B. nana, and B. humilis--all cold-loving boreal and arctic forms. These were distributed in sparce stands and primarily concentrated in gallery forests along the low-lying river valleys. Somewhat greater presence of tree cover is suggested for this time period by the work of Serebryannaya (1972). She has analyzed pollen from the geological site of Karachizh near the city of Bryansk and has found Loess II profiles more boreal than steppic in nature. She suggests that the landscape was covered by Pinus and Betula forests with widespread green moss cover and scattered meadows with open vegetation.

Grichuk (1969a, 1969b) indicates that a change in climate can be seen from the pollen spectra at the type site of Arapovichi on the Desna. Here Loess II layer has yielded evidence for a cold and wet start with the presence of species requiring a good deal of precipitation such as Chenopodium vulgaria, Altiplacs tatarica and Artemisia lat.

No pollen sampling was done at the Upper Paleolithic site of Berdyzh, but Kaletchitz (1972, 1973) suggests that the spectra collected at the nearby geological locality of Shapurovo are contemporaneous with the Berdyzh strata in which the cultural material is found. These profiles

indicate a periglacial tundra-steppe vegetation with the presence of Picea and Betula riverine gallery forests. As noted before, great problems exist with both the stratigraphic context at this site as well as with the nature of the cultural layer—the paleoenvironmental evidence offered by Kaletchitz, therefore, can only be considered tentative. It does, however, argree with the reconstruction offered by Velichko and Grichuk.

The vegetation of the mid-Dnepr basin can be reconstructed from the pollen data of Dobranichevka presented in Figure III-5. The spectra taken at 3.5 meter depth, Pashkevich and Dubnyak (1978) dates to the period under discussion. Here AP represents 32% of the samples and includes Pinus, Betula, and Alnus, as well as singular grains of Salix. Fifty per cent of the pollen belongs to NAP vegetation which includes Chenopodiaceae, Poaceae, Cyperaceae, Rosaceae, Plumaginaceae, and Convolvulaceae families. Pashkevich reconstructs the landscape as one where the higher elevations of plateaus and interfluves were covered by a meadow-steppe while low-lying regions held forest strands with Alnus and Salix, Pinus and Betula forests covered very small areas—probably located on the sandy terraces and in the ravines at the edge of the river valleys. They note the presence of the spores of Botrychium borealis, a tundra form, and interprets this to mean that the climatic conditions were colder than exist in the region today.

C. Fauna

Species found at Berdyzh and Khotylevo II are listed in Table III-3. Species exploited by man, as seen in Table III-4, show the usual Late Pleistocene mix of form which today have differing ecological requirements. At both Berdyzh and Khotylevo II, tundra species, forest species, and forest-steppe species are present. Berdyzh has even yielded steppe forms--remains of Equus sp. It may be somewhat significant that at both sites forest species are more widespread than those presently found in open environments--suggesting, perhaps, a greater presence of forest cover than indicated by the paleobotanical record. The difficulties inherent in using species exploited by man in ecological reconstruction, as well as the fact that the data from both sites are far from complete, preclude me from assigning great significance to this observation.

Remains of microfauna from Berdyzh and Khotylevo II are listed in Table III-5. Berdyzh microfauna consists only of remains of Citellus rufensis--presently inhabiting the steppe. Khotylevo II microfauna includes a mix of steppe (Citellus sp.) cold forest (probably some of the microtines assigned to the broad category of Microtus sp. and, therefore, not typed ecologically), and the predominance of tundra species (Dicrostonyx gregalis, Lemmus obensis, Microtus stenocranius). Sixty per cent of the rodents there today are tundra dwellers, 20% steppe forms, and 20% found in a wide range of environ-

ments. These figures support the conclusions of both Markova (1975) and Velichko et al. (1977) who interpret the rodent data to suggest a cold open vegetation of a periglacial tundra-steppe for this time period. A plot of open vegetation forms against forest forms (Figure III-2) and a plot of steppe against tundra forms (Figure III-3) indicates the predominance of open landscape species at both Berdyzh and Khotylevo II. Khotylevo II rodents indicate colder tundra environment while Berdyzh fauna indicates warmer steppe conditions. This difference may be due to a number of factors including difficulties with Berdyzh stratigraphy as well as possible chronological differences between the sites.

Markova (1975) used the microfaunal data to construct climatograms which show an increase in precipitation for this time period (see Table III-2) when compared to the previous Bryansk Interstadial. She notes the presence of permafrost disturbances in the strata of this time period--another indicator of sizeable precipitation. This observation is somewhat at odds with the general climatic interpretation of this time period offered by Grichuk of increasing aridity.

Greater forest cover, another indicator of adequate precipitation, for the Central Russian Plain during this period is also indicated by the avifauna from the sites. Tables III-6, 7, 8, 9, and 10 list the remains of birds at the Upper Paleolithic sites dividing them into those species economically important to man and those which were not

exploited by man. At Berdyzh only one individual of a forest-steppe species (Bubo bubo) was found. At Khotylevo II seven of the eight species present represent forest or forest-steppe species and only one, Lagopus lagopus is found in tundras. If we divide the birds of Khotylevo II into the category of economically important species and those not exploited by man (presented in Tables III-8, 9), we see that those not exploited by man in MNI, MNB and species could come from the forest zone. Species of economic importance show that a mix of both forest and tundra was exploited (40% of species, 53.6% of individuals, and 29.3% of bones are of forest species; 20% of species, 35.7% of individuals and 67.9% of bones belong to tundra varieties). A combined list of all the avifauna similarily shows the presence of both open space and forest species--but here the forest and forest-steppe types predominate with only 12.5% of the species, 31.3% of individuals and 65.1% of the bones belonging to tundra species. The disproportionately large percentage of bones which belong to tundra species reflect the fact that Lagopus lagopus was exploited as a human food resource which leads to greater fragmentation of bone than found among species not so exploited. A further breakdown into the categories of exploited--not exploited, water birds--land birds, presented in Table III-7, shows that all of the non-exploited species come from the forest while the exploited water birds come from the tundra, the forest, and forest-steppe and the exploited land birds come from

the forest and tundra. I conclude, therefore, that the avifauna indicates a greater forest cover than is indicated by the microfauna. This indirectly supports Markova's claim for greater precipitation in the region than postulated by Grichuk. My figures also confirm greater forest cover as projected by Serebryannaya (1972). Furthermore, these data also suggest that the figures for mean January temperatures offered by Velichko et al. (1977a) of -32.5° may be too low and that Markova's (1975) and Zelikson and Monoszon's (1974) of -17° to -18° C are more accurate.

D. Conclusion

In general, we can characterize the environment of the Central Russian Plain during the 24,000-20,000 B.P. interval as colder than during the preceeding one. The evolution of precipitation during this time period is still unclear while the general trend certainly was to increase aridity with maximal aridity reached in the subsequent Valdai maximum. This period may have begun with an increase in precipitation. The extent of the forest cover is still an open question. The data in general suggest that colder periods saw a deforestation on the Central Russian Plain. The landscape was covered by a periglacial tundra-steppe in the northern part of the plain and a meadow-steppe in the southern part. Gallery forests as well as shrub vegetation existed all across the plain.

Some contradictory data exist to this interpretation, namely Serebryannaya's (1972) pollen data from Karachizh,

Markova's (1975) precipitation figures, and the avifauna figures discussed above. All these suggest greater precipitation, forest cover, and more moderate temperatures. It is impossible, at present, to resolve these contradictions. They may reflect the fact that Soviet researchers do not recognize any climatic oscillations during this 4,000 year period. As noted previously, data exist from points further west that suggest a warmer oscillation somewhere around 21,000 B.P. The presence of such an oscillation may account for the discrepancies in the data presented above.

VII. THE VALDAI MAXIMUM: 20,000--18,000 B.P.

Radiocarbon dates from only one Upper Paleolithic site fall at the borders of this time period--Pogon at 18,690 ±770 (LU 361). The date for Mezin at 21,600 ±2,200, as will be shown in Chapter IV is not reliable. The date for Pogon appears firmer but there are no paleonological or paleobotanical remains to corroborate this date.

Ivanova (1977) notes a break in human occupation of the Molodova sites on the Dnestr during Valdai maximum. A similar situation can be seen in the data from the Kostenki-Borshevo sites on the Don (Klein 1969; Levkovskaya 1977). This suggests that the vast expanse of the Russian Plain was either not occupied or only sparsely occupied during this time period, which corresponds to the upper half of Loess II deposits.

A. Climate

Broad consensus exists in the literature that this time period saw the maximal spread of the Fennoscandian Ice sheet. This spread was accompanied by extremely dry and cold conditions. Compiled figures for the annual averages as well as seasonal temperature maxima and for the rates of precipitation for this time period are listed in Table III-1. They show a decrease of at least 2°-4°C for the annual temperatures when compared to the previous period as well as substantial decreases in both the July and January highs and in annual precipitation.

Morozova's (1969) pedological data indicate that the upper part of Loess II was deposited under conditions that were dryer than during the time that the lower part of Loess II was deposited. Frenzel (1973) notes that the predominance of steppe animals in the faunas all across Europe suggests low precipitation over wide areas. Some divergence exist in the July temperature estimates between those suggested by Butzer and Frenzel and derived by Markova. Markova (1975) models July temperatures fairly close to present day ones at 16°-18°C, while Butzer (1976) and Frenzel (1973) project a fall in mean July temperatures of 7°-10°C, compared to today. No figures are offered for the length of the frost-free period (growing season) but we can project a reduction in that as well from the previous periods' average of 106.5 days. In general, during this arid and extremely cold period, frost free days probably

lasted about 90 days (three months). This implies that very short summers existed in the area as well as long harsh winters. The discrepancies in the projected summer temperatures may reflect both chronological errors, the effect of compilation, as well as the problems associated with modeling paleotemperatures from paleontological and paleobotanical data (for a discussion on the methods used to construct climatograms see Markova 1975 and Velichko et al. 1977). Another important contributing factor to these anomalies may also be that the climatic sequences in broad latitudinal zones were not identical. As Butzer (1976) notes, higher latitudes and those regions closer to the ice front cooled first and warmed last and were subjected to substantially greater deviations than lower latitudes.

Velichko et al. (1977) writes that the position of the high pressure belt insured long anticyclonic cold weather months with low precipitation and light snow cover.

B. Vegetation

Figure III-9 presents the vegetational cover of the Russian Plain at the Valdai maximum. In this reconstruction Grichuk (Velichko 1977) indicates that the Central Russian Plain was covered by a periglacial forest-steppe. In the northern part around the upper and mid-Dnepr basins and the Desna basin, open vegetation also contained sparce Betula, Salix, Pinus and Laris forest stands. The southern part of the Plain is classified as a southern periglacial forest-steppe. Here sparce forests also included some broadleaf

species. Forest growth in both parts of the Central Russian Plain was primarily restricted to riverine gallery forests where some differences existed in the species—lower lying valleys had the broadleaf species, sandy terraces were covered by Pinus.

Grichuk (1969c) underscores the uniqueness of this vegetation cover, writing that concentric floral distribution can only be modeled for the vegetation belt next to the ice sheet itself, whereas below this zone the main changes were sub-meridial going from northeast to southwest. This contrasts sharply with the present day horizontal zonation in the region.

C. Fauna

Markova (1975) uses microfauna collected from Mezin, Novgorod-Severskii, and Chulatovo I to model the climate during the Valdai maximum. The last two sites have not been dated chronometrically and problems exist with their stratigraphies as well. The geology of both sites was done by a paleontologist and dates to the 1930s. Their investigator, Pidoplichko was noted throughout his long career to have held fairly unorthodox views about Late Pleistocene chronology and stratigraphy. In his early works he insisted that such Pleistocene species as Mammuthus primigenius and Coelodonta antiquatis did not live at the same time as man (1933). In his later works, he stated that these species lived well into the Holocene to at least 4,000 BP (see Pidoplichko 1976 for example). He rejected

the existence of the Last Glacial (Pidoplichko and Makeev 1955). All these factors contribute to the unreliability of geologic dating of both Chulatovo I and Novgorod-Severskii.

The dating of Mezin is equally problematic. I have, therefore, decided to include the data from all three of these sites in the following section which leaves no faunal remains to discuss in this section.

D. Conclusion

We can summarize the environment of this time period as one with colder and dryer conditions than found in the preceeding period. As further discussion will show, this time interval was not necessarily the most severe one of the Late Valdai. Chebotareva and Makaricheva (1974) write that the full glacial climatic peak was probably reached well after the ice growth reached its maximal limits. This again underscores the lack of synchronization between the pedological, paleobotanical, and paleontological evidence that was discussed previously. This, in turn, suggests that the sparceness or lack of human occupation on the Central Russian Plain at this time period cannot be directly attributed to the unfavorable climatic conditions between 18,000 B.P. and 20,000 B.P. Other mitigating factors such as the possible changes in the distribution of the exploited species will have to be considered as well.

VIII. AFTER THE VALDAI MAXIMUM— THE ENVIRONMENT BETWEEN 18,000 AND 12,000 B.P.

The majority of the Upper Paleolithic sites on the Central Russian Plain discussed in this work date to this time period. Radiometric dates for the sites of Eliseevichi, Gontsy, Mezhirich, Pogon, Pushkari, Timonovka II, and Yudinovo are shown in Table IV-8. In a subsequent discussion on the dating of the sites, I will show that the sites lacking chronometric dates, such as Burgorok, Chulatovo I and II, Dobranichevka, Novgorod-Severskii, etc. were probably also occupied during this time interval.

A. Climate

We have discussed the history of the Fennoscandian Ice sheet retreat from the Central Russian Plain in the previous chapter. That retreat was not a smooth and gradual process but rather one marked by spasmodic retreats and re-advances. During the re-advances such as the Erdovo-Frankfurt or Vespovo-Pommeranian stages, the ice sheet moved up to almost its previous moraines. The advances and retreats also did not occur at a uniform rate. These fluctuations of the ice sheet created a series of rapid alternating stadial-interstadial climatic oscillations on the Central Russian Plain. A tentative sequence of these oscillations is illustrated in Table II-3. This table delimits four warm episodes: the Laugerie, Lascaux, Raunis, and Bölling. Lamb (1977) notes the presence of at least five climatic cycles in European Russia between 20,000 and 10,000 B.P.—each

with an approximately 2,000 year duration. Soviet authors are still debating the exact number of warm oscillations present and whether these oscillations represent true interstadials or should be considered just interphases (see Chebotareva and Makaricheva 1974; Veklich 1974; Vigdorchik et al. 1974, for example).

The reasons for periodic cyclicity are still being argued in the literature (Kukla 1972; Lamb 1977). As Lamb notes, the repetitiveness and regularity of the cycles clearly points to the importance of the external causes such as solar fluctuations or variations in the tidal forces as being important. The evolution of each oscillation shows that they also were not gradual. Each oscillation, both warm and cold, began and reached its peak very quickly and this peak was followed by a long period of transition (Kukla 1972). The warm peaks, as noted, occured at intervals of approximately 2,000 years from each other and were separated by cold peaks occuring at about the same intervals. Overall this gives us a history of oscillations from warm to cold peaks occuring in 1,000 year intervals for this time period.

These climatic oscillations were not limited to the Central Russian Plain. Ample evidence exists from other continental deposits to suggest them as continent-wide phenomenon (Fluhn 1979; Kaiser 1969; Kozłowski and Kozłowski 1979). Dansgaard et al. (1973) report them for the New World as well. As Butzer (1976) points out, ample

documentation exists from numerous data sources for these fluctuations on a world wide scale.

At the present time no coherent global chronology exists for these fluctuations, however, partially because of the nonsynchronization between local perturbations and responses, and the latitudinal differences in response to perturbations. This last observation is especially important to remember in relationship to the study area. Both Lamb (1966, 1977) and Butzer (1971, 1976) concur that higher latitudes and those lying closer to the ice sheet cooled first and warmed last during these oscillations. These regions were also affected by greater climatic deviations than were lower latitudes. Frenzel (1973) writes that for the post-glacial climatic cycles there may have been a lag of 1,500-2,000 years in the beginning of post-glacial warm periods in such regions as south Alaska as compared to British Columbia and Washington state in the New World; and in the northern Baltic as compared to south central Europe in the Old World. Principles of uniformitarianism suggest that similar regional differences existed in the effect of climatic oscillations in Late Valdai as well. Because of this climatic information collected from the different points of the Central Russian Plain will probably show a lack of synchronization between the more southern and more northern regions. Watt (1980) reports precisely this sort of regional lag for the Late Glacial period in Europe.

B. Evidence for Climatic Fluctuations

The evidence from the Central Russian Plain indicates the occurrence of these climatic oscillations. It unfortunately is not fine-tuned enough to permit me to either construct a firm chronology of these fluctuations nor to offer an accurate paleoenvironmental reconstruction for each fluctuation.

1. Geological Evidence. A previous chapter on Late Valdai stratigraphy showed that the time period of 18,000-12,000 years ago is represented by the gley layer, loess III and relic soil layer in Velichko's stratigraphic scheme (Figure II-7). The presence of embryonic soil formation represented by the gley layer as well as by the relic soil horizon on top of loess III indicate the presence of at least two warmer oscillations in the northern part of the Central Russian Plain. Pashkevich (1976) notes the presence of an additional layer of embryonic soil formation in the loess III deposits of the Ukraine, and suggests the occurrence of an additional, i.e., third warm oscillation. This oscillation is not documented in the Desna deposits of loess III.

Grichuk (1969c) and Chebotareva (1969b) believe that loess III accumulated until the onset of the Allerod some 11,500 years ago. This suggests that the relic soil layer (Timonovka soil) was deposited during the Allerod. Velichko (Velichko et al. 1977), however, dates the formation of the contemporary soil to Alleröd and indirectly,

therefore, implies that the relic soil layer under the contemporary soil must have been formed prior to the Alleröd. It is possible that the Timonovka relic soil can be correlated with the warmer Bölling period. This would, tentatively, date this layer of Timonovka soil to approximately 13,000 years ago. Unfortunately the Bölling oscillation is not correlated to any specific stratigraphic layer in the deposits of the Central Russian Plain.

The top of loess III, as noted previously, also contains evidence of a cryogenic horizon. This horizon shows the widespread presence of polygonal systems,ice wedge casts 4-5 meters deep, and other periglacial phenomenon that may have extended down as far as the 47-48 parallel (Velichko et al. 1969b, 1975b). A comparison of the extent of permafrost on the Central Russian Plain during the 24,000-20,000 year period and during the 18,000-12,000 period suggests that the periglacial phenomenon were more widespread during the later period. This implies that extremely cold continental climatic conditions existed during the 18,000-12,000 BP time --more severe than during the 24,000-20,000 BP. The ground was permanently frozen with a summer thaw layer of 1.5-2 meters in the north of the Central Russian Plain and as much as 2-3 meters in the south. The presence of more extensive permafrost perturbations during this time period agrees with the interpretation of Chebotareva and Makaricheva (1974) that the severest and coldest climate occured after the Valdai

maximum during the subsequent stadials. The data for these disturbances comes from the sites of Eliseevichi and Timonovka II and constitute evidence for the existence of cold oscillations during this time period.

The modeled statistics for the temperatures and precipitation during this time period offered in Table III-2 reflect quite a good deal of disagreement. Velichko et al. (1977) using data from Timonovka II suggest mean January figures of -30° to -35° C, mean July temperatures of +18°-+20° C, and annual precipitation of 200 mm per year with 50 mm in the form of snow. Markova (1975), on the other hand using data from the sites of Chulatovo II, Mezin, and Novgorod-Severskii has a range of January temperatures from -20° to -24° C, July temperatures from 16° - 23° C and equally varying estimates for precipitation. These discreptancies again appear to reflect data collected from sites dated to different time periods. Some of these sites were probably occupied during the warmer oscillations, others during the colder ones. The statistic for 80-100 frost-free days should, likewise, be considered suitable for one of the colder oscillations.

In summary, then, we see that the geological data do reflect the presence of climatic oscillations on the Central Russian Plain. The data, however, have not been coordinated for wide areas of the plain so that a clear sequence of climatic oscillations can not be offered at present.

2. Paleobotanical Evidence. I have previously discussed the difficulties in coordinating the fluctuations of the ice sheet, climatic oscillations, and the evidence for these as seen in the pollen spectra. It will be recalled that the data from the New World indicate that some pollen profiles do not reflect the documented fluctuations of the ice lobes. This underscores the difficulties in using pollen spectra to document climate oscillations within glacial periods.

Paleobotanical evidence from the Central Russian Plain for this time period are somewhat contradictory as can be expected for a time interval with climatic oscillations. More agreement exists for the vegetational cover of the area during the time the gley layer was deposited than for the subsequent period of loess III deposition. I will, therefore, first outline the summarized data for this warm oscillation which is tentatively dated to either the Lascaux warm period at 16,000 BP or to the Laugerie oscillation at 18,000 BP. Then I will discuss the evidence from pollen deposits found in loess III at the sites of Dobranichevka, Mezhirich, and Timonovka II.

a. Pollen from the Gley Layer. Grichuk (1972) reconstructs the vegetational cover of the northern part of the Central Russian Plain as predominantly arboreal. These forests were boreal in nature with Pteridium, Picea, Pinus, Betula, and Alnus present. Deciduous trees represented less than one per cent of the pollen remains. The frequency of deciduous species increased further south where Quercus sp.

formed an important component in the forests. While Grichuk classifies the vegetation of the northern part of the Central Russian Plain as a form of boreal forest, he also points to the increase in steppic associations in the southern part of the plain. Serebryannaya (1972) reports that the pollen profiles from Karachirzh show 65% A.P. and notes an increase of Picea and a decrease of Pinus in the forests. Non-arboreal vegetation is represented by Artemisia, Ephedra, Corispermum and Chenopodium rabrium. Serebryannaya states that the vegetation was similar to the present day south Ural taiga and suggests that the boreal-deciduous forest border lay somewhere just south of the Desna.

Pashkevich's (Pashkevich and Dubnyak 1978) pollen spectra taken at Dobranichevka in the south, from strata contemporary to the Desna gley layer, indicate the increased role of arboreal vegetation also. Pinus represents the majority of the remains (64-87% A.P.) with Alnus, Betula, as well as Salix and deciduous species also present. The NAP (47-60% of pollen) contains Poacea, Cypracea, and Asteracea. She reconstructs the landscape of the southern part of the Central Russian Plain as one covered by a mosaic of meadows and forests.

b. Pollen from Loess III. Unfortunataely no dates exist for the gley layer and, therefore, it is impossible at present to accurately date the time span represented by the subsequent Loess III deposits. Tentatively, Loess III was probably deposited between about 17,000 and 13,000 BP. The

pollen spectra collected from the sites and localities bearing Loess III again show some contradictions. Serebryannaya (1972) reports a climatic amelioration as seen in the spread of the Betula forests with a presence of Quercus, Tilia, Ulmus, and Fagus. Grichuk (1972) sees a simplification and homogenization of the ecologicozonal structures of the Central Russian Plain and underscores the presence of hyperzonality during this time period. He reconstructs the landscape of the north part of the Central Russian Plain as one covered by a periglacial forest-steppe where NAP represented 87-88% of the species and AP 7-8% of the species. The predominantly riverine forests consisted of Pinus, Betula, and Larix.

Pashkevich and Dubnyak (1978) recognized two distinct climatic episodes reflected in the Loess III deposits—the time that the loess itself was deposited and the time during which the embryonic soil layer found within it was formed. During the time that loess was deposited the surrounding countryside was covered by steppe vegetation with NAP representing 67-95% of the grains. The AP primarily belongs to Pinus with Betula, Salix, and Alnus also present. The NAP vegetation of Loess III, in comparison to the preceeding period (i.e., the gley layer), shows an increase in the role of Chenopodiaceae and Artemisiae. The presence of spores of Seliginella selaginoides, a representative of tundra and boreal floras, suggests a deterioration of climate compared to the

previous (i.e., gley layer) period.

Pashkevich and Dubnyak (1978) also recognized the existence of a climatic oscillation to warmer temperatures and increased humidity during the time that Loess III was deposited. This zone found at the depth of 1-1.5 meters at Dobranichevka, is reflected in the presence of an embryonic layer of soil in Loess III. It may be that this embryonic layer found in the middle of Loess III in the south of the Central Russian Plain is a contemporary of the relic soil (Timonovka soil) layer that Velichko places at the top of Loess III in the Desna sequence (see Chapter IV for discussion). Pollen spectra from Dobranichevka show that the steppe associations of Loess III gave way to forest-steppe formations at this time. Arboreal species appear in greater variety including such deciduous species as Quercus, Tilia, and Corylus. The NAP vegetation consists of Polygonaceae, Ranunculaceae, Caryophyllacea, Brassiaceae, Rosaceae, Fabaceae, and a considerable presence of Poaceae and Cyperaceae (see Table III-12 and Figure III-5). Pashkevich and Dubnyak (1978) state that the tree cover was still concentrated in the river valleys, while open spaces of the interfluves and plateaus were covered by meadows or meadow-steppes.

Complete pollen diagrams exist from two sites chronometrically dated to this time period between 18,000-12,000 BP—from Mezhirich and Timonovka II. Pollen diagrams are also available from Dobranichevka but the site has no

chronometric date. Finally, a small number of pollen grains was also collected from the dated site of Eliseevichi but in insufficient quantities to merit the construction of diagrams. The available diagrams and tables are offered in Table III-12 and Figures III-5, III-7, and III-9 .

Paleobotanical data from Mezhirich, presented in Figure III-9, show the predominance of NAP (45-70%) and suggest the dominant presence of steppic associations including Compositae, Artemisia, and Plantago laceolata. The AP (from 20-45%) is mostly represented by Pinus, with Alnaster, Betula nana, B. humilis, and Ribes found along the valley floor. In general, Kornietz et al. (1981) interpret the spectra to indicate that the site was occupied during a dry and relatively cold phase of the glacial climatic rhythm but one which occurred past the glacial maximum. They suggest that Mezhirich was occupied during one of the warm oscillations--possibly the Laugerie. A combination of the paleobotanical evidence and chronometric dates from the site, however, do not preclude the possibility that it was occupied possibly during the subsequent Lascaux oscillation as well.

Eliseevichi, possibly dating closely in time to Mezhirich, is located some 400 km north of Mezhirich. While, as Velichko et al. (1977e) indicate, the amount of pollen recovered there was insufficient for the construction of a pollen diagram, the data collected indicate the predominance of cold-loving grasses. This translates into the presence

of a periglacial steppe environment with some forest cover (probably gallery forests) of Pinus, Picea and Betula. The stratigraphy of the site associated the cultural layer with the gley soil horizon tentatively dated at 17,000 B.P. and associated with a warm oscillation. Like Mezhirich then, Eliseevichi was probably occupied during a warm fluctuation possibly either during the Laugerie or Lascaux interstadials.

The diagram from Timonovka II is presented in Figure III-8. The cultural layer from which the samples were taken is associated with the very end of Loess III accumulation and the beginning of the formation of the relic soil layer (Timonovka soil). Pollen sampling at the site yielded a very small number of grains among which NAP predominated slightly (about 55%). Grasses are represented by Cruciferae, Polygonaceae, Origraceae, Cyperaceae, Chenopodiaceae, Ericaceae, and Polypodiaceae. Dry loving forms predominate the NAP spectra. Arboreal pollen, found to the maximum of 40%, show the presence of such species as Pinus, Betula, and Alnus. Velichko et al. (1981) conclude that the surrounding countryside was covered by a periglacial forest-steppe. The fairly high percentage of AP in the cultural layer as well as the decrease of tree vegetation in the strata overlying the cultural layer indicate that the site was also occupied during a warm climatic oscillation--possibly during Lascaux or even perhaps as late as the Bolling oscillation. The chronometric date of 15,110 $\pm$530 for the cultural layer favors the earlier of the two

oscillations.

Finally, pollen profiles and tables for Dobranichevka are presented in Figure III-5 and Table III-12. There are no chronometric dates for this site. The cultural layer is associated with the layer of embryonic soil which may either correlate to the gley layer or with the relic soil layer (Timonovka soil) of the Desna sequence. It may, however, also date to a warm fluctuation not recorded in the Desna sequence. As the figure and table show, AP represents up to 32% with Pinus as the predominant species present along with Picea, Alnus, and Betula. The NAP (to 59%) shows the preponderance of Cyperaceae and Graminaea families. Comparing these spectra to the ones from the underlying layers, Shovkoplyas et al. (1981) see an increase in both the extent and variety of the forest cover in the area. The forests, however, while covering both the river valleys and the terraces, were found near the river courses while the rest of the area was covered by a cold meadow-steppe. Shovkoplyas et al. (1981) conclude that the site was occupied while the climate was still severely continental but milder than in the preceeding or subsequent times. This indicates that the site was also occupied during one of the warm oscillations.

In general, after Frenzel (1973) and Grichuk et al. (1975), we can conclude that the Central Russian Plain saw a deterioration of climate, increase of aridity and a decrease in forest cover during cold oscillations. The area was covered by open vegetation and sparce tree growth along

river valleys. During warm oscillations on the other hand, climatic amelioration brought about an increase in temperatures which permitted greater seasonal thawing of the permafrost and encouraged greater forest growth on the Central Russian Plain. During these warmer episodes, the Central Russian Plain became a forest-steppe mosaic with the presence of somewhat greater forest cover in the northern part of the plain than in the southern part. As we have seen, ample paleobotanical evidence exists to indicate that the time between 18,000-12,000 was one with numerous climatic oscillations.

3. Paleontological Evidence. There are no perceptible changes in the exploited fauna found at the sites dating to the 18,000-12,000 time period. The same wide mix of species discussed previously is found at such sites as Mezhirich, Dobranichevka, Gontsy, Timonovka II et al. (see Table III-3).

Microfauna from the dated sites is available from Eliseevichi, Gontsy, Mezhirich, Pushkari I, and Yudinovo. Overall, they appear to also indicate the presence of climatic oscillations and show that some sites were occupied at cold times and others at warmer times. Thus, for example, rodents from Dobranichevka and Gontsy belong exclusively to steppe species and indicate warmer climates. Rodents from Yudinovo and Eliseevichi reflect cold tundra conditions. At these sites the majority of species come from tundras in both species—MNB and MNI calculations. This can be readily seen in Figure III-3 which plots the microfaunal remains

along the tundra vs. steppe axes. Figure III-2, showing the plotting of microfauna along the axes of arboreal vs. non-arboreal vegetation, places both groups of sites into a non-arboreal landscape.

Mezhirich rodents indicate the presence of a cold but mixed forest and grassland environment (Table III-5). The high percentage of steppe species suggests milder climatic conditions than indicated by the paleobotanical evidence but is in agreement with the conclusion that the site was occupied during a warmer climatic oscillation.

Similar variation can be seen in the microfaunal remains from sites that have no chronometric date. Rodents from Novgorod-Severskii and Mezin suggest colder climates and open tundra or tundra-steppe vegetation. Chulatovo I rodents suggest that the site was occupied in colder climates when the surrounding landscape was a tundra-steppe while Chulatovo II data indicate that this site was occupied at warmer times. Samples from Pushkari I and Pushkari II indicate an open cold landscape and little tree cover which indirectly suggests occupation during a colder oscillation of the climate. Finally, Dobranichevka and Zhuravka microfauna point to open steppe-like landscapes and occupation during warmer times.

Avifaunal remains have been collected from the sites of Dobranichevka, Eliseevichi, Mezin, Mezhirich, Novgorod-Severskii and Yudinovo. Tables III-6--10 present the bird remains and divide them into various categories of exploited,

nonexploited, land and water birds. An analysis of the avifaunal remains show that the sites were occupied during different climatic oscillations as well. For example, as Tables III-6—9 show, avifauna from Novgorod-Severskii have no tundra species in the list of birds not exploited by man. At Novgorod-Severskii, forest and forest-steppe forms predominate in all the figures including number of species, MNI and MNB calculations. This suggests that the environment at the time of occupation was warmer and that greater tree cover existed than at such nearby sites as Mezin.

Mezin avifauna shows the importance of tundra-dwelling species in all calculations and indicates a cold climate at the time of occupation.

Birds found at Dobranichevka reflect primarily economic pursuits of man and are not very diagnostic for paleoenvironmental reconstruction. They do show the presence of tundra species (i.e., Lagopus lagopus) near the site. This specie, however, is a typical Late Pleistocene denizen and not diagnostic for any climatic oscillations.

Avifaunal remains from Mezhirich agree with the paleoenvironmental reconstruction suggested by the pollen diagrams. Table III-8 shows a mix of forest and forest-steppe birds represented in the assemblage of birds not exploited by man. Tundra species (Lagopus lagopus) predominate in the list of exploited forms.

Avifaunal remains from Yudinovo show primarily the exploitation of tundra species. The paucity of bird bones

at this time does not permit for any additional conclusions to be drawn about the paleoenvironment at the time the site was occupied.

Molluscan remains found at the sites of Gontsy, Chulatovo II, Eliseevichi, Mezin, Mezhirich, Novgorod-Severskii, Timonovka I and Yudinovo are listed in Table III-11. They also indicate the existence of climatic oscillations between 18,000 and 12,000 BP. Once again, I will consider only those molluscs that were not specifically exploited by man. As was noted earlier, molluscs exploited by man were collected in fossil form and come from the marine deposits of the Last Interglacial (Mikulino). I will also not consider the molluscan remains from Eliseevichi as they have yet to be identified.

Molluscs from Gontsy and Yudinovo, where 100% of the species represented are thermophilous, indicate occupation of the sites during warmer climatic oscillations. Molluscs from Mezin, on the other hand, where four species representing 66.8% of the molluscan species are cryophilous, suggest occupation during a cold oscillation.

A comparison of molluscan remains from Mezhirich and Novgorod-Severskii shows that while only one species, representing<4% of the molluscan taxa is thermophilous at Mezhirich, the presence also of one thermphilous species at Novgorod-Severskii reflect 25% of all the molluscan taxa there. The percentages of cryophiles at both sites are approximately equal (50% at Novgorod-Severskii and 43% at

Mezhirich). These statistics suggest that Novgorod-Severskii was occupied when the climate was warmer than when Mezhirich was occupied. Considering the geographic location of these two sites, the warmer climate at the more northern site of Novgorod-Severskii is possibly of chronological significance.

In summary, it has been shown that the paleontological data also support the existence of a number of climatic oscillations during the period of 18,000-12,000 BP. An examination of the microfaunas, avifaunas, and molluscan remains found at the Upper Paleolithic sites indicate that some of the sites were occupied during warm oscillations and others during the cold periods. I will address the questions of chronological significance of these observations in Chapter IV.

C. The Magnitude and Effects of Late Valdai Climatic Oscillations

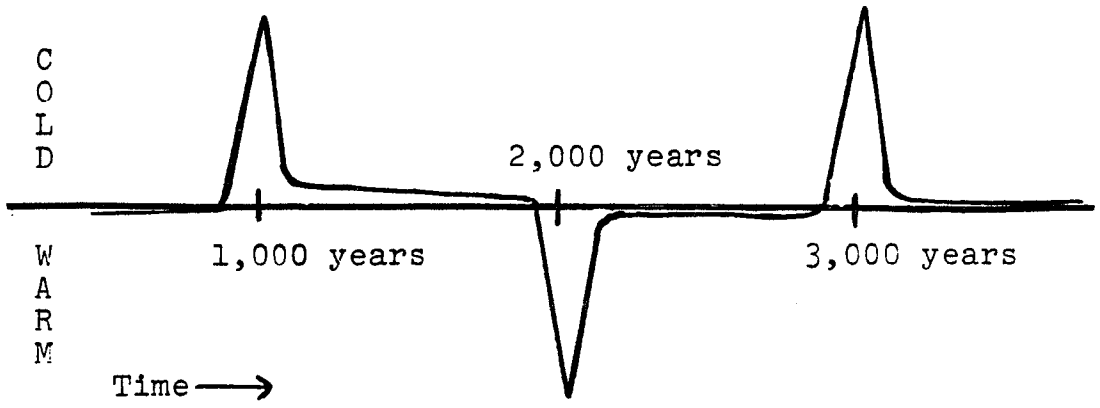
Our previous discussion has demonstrated the existence of numerous climatic oscillations during the 18,000-12,000 BP period. This contrasts sharply with the more gradual climatic changes documented for the preceeding period between 25,000 and 18,000 years ago. These oscillations occurred at the intervals of approximately 10^3 years and produced climatic cyclicity on a time scale of 2×10^3 years. Oscillations of such magnitude, while important for large scale paleometeorological reconstruction of the Late Valdai, are too gross for questions of change in the environment and change in the environmental stress.

Members of biotic communities, including man, have life spans of much shorter duration not exceeding 10^2 years. To understand the adaptation of Upper Paleolithic hunters and gatherers therefore, we must focus on climatic and environmental changes that occurred at intervals considerably shorter than the 1,000 years we have documented.

Sizable literature exists on Pleistocene climates, but as Butzer (1976) writes, "....there is undue neglect in paleometeorological literature of the short-range periodicities." I, therefore, cannot offer an extant scheme that directly and succinctly translates the effect of the documented long term fluctuations into short-term cyclicity. I will, instead, focus on two pertinent aspects of the Late Valdai environment which permits me to offer tentative models of the effects of shorter-term fluctuations: 1) the nature of the long term fluctuations; and 2) the relationship of short to long term climatic cyclicity.

I have already discussed the nature of each climatic cyclicity and have shown that both the warm and cold oscillations were not gradual smooth processes of climatic change but rather had an asymmetrical saw tooth-like pattern. This assymetrical pattern, Kukla (1972) attributes to the behavior of the snow line in response to changes in the solar index. He describes the solar index as the only one of four direct sunspot indices found to have a high level correlation with terrestrial climatic indicators. The assymetrical nature of the long term Late Valdai oscillations

is illustrated below. The time scale employed in this illustration is very tentative and based on Kukla's (1972) model for the relationship of insolation and the snow line.



This diagram indicates that the actual climatic deterioration or amelioration, and the stress conditions presented by such a change in climate, were most severe for shorter periods of time than the length of the oscillation cycle itself. It suggests that these periods of stress may have lasted from 100-200 years. This makes each oscillation most disturbing to the environmental equilibrium short and spasmodic and of a brief enough duration for adaptive responses to be brought into play. This model suggests that the Central Russian Plain underwent a series of short spasmatic jolts every 1,000 years or so.

Paleoenvironmental data on the study area during the 18,000-12,000 BP time period was discussed in an earlier section of this chapter. It will be recalled that the

salient feature of the climate after the Valdai maximum was the presence of numerous climatic fluctuations. The documented presence of these oscillations is in accord with the predictions of the model presented here. The observed discrepancies between the various data bases (e.g., pollen, avifauna, microfauna, and molluscs) can be seen as resulting from the short-term duration of climatic perturbances to which the different taxa responded at diverse rates. Similar lack of synchronization between the geologic and biologic data can likewise be explained as resulting from differential rates of response.

The general aridity of the area in Late Valdai was an additional factor contributing to the severity of these climatic jolts. Wiens (1976) indicates that arid environments are more sensitive to climatic fluctuations and that the repair process following such disturbances is notoriously slow and may persist for decades and even centuries.

Paleobotanical data corraborate the rapidity of climatic and environmental changes within each long term cycle that is suggested by the illustration. Woillard's (1979) pollen data from Grand Pile in northeastern France shows a change from temperate forest to pine-spruce-birch taiga occurring within 150 $\pm$75 years during the last interglacial and projects that the "dramatic borealization of West European forests" may have taken less than 20 years.

We can conclude that the nature of each of the

oscillations was such that it presented much shorter term stress to the environment. I will consider the possible reactions of the Late Valdai landscape to these perturbations in the concluding section of this chapter.

The nature of the relationship between short and long term climatic cyclicity is the second factor that must be considered in this discussion. Meteorological literature addressing questions of contemporary climatic oscillations does indicate that the long term (10^3 or more years) oscillations which appear as smooth and gradual curves of climatic change, in fact mask the existence of more rapid and violent short term oscillations (Kukla 1972; Lamb 1966, Yoshino 1975). Fluhn (1979), writing about the climatic fluctuations of Late Würm, notes that much greater variability probably existed in climates within 100 year periods. Lamb (1977), in noting the existence of long term climatic oscillations in European Russia between 20,000 and 10,000 BP, also states that these long term main fluctuations were superimposed on shorter term ones of about 25, 60, 100, and 400 years. His work with the paleoclimate of Great Britain leads him to conclude that short term fluctuations (year to year and decade to decade) during the Late Pleistocene were from two to three times as great as observed today. In another work, Lamb (1966) notes that the Holocene climatic fluctuations in Great Britain show slow and smooth changes of no more than 1°–1.5°C per 1,000 years on the 10^3 time scale. These long term curves

mask more extreme shorter term fluctuations of both temperatures and precipitation. Extensive climatic records from Greenland which span the last thousand years also show these short term fluctuations.

Kukla (1972) writes that the solar index is cyclical in nature as well and models the length of each cycle to be approximately 200 years. This adds yet another short term cycle to the inventory of meteorological cyclicity relevant to this study.

The presence of the Fennoscandian ice on the Central Russian Plain was another factor that also contributed to the presence of short term climatic cyclicity in the Late Valdai. Spjeldnaes (1964) writes:

> It is reasonable to suppose that the original small changes in temperatures would result in more violent climatic changes if the ice masses are involved than if they are not.... (1964:355)

This observation indicates the existence of deviation amplifying mechanisms in both northern latitudes and in glaciated areas that tend to magnify even minor perturbations and lead to climatic oscillations. The existence and importance of these climatic oscillations (much shorter than 10^3 years in length) is confirmed by numerous researchers. As Dunbar (1973) writes, cyclical climatic oscillations are an important feature of northern environments.

In conclusion, current meteorological research confirms both the existence and importance of short term climatic oscillations today and their existence in the recent

past. These oscillations are invisible on the scale of 10^3 years as the very construction of long term scales summarizes and averages all shorter term deviations. We can, by analogy, presume that these short term climatic oscillations also existed in Late Valdai although the current state of paleometeorological and paleoenvironmental research does not permit us to delineate them. This is because both 1) extant data most often come from a discontinuous stratum sampled at points across the study area, and 2) extant methods are not fine-tuned enough to monitor any but the grossest climatic fluctuations on large time scales.

The data presented above lead me to conclude that both the evolution of each major large scale oscillation as well as the presence of undelineated short term oscillations combined to create climatic and environmental instability on the Central Russian Plain probably in terms of year to year, decade to decade, and century to century deviations. These perturbations can be expected to have had profound effects on the biotic communities of the Central Russian Plain and influenced both the subsistence practices and settlement patterns of Late Pleistocene hunters and gatherers there. I will consider some of these effects, most notably resource linearization and fluctuation, in the final segment of this chapter which will consider the nature and the distribution of the biotic resources on the Central Russian Plain in Late Valdai.

D. Conclusion

This section has presented the data to evaluate the proposition that the time period between 18,000 and 12,000 BP was one of fluctuating climate. Support was found in the geological, paleontological, and paleobotanical data from the study area. A strong case has been made for the reality of both the documented long term oscillations as well as for the shorter term and as yet undocumented ones.

The evolution and chronology of both the long term and short term fluctuations on the Central Russian Plain are not clearly understood. This precludes me from presenting a comprehensive chronology of environmental changes during this time period and from being able to firmly assign the occupation of the sites to specific time periods. This chapter has shown that the following sites were probably occupied during the cold oscillations: Chulatovo I, Mezin, and Pushkari I and II. Chulatovo II, Dobranichevka, Gontsy, Mezhirich, Novgorod-Severskii and Zhuravka were occupied during the warm oscillations. The evidence from Yudinovo is ambiguous and does not permit the assignment of the site to either a warm or cold oscillation. A caveat to this assignment must be noted. The time lag in response of regions closer to the ice sheet to climatic perturbations when compared to those further away will also have to be considered before my tentative assignment can be considered definite. This time lag suggests that sites in the northern part of the Central Russian Plain may still show evidence

for cold climates at the same time that the sites located in the southern part already reflect climatic amelioration. This possible discrepancy adds further difficulties to attempts of synchronizing the paleoclimatic and paleoenvironmental reconstructions of the region, but does not offset the microclimate at each site as indicated.

Finally, it has also been shown that the Late Valdai environment was far more stable and underwent more gradual changes during the first half of the period (25,000 to 18,000 BP) than during the concluding phase of 18,000-12,000 BP. The contrasting climate profiles of these two periods created different environmental conditions in the study area.

IX. THE LATE VALDAI LANDSCAPE

A. Introduction

This chapter has focused on the reconstruction of the Late Valdai environment of the Central Russian Plain. It has considered the distribution of the biotic resources in the area as well as the changes in this distribution on a very gross scale—one that offered little beyond broad generalizations about the presence or absence of specific biotic associations (e.g., forest, periglacial steppe). The conclusions reached about the environment of the study region—namely that it was a periglacial forest-steppe supporting numerous species of large mammals—offer very little additional insights to our understanding of specific subsistence strategies employed by groups who inhabited the

region.

The literature on the subject, as noted, presents us with static models for both Eurasia and Alaska during this time period. These models tend to implicitly assume either a random or even distribution of biotic resources across an undifferentiated landscape (Butzer 1971, 1976; Frenzel 1973; Kurten 1968; Velichko 1969a, 1973, 1974, 1977). These assumptions are at odds both with the ecological literature as well as with our basic understanding about the nature of human adaptive strategies and the scale on which they occur. Watanabe (1978:1-2) writes:

> Nature or the environmental system has its spatio-temporal structure. Being part or elements of the environmental system, natural resources may and should have their spatio-temporal parameters. Without its adjustment to the spatio-temporal parameters of resources any activity of exploiting them may be neither effective nor successful. Therefore, if we are to understand human ecosystems or the system of man-environment relationships from the behavioral point of view, we must firstly discuss (1) the spatio-temporal parameters of the resource environment concerned, then (2) those of the human activity system concerned, and finally (3) how and to what degree the human activity system is adjusted to the spatio-temporal structure of the environmental (resource) system.

The concluding section of this chapter will focus on both the temporal and spatial parameters of the distribution of some key biotic resources on the Central Russian Plain. Guthrie's (1968) observation about the paucity of work on paleontological and paleobotanical communities of

Pleistocene Alaska are equally valid for our study area as well. Data on the vegetation comes from highly biased samplings all of which were taken from locales in or near the river valleys. Paleontological collections reflect the same bias and come from archaeological sites which show human selectional use of the resources. The nature of this data base is such that it precluded me from focusing on the questions of the spatial and temporal distribution of resources. These questions can be raised only after some tentative modeling is done using relevant information from other regions. To these purposes I will use data from Late Pleistocene Alaska, present day environments of northern latitudes, as well as data from present day species-rich grassland environments. The environment of Pleistocene Alaska is considered to have been very similar to that of Late Pleistocene Eurasia (Butzer 1976; Frenzel 1973, Guthrie 1968). Present day environments of northern latitudes can offer numerous insights into the past environments of glaciated regions because of the similar environmental problems faced by the biotic communities of both regions (e.g., permafrost, low temperatures, short growing season, etc.). Finally, a consideration of the spatial parameters in the distribution of the biomas in both temperate and African grasslands today with their large herds of herbivores can also offer some insights into the periglacial grasslands of the Central Russian Plain during Late Valdai which supported numerous ungulates. First, I

will consider the spatial parameters of resource distribution, then focus on temporal variability, and finally, apply these variables to the Central Russian Plain.

B. Spatial and Temporal Variability in Resource Distribution

1. Environmental Patchiness. Ecological theory shows that the assumptions underlying much of the paleoenvironmental reconstruction, namely random or even distribution of the biotic resources, is untenable. Wiens (1976:81) writes:

> In the real world, environments are patchy. Factors influencing the proximate physiological or behavioral state or the ultimate fitness of individuals exhibit discontinuities on many scales in time and space. The patterns of these discontinuities produce an environmental patchwork which exerts powerful influences on the distribution of organisms, their interactions, and their adaptations.

He continues:

> In terrestrial ecosystems, the most obvious framework of spatial patchiness is created by vegetational patterns (1976:85).

Wiens concludes that arid systems, in general, for a variety of factors including climatic effects, abiotic disturbances, soil effects, consumer effects, etc., are more sensitive to factors promoting vegetational patchiness as well as being temporally less predictable. Dunbar (1973) and Bunnell (1980) both characterize the north latitude environments as especially patchy due to the large spatial scale of the systems there.

Patchiness is species defined, and our discussion will focus on patchiness as perceived by human populations in a specific environment—the Late Valdai Central Russian Plain—and as expressed in the archaeological record.

Guthrie (1968), working with large mammalian communities of Late Pleistocene Alaska, clearly shows that differential distribution of both fauna and vegetation existed there as well. He notes a differential distribution of three large herbivore species (mammoth, horse, and bison) across the landscape with mammoth and horse more prevalent in the interfluves. His underlying assumption is that there is a general correlation between the representation of animals in paleontological collections and their actual importance in the contemporaneous faunal communities—an assumption that will also be used in this work. The ecological requirements of these three species suggest that the vegetation favored by each (short grass for bison, medium and tall grasses for mammoth and horse) was differentially distributed also with short grasses prevailing in the interior interfluves and medium and tall grasses predominating near the floodplain. In his work, Guthrie considers the mammoth to have been predominantly a grazer. This conclusion is at odds with the mixed browsing and grazing strategy that I have postulated for the species. This difference, however, is not significant for the present discussion as either strategy would place the habitat of the species in the floodplains. These observations are

particularly relevant for our study area. I have already discussed the general climate of the Central Russian Plain as well as noted the presence of the Fennoscandian Ice sheet in the northern parts of the plain. These two factors permit us, using analogy, to apply the presented ecological observations to the Central Russian Plain, and to conclude that the biotic resources there were discontinuously and patchily distributed. Unfortunately, extant data from the region do not permit me to consider the nature of this patchiness beyond broad generalizations offered previously, namely, 1) the predominance of cryophilous grassland vegetation in the interfluves, and 2) the prevalence of arboreal vegetation near river valleys and floodplains. Alaskan data suggests a proportional increase in medium and tall grasses towards the floodplain and an increase in more xerophytic short grass associations away from the water courses. These reconstructions do not consider any temporal variability.

2. Temporal Variability. Temporal fluctuation in biotic resources is widely reported in the ecological literature (Budyko 1977; Odum 1971; Pianka 1974; Wiens 1976). These temporal population fluctuations occur on a number of scales from seasonal to annual as well as on longer time scales. They are especially significant in northern environments.

Shorter term (seasonal, annual, decadal) population oscillations are well documented for several small animal

species (e.g., lemmings, arctic foxes, hares, and lynx) (Butler 1953; Elton 1924, 1942; Finerty 1981; May 1980; Vibe 1967, 1970). As Amsden (1979) notes, with some important exceptions such as Burch's (1972) work on the caribou, there has been little in the way of systematic research to determine which other species of large mammals are subject to long term population oscillations. Vibe's (1967, 1970) work in Greenland has tentatively outlined long term oscillations for such species as the musk ox, polar bear, ptarmigan, caribou, and various species of whales. Similar observations are offered by White et al. (1980), Naumov (1972) and Batzli (1981).

Temporal population oscillations result from a number of factors most of which are still poorly understood. Climate, however, appears to be one of the prime factors. Dunbar (1973) for example, considers climatic cyclicity as an important variable. Formozov (1946, 1970) and Pruitt (1970) point to the changes in both the amount and nature of the snow cover as factors affecting population numbers of different species. The relationship between the faunal population oscillations and changes in floral communities is less than clear as well.

The documented existence of temporal population fluctuations in northern latitude species, whatever their ultimate causes, offers us an analogy for the Late Valdai Central Russian Plain as well. We can expect that similar population oscillations were an important feature of that

environment and one that played a role in the human adaptive strategies.

3. Climatic Instability and the Distribution of Resources. The effect that the documented climatic fluctuations had on the temporal and spatial distribution of the biotic resources of the area is a third factor that must be considered in this discussion. I have postulated the existence of both temporal and spatial patchiness or fluctuations in both animal and plant communities. I have also shown that these are natural aspects of all environments but of greater significance in northern latitudes. Greater fluctuations necessarily create greater instability in the systems where they occur, and, therefore, northern latitude environments are considered to be less stable than the more southern ones.

May (1973a, 1977b) draws a distinction between a reaction of stable ecological systems and unstable ones to any perturbations. A central feature of a stable system is the presence of feedback that restores perturbed populations to the equilibrium values. In unstable systems, on the other hand, population disturbances tend to be amplified. May (1973a) writes:

> ...Environmental fluctuations are detrimental to populations in two ways, as they both increase the relative severity of population fluctuations and depress the average population numbers.

Budyko (1977) states that when population oscillations occur during periods of unstable climate, their parameters are

amplified and place the populations involved under stress and at times in danger of extinction. The net result of perturbations, then, is both to decrease population numbers and make the populations temporally less predictable as a stable resource.

Applying these observations to the Central Russian Plain, we can postulate that the climatic fluctuations documented for the 18,000-12,000 BP period resulted in both temporal and spatial fluctuations in the biotic resources. These fluctuations were more severe than existed during the previous period between 25,000-20,000 BP—a period of more stable and gradually changing climatic conditions. Specifically, the rapid fluctuations from warm to cold to warm conditions produced changes in vegetation favoring grasslands over forests during cold periods and forests over open vegetation in warmer times. The rapidity of these changes was on a scale short enough to profoundly affect vegetation. The changes in the distribution of the different plant resources also affected the animal species that fed on them. Colder periods would have created particularly stressful conditions for animals inhabiting forests while warmer conditions would have stressed those inhabiting grasslands.

The reaction of species to stress can be predicted to take the form least expensive in energy expenditure. As Slobodkin and Rappaport (1974) succinctly put it, the object is to stay alive with a minimum of change necessary to

insure survival. We can, therefore, expect that environmental stresses were met by adaptive behavioral changes. For mobile animal species these involved changes in the geographic location and distribution as well as possible changes in seasonal aggregations and dispersals. It is also reasonable to assume that changes occured in overall population numbers of specific species as well.

Patchily distributed resources which also fluctuate in numbers and, therefore, in overall availability through time constitute less reliable and less predictable food sources than evenly distributed and stable ones. Exploitation of these resources presents specific problems that have to be met through particular adaptive strategies if the dependent populations are to stay alive (Wiens 1976).

X. THE LATE VALDAI CENTRAL RUSSIAN PLAIN

A. The Faunal Record and Its Implications

Seven species contributed more than 95% by weight, MNI, and MNB of the prey taken by Late Valdai hunters and gatherers in the study area. Table III-3 list the overall fauna represented at the sites divided into economically important and not important categories. Table III-13 segments the economically important species into those used as food and those utilized for economic purposes other than food. Wide consensus exists in the literature that fur bearing carnivores were not used as food (Kornietz 1962; Kornietz et al. 1981; Pidoplichko 1969; Polikarpovich 1968; Shovkoplyas 1965; Vereschagin 1971). Remains of these species show

neither bone fragmentation nor charring associated with food processing and consumption. The seven species considered to have had a major role in the economies of the Central Russian Plain hunters and gatherers are: 1) food resources--Mammuthus primigenius, Rangifer tarandus, Equus sp., Marmota bobac, and Lepus sp.; and 2) nonfood resources--Alopex lagopus and Canis lupus. This section will consider the distribution of these species across the Late Valdai landscape, consider their ecological requirements, and model their possible behavioral patterns.

1. Mammuthus primigenius. The ecological requirements of this extinct species, as was noted previously are subject to disagreement in the literature. Guthrie (1968) considers mammoths to have been grazers feeding on medium and tall grasses. Vereschagin (1971) and Kurten (1973) concur with this opinion. Pidoplichko (1939, 1969, 1976) saw them as browsers. Still others see them as a mixture of grazers and browsers (Ermolova 1963, Velichko et al., 1977). Stomach content of various frozen mammoths found in Siberia are ambiguous--showing the predominance of steppe grasses in some and a mixture of tall grasses and forbes as well as twigs, leaves and bark in others (Kornietz 1962).

Present day Indian and African elephants combine browsing and grazing, each form of feeding being dependent on the specific season. The Indian elephant, as Cornwall (1968) notes, is more of a forest browser. African elephant studies indicate that while the incidence of woodland

forage consumed is as high as of herbaceous feed, the total volume of woodland forage is much lower (Laws et al. 1975; Wing and Buss 1970). Carrington (1958) and Wilson (1975) both note that browsing is the preferred diet of African elephants while grass constitutes a secondary food. A study of the qualitative food intake of elephants conducted by Laws et al. (1975) shows that African elephants ingest 60 per cent herbaceous vegetation and 40 per cent woody vegetation in the form of bushes and shoots. The 60 per cent of herbaceous vegetation consists of from 45%-93% of long grasses. They conclude that the elephant preferred mix would be a combination of woody and herbaceous vegetation as this combination can best maintain the protein to fiber ratio necessary for elephants. Elephants face primary dietary stress during the dry season when both protein and calcium are more difficult to find and ingest.

Guthrie (1982, personal communication) projects for mammoths a dietary strategy with a large volume of high fiber, low nutrient plants, best met by ingestion of medium to tall grasses which have a high stem content. The physiology of all monogastrics (elephants, horses, mammoths) is such that they can increase gut transit time for low quality forage, while ruminants such as bison cannot. Grass is a ubiquitous dependable energy resource which, however, at some times of the year (e.g., dry season, cold season) is quite deficient in nutrients for monogastrics.

Guthrie further states that, as nonruminants, mammoths,

therefore, would have had to balance their amino acids and fatty acids by adjusting intake variety. Mammoths, like elephants, probably did not synthesize many of their vitamins. These two dietary requirements could be met by supplementing a grass diet with forbes, woody dicots, and other arboreal materials.

Even though Guthrie sees mammoths as primarily grazers, he concedes that they would have had to supplement their grass diets by ingestion of woody vegetation as well as ingest a greater variety of plants than just grasses. This mixture of nutritional requirements would place the mammoth, like it does their present day elephant equivalents, in a mixed grassland-forest biome. Such a biome existed in the Late Valdai Central Russian Plain around the riverine gallery forests and we can expect that this was the mammoth habitat in the Late Pleistocene.

Paleontological collections from Late Pleistocene localities both in Alaska and Siberia show that precisely this biome contained the greatest mammoth densities. Table III-17 presents the distribution of Late Pleistocene species in Alaska and in Siberia. Localities from which the Siberian data is summarized are all found in or near the floodplains (Kuzmina 1977). The statistics in this table show that mammoths represent 56.6% of individuals and 82.7% of the biomass of the mammalian remains in Siberia. The biomass estimates for each species used in this work are listed in Table III-16. The summarized Alaskan data show a

smaller overall representation of mammoths—6.5% of individuals and 33.3% of biomass. A comparison of the percentages of mammoths found at the different Alaskan localities reveal the increase of mammoth densities towards the floodplain. Mammoths represent 50.8% of the biomass and 10.9% of individuals at Cripple Creek located 6 km from the floodplain, 36.0% of biomass and 6.7% of individuals at Engineers Creek located 12 km from the floodplain, and 25.6% of the biomass and 4.7% of individuals at Fairbanks Creek located 30 km from the floodplain. African elephant data show a range from 44.6% to 86.0% for elephants in the total biomass of ungulates there (Laws and Parker 1975). We can conclude from these data that the mammoths of the Central Russian Plain in Late Valdai lived predominantly near the floodplains.

The percentage of the mammalian biomass represented by mammoths is more difficult to estimate. Summarized Alaskan data suggest that mammoths accounted for approximately 33 per cent of the biomass while Siberian data indicate 82.7 per cent for this species. These differences may reflect sampling biases. As noted, the Siberian data come directly from the floodplains. It is not unreasonable to assume, given the percentage increases in both numbers of individuals and overall biomass towards the floodplains in Alaska, that faunal assemblages from the floodplains there would likewise indicate an increase in mammoth densities. Laws and Parker (1975) report a nearly two-fold increase in elephant

densities near the floodplains in Africa (from two elephants per km^2 averages in grasslands to 3.85 elephants per km^2 in the riverine areas). At present it is impossible to resolve the differences recorded in Alaskan and Siberian data. Further research both in Alaska and in the USSR will have to determine if real differences did exist in the mammoth ratios there. Pending this, I have decided to use the mammoth densities estimated by Guthrie nearest the floodplain (i.e., approximately 50 per cent of biomass) for the calculations of mammoth densities on the Late Valdai Central Russian Plain. I will consider the overall populations of mammoths in the study area at the conclusion of this chapter.

The previous discussion of both the nutritional requirements of mammoths and the distribution of present day African elephants strongly suggest that a particular sort of patchiness existed in the spatial distribution of mammoths also. Specifically, I suggest that mammoths were linearly distributed in the study area and found in or near the riverine gallery forests-floodplains. The densities of mammoths decreased appreciably as one moved away from the river valleys towards the grassland-covered interfluves.

In addition to spatial variability, temporal variability also played a role in the distribution of mammoths on the Central Russian Plain. While, to the best of my knowledge, no paleontological data exist that addresses this question, data on African elephants indicate the occurance of various

seasonal migration patterns in this species. These migrations, like all migrations of ungulates, are related to the availability of food, and are more prominent among elephants living in regions with fluctuating precipitation. As mentioned before, the availability of water and the distribution of precipitation are the critical variables affecting the distribution of elephants on Africa. Elephant populations are more mobile in regions with pronounced differences in precipitation which create dry and wet seasons. In these regions elephants congregate during the dry season around the few available water bodies where the remaining vegetation is to be found (Bourliere 1963; Laws and Parker 1975; Wing and Buss 1970).

Seasonal migrations for African elephants have been reported as short as 15-25 km in Uganda (Laws and Parker 1975) and as long as seasonal journeys between 250 and 550 km (1,100 km round trip) in South Africa (Roberts 1951 cited in Churcher 1980). Churcher (1980) reports such long distance migrations for elephants in Transvaal, Swaziland, Rhodesia, Moçambique, and Kruger National Forest. He likewise reports comparable migration distances for Indian elephants. This indicates that elephants living in regions with marked seasonal variability all exhibit seasonal migration behavior which sometimes takes the form of exceedingly long-distance treks.

A second important feature of elephant behavior that affects their migration patterns is the aggregation of

elephants during the dry season. Elephant social behavior is such that they are found in matriarchal units of 10–15 individuals. These units consist of a mature female with her adult female offsprings and their immature male and female young. Adult bulls are either solitary or found in ephemeral small groupings that average approximately three individuals. Laws and Parker (1975) report the presence of much larger herds numbering from 100 up to 1,000 individuals. They suspect that these huge aggregations are probably a response of elephants to human encroachment but do not exclude the possibility that larger aggregations are also related to seasonal migrations.

Churcher (1980) has surveyed the literature on the rates of movement of migrating elephants and reports that African elephants spend from 2–3 hours daily asleep and the remaining 20–21 hours feeding and moving. He notes that elephants migrate in two ways: 1) by slowly feeding and moving at an effective rate of approximately 8 km per hour, as well as 2) a rapid nonfeeding march of 10–15 km per hour. In the first instance the elephants can cover up to 160 km in 20 hours. These rates for slow feeding and moving appear, however, too rapid to be steadily sustained, and Churcher suggests that the effective rate of slowly feeding and moving in a particular direction is closer to 1 km per hour. This rate permits the elephants to cover approximately 20 km per day.

The question whether mammoths were seasonal migrants

has received very little attention in the literature. Soviet researchers tend to assume, leaving the reasons for these assumptions usually unstated, that they were seasonal migrants (Kornietz 1962; Vereschagin 1971, 1977, 1979). The possible migration patterns of mammoths are equally vaguely treated in Soviet literature. Kornietz (1962) has suggested that mammoths on the Central Russian Plain migrated laterally; being found in the winter in river valleys and in the summer on the interfluves. This suggestion is offered without any qualifications and has been picked up in the English language literature (see Klein 1973, for example). My previous discussion of the nutritional requirements of mammoths, argues strongly against this model, and suggests that mammoths were found fairly close to the river valleys the year round.

Churcher (1980) has briefly addressed the question of whether North American mammoths migrated and concludes that a strong possibility exists that they did. He suggests that the nutritional requirements of mammoths would have favored a latitudinal migration: north in the summers and south in the winters. This model is supported by Vereschagin (1971, 1977, 1979) who theorizes that Late Valdai mammoths on the Central Russian Plain migrated similarily.

Guthrie (1980) indicates that the daily food intake of mammoths was probably of such magnitude that one area would be grazed rather quickly and, therefore, the animals would have to be rather mobile with some seasonal fidelity in

range use. White et al. (1980) report that African elephants harvest from 10-40% of the plant standing crop in the area they occupy. This shows them to be highly efficient feeders. Reindeer and musk ox, for example, take from 0.1-1.5% of the plant standing crop. We can assume similar high feeding efficiency rates for mammoths as well. Vereschagin (1979) using elephant data, estimates the daily food intake of adult mammoths to have been between 300-400 kgs. per animal, and writes that such high nutritional requirements would have made the species mobile. Laws et al. (1975) report average daily intake for elephants of 4.31% body weight (3.94% for males, 4.68% for females). Given an average weight for mammoths of 3,000 kg. (Guthrie 1968), these figures suggest that mammoths would have taken in an average of 129 kilograms of fodden (4.31% of their body weight) per day. While we can neither estimate the overall productivity of the Central Russian Plain nor the seasonal variability in the productivity of the vegetation there, we can use African grassland data as well as the information on the feeding efficiency of elephants, to suggest that no one region of the study area could have steadily produced sufficient fodder to maintain stable year round mammoth populations. This is because the climate of the study area had both precipitation rates that varied seasonally and an extremely short growing season of two to three month duration. The co-occurance of maximal precipitation and warm weather would have made the summer months the most

favorable for mammoth populations. I suggest that during these times, mammoth groups were most sedentary, ingesting a mixture of grasses and woody plant materials. With the advent of cold weather and the disappearance of the annual grasses, the mammoth diet would increasingly consist of perennials as well as of woody vegetation which remained available in and near the gallery forests in and near the floodplains. An increase in the consumption of woody plant matter would continue throughout the eight to nine cold weather months. It is during these cold weather months, especially the end of winter, that mammoths faced greatest dietary stress. The absence of annuals combined with the high daily intake requirements for the species would seem to mandate mobility.

I suggest that because of the linear constriction in the distribution of the species in and near the floodplains, this mobility was linear also placing the mammoth herds in the north during the summer and in the south in winters. Data on present day northern latitude ungulates indicates that increased patchiness in resource distribution in winter months favors nomadism. Batzli et al. (1981) report a shift in the ungulate behavior strategies which show that the winter decrease in forage quality is met by morphological, behavioral and physiological adaptations.

The nature of vegetation growth in northern latitudes is such that the deciduous forbs and shrubs show rapid new growth some two to four weeks after melt off. These food

sources are the first to appear at the end of winter of the beginning of spring. By contrast, the meadow graminoids (grasses) as Tieszen et al. (1980) report, have a low and continuous growth pattern and become available as food resources later on in the year. I suspect that it was the appearance of the deciduous plant materials that set the mammoths off on their migrations to the north. Their return southward may have been triggered off by an earlier onset of cold weather in the north, and quicker depletion of food resources there.

The postulated differences in the seasonal food intakes of mammoths may well explain the ambiguity in the data from the stomach contents of frozen mammoths found. Specifically, different stomach contents may reflect different seasons of death. Animals who died in summer would show increased amounts of grasses, those who met death in winter months would contain a greater amount of arboreal plant material in their stomachs.

The longitudinal distances of the study area, as Figure II-1 shows, are such that they well may have been within the annual migration ranges of mammoths. Calculating the distances along the major river courses we see that Mezhirich, for example, is approximately 515 km south of the northernmost site of Khotylevo II. The greatest distance between the sites is approximately 540 km (Gontsy to Khotylevo II). These distance figures are within the range of distances covered by African elephants in their seasonal

migrations. If we apply the travel time estimates suggested by Churcher (1980) for slow feeding and moving elephants of approximately 1 km per hour, we can suggest that mammoths would have covered about 20 km per day and, beginning in the far south, been able to reach the most northerly areas of the Central Russian Plain in approximately 26 days. This indicates that approximately two months (60 days) were annually spent in transit, making the mammoth stays approximately eight months long in the south and two months long in the north.

There are numerous implications that this model offers for archaeology of the region and I will address these implications both in the conclusion of this chapter as well as in subsequent chapters of this work.

2. Equus sp. Large sized Late Pleistocene horses, all possibly belonging to the sub-species of Equus caballus latipes (see previous discussion on equids), were a second important food species for Upper Paleolithic hunters and gatherers. As Table III-13 shows, remains of horses are found at most of the Upper Paleolithic sites in the area and at some, equids represent substantial percentages of the faunal remains of food species (e.g., at Fastov equids represent 31.2% of MNI, at Mezin—19.7% of MNI). Kuzmina (1978) does not discuss the ecological requirements of this sub-species. In fact, as Freeman (1973) notes, there is no general agreement on the requirements of Equus caballus. Freeman (1973) cites evidence contradictory to the

assumption that the wild horse was a steppe adapted form; but conversely suggests that "...it does no injustice to the data to speak of the 'open county' ungulate set (Bos, Equus)...." Vereschagin (1979) writes that the morphology and ecology of even the domestic horse point to great plasticity of the species. He, like Freeman, suggests that the Late Pleistocene horses were a fairly widely adapted form that could have inhabited both open and partially forested landscapes.

I have already noted that Guthrie's work with Late Pleistocene Alaskan faunal assemblages shows a co-occurrence of horses with mammoths. Table III-17 shows that overall this species represented 32.7% of individuals and 17% of the biomass in Alaska and 11.7% of individuals and 3.1% of the biomass in Siberia. These figures suggest a greater prevalence of horses in the Late Pleistocene Alaskan faunas when compared to Siberian Late Pleistocene faunas. Alaskan data indicate an increase in horses, both percentages of individuals and percentages of biomass, towards the floodplain. Horses make up 41. 0% of individuals and 18.5% of biomass at Criple Creek (6 km from the floodplains); 36.8% of individuals and 19.1% of biomass at Engineers Creek (12 km from the floodplain) and 17.3% of individuals and 9.2% of biomass at Fairbanks Creek located 30 km from the floodplain. This distribution leads Guthrie (1968, 1980) to conclude that horses, who like mammoths, could increase gut transit time for low quality forage, fed primarily on medium and tall grasses high in fiber content. Spiess (1979) reviews the

sparce literature on the ecology of Equus caballus and concludes that horses appear not only to be highly successful herbivores but also ones that select a diet with the highest fiber, lowest protein content within the grazing community. This would include such foods as parts of non-fruiting plants (especially the stems), older plants, and dried grasses, sedges, as well as some root tubers. The reported co-occurrence of horses and mammoths in Alaska suggests that the two were fairly sympatric, at least during specific parts of the year.

Horses of the Central Russian Plain, as can be best conjectured, probably also co-occurred with mammoths. Being true grazers, however, they exploited the medium and tall grasses as well as sedges (Artemisia), and small amounts of brush, especially in winter months. Following Spiess (1979), we can conjecture that:

> They were probably localized in bands led by a stallion, with a territory including an area of good grazing, access to river or stream water, and a place for shelter (likely along the valley walls) (1979:258).

The presence of numerous ravines on the Central Russian Plain would probably have been suitable horse locales especially in winter months.

Evidence on the seasonal behavior of this species is very sparce in the literature. There are no reports of long distance seasonal migrations for horses, thus they appear to be localized species. Kornietz (1962) proposed that Late

Pleistocene horses, like their contemporary analogues, aggregated in warm weather months. She suggests that these aggregations reached maximal sizes during the rutting season in late summer.

We can summarize our discussion of this species by stating that: 1) horses were locally available non-migrating food resource on the Central Russian Plain; and 2) they probably aggregated in summer months and were found in more dispersed groupings during the cold weather months.

3. Rangifer tarandus. Reindeer (or caribou) are a third food resource present in the faunal assemblages of the Central Russian Plain sites in sizeable numbers. Great difficulties exist, however, in estimating the role that reindeer played in the subsistence practices of the area because of the superficial reporting of reindeer data from the sites. No information exists on what specific skeletal elements were found at which sites although strong suggestions exist that most of the reindeer are represented by antlers only (see Pidoplichko 1969, for example, as well as Klein 1973 and Shovkoplyas 1965a). Since both male and female reindeer shed antlers it is possible that many of the antlers were collected in shed form and their presence in the assemblages in no way indicates active hunting of the species. At some sites, skeletal remains other than antlers have been found, as well as antlers still attached to crania--suggesting that at these sites, such as Mezin for example, some reindeer hunting did take place. As noted before, much of the faunal

material from the sites, especially collections excavated prior to the 1950s no longer exist.

As both Burch (1972) and White et al. (1981) report, present day reindeer belong to two behaviorally distinct forms—the barren ground and the woodland varieties. The former undertake long distance seasonal migrations of up to 2,400 km between winter and summer pastures, while woodland reindeer migrate over shorter distances of up to 200 kilometers. Spiess' (1979) exhaustive study of both present day reindeer and Late Pleistocene reindeer of southwestern France indicates, however, that no fast and easy way exist in determining the ecology of reindeer of specific regions. This is because neither skeletal elements nor antler morphology correlate well with group size or migratory behavior of the species. Spiess (1979:137-138) writes:

> ...the typologizing of caribou behavior into tundra and forest forms is a falsehood by gross oversimplification... We are reduced to considering each archaeological span of time and geographic area as an individual case, using osteoarchaeological techniques on several sites, before deciding what the caribou behavior and migration patterns were like. Much more work is needed before we can be precise about migration patterns beyond the certainty that they varied over geographic distances and time as conditions changed.

He concludes that:

> Caribou tend to live in smaller population aggregations at a lower overall density in areas with a more diverse ungulate fauna. In such areas, usually of microenvironmental diversity...Rangifer does not form large herds or migrate long distances over highly predictable paths (1979:247).

He uses these observations to state that Late Pleistocene reindeer populations of southwestern France in all probability were not analogous to tundra forms of today and did not undertake long distance migrations. This, however, does not mean that they were locally available year-round as Bouchud (1966, 1977) thought, as shorter distance seasonal migrations were certainly both possible and feasable.

Table III-13 shows that reindeer composed 8.8% of individuals and 0.8% of biomass in Late Pleistocene Siberian paleontological assemblages and 4.3% of individuals and 0.6% of biomass in Alaskan assemblages. Alaskan data show no directional increase in this species either towards or away from the floodplain.

Siberian data, as well as faunal assemblages from the Central Russian Plain sites, indicate that the Late Pleistocene environments in both regions contained diverse ungulate faunas and, by extension, implies that reindeer of the Central Russian Plain, like their equivalents in southwestern France, lived in small population aggregations at lower overall densities than found among tundra reindeer today. There is, however, very little else that we can say about the behavior of the Late Pleistocene reindeer on the

Central Russian Plain aside from a vague conjecture that they too may have been more localized in their distribution and likewise, not analogous to present day tundra dwellers.

Spiess (1979) notes that most of the populations of most species, including reindeer, during winter months seek shelter in grassy river floodplains and in deep cut valleys. This suggests that the reindeer of the Central Russian Plain would have also been located in and near the river valleys during the cold weather months.

As noted before, Pidoplichko (1969) having examined faunal assemblages from several major sites in the study area (Chulatovo I, Dobranichevka, Mezin, Mezhirich, and Novgorod-Severskii) reports that no young reindeer are present and interprets this to mean that the animals were exploited during cold weather winter months. Reindeer, as he reports, exhibit a regular birth cycle with most births occurring during the May and June months of spring. He goes on to use these observations to suggest that the reindeer were present in the area during winter months only and postulates that the species migrated north, beyond the study area, in summers to where the calving grounds were located. Vereschagin (1971, 1977, 1979) also writes that reindeer followed north-south seasonal migrations. As Spiess' work indicates, these observations are highly conjectural at this point and can only be proven or disproved with a great deal of additional research on the Late Pleistocene reindeer of the region.

Some suggestions exist in the literature that Rangifer

tarandus, like many ofther species inhabiting northern latitudes, undergo long term oscillations in population numbers (Amsden 1979; Vibe 1967, 1970; White et al. 1980). The length of these cycles has been reported in the magnitude of approximately 100 years. The current state of research on the subject of long term population oscillations of mammals of the north does suggest that this species also is probably linked into complex predator-prey oscillation cycles. We can, therefore, expect that Late Pleistocene reindeer also may have been subject to long-term population fluctuations. The current state of research on the subject precludes me from examining possible past temporal fluctuations of this species in any detail.

In summary, then, all that can be concluded about Rangifer tarandus of the Late Pleistocene Central Russian Plain is that the species may have exhibited spatial patchiness in distribution during cold weather months at least. During the eight to nine month long winter season they may have tended to be found close to the floodplains and may have undertaken seasonal north-south migrations of uncertain length or duration. Finally, we can postulate that long term temporal fluctuations in population numbers of this species may have also affected Late Pleistocene reindeer and made them more patchily distributed resource both temporally and spacially as well.

4. Marmota bobac. Remains of steppe marmots figure prominently in the faunal assemblages of some of the sites.

As Table III-13 shows, this species represents 24.8% of MNI of food species at Chulatovo II, 17.1% of MNI of food species at Mezin, and a high percentage of 85.9% of MNI of food species at Zhuravka. The ecology of this species is fairly well understood and has been reported on extensively by Zimina (1953) and Zimina and Gerasimov (1970, 1971). As a species it is a relatively recent form which made its appearance in the Pleistocene from an ancestral Asian stock. Marmota bobac formed an important component of Late Pleistocene rodent communities becoming especially widespread during the second half of the Valdai glaciation. These typical grassland dwellers found today in areas with continental climate, were extremely well adapted to cold climate conditions of the past. Present day steppe marmots feed on herbaceous vegetation (Artemisia and Stippa predominantly), augmenting it occasionally by insects. Marmota bobac is a highly social species living in family units of 10-15 individuals in burrows from which they emerge daily for feeding. These co-residential groups are further aggregated into colonies which sometimes number in the hundreds. Zimina and Gerasimov (1970, 1971) report that while today they dig deep and complex multiple burrows, during the Valdai glaciation they probably lived in shallower burrows extending no deeper than 1-1.5 meters (the permafrost thaw layer at the time).

Steppe marmots are highly seasonal species who hibernate in the winter in their burrows. Freeman (1973) reports that

marmots hibernate when ambiant termperatures drop below 3-4°C. Present day marmots in northern parts of Siberia spend as many as eight to nine months in hibernation, and Zimina and Gerasimov (1970) postulate a nine month hibernation period during Late Valdai.

As all hibernating species, marmots have a highly seasonal accumulation of fat and weigh from 800-1200 grams at the onset of hibernation. This weight is drastically reduced during the cold weather months and they emerge from their burrows in the spring weighing from 100-200 grams (Zimina and Gerasimov 1971). Mating takes place in the spring after the animals emerge from burrows and litters of two to nine are born after a gestation period of from 35-42 days. The young reach adult size in two years and sexual maturity in three years. The young remain in their familial burrows until sexual maturity.

We can translate these observations on the ecology of the steppe marmosts to suggest the following for Late Pleistocene steppe marmots of the Central Russian Plain: 1) they were a temporally variable species which was available for exploitation during two to three warm weather months only; 2) they inhabited open grassland environments and thus would have been more numerous away from the riverine gallery-forests and concentrated more in the interfluves; and 3) their seasonal accumulation of fat would have made the fall months optimal time for exploiting this species, after the animals had accumulated maximal fat and before they went into

winter hibernation.

It is interesting to note that both Kirikov (1966) and Zimina (1953) report that the exploitation of this species as a food resource has persisted in the southern part of European USSR until recent times and marmots historically formed an important food source during periods of food shortages.

5. Lepus sp. Leporids are the fifth group of mammals which figure prominently in the faunal assemblages of the Central Russian Plain. They were utilized as food as well as for their pelts. At Mezhirich they represent 28.8% of the MNI of food species and 19.8% of MNI of food species at Chulatovo II. As I noted previously, the classification of leporid remains found at the sites is still unclear. Gureev (1964) suggests that all Late Pleistocene remains found on the Central Russian Plain may belong to the extinct Late Pleistocene form of Lepus tenaiticus. Gureev (Personal Communication, 1978) believes that this large Late Pleistocene species was about one and one half times as large as present day Lepus timidus--the closest present day analogue inhabiting the boreal forest and tundra biomes, and at least 10% larger than the largest hares found today. Naumov (1948) stated that Lepus timidus feeds on grasses in the summer but switches to forbes, shrubs, and more arboreal vegetation in the winter months. Salix, Betula, and Populus twigs, leaves and shoots predominate in the arboreal vegetation ingested by this species that also includes such

deciduous growth as Quercus. Gureev (1964) writes that in more northerly regions Lepus timidus is predominantly found in the protected river valleys where a mix of grassland and arboreal vegetation is found year-round. He suggests that some seasonal migrations take place but does not specify either their direction or the distances that such migrations cover. As all other seasonal migrations, those of hares are related to the availability of food resources. Lepus timidus undergoes two molts a year--to summer pelage sometime from mid-March to the end of May and to winter pelage from mid-October to mid-December (Gaiduk 1970).

We can, therefore, conclude that Lepus timidus today, especially in higher latitudes, is a patchily distributed species which is predominantly found in forested regions of the river valleys. Literature on the ecology of mammals in northern latitudes indicates that this species also exhibit temporal variability in population numbers (see Naumov 1972 for example). First, as Gureev (1964) reports, hares breed in northern regions in the spring and produce the first litters some 50 days later by early and middle June. A second litter is born some 50-55 days after that by mid-August. Gaiduk (1970) reports that the average litter size is around 8.6 individuals per litter. Third litters do not seem to occur among hares in northern latitudes. These observations then indicate that differences exist in hare populations of a region between the winter and summer months. Secondly, as both Bliss et al. (1973) and Naumov (1972)

report, arctic hares aggregate during summer months into local groupings numbering as many as 700 individuals and disperse in winter months. This behavior increases the patchiness of the spatial distribution of hares during the summer months. Finally, numerous reports in the literature indicate that hare populations in northern latitudes undergo regular oscillations in population numbers and that population crashed in hare numbers occur on the average of every nine to ten years (see Bliss et al. 1973; May 1980, Vibe 1971). This third factor adds another parameter of variability to the temporal variability of hares as a steady and dependable food resource. As noted before, Gureev considers the extinct Late Pleistocene leporids of the Central Russian Plain, Lepus tenaiticus, to have been behaviorally and ecologically most similar to Lepus timidus.

We can, therefore, deduce the following for the hares exploited by Upper Paleolithic hunters of the study region: 1) the species was patchily distributed across the study area, being found predominantly in the gallery forest ecotone; 2) the species was more abundant in warm weather months, when it was more patchily distributed but found in larger sized patches; 3) the species may have exhibited some limited latitudinal seasonal migration, possibly moving short distances to the north in summers and south in winters; and 4) population numbers of leporids probably underwent periodic population crashes occurring at intervals of about ten years.

Two carnivorous canid species, Alopex lagopus and Canis lupus figure prominently in the faunal assemblages also. As mentioned before, these species were important economic resources used not as food but rather, as will be shown in the following chapter, served primarily as sources of pelts as well as raw material for the manufacture of bone tools.

6. Alopex lagopus. As Table III-3 shows, the arctic fox played an important role in the faunal assemblages at some of the sites. This species is represented by 68.5% of MNI and 53.3 of MNB at Eliseevichi, 26.2% of MNI and 62.9% of MNB at Timonovka II, 22.7% of MNI and 22.4% MNB at Mezin, and 11.7% of MNB and 10.3% of MNI at Novgorod-Severskii. Table III-14 shows that this species represents but 0.9% of MNI in the summarized Siberian Late Pleistocene assemblages and supports my contention that the species was specifically exploited by Upper Paleolithic hunters and gatherers of the Central Russian Plain.

Recent arctic foxes are characteristic representatives of tundra-boreal forest fauna being found in the summer months in the tundra and venturing into the forest zone in winter months (Adlerberg et al. 1935; Formozov 1970; Shilyaeva 1970; Vibe 1967). As Benesz (1975) points out, this specialization to an extremely cold climate appeared fairly recently, as late as the Middle Würm and possibly even later. The species in Late Pleistocene was widespread in Europe occurring as far as the Pyrenees and the Cote d'Azur in the west and to Crimea and southern boundary of Siberia in the

east. Benesz (1975) writes:

> During the Late Würm and Early Holocene the arctic fox retreated to the north, following the glaciers (or more precisely, periglacial areas)... (1975:195).

He underscores the increased body size of Late Würm arctic foxes when compared to their earlier antecedents, an increase that he reports may be going on up to the present time. Benesz's work with Alopex lagopus permit us to consider the living arctic foxes as suitable analogues to the Late Valdai species on the Central Russian Plain.

The species today occurs in two color phases--white and blue. This dichromatism is controlled by recessive genes and has no expression in the skeletal morphology of the animals (Chesmore 1975). Arctic foxes feed on lemmings, mice and other rodents, as well as on birds and berries in summer months. Their distribution is controlled by the distribution of rodents. There is no clear indication in the literature on the spatial patchiness in the distribution of this species other than the prevalence of pupping dens near water. We must, therefore, assume that the Late Valdai foxes were also fairly evenly distributed across the landscape, possibly favoring the proximity to water (i.e., gallery forests) in the warm weather months.

Great temporal variability, however, does exist in the distribution of this species today. Specifically, arctic foxes have been reported to regularly undertake extensive fall (August and September) and late winter--early spring

migrations and cover over 1000 kilometer distances one way in their seasonal trecks. These migrations are especially important in lean years--when prey rodents are scarce. As mentioned, arctic foxes spend winter months in the forest zone in the south and return north to the tundra in spring and summer (see Formozov 1970 and Shilyaeva 1970). The migration routes of the species follow the river valleys.

The reproductive behavior of the species is such that mating occurs from mid-February to mid-March (earlier in the south, later in the north) and the young are born around the middle of May after a gestation period ranging from 49-57 days. Females produce only one litter per year with litter averages of seven to ten whelps and a maximum of up to 22 whelps. The size of the litter increases during years when food is abundant and decreases in lean years. Newborn whelps achieve full maturity in nine to ten months. The species undergoes two changes of pelage a year--a summer pelage in May and a fall molt to full winter covering in early November. The quality of fur is best in late fall and early winter months, from December through February.

As the above discussion indicates, a number of demographic changes occur in arctic fox populations throughout the year. First, population sizes and densities fluctuate with greater numbers present after the birth of litters. Marakov (1970) reports that average densities of 3.25 to 3.4 individuals per km^2 in Siberia increase to 5.25-5.5 per km^2 after pupping. This suggests an approximately

62% increase in arctic fox numbers after the birth of new litters. Secondly, presence of immature individuals is felt only during summer and fall months, by the winter (December-January) all are adult, although the yearlings are still recognizable in skeletal morphology.

The reproductive and migratory behavior of Alopex lagopus has led Pidoplichko (1969), noting that the remains of this species found in the Central Russian Plain sites show the presence of only adult individuals, to conclude that this species probably did not reproduce in the area but rather migrated to the Central Russian Plain only during winter months. Vereschagin (1977) reports the following demographic composition of Alopex lagopus from the site of Eliseevichi:

Yearlings:	127	44.3%
Adults:	136	47.7%
Old:	24	8.4%
N =	287	

My own examination of faunal remains from other Central Russian Plain sites also shows the presence of adult individuals in all collections and the absence of immature ones. Vereschagin (1977) concludes that the demographic composition of foxes at Eliseevichi indicates that hunting of the species took place in winter months only. This, for Vereschagin, need not imply that the species was only present in the area during these times—but rather that cultural practices alone influenced the demographic composition of the faunal remains. The demographic composition of foxes at

Eliseevichi agrees well with the one Marakov (1970) reports for Siberian populations in winter months. He states that in January and February, yearlings represent 50.4% of the population and adults 49.6%.

With the data on hand it is not possible, at present, to fully evaluate either Pidoplichko's or Vereschagin's hypotheses, and the question of whether this species was present year round on the Central Russian Plain or was only a seasonal visitor must be left open. A far greater number of Alopex lagopus at the sites in the northern section of the study area than in the southern section (see Table III-6 is suggestive and implies that the species may have been far more abundant in the north. Greater availability in the north, as present day migration behavior of the species indicates, may well have been a seasonal phenomenon.

Finally, additional temporal variability is reported for this species today. The population numbers and densities of Alopex has been tied to the densities of lemmings, and Alopex lagopus, like lemmings, is reported to undergo regular population oscillations every three to four years (Braestrup 1941; Butler 1953; Formozov 1970; Marakov 1970; Shilyaeva 1970; Vibe 1967). In addition, data from both fur trade and ecological studies suggest the existence of yet another long term cycle in the population numbers of arctic foxes—occurring on the average of every 10-20 years (Butler 1953, Vibe 1967).

We can conclude the following observations for the

distribution of Late Valdai arctic foxes in the study area: 1) they were patchily distributed--favoring areas near the river valleys both in warm weather months while pupping and in the cold weather months while migrating north-south; 2) their population densities varied seasonally, being significantly greater after pupping as well as during periods of migration along the migration routes, and 3) their population numbers fluctuated at regular intervals of approximately every three to four years as well as every 10-20 years. Some circumstantial and conjectural evidence exists that the species was present in the study area during cold weather months and may have reproduced elsewhere. This evidence is still tenuous and inconclusive and must await further research to be substantiated or rejected.

7. Canis lupus. Canis lupus remains are represented by sizeable numbers at three of the sites--at Khotylevo II, 12.8% of MNI and 19.8% of MNB; 11.9% of MNI and 12.3% of MNB at Mezin, and 7.0% of MNI and 30.7% of MNB at Pushkari I. Siberian paleontological collections (Tables III-14, III-17) show only 2.7% of individuals belonging to this species. Alaskan data indicate that wolf remains account for 0.8% of individuals. A comparison of the statistics from the Central Russian Plain with those from Alaska and Siberia does indicate that this species was selectively exploited at some sites during the Upper Paleolithic period as the remains of the species are found in much higher percentages than could be expected from random non-directional catches.

Some interesting differences appear between the Alaskan and Siberian data. Guthrie (1968) notes that the percentages of Canis lupus in Alaska indicate a ratio of 1:130 for wolves to ungulates there and states that these proportions are fairly similar to the present day densities of wolves in the area. Siberian Late Pleistocene data show that a much greater number of wolves was present and suggest a ratio of approximately 1:35 wolves to ungulates. These differences may imply that a greater density of both predators and prey existed in Late Pleistocene Eurasia than in Alaska. Highest present day wolf densities in Siberia are reported to range from 1 3 wolves per 100 km^2 in unpopulated regions (Kirikov 1979). I will assume that these densities are fairly close to the one that existed during Late Valdai as well.

Canis lupus is a widely distributed Holarctic species with highly plastic ecological requirements that permit wolves to inhabit a wide variety of environments ranging from the tundra to deciduous forests to steppes (Mech 1970; Naumov and Gentner 1967; Pimlot 1975; Stroganov 1965). Stroganov (1965) reports greater patchiness in the distribution of this predator in forested regions where snow conditions make wolves favor river valleys with harder and more compact snow. In general, as Stroganov writes, the distribution of this species is associated with the distribution of medium and large sizes ungulates on which it preys. The species is a fairly sedentary one, living in monogamous familial packs which number from 5-11 individuals. The packs inhabit a

specific territory and Gurskii (1978) reports a lifetime range of wolves in European Russia as averaging between 120 and 160 km^2. Pimlot (1975) states that the long held assumption that the social organization and territoriality of wolves breaks down in summer and wolves become mobile have been recently proven incorrect and that packs persist throughout the year. Likewise Pimlot writes (1975:285):

> There seems to be little substance to the belief that wolves travel over their ranges following a cyclical, predictable pattern. Relatively little is known for certain about the size of home ranges of packs which live in areas where no physical barriers exist to their movements.

These data then indicate that wolf distribution is controlled by the distribution of ungulates. Where suitable densities of ungulates are present wolf packs occupy specific and distinct territories year round.

I have previously postulated greater ungulate densities for the gallery forest-steppe ecotone on the Central Russian Plain. If this postulation is correct, it would suggest that greater wolf densities existed along the riverine gallery forest-floodplains than in the interfluves. The noted increase in wolf densities along river valleys reported for Siberia also supports this conclusion.

Temporal variability in wolf population sizes is also reported in the literature. Stroganov (1969) writes that population numbers of this species vary greatly from year to year. Little work exists on the long term population

fluctuations of wolves. Pulliainen (1975) shows that a clear predator-prey relationship exists between the population density of the lynx (Lynx lynx) and Canis lupus and writes that:

> ...when the population density of wolf was great in Finland, wolves kept the population (density) of the lynx low. After the decrease of the wolf population, the population (density) of the lynx increased. The predator-prey relationship between these two species was thus very clear (Pulliainen 1975: 298-299).

Lynx are reported to undergo regular long-term population oscillations on the scale of every nine to ten years (Butler 1953; Vibe 1967; 1970, White et al. 1980). Both wolves and lynx are probably also tied into the predator-prey oscillation cycles of their prey such as hares. The predator-prey relationship between the wolf, lynx, and other small animals implies that wolf populations also undergo regular long-term population oscillations as well.

Wolves, like other fur bearers, undergo two molts during the year. Full winter pelage is grown by November and molting to summer pellage takes place sometime in April. Optimal pelt conditions for the species is shortly after the fall motl—from November to January. Mating in northern latitudes takes place from mid-February to early April with pups born primarily in June and early July. Average litter sizes for European wolves reported by Pulliainen (1975) are five to six individuals. Pups begin to hunt for themselves at the age of seven to eight months—usually in the spring

following their birth. Full adult size is reached after about 22 months and sexual maturity occurs between two and three years of age. Life spans of wolves range from eight to ten years on the average.

We can conclude the following for the Late Valdai population of Canis lupus on the Central Russian Plain: 1) they were patchily distributed across the landscape with greater densities found in and near the gallery forests; 2) they were a fairly localized species that did not undertake seasonal migrations; 3) some temporal variability existed in the population numbers of the species with greater numbers found in a region following spring pupping; 4) the population of wolves may have undergone regular long-term population oscillations of as yet undetermined magnitude; and 5) optimal pelt conditions occurred in the species in late fall—early winter months.

Soviet researchers have from time to time suggested that some of the Canis lupus remains found at the Central Russian Plain Upper Paleolithic sites belong to domesticated dogs. Pipoplichko (1969) has postulated that some of the canid remains at Mezin represent dogs. Polikarpovich (1968) likewise wrote that dogs were present at Eliseevichi. However, he did not undertake a specific study of the canid remains to determine the morphological characteristics but rather extrapolated from extant literature on faunal canid remains from other sites (particularly from Afontova Gora in Siberia). Gromov (1925) examined the canid remains excavated at the

Upper Paleolithic site of Afontova Gora and concluded that the small size and forshortened muzzles of some of the Canis lupus crania indicate that domestication had taken place. In general, Soviet paleontologists in the 1920s and 1930s assumed that small sizes in canid remains reflected domestication and the presence of domestic dogs was ascribed to canid remains from many Upper Paleolithic sites (Bonch-Osmolovskii 1931; Gerasimov 1931; Gromov 1925).

Pidoplichko (1969) based his conclusions about the presence of domestic dogs at Mezin on the measurements of a single cranium (specimen #5-490) and reported both a small size and foreshortening of the muzzle as evidence for the domestication of the animal. He aged the animal as about one years old. My own examination of the specimen, housed in the Museum of Zoology of the Academy of Sciences of the Ukranian USSR in Kiev, showed a somewhat younger age for the cranium than postulated by Pidoplichko. The aging criteria I used were derived from work by Allan (1920), Dolgov and Rossolimo (1966), Gilbert (1973), Meck (1970) and Silver (1969) for the sequence of suture fusings on the crania, and Dolgov and Rossolimo (1966), Mech (1970), Silver (1969) and Taber (1971) for the tooth eruption sequence. The results showed that the adult canines were fully erupted, unworn, and about three-fourths of the way in—suggesting that specimen #5-490 was approximately eight to nine months old at the time of death. Some of the cranial sutures were still open (the vomer as well as the basioccipital-basiphenoid suture) and confirmed

that the animal was less than a year old. Ample zoological literature exists today that shows that only adult full-grown individuals should be used for morphological evaluations for identification. Specimen #5-490, therefore, cannot be used to prove the existance of domestic dogs as it is an immature individual that has not reached his full size.

Lawrence (1966) and Lawrence and Bossert (1967, 1975) have done an exhaustive review of the suitable criteria in determining the domestication of Canis lupus and concludes that only a battery of measurements (42 cranial measurements) subjected to multiple character analysis can reveal whether a particular individual is a wild or domestic form. As both Lawrence and Bossert and Rossolimo and Dolgov (1965) amply indicate, populations of Canis lupus show a great deal of skeletal variability of size both within particular populations as well as between the different populations inhabiting different regions. Rossolimo and Dolgov report that divisions of variation for certain characteristics differ by as much as 32.8% from the mean value.

I could not take the cranial measurements suggested by Lawrence and Bossert because the Mezin specimen is damaged and many of the necessary cranial parts are missing (e.g., zygomatic arches). However, the previous discussion does indicate that small size of the specimen from Mezin--1) is more likely due to immaturity and 2) falls within the normal range of variability in wolf populations. Pidoplichko's measurements of specimen #5-490 as well as of a wild Canis

lupus from Mezin and present day dog and wolf from the Ukraine are offered in Table III-18.

The foreshortening of the muzzle observed by Pidoplichko in specimen #5-490, the second criteria offered by Pidoplichko for domestication, is also problematic due to the age of the specimen. The length of the muzzle, as Table III-18 shows, is 226 mm. and is just 22% shorter than the length he reported for the wild form of Canis lupus from Mezin (specimen #5-488)--a size variation well within the normal range of variation for Canis lupus. In conclusion then, there is no evidence that specimen #5-490 from Mezin represents a domestic dog.

Skeletal remains of Canis lupus from Eliseevichi were likewise not complete enough for measurement using Lawrence and Bossert's criteria. In fact all the crania were highly fragmented and the vast majority of skeletal remains in the faunal collection belong to post-cranial elements. To date, no paleontological examination of the remains has been conducted to determine if the size variation present in the assemblage is beyond the range of normal size variation for wild canids. Vereschagin (Personal Communication, 1978) believes that all of the remains, in fact, represent Canis lupus and that no evidence exists for the presence of domestic dogs anywhere on the Central Russian Plain during the Late Valdai.

Olson and Olson (1977) have recently proposed that the presence of a "turned-back" apex of the coronoid process of

the ascending ramus is a good criteria for establishing the domestic status of a canid. They report this feature present in domestic dogs and absent in all wild canids with the exception of the Chinese wolf. Olson (Personal Communication, 1981) reports that this feature is absent in all of the canid mandibles he has examined from the Central Russian Plain and, like Vereschagin, concludes that no evidence exists that some of the canids were domesticated in the Late Valdai.

In summary then, both my own examination as well as those of Olson and Olson and Vereschagin reveal that no solid ground exist to claim that some of the Canis lupus remains from the area belong to domestic dogs. The remains found to date all belong to the wild species Canis lupus.

B. The Carrying Capacity of the Late Valdai Central Russian Plain

Faunal assemblages found at the Upper Paleolithic sites of Eurasia as well as the Late Pleistocene paleontological localities of Alaska and Siberia, has led many scholars to postulate that the periglacial forest-steppe environments provided conditions as favorable for ungulates as do the temperate grasslands today (Butzer 1971, 1976; Frenzel 1973; Guthrie 1968; Martin 1973). These authors have suggested that the carrying capacity of present day tundras (ca. 800 kg of ungulates per km^2) is considerably lower than that of Late Pleistocene grasslands. Butzer (1971) reports that the temperate Eurasian steppe-grasslands today have an ungulate carrying capacity of 350-3,000 kg per km^2. Guthrie's work

with Alaskan Pleistocene faunas suggest that Late Pleistocene grassland supported a crop close to or above the maximum estimates for present day temperate grasslands. Martin (1973) assumes even greater ungulate biomass for Late Pleistocene North America and, basing his estimates on the ungulate crop of African grasslands today, offers a figure of 9,000 kg per km^2 for Late Pleistocene. The most conservative estimates for the ungulate biomass are to be found in the work of Budyko (1977), who uses 800 kg. of ungulates per km^2.

These estimates, however, must be modified if they are to be used for estimating man-land relationships. The potential carrying capacity of an area is meaningless for such calculations, and as numerous authors have pointed out, we must take into consideration human perceptions as well as carrying capacities are culturally defined (see Jochim 1975, 1981, for example). The following discussion, therefore, will focus on the abundance and distribution of only those species significantly represented in the archaeological record of the study area.

I have noted previously that patchiness of distribution is a natural spatial feature of all environments. This makes the carrying capacity of an area also variable from locality to locality. Bourliere and Hadley (1970) and Guthrie (1968) note a rise in ungulate biomass when proceeding from a grassland to riverine gallery forest. Likewise, Martin (1973) postulates greater carrying capacities for the Late

Pleistocene floodplains of North America. Bourliere and Hadley (1970) write that in African grasslands three-fourths of the large ungulate crop (elephant and rhinoceros) is found in the gallery forest-savanna ecotone and suggests that, in general, the gallery forest zone is vastly more productive than savanna. Andreev and Aleksandrova (1981) report that in present day Soviet arctic environments, riverine vegetation is lusher and more productive as well.

These studies suggest that the gallery forest-periglacial steppe ecotones of the Central Russian Plain also had higher carrying capacities than the periglacial steppe of the interfluves. I have already postulated a greater density of both mammoths and horses, as well as wolves, in this biome and a greater density of steppe marmots away from the floodplain.

Temporal variability in the carrying capacity of the Central Russian Plain can be postulated as well. Seasonal migration of ungulate species is a prominent feature of north latitude environments today. It was probably also important during Late Valdai but little work has been done on this question, and the evidence for it is circumstantial. I have postulated seasonal migration for mammoths as well as for arctic foxes. Pidoplichko (1969) has suggested that reindeer may have been in the study area in cold weather months only. Chernysh (1958) postulates that the woolly rhinoceros and the musk ox migrated into the area only in winter months.

Ecological literature indicates that gallery forests and their vicinities present important refugia for animal species

during critical periods of the year. Both Jochim (1975) and Spiess (1979) write that in winter the distribution of large game tends to overlap that of plants and fish and small game--i.e., is localized in and near the floodplains. Bourliere (1963), Bourliere and Hadley (1970) and Laws et al. (1975) indicate both greater numbers of large ungulates in the gallery forest ecotones in general, as well as seasonal aggregation of ungulates in the gallery forest during dry seasons--the critical period for African ungulates. Vereschagin (1971), Korniez (1962), and Pidoplichko (1969, 1976) suggest that similar aggregations occurred in the riverine gallery forest on the Late Valdai Central Russian Plain during critical times of the year--the cold weather months. I have postulated greater densities of reindeer as well as of wolves and leporids in this region in cold weather months. I have also suggested that arctic foxes may have been found in this area during cold weather months.

Finally, I have also postulated that seasonal aggregations may have existed among the equids and leporids, as well as possibly the arctic foxes. These seasonal aggregations--late summers for horses and hares and spring and fallmonths while migrating for the arctic foxes, would have added additional patchiness to both the temporal and spatial distributions of these species in the study area. Likewise, the restricted seasonal availability of the steppe marmots (summer months only) created both spatial and temporal variability in the distribution of this species as well.

We can, therefore, conclude that the density of mammals of the Central Russian Plain varied spatially, seasonally, and structurally as well. Lack of fine-grained paleoenvironmental reconstruction do not permit me to consider the question of the quality of this patchiness.

1). Distribution and Density of Mammoths. Mammoths, as Table III-13 shows, are the most abundant species found in the faunal assemblages of the study area both in MNI and MNB calculations. They are thought to have played a major role in the subsistence practices of the Late Pleistocene hunter-gatherers. Bibikova and Belan (1979), using faunal data from the Upper Paleolithic sites, have in fact subdivided the Russian Plain into different theriocomplexes, each of which reflects a unique mix of fauna. They characterize the study area as belonging to one broad mammoth complex, but subdivide it into two sub-complexes: the northern part they classify as a mammoth-reindeer area, the southern part as a mammoth area. Numerous arguments exist in the literature on whether all of the mammoths found represent actual kills, and Vereschagin (1971, 1977, 1979) as well as Gromov (1948) have suggested that the remains reflect both active hunting as well as scavenging of mammoth bone for use. Differential weathering has been reported for the mammoth remains at the sites and interpreted to mean different times of procurement or acquisition. To date no studies have directly addressed this question and, therefore, I cannot estimate the role that each of the two possible procurement activities played in the

accumulation of the mammoth bone. I will return to this question shortly, and now will consider possible mammoth densities in the area.

Table III-19 offers various estimates based on differing assumptions. The uniform assumptions employed in all calculations are as follows: 1) the average live weight of mammoths for all age classes of 3,000 kg. (after Guthrie 1968); and 2) mammoths represented 50% of the ungulate biomass in the area (see previous discussion on mammoth ecology). The carrying capacity estimates express the carrying capacity of ungulate biomass only: column 1 after Budyko (1977) of 800 kg. per km^2, column 2 after Butzer 1971 of 3,000 kg. per km^2, column 3 after Martin (1973) of 9,000 kg. per km^2. Column 4 offers estimates for mammoth densities using data for elephants in African grassland savannas. Population numbers have been estimated for three sizes of the area. The first, A, calculates numbers of animals over the whole study area of 180,000 km^2; B presumes the linearized distribution of mammoths close to the river valleys, and with an estimated 1,500 km. stretch of the rivers, multiplied by 60 km. (30 km. each side) for the river valleys, estimates mammoth densities in the area of 90,000 km^2; and C which estimates a 50% reduction in overall numbers of linearly distributed mammoths. This last calculation is based on the assumption of seasonal north-south migration of mammoths. African elephant data suggest much lower overall densities of elephants in regions where long distance seasonal migrations

are an important part of elephant ethology (Bourliere Laws et al. 1975; Sikes 1971). To the best of my knowledge, no precise figures exist that express these density differences and I have, therefore, arbitrarily adopted a calculation of a 50% reduction in the density estimates.

An additional set of calculations was done to estimate possible mammoth densities using a paleontological data from Siberian Late Pleistocene faunal assemblages and are expressed in calculation E of Table III-13. Here I took present day wolf densities reported for Siberia (1-3 individuals per 100 km^2) and applied them to the wolf to ungulate ratios found in the Siberian paleontological assemblages (reported in Table III-17). This permitted me to estimate the possible numbers of ungulates in the study area. I arrived at the estimates for mammoth densities by employing the ratio of the number of mammoths to other ungulates found in the Siberian paleontological assemblages--this ratio shows that mammoths comprised 44.7% of all ungulate individuals in the collection. The figures derived from these calculations (28,000-84,483 mammoths in an area of 180,000 km^2; 14,081-42,242 mammoths if linearized in distribution along the river valleys; and 7,941-21,121 mammoths if linearized and undergoing seasonal migrations) fall between estimates derived using the carrying capacity estimates of 800 kg. per km^2 and the estimates at 3,000 kg. per km^2. This indicates that the carrying capacities suggested by Budyko and Butzer come closer to possible Late Valdai carrying capacity of the area than

either figures derived after Martin or using contemporary African grassland data.

Note that all of these calculations are based on carrying capacities of ungulate biomass in open landscapes--either tundra or northern grasslands. I have shown, however, that climatic fluctuations during the time period of 25,000-12,000 B.P. saw the vegetational cover of the study area change from open landscapes during cold periods to various degrees of forestation during the warm periods. These vegetational changes profoundly affected the ungulate carrying capacities of the area--and calculation D in Table III-19 estimates mammoth densities that would have been supported during the periods when the study area was forested. The underlying assumptions in this calculation remain the same: 1) weight of mammoth at 3,000 kg. and 2) mammoths represented 50% of the ungulate biomass. The carrying capacity of 500 kg./km^2 for ungulates is after Butzer (1971) for mixed forest zones in northern latitudes. These calculations indicate a 61.5% reduction in mammoth population numbers compared to those estimated for the cold periods using a carrying capacity estimates of 800 kg./km^2 or a reduction of 85.7% in numbers when compared to mammoth populations derived by using a carrying capacity of 3,000 kg/km^2. The estimates presented in Table III-19 do not pretend to accurately estimate the mammoth populations in the study area. Lack of chronological controls, absence of fine tuned environmental reconstructions, as well as a lack of present

day mammoth populations all combine to preclude any precise estimates of past mammoth populations. I offer these estimates purely as heuristic devises—to be used in constructing adequate models for man-land relationships during the Late Valdai.

Calculations of potential mammoth densities do indicate that overall population numbers of the species would have fluctuated throughout the Late Valdai time period. The relatively more stable period of 25,000-20,000 B.P. with gradual climatic deterioration should have had a more stable population of mammoths while the more fluctuating period of 18,000-12,000 B.P. would have seen much greater population oscillations. The magnitude of such oscillations is impossible to determine precisely--my estimates just offer some possible parameters for such fluctuations.

Research to date has focused on the fluctuations on the wave length of years and, at best, decades. No work exists that examines the relationship of these fluctuations to longer term ones on the wave length of centuries. Haber (1980) for example, has shown that population fluctuations combined with predation pressures, create three population equilibria for moose. Under natural circumstances, subarctic moose populations are expected to fluctuate about the equilibrium point for a relatively long time (to ten years) but the population reacts differently at the three equilibria thresholds. Moose increment rates decrease at threshold levels of both high and low population densities, but increments to populations are positive at the medium density equilibria levels. This

leads Haber to conclude that oscillating moose populations have two recovery thresholds--from both medium and high density equilibria. Moose, however, are most vulnerable at the third--low equilibrium. The natural predator-prey relationships between moose and their main predators are such that additional predation pressure added to the low population threshold, even at small percentage rates, could be catostrophic for the moose populations.

Haber's model for the wolf-moose relationship uses catastrophe theory to explain the predator-prey relationship and ensuijg prey population densities. May (1977), while reflecting the specific use of the catastrophe theory as an explanatory devise in ecology, likewise reports the presence of several different equilibria states in both plant and animal species. This implies the existence of different population thresholds and breakpoints for different species. Using fisheries data, May, for example, shows that the presence of different equilibria levels is responsible for the differential reaction to steady predation. In some cases, as when the particular population is at an equilibrium of low population values, continuous harvesting rates can cause discontinuous collapse in fisheries.

Haber (1980) suggests that such a model may be quite applicable to population fluctuations recorded in many north latitude species including reindeer and musk-ox. A decrease in population numbers of north latitude ungulates have been reported and related to climatic oscillations and especially

to climatic deterioration (Spiess 1979; White et al. 1981). These decreases occur as a result of decreased fertility and greater mortality among the juvenile age set of the species. Lack of long-term studies among northern ungulates precludes me from assessing either the universal applicability of such a model to ungulate populations in general, or from applying it to the Late Valdai Central Russian Plain. The model does suggest, however, that additional stress--either predator-generated or climatic, may be more detrimental to some species than to others as well as at some times and not others. Specifically, the longevity and low reproduction rates of large ungulates would make them more vulnerable to stress and more likely to be subjected to catastrophies. If Late Valdai populations of large ungulates, especially mammoths, were in as complex predator-prey relationships as Haber reports for moose, then either additional climatic stress (such as presented by climatic fluctuations between 18,000-12,000 B.P.) or increased predation may have been catastrophic for the population.

Firm data on African elephants is available only for the last twenty years or so. This time span is insufficient for establishing long-term population changes for the species with the longevity (approximately 50-60 years) and slow reproduction rates (gestation period of 22 months, three to seven year intervals per female between births) of elephants. We simply do not know either whether the African elephant populations are at equilibria or have more than one

equilibrium points.

Laws et al. (1975) report population growth rates as averaging 4.6% per year for African elephants and mortality rates as 28.5% for 0-5 age set and 6.4% for the 5-50 age set. They note that mortality rates are uniformly spread within the 5-50 age set. These statistics suggest that the studied populations are not at equilibria. Saunders (1980) reports average increment rates for African elephants of about 6% with a range from 0-20%. Saunders' figure approaches the mortality rate more closely and indicates that at least some of the elephant populations are close to equilibria. Populations at some equilibria levels, as Haber's work has shown, can sustain only the most limited stress caused either by climatic change or predation.

The effects of inclement climate on the recruitment (i.e., the numbers of newborn) of African elephants has been studied by Laws et al. (1975) who reports a cyclical fluctuation with a wave length of six to eight years which correlates with rainfall cycles. Laws' findings of decreased recruitment rates associated with climatic stress have been also confirmed by Douglas-Hamilton (1972). Laws (1975) reports that changes in habitat result in decreased reproduction, lower pregnancy rates, and increased calf mortality. In short, elephants react to climatic stress in a way that is detrimental to population numbers.

All of these data suggest that habitat changes during the climatic fluctuations in Late Valdai may have created

similar effects on mammoth populations. As noted, populations under climatic stress may react catastrophically to added stress such as presented by additional predation, for example. It can be postulated that even the same levels of predation could catastrophically effect populations that are under climatic stress. These observations suggest that mammoth populations during the 18,000-12,000 B.P. may have been under stress brought about by the oscillating climate. I have previously shown that mammoths on the Central Russian Plain were prey to Upper Paleolithic hunters and gatherers. This additional stress may have ultimately brought about decreases in the population numbers beyond recovery thresholds.

Budyko (1967, 1977, 1980) has attempted to model the effects of just such stress on mammoth populations during Late Valdai. His model assumes that this species was at or near equilibrium and that the added stress was generated by increasing human predation. This assumption employs an increase in population of hunters-gatherers as a necessary and sufficient variable and postulates that this increase in stress brought about the ultimate crash in mammoth numbers and was responsible for the subsequent extinction of the species. Budyko's model is, in this aspect, quite similar to the one offered by Martin (1973) for the extinction of mammoths in North America. The problems with the assumptions underlying these models (i.e., increases in population of hunters-gatherers as well as single equilibria levels for the species) have been widely discussed in the literature

(see, for example, Hassan 1981, Zubrow 1976). What is interesting about Budyko's work, however, is his modeling of the temporal effects of stress on mammoth populations. As I have shown, added stress can be caused by a number of factors. I have also documented the increased climatic stress during the Late Valdai. We can consider Budyko's model, therefore, either substituting climatic stress for predation stress, or by combining the two.

Budyko postulates that added stress to the mammoth populations would have resulted in little population change over a long period of time. This is because of both the low birth rate and longevity of the species. The mammoth populations would have faced a slow decline in numbers imperceptible in the archaeological or paleontological record. At some point though, the population would have reached and crossed a low threshold and then proceeded to decrease rapidly. Archaeologically and paleontologically this would appear in the record as a population crash or extinction. While, as noted, Budyko's assumptions of both the carrying capacity of the area as well as increasing predation resulting from population increases of hunters-gatherers in the area are quite problematic, the scenario he offers is a most interesting one worth further investigation. Precise modeling is needed that would take mammoth populations through time to see if different density thresholds existed for this species and possible population responses at the different thresholds. Likewise, much finer chronological controls are needed to

determine if human predation rates were stable or varied in the Late Valdai. Data on hand suggest a general increase in mammoth hunting from the Middle Paleolithic to Upper Paleolithic all across the Russian Plain (Vereschagin 1972). I will consider the question of changing predation rates for this species in a subsequent chapter. For the purposes of this discussion I will assume a stable rate during the Late Valdai.

I have postulated that mammoth densities varied during Late Valdai—they were higher during the colder time periods and lower during the warmer ones. It is interesting to consider the effects that such differences in population numbers would have had on the recruitment group sizes of mammoths. Table III-20 presents these calculations using the carrying capacity for the area postulated after Budyko (1977) and Butzer (1972), and calculates the recruitment age population both if the mammoths were linearly distributed near the river valleys and if they also migrated seasonally. The estimated recruitment rate of 4.7% per year is taken from elephant data reported by Laws et al. (1975).

Table III-20 shows, for colder times, the population of recruitment age mammoths (0-2 years) ranging between a low of 282 and a high of 2,115 individuals. During warm times, recruitment age mammoths number from 176-352. The decrease in the size of the recruitment age sets between the mammoth populations in cold and warm climate is correlated to the postulated decrease in the mammoth densities from the cold to

the warm periods. The decrease in the recruitment age set between the two estimates is quite large and suggests that human predation, especially during warm times, could have been quite critical. I am assuming that the population of mammoths was at any one time at an equilibrium--an assumption that may not be warranted.

The MNI estimates for mammoths at the Upper Paleolithic sites in the area, listed in calculation D of Table III-20 shows that the numbers of mammoths found at each site represent very large proportions of the annual recruitment rate. For example, the 149 mammoths at Mezhirich represent 26% of the recruitment numbers calculated using 800 kg./km^2 estimates, 7% using the 3,000 kg./km^2 carrying capacity; and a 42% of the expected recruitment age population in temperate forests. As this calculation shows, equally large numbers of mammoths found at the other sites likewise indicate that large segments of the recruitment age numbers are represented. Since we do not know what time span is represented in each of these assemblages, we cannot estimate the rate of human predation. The figures are offered here as heuristic devices to show that human predation may have been especially significant during the period of climatic oscillations between 18,000-12,000 B.P.

Another assumption underlying these calculations is a steady natural mortality rate for mammoths. This assumption, likewise, may be unwarranted as mortality rates probably varied greatly and increased during periods of climatic stress.

During periods of equilibria, if such were present, we can estimate that natural mortality of mammoths would have been at or near the recruitment rate. During periods of climatic stress it may have increased appreciably. Vereschagin (1979) for example, postulates a mortality rate of 15% for Late Valdai mammoths—occurring during times of oscillating climate, especially periods of increased precipitation and snow fall. Spiess (1979) reports an increase of from 5-10% of the mortality of such north latitude ungulates as reindeer during periods of climatic deterioration. Laws et al. (1975) report an increase in the mortality of elephant calves from an average of 28.5% to a high figure of 42.9% per year during periods of habitat change. These observations suggest that mammoth calf mortality probably also increased greatly during periods of climatic oscillations.

Future work on mammoth populations in Late Valdai will also have to consider the probable lack of synchronization between climatic stress and population response of mammoths. The slow recruitment rates and longevity of the species indicate that at least one mammoth generation (50-60 years) would have to pass before the population would feel the effects of reduced recruitment. This initial decrease in mammoth numbers would be felt in the recruitment age set only, while the effect on the whole population would be felt even later than one mammoth generation--when a few age sets born under climatic stress had entered the population--some 100-150 years later. This lack of synchronization between climatic

stress and population response would create apparently stable mammoth numbers way past the period of climatic stress and make the stress of predation doubly detrimental. Archaeologically and paleontologically it may create a picture of steady predation on steady populations, while in fact, the situation may have been very different.

My postulation of the 200-year duration of acute climatic perturbation followed by a slow and long period of climatic recovery for the profile of climatic oscillations between 18,000-12,000 B.P., implies that mammoth populations may have showed decreasing population numbers long after the stress period, all the way through at least half of the recovery period of climatic stabilization. It implies also that particular dangers to mammoth populations existed during these long periods of climatic recovery as well, and suggests that the length of time for the build-up of population numbers came close to coinciding with the periods of climatic stress. The shortness of the period of acute climatic stress (i.e., 100-200 years), may have been insufficient to restore populations to previous sizes. Admittedly these postulations are highly speculative. I offer them here as an indication of the direction that future research must take before we can consider the Late Valdai man-land relationships on the Central Russian Plain on anything beyond a speculative or anecdotal level.

In conclusion then, I have shown that: 1) mammoth populations numbers probably fluctuated greatly during the

Late Valdai and decreased appreciably during the warmer periods; 2) recruitment rates in mammoth populations probably also fluctuated--decreasing during times of climatic stress; 3) mortality rates of the population also varied, increasing during periods of unfavorable climate; 4) overall population numbers of mammoths were fairly low on the Central Russian Plain--during favorable times mammoth densities may have ranged from 0.5 km^2 to 0.13 km^2 to a low of 0.08 km^2 during warmer periods; 5) steady human predation on mammoths would have been especially detrimental to the population during the warm climatic episodes; and 6) predation and/or climatically induced stresses to mammoth populations may have resulted in rare but periodic crashes of mammoth populations that would be the only population phenomenon visible in the record.

I have also postulated a possible existence of multiple equilibria points for mammoth populations. If these did exist, then predation pressure or climatic stress may have affected the population differently depending on the particular density equilibrium that the population was near. Lack of research on the question of multiple equilibria do not permit me to consider the questions of changing reactions to stress that mammoths may have undergone. Rather, I have had to treat the mammoth populations statically and suggest some variables that may have effected it through time. This static modeling is most inaccurate and fails to consider crucial variables involved. The current state of research on the subject, however, permits me no alternative options.

2. Distribution of Other Species. The ecological requirements of other species which played a major role in the economies of the hunters and gatherers in the study area also indicate that these species, like the mammoth, probably underwent changes in population numbers during the period of climatic oscillations. In general, we can expect that increased forestation during warmer episodes would have seen an overall reduction in the populations of equids and wolves. Equids would have decreased because increased forestation would have reduced their medium to tall grass pastures and wolves because of the projected general decrease in ungulate numbers.

The reservations about reconstructing behavioral patterns of Late Pleistocene reindeer, discussed previously, do not allow for any speculations about the effect of climatic fluctuations on this species. Reindeer densities, however, as Spiess (1979) reports, appear greater overall in open landscapes and lower in forests. Therefore, warmer times with greater forest cover may have seen an overall reduction in the size of Rangifer populations in the study area.

Greater forestation would have also favored a reduction in the population of steppe marmots. It is unclear what effect fluctuations may have had on the population numbers of hares and of arctic foxes.

In addition to changing the overall numbers of the different species, climatic fluctuations also affected their

behavior. We can expect that changes occurred in the spatial distribution as well as in the migration patterns of the animals. Specifically, the pattern of linearization of many food species near the river valleys postulated for the cold periods may have changed to greater dispersal over the area in warmer periods. It is also possible that during some of the warmer periods such migrants as the arctic fox may not have wintered in the study area at all or been present in greatly reduced numbers. Instead they would have been found north of the area.

In short, what this section of the chapter has done is to show that great temporal and spatial variability existed in the distribution of the resources in the study area during the Late Valdai and that the exact nature of this variability cannot be specified with any accuracy at present. I have presented some unquantified and often ancedotal indications of what some of these variables may have been.

C. Implications for Human Subsistence Strategies

I stated at the beginning of this chapter that the goal of this work is to understand human adaptations on the Central Russian Plain during the Late Valdai. I have considered the question of the ecology of the Central Russian Plain so as to understand the resources available to the Upper Paleolithic populations in the area. This ecological approach has most recently been manifest in the application of various ecological models derived from nonhuman ecology to human foraging practices and can be found in the works of Jochim

(1975), Keene (1981), Reidhead (1977, 1979, 1980), Smith (1981), Winterhalder (1977, 1981a, 1981b) and others. The underlying assumptions of all these models, be their optimal forager constructs or marginal value theorems, is as Winterhalder (1981) writes:

> From an array of potential food species, foraging locations, and pathways, the foragers can choose combinations which more or less effectively and efficiently procure subsistence. The foragers choice makes up a strategy of adjustment to ecological conditions, and adaptive patterns result from evolutionary processes and the constraints of situation, time, and chance (Winterhalder 1981 :66).

They all assume the goal of maximization of a currency (usually energy) as well as consider a parameter (net capture rate) to formulate hypotheses about the behavior of foragers in particular environments. Lastly, all of these models use the qualities of the resources and of the environmental mosaic as an independent variable. I will discuss the philosophical problems with these models at a later time as well as consider potential benefits to be gained from them. The application of these models to archaeological problems, however, is beset with problems created by chronology. Grayson (1981) writes that the main problems in testing the optimal forager behavior with archaeological data is: 1) it presumes an accurate reconstruction of the environment; and 2) it presumes an accurate assessment of the exploitation patterns employed by human populations of the past.

As this chapter has shown, the first assumption—an accurate paleoenvironmental reconstruction—is not met by the

data from the Late Valdai Central Russian Plain. Neither do we have any firm chronological controls for the data set. Lastly, we do not have any assessments of the exploitation patterns employed by Upper Paleolithic hunters and gatherers. At best, therefore, what can be hoped for is a set of "just so stories"--tentative models that account for the observed variability in the faunal data base.

I will, therefore, now offer some wholesale observations, derived from the ecology of the exploited species, about the best time of the year for hunting of particular species as well as their possible location in the study area. I will test the validity of these predictions in a subsequent chapter. This information is summarized in Table III-21 which depicts the spatial, temporal, and behavioral parameters in the distribution of each species. The table first in column A considers the spatial distribution of a species, and then, in column B the social behavior of the species during the annual cycle. Column C considers the temporal variability both in the location of the species as well as in population numbers, and column D evaluates the quality of pelts in fur bearers. Based on these variables and using some basic assumptions of the optimal forager theory, I then proceed to project the best times for hunting of the particular species--shown in column E. The assumption employed in these projections is that hunting behavior in the past had as its goal the maximization of some desirable value (e.g., energy) per energy expanded. This indicates

that a particular species would be most profitably hunted during the period of its greatest local abundance. In the case of fur bearing carnivores who were hunted for purposes other than consumption, it is assumed that, all other things being equal, the goal is the capture of animals when their pelts are in optimal condition.

I am forced to consider the species in a static context of a uniform and unchanging environment. The stated difficulties with paleonenvironmental reconstruction and with accurate reconstruction of the ethology of the species prevent me from considering the dynamics involved. Because of this, the projected spatial and temporal distribution of the prey is modified in a cold open landscape in which arboreal growth is restricted to the vicinity of the floodplains.

In such an environment the optimal times for hunting fur bearers would have been controlled both by the quality of their pelts as well as by the overall abundance and distribution of the species. Optimal pelt conditions, as noted, for Canis lupus would have been in late fall-early winter. Their distribution in the study area was local (near the gallery forests) and dispersed throughout the year. This suggests, as column E indicates, optimal hunting times in late fall-early winter, approximately from late November to the end of January.

Alopex lagopus aggregated during fall-winter migrations and may have been only present in the area during cold

weather months. Optimal pelt conditions for this species is projected from December to February and coincides with their availability in numbers in the area. I calculate, therefore, the early winter months as optimal time for hunting of Alopex lagopus. The possibility that they were only seasonally present in the northern part of the study area also suggests that the hunting of this species would have been more important in the north of the study area. This proposition will be tested with the archaeological data in a subsequent chapter.

Leporids were probably available year round, with minor north-south migrations making them slightly more plentiful in the north in warm weather months and in the south in cold weather months. Their possible aggregations in late summer, August, made this an optimal time for harvesting this species. The species probably reached optimal pelt conditions sometime later, in late fall-early winter (December), and perhaps additional procurement may have taken place at that time also.

Marmota bobac, because of their seasonal fat accumulation as well as their hibernation, would have been optimally harvested in late summer. Their projected distribution in the interfluves would have made this region the locale for their procurement. Their small size would not have been a hindrance to transporting whole skeletons to the habitation sites, and we can expect to find all parts of their skeletons represented in the archaeological assemblages.

The difficulties in reconstructing past ecology and behavior of Rangifer tarandus have been discussed. Their projected concentrations in the gallery forest ecotones during cold weather months suggest that optimal times for hunting this species would have been from October to April in the gallery forests.

The local distribution of Equus sp. near the floodplains would have made the vicinity of the gallery forests the locale for their procurement. Their possible seasonal aggregations in late summer suggest that the optimal time for procuring this species would have been sometime in August.

Finally, as I have projected seasonal migrations for mammoths, I conclude that there may have been a difference in the optimal time for hunting of this species between the north and the south of the study area. Mammoths would have been procured in the north (Desna region) in warm weather months of July and August. From October to approximately May, they would have been available in the mid-Dnepr region. If my reconstruction of mammoth ethology is correct, we can anticipate, all other things being equal, finding approximately four times the mammoth densities in the assemblages of the sites in the south when compared to those in the north. I will test this proposition with faunal data in a subsequent chapter as well.

D. The Central Russian Plain Data, Mammoth-Hunting Strategies, and Mammoth Migrations

I will conclude this chapter with a consideration of the strategies employed in hunting mammoths. As

Saunders (1979) has pointed out, nothing has generated as much debate in the literature as the possible methods employed in hunting species as large as mammoths. Ethnographically we do not know of any group that habitually hunted elephants in sizeable quantities prior to the advent of the ivory trade (Carrington 1958; Sikes 1971; Vereschagin 1971, 1979). Much of the debate, as Saunders (1979) aptly puts it, is attributable to our inabilities to imagine how prehistoric hunters armed with stone implements could have habitually taken down such sizeable prey as mammoths. Yet the archaeological evidence from both the Old and New Worlds amply documents that such successful hunts did indeed take place in the past. This archaeological reality has led to a number of speculations on the hunting methods used (see, for example, Saunders 1979; Vereschagin 1971). Kornietz in her 1962 dissertation first proposed the hypothesis that Late Pleistocene hunters took mammoths by driving and slaughtering whole herds. She based her hypothesis on the analysis of the age composition of mammoths found at three Upper Paleolithic sites on the Central Russian Plain: Dobranichevka, Mezin, and Radomyshl'. She concluded that the demographic distribution of the mammoth remains at these sites closely resembled the demographic composition of present day Indian elephant herds, and interpreted this to imply that Upper Paleolithic hunters took whole herds.

Recently Saunders (1979, 1980), quite independely, has advanced the same argument for Late Pleistocene hunters of the New World. Specifically, Saunders claims that the

demographic composition of mammoth remains at such sites as Lehner Ranch, Dent, and Miami indicates that hunters killed whole herds of Mammuthus columbi. At other sites, namely Murray Springs and Blackwater Draw, Saunders argues that individual mammoths were hunted and this resulted in a demographic profile quite different from those found among African elephant herds.

Both Kornietz and Saunders developed methods for aging mammoth teeth based on present day elephant analogues. Kornietz also proceeded to develop a method for sexing mammoth remains based on both sexual dimorphism of teeth as well as on the anatomical structure of the mandibles.

Kornietz reached her conclusions about the hunting methods without any statistical testing of data. Saunders, on the other hand, tested his conclusions by employing statistical techniques. In their arguments both Saunders and Kornietz also relied on ethnographic analogues which report that indigenous populations both in the Old and New Worlds did indeed take large numbers of various species, such as bison and reindeer, in massive drives.

Recently, a Late Pleistocene "mammoth cemetery" has been discovered in Siberia which contains sizeable numbers of mammoths as well as other species. This site of Berelyoha, C-14 dated at 11,830 $\pm$110 (LU 147) and 12,240 $\pm$160 (LU 149), is located on the Berelyoha River at 71°N 145°W at the border of the tundra and boreal forest ecozones. Vereschagin (1977) investigated this paleontological locality

and recorded all the faunal remains found there. These are presented in Table III-15. Table III-22 presents the demographic analysis of Berelyoha mammoths done by Zherehova (1977).

While an Upper Paleolithic archaeological site has been found next to the bone deposits, the consensus of opinion is that the Berelyoha bone deposit represents a paleontological accumulation of animals who met their death through natural processes and that their accumulation in no way is the result of human action.

The discovery of Berelyoha presents us with an opportunity for the first time to test the validity of the conclusions about the past hunting practices advocated by both Kornietz and Saunders. As Tables III-15 and III-22 show, remains of 166 mammoths have been found at Berelyoha and sexes and ages were determined for the individual mammoths represented.

African data on elephant mortality indicates that death assemblages accumulate from accretional mortality of individual animals rather than from catastrophic deaths of whole herds. We can, therefore, assume that similar mortality patterns in the past would produce a demographic composition at Berelyoha that should be significantly different from those found at either the Old or New World sites as well as different from extant elephant herds.

I used Saunders (1980) as the source for data both on African elephant herds and the demographic composition of mammoths found at the New World archaeological sites. I used

Kornietz (1962) and Pidoplichko (1976) for the demographic composition of the remains found on the Central Russian Plain. As noted, data on Berelyoha mammoths come from Vereschagin (1977) and Zherehova (1977). In my calculations of the mammoth statistics I followed the categories used by Saunders in his tests and grouped the mammoth remains from the Central Russian Plain and Berelyoha accordingly. All of these data are presented in Table III-23.

My application of the Kolomogoroff-Smirnov tests is presented in Table III-24. I tested for the significance of differences between two data sets, and used the 0.05 level of significance in a two-tail test. My tests show the following: 1) no statistical difference between the demographic composition of Berelyoha mammoths and African elephants (chi^2 of 2.23,df 2); 2) no statistical differences between the demographic composition of mammoths found at the New World sites taken cumulatively and those of Berelyoha (chi^2 1.34,df.2); and 3) a significant statistical difference in the demographic composition of mammoths remains found at the Upper Paleolithic sites from the Central Russian Plain taken cumulatively (chi^2 of 6.077,df 2).

Comparisons of the Berelyoha mammoth remains with specific assemblages found in the New World sites show that remains at the Lehner Ranch (chi^2 6.33, df.2), Murray Springs (chi^2 9.7,df 2) and Blackwater Draw (chi^2 8.86,df.2) are significantly different from those of Berelyoha. Likewise, remains found at Mezhirich are also significantly different

from those of Berelyoha (chi^2 10.53,df.2). Remains of the following Old World Central Russian Plain sites show no significant differences from Berelyoha--Mezin, Dobranichevka, and Radomyshl'. The following New World assemblages show no statistical differences from Berelyoha--Dent and Miami.

The conclusions I reach from these tests are ambiguous. First, the statistical similarity of the majority of both the Old and New World mammoth assemblages to both Berelyoha and African elephant herd compositions lead me to conclude that no assumptions about taking of mammoth herds in Late Pleistocene is warranted. Vereschagin (1977, 1979, 1981) for one, has postulated that whole herds of mammoths may have perished together during certain times in Late Pleistocene--during crossings of thin ice on newly frozen rivers, for example. This hypothesis implies that Late Pleistocene mammoth assemblages will also reflect natural herds in their demographic profiles--and the Berelyoha remains certainly support such an interpretation. This, in turn, implies that the phenomenon of equifinality may play a role in the composition of archaeological faunal assemblages--both natural mortality and human hunting practices can leave behind the same demographic composition. Therefore, demographic profiles of mammoth remains alone cannot tell us the hunting methods employed by Upper Paleolithic hunters.

Quite obviously, my statistical tests do not exclude the possibility that hunters did also take whole herds--rather these tests reduce what both Saunders and Kornietz have

claimed as a probability to the ranks of possibility. The possibility that herd taking was a hunting strategy in mammoth exploitation must, at present, remain unproven.

Soviet researchers beginning with Gromov (1948) have suggested that Upper Paleolithic hunters not only hunted mammoth but also scavenged bone from already dead animals. Current data cannot refute this hypothesis either. If mammoths did indeed perish in herds from time to time during Late Pleistocene as Vereschagin has postulated, then scavenging of these carcasses could have also brought about the demographic compositions found at the Upper Paleolithic sites of both the Old and New Worlds.

Finally, the statistically different demographic profiles of mammoths found at Blackwater Draw (chi^2 8.859,df.2), and Murray Springs (chi^2 9.7,df 2) compared to Berelyoha do, as Saunders (1980) indicates, point to possible taking of single individuals (solitary males?) also. I suggest that similar hunting practices may be postulated for the mammoth assemblages at Mezhirich and Lehner Ranch as well.

The current state of research on the patterns of mortality of Late Pleistocene mammoths does not permit us to discern the effects of particular human activities in the faunal assemblages using demographic profiles alone. This conclusion should also be extended to include all speculations about elephant hunting in the Pleistocene (Freeman 1975 on Torralba-Ambrona, for example). While, overall, I do intuitively agree with both Saunders and Kornietz that some mammoths were taken in herds, at present no analytic methods

exist that can clearly demonstrate this, and our hypotheses must unfortunately, remain "just-so stories"--unproven hypotheses. The abundance of the faunal assemblages in both the Old and New World Late Pleistocene sites together with documented evidence for taking of large numbers of other species in drives or jumps are documented both in the Late Pleistocene and early Holocene (e.g., bison at the Upper Paleolithic site of Amvrosievka, wild asses in Middle Paleolithic Staroselye, bison at Olson-Chubbock). This evidence argues for the sophistication of hunting skills of Late Pleistocene--early Holocene populations. Also, as Saunders (1980) reports, present day cropping practices in Africa favor cropping of whole herds of elephants over taking of individuals. This is because of the "mobbing" action of the herd around the injured individual which prevents both present-day game wardens, and by analogy, would have prevented past hunters, from successfully retrieving their prey. All of this evidence combined does favor hypothesizing that mammoths were most efficiently exploited in the past by taking whole herds also. Our lack of suitable analytic methods for proving this hypothesis speak for the need of future research on the subject and for the development of sensitive enough methods that will permit us to distinguish the causes that produced particular demographic profiles in the various mammoth assemblages.

Much additional work is needed both on taphonomy as well as on Upper Paleolithic hunting strategies before we can test

for possible seasonal differences in the location of mammoths in the study area. I have previously hypothesized that the species in Late Valdai migrated seasonally and were found in the north in warm weather months (two months) and in the south in cold weather months (eight months). Extant data on the demographic composition of mammoth remains are both insufficient and ambiguous. I suggest, however, that with chronology and taphonomy under control, we should be able to detect demographic differences such as in the percentages of foetal and newborn mammoths between the northern and southern regions of the study area.

Recently Vereschagin and Kuzmina (1979) have demonstrated that the percentages of mammoths in this age group (i.e., foetal and newborn) are significantly lower than expected at the Upper Paleolithic Kostenki-Borshevo sites on the Don. They interpret this to imply that mammoths were found in the region only during cold weather winter months and summered elsewhere. Their observations lend some support to my conclusions about the seasonal migrations of mammoths on the Central Russian Plain. There are, however, a number of problems with their underlying assumptions that diminish the significance of their conclusions. These moot assumptions are: 1) strictly seasonal births for mammoths, 2) hunting strategies that did not discriminate between age classes, and 3) faunal remains that reflect cultural practices only. As my previous discussion on mammoth assemblages has shown, the demographic composition of faunal remains appears to bear

a mark of equifinality. In brief then, these questions also must remain for future research to consider.

CHAPTER IV

THE DATING OF THE SITES

I. INTRODUCTION

This chapter will discuss available methods for dating the Upper Paleolithic sites of the Central Russian Plain as well as the various, and often highly controversial, chronological schemes that exist in the literature for the area. It will focus first on the data for relative dating including stylistic criteria and biostratigraphic information. After a consideration of both the data base and of the serious problems that still remain to be solved, I will next turn to chronometric dating and present all the available ^{14}C dates for the sites as well as offer five new dates obtained recently from the Radiocarbon Laboratory of Queens College, City University of New York. Next I will present a chronological scheme for the study area. Finally, in the last section of the chapter, I will once again return to the questions of spatial distribution of the sites in the study area that were considered in Chapter II and examine for variability introduced by chronological differences.

II. RELATIVE DATING OF THE SITES

A. Introduction

Upper Paleolithic sites of the Central Russian Plain have been dated by a variety of relative methods that can be divided into two distinct categories: 1) archaeological chronologic ordering based on the stylistic criteria of the lithic assemblages found at the sites, and 2) biostratigraphic methods which include dating based on geologic data as well as on the more recent, and as yet undeveloped, schemes that incorporate biologic information. As elsewhere, relative means of dating have been used the longest in the area and are the most prevalent in the literature. Archaeological dating methods have been in use the longest and 1) offer the greatest number and variety of dating schemes, 2) show considerable changes in interpretations through time, and 3) are perhaps the most problematic of all of the dating methods.

As has been noted previously (see Chapter II), stratigraphic dating underwent a major revision in the USSR in the last thirty years. This revision, based primarily on the work of Gerasimov and Markov (1939) and especially on Velichko (1961), alligned the Upper Paleolithic period with the last Valdai glaciation and synchronized its appearance in the study area with the last stages of that glaciation. The geochronological scheme offered by Velichko represents a first major effort at a uniform chronology and will for the basis for the discussion in this work. As will be

shown, however, this scheme is still quite tentative in nature.

Biologic information presented in Chapter III will be used in this chapter in a construction of a chronological scheme. The innate connection of this data base to the geologic-stratigraphic scheme, as well as its dependence on chronometric dating for ultimate relevance, do not make this source of information an independent one for ordering the sites through time. Rather, biologic data can best serve as a control for evaluating the accuracy of the geologic information and interpretations.

B. Stylistic Dating of the Sites

1. Introduction. Today, while problematic but fairly inclusive stylistic chronologies exist for some regions of the Russian Plain such as the Molodova sites on the Dnestr (see Chernysh 1959, 1973; Ivanova 1969; and Klein 1973, for example) and the Kostenki-Borshevo sites on the Don (see Klein 1969; Lazukov et al. 1981; and Rogachev 1957, for example), no agreement exists in the literature on the chronological ordering of the sites in the Dnepr-Desna region. As I mentioned in the introductory chapter, there is uniform agreement among both Soviet and Western researchers that the area of the Central Russian Plain constituted a uniform cultural unit (whether single or with multiple subdivisions) during the Upper Paleolithic. At the same time strong disagreements exist on how to segment the region either synchronically or diachronically. The range of

opinions and schemes offered by researchers extends from the unified mono-cultural scheme of Shovkoplyas (illustrated in Table IV-1) who sees all of the sites of the study area belonging to a single Mezin culture and explains the observed differences between the sites by chronology alone, to the other extreme as expressed by Grigor'ev (1970). Grigor'ev wrote that insufficient information exists on the sites to either: 1) clearly separate them into different archaeological cultures, or 2) to order these cultures chronologically.

As Table IV-2 shows, the different sites in the study area have been differently dated by various researchers. Mezin, for example, has been assigned from the Aurignacian to the Azilian cultures, and Kirillovskaya from the Mousterian all the way to the late Magdalenian. Such a range, in part, reflects the changes in classification criteria through time. Today it also reflects the theoretical crossroads at which Soviet Paleolithic archaeology finds itself. The views of Soviet archaeologists, like those elsewhere, reflect cultural and historical realities. I have already discussed the history of Soviet Paleolithic archaeology in a cultural-historical context in Chapter I and shown how the historical changes in ideology affected this research. Here I want to briefly return to these changes in the ideological super-structure to show how they have brought

about our current difficulties in stylistic dating.

2a. The History of Paleolithic Archaeology in the Study Region: The Formative Period. 1873-1928. The salient point of the history of Russian and Soviet Paleolithic archaeology for this discussion is that both its origin and early development were profoundly affected by the work of the French, most notably of de Mortillet and Abbe Breuil.

After an initial period of disagreement on the dating of some of the sites (e.g., between Hvoika and Volkov on Kirillovskaya for example, see Efimenko 1928), the French classic scheme of de Mortillet for subdividing the Paleolithic was accepted and used widely as was the French methodology of excavation and the use of "indexes fossil" as chronological markers. A few researchers did note local differences and attempted to subdivide the classicil French unilineal and uniform stages. Most notable among these attempts was one by Gorodtsov (1923), who used the stylistic differences in art as criteria for dividing the Magdalenian into three provinces: the Western (Atlantic), the Middle and Eastern European one, and the Mezin-Eastern European variants. Gorodtsov's scheme, however, was not accepted, and lithic classifications dominated all attempts at classification.

In general, throughout this period lithic classification was based on the classic French scheme and local

differences were neither noted nor considered.

2b. Development Period, 1928-1950s. As discussed in Chapter I, this period in Soviet Paleolithic archaeology saw profound ideological changes--most notably the establishment of dogmatic Marxist thought and with it the periodizations of history found in Marx. Marxist archaeologists working with Paleolithic materials, most notably Efimenko, Ravdonikas, and Boriskovskii, worked out appropriate socio-economic formations and their archaeological correlates (Davis 1983). Those parts of Efimenko's scheme that relate to the study area are presented in Table IV-1. This scheme differed from the French one primarily in the omission of the Perigordian-Gravettian level.

Since what happened in the past was known and delineated, what was needed were just illustrations. Inferential machinery was, therefore, left underdeveloped. Typology and classification were, as before, mainly adopted from the French, and not paid much attention to. In fact, interest in any classificatory ordering of archaeological data was derogatorily labeled as "thingisation" and considered ideologically deviant (see Boriskovskii and Okladnikov 1953 for attitudes; Howe 1976 for history). The focus was on "paleoethnology"--on illustrating the various known stages through this approach.

Since no typological or classificatory work was conducted, different typological concepts led different

researchers to classify materials found at the sites differently--as can be seen in the comparison of Voevodskii's chronology to that of Efimenko, for example, in Table IV-1. The lack of uniformity in typology, likewise, resulted in the different classification for the sites illustrated in Table IV-2.

2c. Period of Crisis, 1950s-1970s. This period saw a beginning of change in chronological ordering of paleolithic assemblages. Rogachev's (1957) work at the Kostenki-Borshevo sites glaringly showed the inadequacies and errors in the previously held unilineal evolutionary schemes, based as they were on mega-cultural stages. Working at Kostenki I-1, Rogachev discovered the Aurignacian middle layer lay sandwiched between two Solutrean ones. At Kostenki IV he observed that the Solutrean layer was found overlying the Magdalenian. At Telmanskaya the Magdalenian layer was found below the Mouseterian one. With these upsetting observations in hand, Rogachev called for: 1) the abandonment of unilineal evolutionary stages; 2) the recognition of local cultural units and sequences; and 3) the construction of local chronological sequences based on changes in the local cultures through time.

During this period, some archaeologists like Zamyatnin (1951), undertook the general classification of Upper Paleolithic cultures using a mixture of lithic and

non-lithic criteria. For the Old World Zamyatnin came out with three distinct cultural zones: the Siberian (Asian), the Atlantic (European periglacial), and the circum-Mediteranean-African one. This was still within the old French classificatory tradition--it just segmented the Upper Paleolithic oikumene somewhat more than had been allowed under the classic scheme. Others, like Boriskovskii (1953), refined the classic scheme and tailored it to the data from the Russian Plain. Boriskovskii chose to segment the Upper Paleolithic into seven stages and to classify the sites in the study area along this continuum--his scheme is presented in Table IV-1. This scheme, while ostensibly not tied to the French one, still offered the local equivalents of classic stadiality. In this chronology, however, we already see a collapse of a clear distinction between the Aurignacian and the Solutrean periods and the emergence of an Aurignaco-Solutrean period. This collapse finds its somewhat later expression in the chronological scheme of Shovkoplyas also illustrated in Table IV-1. Here we see the elimination of an independent Solutrean stage or period and the follow-up of the Aurignacian by an Aurignaco-Solutrean period. Both of these schemes, unlike their predecessors, are unilineal but regional. In this they were an update of the classic scheme as well as reflected the growing recognition of the importance of regional differences. Both these schemes were based on intuitive typologies, individual classificatory schemes, and, in many cases, on noncomparable criteria for

classification. As a result of this absence of uniformity in either taxonomy or classificatory criteria, these two researchers classified the same lithic inventories quite differently—for example, Shovkoplyas saw material from Pogon as Aurignaco-Solutrean while Boriskovskii assigned it to his stage V (early Magdalenian); parts of the Gontsy material were seen by Boriskovskii as belonging to stage I of early Mesolithic and by Shovkoplyas as middle Magdalenian. Still other archaeologists augmented both the classic French and Efimenko's schemes by introducing new regional cultural classifications. Budko (1966, 1967c), for example, classified assemblages from some sites as Gravettian (see Table IV-2, see also Valoch 1968).

Reacting to the severe problems of noncomparability of the different extant typologies in use, Klein wrote that (1973:76):

> Because not all Soviet authors use the same typological concepts or are equally rigorous in applying their concepts, it is currently impossible to obtain a detailed notion of the typological variability among Ukranian Upper Paleolithic assemblages.

He concluded that:

> Comparison of Ukranian Upper Paleolithic artifact assemblages with contemporaneous assemblages from elsewhere in Europe suggests that the cultures which are represented were more or less restricted to the Ukraine and its immediate neighbors. Soviet investigators and others have sometimes underestimated the originality of their materials and have described them with cultural terms like Aurignacian, Solutrean, and Magdalenian, which have

> their principal application in western Europe.... Sometimes the Ukranian sites have been lumped with others in eastern and central Europe into the 'Eastern Gravettian'. Whichever practice is followed...applying western European labels...or lumping them into one culture...the same basic mistake is made. The extensive variability which is a major characteristic of the Ukranian Upper Paleolithic is thereby masked (Klein 1973:89).

Klein's observations are still most relevant for the study area today.

In summary then, the developments in Soviet Paleolithic archaeology in this period reflected a surfacing of a major theoretical disagreement--one quite similar to that going on in American anthropology at about the same time. This was the debate between the unilineal evolutionary schemes of White (1959) and multilineal evolutionism of Steward (1955) which was rephrased and reconciled into "specific" and "general" evolution approaches by Sahlins and Service (1960). In Soviet archaeology, which was always held to be a historical science, this disagreement surfaced in debates on classification and chronological ordering. In areas of the Russian Plain where uniform typological concepts and classificatory criteria were employed, such as in the Dnestr and Don basin sites where research was conducted or directed by a small number of researchers, regional classificatory typologies and chronologies were constructed. In areas investigated by a greater number of researchers who were not institutionally or academically allied with one another, no firm or widely accepted regional typologies or chronologies

emerged. This was the case with the Central Russian Plain.

2d. Classification and Chronologies Today. Bulkin et al. (1982) and Klejn (1977) have recently comprehensively reviewed the status of Paleolithic archaeology in the USSR today. As Klejn points out, the most recent period has seen the reemergence of a number of diverse trends in archaeological classification, regional typologies, and chronological dating. First among these trends is a return by some researchers to the construction of uniform typologies. Both Isaenko (1978) and Gladkih (1973) have done some work on establishing explicit standards for classification for some of the Byelorussian and Dnepr valley sites respectively. These attempts, however, are of most preliminary kind and no firm typologies have been offered for the study area as a whole. This problem with typological criteria has also been compounded by debates on the meaning of the observed (though unsystematized) differences in lithic assemblages from site to site. Some argue that these differences, seen primarily in lithics, reflect "archaeological cultures" that have ethnographic significance (Grigor'ev 1970, for example). This position is quite akin to the Bordesian one in the now famous Binford-Bordes debate on the significance of variability in Mousterian industries of southwestern France (Binford and Binford 1966; Bordes 1968).

Others, such as Shovkoplyas (1965a) and Gladkih (1973, 1977), using a wider data base that includes stone tool typologies as well as features, argue for the recognition

of techno-complexes that reflect broader scale of differences above ethnographic identities and have both a temporal and spatial unity. Gladkih (1977, personal communication), for example, working with data from some sites in the study region, has argued for the recognition of an overall cultural unity of the area through time. His chronological scheme is illustrated in Table IV-3 and shows that the earlier Upper Paleolithic assemblages such as found at Radomyshl', Pushkari I, and Klyusy evolved into three coeval cultural subgroups during the Magdalenian period: one that included Gontsy and Mezhirich and somewhat later in time, Dobranichevka; another represented by Zhuravka, and a third by Mezin. Gladkih's scheme again suffers the fate of other such attempts--no clear justification is made for the selection of specific variables or attributes and no distinction is made about the significance and meaning of the observed variability--whether they reflect functional, structural, or cultural differences. Gladkih constructed his scheme on a study of nuclei and pieces with secondary retouch. Using the Brainerd-Robinson technique of coefficient correlation, he proceeded to compare materials found within the four complexes at Dobranichevka, both amongst themselves and with those from Gontsy, Mezhirich, and Mezin. His results show a close similarity between Dobranichevka, Gontsy, and Mezhirich and a lesser degree of similarity between this group of sites and Mezin. These observations, while interesting and suggestive, still fail to be totally convincing because of the discussed

problems of attribute selection.

Grehova (1970), working with intuitive typologies, has postulated a great similarity in the lithic inventories of Bugarok, Chulatovo I, Chulatovo II, Suponevo, Timonovka I and II, and Yudinovo. She interprets this similarity as showing both cultural unity and the synchronic occupation of the sites.

Gvozdover (Lazukov et al. 1981) recognizes the presence also of the Pushkarian culture (which includes Klyusy, Pogon, and Pushakari I), the Dobranichevka culture outlined originally by Gladkih (which includes Dobranichevka, Gontsy, and Mezhirich), the Mezin culture represented by just that site, and the Timonovka culture as delimited by Grehova. Gvozdover's scheme is outlined in Table IV-3 also. In this scheme, while chronological relationship between the cultures is not specified, the Pushkarian one is considered earlier in time than the others.

Recent increasing cooperation between paleogeographers and archaeologists noted in Chapter I has led to a new synthesis of observed variability in lithic assemblages with documented climatic fluctuations and to the creation of stylistic geochronologies offered by Doluhanov (1979), Kozłowski and Kozłowski (1979) and Doluhanov, Kozłowski, and Kozłowski (1981) which is illustrated in Figure IV-1. This scheme fits into the category of a general evolutionary scheme for the Upper Paleolithic of all of Europe. Here again, however, attribute selection is neither explained nor

justified, the correlation between environmental conditions and specific industries moot, and the significance of the scheme open to debate.

Finally, as I mentioned earlier in this discussion, on the other extreme of the debate are archaeologists such as Grigor'ev who reject attempts at either chronological or regional classification of the sites in the study area because they feel that insufficient work on typologies and classification have been done to date. Grigor'ev (1970:45) wrote that:

> ...A large number of excellent sites are known from the Desna and Polissya regions whose significance for the study of the prehistory of Eastern Europe is partially determined by the remains of dwellings and an abundance of art objects found. These are, in addition to those mentioned earlier [(sic. Mezin and Mezhirich)]--Yudinovo, Suponevo, Timonovka, Eliseevichi, and Dobranichevka. Since the data on these sites are still not fully published, the question of the cultural assignment of these sites must remain open. (Translation mine)

More recently, Grigor'ev (1979, personal communication) has recognized the existence of the following cultural co-traditions in the study area: Pushkari-Klyusy, Mezin, Dobranichevka-Gontsy-Mezhirich, Timonovka I and II-Yudinovo, and Berdyzh which he alligned with the Kostenki-Avdeevo culture. The chronological relationship both between and within these co-traditions remains unclear as does the cultural significance of the co-traditions themselves.

2e. Summary and Conclusion. This discussion has shown

that today no unequivocable classificatory or typological schemes exist for the assemblages found at the sites in the study area to either: 1) assign particular collections to specific archaeological cultures, or 2) clearly differentiate assemblages and/or cultures in time. This is because 1) the classic French scheme of stadial unilineal evolution was accepted which was based on the presence of particular "index tools", and 2) no uniform criteria for typological assignment have been worked out more recently for the study region. While today the extant Upper Paleolithic regional typologies are coming under increasing scrutiny in other parts of the Old World (see White 1980, 1982; Wobst and Keene 1982, for example), the existence of these typologies, while problematic for significance, still offers some scale for chronological ordering. The absence of such schemes for the study area make this method of relative dating nearly impossible here.

The problems caused by this lack of chronological ordering can best be exemplified in the dating of two sites: Radomyshl' and Zhuravka. Shovkoplyas (1964, 1965a, 1965b) has argued that the presence of crude Mousterian tool types together with Aurignacian elements in the assemblage at Radomyshl' indicates a very early Upper Paleolithic date for the site. The criteria he used for this are an evolution and refinement of tool types through time. The falacy of this uniformitarian assumption is pointed up by Rogachev's work at Telmanskaya in the Kostenki-Borshevo region, where,

as noted before, the upper layers contain Mousterian tools and the lower Magdalenian ones. In the case of Zhuravka, early assignment of the site's assemblage to the Aurignacian stage (Rudinskii 1929) was later ammended by Boriskovskii (1953) to the Mesolithic and still later to the Azilian (Boriskovskii and Praslov 1964). This change in typological dating of the site occurred because microlithization of tools in general became considered a development of very late Upper Paleolithic (primarily of the Mesolithic) and one that happened more or less synchronically everywhere. The implicit argument was that since the inventory at Zhuravka shows a good deal of microlithization, then the site must necessarily date either to the very end of the Upper Paleolithic or, more probably, to the Mesolithic. Gladkih (1973) and Smirnov (1973) point out, however, that other sites in the southern part of the study region also show fairly high percentages of microlithisation (7% at Dobranichevka, 11% at Mezhirich and 6% at Mezin). They suggest that this feature should not be taken as a chronological marker, and that microlithisation of tools and the concomitant use of composite or insert tools may have arisen at different times in different areas. By implication then, Gladkih argues that the presence of microlithisation reflects a possible spectrum of variables including functional and stylistic ones in addition to the chronological one.

In conclusion then, while undoubtedly chronological differences do exist between the sites in the study area,

unequivicable archaeological methods of specifying these differences do not exist at present.

C. Biostratigraphic Chronologies

1. Geologic Dating. The history of stratigraphic dating of the sites in the study area is a turbulent one and can be roughly divided into two periods. Geological work done before the middle of this century (e.g., Mirchink 1934, 1937, and, most notably, Gromov 1948) was primarily based on the correlation of the sites with specific river terraces and on the construction of chronologies for these terraces. As I noted in Chapter II (p.40), Gromov's chronological scheme won wide acceptance and predominated in geologic literature until the middle of the 1960s. The crux of Gromov's position was that the Upper Paleolithic sites dated as far back as the last interglacial. Gromov's dating of individual sites is presented in Table IV-4, and his overall geochronology for the area in Table IV-5.

Late in the 1950s, Velichko undertook a major revision of Gromov's scheme, one that took into account the rest of the Old World, and that placed the Desna and Sudost' sites into a new geochronologic framework. Velichko's (1961) basic stratigraphy and geochronology have already been discussed in detail in Chapter II. As mentioned there, this scheme incorporated both erosional as well as depositional episodes of plateau and terrace building. Velichko's geologic dating of the individual sites is presented in Tables IV-4 and IV-5. His stratigraphic reconstructions for the Desna and Sudost'

sites is illustrated in Figure IV-2. As that figure shows, this stratigraphic sequence was established only for the Desna and Sudost' region of the study area, and incorporated only ten of the sites considered in this work.

Isaenko (1968), working with geological data from the Sozh and Pripyat', has offered a comparable scheme for dating Berdyzh and Yurovichi. This is illustrated in Figure IV-3. This scheme is based on the geological work of Voznyachuk (1973), and Kaletchitz (1972, 1973). Their scheme for Sozh and Pripyat' valley stratigraphy and terrace forming processes, is in general agreement with Velichko's but differs on a number of important issues. Data from the southern part of the study region has led Ukranian geologists to construct a stratigraphic scheme also somewhat at odds with that of Velichko. The existence of these various schemes indicates that a number of problems exist in extending Velichko's scheme to the Central Russian Plain as a whole. Some of these problems have already been mentioned in Chapter II, those most germane to the dating of the sites will be examined below.

Other sites in the study area have either not been included in any of the schemes and have been tentatively dated by analogy to the Desna sequence, or, especially for the sites excavated and studied prior to the 1960s, roughly dated by their association with specific river terraces. This information is presented in Table IV-4.

Finally, as Table IV-4 shows, a number of the sites remain beyond the scope of geologic dating at present. In

some cases, such as for the newly discovered sites of Korshevo I, II, and Kositsa, this is because their geology has not been studied. In others, such as Radomyshl', the sites remain undated because erosional episodes play a far greater role in the stratigraphy of the region than did the depositional ones. For yet a third group of sites, such as Novgorod-Severskii and Fastov , the local stratigraphy remains poorly understood. This is the fate of six out of the 29 sites considered in this work (see Table IV-4).

A brief comparison of geochronologic dating schemes offered by Gromov and Velichko (Table IV-5) shows numerous divergences. These reflect in part the different paradigms used by the two geologists. They also exist because insufficient research does not permit the extension of local stratigraphic schemes over large sections of the Central Russian Plain. Velichko's 1961 monograph was the last attempt in the Soviet literature to construct a large-scale regional geochronology for the Russian plain.

In the English language literature, Klein (1973) presented a synthesis of extant Soviet views and attempted to resolve the divergences by: 1) broadly following Velichko's scheme, 2) tentatively extending this scheme to the whole of the study region, and 3) collapsing possible geochronological distinctions. He divided the occupation of the sites into two distinct periods--one during the Middle Valdai and one during Late Valdai (see Table IV-4 for Klein's scheme). This attempt is likewise unsatisfactory because it is both partisan and obscures significant

chronological differences. It does, however, clearly point out a number of difficulties that existed and still exist in geochronologic dating of the sites. These difficulties can be grouped into the following categories of problems that still remain to be solved: 1) the dating and synchronization of the river terraces; 2) the synchronic and diachronic uniformity of plateau and terrace deposition, both intra- and interregionally; and 3) the precise dating and synchronization of ravine formation.

1a. Dating of the Sites through River Terraces. As I have already mentioned in Chapter II (pp. 35-38), only the terraces of the Desna and Sudost' have been adequately studied and terraces of the different segments of the rivers tied to one another. While Table II-1 offers a broad consensus of opinion on the height of the different terraces in the area today, major disagreements exist on the dating of the individual terraces. Thus, for example, Velichko (1961) states that the second terrace of the Desna and Sudost' formed during or just prior to the Bryansk interstadial some 25,000-30,000 years ago, while Voznyachuk et al. (1969a, 1969b) date the formation of the second terraces of the Dnepr, Sozh, and Pripyat' much earlier--to a time period between 30,000 and 45,000 B.P. This disagreement brings into question not only the synchronization of terrace formation but also the dating of the sites found on second terraces, as well as the overall antiquity of the Upper Paleolithic period in the area. As a result, today it is

not at all clear that the second terrace of Sozh, for example, necessarily formed at the same time as did the second terrace of Sudost' or Sula.

Other more concrete problems exist that also add to the difficulties in dating of the sites. In the case of Yudinovo, for example, Velichko (1961) writes that cultural remains are found on the first terrace while Kaletchitz (1972, 1973), Polikarpovich (1968), and Gromov (1948) placed the site on the second Sudost' terrace. Zhuravka has been similarily assigned to either the first or the second terrace of Sula (see Table IV-4).

In summary then, much more stratigraphic work both on local erosional sequences as well as on areal applicability of terrace formations as concrete time markers remains to be done before river terrace dating can offer chronologic information fine tuned enough for archaeological questions.

1b. Local Stratigraphies and Their Synchronic and Diachronic Significance for the Dating of the Sites. Velichko's Late Valdai stratigraphy for the study area distinguished two depositional sequences: (a) loess deposits during cold stadial periods and (b) formation of the soil and gley layer during warmer periods. As I mentioned in Chapter II (pp. 51-55), Velichko divided Late Valdai loess deposits into Loess I, II, and III. This division was broadly in agreement with the loess sequences observed elsewhere in Central and Eastern Europe. Recent radiometric dating of sites found in comparable loess strata, however, has shown

some major difficulties. For example, Velichko noted that such Central Russian Plain sites as Eliseevichi, Suponevo, and Yudinovo were found in Loess III, as were such sites as Dolni Vestonice and Pavlov in Czechoslovakia. Radiometric dating, however, shows that Dolni Vestonice dates to 25,600 ±170 (Gro. 1286) and Pavlov to 26,400 ±230 (Gro. 1272) and 24,800 ±150 (Gro. 1325) (Klima 1963). Kukla (1975) reports that the corrected dates for these sites are 25,020 ±150 for Dolni Vestonice and 26,730 ±250 for Pavlov. As Table IV-8 shows, such sites as Yudinovo and Timonovka II, found in Loess III date between 13,650 ±200 and 15,110 ±530, respectively. These chronologic discreptencies are of large magnitude. They can either reflect errors in the processing of the sample for dating or, more likely, the noncomparability of the strata.

Similar difficulties exist also with the use of the Bryansk soil layer, the gley layer, and the layer of Timonovka relic soil as chronologic markers. I have already discussed the difficulties with the Bryansk soil layer itself--namely its dating and its correlation with the Stillfried B (see Chapter II, pp.56-59). In addition to this, recent work at Pushkari I indicates that an error may have been made there in the identification of the strata underlying the cultural remains. Velichko (1961) wrote that cultural remains at both Pushkari I and Pogon were found immediately above the Bryansk soil and dated the whole Pushkari group of sites (Bugorok, Pogon, Pushkari I)

accordingly. Belyaeva (1982, personal communication) reports finding the cultural layer at Pushkari I right above the gley layer and not Bryansk soil--the later is present further down in the stratigraphic column.

Velichko's stratigraphic column for the Desna shows the presence of a single gley layer that separates Loess II from Loess III (see Figure IV-2). As I have noted previously in Chapters II and III, stratigraphic sequences from other parts of the Russian Plain show the presence of additional gley or humic layers that date to the same time period. Pashkevich and Dubnyak (1978) report that the cultural materials at Dobranichevka were found over a humic or gley layer in Loess III itself, above the gley layer that separates Loess II from Loess III. Ivanova likewise reports at least two gley layers above Loess II in the Dnestr sequence (see discussion in Chapter II, pp. 56-59). Thus, both data from the Dnestr and from Dobranichevka, strongly imply that Velichko's scheme may be too simplistic and does not reflect the complexity of climatic events and local responses over the entire study area.

Finally, radiometric dating of Timonovka II creates additional problems for Velichko's stratigraphic scheme. As Figure IV-2 shows, he dates the occupation of this site to the very end of Loess III deposition and the beginning of the formation of the Timonovka relic soil. This relic soil is found directly beneath present-day Holocene soil. The ^{14}C date for Timonovka II--15,110 $\pm$530--is thus disproportion-

ately too old. As will be recalled from Chapter II (p. loess deposition continued until the onset of the Allerod some 11,500 years ago. This incongruity may in part stem from the operation of unrecognized erosional episodes in the Desna and Sudost' regions--erosion that interrupted or obliterated subsequent loess depositions in the Timonovka area.

As I have shown in Chapter III, the time interval between 18,000-12,000 B.P. was one marked by rapid climatic fluctuations. These fluctuations, tentatively outlined in Figure II-3, suggest that we can anticipate the existence of more than one gley layer (or relic soil layer) during this time period. It may well be that these additional layers are better preserved in regions to the south of the Desna and Sudost'--at the more southernly Dnestr and Dnepr sites. If this is so, then the gley layer of Dobranichevka (found in Loess III) may well be a chronological equivalent then the Timonovka relic soil layer.

In summary then, while the geochronological scheme developed by Velichko remains the only one available for the area, recent data are strongly suggesting that it be used tentatively as a first approximation that requires a great deal of additional geologic research and refinement before it can be extended over the entire study region as a whole.

1c. Ravines and Geochronologic Dating. As Table II-5 showed, nine of the sites are found in ravines. Erosional

and depositional processes responsible for ravine formations are the most localized of geologic events and cannot be broadly correlated over large geographic regions. The correlation of specific ravines deposits with either nearby terraces or plateau strata is, hence, an even more complex procedure than is the identification of the terrace on which particular cultural deposits are found. It is, therefore, not surprising that disagreements exist in the literature on the association of ravine deposits with terraces. For example, Klein (1973) using some Soviet geologic interpretations, associated such ravine sites as Berdyzh and Yurovichi with the first terraces of the rivers, while Kaletchitz (1972, 1973) stated that both Berdyzh and Yurovichi ravines were associated with the second terraces of Sozh and Pripyat'.

At some of the sites (e.g., Berdyzh, Mezin), Upper Paleolighic hunters and gatherers apparently settled in the ravines themselves. In such cases the dating of cultural remains geologically is a somewhat easier procedure than in cases where post-depositional taphonomic processes resulted in the location of the remains in the ravines. This means that, while we can tentatively accept the association of some ravine sites with particular strata (e.g., the association of Mezin with the second terrace of the Desna), in cases where cultural remains in ravines were not <u>in situ</u> no such chronological reconstruction can be made (e.g., at Novo-Bobovichi, Yurovichi, and possibly Klyusy, Kurovo).

What I am suggesting, in brief, is that sites and/or cultural remains found in ravines are the most difficult to date reliably through stratigraphic methods. Their assignment to a particular time period (listed in Table IV-4) should, therefore, be accepted only most tentatively.

1d. Undated or Undatable Sites. Six of the 29 sites considered in this work belong to the undated category and three have been assigned only to one of the two subdivisions of the Valdai. The undated sites are: Fastov , Klyusy, Korshevo I, Korshevo II, Kositsa, Novgorod-Severskii, and Radomyshl'. The three assigned either to Valdai in general or specifically to Late Valdai are Chulatovo I, Mezin, and Pushkari II. Clearly, here also much work remains to be done both at the specific sites and in the study area before geochronological methods can be used for ordering these sites through time.

1e. Discreptancies between Archaeological and Stratigraphic Dating. Finally, without belaboring the already made point about the difficulties in dating the sites through relative methods--major discreptancies exist in the chronologic assignment of the sites by the two methods. A comparison of Tables IV-1 and 2 with Tables IV-4 and 5 shows an almost unanimous assignment of Chulatovo II, for example, to a very late phase of the Upper Paleolithic period on stylistic criteria and to a relatively earlier period (Loess II in Velichko's scheme, late Middle Würm in Klein's) on geologic criteria. Similar differences of opin-

ion exist on the dating of almost all of the other sites as well.

I have shown in the beginning of this chapter the difficulties associated with the use of archaeological methods for dating and in this section focussed on the problems in the use of stratigraphy for the same purpose. The discreptancies between the two methods noted here should, therefore, not seem surprising but be fully expected. Various authors have dealt with these discreptancies differently--Soviet archaeologists, by and large, have favored chronological schemes based on unspecified stylistic criteria. Non-Soviet archaeologists have either glossed over the differences and tacitly used modified versions of stylistic schemes (see Kozłowski and Kozłowski and Bhattacharya 1977). or, as Klein (1973), abandoned stylistic criteria totally in favor of stratigraphic ones. Still others, like Shimkin (1978) have abandoned all efforts at any chronological ordering and opted for a descriptive presentation of the data instead. Clearly, none of these approaches can be considered satisfactory.

2. Biological Data and Chronologies: Introduction. As I noted earlier both in Chapter III and in the beginning of this chapter, climatic information derived from floral and faunal data provides an additional source of chronologic information. This data base, however, is not an independent one, rather it is innately connected to the stratigraphy and the geomorphology of an area. Since both

pollen and faunal remains are found in particular strata, their significance is relevant to that stratum and the diachronic information they carry necessarily also depends on the stratigraphic reconstruction. Information provided by flora and fauna, however, can be used as a control to both check the accuracy of stratigraphic schemes as well as to point out some deficiencies or inconsistancies in these schemes.

The use of biologic information on a time scale relevant for archaeological questions addressed in this work is beset by a number of problems. These problems first and foremost include the lack of synchronization found between the geologic and biologic data, and within the biological framework between the floral and faunal data. Secondly, floral and faunal data cannot be taken as absolute indicators of climate because neither their past nor their present day proveniences need necessarily reflect the boundaries of their ecological tolerance. Additional difficulties arise as well because of the gross nature of information collected which masks possible important differences. For example, a discovery of warm climate flora and/or fauna at a site on a time scale of 10^3 years may equally reflect the general climate as well as the season of occupation. Because of this, "noise" is created in the record which precludes us from using biological information as an unequivocable indicator of climate alone. To compensate for this problem as best I can, I will, as in Chapter III, use only ichtyofauna, microfauna, and avifauna in this discussion. Lastly, as noted

previously, biologic data from the study area necessarily reflect also geographic (i.e., latitudinal) differences--these must be taken into account when using biologic data for biostratigraphic reconstructions and modelling.

2a. Climatic Differences and Time Scales. I have discussed in detail in Chapter III climatic inferences made on the basis of biological data from the sites in the study area. This information is presented summarily in Table IV-6 where Column C presents climatic reconstruction based on avifauna, Column D on microfauna, Column E on molluscan fauna, and Column F on pollen data. As can be readily seen from this table the use of different taxa lead to divergent interpretations. For example, at Berdyzh cold climate is suggested by both avifauna and pollen, while microfauna points to the existence of warmer climate at the time of occupation. At Yudinovo microfaunal and malacofaunal data are in conflict as well.

Column G in Table IV-6 summarizes the biologic information on the sites presented in full in Chapter III and offers a tentative ranking of the sites along a cold-warm climate axis. Since four sources of biologic information were used (avifauna, microfauna, molluscs, and pollen), each was assigned an arbitrary weight of 25%, absence of information from any one data source was treated as contributing zero information, and the remaining sources re-weighed accordingly for the estimates. For example, in cases such as Yudinovo where only microfauna and molluscs

were available, each was given an equal weight of 50 per cent. The ranking was then done along the following gradient:

Climate	Rank	Weight of Score
Warm	1	25% or less of biologic data indicate cold conditions
	2	25%- 50% of bilogic data indicate cold conditions
	3	50%- 75% of biologic data indicate cold conditions
Cold	4	75%-100% of biologic data indicate cold conditions

Column H in Table IV-6 presents ranked geologic data on the climate of the sites at the time of occupations. The ranking here was achieved in a similar manner. I used paleoclimatic information on the minimal and maximal temperatures listed in Table III-2 to rank the various geologic strate with which the sites were associated. To make the ranks in Columns G and H comparable, I collapsed some of the paleoclimatic information in the following manner:

Climate	Rank	Stratigraphic Layer
Warm	1	Bryansk soil
	2	Gley layer
	3	Timonovka soil
Cold	4	Loess II and Loess III

A comparison of Columns G and H again shows numerous contradictions. In order to control for latitudinal differences that may contribute to these contradictions, I proceeded to subdivide the sites into two groups--those

found in the northern half of the study area and those found in the southern half. Table IV-7 presents the climatic ranking of the sites on biologic criterial dividing them into northern and southern sites. As this table shows, sites found in the north appear to reflect a much wider range of climatic conditions than do the sites in the south. Thus, while a full range of climate in the north shows occupation both during very cold climate at such sites as Mezin and Chulatovo I, and during warmer conditions such as at Chulatovo II and Timonovka II, only relatively warm times can be reconstructed for the southern sites. Within this warmer climate, however, some differences can also be observed in the southern sites—Mezhirich, for example, appears to have been occupied during colder times than were Dobranichevka, Gontsy, and Zhuravka.

2b. Conclusion. In light of the discussion of paleoclimatic fluctuations in the area presented in Chapter III, the observed climatic differences in Table IV-7 do have chronologic significance and suggest that the different sites found in the area were occupied at different times. These observed differences confirm the different chronology of the sites suggested by geologic information. A comparison of climatic ranking derived from biological information (Column G, Table IV-6) with that derived from geologic information (Column H, Table IV-6), however, shows that a number of disagreements exist as well. The presence of these contradictions and inconsistencies can be attributed

to a number of factors, some of which were discussed in Chapter III. They include: 1) insufficient information; 2) biased sampling; 3) non-synchronization of the different data bases; and 4) the falacy of using biological analogies for paleoclimatic reconstructions when insufficient information exists on the ecological limits or tolerances of the species. In addition to this, it is my contention that these discreptancies also point to the inadequacy of extant stratigraphic and geochronological models. Specifically I interpret the observed differences as indicating that geochronological schemes for the study area are vast oversimplifications and mask important diachronic differences.

In conclusion, then, this discussion has shown that:

1) Geologic and biologic data indicate that chronologic differences are present between the sites.
2) Geochronologic and biologic data can, with due caution, be used as tentative chronologic indicators only for small sections of the study area and should not be extended over the entire region.
3) The presence of numerous problems with the geologic scheme offered by Velichko for the study area suggest that the scheme may be oversimplifying past climatic occurrences.

4) Particular care should be taken with biostratigraphic data from the post-maximum period of 18,000-12,000 B.P. when the Desna stratigraphic sequence appears most in conflict with data from the Dnepr and its more southerly tributaries.

Concretely these observations mean that Velichko's depositional sequence of Loess II-Gley Layer-Loess III-Timonovka relic soil-Holocene soil outlined for the Desna and Sudost' valleys may be of local significance only and unsuitable as a general scheme for the entire Central Russian Plain.

The most alient point of the discussion of extant biostratigraphic chronologies for the study area is that these relative dating methods have not been applied with sufficient rigor in the study area to offer firm and acceptable chronologies. Much additional work remains to be done before this important dating technique can produce a working scheme for the occupation of the study area during Late Valdai.

III. CHRONOMETRIC DATING OF THE SITES

A. Introduction

Radiometric dating of materials from Upper Paleolithic sites of the Russian Plain has had a brief and turbulent history. First attempts at dating materials by the ^{14}C method go back to the 1960s and they resulted from the work

of Ivanova and Chernysh at Molodova (Ivanova 1963). Since then, radiometric dating has had a problematic history in the USSR and has received a mixed reception from Soviet archaeologists. This reception, as elsewhere, was based primarily on how well the obtained dates upheld or rejected the chronological models developed on stylistic criteria. In those parts of the Russian Plain where archaeological research coincided with geologic research and the use of chronometric dating (such as at the Molodova sites on the Dnestr), the chronological information provided by ^{14}C did not have to contest extant schemes and the dates were accepted more readily. In other parts of the Plain, such as at the Kosteni-Borshevo sites on the Don, where archaeological research and stylistic periodizations preceeded radiocarbon dating by a good 80 years or so--radiometric dates found a more limited acceptance (see, for example, Grigor'ev 1979).

The history of research on the Central Russian Plain, as discussed in Chapter I, saw a progression of numerous researchers who were not administratively connected to one institution (as in the case of Kostenki-Borshevo sites), nor engaged in long-term research in the area on a permanent basis (as in the case of the Molodova sites). This produced a plethora of stylistic chronologies and geologic schemes for the area which were, as often as not, in conflict with one another. The advent of radiometric dating methods had, therefore, minimal impact on the study of the Upper Paleolithic sites in the area, for which 1) very few

dates were available until recently, 2) the available dates came from materials with suspect proveniences, and 3) this dating technique itself was not accepted by a number of major researchers in the area (see, for example, Grigor'ev 1979; Pidoplichko 1976; Shovkoplyas 1978, personal communication). The use of this dating technique was routinely introduced into the area by Velichko and his staff who have been providing a steady, if somewhat faint, stream of dates for the sites since the 1970s (see Kurenkova 1978; Velichko et al. 1976).

An added problem which impeded and still continues to impede the acceptance of this dating method is the persistent inconsistency found in the dates derived from different materials and from different laboratories on materials from the same sites. This problem can best be illustrated by the list of ^{14}C dates obtained for the site of Sungir, located some 450 km. to the east-northeast of the area. The following dates have been reported by Bader (1978):

Lab & No.	Date	Provenience	Material Dated
Gro. 5425	25,500 ± 200	Cultural layer at 3.2 m	Wood charcoal
Gro. 5446	24,430 ± 400	Cultural layer	Collagen from reindeer bone
GIN 326b	22,500 ± 600	Cultural layer	Wood charcoal
GIN 326a	21,800 ±1000	Hearth, cultural layer	Wood charcoal
GIN 16	20,540 ± 120	Soil, 1 m below cultural layer	Soil
LE 1058	19,780 ± 80	Cultural layer, excavation II, horizon V	A mixture of charcoal and soil
GIN 15	16,200 ± 400	Soil under cultural layer	Soil
GIN 14	14,600 ± 600	Cultural layer	Bone

(Labs: Gro.--Gronigen; GIN--Geology Institute, AN SSSR; LU--Leningrad University; LE--Leningrad Division, Institute of Archaeology AN SSSR)

As can be seen from this listing, radiocarbon dates from Sungir, exemplify the inconsistency problem and show a large variance in the dates both across the medium dated and between labs. While these problems are more readily evident at Sungir where a number of samples have been dated, similar difficulties exist in the dates obtained for the sites in the study area as well.

B. Radiometric Dates for the Study Area

Table IV-8 presents all of the ^{14}C dates available at present for the Upper Paleolithic sites in the area. Of the 21 dates presented in the table, 16 have been obtained by various laboratories in the USSR over a period of some twenty years, and five have been obtained from the Radio-

carbon Laboratory of Queens College, City University of New York, from 1978 to 1980. Three of the dates from the Queens College Radiocarbon Lab—those for Gontsy (QC 898) and Mezhirich (QC 897, 900) came from materials I collected from ongoing excavations in 1978 and 1979. The Eliseevichi sample (QC 889) came from materials collected by its most recent excavator L.V. Grehova, while the sample for Pushkari I (QC 899) came from materials excavated in the 1930s. These dates, like the remainder presented in Table IV-8, are "raw" and have not been corrected by the $^{12}C/^{13}C$ method.

The presented dates are of varying significance, reliability, and require some discussion. There are three basic problems associated with them: 1) questionable provenience; 2) possible redeposition of the cultural remains; and 3) non-equivalency of media tested. These problems affect a number of the presented dates, in some cases totally negating their significance and in others seriously questioning the accuracy of the date itself.

1. Questions of Provenience. Two dates, GIN 80 for Eliseevichi and GIN 4 for Mezin, are at issue here. Both appeared in the early 1960s in the literature and represent the first efforts by the Geology Institute of the AN USSR at dating. In the case of Mezin, the date was reported for the first and only time by Ivanova (1963). No provenience was given for the dated mammoth tooth, and the date has subsequently not appeared in any Soviet literature. The quick disappearance of the date from publications, its absence in the monograph on Mezin published after the date

was obtained (Shovkoplyas 1965), as well as the absence of a discussion in the literature on the merits of the date all lead me to conclude that, for reasons unknown, the date should not be accepted.

A similar fate met the GIN 80 date of 33,000 ±400 for Eliseevichi. The date was first reported by Alekseev et al. in 1964 who wrote that it was obtained from wood found in the cultural layer. Subsequently other publications have stated that the dated material was bone, in other cases loess-loam (Kurenkova 1978; Shimkin 1978). Today the date is absent from the literature, the provenience of the dated material is held highly suspect, and the validity of the date is dismissed by Soviet investigators (Kaletchitz 1978, personal communication; Kurenkova 1978; Lazukov et al. 1981).

2. Dates on Redeposited Materials. Radiocarbon dates from two additional sites, Berdyzh and Yurovichi, pose problems of reliability as well. As was discussed in Chapter II (pp.63-66,122), the cultural materials at both sites have been redeposited--partially at Berdyzh and totally at Yurovichi. Because of this the provenience of the dated materials (mammoth teeth in both cases) is highly questionable. Redeposition of organic materials in general exposes the materials to dangers of contamination by absorption of fresh carbon thereby giving a younger date to the material.

As Butzer (1971) wrote, for bone, danger also exists of contamination by older carbon as well. In the case of both Berdyzh and Yurovichi, the obtained dates appear a

good deal older than could be expected from the stratigraphy of the sites. I have noted in the earlier section of this chapter that while the geology of both Sozh and Pripyat' valleys is less well known than of the Desna, the two sites appear more or less coeval with those found on the Desna and Sudost'. At present, therefore, I suspect that some as yet unidentified factors may have been responsible for the relatively early dates obtained for both of the sites and that these factors are probably related both to the re-deposition of the dated material as well as to the nature of the dated medium itself. This then adds more uncertainty to the chronologic assignment of these sites on radiometric criteria as well. This problem cannot be resolved by consulting either the biostratigraphic or stylistic criteria as those also fail to uniformly date the sites (see Tables IV-2 and IV-4). I am, therefore, forced to consider both possibilities that: a) the sites are possibly two of the oldest found in the study area, or, b) that they date to the same 18,000-12,000 B.P. period as do the remainder of the sites with the exception of Khotylevo II.

3. The Dated Medium. General agreement exists in the literature that wood charcoal is the optimal medium for radiocarbon dating. The absence of burnt wood, however, is a notable feature of Upper Paleolithic sites in the study area that has been widely commented on in the literature (Klein 1973; Kurenkova 1978; Lazukov et al. 1931). This, by necessity, has led researchers to using a variety of less

optimal media for dating--and, as Table IV-3 shows, the dates for the sites in the study area have been obtained from burnt bone, wood charcoal (one sample), as well as unburnt bone. Unburnt bone, as both Butzer (1971) and Michaels (1973) among others point out, is exposed to far greater dangers of contamination from both older and younger carbon. To combat this problem, Soviet researchers have focused on developing methods for dating the more impermeable type of bone--namely mammoth teeth, and a number of the Soviet ^{14}C dates in Table IV-8 come from this medium (see discussion in Velichko et al. 1976, Kurenkova 1978, for example). Seven of the 21 dates listed in that table were obtained from mammoth teeth.

Radiocarbon dates obtained from Queens College, on the other hand, came from burnt mammoth bone. These five dates, together with the LU 103 date for Yudinovo also obtained on burnt bone, appear consistantly to be younger than the dates obtained from teeth. A comparison of dates from mammoth teeth to dates from burnt mammoth bone is presented in Table IV-9. It shows that for Eliseevichi the date on mammoth tooth of 17,340 $\pm$170 is older than the QC date QC 889 on burnt bone. Similarily, at Mezhirich the KI 1054 date of 17,855 $\pm$1080 (QC 900) and 14,320 $\pm$270 (QC 879) on burnt bone. The same anomalie can be seen in the dates for Yudinovo where the date on burnt bone is substantially younger than the one from mammoth teeth.

In addition to showing a chronological difference in the dates obtained from the two media, Table IV-9 also

indicates that greater clustering exists between the dates obtained from burnt bone. The significance of this observation cannot be evaluated at the present time because only three of the sites have multiple dates obtained from different media. It is offered here as a suggestion for future work in the area. Specifically, I suggest that the use of burnt bone as a dating medium may offer greater consistancy and reliability than the use of other media. The very wide range of dates obtained by the same lab on mammoth teeth at such sites as Eliseevichi, for example, (which range from 17,340 ±170 to 12,970 ±140) appear to indicate that mammoth teeth are quite susceptible to contamination that is difficult to control. This suggests that the use of mammoth teeth is, at present, less than desirable.

C. Summary and Conclusion

The foregoing discussion on radiometric dating has shown that this method of chronological ordering is equally problematic as were the relative methods of chronological ordering discussed earlier. I have suggested that available data, sparce as it is, indicates that the use of one medium—namely burnt bone—may be more suitable for dating the sites in the study area. My observations on the tendency of mammoth teeth to produce older dates than those from other media puts into question the early dates obtained from the sites of Berdyzh, Khotylevo II, and Yurovichi. Younger dates, those ostensibly dating to the post Valdai maximum such as Pogon and Timonovka II, may likewise be problematic and too

old. In the case of Timonovka II, the date of 15,110 ±530 is not consistent with the stratigraphic data from the site. The inconsistency may well be due to errors in radiometric dating of a particular medium.

Few concrete conclusions on chronological ordering of the sites can be drawn from this discussion. Those that appear justified are too general in nature to be of much use for archaeological questions. Specifically, we can conclude that:

1) available ^{14}C dates do generally indicate that Upper Paleolithic sites in the study area do date to Late Valdai.
2) There exist serious problems with older dates, those prior to the Valdai maximum, which do not permit us to state with certainty that two clear periods of occupation existed in the area: an earlier one predating the maximum and a later one after the maximal extent of the glaciation.
3) The ambiguity of the data do not permit us to reject the possible existence of two periods of occupation.

Clearly, much geologic work remains to be done and many more chronometric dates are needed before a firm chronological

ordering of the sites can be achieved.

IV. PROPOSED CHRONOLOGICAL ORDERING OF THE SITES

As discussed previously, all that can be said with certainty at present about the Upper Paleolithic sites in the study area is that they were all occupied during the Late Valdai--from approximately 25,000-10,000 B.P. Within this 15,000 year period an additional subdivision can be made that permits further chronological grouping of the sites. Table IV-10 presents this grouping. The assignment of the sites to a particular chronological grouping is based on a combination of stylistic, biostratigraphic, and chronometric data. In this table I have chosen to divide the broad interval of the Late Valdai into three periods: the pre-mximum time dating between some 26,000 and 20,000 B.P. during which the Bryansk soil formed and part of Loess II were deposited, the middle period of the Valdai maximum itself (20,000-18,000 B.P.) during which Loess II continued to be deposited; and the post-maximum period from 18,000-12,000 B.P. which saw the deposition of both Loess III and the gley and Timonovka soil layers. I have basically followed Velichko's stratigraphic scheme in distinguishing these three chronological categories but amended it, especially for the post-maximum period.

Conflicting conclusions from the stylistic, stratigraphic, and chronometric data did not permit me to subdivide these three broad periods further. Biological information, however, did permit a delineation within each broad category

of two distinct periods of occupation: sites occupied during colder climate and those occupied during warmer climate. Since paleoenvironmental information was lacking for some of the sites within each chronological period, I also delimited a third sub-category--one which broadly belongs to a time period but to no specific climatic episode within that period.

A. Sites of the pre-Valdai Maximum (Older than 20,000 B.P.)

Combined dating methods suggest that four sites: Berdyzh, Khotylevo II, Radomyshl', and Yurovichi may have been occupied during this period. Three of the sites, Berdyzh, Khotylevo II, and Yurovichi have been dated chronometrically but as discussed earlier in this chapter, these dates are ambiguous. The fourth site, Radomyshl' is considered by Soviet researchers, stylistic criteria, to be the oldest in the study area (see Gladkih 1973, Lazukov et al. 1981, Shovkoplyas 1964, for example). As I concluded previously, the ambiguity of data on these four sites precludes me at present from either fully accepting their antiquity or from dismissing such a possibility. I have, therefore, listed these sites in Table IV-10 as belonging to either this early period or to the later one.

B. The Valdai Maximum (20,000-18,000 B.P.)

No sites in the study area firmly date to this time, and it appears, as Velichko (1961) suggested, that the area may have been either totally uninhabited during this period or inhabited by a much smaller population. It is interesting to note that similar depopulation is also postulated for the

other river valleys of the Russian Plain. Ivanova (1977) notes a cultural break in the Molodova sequence on the Dnestr that lasted from approximately 23,000 B.P. to 17,000 B.P. She writes that while man did not totally leave the area, archaeological evidence suggests both a decrease in population as well as a change in subsistence practices and settlement systems. Zarrina and Krasnov (1979) note the same phenomenon in the Kostenki-Borshevo region during the 21,000-17,000 B.P. period. These observations are in agreement with my conclusion that the Central Russian Plain also was either totally uninhabited or had very sparce populations during this time.

C. Post Maximum Period (18,000-12,000 B.P.)

As Table IV-10 shows, the vast majority of the sites (25 out of 29) were probably occupied during this 6,000 year period. Since conflicting data on the chronological assignment of each site precluded any internal ordering of the sites. they are presented in Table IV-10 in alphabetical order only. While evidence presented above suggests that chronological differences do exist between the sites--it is only the paleoenvironmental differences that can be monitored with any certainty at the present time. As Columns D and F in Table IV-10 show, roughly the same number of sites can be assigned to the periods with warm climate (6-8) as to cold periods (8-10). The existence of numerous climatic fluctuations between 18,000-12,000 B.P. preclude me from assigning the sites in either of the two groups to a specific

warm or cold oscillation. Lastly, those sites for which paleoenvironmental information is lacking (N = 9-11) are presented in Column E.

V. OCCUPATION OF THE CENTRAL RUSSIAN PLAIN AND CLIMATIC FLUCTUATIONS

In chapter III, I discussed at length the paleoenvironment of the study area during Late Valdai and showed that the gradual climatic changes which characterized the period before the maximum gave way to relatively rapid climatic fluctuations after the maximum. In light of this it is significant to note that the most intensive occupation of the study area is monitored precisely during the period of climatic fluctuations. This co-occurrence of site occupation and climatic oscillations is more clearly visible in Figure IV-4, where paleoclimatic data is presented together with the radiometric information. The radiocarbon dates depicted in this figure show both a mean date (solid line) and a full range (dotted line) of the dates available for each site. The mean date was calculated for sites where more than one date was available, the range of dates reflects the extent of the standard deviations of all of the dates per site combined.

As both Figure II-1 and Table IV-10 clearly show, the number of sites during the post-maximal period show more than a four-fold increase (86% of the sites) when compared to the pre-maximum period. Since, as will be demonstrated in Chapters V and VI, no major large-scale differences

exist between the earlier sites and those occupied after the Valdai maximum in either the size of the sites, the thickness of the cultural layers, the volume of cultural remains, or in the number of features present per site, I conclude that the observed increase in the number of sites most likely reflects an increase in the size of the population inhabiting the area during the later period. I will consider the implications of this observation in the subsequent part of this work both in Chapters V, VI, and VII.

VI. THE LOCATION AND DISTRIBUTION OF THE SITES

I have discussed at length in Chapter II (pp. the location of the Upper Paleolithic sites as well as considered some observed regularities in the distribution of these sites across the Central Russian Plain. At that time, as will be recalled, I considered the geography of the sites without controlling for possible chronologic differences. Having reviewed the chronology of the sites and having established a tentative chronological ordering, it is of interest to return to the questions considered in Chapter II to see if any changes can be monitored through time. Specifically, since I have postulated the possibility of two periods of occupation in the area, I will now compare the geographic information on the sites in these periods.

Since the chronology of the early sites is problematic and because such a small sample is available (N = 4), the data are far from rigorous enough to warrant any statistical manipulations. I will limit myself to making a series of

observations which may, after additional research, prove to be significant. These observations are based on a comparison of the geographic locations of early sites vis-a-vis all of the sites discussed in Chapter II (see Figures II-1 and IV-5).

A. Site Locations--Microgeographic Variables

In Chapter II, I used the following six categories for analyzing the locational relationships of the sites: 1) river valleys, 2) proximity to water, 3) microclimates and micro-environments, 4) south facing slopes and/or promentories, 5) lithic resources, and 6) mammoth procurement strategies. Some differences are observed in the location of the early sites only for the first and fourth categories.

1. River Valleys. As I showed in Chapter II, all of the sites are located in the river valleys. For the 22 sites considered in that chapter the reported mean distance of the site to the river was 240 meters. Sites occupied prior to the Valdai maximum are also located in river valleys, but found at greater mean distances from the rivers (see Column S, Table II-5, for the present day distances to the rivers). This mean distance is 1,291 meters--two sites, Berdyzh and Khotylevo II are located less than 100 meters from the river, and Radomyshl' and Yurovichi 3,000 meters and 2,000 meters respectively.

The overall significance of this observed difference in mean distances may be moot because of both the difficulty of dating these sites firmly and the small sample size. If we assume, however, that these sites were indeed occupied early,

then the observed differences point to a change in the paleogeography of the area and changes in cultural practices of site location. Specifically, as I hypothesized previously, climatic factors and the enlargement of the rivers after the Valdai maximum effectively linearized the distribution of the flora and fauna along the river valleys and this linearization exerted a strong pull on the settlement systems and resulted in the riverine location of the Upper Paleolithic sites. The location of earlier sites further from the rivers indirectly supports this interpretation of settlement systems during the later period and indicates either the absence of such linearization before the maximum or it's much weaker "pull" on the settlement system.

The second observation made about the location of the sites, namely that they are found on the northern or left banks of the river valleys, appears to hold for the four early sites as well. These sites, like the ones occupied later, are found on the higher and better drained northern or left sides of the valleys.

The height of the sites above the rivers also does not appear to exhibit significant change through time. Available data on 19 sites (presented in Table II-5) shows that of the 17 later sites, 9 are found higher than 5 meters above the river and 8 either on the floodplain or 1-2 meters above it. For the early sites information is available on the altitude above the rivers only for Khotylevo II and Radomyshl'--both are located from 4-7 meters above the river, and thus their

location does not show a significant difference from those of later sites.

As I also showed in Chapter II, the location of sites with large numbers of mammoths and mammoth bone dwellings is strongly associated with floodplain and/or ravine topography (see Table II-5). Quantifiable data exist on 21 of the sites--18 of these date to the post maximum period and three to an earlier period of occupation. Two (or 66.%) of the early sites with large numbers of mammoths have mammoth bone dwellings (Berdyzh and Radomyshl'). Nine (50% of the sites) occupied during the later period have mammoth bone dwellings as well. The observed differences in the percentages of sites with dwellings during the early and late periods of occupation are not significantly different. Furthermore, the two early sites with mammoth bone dwellings, like their counterparts in later periods, are also associated with floodplain and/or ravine topography. I conclude from this that no significant differences can be observed in either the frequency of sites with dwellings or in the location of these sites through time.

2. Site Orientation. An interesting difference does emerge in the cardinal orientation of early vs. late sites. As I have discussed previously (Chapter II), 15 or 66.5% of all of the sites in the area face either true south or modified southerly direction. I interpreted this to mean that after the first condition of site location was met--proximity to the water, preference in site location was given

to the south facing slopes or promentories. As I have pointed out, above, immediate proximity to water is less evident in early sites. Data in Table II-5 show that the pull of south facing locations may have been less strong as well. Of the 20 sites occupied after the Valdai maximum, 15 (75%) face either true south or modified southerly direction while only one site (Khotylevo II--25% of the sample) occupied early is oriented towards the south. The remaining three sites--Berdyzh, Radomyshl', and Yurovichi--all face either true north or modified northerly direction.

The significance of this observation is likewise open to discussion. If these sites are indeed early, then we can anticipate that they were occupied when climatic conditions were less severe than those postulated for the 18,000-12,000 B.P. period (see Chapter III for a discussion of the climate during Late Valdai). It is possible that milder climate reduced the "pull" of south facing locations for site selection and allowed for the predominance of other, as yet unknown, site selection criteria.

B. The Distribution of Sites--Macrogeographic Variability

A discussion of macrogeographic variability among all of the sites has shown that the sites are neither randomly nor evenly distributed across the study area (see Chapter II, pp.136-141). In this section I will compare the distribution of the early sites to those occupied later, again using the categories established in Chapter II. The first of these locational regularities was the placement of the sites in

river valleys. As was shown in the previous discussion, this general observation holds through time--both early and late sites are found in the river valleys, though early sites are at somewhat greater distances from the rivers themselves.

1. The Dispersal of Sites Across Space. Various Dimensional Analyses of Variance Tests performed in Chapter II showed that the sites are not evenly or randomly distributed across the study area but found aggregated in certain parts of the area. Specifically, it was found that the sites clustered in the north-east and south-west sections of the area in "block-size 4" quadrants number 2 and 3.

Chapter II; also Figure II-31a, b for discussion and illustration). A sumperimposition of these "block size 4" quadrants over the map of early sites is presented in Figure IV-6. This figure shows that the four quadrants contains two sites in quadrant 1, one in quadrant 2, one in quadrant 3, and no sites in quadrant 4. As this figure shows, three of the early sites (75%) are found in the northern half of the study area and only one (25%) in the southern half. If we can stretch the concept of clustering to include a discussion of just two sites, then it can be said that the only observed clustering occurs in the northwestern quadrant #1 where both Berdyzh and Yurovichi are located. Only one site, Radomyshl', is found in the southwestern quadrant #3.

This pattern of site distribution contrasts with that observed for all of the Upper Paleolithic sites--early sites

are predominantly found in the northern half of the region and are more numerous in the northwestern section of the area.

2. The Distribution of Sites Without Dwellings. As I showed in Chapter II, sites without dwellings clearly cluster in the northeastern part of the study area in quadrant 2 and are linearized along the Desna and Sudost' rivers. Two sites without dwellings are known for the early period of occupation--Khotylevo II and Yurovichi. As will be recalled from Chapter II, Yurovichi cultural materials were not found in situ. It is, therefore, impossible to say at present that the site was without mammoth bone dwellings at the time of occupation.

3. The Distribution of Sites With Dwellings. As I showed previously (Chapter II, pp. 141-3), sites with dwellings cluster in the northeastern and southwestern parts of the Central Russian Plain (quadrants 2 and 3). As Figure IV-6 shows, early sites with dwellings are found in the western half of the area--Berdyzh in the northwestern quadrant 1 and Radomyshl' in the southwestern quadrant 3. The location of early sites then appears to be restricted to the western part of the study area and shows a straight vertical distribution while later sites are diagonally distributed across the area. Secondly, earlier sites again are far fewer in number.

4. Proximal Associations. Chapter II pointed out some regularities in the proximal associations of sites with dwellings and of those without dwellings. Discussing all

of the upper Paleolithic sites with dwellings,
that no geographic north to south differences can be observed in the distribution of the sites and that the sites are spaced approximately 70 km (mean distance) from each other. The two early sites with dwellings, Berdyzh and Radomyshl', by contrast, are located at a much greater distance from each other--250 km as shown in Table IV-11. This distance is more than three times greater than the mean distance between all the sites with mammoth bone dwellings. The significance of this difference is unclear at present, as it may reflect a combination of archaeological sampling bias, the increased population of the area through time, and possible changes in the settlement system. Chronological uncertainties about the dating of these sites probably also add "noise" to the observed pattern. I interpret these observed differences to tentatively suggest that both a smaller population occupied the area prior to the Late Valdai maximum and that this population was more concentrated in the western part of the region.

The distribution and proximal association of early sites without dwellings again differs from those noted for all of the sites in Chapter II. These sites, as will be recalled, clustered in the northeastern quadrant (number 2--"block size 4"). Early sites, on the other hand, while located in the northern half of the area, are found at far greater distances from each other (350 km), and in different quadrants (see Figure IV-6). Here again, all other things being equal, we see the exclusive northern location of the

early sites but fail to observe any clustering of them beyond that.

C. Summary

Both the paucity of data and uncertain chronological assignment of the sites have precluded me from drawing any firm conclusions about the possible differences in the location and distribution of the early Upper Paleolithic sites. If the four discussed sites were indeed occupied prior to the Valdai maximum (i.e., before 20,000 B.P.) then:

1) There is a much smaller number of early sites in the area. Only 14% of the sites found to date can be assigned to this early period of occupation.
2) Early sites, like sites occupied in the subsequent 18,000–12,000 B.P. period, are also found in river valleys but appear to have been placed at greater distances from the rivers and do not show the same selection of south-facing slopes for settlement as do the later sites.
3) Early sites are found predominantly in the northern part of the study area.

4) Early sites do not show the same pattern of geographic aggregation as do the later sites. Those with mammoth bone dwellings are located in the northern and western parts of the Central Russian Plain; those without them in the northern part of the region.

VII. CONCLUSIONS

This chapter has discussed the dating and chronological ordering of the sites in the study area. It has reinterated an important point that, to date, no single dating technique--relative or chronometric--has yielded satisfactory chronologies. After reviewing all of the evidence on hand for the chronological ordering of the sites, I then presented a tentative chronological scheme that will serve as a basis for all further discussions and analyses in this work. In this scheme I advanced the proposition that the Central Russian Plain shows two periods of occupation during the Upper Paleolithic: an early phase that dates between some 26,000 and 20,000 years ago, and a late phase dating from 18,000 B.P. to 12,000 B.P. A point was also made that the area appears to have been either totally unoccupied or settled only very sparcely during the Valdai maximum itself--from 20,000-18,000 B.P.

The sites occupied during the early period are considerably fewer in number and appear to have been settled

during a time of both milder climate and climatic conditions that underwent more gradual oscillations. Only four sites are known from this early 6,000 year period--giving a frequency of occupation of about 1 site per 1,500 years.

Sites occupied during the late period are far more numerous--25 are known from a period of 6,000 years--giving a frequency of occupation of 1 site per 240 years. These sites were occupied during a time period replete with numerous climatic oscillations--sites occupied during the warm fluctuations appear to be as numerous as those occupied during the cold oscillations.

I interpret these differences in the intensity of occupation of the area through time to indicate an increase in population from the early period to the late. In addition to this, I also hypothesize that the distribution of the sites across the study area during the late period is different from that found during the early period. Late period sites are more diagonally distributed across the Central Russian Plain and cluster in the north-east and south-west parts of the region. The degreee of similarity between these two clusters will be examined in a subsequent chapter. The salient points of these observations for this discussion is that this late pattern of settlement differs from the one noted for the earlier period. The observed difference suggests that a change had occurred in the pattern of utilization of the area--one that resulted in a change in the settlement systems themselves.

As I hypothesized in Chapter III, Late Valdai climatic

oscillations effectively linearized the distribution of flora and fauna along the river valleys. I also suggested that such a linearization would have strongly favored migratory behavior for mammoths and that these migrations may have occurred along the south-west to north-east trajectory. I conclude here that the diagonal distribution of late sites and their clustering in the north-east and south-west sections correlates well with the proposed annual range of mammoths and that the two phenomenon are systemically connected. I will examine and evaluate this hypothesis in detail in a later chapter of this work. I note here also that no such pattern is discernable for the earlier period of occupation where overall settlement preference is given to the northern half of the area. In turn, I interpret the absence of this pattern during the early period to suggest that different subsistence practices and settlement systems may have existed during this period.

Finally, perhaps the most significant conclusion that must be reached from the discussions presented in this chapter is that any observations made on chronological changes in the patterns of human utilization of the Central Russian Plain through time are the most tentative and may prove in time to have no validity. This is because the numerous serious problems in the dating of the sites will first have to be satisfactorily resolved before any sophisticated locational analyses can be conducted and valid conclusions drawn. Since the chronological differences in the utilization of the region outlined in this chapter are at this point

no more than suggestions or guidelines for future research, I will throughout this work primarily use conclusions reached on the overall patterns of site location and distribution, presented in Chapter II, which were derived from the analysis of all of the Upper Paleolithic sites.

CHAPTER V

SUBSISTENCE PRACTICES AND SEASON OF OCCUPATION OF THE CENTRAL RUSSIAN PLAIN SITES

I. INTRODUCTION

Cultural systems acticulate the human actors with their environment, both naturally and socially, through their subsistence components. In the first section of this work I have presented both a temporal and spatial reconstruction of the natural environment of the Central Russian Plain in Late Pleistocene and set the stage for a consideration of the subsistence practices of the inhabitants during the Upper Paleolithic. In this chapter, I will examine both the subsistence base, and the organization of procurement. By chosing to consider these "man-land" relationships first, I am in no sense affirming the primacy of the technoenvironmental variables in determining the nature of a cultural system. My approach mirror's Jochim's, who writes (1981:64) that:

> Food procurement is simply one (albeit vital) aspect of human behavior...If human behavior is to be viewed in systemic terms--then subsistence activities provide one point at which to enter the system for study.

As will be clearly shown, however, the Late Pleistocene

economies in the study area included a substantial non-food component--such large scale exploitation of fur bearers. In this chapter, I will examine both the food and non-food components of the subsistence system.

I have selected to use the subsistence system as an entering point in spite of recent cogent criticism of the techno-environmental focus in archaeology (see Bender 1978, 1981; Keene 1983; Moore 1983; Root 1983, for example). This is because "man-land" relationships must be first outlined, however tentatively, before we can begin considering the other pertinent variables. Simply put, while "what people do to make a living" and "how they do it" are affected both by natural and social phenomenon, both are channeled by "what is available to make a living from".

The many approaches to reconstructing past subsistence practices found in the archaeological literature can be grouped into two categories: 1) predictive and 2) descriptive. The first, more sophisticated and rigorous, begin by modeling optimal subsistence behavior for a particular environmental setting and then testing these predictions against the data base (see, for example, Jochim 1976; Keene 1981; Reidhead 1980; Winterhalder 1981b, a). The serious problems with these approaches, including the justification of certain behavioral assumptions, methodological difficulties in reconstructing past environments, and the scalar problems have all been discussed in the literature (see Bettinger 1980; Jochim 1983; Keene 1983; Yessner 1981, for example).

As I have pointed out in Chapter III, such predictive modeling is first and foremost predicated on accurate environmental reconstruction, which, at present, is just not possible to do for the study area.

Instead, I have selected the second approach--descriptive modeling and will investigate the subsistence economies using the excavated archaeological collections on hand. This approach is also beset with epistomological and methodological problems that have both been discussed in the literature and mentioned in previous chapters (for a discussion of the biases in faunal collections and their interpretations see Behrensmeyer and Dechant-Boaz 1980; Binford 1978, 1981; Binford and Bertram 1977). I do so in spite of all the biases distorting the record, because the record does, in this case at least, come closer to past behavioral realities than do modeling constructs erected on recent ethnographic analogies. Watanabe (1978a:17) writes that:

> Man has his own view of environment: his activities react to and are limited by the nature of environment as seen by him. This implies that working of a given people in relation to their habitat should be understood not only in terms of ecology in the narrower sense but also in terms of the relationship between a people and their environment as perceived by the people themselves.

Because of this, ethnographic analogies, no matter how close, cannot consider the "emic" component. Some will argue that neither can the archaeological record--or at least our present

methods of working with the record. I suggest, however, that the record itself does contain this component, whether we recognize it as such or not, and should be our starting point. This is especially valid when dealing with past cultures for which no suitable ethnographic analogies exist.

After considering the subsistence economies in the study area and delineating what changes can be observed through time, I will discuss the question of seasonality of occupation of the sites. The concluding section of this chapter will offer a descriptive model for the observed variability in the subsistence practices.

II. METHODOLOGY

I will consider the archaeological data related to the subsistence practices and offer a number of hypotheses to account for the observed synchronic and diachronic variability. These hypotheses, where possible, will be evaluated using a series of simple statistical procedures widely found in the literature including Measures of Association (ϕ) (Thomas 1976), Fisher's Exact Test (Thomas 1976), Pearson's Correlation Coefficient and the Comparison of Correlation Coefficients (Zar 1974), and the Difference of Means or Student's t Test (Blalock 1972). Since the sample sizes available for all manipulations were both small and came from finite populations, I have applied finite population corrections where appropriate (e.g., such as in the Difference of Means Test) using the following formula for these corrections given in Thomas (1976:233):

$$S = \frac{n}{n-1} \hat{S}$$

where $\hat{S}$ is the standart deviation of the sample and S is the corrected value. Unless otherwise indicated, probabilities were based on the application of a 2-tail test and deemed significant at the 0.05 level. All probability estimated can be found in appropriate tables. In the discussion of the results of various tests I will list the relevant test statistics in the text itself while the sample sizes (N), mean values ($\bar{x}$), and probability values will be given in the appropriate tables. In cases where the test statistic is important but the probability estimate exceeds the 0.05 level both the value and the probability associated with it will be listed in the text.

In cases where the statistical procedure employed is less common in the archaeological literature (e.g., the Diversity Index) I will describe in detail the manipulations involved.

Finally, a cautionary note should be sounded about the use of statistical procedures, especially parametric statistics, on the data on hand. My sample sizes in all cases are exceedingly small, and in most cases a normal distribution cannot be assumed. Some may argue that the nature of my data does not warrant the use of any statistical evaluation other than the simplest nonparametric calculations on nominal scales. I have selected to use the more powerful procedures and argue that the repeated patterning observed

is both relevant and important and does elucidate the patterning in the data themselves.

III. THE SUBSISTENCE STRATEGIES

A. Floral Resources

Archaeological data relating to the subsistence practices of the Upper Paleolithic hunters and gatherers from the Central Russian Plain comes in two forms: organic remains that testify to what was consumed or utilized, and tools used in the procurement of these resources. The organic remains from the study area, listed in Table III-3, are exclusively composed of fauna and have led both Soviet and Western researchers to view the economies as based primarily on the procurement and consumption of meat. Ethnographic evidence on the subsistence of hunters and gatherers, as well as the nature of the recovery techniques used in excavating the sites in the study area, have led some researchers, especially Western ones, to wonder about the role of plants and vegetal resources in subsistence. Klein (1973:60), for example, wrote:

> The abundance of animal remains in these sites indicates clearly that human beings survived, and perhaps even thrived through the exploitation of relatively varied and reasonably abundant game. In addition, since virtually all historically known peoples to whom hunting was a major form of subsistence also utilized plants to a greater or lesser extent (some Eskimoes being the major exceptions), it is possible to suppose that the Last Glacial inhabitants of

> the Ukraine did so as well. Unfortunately, this is difficult to document since plant refuse does not fossilize as readily as bones do. It is now known, however, that tiny charred seeds, which may escape the eye of the excavator, can turn up in sizeable numbers if special techniques are used to find them.... The application of such techniques to sediment samples from Ukranian sites may one day give us a better idea of the extent to which Last Glacial peoples there utilized plants.

Ethnographically, as Lee (1968) and Watanabe (1968, 1969) have convincingly demonstrated, the role of vegetal resources in the diet decreases latitudinally so that it is not only some Eskimo groups but all inhabitants of extreme north latitudes that meet their nutritional needs almost exclusively from animal products. Given the paleoenvironmental reconstruction of the Late Pleistocene Central Russian Plain offered in Chapter III, I suggest that it is not the lack of appropriate recovery techniques that is responsible for the absence of floral remains in the archaeological record but rather that floral resources played a very minor role at best in the subsistence.

As I will demonstrate later in this chapter (see pages), both sifting and flotation were used in the excavation of some of the sites and have resulted in the recovery of both microfauna and/or fish remains at Eliseevichi, Mezhirich, and Mezin. While it is true that use of such recovery techniques has been sporadic at best, I interpret the fact that when used, they did not recover

floral remains supporting my contention that vegetal resources were not a significant component in the Upper Paleolithic diets. This is not to argue that mushrooms or berries or seeds were ever eaten, but rather to state that, if eaten, these resources were at best opportunistically collected and played a role of "treats" rather than "basics" in the diets.

The second source of information on the type of foods eaten comes from the tools associated with the procurement and preparation of food. Soviet researchers have long noted the presence of bone digging implements, variously interpreted as "hoes" and "digging sticks" at the sites, and suggested that these may have been used to procure various roots and tubers (see Pidoplichko 1976; Polikarpovich 1968; Shovkoplyas 1965a, for example). Since these tools have been found at sites with storage pits (e.g., Eliseevichi, Mezhirich, Mezin) they could have just as easily been used to dig out the pits as for root and tuber procurement.

Finally, Rogachev (1973) has used the presence of numerous grinding stones and slabs of sandstone, quartzite, and flint, to argue for the procurement and processing of seeds and grains and for the importance of gathering and use of plant resources by Upper Paleolithic inhabitants of the Russian Plain. In his discussion, Rogachev did not consider the residue found on these grinding stones. Table V-1 presents the data on the grinding stones in the study area as well as the available evidence on what was ground in

them. Semenov (1939), Shovkoplyas (1972) and Velichko et al. (1977a) have stated that the slabs at Timonovka I, II, and Dobranichevka held traces of ocher, while at Gontsy the slabs seem to have been used for grinding bone. Columns 3 and 4 in Table V-1 denote the sites where ocher and worked bone were found. Since the residue found on some of the slabs indicated that these tools were associated with bone and ocher processing, I decided to test the associations between slabs and worked bone and ocher. The resulting ϕ coefficients and probabilities are given in Table V-2, and show worked bone associated with grinding stones (ϕ = +0.37) and even stronger positive association of ocher and grinding stones (ϕ = +0.66). I interpret this to indicate that the stones were behaviorally associated with the production of bone implements as well as with the processing of pigments. While they may also have been used for grain and seed processing, such use still remains to be demonstrated.

The presence of grinding stones is also positively associated with the presence of storage pits at the sites (ϕ = +0.33, p = 0.06). I will argue at the conclusion of this chapter that sites with storage pits were occupied during cold weather months. This association indicates that the stones were used during cold-weather months--in seasons when plant resources would have been scarce at best, or totally absent.

Finally, since I have argued for the existence of milder climatic conditions during the early period of

occupation of the study area, and such conditions in turn imply the presence of a wider range of vegetal resources, we can anticipate that plant collecting may have played a greater role at the sites occupied before the Valdai maximum. If, as Rogachev suggests, grinding stones were used in plant processing, we should observe a decrease in the use of them through time in the study area. Data on hand in Table V-3 on the proportion of the sites with grinding stones also do not support Rogachev's hypothesis and indicate an increase rather than a decrease in the proportion of the sites with griding stones through time.

I conclude from this discussion that data on hand, both ethnographic as well as archaeological, do not permit us to consider vegetal resources as a major component of Upper Paleolithic diets in the study area.

B. Storage

The subsistence economy of the Central Russian Plain employed storage throughout the Upper Paleolithic period. As Table II-6 shows, numerous pits have been found at the sites, and are documented both for the sites occupied early (e.g., Berdyzh, Khotylevo II, and Radomyshl') as well as late. Table V-5 illustrates the number of these pits per site as well as their sizes, volume, and content. While pits found at the 13 (45%) sites show a range in both size and volume, they can be broadly subdivided into two groups: 1) small pits under 0.01 m^3 in volume, and 2) large pits with volume over 0.5 m^3. The difference in mean storage volume between

these two groups of pits is significant (z = 16.9)--the mean storage volume of each group can be found in Table V-5.

Small pits have been recognized and reported at four (14%) of the sites and interpreted as roasting pits (Gontsy), possible postholes (Chulatovo II, Pushkari I, and Yudinovo) as well as small cache repositories for lithic and bone artifacts (possibly Eliseevichi and Mezin).

Large pits, identified as storage pits by the excavators have been found at ten of the sites in numbers ranging from 1-12 per site. Their presence at the sites is strongly associated with the presence of mammoth bone dwellings--nine (82%) of the sites with dwellings have also large storage pits. The strength of this association is listed in Table V-2 (Q = +0.60).

Mammoth bone dwellings have been found without large storage pits at two sites: Kirillovskaya and Puskari I. The absence of them in the first case is probably due to the early date of the excavation before features were recognized at archaeological sites, and in the second due to the relatively small size of the area excavated to date. Unfortunately, no systematic study has been done on the content of the storage pits--the site reports just note the presence of large numbers of mammoth, horse, and reindeer bones and lesser amounts of carnivore remains in them. Soviet researchers have noted in passing some structural differences between the pits. Gladkih (1978, personal communication) states that two types of large pits exist at

are separated from each other and dispersed in loess and colluvium matrix, and 2) "packed bone type" where no matrix or layers exist between the bones. He interprets these differences to indicate that meat on the bone was stored in the first group and bone itself in the second. These observed differences may, however, have resulted from different behavioral sequences in the use of the pits--sequential reuse of pits first for storing meat and then the bone, for example. Gladkih's observations, however, about the packing of bone in some pits does argue that bone itself may have been the primary storable. Bone, as can be seen in Table II-8, represented an important raw material used both for artifact production and also as fuel. Because of this, the storage of bone in pits dug into permafrost where it would both retain its freshness and be inaccessible to predators should not appear surprising. Ample documentation can be found in the literature, although not quantified, that some pits contained skeletal elements such as antlers and tusks that had no food utility value but were important for tool manufacturing. The pits also held sizeable amounts of flat bones such as pelvises and scapulae which, while of low nutritional value, were useful as construction materials (see Pidoplichko 1976; Shovkoplyas 1965a, for example).

The discovery of filled storage pits at the Upper Paleolithic sites of the Central Russian Plain may seem paradoxical. Archaeologists working in northern latitudes

today usually report finding empty storage pits (Arutyunov et al. 1982; McCartney 1979, 1980; White 1982, personal communication). This seeming paradox can, however, be resolved by a number of scenarios both from the ethnographic and archaeological record. In the first case, as Binford (1982, personal communication) reports, the exact location of cache pits is sometimes forgotten by present day Nunamiut. This indeed may have been the case at Dobranichevka and Mezin where some of the pits were covered by a layer of loess and the natural depressions created on the surface subsequently used as basins for small hearths. This hypothesis presupposes multiple reoccupation of some of the sites. In other cases where no such diachronic evidence is present, a sequential use of the pits mentioned earlier can also be suggested--first as meat caches and then as repositories for raw material. The evaluation of these two hypotheses must await further research.

The depth to which these storage pits were dug is interesting as it never exceeds one meter--a depth postulated in Chapter III for the permafrost thaw later in warm-weather months. Logistics of excavating pits in permafrost, as well as the documented depth of the pits, suggests that their dimensions were dictated by the thaw later itself and implies that they were excavated in warm-weather months.

The use of storage facilities in the study area has a number of important implications for both the subsistence practices and settlement systems. First, it denotes that we

are dealing with what Binford (1981, 1982b) has characterized as "logistically organized" hunters and gatherers. Testart (1982:534) writes:

> All hunter-gatherers do store or preserve food to some extent. However, these practices do not play the same role everywhere, and they are part and parcel of very different economic structures...Hunter-gatherers who practice intensive storage of abundant seasonal resources every year live off these stores during the entire season.

Although we lack adequate data to evaluate the extent of storage on the Central Russian Plain, we can accept the proposition that intensive storage was practiced in the study region. At Dobranichevka, for example, 12 storage pits with a total storage volume of 30 m^3 have been reported.

The rationale behind storing behavior has been discussed in the literature and can be found in Colson (1979), Jochim (1976, 1981) and Perlman (1980). In general, they focus on the techno-economic advantages that storage provides. Jochim (1981:176) terms storage a short-term maintenance strategy and states that:

> If territoriality and conservation represent long-term maintenance strategies, resource storage, by contrast, a relatively short-term anticipatory strategy....storage represents a security strategy aimed at providing sufficient resources for anticipated lean seasons. Storage may also represent a strategy efficiency, designed to take advantage of the short-term availability of

> particular resources. In either case, it implies significant environmental seasonality--strong seasonal contrasts in resource availability and sufficient seasonal regularity that lean seasons may be anticipated. As a result, northern-and temperate latitude troups of...farmers and hunter-gatherers should be more likely to practice food storage than tropical groups would be.

Perlman (1982:532) adds that:

> Populations are limited by the season of minimum yield, unless that season's yield can be counteracted. A group can utilize storage to achieve this objective by transferring the cost and benefits from one feeding period to another.

Elsewhere he notes that storage reduces return rate of the stored item, works to minimize subsistence activities during lean months by acquiring high return resources when it is more productive and considers the practice of storage as an independent variable.

For Testart (1982:524-525):

> Where some natural food resources are <u>bountiful</u> but <u>seasonal</u>, they can be gathered en masse while available and stored <u>on a large scale</u> once transformed through appropriate food preservation techniques, thus becoming the staple food year round. This possibility lies at the intersection of four conditions, two ecological (abundance and seasonality of resources) and two technical (efficient food-betting and food-storage techniques). The presence of these four conditions determines an economy in which storage provides the bulk of food during the season of scarcity. This economy has

> two main characteristics.
>
> The first is a conspicious seasonal variation in the intensity of food getting activities....The second characteristic of the storing economy is its relative rigidity.... In storing economies planning plays a central role.

Underlying all of these conclusions is the assumption that storage is a beneficial subsistence strategy for hunters and gatherers in environments characterized by abundant but seasonally available resources. Recently, two additional interesting qualifications have been offered to the above observations. Colson (1979) in discussing both the short and long term fluctuations in resource availability in all environments, underscores the reality of recurrent periods of long term scarcity, and notes an <u>internsification</u> of such short-term coping mechanisms as storage during what she calls the "bad years". This suggests then that an increase in storage need not indicate increased abundance but may signal quite the reverse situation. Speth and Spielman 1983), in reviewing the nutritional requirements and regimens of north latitude groups, suggest that storage also may be designed to counteract seasonal imbalances and concommitant disturbances in human metabolisms that come from ingestion of lean meats available to hunters in late winter-early spring months. Storing is done in warm-weather months when the animals in general are fatter and may be selected for preferred storage of either fatter species or fatter parts of the animals.

We can summarize this discussion by saying that the techno-environmental rationale for storage favors the storage of seasonally abundant resources rich in both calories, nutrients, and probably fats to offset the reduced availability of these resources during the lean months. Such subsistence strategies are amply documented both in the ethnographic and archaeological literature (see Balikci 1970; McCartney 1979; Nelson 1971; Watanabe 1968, 1978b, for example), and empirically confirm the adaptive hypotheses and generalizations about storing behavior discussed above. As I have shown in Chapter III, the natural conditions favoring storage economies were more than met by the Late Pleistocene environment of the Central Russian Plain--one that I have characterized as having highly nucleated resources.

The emphasis on the individual as the unit of analysis found at the base of all ecologically based approaches to subsistence behavior are by their nature bound to misinterpret the archaeological record on subsistence. Keene (1983) states that:

> Archaeologists have circumvented this problem to some extent by treating populations or societies as aggregates of individuals...But clearly the problem is more complex than this, and we must consider whether a society isn't more than the sum of its parts... The social demands on surplus production, reciprocity, and information sharing, for instance, are not entirely visible when the individual is the unit of analysis. Social repro-

> duction necessitates more than the reproduction of the individuals.

The social component affecting subsistence practices and specifically storage behavior have received less attention in the literature to date. Recent work by Bender (1978, 1981), Moore (1983), and Weissner (1982) among others has been increasingly drawing attention to this "man-man" component. Weissner (1982a:176) writes that:

> Environmental variability, then, can set the bounds within which certain strategies work effectively according to abundance, spatial and temporal distribution, and patterns of variation of resources, but in most environments there are a number of organizational strategies which can fill certain needs.

Bender's (1978, 1981), Moore's (1983), and Root's (1983) work indicates that it is the social component that crucially affects these organizational strategies. For example, Bender in discussing hunter-gatherer sedentism and related intensification of subsistence production, underlines the role played by the establishment and maintenance of social alliances in making demands on production and promoting the intensification of production. The form that these social alliances take is irrelevant for the moment and will be examined later--what is important, however, is that we must consider this component when discussing any subsistence practices and especially changes in such practices and strategies. The archaeological record

from the Central Russian Plain (Table V-4, V-5), for example, shows a two-fold increase in the mean storage volume at the sites through time ($z = 1.87$, $p = 0.06$). Such an increase indicates an intensification in subsistence practices, that, as will be shown later in this section, is associated with increased populations in the area and an increase in subsistence risk due to climatic fluctuations. The inventories of the Central Russian Plain sites show the presence of such nonlocal exotic materials as amber, fossil marine shells, and moutain crystal (see Tables II-7, II-8). As I will show in Chapter VI, the presence of exotic materials implies the existence of social alliances and interactions and these also intensify through time. Thus, we also have data that indicate the importance of the social component in the Upper Paleolithic adaptations in the study area.

The presence of storage pits thus indicates that storage strategies were employed and that changes in storage behavior did occur through time--changes, as will be shown later both in this chapter as well as in subsequent chapters, that were initiated by environmental, demographic, and social factors.

C. The Faunal Record

As discussed in Chapter III, the fauna present at the sites can be broadly divided into two categories: 1) economically important taxa, and 2) those of no economic significance that are present at the sites through the

action of nonhuman agents. Taxa of economic importance to man have been identified by Soviet researchers as those bearing some man-inflicted markings such as cut marks, burning, systematic patterning of disarticulation, etc. (see Gromov 1948; Pidoplichko 1976; Vereschagin 1971, 1979, for example). Soviet researchers have divided the economically important species into 1) those that constituted food resources, and 2) carnivores who played important non-food roles in the economies. The rationale behind this second subdivision was mentioned in Chapter III and comes from the observed differential utilization of these taxa. As Pipoplichko (1969, 1976) and Vereschagin (1971, 1979, 1981) pointed out, while numerous remains of fur bearers are found at most of the sites, the bones belonging to these taxa never show any signs of having undergone food processing or food preparation. My own research on faunal materials from the sites, specifically focusing on the remains of fur bearing carnivores and lagomorphs, fully support this division and I will evaluate the exploited taxa accordingly.

There are, however, a number of problems with such a subdivision based simply on a-priori assumptions of the investigator and not on empirical evidence from the taxa themselves. This problem is less significant in separating out species of economic importance from those of no importance as the criteria used are acceptible. Likewise, there is little difficulty in designating those species that were not used as food. The residual group of food species, however,

presents the crux of the problem. I have already mentioned the debate in Soviet literature on the exact role played by mammoths in the subsistence practices. Evidence exists that mammoth bone was extensively used for fuel and the overwhelming majority of the hearths found at the sites contain burnt bone and burnt bone only. Similarily, dwellings found at the sites are exclusively made of mammoth bone. As noted before, bone was also an important raw material used in the manufacturing of both tools, jewelry, and art mobiliere.

The wide spectrum of use to which mammoth products were put--food, architecture, fuel, and raw matterial--did not all require utilization of freshly killed animals. If, for a moment, we omit the use of mammoth as food from consideration, we see that gathering of bone could have met the needs for other activities also. Specifically, the burning of bone for fuel just necessitated the presence of relatively fresh or "green" bone with its collagen and fat content in tact (see Buikstra and Swegle 1982 on burning of bone in general). Given the climatic conditions reconstructed for the area at the time of occupation, we can anticipate that bone would have remained fresh for long periods of time especially if gathered "green" and stored in pits in the permafrost. Bone also could have been collected from bone deposits accumulated in the permafrost--deposits that accumulated as a result of the action of natural agents and were subsequently used by man. The

freshness of bone from permafrost deposits was attested to by recent excavations at Berelyoha as well as by numerous discoveries of frozen mammoth carcases in Siberia where not only the bone but the flesh was preserved fresh over thousands of years (Vereschagin 1979).

Bones for the construction of dwellings, likewise, could have been gathered. Although no taphonomic studies of differential weathering of bone used in construction have been undertaken to date, signs of differential weathering have been noted in the Soviet literature. These differences, by and large, have been attributed to differential deposition rates (see Pidoplichko 1976; Shovkoplyas 1965a; Vereschagin 1979, 1981, for example). It is just as possible that differential weathering reflects the different times of death and different periods of exposure prior to use by man. Quite obviously, only future research can evaluate these conflicting hypotheses.

The collection of bone--whale bone in particular--for construction from both discovered carcasses as well as from previous structures has been amply documented for the Thule culture in Alaska (McCartney 1980). This collecting behavior has led Alaskan researchers to also question the extent to which active hunting contributed to the presence of whale bone in Thule assemblages and forced a closer look at archaeological remains for corraborative evidence for active hunting (see discussion in McCartney 1979, 1980, for example).

Finally, similar objections can be raised to the

assumptions that bone used as raw material in manufacturing came from active hunting. Fresh bone, as has been shown in the literature, is more plastic and ammendable to flaking (see Morlan 1980 with references). As I noted above, however, bone under periglacial conditions would have remained fresh for longer periods and could have, therefore, been collected from carcasses. For some manufacturing tasks, for example those requiring the use of tusks, collecting of ivory from carcasses was apparently required. First, as Semenov (1939) and Voevodskii (1952d) have pointed out, removal of tusks from freshly killed mammoths could not have been accomplished without the breaking of the sustaining alveoli. Voevodskii (1952d) noted that the alveoli on mammoth crania at Pushkari I are intact--indicating that at least some of the 65 tusks there were collected after natural taphonomic processes had already disarticulated them. Filippov (1977) manufactured a number of bone and ivory implements experimentally and concluded that in many cases natural exfoliation patterns present in weathered tusks were utilized by Upper Paleolithic craftsmen who used the exfoliated layers as blanks. He stated (Filippov 1979, personal communication) that some of the ivory objects, therefore, were manufactured either from collected tusks or at least from tusks that had been left in the open to weather naturally.

Taphonomic research on post-depositional histories for the different taxa conducted by Behrensmeyer and Dechant-

Boaz 1980, Gifford 1980, and especially on elephant carcasses by Coe (1978), indicate that carcasses left on the surface and not subject to rapid burial will be disarticulated and scattered both horizontally and vertically in a short period of time. The evidence from Berelyoha, on the other hand, points also to the possibility of accumulation, more or less in tact, of skeletal remains in particular micro-regions such as ravines and crevasses in river valleys under periglacial conditions (for a discussion on the natural processes leading to such accumulations see Vereschagin 1979, 1981). Vereschagin's work strongly suggests that such bone accumulations, especially of mammoth bone, may have been present on the Late Pleistocene landscape along river valleys and that Upper Paleolithic hunters and gatherers both found and utilized such accumulations. The procurement of mammoth tusks for ivory trade from just such deposits has been documented historically for Siberia (Vereschagin 1979, 1981). While, to date, no Late Pleistocene mammoth bone "cemeteries" have been found in the study area, this is not surprising. First, because the permafrost conditions favoring their preservation have not existed in the area since the onset of the Holocene, and secondly, possibly because they were regularily utilized during the Upper Paleolithic. Lastly, such sites as Novo-Bobovichi where the overwhelming number of the faunal elements belong to mammoths (11 individuals) and cultural remains are represented by one burin may indeed be remnants of just such past "cemeteries".

Similar difficulties arise if we interpret the presence of reindeer at the sites to indicate active hunting only. Pidoplichko (1969, 1976) noted that reindeer at many sites are represented by shed antlers which could have been collected. The collection of shed antlers is amply documented in the ethnographic and archaeological literature (see Bouchoud 1966, 1975; McCartney 1979; Spiess 1979 with references; and White 1980, for example--but also see Binford 1982a). Since, as pointed out in Chapter III, we have no information on what skeletal elements were used in compiling the MNI estimates at the sites and know that the antlers may have been collected, we must also question the role that active hunting played in the procurement of antlers.

Finally, animal teeth were extensively used as items of personal adornment during the Upper Paleolithic period on the Central Russian Plain. Teeth of various taxa, but especially of the wild boar, bear, steppe bison, horses, arctic foxes and wolves, were modified by circumferential grooving and piercing and used as pendants (see Pidoplichko 1976; Polikarpovich 1968; Shovkoplyas 1965a for illustrated examples). Since no indication exists in the literature on what skeletal elements of bear, steppe bison, and wild boar were used in tabulating the MNI values for them at the sites, and because of the high diagnostic value of teeth, it may well be that the presence of these species at the sites was established on the identification of teeth alone. Such,

indeed, is the case for wild boars at Dobranichevka, Gontsy and Mezhirich (Kornietz 1979, personal communication). Here again, as with antlers and mammoth bone, collecting activities could have supplied the teeth without active hunting taking place.

The resolution of these problems necessarily lies in further archaeozoological and taphonomic research using the collections themselves. This avenue, however, is not possible for most of the materials excavated prior to the 1950s as they are no longer in existence. Furthermore, as indicated in Chapter III, remains of such large sized taxa as mammoths and wooly rhinoceri for logistical reasons are usually not curated to museums. Lacking this avenue of research, I decided instead to investigate the procurement practices by considering the relationship between the MNB and MNI counts per taxon found at the sites. The assumptions I made were as follows: 1) differential behavior used in obtaining different taxa would be reflected in the MNB-MNI relationship; 2) size dependent differential preservation rates reported in the literature should pattern equally through space and time; and 3) differential treatment accorded to high nutrition yield body parts should be a size dependent phenomenon (for a discussion of these assumptions see Binford 1978).

Since all faunal data present serious problems for interpretation of past behavior and since data from the Central Russian Plain for many sites is "guesstimated" at

best, I will not focus on the significance of any one particular test result, but instead argue that the overall consistent patterning observed in the behavior of the data is significant (see Guilday 1970 for a classic example). This point--that it is the repeated patterning which is important--should be especially kept in mind during the ensuing discussion of MNB-MNI correlation coefficients per taxon.

Because sites in the study area are known from excavations vastly differing in size, I first controlled for this difference by transforming the raw MNB and MNI counts into density measures of MNB and MNI per meter square at each site. These transformations per taxon per site can be found in Table V-6. Eleven sites were eliminated from consideration because either they were totally redeposited (Chulatovo I, Kurovo, Novo-Bobovichi, Novgorod-Severskii, and Yurovichi) or no values existed for the MNB and MNI counts at the sites (Bugorok, Klyusy, Korshevo I and II, Kositsa, and Pogon).

Since possible chronological differences between the 16 sites used in these calculations are difficult to control (see Chapter IV for discussion of chronology), I will first consider all of the sites as if no significant chronological differences exist between them. After establishing a pattern for the study area, I will control for chronology and monitor possible differences through time.

Finally, I have elected to treat the northern and

southern halves of the study area separately and will term them "regions" in all subsequent discussions. This was done because my own locational analysis presented in Chapters III and IV indicated that they may have been occupied by more than one group. Also, as noted in Chapter III, Bibikova and Belan (1979) have divided the area latitudinally into different faunal regions suggesting the existence of two distinct biotic communities there during the Late Pleistocene.

Summarized density controlled MNI calculations for the two halves of the Central Russian Plain are presented in Table V-7a and density controlled summarized MNB values in Table V-7b.

To investigate the procurement practices using faunal data, I performed two basic statistical calculations: 1) a calculation of Pearson's correlation coefficient per taxon between the MNB and MNI values both separately for the north and south as well as jointly for the study area and 2) a comparison of the Difference of Means in both MNI and MNB values per taxon in the two regions. The resulting coefficients are presented in Table V-8 and the linear regressions are illustrated in Figures V-1-21. As can be seen from Table V-8, the coefficients for some of the species differ significantly when calculated separately for the north and the south. For example, mammoths showed a value of $r = +0.75$ in the south and $r = +0.57$ ($p = > 0.1$) in the north. Steppe bison showed an even greater difference of $r = -0.40$ in the north and an $r = +0.99$ in the south. The

significance of these differences was then evaluated by comparing the correlation coefficients and using a 1-tail test with a critical value of Z = 1.64 and p =>0.1. The results are presented in Table V-9. Results of the Difference of Means tests are listed in Table V-10.

Since the correlation coefficients were calculated on the MNB and MNI values and these values can reflect such cultural practices as the "schlep effect" pointed out by Perkins and Daly (1968) and Binford (1979), I first investigated the overall relationship between the correlation coefficients and the size of the taxa. This relationship is illustrated in Figure V-3 where live weights per taxon are plotted against the correlation coefficients for the taxa taken for the entire region. The live weights were taken from Table III-16. As Figure V-3 shows, the size of the taxon does not pattern the correlation coefficient.

To establish some parameters for the evaluation of the coefficients, as well as to generate some expected values, I calculated them for the summarized and density controlled microfaunal remains. These taxa, as noted, accumulated at the sites without human action. The figures and plots for microfauna, as can be seen both in Table V-9 and Figure V-4, show very high positive values (north r = +0.98, south r = +0.99; entire region r = +0.99). Coefficients for reindeer, on the other hand, where gathering of antlers may have been responsible for the presence of the bone at the sites, was, as shown in Figure V-5, considerably lower (entire area r = +0.33). Similarily low coefficients (r = +0.34) were found

for the summarized values of all other antler bearing taxa (giant elk, red deer, deer sp., see Figure V-6). In fact, the correlation coefficients for all the taxa where collection may have played a role in procurement are appreciably lower than for those where such evidence of collecting is lacking: mammoths r = +0.54, steppe bison r = +0.46, wild boar r = +0.75, summarized antlered species including reindeer r = +0.34. I interpret these differences in the correlation coefficients to indicate that a selectional presence of particular skeletal elements would yield a lower correlation coefficient while a non-sectional presence of skeletal elements at the sites would yield a higher r-value. Such selectional introduction of particular elements can be anticipated from gathering.

As Table V-8 and Figures V-1-21 show, regional differences in r-values also emerged for some taxa and suggest the existence of different procurement strategies in the north and in the south.

Before proceeding to discuss my conclusions about the procurement practices employed, I must interject a few serious cautionary notes about the limits on inferences that can be drawn from any statistical manipulation of faunal data. First, both high and low positive correlation coefficients can reflect a number of different cultural practices. For example, let us consider possible behavioral variants associated with the exploitation of fur bearers. A spatial separation of the initial processing activities from

the ultimate desposition of the processed products, i.e., furs or hides, would produce very different coefficients for the two groups of sites. Type 1 sites where the fur bearers were trapped and skinned would yield an abundance of skeletal elements such as long bones whose diagnostic value is lower than of the elements that may have been left on the furs (such as crania and phlanges). In this case we can anticipate a greater number of MNB, few MNI and a lower correlation coefficient. At the Type 2 sites where the furs were deposited on the other hand, assuming that the heads and feet were left attached to the furs, we would get a greater similarity in the MNB and MNI values and a higher correlation coefficient. It is expected, however, that such possible intersite differences will be minimized when the study area was either considered as a whole or divided into two latitudinal components only.

The selective use of long bones of some taxa as raw material for tool manufacturing can be expected to introduce ambiguity into the correlation coefficients also. Such use of bone is amply documented for the study area during the Upper Paleolithic (Filippov 1977; Klein 1973; Pidoplichko 1976; Polikarpovich 1968; Shovkoplyas 1965a). Worked bone, however, as can be seen in Table II-8, has been found at both the northern and southern sites and I will assume that no major interreginal differences in bone tool manufacturing existed that would skew the correlation coefficients (for confirmation of rate of bone manufacturing and densities of

worked bone see Chapter VI).

Another example of the ambiguity in the correlation coefficients can come from considering the r-values for mammoths. First, it is important to note that both the r-values for the region as a whole ($r = +0.54$) is fairly low and significantly different for the r-value for microfauna ($r = +0.99$, $Z = 3.93$). Similar differences in the r-values are observed when comparing mammoths and microfauna in the north and the south separately (see Table V-9). I interpret the low r-values for mammoths to indicate that some bone was procured by activities other than active hunting and that the species was both hunted and gathered. Such an interpretation, however, raised a number of added problems. First, if we consider the large size of the animals, we can anticipate that selective introduction of different skeletal elements to the sites took place. Such behavior would necessarily result in different r-values for this taxon than for smaller sized taxa. As I have demonstrated previously, size alone does not determine the magnitude of the correlation coefficient.. Secondly, data on the skeletal elements present at the sites indicate that such selective introduction did not play a determining role in the structuring of the mammoth remains at the sites. Kornietz (1962), Kornietz et al. (1982) and Shovkoplyas (1965a) have all noted the presence of foetal mammoths at Mezhirich and Mezin. The presence of whole articulated vertebral columns is known from Mezhirich (Soffer 1981). Data from other sites also indicate

an abundance of crania, mandibles, scapulae, metatarsals and metacarpals, and phalanges--in a word, all the skeletal elements appear to be present. While no systematic study has been done to quantify these observations for most of the sites, Pidoplichko does give these figures in his 1976 publication on Mezhirich. They are offered in Table V-11.

Another objection can be raised to my "gathering" hypothesis by pointing to the important role that mammoth bone played as fuel. The burning of bone, especially mammoth bone, is widely reported in the literature. It could be argued that such destructive use of bone could also produce lower r-values for this taxon. While it is more difficult to refute this argument since no studies exist to identify what bones and from what taxa were burned, I would suggest that, pending such studies, it is more reasonable to assume that selection of either taxa or skeletal elements did not play a significant role in burning and argue that all bone was probably used as fuel.

I will examine and test the hypothesis that mammoth bone was gathered later in this chapter. I offer it here to account for the observed differences in the correlation coefficients in the north and the south. If we assume that some bones were collected from "cemeteries", then the presence of such cemeteries either in greater numbers or in more undisturbed condition in the south could result in the observed differences in the r-values, between the north and the south. Admittedly this is a fairly far-fetched explanation and it is offered

here as a suggestion for future research without which the role of mammoths in the economies cannot be evaluated.

In this "gathering hypothesis", I assume that the sites would have been selectively placed near such bone cemeteries out of logistical considerations for the cost of transporting mammoths would have been staggering. Weights of the different skeletal parts of this taxon are listed in Table V-12. Most of the listed values in the table are a result of my weighting of mineralized bones in the collection of the Zoological Institute of the Ukranian Academy of Sciences of the SSR in Kiev. Weights that could not be determined were kindly provided by Dr. N.K. Vereschagin. With this transport cost in mind, it is interesting to note that, by and large, all mammoth skeletal elements are found at the Upper Paleolithic sites where bone dwellings are present. My previous discussion as well as Pidoplichko's figures in Table V-11 indicate that, in certain cases, no selectional transport of mammoth bone was employed at all, and implies that either the sites with dwellings were placed directly on the kill sites or else placed near mammoth bone "cemeteries". The low correlation coefficient for this taxon for the study region as a whole leads me to conclude that the second of the two practices was probably employed and sites were located near these "cemeteries".

The discussed examples of possible effects of cultural practices on the correlation coefficients prevent this index from being an absolute reflection of specific activities.

As noted, the r-value is ambiguous and should be considered only together with a comparison of the Difference of Means calculated both on the MNB and MNI values. I suggest, therefore, that all three together offer a viable entry into the reconstruction of poast hunting behavior and argue that it is the repeated patterning of the data that can be used to evaluate the hunting vs. collecting hypotheses.

(1) Food Species

In this section I will discuss the procurement of taxa used for food, and, using each taxon as a unit of analysis, compare their harvesting in the north and in the south of the study area. I will henceforth use the colloquial names for the taxa. Their latin names can be found in Table III-3.

(a). Mammoths. Mammoths have been found in all of the northern sites and in 83% of the southern sites of the study area. As noted, there is a difference in the correlation coefficients in the south ($r = +0.75$) and in the north ($r = +0.57$), but it is not significant ($Z = 0.43$). Overall, the correlation coefficients for this taxon are lower than those for other food species and I interpret this to indicate that some mammoth bone was also gathered. Similarily, a comparison of both MNB and MNI values for mammoths found in the northern and southern sites shows no significant inter-regional differences (MNI: $z = 0.60$; MNB: $z = 1.28$). This lack of differences in mammoth densities between the northern and southern sites does not support my hypothesis offered in Chapter III on mammoth exploitation. There, after modeling

mammoth behavior and placing the animals in the north for a short two month warm season and in the south for the long eight month cold season, I predicted that if this taxon was exploited in proportion to its availability, we should find approximately four times as many mammoths in the southern sites as in the northern ones. The lack of corraboration for this hypothesis further strenghens my interpretation that a good deal of the mammoth bone was gathered.

At present, therefore, I conclude that mammoths did not play the major role in subsistence that has been widely attributed to them both in Soviet and Western literature. While some mammoths were undoubtedly hunted, how many remains a question for future research to solve. Future research will also have to determine the frequency of mammoth kills, whether they were a seasonal or annual event and, therefore, mammoths played a role in the subsistence, or, if harvesting occurred at long intervals at frequencies similar to those postulated by Steward (1938) for the Shoshone antilope drives (every ten years) or by Frison (1978) for the Paleo-Indian bison kills (every 25 years or so). Since the contribution mammoth meat made to the Upper Paleolithic diets is unclear, I will use two estimates for this taxon in this section: one at 0% (if no mammoths found at the sites came from kills) and the other at 50% (if half of the mammoths found at the sites were hunted). Also, because no differences have emerged in the regional hunting behavior for this taxon (correlation coefficients, MNB and MNI comparisons) I will assume that

man-mammoth relationships were uniform throughout the area.

(b). Wooly Rhinoceros. Remains of wooly rhinoceri have been found at 65% of the sites in the stuby area. In contrast to the mammoths, the bones of this taxon were not used in the construction of dwellings nor have its bones been found in storage pits. The correlation coefficient for this large sized taxon shows high positive values both in the north ($r = +0.96$) and in the study region as a whole ($r = +0.95$--also see Figure V-7 for linear regression plots). Since the species was only found at two southern sites, no correlation coefficients could be calculated for the south and no regional differences examined. The linear regression plot in Figure V-7 for all of the sites, however, appears to indicate that whooly rhinoceros was actively hunted over the entire study area. Remains of wooly rhinoceri are found in much higher densities in the northern sites (MNI: $z = 3.20$). I conclude, therefore, that while this taxon was actively hunted all over the area, they were taken in greater numbers in the north. If the species was exploited in proportion to its availability, then we can anticipate that it was far more numerous in the north.

(c). Steppe Bison. Remains of steppe bison have only been found at the sites with large storage pits and, as I have noted, bison teeth were widely used as decoration. The taxon is represented at 37% of the northern and 57% of the southern sites. While a correlation coefficient for this taxon calculated for the entire study region shows a sur-

prisingly low value (r = +0.43), a great difference (Z = 2.18) exists between the r-values calculated for the north (r =-0.40) and for the south (r = +0.99). This evidence leads me to conclude that 1) the taxon was actively hunted in the south only, and 2) their presence in the north at densities indistinguishable from the south must have resulted from procurement practices other than active hunting. With the data on hand it is not possible to determine just what those practices may have been as both gathering and inter-regional exchange are a possibility especially if we assume that the northern sites mostly contain bison teeth. I will present evidence for regional interactions in a subsequent chapter and show that other items of personal adornment were a part of such networks.

At present, I take the data on hand to indicate that a number of mechanisms existed for the procurement of this species. Biogeographic evidence indicates that steppe bison were found in larger numbers in the southern part of the study area during the Late Pleistocene. Archaeological data from the Russian Plain as a whole also points to their extensive exploitation in the steppe zone located to the south of the study area (see Bibikova and Belan 1979; Boriskovskii 1953; Boriskovski and Praslov 1964, for example). These data support my conclusion that steppe bison were hunted only in the southern part of the study area.

(d). Wild Cattle. Cattle identified only to the genus Bos sp. were reported at two sites: Berdyzh and

Zhuravka. In both cases no estimates exist on the MNB counts found. Therefore no coefficients could be calculated for this taxon and no interregional comparisons made. I have, therefore, arbitrarily decided to treat this taxon together with the steppe bison in all future calculations but will not assume that they were actively hunted except in the south.

(e). Musk Oxen. This taxon was only found at three sites, two in the north and one in the south. Quantified data on the MNB and MNI values exist only for Dobranichevka and Mezin. As Table V-7a shows, only 14% of the sites in the study area contain remains of this taxon. Wilkinson (1974) has argued that the logistics of hunting musk oxen are such that the taxon very rarely plays a role in the subsistence practices of hunters and gatherers and is only taken opportunistically when accidentally encountered. The low profile this taxon shows at the Upper Paleolithic sites in the study region indicates that similar man-musk oxen relationships existed there as well. While a comparison of the number of musk oxen found in the northern sites (both MNI and MNB) is considerably larger than in the south, these differences, in all probability, are insignificant. All that can be concluded from this discussion is that musk oxen did occassionally contribute to the diet at both northern and southern sites but such contribution was irregular and resulted from opportunistic encounters with the species.

(f). Horses. Remains of horses were found at 7 (50%) of the northern and 3 (43%) of the southern sites. While, as Figure V-8 illustrates, the correlation coefficients from the two parts of the study area show sizeable differences ($r = +0.76$ in the north and $r = +0.99$ in the south; $Z = 2.29$), north to south comparisons of the MNB and MNI values show no such disparities. Since horses are found at about the same proportion of the sites and at similar densities in both the north and south, I interpret the differences in the r-values to suggest that while horses at southern sites came exclusively from active hunting, those in the north may have been procured through other strategies as well. Horse teeth, like those of steppe bison and wild boras were also used in decoration. It is possible that at some sites northern especially this taxon is mostly represented by teeth. While quantified information does not exist for the content of the storage pits at the sites in the study area, Shovkoplyas (1965a) did report the presence of horse crania, mandibles, and long bones at Mezin with Pidoplichko (1976) reporting the same at Mezhirich. This indicates that parts other than teeth were found at the sites as well.

In summary, the data on hand indicate that horses were hunted in both parts of the study area.

(g). Reindeer. I have already discussed the reindeer data from the study area and postulated that this taxon was both actively hunted and collected during the Late Pleistocene. While both the MNB and MNI values for reindeer

show that approximately the same proportion of southern sites have reindeer as northern sites (about 50% for both MNI and MNB), the correlation coefficients are significantly different between the north and south (north r =+0.99; south r =+0.53; Z = 1.78). This difference supports my conjecture that reindeer were actively hunted only in the northern part of the area while the antlers present at the southern sites were procured by collecting. It is also possible that antlers, an important raw material used extensively for tool manufacturing, may have traveled along exchange networks and that at least part of the antlers got to the southern sites through exchange. While this conclusion does not preclude occassional taking of a small number of reindeer in the southern sites through hunting, the bulk of the evidence points to the prevalence of the role of collecting. In further calculations I will, therefore, assume that active hunting of this taxon occurred in the north only.

These observations on the procurement practices also suggest that the taxon may have been a migratory form at least in the southern part of the study area while the northern region may have had a more sedentary reindeer population.

(h). Other Antlered Taxa. A small number of other deer species (giant deer, red deer, deer sp.) have been found and quantified at four northern sites. The scarcity and disparity of these taxa have led me to group them

together for the purposes of evaluating the relationship between their MNB and MNI counts. The correlation coefficient, as shown in both Table V-8 and Figure V-6, is a perfect positive value of r =+1.0. This value, together with the locus of these taxa in the north, lead me to conclude that these taxa, like reindeer, were actively hunted in the north only. The presence of an unquantified amount of bone assigned to one red deer at Zuravka may, therefore, have come from collecting activities.

A camparison of the MNI mean values for these taxa found in the north to those found in the south shows no significant differences and points to the minor role that these animals played in the economies in the study area as a whole. They are found in approximately the same proportion of the sites in both the north and the south (31% in the north, 25% of the sites in the south).

A comparison of the r-values for reindeer to those for all antlered cervids in the north show no significant difference between them (Z = 0.80), and support my hypothesis about the role of these cervids in the Upper Paleolithic economies.

(i). Wild Boar. Remains of wild boar, primarily, if not exclusively represented by teeth, have been found and quantified at one northern site and two southern sites. The hypothesis I offer for the role of this taxon in the subsistence practices comes from a very small sample size and should be taken as a tentative estimation at best.

First, both the MNB and MNI comparisons between the northern and southern sites show that this taxon was found in considerably larger numbers in the south. This observation conforms to the paleoenvironmental reconstruction for the area offered in Chapter III which projected a greater presence of deciduous forests in the south. The archaeological record shows that not only were the remains of wild boars more abundant in the southern sites but also that a large proportion of the southern sites (43% on MNI estimates and 33% on MNB values) have this taxon present than found in the north (8% of the sites on both MNI and MNB values). A correlation coefficient calculated for the area as a whole for this taxon yielded a moderately high value of $r = +0.75$ ($p => 0.1$) which is ambiguous (see Figure V-9).

As I have discussed earlier, this taxon is often represented by teeth and the presence of teeth does not necessarily signal active hunting. Since we know that boar teeth were used as decoration, it is interesting to look at the sites with boar teeth in greater detail. The teeth have only been found at sites used as winter base camps (Chapter VI). These sites show a presence of both numerous and diverse features and contain exotic materials. This co-occurrence is interesting and suggests that boar tooth decorations need not have resulted from active hunting alone. While I suspect that collecting and exchange possibly played a role in the movement of wild boar teeth across the landscape, I lack data to evaluate this proposition at present.

I will, therefore, assume that some hunting of this taxon did occur and occurred more often in the south.

The taxa discussed above have been considered primarily as contributing to the Upper Paleolithic diets. Given the ample ethnographic evidence on the use of hides from food species, we can anticipate that the hides of these taxa were also utilized as were their bones for bone tool manufacturing. In this work, however, I will just consider their role in the economies as food resources. The following three species, however--marmots, beaver, and hares--clearly served a dual purpose of providing both energy as well as furs. Soviet researchers point to the systematic presence of both butchering and skinning marks on the bones of these taxa and note that the bones are often charred and cracked (see Pidoplichko 1969, 1976; for example). My own analysis of the lagomorph and marmot remains found at the sites fully supports this interpretation as well.

(j). Marmots. Remains of steppe marmots have been found and quantified (both MNB and MNI values) at five of the sites in the study area. While no differences exist in the mean densities of either MNI or MNB counts found in the north and the south, a comparison of the ratio of sites with marmots shows that approximately twice as many southern sites as northern sites have this taxon (MNI: 23% of the northern and 57% of the southern sites; MNB: 15% of the northern and 50% of the southern ones). I interpret this to indicate a greater abundance of marmots in the south in general

during the Late Pleistocene.

Because of the small sample size of sites with this taxon, correlation coefficients could not be calculated for the northern sites. The r-values for the southern sites ($r = +0.99$) as well as for the study area as a whole ($r = +0.94$) can be found in Table V-8 and the regression plots in Figure V-10. The table shows very similar r-values and leads me to conclude that marmots were hunted over the entire region. Since marmots were only available seasonally they were, in all probability, taken in late summer-early fall months (see discussion of marmot ecology in Chapter III). The differences observed between the ratios of sites with marmots in the north and south suggests that the taxon was both more abundant in the south and hunted there more frequently.

(k). Beaver. This taxon is represented by the remains of one individual at one site, Yudinovo and therefore, of little significance. Its scarcity at the sites suggests that the taxon did not play any significant role in the Late Pleistocene economies and its very rare procurement was probably highly opportunistic.

(l). Hares. Both MNI and MNB calculations indicate that hares were found at more than 50% of both the northern and southern sites. Their frequency at the site, surpassed only by some gregarious herbivores, indicates that this taxon was systematically rather than opportunistically procured. While a comparison of the overall differences in

the mean numbers of hares per m^2 at the northern and southern sites did not show significant differences, the plotting of the MNB to MNI relationship (see Table V-8, Figure V-11) shows the presence of two types of sites with hares in both the north and in the south. As I will show in a discussion of fur bearing carnivores, this occurrence of two sample populations of sites (one with high and the other with low densities of fur bearers) is characteristic for the distribution of all fur bearers, and is related to the fur procurement and processing needs more directly than to the nutritional requirements. The sites having high mean numbers of hares (MNI and MNB values) as well as those having low densities are listed in Table V-8. The numerous Difference of Means Tests run both on the MNI and MNB values to distinguish these two groups of sites can be found in Table V-10. They show that in both regions considerably greater numbers of both bones and individuals (MNI--170 times greater in the south and 25 times more in the north at the high density sites; MNB--25 times more prevalent in the south and 2 times more prevalent in the north) are present at the high density sites. A comparison of the high density northern sites to the one high density southern site (Mezhirich) showed 11 times higher values for individuals and 199 times greater densities of MNBs in the south ($z = 47.5$ and $z = 1719.0$ respectively). No differences exist between the densities of either MNB or MNI values at the low density sites in the north and in the south. I

interpret these statistics to indicate that: 1) differential use of the taxon existed in both the north and the south, with greater use at the high density sites, and 2) hares played a greater role in the economy of the southern high density sites than they did in the northern ones.

A calculation of the correlation coefficeints for hares was first done for all of the northern and all of the southern sites. It showed a very high r-value for the southern sites ($r = +0.99$) and a significantly lower one for the north ($r = +0.25$; $Z = 2.08$). This indicates that active hunting played a significant role in the procurement of hares in the south only (for linear regression plots see Figure V-10a, b, and c). Because of sample size problems, a separate calculation of the correlation coefficients for the observed two groups of sites could only be done for the high and low northern sites and low southern ones. As Table V-10 shows, they indicate no correlation at all at the northern low density sites ($r = +0.02$) and a fairly high negative one at the high density sites ($r = -0.96$). The r-value at the low density southern sites is $r = +0.99$ and for all the southern sites $r = +0.99$. These values further strengthen my arguement that active hunting played a role in hare procurement in the south only.

The projection of active hunting only for the southern sites, however, still leaves open the question of procurement strategies employed which resulted in the presence of hares at the northern sites. As I have discussed at the beginning

of this chapter, a myriad of cultural practices affect the faunal record found at archaeological sites. In the case of fur bearers, the spatial separation of procurement and processing activities would profoundly affect the structure of the remains found at the sites. In the particular case of hares, the similarity of their behavior in faunal assemblages to that of fur bearing carnivores, strongly implies that this taxon was important for its fur.

As will be shown in Chapter VI, the presence of fur bearers (including hares) at high densities at some of the sites is strongly associated with the presence of exotics. Both exotics and numerous fur bearers have been found at the more elaborate sites of the study area. The concentration of such activities as fur procurement or processing, importation of exotics, and the construction of elaborate features all point to a behavioral complex at some sites that is not directly related to simple subsistence needs. These considerations lead me to conclude that the presence of hares at all of the northern sites can better be explained by invoking exchange rather than active hunting.

(m). Birds. Bird remains in small MNI values but belonging to many taxa have been quantified at only four sites. I have elected to treat them summarily in this discussion and their densities per site can be found in Table V-6. The proportion of the sites with birds appear to be about equal in both the north and the south when calculated on the MNB values, while the MNI values show approximately

two times as many birds present in the south. These differences, however, as Table V-10 shows, are not significant (MNI: z = 0.19; MNB: z = 0.51).

The small sample size of sites with birds precludes me from separately calculating the correlation coefficients for the north and the south. The calculation done for the study area as a whole (illustrated in Figure V-12) shows a very high positive correlation of r =+0.96. I interpret the observed distribution of the data to indicate that: 1) birds were actively hunted over the entire study area, 2) they did not play an important role in the economies of the Central Russian Plain, and 3) they were, most probably, exploited opportunistically.

In a discussion of the season of occupation of the sites at the end of this chapter, I will show that most of the energy contributed by this taxon came from one species--the willow ptarmigan which was used as a winter "starvation food" (for ethnographic confirmation of this role for the willow ptarmigan see McGovern et al., in press, with references and Watanabe 1969, for example).

(n). Fish. Fish remains, like those of birds, have been documented only for a small proportion of the sites in the study area. As Table V-7 shows, fish have been found at about 15% of the sites (both MNI and MNB values). The role of fish, especially anadromous fish, in the diets of Upper Paleolithic hunters and gatherers has recently received a great deal of attention. Some researchers have postulated

that: 1) fish contributed a far greater proportion of calories to the diets than hitherto considered, 2) the small numbers of fish remains found at the sites can be attributed to faulty recovery techniques, and 3) since fish remains are subject to greater destruction than mammalian remains they should be present in lower numbers at the sites than mammals (see, for example, Casteel 1976, Jochim 1979, Marschack 1979, and White 1980).

While these observations are both pertinent and interesting, the data from the Central Russian Plain doe not fully support the conjecture that fish were heavily exploited. The lack of sifting or floatation in the excavation repertoire of Soviet researchers has been noted previously. To date neither is a standard procedure at excavations. Such recovery procedures, however, were employed at three sites: Eliseevich, Mezhirich and Mezin. Polikarpovich (1968) in his monograph, Paleolit Verhnego Podnestrov'ya, described the use of washing and floatation during the 1946 and 1948 field seasons at Eliseevichi. He had spent some time during the Second World War with a geologic expedition in Asia where he learned this recovery technique and implemented it upon his return to Eliseevichi. It netted him the recovery of between 14 and 27 crystalline fish eye lenses which he identified as belonging to the Cyprinid (carp) family. In Table II-3 I list both the numbers of these lenses and the MNIs they represent as ranging from 7 to 14 because my own subsequent research showed some of the lenses

to be nonorganic in nature. The presence of crystalline fish eye lenses at Eliseevichi intrigued me long before my first fieldwork in the USSR because I had found no mention anywhere in the literature of the recovery of this element. While in the USSR in 1977-1978, I was able to locate and examine only 11 of the original 27 found. Since I could not ascertain who had made the original identification of the lenses (Polikarpovich was an archaeologist who had Dr. N.K. Vereschagin at the Institute of Zoology in Leningrad do his faunal identifications) as Dr. N.K. Vereschagin (1978, personal communication) had only identified the mammalian, avian, and rodent remains, I submitted the lenses for spectral analysis to the Institute of Geology in Moscow. The results of this analysis showed that six items were non-organic in nature (glayed loess particles, quarts grains, etc.) while the remainder were possibly organic. The remaining five orgainic(?) pieces were examined by Dr. E. Sychevskaya, an ichtyologist at the Paleontology Institute in Moscow. She stated (1978, personal communication), that, while, she had never come across fossilized and preserved remains of crystalline fish eye lenses, at least one of the samples did resemble the lenses of the Cyprinids. In short, Dr. Sychevskaya concluded that the particular specimen could belong to the Cyprinids as identified by Polikarpovich. I have, therefore, arbitrarily decided to assume that only half of the lenses reported by Polikarpovich were such, treat both the MNB and MNI as a range, and use

a means value in the calculations.

Washing and sieving at Eliseevichi did recover both fish and rodent remains during the 1946 and 1948 excavations that were not found in 1935 and 1936 field seasons when this recovery procedure was not employed. The small number of fish remains recovered out of a total of 15,689 MNBs reported by Vereschagin and Kuzmina (1977) (a number that does not include "many thousands of mammoth bone fragments") suggests that fish did not consitute a significant or important component of fauna at the site.

Similarily, Pidoplichko (1976) employed sifting in his excavation at Mezhirich and both he and Shovkoplyas (1965a) at Mezin. While this procedure, as at Eliseevichi, recovered a great deal of microfauna and some avian remains, it recovered no fish remains. Having been trained in the needs of employing rigorous recovery techniques in excavation, both in theory during my graduate training and in practice while excavating with Dr. J. P. Rigaud at Vaufrey and Dr. H. deLumley at Lazaret, my immediate instinct upon reaching Mezhirich during the 1978 field season was to institute both dry sifting and floatation. The net results of this experiment of "New Archaeology" confronting "Old Archaeology" was the recovery in two field seasons (1978, 1979) of one vertebrae of an aged pike. The identification of the vertebrae as well as its ageing (about eight years) was kindly provided by Dr. E. Sychevskaya (1978, personal communication). While it can be argued that most of the

1978 and 1979 excavations of dwelling #4 and the surrounding area at Mezhirich (see floor plain in Figure II-19) were done above the cultural layer and that once the whole layer is excavated many more fish remains will be found, I suspect that this prognosis constitutes just wishful thinking. Fish remians, by and large, are either not there or there in such small numbers that they do not warrant claiming an important role for fish in the Late Pleistocene economies of the Central Russian Plain. One of the reasons for this, as will be shown at the end of this chapter as well as in Chapter VI where I will present a typology for the sites, is that the majority of "high visibility" sites in the area (i.e., those having mammoth bone features) are cold-weather occupations. As Table III-3 indicates, fish remains have also been found at Chulatovo I and Novgorod-Severskii. These sites will be typed as warm-weather occupations. Both of these sites, as noted in Chapter II, were redeposited and, therefore, could not be included in this discussion.

In summary, then, although I admit that fishing did play a role in the overall subsistence economies and that both direct evidence of fish remains as well as indirect evidence exists (one possible bone fishing hook at Mezin reported by Shovkoplyas 1965a as well as the predominance of water-related motifs in the ivory engravings from the study area reported by Marshack 1979), I do not see the archaeological and faunal evidence on hand supporting a major role for fish procurement on the Upper Paleolithic

Central Russian Plain.

The advantages and disadvantages of dependence on fish have been recently cogently discussed by Schalk (1977) whose research has put a damper on the often assumed equasion of fish (especially anadromous) equal a predictable high yield resource.

The density controlled counts of fish remains from the study area are listed in Table V-6. The Difference of Means tests in Table V-10 show that northern sites had both a significantly larger number of fish bones as well as individuals. The small sample size of sites used in these calculations, however (N=3), preclude me from drawing any firm conclusions about the significance of these differences. A calculation of the correlation coefficients for fish remains done for the study area as a whole shows a very high positive value of r = +0.99. As the scatter plot of this linear regression in Figure V-13 shows, the correlation is strong. I conclude that fishing was practiced all over the study region but that fish were not a major food resource during the Upper Paleolithic period.

(2) Conclusions on the Food Species

In the foregoing discussion I have suggested that the following species were actively hunted for food in the different regions of the study area:

SPECIES	NORTH	SOUTH
Mammoths	+(?)	+(?)
Wooly rhinoceros	+	+
Steppe bison	-	+
Wild cattle	+(?)	+
Musk oxen	+	+
Horse	+(?)	+
Reindeer	+	-
Other antlered taxa	+	-
Wild boar	+(?)	+
Marmots	+	+
Beaver	+	-
Hares	-	+
Birds	+	+
Fish	+	+

\+ active hunting, fishing
\- not procured by hunting
(?) role of active hunting problematic

In order to test the validity of my conclusions about the differential role that active hunting (or fishing) played, I calculated the MNB-MNI correlation coefficient for large sized food species in the overall study area first without any differences in procurement strategies being taken into account ($r = +0.64$) and then excluding taxa not actively hunted from the northern and southern regions ($r = +0.94$). As Table V-8 shows, the observed improvement in the positive correlation obtained when the role of active hunting was considered in the calculation is significant ($Z = 2.25$). The addition of small sized food species, also calculated with regional differences in the procurement strategies in mind, did not, as can be seen in Table V-8, significantly lower the high positive correlation (for all sized food species $r = +0.93$). The linear regression for all food species is illustrated in Figure V-14. The r-values

calculated spearately for the northern and southern sites that considered the role of active hunting also do not show significant differences (north: r =+0.93; south: r = +0.99).

While a comparison of correlation coefficients calculated on microfaunal remains (done separately for the north and south) with those obtained for food species showed no differences, differences can be observed in the r-values between the food species and mammoths (see Table V-9). The difference in the correlation coefficients for the summarized food species in the north (r =+0.96) and mammoths in the north (r =+0.57) is significant (Z = 1.94). A similar difference is present in the southern sites between the r-values for summarized food species and for mammoths (food: r = +0.99; mammoths: r =+0.75; Z = 2.07). These observations conform to the general pattern observed in the behavior of mammoths when compared to food taxa separately and lead me to include this taxon in the food species list on page as a food source of undetermined importance.

The similarity of r-values for microfauna to those for the summarized food species suggests a high rate of transport for the food species. Specifically, since microfauna found at the sites can be expected to have died at the sites, the high correlation coefficients for food species suggest that most of these taxa were also brought back to the sites without much processing done away from the sites. Such transport behavior can be expected in storage economies where cacheing of food provisions is done at or close to

the sites. This expectation runs counter to much of the recent ethnoarchaeological information provided by Binford (1978) on the curation and processing of food among the Nunamiut and the Navaho. I suggest, however, that this disparity between my data and Binford's is more apparent than than real and is due to the coarse scale of my data (unqualified MNB and MNI counts).

Having outlined a general model for hunting behavior on the Upper Paleolithic Central Russian Plain, it is interesting now to consider regional differences in the densities of food species. The comparison of density controlled Differences of Means done on both the MNB and MNI values excluding mammoths and including only those species actively hunted shows no significant differences between the northern and southern sites (see Table V-10). The only regional differences that can be observed are a greater number of both MNI and MNBs for musk oxen and fish at the northern sites, and for wild boars at the southern ones. As noted earlier, these differences probably just reflect biogeographic differences in the distribution of these taxa across the Late Pleistocene landscape.

Both regions, however, have high and low density food sites. The presence of these differences reflects the existence of different settlement types and will be evaluated in the context of the discussion of site typologies and settlement systems in Chapter VI.

(3) Calories on the Central Russian Plain

The faunal record from the study area shows, both in the number of sites and in the densities per site, that large gregarious herbivores were an important source of food. Regional differences existed in what taxa were exploited there--differences that, in all probability, reflect Late Pleistocene biogeography. Thus, the groups in the south focused more on steppe bison and horses while the northern inhabitants exploited reindeer. Gregarious herbivores, however, were not the sole or even the most important source of food. As can be seen from Table V-7a and b, solitary wooly rhinoceros were found at a large number of the sites in the north (54%-MNI). Both marmots and hares were found in sizeable numbers as was a mix of other both large and small food species at the sites. In order to evaluate the contribution to the diet that these different taxa made, I have transformed the faunal data on food species into density controlled Kcal calculated per taxon, per m^2, and per site. I have elected to evaluate the contribution to the diet by looking only at energy values (Kcals) even though recent research is suggesting that other nutrient values may be more relevant (see Keene 1981; Reidhead 1979, 1980; Speth and Spielman 1983, for example). I do so because no nutritional values other than Kcal exist in the literature for the extinct taxa exploited on the Central Russian Plain.

Table V-13 lists these values per taxon in rows 1-15.

Since it is impossible, at present, to determine what contributions mammoths made to the diet, I have decided to list this taxon in Table V-13 in three values: if all mammoths were a food resource their Kcal contribution can be found in column 16, while the Kcal value for half of the mammoths is listed in column 17. Total Kcals contributed with all the mammoths considered are in column 23. All Kcal values per taxon are based on the data presented in Table III-16. The Kcals per individual per taxon per m^2 listed for the sites in Table V-13 were derived as follows:

$$\text{Kcals per } m^2 = \frac{\text{MNI}}{m^2} \text{ X Kcals per individual}$$

Since using other data, I have postulated that active hunting did not play a role in the procurement of some taxa. In Table V-13, I decided to evaluate what effect the exclusion of species not hunted would have on the overall summary of Kcals per m^2 at the sites. Because no regional differences were observed for mammoths, I evaluated the effect of excluding species not hunted without using mammoth values. Column 18 summarizes the Kcals per m^2 per site without taking active hunting into account while column 19 lists values calculated only on taxa actively procured in the north and in the south. Column 20 lists the degree of similarity between the values in columns 18 and 19, and column 21 the proportion of the difference. As can be seen in column 21, the maximal difference in Kcal values is 32%

and such high differences are found at only two of the sites. The other differences are all well below 20%. I conclude, therefore, that controlling for the role of active hunting does not significantly depress the Kcal values per site and will only use values in all future calculations for those taxa that were actively hunted at the sites. These differences become totally meaningless if mammoth Kcals are added to the values.

Table V-14 a-c presents the proportional contribution each taxon made to the Kcals at the sites: Table V-14a if no mammoths were actively hunted, Table V-14b if half of the mammoths found were hunted, and Table V-14c if all mammoths at each site were actively hunted. Regional north-south comparisons on the contribution of each taxon to the diets are offered in Table V-15 a-c--again in three versions depending on the proportional presence of mammoths. Differences of Means tests comparing north and south Kcal data is in Table V-16. I calculated the Difference of Means values only at two mammoth proportions: if no mammoths were eaten and if 50% of the mammoths were consumed. No calculations were done using all of the mammoths because of the swamping effect that inclusion of all mammoths have on the Kcal values which totally erases any potential differences in the data. Figures V-15 a-d illustrate the contribution of the different taxa to the Late Pleistocene diets of the hunters and gatherers on the Central Russian Plain both if no mammoths were taken and if half of the mammoths were

consumed.

Lastly, it is important to note that while there are no overall differences in either the MNB, MNI, or Kcal estimates between the northern and the southern sites, using the Kcal values we can monitor the presence of both high and low food density sites in the north and south. Density controlled values for MNB, MNI, and Kcals are significantly higher at Khotylevo II, Mezin and Pushkari II in the north and at Mezhirich in the south. These differences, however, are muted when chronology is not controlled and I will consider them in detail after examining possible changes in the subsistence practices in the area through time.

(4) The Subsistence Base

(a). The Herbivores. I have already discussed the problematic role of mammoths in the subsistence practices of Upper Paleolithic hunters and gatherers on the Central Russian Plain. Similar difficulties also exist with the second largest herbivore--the wooly rhinoceros. While the correlation coefficients presented earlier suggest that this taxon was actively hunted, the distribution of the MNIs show a strong regional difference and imply that the wooly rhinoceros played a far more important role in the north. This point is clearly illustrated in Figure V-15c which compares the Kcal composition of the sites in the north and in the south. If we look at Table III-6, we can see that overall, this taxon is found in only 11 (46%) of the sites in the study area. Its Kcal contribution, however, seems

overwhelming at those sites where found as well as in the northern region as a whole. No information exists on the skeletal elements of this taxon at the sites, and its bones did not contribute significantly to the construction of bone dwellings or figure prominently in the storage pits. In addition, bone elements of the wooly rhinoceri are quite distinct structurally, and, therefore, the identification of them as to taxon can be expected to occur at fairly high rates. Although the species is thought to have been fairly solitary (Vereschagin 1979), its large size and defensive behavior suggest that it would best have been persued by a group of hunters. The overall size of the animals (estimated in Table III-16 at 1200 kg live weight and a total of 1,260,000 Kcals for the animal) was such that one kill would have provided a vast amount of storable food supply and in yield it can be considered analogous to aggregations of smaller gregarious herbivores. Lack of data on the seasonal behavior of wooly rhinoceros do not permit a consideration of seasonal implications for its harvesting.

Smaller sized gregarious herbivores (horses, steppe bisons, reindeer, etc.) are found at the vast majority of the sites (in 81% for the entire region; at 79% of the northern and 86% of the southern sites). This fact together with the Kcal contribution they made to the Late Pleistocene diets (38% of Kcals if mammoths are excluded from consideration) suggests that they figured prominently in the subsistence practices. As I have already discussed in Chapter

III, different taxa in this category probably had different aggregation schedules in Late Valdai, and would have been optimally harvested at these times of peak abundance. The presence of storage economies in the study area indirectly confirm this prediction, and I conclude that 1) these species were hunted by fairly large sized groups of hunters also, and 2) that they figured prominently in the scheduling decisions employed in the area. While regional differences exist between the northern and southern sites in the types of gregarious herbivores exploited, as Tables V-7 and V-15 show, no significant differences exist in either the Kcals available in the two regions or in the overall numbers of animals found.

(b). Small Sized Fauna. The faunal data from the Central Russian Plain do not confirm the interpretation found too often in the literature that the Late Pleistocene groups there were exclusively large game hunters. While the bulk of Kcals (see Figure V-15a-c) did come from the large sized herbivores, strong evidence exists also for opportunistic exploitation of other taxa as well. Wild boars, fore example, because of the high Kcal values, overcome the swamping effect of large sized herbivores in the southern part of the region especially (Figure V-15a shows 4% of the Kcals in southern sites came from this taxon).

Part of the difficulty in evaluating accurately the importance of the smaller sized fauna in the subsistence

practices comes from the variable I selected to measure--Kcals. Since this value is highly sensitive to the size of the animal, such large size disparities as observed in the Central Russian Plain fauna are bound to mask other pertinent variables. Speth and Spielman (1983), as noted before, have offered the fat content of taxa in northern latitudes as a variable to consider when evaluating subsistence practices. Their suggestions that fat plays a crucial role in diets of northern latitude populations appear most germane for this study. It accounts nicely for the exploitation of such species as wild boars and marmots--both very fat intensive taxa.

The southern sites have more fat species as well as a greater overall mix of food species. The narrower range of resources in the north together with the predominant exploitation of leaner herbivores (e.g., reindeer and horses in contrast to the steppe bison in the south) may also account for the greater role that wooly rhinoceri played in the north. As Table III-16 shows, this taxon yielded approximately 1,750 Kcals per kilogram of live weight, a value considerably higher than for most other herbivores. These observations are offered here not as a definitive statement on the subsistence base in the study area (the ecological and archaeological data on hand are too problematic to test the implications of these variables) but rather, I offer them here as areas for future research to take.

(c). Implications for Hunting Strategies and Technologies. The nature of the species exploited as food carry a number of implications for both the hunting technologies and hunting strategies.

A number of researchers including Vereschagin (1972) have suggested that different tool types were used in hunting different taxa during the Upper Paleolithic. Gvozdover (1974) reviewed this hypothesis and found absolutely no relationship between the lithic tool types present at the sites of the Russian Plain and the species exploited. The methods as well as the types of weapons used to harvest the food species thus remains problematic. While the use of various spears and lances is widely accepted for the Upper Paleolithic of the study area, the use of bows and arrows is a point of debate. Praslov et al. (1981) have recently advanced a strong argument for the use of arrows in the Kostenki-Borshevo region. Gladkih (1973), as noted in Chapter IV in a discussion of the stylistic dating of the sites, has shown a fairly high rate of microlithization of tools at some of the southern sites. While he has not addressed the question of the function of these microliths, their presence can be taken to suggest a possibility that arrows were in use as well.

The question of just how large-sized herbivores such as mammoths and wooly rhinoceri were hunted during the Late Pleistocene has been a subject of much speculation on both sides of the Atlantic (see Freeman 1975; Frison 1978;

Pidoplichko 1969, 1976; Saunders 1980; and Vereschagin 1971, for example). A variety of methods have been offered including mass drives and individual stalk and kill strategies. While data on the use of these strategies during the Late Pleistocene do exist, no empirical studies have been done on Soviet data to substantiate the various hypotheses. As discussed in Chapter III, the idea that large herbivores were taken as herds cannot be clearly demonstrated. Even though we cannot state just what sorts of weapons were used to kill the various taxa, the broad variety of species exploited does point to a probable existence of a number of harvesting techniques.

The relationship between the type of resources hunted and the strategies employed has been widely explored in the literature. Woodburn (1972:199), addressing strategies employed in hunting large animals, states that: "...where the number of hunters is greater, the interval between kills are not only smaller but more equal in length. Wilmsen (1970), in modeling Late Pleistocene human ecology, used the patterns observed in the predator-prey relationship of nonhuman species to suggest that hunting of concentrated large species is best achieved through group efforts that involve the participation of a number of hunters. Bishop (1973), based on a consideration of data accumulated by Rogers on the Ojibwa, concludes that the number of large game animals taken per capita increase with the number of men participating in the hunt and that maximal efficiency is

attained when six to seven men are involved. He notes a decline in the per capita of kills when either this optimal size is decreased or increased. It is interesting to note that recently Johnson (1982) has considered the relationship of group size and information processing and offered similar figures of six individuals as representing a threshold in both comfortable and effective information exchange among egalitarian groups. In discussing the "scalar stress" thresholds present in the interaction among egalitarian groups, he notes that when the number of interacting units exceeds six then either temporary hierarchies are established or the second option of group break-up comes into play. The empirical evidence on the number of hunters involved in Ojibwa hunts conforms nicely to Johnson's observations.

Cooperative efforts by a number of hunters is implied by the presence of both large-sized taxa and the sizeable numbers of smaller gregarious herbivores at the sites. The harvesting of small numbers of solitary species such as wild boar, musk oxen, and red deer indicates the use of single stalk and kills as well. Pidoplichko (1976) has also suggested that snaring was widely used in taking such small animals as the willow ptarmigan and possibly hares. Fish harvesting techniques are more difficult to reconstruct. As noted before, however, the discovery of a part of a bone fish hook at Mezin suggests that this method was employed. The small numbers of fish found at the sites, if not solely

due to taphonomic factors, also tend to imply that such mass harvesting techniques as netting or construction of fish damns were not in use during the Upper Paleolithic period.

This discussion of the optimal group size for harvesting of gregarious herbivores also carries implications for the size of the coresidential group. The cooperative hunting efforts of six to seven men means that, at least during hunting times, the total group size of the coresidential unit would number 30-35 people (assuming a mean number of five individuals per family for each hunter). As numerous authors have pointed out, exploitation and processing of seasonally available large clumps of resources such as gregarious herbivores is a labor-intensive activity as is the processing of the animals killed in such hunts. In those economies where forms of portable storage were practiced (e.g., the making and transportation of dried meat), such as among the Plains Indians in the New World, the requirement of manpower both for hunting and processing was combined in a short period of time. When the requirements for manpower for hunting is combined with the technology of nonportable storage (i.e., storage pits), we see a multiplication of labor requirements. In such cases not only is planning and scheduling necessary for the hunt itself but also for the construction of the storage facilities before or after the hunt. Both Riches (1979) and Schalk (1977) have recently argued that often it is the

manpower to process the harvested resources that is the limiting factor among hunters and gatherers.

It could be argued that both Riches and Schalk have considered only manpower limitations in fish harvesting and that those are unique because harvesting takes place in warm weather months and the catch must be quickly processed before it spoils. I argue that similar constraints can be seen functioning in the exploitation of the gregarious herbivores as well. As Wheat (1972) first noted, Paleo-Indian bison kills in the New World show that large numbers of the killed bison were not utilized at all or only partially utilized. Such under-utilization has been interpreted as indicating a lack of resource management among the hunters and gatherers. I suggest that such behavior can better be understood if we take into account the manpower limitations involved. While, Frison (1978) and Wheat (1972) have shown, the bison, once set in motion will literally kill themselves, much greater manpower is needed to both process and transport the kills than is available at the time of the kill.

Unfortunately, no unequivocable kill sites have been found to date on the Central Russian Plain. The only kill site known from the Upper Paleolithic Russian Plain, Amvrosievka, is located well to the south of the study area. Boriskovskii (1953) reported that over 950 steppe bison were found at the site but offered no information on the extent of butchering there. Information on the skeletal

elements present at the Central Russian Plain sites is also lacking, and thus, does not permit me to consider the processing sequences involved in the procurement. I have previously suggested that procurement of the stored resources was done close to the sites with storage pits. Such synchronization of procurement, processing, and storage in non-movable facilities would also select for large group size among hunters and gatherers. Specifically, I am suggesting that while hunting of large-sized herbivores favored the cooperation of at least six to seven hunters and their families, the processing and storage in pits of the animals taken, required additional labor input.

This requirement for greater labor input, in turn, favored a decrease in the fluidity in group membership widely reported for some present day hunters and gatherers. Group fluidity reported by Lee (1979) and Yellen (1977) for the !Kung San has been adopted all too readily as a model for all hunters and gatherers. Individual or family mobility can be anticipated in nonstoring economies where the subsistence risk is primarily transferred into various social channels (see Weissner 1982b for a discussion of risk minimization). A reduction of both individual and family mobility can be expected among logistically organized groups who use non-mobile storage for risk minimization.

The origins of storage are a moot question and not germane to this work since we find evidence for storage in

both early (e.g., Berdyzh) and late sites in the study area. What is important, however, is a realization that once storage comes into existence--whether provoked by ecological man-land or man-man factors--it favors both greater group sedentism as well as a decrease in the fluidity of membership in the coresidential unit.

The relationship between storage and increased sedentism has recently received a great deal of attention in the literature. While some researchers, as noted before, favor looking at social factors as independent variables and others as natural factors, the connection between reduced residential mobility both on an individual family level as well as on the level of the residential unit itself seems firmly accepted (see Bender 1978, 1981; Hitchcock 1982, for example). Hitchcock (1982:235) writes that:

> Mobility reduction occurs in a variety of contexts...It is a complex process involving a wide range of variables, all of which must be examined if we are to understand organizational changes in human adaptation.

The extent of this residential stability or the duration of sedentism at the study sites, as well as the social implications of such reduced mobility, will be examined at the end of this chapter as well as more extensively in Chapter VI. I have raised the issue here both to 1) classify the Upper Paleolithic hunters and gatherers in

the study area as logistically organized groups, and 2) to indicate that, given the exploited resources and the use of storage, we can anticipate finding evidence of greater sedentism in the study area.

(5) The Fur Bearers

Fur bearers were exploited extensively in the study area and various parts of these taxa were used to satisfy clothing, raw material, and decorative needs. Carnivorous fur bearers, like hares, are differentially distributed in both regions of the Central Russian Plain. Difference of Means tests (Table V-10) on both the MNI and MNB values show that fur bearers are found at both high and low densities at both the northern and southern sites. For example, while the summarized MNI values for arctic fox densities show no overall differences between the northern and southern sites ($z = 0.18$), sites with high density of fox remains in the north have twice as many individuals ($z = 1.82$; $p = 0.08$) as the low density northern sites; in the south, the one high density site, Mezhirich, has more than four times the number of foxes as the other southern sites ($z = 6.97$).

A comparison of mean wolf densities between the two types of sites in the north and in the south similarily shows significant differences--four times as many wolves are found at the high density sites in the north ($z = 2.82$) and eight times as many wolves in the southern high density site ($z = 20.90$) as in the low density sites of each region.

Finally, summarized data of all fur bearers, including hares, show a similar large difference between the high and low density sites (north: MNI - z = 2.32; south: MNI - z = 22.66). In brief, these differences can be summarized as follows:

A. NORTHERN SITES

Species	I. High Density	II. Low Density
Arctic Fox	Eliseevichi Mezin Timonovka II Yudinovo	Berdyzh Chulatovo II Khotylevo II Pushkari I Suponevo
Wolf	Eliseevichi Khotylevo II Mezin Pushkari I, II	Berdyzh Chulatovo II Suponevo Timonovka I, II
Bear	Chulatovo II Mezin Pushkari II Timonovka II	Berdyzh Chulatovo II Khotylevo II Pushkari I Suponevo Timonovka I, II
Wolverine	Khotylevo II Mezin Timonovka II	Eliseevichi
Hares	Chulatovo II Mezin Pushkari II Timonovka II	Eliseevichi Khotylevo II Suponevo Timonovka I Yudinovo
All Fur Bearers	Eliseevichi Mezin	Berdyzh Chulatovo II Khotylevo II Pushkari I, II Suponevo Timonovka I, II Yudinovo

B. SOUTHERN SITES

Species	I. High Density	II. Low Density
Arctic Fox	Mezhirich	Dobranichevka Gontsy Zhuravka
Wolf	Mezhirich	Dobranichevka Gontsy Kirillovskaya
Bear	Mezhirich	Dobranichevka Gontsy Kirillovskaya
Wolverine	Mezhirich	Dobranichevka Gontsy Kirillovskaya
Hares	Mezhirich	Dobranichevka Gontsy Kirillovskaya
All Fur Bearers	Mezhirich	Dobranichevka Gontsy Kirillovskaya Zhuravka

Calculations of the correlation coefficients for fur bearers (Table V-8), both per taxon and summarily, show high positive values for the area as a whole as well as for the north and south regions. When, however, the existence of the two types of sites is taken into account and r-values are calculated spearately per region and per type of site some interesting differences in the values come to the fore. For example, while the r-value for arctic foxes in the north is very high ($r = +0.99$) and significantly different from an equally high value for the southern sites ($r = +0.96$; $Z = 2.90$), these high r-values mask the intraregional differences present. High density northern sites show a

correlation coefficient of r = +0.99 while the low density ones yield a significantly lower value of r = +0.27 (Z = 2.65). It can be argued that the small sample sizes in the calculations, as well as the violation of some important assumptions when using these statistical methods on the data preclude us from assigning any significance to these differences in the r-values. I suggest, however, that the repeated patterning of these values observed when each taxon is evaluated separately, as well as when all the fur bearers are considered summarily, show the presence of patterning in the data itself and that this patterning does reflect past behavioral differences.

This patterning can be observed for all the fur bearers but is especially strong for two taxa: wolves and arctic foxes. These two species are found at much greater densities (MNI and MNB) in both the northern and southern sites than are other fur bearers. Arctic foxes, for example, are found at 77% of the northern and 57% of the southern sites at mean densities of $0.07/m^2$ and $0.01/m^2$ respectively. Wolverines, on the other hand, while found at the same percentages of the sites in the south (57%) occur in only 31% of the northern sites, and their mean respective densities are 0.005 per m^2 in the south and 0.006 per m^2 in the north. Similar low mean densities can be observed for bears as well as for summarized remains of other fur bearers such as lynx, cave lion, and hyena found in singular numbers at a few of the sites.

A cautionary note should be sounded when dealing with the remains of fur bearers. As mentioned before, hare, fox, marmot, and wolf bones were extensively used in the manufacturing of bone tools and jewelry. The long bones of these taxa were especially favored for tool making. Such use of long bones affectively removed these elements of lower diagnostic values from the inventories and left behind, at least at some sites, a disproportionately large number of highly diagnostic elements such as crania, mandibles, teeth, scapulae, and pelvises. Because of this, I believe that greater weight should be given to the MNI values when evaluating the distribution of these taxa at the sites. I suspect, for example, that the discreptancies between the densities of arctic fox MNI and MNB values at low density southern and northern sites is due to the "noise" generated by such selective removal of long bones (see Table V-10 for MNB and MNI values at low density sites).

Four hypotheses can be proposed to account for the differential distribution of fur bearers in the study area:

1. Biogeographic variability in the distribution of the taxa themselves.
2. The differences in the season of procurement of the taxa and in the season of occupation of the sites.

3. Demographic variability in demand for the furs or pelts due to differences in either group size and/or length of occupation at the sites.
4. Differential social demands.

Each of these hypotheses carries a number of implications that can be evaluated with the data on hand. Thus, if the biogeographic distribution of the fur bearers was the independent variable and they were taken in direct proportion to their availability near the sites, we would expect both more fur bearers in the north in general, as well as locational differences between the high and low density sites in the study area. If the season of occupation played a decisive role in the accumulation of the remains of these taxa in either high or low densities, then we can expect to find evidence for the occupation of the low density sites in warm weather months and of the high density sites during the cold seasons. Demographic variables as the independent variable responsible for the differential distribution of fur bearers imply that low density sites should show evidence for shorter occupation and/or smaller group size and high density sites the opposite.

To evaluate this proposition I will assume both similarity in clothing requirements for all the groups in the study area and a uniform requirement for pelts or furs per individual.

I will evaluate the first three propositions using primarily data on arctic foxes because they 1) are found in the greatest densities at most of the sites in the study area than other fur bearers, and 2) age and sex data on the demographic composition of this taxon is available for some of the sites.

The last hypothesis, that social variables are responsible for the observed distribution of some of the fur bearers remains (especially for arctic foxes and possibly wolves and hares) will be briefly examined in this chapter and evaluated in greater detail in Chapter VI.

Since we can expect that a number of these variables (i.e., biogeography, seasonality, demographic demands) could have affected the procurement of particular taxa differently, I will, when possible, evaluate the importance of these variables per taxon as well.

(a). Arctic Fox. Remains of this taxon, as noted have been found at a high proportion of the sites in the study area. The correlation coefficients calculated on the MNB-MNI values in both the north and the south, listed in Table V-8 and illustrated in Figures V-16a-c, show high positive values. Taken overall, the r-values indicate that foxes were actively hunted all over the study area. The lack of uniform patterning in the data along the north-south axis excludes the biogeographic hypothesis as a viable explanation for the differential distribution of this taxon. First, as noted previously, no overall differ-

ences can be observed between the north and south either in MNB or MNI densities. The differences that do occur are intraregional in nature. Thus, the one high density southern site, Mezhirich, has a significantly greater number of foxes (both MNI and MNB) than the low density northern sites (MNB: $z = 3.20$; MNI: $z = 11.5$). At the same time, no significant differences exist in either MNB or MNI densities between Mezhirich and the high density northern sizes (MNB: $z = 1.24$, $p = 0.1$; MNI: $z = 1.57$, $p = 0.12$).

As I have noted in Chapter III, the aging of fox remains at Eliseevichi by Pidoplichko (1976) and Vereschagin and Kuzmina (1977) observations on the ages of foxes from the Upper Paleolithic sites indicate that no juveniles are present and imply that arctic foxes were hunted in late winter-early spring months. Since the age profiles of foxes from such northern sites as Eliseevichi and Mezin do not differ from those of the southern Dobranichvka, Gontsy, and Mezhirich, we can eliminate the season of occupation as the independent variable responsible for the differential distribution of arctic foxes at the sites.

The possibility of population size being the variable responsible for the observed differences is more difficult to evaluate. I will consider in detail the question of population size at the sites in the following chapter of this work. As Tables VI-34 shows, my group size estimates do differ for the sites in the study area. By and large, the sites with high fur bearer densities are those for which

I have projected a larger population. At the same time, however, there appears to be no direct relationship between the projected population size and the density of fox remains. No sizeable population differences, for example, can be projected for Dobranichevka and Mezhirich, yet Dobranichvka has few foxes and Mezhirich many. Similarily, while a much smaller group size is suggested for Eliseevichi than for Pushkari I, Eliseevichi fox density is significantly higher (MNI of 0.456 per m^2) than at Puskari I (MNI of 0.01 per m^2). These comparisons suggest that the population size of the hunters and gatherers group inhabiting the site is also an unsuitable variable to fully account for the differential distribution observed.

I conclude, therefore, that the most viable explanation for the distribution of arctic foxes, and by extention of all fur bearers, is to be found in social relationships and the demands that such relationships generated. I will return to this hypothesis and test some of the implications that can be generated after a brief review of the other fur bearers exploited in the study area.

(b). Wolves. Correlation coefficients calculated for wolves are presented in Tables V-8, V-9 and Figure V-17. They show high positive values in the southern sites ($r = +0.99$) and a somewhat lower value in the northern ones ($r = +0.55$). The correlation coefficient calculated for the northern high density sites shows a higher positive value ($r = +0.88$, $p => 0.1$) and a somewhat lower one for the low

density sites (r =+0.54). The difference between these two r-values is not significant, however (Z = 0.55). While wolves are found in approximately the same proportion of sites in both regions of the study area (85% in the north and 71% of the sites in the south), wolf exploitation appears to have been more intensive in the northern sites as these show three times as many wolves present on MNI comparisons and over 300 as many wolf bones on MNB values (see Table V-10). These overall differences probably reflect the different biogeographic distribution of this taxon, and are in marked contrast to those observed for the arctic foxes.

The intraregional differences between the high and low density sites observed for arctic foxes are repeated in the distribution of the wolves as well. Thus, as Table V-10 shows, both northern and southern high density sites have significantly greater numbers of both MNIs and MNBs than the low density sites. Intraregional comparisons presented in the same table, show the one high density southern site, Mezhirich, having fewer wolves (both MNI and MNB) than northern high density sites but more wolves (MNI) than the low density northern sites.

In a discussion of wolf ecology in Chapter III, I suggested that optimal pelt condition for this taxon existed in cold weather late fall-early winter months and projected that time as the optimal one for procuring wolves. While no age profiles exist for wolves in the study area, both Pidoplichko (1969, 1976) and Vereschagin (1979, 1981)

note that, by and large, no newborn whelps have been recorded in the collections and that the youngest specimens found belong to sub-adults. My own examination of the remains of this taxon from the sites confirms these observations. This indicates that wolves, like foxes, were taken in cold weather months and precludes the season of procurement from being the variable responsible for the differential distribution of wolves observed in the faunal record.

I interpret the data to indicate that while wolves were opportunistically taken all over the study area, they were more intensively exploited in the north. The differential distribution of wolves within each region, like that of arctic foxes, cannot be adequately explained by biogeography, demographic demands or seasonal variables alone.

(c). Bear. While bears have been found in 77% of the northern and 57% of the southern sites, they have been found at much lower mean densities than either wolves or foxes (see Table V-7a and b). The r-values listed in Table V-8 as well as illustrated in Figure V-18, show patterning very similar to that observed for arctic foxes and wolves and support my contention that this taxon was actively hunted throughout the study area. While higher r-values come from low density sites ($r = +0.99$) than from high density sites ($r = +0.66$) in the north, these differences are not significant ($Z = 1.35$).

The Difference of Means tests in Table V-10 show that while no differences exist in bear densities (either MNB or MNI) between the high density northern and southern sites (MNB: z = 1.73; MNI: z = 1.42), both have considerably greater densities than do the low density sites in each region (north MNI: z = 2.33, MNB: z = 2.36; southern sites MNB: z = 19.6, MNI: z = 6.83). The fact that low density northern sites have approximately three times as many bears on MNI counts (z = 2.0) as do the southern low density sites leads me to conclude that bears, like wolves, were possibly more abundant in general in the north.

No seasonal data can be inferred from the bear remains because of the low density of bears at the sites. The types of bones found suggest more than anything the presence and use of bear skins at the sites, and are in contrast to the remains of foxes and wolves where all skeletal elements are present (Pidoplichko 1976).

I conclude that while bears were actively hunted all-over the study area, their procurement can best be characterized as opportunistic with small numbers taken possibly in proportion to their general densities in the regions.

(d). Wolverines. The role of wolverine in the Late Pleistocene economies of the Central Russian Plain is difficult to evaluate for a number of reasons. First, as Table V-6 shows, this taxon was only found at sites with storage pits. This is in sharp contrast to the distribution of the other fur bearers discussed so far. Since,

as will be shown later in this chapter (see Table V-32), with the exception of Khotylevo II, all the sites with storage pits can be assigned to cold weather occupation. The presence of wolverines at sites points to cold weather months as the season when this taxon was hunted. The correlation coefficients calculated on the MNB-MNI values are presented in Table V-8 and Figure V-19 and indicate that wolverines were hunted over the entire study area and that the distribution of wolverine remains shows no differences along the latitudinal axis.

Intraregional comparisons of the distribution of this taxon shows the existence of both high and low density sites in the north and in the south. The data on the density differences calculated on MNI values between the high density sites in the north and south conflict with those from the MNB values. Thus, while Mezhirich has approximately three times more wolverines than the northern high density sites of Khotylevo II, Mezin, and Timonovka II ($z = 15.29$ on MNI), the norther sites have twice the number of wolverine bone remains (MNB: $z = 297.50$). Similarily, while low density northern sites do not differ from their equivalents in the south on MNI, significantly greater mean numbers of wolverine bones come from northern low density sites ($z = 3.57$). At the same time, a smaller proportion of the northern sites (4--31%) than of the southern sites (4--57%) has this taxon.

The small sample size of sites precludes me from

attaching a behavioral significance to these statistical differences and lead me to conclude that the overall distribution of the wolverines broadly conforms to that observed for the other carnivores exploited opportunistically in the study area. The differences in the distribution of wolverine remains suggest that this taxon was exploited in proportion to its biogeographic distribution, being taken in greater numbers in cold weather monghs and/or near the sources of its principal prey-mammoth carcasses (see Vereschagin 1979 on wolverine--mammoth predator-prey relationship).

(e). Other Fur Bearing Carnivores. A small number of cave lions, lynx, weasels, and hyenas have been found at five of the sites and could be quantified for MNB and MNI values at four of the sites. I have selected to combine them and summarize their densities under a heading of "other fur bearers" in all of the tables in this chapter. As Tables V-8-10 and Figure V-20 show, the pattern in their correlation coefficients and the mean distribution of both MNI and MNB values are similar to those observed in other fur bearers. In contrast to the discussed fur bearers, this group does not occur in different densities intra-regionally, and, like wolverines, these taxa are found only at sites with storage pits. They are found at a slightly greater number of sites in the south (43% of the sites) than in the north (14% of the sites). Since, however, a larger proportion of the southern sites have storage pits, the

higher rates of occurrence of these taxa in the south can best be explained as a function of the season or occupation and group size.

In general, I conclude that these summarized fur bearers, while being actively hunted over the entire study area, were opportunistically taken as encountered, and were not objects of specific hunting practices.

(6) Conclusions of the Exploitation of Fur Bearers

I have noted in a previous discussion that one food species, hares, showed interregional differences in distribution that conformed to the pattern outlined for the fur bearers, and suggested that hares were probably utilized both as food as well as for their pelts. As discussed, the exploitation of hares was especially prevalent in the southern part of the study area, and I concluded that this taxon was actively hunted only in the south. Having presented data on carnivorous fur bearers I will now evaluate the hypothesis that hare exploitation in the south was conditioned by the desire for pelts.

It will be recalled from Chapter III that I projected optimal hunting for hares at two distinct seasons--late summer (August) if food patch size was being selected for, and late fall or early winter (December) if pelt conditions were of prime value. As I have already shown, strong evidence exists that arctic foxes were taken in cold weather months. Because of this, we can predict that if hares were taken at prime pelt conditions--December--their densities should be highly correlated with the densities of

arctic foxes; whereas if hares were taken in late summer no positive relationship should be observed between the hares and arctic foxes.

I calculated the Pearson's correlation coefficients on MNI densities of arctic foxes and hares found at the southern sites where both taxa were actively procured, and, as Figure V-21 illustrates, the high positive correlation of r =+0.94, supports the hypothesis that hares were procured in cold weather months. The observed density differences in the distribution of this taxon in the southern sites can now be better understood. It is a southern equivalent of the general pattern observed for all other fur bearers.

In conclusion then, I offer the following summary of what taxa were actively hunted in the study region:

SPECIES	NORTH	SOUTH
Arctic Fox	+	+
Wolf	+	+
Bear	+	+
Wolverine	+	+
Summarized Other Fur Bearers	+	+
Hares	-	+

+ -- actively hunted
- -- not actively hunted

As this diagram shows, with the exception of hares, all other fur bearers were actively procured over the entire study region. Ethnographic literature shows that the procurement of fur bearers requires use of different strategies than those used for most of the food species I discussed

previously. Specifically, the data on hand indicate that some form of trapping was probably practiced. Pidoplichko (1976) and Vereschagin (1971) suggested that some form of dead falls were used as a large percentage of the crania of fur bearers are found highly fragmented. Since Upper Paleolithic bone industries used many of the long bones of these taxa as raw material I was unable to discover, as I had hoped to do, evidence of the use of leg traps. I suggest that some form of leg traps may have also been in use because some of the crania, especially of hares, wolverines, bears, and cave lions were found intact and in association with foot bones suggesting the use of rugs with heads and paws attached (see for example, Shovkoplyas 1965a on Mezin fur bearers).

I conclude this review by suggesting that we can discern two types of hunting behavior in the exploitation of fur bearers: opportunistic or utilitarian, and 2) specialized. The first, which I call opportunistic exploitation, satisfied the clothing, decorative, and industrial needs. Different taxa were exploited to this end in proportion to their availability in the area, thus we have more emphasis on the taking of hares in the south and greater numbers of wolves and bears in the north. It is this sort of opportunistic exploitation, controlled as it is both by local biogeography as well as by population sizes of the local hunter-gatherer groups, that brings about no visible differences in the densities of the different taxa

when overall north summaries are compared to the southern ones. It is quite probable that all fur bearers were exploited to meet utilitarian needs--and we can expect that some of the procurement of arctic foxes and wolves also satisfied these needs. To some, and as yet an undetermined extent, some differences observed in the density distribution of fur bearers intraregionally (i.e., between the high and low density sites) can be attributed to such factors as population size differences and differences in the season of occupation. As I have shown, however, in the discussion of arctic foxes, these variables fail to fully account for the observed differences and it is the social needs that have to be considered to explain such density differentiation.

Specifically, I suggest that specialized hunting was also carried on in the study area and focused on the procurement of arctic foxes and possibly wolves in the north, possibly hares in the south, and that these taxa were taken in quantities beyond those needed to meet utilitarian needs. The results of this specialized hunting, as noted, can best be seen in the faunal inventories at the high density sites. Thus, as Table V-10 shows, arctic foxes and wolves are five times as numerous at the high density northern sites of Eliseevichi and Mezin as at Mezhirich (MNI: $z = 2.22$). The density of hares, as discussed earlier, is the exact opposite and 11 times more hares are found at Mezhirich than at the high density northern sites

(MNI: z = 47.5). My conclusions on specialization in hare procurement are more tenuous than for foxes and wolves.

As noted previously, the greater densities of fur bearers at some sites cannot be adequately explained by biogeographic or demographic variability. The invocation of social relationships as an explanation has been proposed but before I can evaluate this hypothesis I must first examine the relationship between the high and low density sites. To this end it is interesting to consider whether 1) more intensive hunting and processing went on at the high density sites in toto, or if 2) high concentrations of fur bearers at these sites resulted from initial hunting and processing at the low density sites and the transportation of furs or pelts themselves to the high density sites.

If more hunting per se went on at Eliseevichi, Mezhirich, and Mezin, then we can anticipate finding far greater numbers of both MNB and MNIs per taxon at these sites as well as finding most of the skeletal elements of the hunted taxa present in their faunal assemblages. The following ratios of MNBs and MNIs have been reported at the sites:

SITE	TAXON	NUMBER OF MNB	NUMBER OF MNI	MNB:MNI RATIO
Eliseevichi	Arctic Fox	15,374	278	55:1
	Wolf	1,045	36	20:1
Mezhirich	Hares	2,633	79	33:1
	Arctic Fox	146	11	13:1
	Wolf	89	12	7:1
Mezin	Arctic Fox	1,842	112	16:1
	Wolf	1,004	59	17:1

Data above, especially for arctic foxes at Eliseevichi, tend to confirm the hypothesis that more intensive hunting did take place at these sites. The wide range in the MNB: MNI ratios, however, also suggests that factors other than intensive active hunting may also have played a role. To test the second hypothesis--that some of the fur bearers entered the high density sites already as prepared furs--I decided to compute the correlation coefficient between fur bearers and fur processing tools at both the high and low density fur sites.

In order to work with the largest sample size possible, I compared the relationship between arctic fox MNIs and the summarized end scraper and burin densities at the northern sites. Soviet researchers associate both end scrapers and burins with hide processing as well as with the manufacturing of bone tools (see Filippov 1977; Gvozdover 1974; Leonova 1977; and Semenov 1939, 1968). While it is end scrapers that are more directly associated with skin and hide work and burins with bone work, I elected to combine them for this analysis because I assumed that the processing

of fur and tool manufacturing from bones of the fur bearers would tend to occur at the same locales. Lastly, due to the small sample sizes on hand, I felt that more reliable results would be obtained if larger counts of tool types were used as the units of analysis.

Table II-7 lists the overall numbers of lithics found at the Central Russian Plain sites. As I noted in that chapter and discussed in Chapter III, good quality flint outcrops existed all along the Desna Valley. These outcrops were extensively used by Upper Paleolithic hunters and gatherers in the region, while those occupying the southern part of the Central Russian Plain utilized lower quality cobble flint. This difference in the availability of raw material for lithic manufacturing is widely noted in the Soviet literature and can be expected to have had an effect on the rate of lithic utilization. In general, as Gladkih (1973) and Shovkoplyas (1965a) have noted, there is a much greater density of lithics as well as a lower overall percentage of tools at the northern sites than at the southern ones. They interpret this to indicate that far greater conservation was practiced by southern flint knappers than by their northern equivalents. I will return to this observation and test it in subsequent discussions of interregional differences in Chapter VI. For the purposes of the present discussion, these observations are offered to suggest that we can, therefore, anticipate finding different lithic density to tool density relation-

ships in the southern sites than in the northern ones.

Table V-17 divides the area regionally and lists the densities per m^2 for both lithics and end scrapers and burins found at the sites. Since I anticipated that there would be a relationship between the numbers of end scrapers and burins and overall lithic densities at the sites, I first tested for the presence of such a relationship in each region. As Table V-17 shows, significant high correlations exist between these two lithic categories (north: r =+0.45; south: r =+0.90). In order to control for that proportion of end scrapers and burins present at the sites due to tool manufacturing itself and therefore, not related to fur processing and bone manufacturing, I then calculated the residuals of end scrapers and burins from lithic densities and thus obtained density values for this category of tools that were not related to the overall lithic densities or lithic manufacturing at the sites. These values (residuals) are listed in column 4 for the northern sites and column 8 for the southern ones.

The relationship between end scraper and burin residuals and density controlled values of arctic foxes (MNI) at the northern sites can be found in Table V-18. While there is a strong negative correlation (r =-0.99) at the high density fox sites, there is a much weaker and positive correlation present at the low density sites (r = +0.43). The difference between these r-values, as shown in Table V-18, is significant (Z = 3.10) and supports my

second hypothesis that some pelts reached the high density fur sites as finished products. A similar positive correlation was also obtained for the end scraper and burin residuals and fox densities at the low density southern sites ($r = +0.70$, $p = 0.1$). Quite obviously the very small sample sizes in all of these calculations do not permit me to consider the second hypothesis fully confirmed. Rather, they point out some interesting pheonomena that can only be confirmed by further archaezoological research. Specifically, if the observed relationships are valid and assuming uniform skinning practices that removed heads and feet with the hides, we can than anticipate finding a disproportionately larger number of crania and foot bones at the high density sites than at the low density sites, and conversely, a far greater ratio of long bones and other nonextremity parts at the low density sites.

In general, this discussion has shown that both utilitarian or opportunistic and specialized exploitation of fur bearers existed in the study area in Late Pleistocene. Specifically I have suggested that specialized exploitation of fur bearers was propelled by regional social interactions and that exchange networks existed in the area. Since, as will be shown below, these networks greatly intensified through time and are more clearly visable during the second period of occupation--between 18,000 and 12,000 B.P.--I will return to this hypothesis after reviewing changes in the subsistence practices through time.

D. Changes in the Subsistence Strategies Through Time

In this section I will examine for changes in the procurement practices that occurred in the area through time and conclude by offering a model that best explains these changes. First I will consider changes in food procurement and then examine changes in the exploitation of fur bearers.

(1) Procurement of Food

(a). Active Hunting. Only four early sites are known in the study area, and, as noted in Chapter IV, this chronological assignment is problematic at best. Quantified faunal information exists for only three of the early sites: Berdyzh, Khotylevo II, and Radomyshl'. Because of the small sample size on hand, I could not examine possible inter-regional differences between the hunting practices in the early and late sites. Some will argue that the lack of correlation coefficients for the early sites does not permit a chronological comparison of hunting behavior through time. I argue that the repeated patterning of r-values per taxon from the early to late sites indicates that no significant changes can be observed in active procurement of these taxa through time. Thus, for example, the correlation coefficients for wooly rhinoceri for the late period in the north ($r = +0.96$) is not significantly different from that reported for all of the northern sites ($r = +0.95$). The correlation coefficients for steppe bison remains found in the south in the late period ($r = +0.99$) is the same as found there if chronology is not controlled

(r =+0.99, p =>0.1).

A comparison of the correlation coefficients per taxon listed in Tables V-8 and V-9 between all of the sites and the sites occupied during the late period shows, in general, no significant changes for the following taxa: mammoth, wooly rhinoceros, horse, reindeer, marmot, and the summarized food species. I interpret this to indicate that the listed taxa were actively procured in the area throughout the entire period of occupation.

At the same time as we observe a continuation of the basic subsistence pattern in the area, we can also see a diversification in the food base occur through time. The following taxa are only found in the late sites: red deer, giant deer, deer sp., musk ox, wild boar, beaver, and fish. Hares and birds occur only at one early site, Khotylevo II, while they are found at numerous late sites.

We can also see an intensification in gathering behavior through time--reindeer antlers become more prevalent in the late southern sites and steppe bison remains in the north. This increase in collecting of antlers and teeth depresses the correlation coefficients for each taxon in each region. For example, the r-value for steppe bison from late northern sites is r = -0.81 (p =>0.1) while it is r = +0.59 for all of the southern sites.

Difference of Means comparisons between densities of different taxa through time can be found in Table V-10. Overall, they also indicate an increase in the exploitation

of food species through time. Much greater numbers of both MNIs and MNBs of the following species are found in the study area in time: wooly rhinoceri, horses, steppe bison and probably birds. This increase is especially evident if, for example, we look at the wooly rhinoceri values at northern sites where a five-fold increase in MNIs can be observed in time ($z = 2.49$). In the south, a comparison of the densities of horses found at the early and late sites shows a six-fold increase in time (MNI: $z = 1.76$, $p = 0.08$).

At the same time as we can observe changes in the rate of exploitation and monitor the appearance of new food species at the sites, other taxa do not show any change in their densities through time. Data on mammoths, as Table V-10 shows, indicate no change either regionally or for the study area as a whole in mean densities of either MNBs or MNIs. Summarized data on all food species, likewise, shows no chronological changes either in the northern or southern regions (MNI: north: $z = 0.06$; south: $z = 1.73$). For both the early and late periods we can observe the presence of high and low density food sites in the north. In the south, on the other hand, no high density food sites exist in the early period and appear only in the late period of occupation. These differences, however, can better be examined for significance and implications if we take energy value (Kcals) rather than individual animals as the unit of analysis.

Comparisons of the difference in mean Kcals found at the early to those at the late sites are presented in Table V-16 and offers values both if no mammoths were taken for food and if half of the mammoths were consumed. Here again, as in previous calculations, the unclear role that mammoths played in the subsistence does not permit a formulation of firm conclusions. In general, at both mammoth values, a comparison of Kcals available in the north and in the south during the early period suggests that more Kcals were available at the northern sites (no mammoths: $z = 2.79$). At the same time, no significant differences can be discerned between all early and all late sites (no mammoths: $z = 1.63$; half mammoths: $z = 0.31$). While calculations of Kcals without mammoths show greater values present in the northern late sites, if half of the mammoths are included in the calculations then late southern sites with storage pits appear to have more Kcals available. Thus, as can be seen from Table V-16, no clear patterning for the study area is discerned through time. The only consistent patterning indicates more food at the early northern sites than at early southern ones.

Data from the comparisons of MNB, MNI, and Kcal values at the sites indicate the presence of both high and low density food sites in the northern and southern parts of the study area. These values are illustrated in Figures V-22 and V-23. All three early sites, Berdyzh, Khotylevo II, and Radomyshl', fall into the group of low density food sites

if mammoths are omitted from the calculations, while with half of the mammoths included, Berdyzh falls into the high density group. The following grouping can be offered for the sites occupied late, between 18,000-12,000 B.P.:

A. KCALS CALCULATED WITHOUT MAMMOTHS

I. HIGH KCAL VALUES

NORTH		SOUTH	
Sites Without Pits	Sites With Pits	Sites Without Pits	Sites With Pits
Chulatovo II Pushkari II	Mezin	--	Mezhirich

II. LOW KCAL VALUES

Pushkari I	Eliseevichi Suponevo Timonovka I, II	Fastovo Kirillovskaya Zhuravka	Dobranichevka Gontsy

B. KCALS CALCULATED WITH HALF THE MAMMOTHS INCLUDED

I. HIGH KCAL VALUES

Pushkari I, II	Mezin Eliseevichi	--	Mezhirich

II. LOW KCAL VALUES

Chulatovo II	Suponenvo Timonovka I, II	Fastov Kirillovskaya Zhuravka	Dobranichevka Gontsy

I will offer a number of hypotheses to account for these differences in context of site typology and settlement system analysis in the following chapter of this work.

(b). Changes in Procurement Techniques. I have noted a diversification in species taken as food through time, the increase in the exploitation of smaller size taxa, and

the appearance of more solitary herbivores at the late sites. Such diversification and exploitation of smaller sized resources suggests that either solitary harvesting or hunting by a smaller group of hunters also increased in time. In addition, the exploitation of smaller size taxa also indicates a diversification in the harvesting techniques through time.

I have already observed that storage pits are found at both the early and late sites in the study area. Data on mean storage volume per site presented in Table V-4 also indicate an increase in storage through time. Thus, as Table V-5 illustrates, we see approximately a three-fold increase in storage volume in late sites ($z = 1.87$, $p = 0.06$). No interregional differences in storage volume, however, can be observed between either the late sites or all of the sites without chronological controls.

(c). Conclusions. I offer the following conclusions on the changes in subsistence through time:

1) An intensification in the exploitation of some taxa, especially of gregarious herbivores.
2) A diversification of the species harvested and used as food.
3) An increase in food preservation and storage.
4) No changes in the overall calories available at the sites.

We can envision a number of processes that could have generated these observed differences. Assuming little or no change in time in the taphonomic processes operating in the area, all of the processes involve changes in the settlement practices--either in the numbers of people co-residing at the sites, in the length of occupation of the sites, or finally in the number of re-occupations of the sites. I will return to these hypotheses and evaluate them with additional data in a subsequent chapter of this work.

(2) The Procurement of Fur Bearers

Because of the small sample size of early sites on hand, no correlation coefficients could be calculated for the fur bearers. A comparison of r-values per taxon calculated for all the northern and southern sites without chronological controls to those calculated per region on late sites, offered in Table V-8, show no significant differences in the resulting values. For example, the r-value for arctic foxes at all northern sites is $r = +0.99$ and $r = +0.99$ for the late northern sites. The correlation coefficient for wolverines in all northern sites is $r = +0.93$ and $r = +0.93$ ($p = 0.1$) for the late northern ones. I interpret the similarities in the values to indicate that no perceptible changes in the active procurement of fur bearers can be observed through time in the northern region. While no fur bearers have been found at the one early southern site, Radomyshl', I do not attach any significance to this observation. This is because only one early southern

site is known, and, as noted in Chapters II and III, the cultural layer at Radomyshl' was found very close to the present day surface and all the faunal remains were very poorly preserved.

I conclude, therefore, that fur bearers were actively hunted throughout the entire Upper Paleolithic period.

(a). Opportunistic Exploitation. I have delimited two types of exploitation strategies for fur bearers in the study area as a whole: opportunistic procurement as well as specialized exploitation. Table V-19 summarizes the frequency data on the exploitation of all fur bearers through time. All of the calculations in the table are based on the camparison of the MNI and MNB mean values listed in Table V-10. Columns 3-6 and 9-12 in Table V-18b list the proportions of either MNIs or MNBs found at the two categories of sites (high density or low density) which the Difference of Means tests have shown to be significant (for significance estimates and actual mean densities see Table V-10).

As Table V-19 shows, no fur bearers have been found in Radomyshl' and all taxa come from the early northern sites. The table shows both an increase through time in the exploitation of fur bearers in the study area as a whole as well as an increase of these species in the northern sites. First, with the exception of wolverines, there is an overall increase in the proportion of sites exploiting fur bearers. Secondly, while the densities of some of the species at the

sites show no change through time, other taxa are present in greater numbers in the late sites. For example, mean MNI values for bears and arctic foxes at the low density northern sites do not show an increase through time (bears: $z = 0.31$; arctic foxes: $z = 0.15$). Wolves, on the other hand, show a two-fold increase in MNI densities at the late low density northern sites (MNI: $z = 1.94$, $p = 0.06$). In general, I conclude that some intensification can be monitored in the opportunistic exploitation of fur bearers through time and can best be seen in the sites with low densities of fur bearers.

(b). Specialized Exploitation. With the exception of Khotylevo II, all of the early sites have fur bearers present in low densities. Khotylevo II does not fit this pattern--both wolverines and wolves have been found there in high densities. While Khotylevo II is poorly known in the literature and is still undergoing excavation, its uniqueness in both features and assemblages has drawn much attention from Soviet researchers. Zavernyaev (1978) writes that stylistically Khotylevo II lithics resemble more anything those found at the Kostenki-Borshevo early sites. Gvozdover (1982, personal communication) states that the Khotylevo II art mobiliere and engravings place the site in the Kostenki-Avdeevo culture. As I will show in Chapter VI, the features found at the site as well as the nature of its living floor are also more similar to those of Kostenki-Borshevo sites than to any found in the study area. While

it is too early to assign this site either to a different culture or a different settlement system than the other Dnepr-Desna sites, enough data exist for me to both consider the site unique in the study region and not representative of the overall Dnepr-Desna pattern.

Omitting Khotylevo II from the discussion, we see that the sites with high densities of fur bearers, especially those where particular attention was paid to the procurement of arctic foxes, wolves, and hares, date to the late period of occupation and that such sites are located both in the north and in the south. Including data from Khotylevo II, we see that both 1) sites with a high density of foxes date only to the late period of occupation, and 2) in time there is a sizeable increase in the density of wolves at the sites. A comparison of mean wolf densities on MNI counts shows a four-fold increase in the north high density late sites ($z = 3.60$).

I conclude, therefore, that the following changes in the exploitation of fur bearers can be observed through time:

1) A moderate increase in the opportunistic exploitation of all fur bearers.
2) A rise of specialized exploitation of fur bearers with particular emphasis on the procurement of arctic foxes and possibly wolves and hares.

3) A differentiation of the distribution of fur bearers which results in the existence of both high and low density fur sites in both the northern and southern regions of the Central Russian Plain.

IV. THE SEASONALITY OF OCCUPATION OF THE CENTRAL RUSSIAN PLAIN SITES

The richness and diversity present in the faunal assemblages of the Upper Paleolithic sites of the Central Russian Plain has created a plethora of problems for researchers and resulted in a wide divergence of opinion about the very nature of the occupation of the sites. In general, however, the question of the season of occupation of the sites has not been seriously addressed to date. Soviet researchers, relying heavily on sheer volume of food found, and assuming that what was found at the sites represented just a portion of the food taken, have, by and large, concurred that many of the sites (especially those with dwellings and storage pits) were occupied by fully sedentary groups who remained at the settlements for decades (see Bibikov 1969; Pidoplichko 1969, 1976; Shovkoplyas 1965a; for example). Pidoplichko (1969:148), using meat weight estimates, postulated the following length of uninterrupted occupation for the sites:

SITE	LENGTH OF STAY IN YEARS
Dobranichevka	8
Gontsy	9
Kirillovksaya	about 7
Mezhirich	20
Mezin	8

Other Soviet researchers, citing the presence of particular taxa at the sites that were presumably harvested in different seasons have argued also for year-round occupation of the sites. Kornietz et al. (1981) for example, cited the presence of reindeer to indicate fall, birds for spring to fall, and fur bearers for winter occupation of Mezhirich. English language literature on the area has either repeated Soviet conclusions or skirted the issue altogether (see Klein 1973, Shimkin 1978 for example; but also see Sklenar 1975, 1976).

Soviet researchers working at the more ephemeral Upper Paleolithic sites in the area (those lacking storage pits and dwellings) have, on the other hand, presumed that such sites as Chulatovo II, Fastov , Pushkari II, and Zhuravka were seasonal occupations (see Boriskovskii 1953; Boriskovskii and Praslov 1964; Leonova 1977; Voevodskii 1952a, for example).

All of these uni- and multi-seasonal estimates have been based on either intuitive guesses or on very problematic assumptions. Estimates of the duration of occupation solely based on the volume of available kilograms of meat have met strong criticism on both sides of the Atlantic (see, for example, Guilday 1970 and Vereschagin 1971, 1981).

Determination of the season or seasons of occupation based on the recognition of a few elements of a few small taxa are equally untenable.

The question of the duration of occupation of the sites--whether uni- or multiseason--is of prime importance for understanding both the adaptive strategies as well as the settlement systems in the area. The faunal data found at the sites offers a starting point for such an investigation. Having presented the faunal data from the sites, I will spend the remainder of this chapter examining this question. The conclusions reached will then be used in the following chapter to formulate both a site typology and to delineate a settlement system for the study area.

Faunal remains have been extensively used in archaeology as indicators of the season of occupation. The rationale for such use of faunal data is too well known to warrant a discussion (see Chaplin 1971; Gilber 1973; Monks 1981, for example for a discussion of seasonality). Faunal data in and of themselves, however, do not offer clear and unequivocal solutions to the problem of seasonality. This is because a number of behavioral stances can profoundly distort information on seasonality. This problem is especially acute when dealing with hunters and gatherers who also practice food storage. Binford (1978, 1981) has recently extensively described the distortions that such practices can introduce into the faunal record of the sites. The most obvious example of distortion we can expect in the

study area is that remains of taxa found in the storage pits may reflect hunting that took place during different seasons than when the sites were occupied. As Binford (1978) and Testart (1982) have shown, food stores are put up during a season of food abundance and used during times of food shortage. To control for such possible distortions I have decided to compile evidence on the season of occupation from a number of different sources including faunal remains, the density of indoor and outdoor hearths at the sites, the abundance of fur bearers, as well as from altitudinal location of the sites above the flood plain. Finally, because of the nature of the data on hand, I have elected to only distinguish two seasons in the study area: warm weather (arbitrarily from May through September) and cold weather (from October through April) months. The assumptions and methodologies involved for each estimation will be discussed in the context of each analysis. I will begin by introducing the use of the Diversity Index as a method for estimating the season of occupation.

A. Diversity Index

Ecologists have long used a diversity index or information statistic in comparing populations inhabiting different environments in terms of both the numbers of categories (species) present and the distribution of the population within each category (MacArthur and MacArthur 1961; Odum 1971; Pielou 1969). Of a number of indices available, two in particular have achieved the greatest popularity--the

Simpson's Diversity Index which tends to favor the more abundant species, and the Shannon (or Shannon-Weiner) Diversity Index which favors the rarer species.

Recently archaeologists have begun using these indices, especially the Shannon one, but have primarily used them to examine the similarities and differences in lithic, ceramic, or portable art inventories (Conkey 1980; De Boer and Moore 1982; Yellen 1977). Yessner (1977) has used the index on faunal data from the Aleutian sites as a way of comparing richness or diversity in the subsistence bases. In this work I offer the index as a viable method for examining the season of occupation of the sites and have selected to use the Shannon Index on the faunal data from the Central Russian Plain.

The diversity index was calculated on the proportions of taxa found in the assemblages of the sites. The mechanics of the application of the index are discussed at length in Zar (1974) who also presents a way of testing the difference between the diversity indices. The basic formula offered by Zar and used in this work for the calculation of the index is:

$$H = \sum_{i=1}^{k} p_i \log p_i$$

where k is the number of categories and p_i the proportion of the observations found in category i. As Zar states, however (1974:115):

The magnitude of H is affected not only by the distribution of the data but also by the number of categories, for, theoretically, the maximum possible diversity for a set of data consisting of k categories is

$$H_{max} = \log k$$

A way of controlling for that is to convert the H statistic into a J statistic that expresses the observed diversity as a proportion of the maximum possible diversity. The J statistic measures more the evenness of the distribution and, therefore, is a measure of relative diversity. The conversion of H to J is achieved using the following formula:

$$J = \frac{H}{H_{max}}$$

As Zar (1974:115-116) indicates, Hutcheson has in turn developed the following t-test that can be used for comparing two H values:

$$t = \frac{H_1 - H_2}{s_{H_1 - H_2}}$$

The variance of H is approximated by:

$$s^2_H = \frac{f_1 \log^2 f_1 - (f_1 \log f_1)^2/n}{n^2}$$

The DF associated with the t-test are approximated by:

$$V = \frac{(s^2_{H_1} + s^2_{H_2})^2}{\frac{(s^2_{H_1})^2}{n_1} + \frac{(s^2_{H_2})^2}{n_2}}$$

The range for both the H and J statistic are from 0-100% with the higher values reflecting greater diversity and lower ones lower diversity.

Ethnographic literature on hunters and gatherers in northern latitudes amply documents a greater diversity in food resources available during the warm weather months and a reduction in this diversity during cold weather (see Binford 1978; Boas 1964; Helm 1968; Jochim 1976; Keene 1981; and Nelson 1971, for example). Because of this, I assumed that, all other things being equal, fauna caught during warm weather months should produce a higher diversity index than that caught during the cold season both in northern latitudes and, by extention, in the study area as well. To test the validity of this assumption I calculated the H and J values on ethnographic data first.

Binford and Chasko (1976:102) offer data on game taken by a Nunamiut hunter from June 1950 through May 1951. I retabulated their data into categories suitable for the calculation of the index by dividing their month by month record into groupings of taxa taken during the cold October-

March months and those taken in the warm April to September season. These retabulations are presented in Table V-20 which also shows the H and J values calculated both on the MNI values and on the Kcal per taxon as the unit of analysis. The Kcal values used per taxon are listed in the table as well. As this table shows, the choice of Kcals rather than MNI values as the unit of analysis did not significantly alter the indices (for cold weather H on MNI = 0.27, on Kcals H = 0.32; for warm weather monghs on MNI H = 0.68, Kcals H = 0.52). A comparison of H values between the warm and cold seasons gave a t = 3.80 at v = 200 and a significance level of p = 0.001. As Table V-20 shows, the two indices did discriminate well the season of harvest.

A second test for the diversity index as a seasonal indicator is presented in Table V-21. Data on the Ojibwa come from Jochim (1976) and have again been recalculated into Kcal values per taxon as the unit of analysis. While the Ojibwa H indices for both the cold and warm weather months (cold weather: H = 0.005; warm weather H = 0.12) were considerably lower than those for the Nunamuit data, the t-test listed in Table V-21 showed a significant difference between the two Ojibwa H values (t = 181.82, v = 1.0, p = 0.05).

Having tested the validity of my assumptions that the diversity index can be a powerful tool in discerning seasonality at the sites, I proceeded to calculate the H and J statistics for all of the undisturbed sites in the study area using the density controlled Kcal values per taxon as

the unit of analysis (i.e., proportion of the Kcals per taxon per m^2). In these calculations I included only those taxa that were actively hunted in the region (see discussion of procurement practices on pages 420-423). Since mammoths remain an ambiguous food resource, I calculated the indices for each site if no mammoths were hunted (columns 1 and 2), if half of the mammoths were hunted (columns 3 and 4), and if all mammoths were hunted (columns 5 and 6).

A number of additional mitigating factors should be considered before turning to examine the indices. While, as shown, the index is sensitive to the season of procurement, other independent variables can also affect it. For example, a low density index at the sites without storage pits can reflect both the hunting season as well as the exploitation of just one resource. Thus both weather and specialization in procurement can result in a low index. At the sites with storage pits, on the other hand, a low diversity index need not necessarily reflect a cold season of occupation for the practice of storing one or a few abundant resources caught during the warm season will also result in a low index. In general then, the index should be seen as a heuristic or exploratory device--one that will give first approximations within a particular region. These seasonal estimates should then be checked against other independent data for confirmation or refudiation.

In calculating the H and J values for the sites I had to summarily deal with taxa present in very small quantities.

These are listed in Table V-14a-c as ins. (insignificant). For the purpose of calculating the index I assigned each taxon listed as ins. an arbitrary proportion of 0.01. For example, in the calculation of the index for Mezin (omitting mammoths), the following proportions were obtained:

SPECIES	fi (PROPORTION)
Horses	50.00
Wooly Rhinoceri	16.00
Reindeer	21.00
Musk Oxen	10.00
Giant Deer	1.00
Wild Boar	1.00
Marmots	0.01
Birds	0.01

Since the diversity index is sensitive only to the number of categories or species and to the distribution of individuals per taxon and as both statistics are also available for the severely disturbed and redeposited sites, I also proceeded to calculate both the H and J-values for those sites. As with the undisturbed sites, I first converted the MNI per taxon values (without controlling for density) into Kcals per taxon and then estimated for each taxon a proportional contribution. These calculations, as well as values for summarized Kcals available per site at the three mammoth densities, are illustrated in Tables V-24 and V-25. The H and J-values for the disturbed sites are listed in Table V-26.

As noted before, some Soviet researchers have hypothesized migratory behavior for the gregarious herbivores of the Late Pleistocene Central Russian Plain that would

have placed the taxa only seasonally in the northern or southern regions of the study area (Pidoplichko 1969, 1976; Vereschagin 1979). Kornietz (1962), as I stated in Chapter III, postulated a latitudinal migration pattern for some of the herbivores that also would have made the taxa available only seasonally in the river valleys. Finally, in my own reconstruction of the behavior of some taxa in the study area in Chapter III, I also hypothesized that seasonal migrations for some taxa would place them in the north of the study region during the warm weather months and in the south in the cold season. There are a number of interesting archaeological implications from all these projections that can be tested with the diversity index. Specifically, we can hypothesize that if some herbivores were available in the north only during warm weather months and in the south during the cold seasons, then the hunters and gatherers exploiting them may also have been seasonally mobile--living in the north during the warm weather months and in the south in the fall and winter. If this was the settlement pattern during the Upper Paleolithic, then the diversity index for the northern sites should be higher than for the southern ones.

Cumulative indicies for the northern and southern sites at the three levels of mammoth inclusion are presented in Table V-23. All in situ sites were included in these calculations without a consideration of possible chronological differences between them. No significant differences were

found in the H-values between the north and the south (h_1 north = 0.08; H_2 south = 0.05) with all the ammoths included (t = 0.57), or with half of the mammoths included (H_1 north = 0.12; H_2 south = 0.05, t = 1.32). The only significant difference in the H-values emerged in calculations when no mammoths were included and showed that the H-values for the north (H_1 = 0.40) was significantly lower than for the south (H_2 = 0.59; t = 2.92).

The conclusions from these regional comparisons are ambiguous at best since, once again, the uncertain role that mammoths played in the economies prevents me from selecting a specific index as the more significant one. Overall, however, the tests do strongly suggest that we can exclude seasonal migration as an explanation for the settlement system and exploitation strategies. I have arbitrarily selected to use the middle values, obtained if half of the mammoths are included in the calculations, in all future evaluations in this chapter.

Figure V-24 graphically presents the distribution of the J-values of all of the sites dividing the study area into the northern and southern regions. As this figure shows, sites with high indices are found in both the north and in the south. Figure V-24 also shows that the sites with mammoth bone dwellings all have relatively low diversity indices and suggests that these sites were occupied during the cold season.

I tested the association of sites with low indices

(J below 0.20) and sites with dwellings using the ϕ and Fisher's Exact Test. The results show a strong positive association between sites with dwellings and low indices (ϕ = 0.47, p = 0.05, see Table V-2). I conclude, therefore, that sites with dwellings appear to have been occupied during the cold weather months.

Diversity indices could be calculated for only three of the sites occupied early with 50% of mammoths included. All three, Berdyzh, Radomyshl', and Yurovichi have a low index, suggesting occupation during cold weather months. Berdyzh and Radomyshl' also have remains of mammoth bone dwellings. Since the mammoths found at Khotylevo II have not been quantified, no index could be calculated for the site including this taxon. The site has yielded a relatively low index when calculated without mammoths. We can anticipate that its index would be equally low with half of the mammoths included as well. Khotylevo II's J-value is considerably lower than the values for Berdyzh, Radomyshl' and Yurovichi (without mammoths) and would remain equally low with half the mammoths counted in. This suggests that Khotylevo II was also occupied during cold weather months.

Figure V-24 shows that most of both northern and southern sites with storage pits and dwellings occupied during the late period have low J-values. The two exceptions are Mezin and Suponevo in the north which have relatively high indices. Sites without dwellings and storage pits, on the other hand, in both the north and the south have either

very low or very high indices. I have previously discussed different behavioral variables that would affect the index and suggested that while high indices in general would reflect warm weather occupation, low values could also be generated by specialized exploitation of one resource. I suspect that this indeed is the reason for low values at Fastovo and possibly Pushkari II. I interpret the high indices at the other sites without storage pits and without dwellings as indicating warm weather occupation.

My estimates for the season of occupation based on the J-values are listed in column 1 in Table V-32 which presents seasonality estimates for the sites from a number of data sources.

In summary then, the calculation of the diversity indices for the sites individually as well as for the northern and southern parts of the study area cumulatively have shown that both cold and warm weather sites are present in both regions. I have also shown that the sites with storage pits and dwellings appear to be cold weather occupations. Data are ambiguous on the season of occupation of Mezin and Suponevo, however.

In general, Figure V-24 shows that there appears to be a greater diversity in the northern part of the area where we can monitor the presence of numerous cold and warm weather occupations. Only one site in the south, Zhuravka, has produced a high index and indicates warm weather occupation. At first glance the differential distribution of warm

weather sites in the north and south appears interesting. However, as I have argued previously, the diversity index itself is ambiguous and low values can also be generated by specialized exploitation of one resource.

When dealing with the indices from the Upper Paleolithic Central Russian Plain sites we also have to consider the effect that the documented climatic fluctuations would have had on the indices. The J-values were calculated without considering these fluctuations. Likewise, as I have shown in Chapter IV, the sites cannot be unequivocally assigned to a specific cold or warm fluctuation. It could, therefore, be argued that the presence of cold and warm weather occupations in the north date to a warm interstade and the cold weather occupations in the south to a cold interstade. This suggestion implies a latitudinal shift in settlements through time as a response to climatic fluctuations. As I have shown in Chapter III, biological data on the climate at the time of occupation are sparce and often contradictory. What data are available have been plotted against the diversity indices of the sites in Figure V-25a and b for the north and south separately. Climatic ratings from 1 for warm to 4 for cold have been presented and discussed in Chapter III.

As this figure shows, the data do not support the hypothesis on the shifting of the settlement system along the latitudinal gradient during the warm and cold interstades as an adequate explanation for the distribution of the cold weather sites in the study area. Sites with

dwellings in the south, such as Dobranichvka and Gontsy, were occupied during a warm climate phase. In the north, Mezin, with its relatively high diversity index, was occupied during a cold climate phase. Both Eliseevichi and Pushkari I, with mammoth bone dwellings and low diversity indices also seem to date to a cold climatic episode.

Quite clearly we cannot, at present, fully reject the hypothesis that the north and the south were occupied only seasonally. Much work remains to be done on chronologies as well as on climatic reconstruction before it can be fully demonstrated that year-round occupation occurred in both the north and the south of the study area. The data I have presented, however, argue for just such a conclusion and indicate that sites with dwellings in both parts of the study area were occupied during the cold season while those without dwellings and storage pits were warm weather occupations. I will now evaluate these seasonal assignments by considering independent data.

B. Season of Occupation On The Taxa Exploited

In the course of a paleoenvironmental reconstruction of the Central Russian Plain in Chapter III, I discussed the ecology of some of the more abundant taxa found at the sites, and projected an optimal time for their harvesting. These projections are listed in Table III-9. For the purpose of this discussion I will assume that species taken were hunted at the season of their greatest abundance.

In some cases, especially when dealing with small

sized taxa such as hares and marmots, finer estimations for the season when actual hunting took place could be obtained than just cold-warm weather months. I have presented evidence earlier.in this chapter that hares were taken in early winter (December possibly) when their pelts were in optimal condition. Similarily, since I have shown that arctic foxes were hunted in late winter, I can now also test the hypothesis that marmots were taken in late summer-early fall. If the sites in the study area were seasonally occupied and if marmots were taken in late summer, then we can expect to find a negative correlation between the MNIs of marmots and foxes. Their scatter plot and regression line are illustrated in Figure V-26 and show that the two are negatively correlated ($r = -0.46$, $p \Rightarrow 0.1$) although the sample size ($N = 6$) is too small for this correlation to be statistically significant. I interpret this correlation as confirming my hypothesis that marmots were taken in warm weather months while they were out of the burrows.

In order to estimate the season of occupation of the sites based on the food taxa exploited, I decided to first eliminate both mammoths and wooly rhinoceri from consideration as these taxa offered no information on the season of exploitation. Secondly, I also excluded fish and birds since they will be subjects of separate analyses. I proceeded to group the taxa per season of exploitation (warm or cold weather) where such estimates could be made, and also created a third category of species that could not be assigned

to a particular season of exploitation. The units of analysis for this exercise were density controlled Kcals per taxon at the undisturbed sites and the MNI counts converted to Kcals per taxon for the severely disturbed and redeposited sites. New values for the Kcals per site (without mammoths and wooly rhinoceri) were then calculated and proportional weights assigned to the different taxa. These proportions can be found in Table V-27. The final column in this table lists in order of magnitude the season or seasons of occupation based on the data in the table. For example, the entry for Chulatovo II where 46% of Kcals come from reindeer harvested during the cold months and 54% come from taxa hunted during the warm moths is listed in the last column as C+W. Berdyzh, on the other hand, where 37% of Kcals come from warm weather hunting and 63% from hunting during an undeterminable season is listed as W+ND (no data). The estimates can also be found in column 2 of the overall season of occupation table (V-32).

The resulting seasonal indications are ambiguous at best. As I have discussed previously, in storage economies one can anticipate a lack of clear seasonality at the sites where storage is practiced. What the seasonal indications did reveal, however, is a prevelance of multi-seasonal fauna at sites with dwellings and storage pits, and uni-seasonal fauna at sites without such features. I tested the association of sites with dwellings with the presence of multi-seasonal faunas, as well as the association of

sites with storage pits with multi-seasonal faunas. The results of the Fisher's Exact Test and the ϕ values are listed in Table V-2. As that table indicates, there is a significant positive association of $\phi = 0.64$ between sites with dwellings and the presence of multi-seasonal faunas ($p = 0.01$), while no significant association was found between sites with multi-seasonal faunas and those with storage pits ($\phi = 28$, $p = 0.17$). I interpret these results to indicate the following:

1) two types of storage behavior may be present in the study area:
   a) one found at sites with storage pits and dwellings where diverse resources were cached for later use in winter base camps,
   b) the second, at such sites without dwellings as Timonovka I and II, where one specific abundant resource was stored at the time of harvest; and
2) sites without dwellings show subsistence practices that both included provisioning and storage prior to occupation, as well as, opportunistic exploitation of available resources during the occupation of the sites.

These conclusions imply that sites with storage pits but

without dwellings should exhibit a faunal composition low in diversity while those with storage pits and dwellings should show greater diversity. Data on hand on the diversity indices do confirm these predictions--sites with storage pits and dwellings show somewhat higher indices than Timonovka I and especially Timonovka II. At the present time, however, the sample sizes are too small (e.g., two sites with storage pits and without dwellings, Timonovka I and II) to fully evaluate this prediction.

(1) Fur Bearers

I have previously shown that fur bearers, especially arctic foxes, wolves and hares were exploited in the study area during the cold weather months. In this discussion I will use the densities of fur bearers found at the sites as a seasonal indicator. I will arbitrarily assume that the density of fur bearers only reflects their availability in the area at the time of occupation and assign sites with low densities of fur bearers to warm weather months and those with high densities to cold weather months. The assignments are listed in column 3 in Table V-32.

(2) Fish as Seasonal Indicators

Fish have long been recognized in archaeology as highly sensitive indicators of the season of occupation at sites. Ethnographic evidence amply documents that concentrated efforts at securing fish are undertaken by north latitude groups during fish spawning periods when they are most abundant (see Boas 1964; Casteel 1976; Jochim 1976, 1981;

Keene 1981; Nelson 1971, for example). While the small numbers of fish found at the sites suggest that fishing was an opportunistic strategy not keyed to maximal exploitation of fish, for the purposes of this discussion, I will assume that the fish found were taken at the period of their greatest abundance as well.

Data in both the archaeological and ichryological literature indicate that north latitude fish have widely varying spawning seasons with some species such as pike spawning in cold weather months (late winter-early spring) while others, such as catfish, exhibit far greater sensitivity to water temperatures and spawn in summer months only (Berg 1964; Carlander 1969; Cleland 1982; Wheeler 1969). Table III-3 lists the economically important fish exploited in the study area and shows that both these species, the pike and catfish, are present in the faunal assemblages. Table V-28 presents the fish remains grouping them on the basis of their spawning season. Spawning season could be determined only for those taxa identified to species. In cases where fish remains were identified to the genus only (e.g., salmon, carp, and bream families), I could only project spawning during warm weather months because these three genera are described in the literature as temperature sensitive spawners (see Carlander 1969 and Wheeler 1969).

Two taxa in Table V-28 are cold weather spawners while the remaining eight are warm weather spawners. Column 7 in this table lists the MNI counts for the fish assigned to a

spawning season, while column 8 offers the proportion of the fish per site that are cold spawners and column 9 the proportion of warm weather spawners per site. Column 10 estimates the season of fish harvesting at the sites based on the ratio of cold to warm spawners in the faunal assemblage. As Table V-32 shows, these seasonal estimates are consistent with both the conclusion on the season of occupation from the diversity indices and from mammalian fauna.

Fish remains at Eliseevichi, however, indicate that fishing at the site may have been done during the warm weather months. Since fish remains from Eliseevichi are both problematic (see previous discussion on pp. as well as identified to the genus only, this inconsistency does not appear too serious. As Berg (1964), Carlander (1969), and Wheeler (1969) indicate, the carp family includes a number of species with widely ranging sensitivities to water temperatures--some Cyprinids spawn in early spring while others do so in the fall. This suggests that Eliseevichi carps could have also been harvested during the early spring when the bulk of the fur bearers found at the site were procured.

(3) Birds

Umanskaya (1978) has investigated the avian remains found at the Central Russian Plain Upper Paleolithic sites and has divided them into two categories: 1) those of economic importance to man who became a part of the faunal inventories as a result of direct procurement, and 2) those

taxa not exploited or utilized by man. Birds that she identified as economically important belong to two broad categories: terrestrial and water fowl. Terrestrial birds include two taxa: the willow ptarmigan and the black grouse. The willow ptarmigan today is an overwintering species in northern latitudes, and can be presumed to have been such in the Late Pleistocene as well. The black grouse, as well as all of the remaining water fowl are migratory today. In a discussion of the present day biogeography of the study area in Chapter III, I have listed data provided by Voitenko (1965) on the dates of the return of migratory taxa to the environs of Kiev. These data can be used to approximate the return dates for the migratory taxa to the study area during the Late Pleistocene as well.

The different avian taxa found at the site that were exploited are listed in Table V-29 in groupings that designate their terrestrial or aquatic habitat as well as their sedentary or migratory behavior. As this table indicates, only one species, the willow ptarmigan, would have been available in the area year round. The remaining taxa were present and available for exploitation during warm weather months only.

The willow ptarmigan, on the other hand, could have been exploited year round. Ethnographic literature on north latitude hunters and gatherers repeatedly indicates that this taxon is usually harvested in cold weather winter months and constitutes what Watanabe calls "starvation food"

(Watanabe 1969; also see Boas 1964; McGovern et al., 1984 ; and Nelson 1971, for example). To test the proposition that the willow ptarmigan also constituted a winter "starvation food" for the inhabitants of the Upper Paleolithic Central Russian Plain, I calculated a correlation coefficient between the MNI values of hares and willow ptarmigans. Ideally such a correlation should be calculated for only the southern sites, since I have suggested that active procurement of hares was done only in the south. Hares and willow ptarmigans, however, are only found at two southern sites--Dobranichevka and Mezhirich. If, on the other hand, we include the northern sites where these taxa cooccur in the sample, then the sample size is sufficient for the r-values to be calculated. The inclusion of northern sites where hares were not actively hunted in this sample is justified because we can assume that the hares found at northern sites came from kills outside the region. As I have shown previously, hares were hunted in the south at the onset of winter. Therefore, if we assume that willow ptarmigans were winter food as well, we can predict a high positive correlation between the MNI counts of these taxa at the sites. As Figure V-27 illustrates, a high positive correlation does exist between the density controlled MNI values of hares and willow ptarmigans ($r = +0.88$) and confirms my hypothesis that willow ptarmigans were taken during cold weather months.

Columns 11-15 in Table V-29 present the numbers and

proportions of overwintering birds (i.e., willow ptarmigans) and proportion of migratory birds found at the sites. Column 16 estimates the season of occupation of the sites based on the proportions of overwintering to migratory taxa. While the data for both Dobranichevka and Eliseevichi suggest cold weather occupation (100% of the birds at both sites are overwintering willow ptarmigans), those from Khotylevo II, Mezhirich, Mezin, and Novgorod-Severskii are more ambiguous. The low ratios of overwintering to migratory taxa at both Khotylevo II and Novgorod-Severskii (36% to 64% at Khotylevo II and 24% to 70% at Novgorod-Severskii) suggest that the predominance of birds were taken in warm weather months, those from Mezhirich and Mezin (75% overwintering and 25% migratory at both sites) suggest procurement during the cold weather months. To test the validity of such seasonal assignment of the sites, I performed the Difference of Means test on the avifaunal proportions. Since the variables were proportions rather than absolute values they had to be first submitted to the arcsine transformation. The statistical justification as well as the mechanics of arcsine transformations are discussed in Zar (1974:185-186) where the following formula is used for the transformation:

$$X' = \text{Arcsine} \quad X$$

where X is the original proportion itself and X' the arcsine transformed proportion. The following arcsine transformed

values were obtained for the sites:

SITES	ARCSINE TRANSFORMED PROPORTIONS	
	OVERWINTERING	MIGRATORY
Khotylevo II	35.67	54.33
Mezhirich	60.00	30.00
Mezin	60.00	30.00
Novgorod-Severskii	27.27	62.73

The Difference of Means test showed a significant difference between mean proportion values from Mezhirich and Mezin and Khotylevo II and Novgorod-Severskii (X_1= 60.; X_2= 31.47. N = 4; z = 9.58, p = 0.0001). I interpret these results as supporting my hypothesis for winter occupation of Mezhirich and Mezin and warm weather for Khotylevo II and Novgorod-Severskii.

As previously, conclusions reached on the season of occupation based on the analysis of avifauna have been entered in column 7 in Table V-32.

C. Altitude of Sites Above the Floodplain

Ethnographic literature on settlements in the north latitude, especially in tundra regions with permafrost, repeatedly indicate that while cold weather settlements are located on or near the floodplains, warm weather ones are either further inland or higher up and away from the floodplain (see Nelson 1971, for example). The reasons for such movement of villages or camps are related both to the marshy and swampy terrains of river valleys as well as to the presence of enumerable mosquitoes and gnats in the valleys

during warm weather months. Given the paleoenvironmental reconstruction of the Late Pleistocene Central Russian Plain (see Chapter III), it is reasonable to suppose that under those conditions, similar terrain and insect problems would have existed on the floodplains in warm weather months.

With this assumption in mind, we can now consider the altitudinal location of the sites as a possible source of information on the season of occupation. My working assumption here is that warm weather sites should be located higher up from the floodplains than cold weather settlements. I have already hypothesized that sites with mammoth bone dwellings appear to be cold weather settlements and have shown in Chapter II (pp.145-147) the association of sites with dwellings with floodplain and ravine topography. Here I will test the proposition that if sites with dwellings are indeed cold weather occupations then they should be located either on the floodplains themselves or close to them. Sites without dwellings, which I have previously indicated may have been warm weather occupations, should be found higher in elevation above the floodplains. Column 5 in Table V-32 demarks the sites with mammoth bone dwellings, while the height of the site above the floddplain is in column 8. The results of a Fisher's Exact test and O calculation on the association of sites with dwellings with floodplains is presented in Table V-2 and indicates a strong positive association (O = +0.65, p = 0.01). In computing this test statistic I considered sites either on the flood-

plain sites while those more than 2 meters above the floodplain as off it. In cases such as Chulatovo II, where a range in altitude above the floodplain is listed, I used mean values for the calculations. I interpret the results of this test to confirm my hypothesis that there is a difference in the altitudinal location of warm and cold weather sites. Estimates on the season of occupation of the sites based on their altitudinal location are listed in column 9 of Table V-32.

This seasonal indicator, as can be seen in the case of Zhuravaka, is also not unambiguous. Zhuravka's location on the floodplain argues for winter occupation while all the other seasonal indicators considered heretofore suggest that it was occupied during warm weather. This discrepancy does not invlaidate the conclusions reached on the season of occupation using altitude as a variable but rather it supports my argument that no one indicator is sufficient and should be considered along with information from other independent data bases.

D. Data from the Hearths as Seasonal Indicators

The indoor or outdoor location of hearths as well as the volume differences between them represents the last source of information on the season of occupation of the sites with dwellings. As Table II-6 indicates, hearths have been found both inside and outside the dwellings at some of the sites in the study area, and data are available

on both the volume of ash in the hearths as well as on the density of hearths per m^2 of the sites. This information is tabulated for the undisturbed sites in Table V-30. We can use these data to test for the season of occupation after making the following assumptions: 1) all other things being equal, more time should be spent indoors and more activities performed inside the dwellings during cold weather months; 2) more time will be spent outdooors and more activities performed outside of the dwellings during warm weather months, and 3) the volume and density of the hearths are sensitive to both duration of occupation as well as to the number of occupants at the sites. Given these assumptions, we can then predict that both the number of indoor hearths as well as their volume should be considerably greater at sites occupied during the cold weather months than at sites occupied during the warm weather. I proceeded to test these predictions using the data on hand.

To control for the differences in the sizes of excavated portions of the sites I transformed the raw density or volume data into measures of both density and volume per m^2 per site. Necessary data to test the stated hypothesis are available for only four of the sites: Dobranichevka, Mezhirich, Mezin, and Pushkari I and are presented in Table V-31. The values for the mean hearth volume for each site were obtained by multiplying the mean depth of the hearths by the mean number of hearths found at the sites.

A comparison of the figures for the total hearth

volume found in the interior hearths to that of the exterior hearths at these four sites shows large differences present. For example, interior hearths at Dobranichevka hold 3.5 times the volume of ash as do the exterior ones. Similarly high ratios of interior to exterior volume can be observed at Mezhirich, and a somewhat smaller one at Pushkari I. At Mezin, on the other hand, exterior hearths hold about 75 times more volume than the interior ones. These differences suggest that the four sites may have been occupied during different seasons--the first three in cold weather months and Mezin during the warm season. I proceeded to evaluate these differences through the Difference of Means tests on both the volume and hearth densities and the results can be found in Table V-31b. The test results show that both the interior hearth volume (about 13 times greater, $z = 2.44$) and the interior density of hearths per m^2 (about 16 times denser, $z = 5.77$) are significantly higher at Dobranichevka, Mezhirich and Pushkari I. The volume of exterior hearths at Mezin is about four times greater than at Dobranichevka, Mezhirich, and Pushkari I ($z = 12.54$). The density of exterior hearths per m^2, however, showed no difference between the sites.

The conclusion I draw from these comparisons is that hearth data from these four sites indicate that more people spent more time indoors at Dobranichevka, Mezhirich, and Pushkari I and more time outdoors at Mezin. I therefore estimate cold weather occupation for the first three sites

and warm weather occupation for Mezin. These estimates are listed in column 10 in Table V-32.

In these tests I assumed that all other things were equal including both population size and length of stay. These two variables, however, cannot be considered equal as both affect hearth densities and hearths volume and can be expected to range at the sites. If we assume, for example, that hearth volume roughly reflects the duration of occupation and that the number of hearths is sensitive to population size, then the results of the Difference of Means tests reported here carry additional implications for the sites. I will return to them and examine them in greater detail in a subsequent chapter of this work.

E. Conclusions on the Season of Occupation of the Sites

Seasonality estimates from the diverse sources discussed in this chapter are listed in Table V-32. A comparison of seasonality estimates offered in all of the columns shows a great deal of ambiguity and contradiction. I suggest that conclusions on seasonality based on the mammalian food species present (listed in column 2) are the weakest indicators. This, as discussed previously, is because we are dealing with logistically organized hunters and gatherers who extensively utilized storage in their procurement practices and subsisted on stored provisions during at least a part of the year. In a discussion of food taxa as seasonal indicators I have demonstrated that all sites with dwellings and storage pits show the presence

of multi-seasonal faunas and that only sites without such facilities show uni-seasonal occupation. I conclude, therefore, that the practice of storage affectively obliterates the utility of most faunal seasonal indicators.

The density of fur bearers is equally unreliable as an indicator of the season of occupation. While the assignment of high density fur sites to a cold weather occupation conforms to the estimates from other sources, the assignment of all sites with low densities of fur bearers to the warm season is clearly in conflict with other evidence. This is because low densities of fur bearers at the sites reflect a number of both technological and social variables. I therefore conclude that faunal data on fur bearers in its present form is unsuitable for use as an unambiguous source of information on the season of occupation.

Seasonality estimates based on both fish and bird remains appear to be more reliable and consistent. Unfortunately, however, these data are available both for a very small number of sites and in numbers too small to be significant. Similarily, data on the hearth volume and densities appear interesting but again suffer from the problems of sample size.

I offer seasonality estimates based on the diversity indices and on the height of the sites above the floodplains as the most reliable. As discussed, both are problematic and make a number of assumptions that need to be tested in future research. Overall, however, I suggest

that it is these two indicators that are in closest accord with each other and come closest to accurately estimating the season of occupation of the sites. Consequently I have heavily favored conclusions on the season of occupation listed in these two columns in reaching my final estimates for the season of occupation of the sites. These final estimates are listed in column 11 in Table V-32.

Some will question the value of estimates obtained without adequate climatic or chronological controls. I concur that both paleoenvironmental and chronological controls are problems that cannot be surmounted with the data on hand but also argue that as problematic as my seasonal estimates are, they do further our understanding of the Upper Paleolithic settlement practices in the study area and must be done if we are to get beyond looking at individual sites as Upper Paleolithic universes.

I conclude from this discussion that all of the sites in the study area were seasonally occupied and do not represent permanent settlements inhabited for years or decades. I will examine the duration of occupation of the sites in Chapter VI and offer possible ranges for the extent of sedentism on the Central Russian Plain.

I also conclude that the northern and southern regions of the study area did not represent territories exploited seasonally by one group. The presence of both warm and cold weather occupations is documented for both parts of the study area and indicates local or regional territorial

fidelity. Regional comparisons between the numbers of cold and warm weather sites listed in Table V-33 show very similar proportions of cold to warm weather sites both inter-regionally as well as through time. For example, 47% of all northern sites and 67% of all southern sites were occupied during the cold season. The proportions for warm weather sites during the late period of occupation are similarly close: 55% for the north and 33% for the south. As the results of the Fisher's Exact test and associations presented in Table V-2 show, these differences in the proportions are not significant given the nature of the data on hand and the history of archaeological research in the study area.

Because of sample size problems it is more difficult to evaluate the possible changes through time. It is obvious that time factors themselves would favor the preservation of sites with more permanent features such as storage pits or bone dwellings and would remove a disproportionately large number of the more ephemeral sites from the archaeological record. Given these assumptions, it is not surprising to find, as Table V-33 shows, that the three early northern sites all appear to have been occupied during cold seasons. In light of my discussion on the association of cold weather sites with more permanent features, both the lack of bone dwellings at Khotylevo II as well as its location above the floodplain is surprising. As I noted before, however, Khotylevo II is a unique site that differs

from the other Dnrep-Desna Upper Paleolithic sites stylistically in its lithic and bone assemblages as well as in its portable art. As a subsequent discussion in Chapter VI will demonstrate, Khotylevo II is enigamatic and does not easily fit into the site typology I offer for the study area.

Finally, I offer the following generalizations on the season of occupation of the sites in the study area: 1) sites with mammoth bone dwellings with or without storage pits, were occupied during cold weather months, 2) sites without dwellings and storage pits were occupied during the warm weather months, and 3) sites without dwellings but with storage pits were occupied during cold weather months also. Three of the sites with storage pits and dwellings, Mezin, Radomyshl', and Suponevo do not fit this pattern perfectly. For Radomyshl' I offer an explanation based on its early period of occupation and its location in the southern part of the study region. Since it was occupied during a relatively warm period of the Bryansk Interstadial, prior to the general post Bryansk cooling, we can anticipate a more temperate environment with greater faunal diversity in its environs. Given milder climatic conditions and greater faunal diversity in the region, we should expect that the diversity indices of the cold weather sites from this period would show higher values than the indices from cold weather sites occupied during the subsequent much harsher post-Valdai maximum period.

Data from Mezin and Suponevo are more difficult to

occupation cannot be taken to indicate year-round sedentism at these sites. As I will show in Chapter VI, neither the cultural layer, available food Kcals, the number of features, nor the densities of lithics and bone assemblages at these sites differ significantly from other sites with mammoth bone dwellings and storage pits. I suggest that Mezin and Suponevo show multiple seasons of occupation because the number of sequence of reoccupation are more visible at these sites. I have already suggested that transport costs and logistics imply that the procurement of the stored foods went on in the vicinity of the storage pits. If we suppose that this provisioning and stocking of the storage pits was done during the warm weather months, we find the hunters and gatherers present near the storage pits during both the cold, and at least partially, the warm seasons. The locus of warm weather activities in some cases would be concentric to the locus of the subsequent cold weather month activities and, depending on the rates of sedimentation in the area, be indistinguishable from one another. In other cases, because of some highly local topographic or geomorphological factors, there could be a greater separation in the seasonal loci of activities. This would result in a spatial separation of season-specific behavior. The first may indeed be the case at Mezin where, as I have indicated in a previous discussion on hearths, both warm and cold weather occupation is indicated. The second case may exist in the Pushkari

group sites. Pushkari I, which I have classified as a cold weather occupation is located just some 300 meters away from Pushkari II, occupied during the warm season. The relationship of these two sites to each other remains unclear in the Soviet literature (see Boriskovskii 1953 and Voevodskii 1952c, 1952d). Both are known from relatively small-sized excavations, and the area between them has not been investigated. Finally, Suponevo data are insufficient to offer either one of these two explanations to account for the multi-seasonality indicated for the site. In conclusion, I suggest that in spite of these three discrepancies, the overall seasonal patterning observed is significant and warrants our acceptance of the sites as seasonally occupied settlements.

V. A TENTATIVE EXPLANATION FOR THE OBSERVED CHANGES IN THE SUBSISTENCE PRACTICES THROUGH TIME

This chapter has examined the nature of the man-land interactions on the Late Pleistocene Central Russian Plain. I will close with a brief review of what changes have been noted through time both in the landscape itself as well as in the man-land interactions and offer a model to account for the observed changes.

In Chapter III I presented evidence for two major changes in the Late Pleistocene landscape through time as seen in the gross numbers of sites for each time period of occupation. In the same chapter, comparing the distribution of settlements through time, I also concluded that not only

do we see an increase in the number of sites but also can observe a change in the location of the sites. In time they become linearized along the river valleys. I related this change in the settlement pattern directly to the observed linearization of the resources.

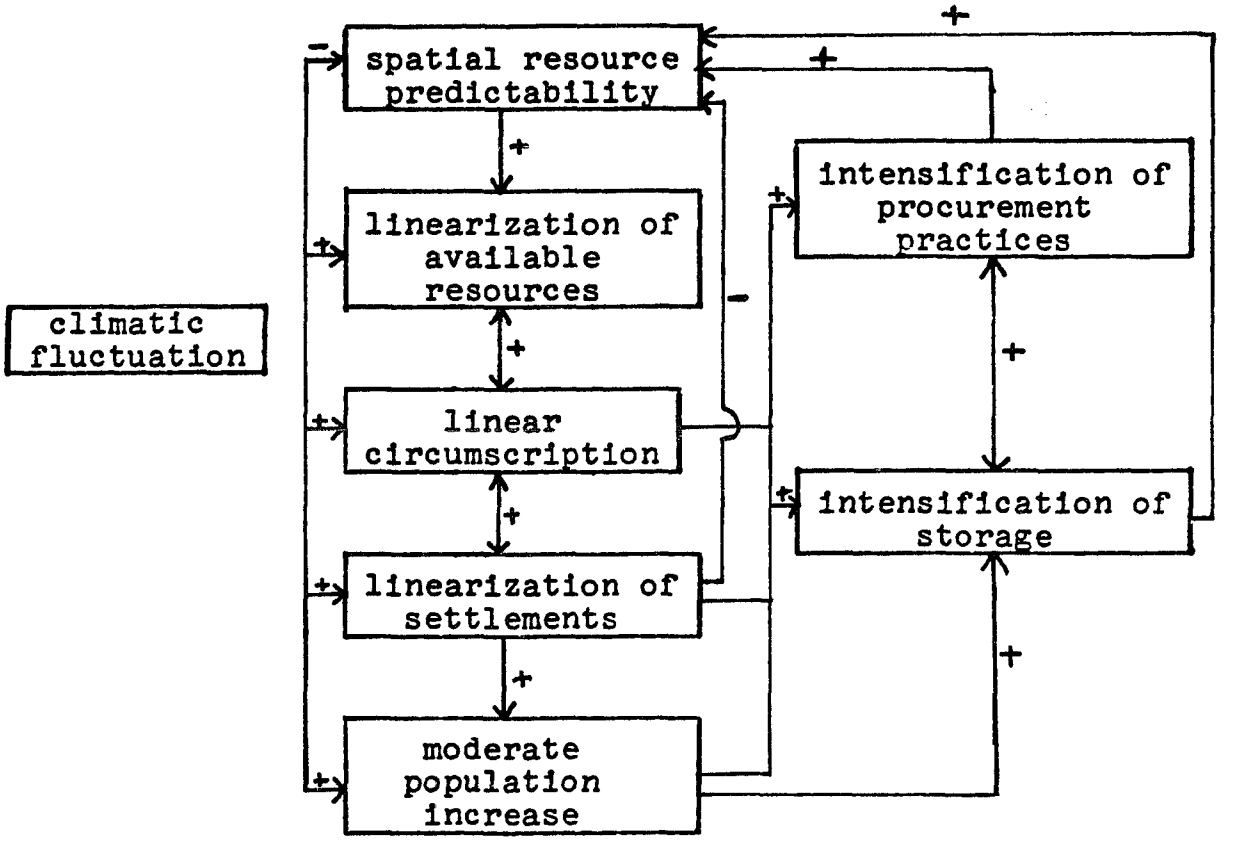
In a discussion of subsistence practices in this chapter, I have shown a general intensification of exploitation of economically important taxa as well as in the diversification of the species used as food through time. Similar intensification was also noted in storage behavior.

At the same time this chapter has also shown a lack of change in a number of important components of the subsistence practices--most notably in the organization of subsistence activities as well as in the fundamental composition of the subsistence base. As I have demonstrated, gregarious herbivores formed the subsistence base during the entire period of Upper Paleolithic occupation of the study area and the strategies employed in harvesting them did not undergo major changes through time.

Allowing for gaps in the data, I have monitored a continued presence of both warm and cold weather sites through time, as well as found no differences in either MNB or MNI densities of economically important taxa through time. Summarized Kcal values on food available at the sites also did not exhibit a significant change.

These observations represent the major components of my model and their relationship to each other is diagramed

below:



LEGEND: + = positive feedback
- = negative feedback

It is important to reiterate that this model is offered only for the observed changes in man-land relationships and does not consider social relationships. It is a heuristic device designed to account for just a part of the variables annotating those eminating primarily from man-land relationships. As such, it explains the function of one of the subsystems of the total Upper Paleolithic adaptive complex.

Stress brought on by climatic fluctuations is seen here

as the independent variable responsible for the observed changes through time. Environmental stress was felt and reacted to by man on the level of resource availability and predictability. The linearization of the resources after the Valdai maximum brought about a rearrangement of the settlement system and created both demographic and resource circumscription.

It is a moot point whether the observed moderate increase in population was real or just a product of a different (in this case linear) arrangement of the same numbers of people in space. I argue here that even if no actual increase in numbers of people occurred the linearization of the population created linear circumscription which can be considered an equivalent of demographic increase. This demographic circumscription or linearization in turn amplified the resource stress and brought about an intensification and diversification of the subsistence base as well as the intensification in storage behavior.

It is important here to reiterate that the organization of the procurement practices did not change through time--the basic subsistence practices remained the same but were just intensified.

The model offered here is similar in a number of aspects to those offered both by Hayden (1981) for the Late Pleistocene as well as by Price (1981) for the Mesolithic of Europe. Hayden (1981) has proposed resource stress as the most important motive for patterned directional change

in cultural systems. Price (1981) has argued for the importance of demographic stress in rich but environmentally circumscribed regions in promoting increasing complexity in hunter-gatherer settlement and subsistence systems. Both authors see these stresses, environmental in the first case and environmental cum demographic in the second, as bringing about directional change that can be termed evolutionary.

The model I offer also underlines the importance of both the environmental and environmental-demographic stress in bringing about the observed changes--in contrast to both Hayden and Price, however, I do not see this change as directional. I suggest that the observed change can be better understood as fluctuational--one that has no ultimate evolutionary significance.

Recently both systems theorists and ecologists, as well as an increasing number of anthropologists, have come to recognize that dynamic systems, especially living ones, have fluctuations present that are a part of even the most stable states (see Glansdorf and Prigogine 1971; Nicolis and Prigogine 1977, for example). In ecology, May (1973a, 1973b, 1977) has shown that not-directional fluctuations (i.e., those that do not lead to a directional or permanent change) are present in most living systems. I have already discussed Haber's (1980) data on the stability and fluc-
tuations (i.e., those that do not lead to a directional or permanent change) are present in most living systems. I have already discussed Haber's (1980) data on the stability

and fluctuation in moose populations in Chapter III. Therefore, since such fluctuations exist and living systems can be observed at different states through time, we should expect to find a diachronic variability in the state of a system.

Friedman (1979) has applied some of these observations to culture and history in general, and criticized the acceptance of the cybernatics model in anthropology. Approaching past human cultural systems from this perspective, one that allows for fluctuation, I, after Friedman (1979), would argue that we must expect to find a great deal of variability in all adaptive practices be they related to subsistence or settlement. Given this, when we note change in one or more of the components of the cultural system we cannot assume that this change, ipso facto, is evidence for directional change or evolution. Translating this into archaeological implications, I suggest that we can argue for directional or evolutionary significance in observed change only after we have eliminated the possibility that what we are witnessing falls within the normal range of expected fluctuations.

Following Steward's lead (1955), archaeologists have long accepted the idea that a given environment does not determine or prescribe a particular set of cultural behaviors but just imposes certain rather broad limits on such behavior. Weissner (1982a) has stated that at any given time in any given environment there are a number of

organizational strategies that can fill subsistence needs. Bettinger (1978) has cogently argued for the eimpirical reality of alternative solutions to adaptive strategies in the prehistoric Great Basin. I argue here that we can project the existence of these alternate solutions in time as well. Their coexistence in space is a synchronic equivalent of temporal fluctuations. From this perspective, most changes in the cultural systems through time first and foremost represent behavioral adjustments (or alternate strategies) that need not, in most cases do not, have evolutionary significance.

The data from the Central Russian Plain presented in Chapters II-V of this work have shown both the presence of change, especially in some aspects of the subsistence behavior, as well as evidence for the continuity of basic adaptive strategies through time. I interpret the type of changes observed as "variations on a theme" or quantitative rather than qualitative in nature.

In this model I argue for a linearization of the settlement systems along the river valleys during a later period of the Upper Paleolithic (18,000-12,000 B.P.) as a response to the linearization of resources. This suggestion is in contrast to the arguments advanced by Wobst (1976a) that linear settlements occurred in the Upper Paleolithic only after certain population density tresholds were passed. Wobst (1976a:56) wrote:

> Not only does full-time specialization on a linear environment require extreme population densities to begin with, but it also creates such a strong locational dichotomy between the more centrally located and the more marginally placed groups that it may well overburden the social mechanisms available to egalitarian band societies.

Wobst's arguments are based on a number of spatial considerations of optimally packing human mating networks on the Late Pleistocene landscape. In his model he assumes both 1) an undifferentiated uniform landscape, and 2) maximization of information or communication access as the crucial variable in the distribution of people in space.

The Late Pleistocene landscape in the study area, however, was not uniform or undifferentiated and represented a case of extreme linear circumscription. Under such environmental conditions optimal hexagonal packing of human groups modeled by Wobst becomes untenable and linearization of settlements becomes a reality. This can occur at population density levels well below the extreme ranges Wobst advocates.

It is interesting to note here that linearized settlements in hunter and gatherer societies have long been associated with a heavy reliance on fishing (e.g., the Northwest Coast groups, the Ainu). Since such groups also lived in high population densities, the two variables--linearization and high population densities--became systemically related in our models. I suggest, however, that

linearization of settlements can and did occur in the past without high population densities being present and that linear circumscription of resources was sufficient to bring it about. Geographical and historical data bear witness to this idea. Eidt (1966, 1967, 1971, 1975) has shown at length that the most successful colonization schemes all over the 19th and 20th century Latin America were based on a linear distribution of settlers along the rivers. This colonization model, termed Waldhufendorf, and based on the medieval German system of colonization of forest lands, was repeatedly more successful than the various hexagonal systems tried in colonizing virgin lands in Argentina, Brazil, Colombia, Peru and Venezuela.

As Wobst (1976a) noted and as historic data on linear settlements reiterates, there are numerous communication and distance problems that linear settlement schemes generate. These problems, however, fall in the sphere of man-man relationships and will be dealt with in a subsequent chapter.

The model offered here accounts for the observed change in both the land and man-land relationships and takes into consideration only the environmental and technological variables. It is, as I noted, a heuristic devise for the present designed to control for part of the variability observed in the archaeological record and will be modified and developed to take social relationships into consideration.

CHAPTER VI

SITE TYPES AND THE SETTLEMENT SYSTEM ON THE CENTRAL RUSSIAN PLAIN DURING THE UPPER PALEOLITHIC

I. INTRODUCTION

In Chapters II and IV, I briefly examined the location of sites in the study area and pointed out some regularities in the distribution of particular kinds of sites (e.g., sites with and without mammoth bone dwellings). In Chapter V, I showed that all of the sites were seasonally occupied. Both of these characteristics, duration of occupation and site location, are aspects of the second major component of Upper Paleolithic cultural systems on the Central Russian Plain. They are variables of the settlement system. This chapter will focus on the reconstruction of the settlement system and will: 1) first offer a site typology, 2) then consider the parameters of group size and duration of occupation of the various types of sites, 3) then outline the settlement system extant in the study area, and 4) consider chronological changes in the settlement system over the 15,000 year period of Upper Paleolithic occupation.

I have selected to work with the settlement system as an analytic tool for studying past human adaptations because, at present, it is the most powerful method available for understanding the temporal and spatial operation of hunter-gatherer groups in their environment. This approach has been

extensively used both by ethnographers and archaeologists (see Balikci 1970; Binford 1982b; Damas 1972; Lee 1979; Winters 1969; and Yellen 1977, for example). Price (1978:82) writes that the concept of the settlement system:

> ....refers to the functional interrelationship among different kinds of settlements within a region and their articulation with the natural environment. More specifically, the concept provides a framework in which to place the variety of sites that may appear in the record.... These seemingly diverse remains may thus be understood as the "seasonal" poses or postures... that human groups may take during the course of a yearly cycle of activities. In this sense, the concept of settlement system simply formalizes a general pattern of behavior that has been described for many ethnographically-known groups of hunters-gatherers.

Since all ethnographically know hunters and gatherers exhibit locational mobility in their subsistence pursuits, this mobility results in the existence of numerous settlements or camps for a given group both in time as well as in space (for a detailed discussion of hunter-gatherer settlement variability see Binford 1980, 1982b; and Watanabe 1968; for example).

Lee (1979) has recently offered a second universal strategy for hunter-gatherer settlements: aggregation and dispersal. He writes:

> What are central to all these cases ...are a pattern of concentration and dispersal, usually seasonal.... The worldwide occurrence of this pattern of spatial organization in vastly

> different kinds of environments indicates the degree to which it is basic to the hunting and gathering adaptation (Lee 1979:360-361).

This second universal mechanism, in turn, implies that we can anticipate finding very different sizes of sites for a given group of hunters and gatherers.

The settlements themselves, as numerous authors have pointed out, can and do vary along a number of parameters including season, duration of occupation, location, and composition. These parameters, in turn, are affected by such factors as subsistence and social needs (see Jochim 1981 for a thorough discussion). While the settlements or sites themselves are features of a specific adaptive strategy of a given group, their variety across all groups is not limitless. In general, two broad classes of sites have been distinguished for hunters and gatherers on the basis of both the range of activities occurring in them as well as the size of the group performing these activities and occupying the sites: 1) base camps, and 2) special purpose or extractive camps (Binford and Binford 1969; Binford 1980). Price has summarized the different activities associated with these two classes of settlements as follows:

> Extractive activities involve the acquisition of specific foods, fuels, or materials from the environment. Maintenance activities include those fundamental, general-purpose, routine activities of daily life: food processing and preparation, manufacture and repair of tools, construction for shelter and protection.

> Among hunters-gatherers, maintenance activities frequently take place at base camps--the settlement of a co-resident unit of population involved in such general purpose activities. Extractive camps are more special-purpose activity localities such as hunting camps, kill sites, quarries, gathering stations, etc. that reflect the acquisition of special environmental resources. Extraction camps may correspond to the activities of only a segment of the co-resident unit of population (a 'task group') and are generally ancillary to base camps. Other general classes of sites that may appear are transient camps--temporary, perhaps overnight, settlements intermediate in location to base camps or base camps and extraction camps--and symbolic sites--special locales for ritual or ceremonial activities, not directly articulated to the physical environment (1978:85).

Recently, Binford (1980) has focused on the different settlement types generated by more mobile foragers and by logistically organized good collectors. He writes that:

> Collectors, like foragers, actually procure and/or process raw materials at locations. However, since logistically organized producer parties are generally seeking products for social groups far greater than themselves, the debris generated at different locations may frequently vary considerably (Binford 1980:10).

This implies, then, that we can anticipate finding a wide range both in site size as well as in the assemblage densities at extractive camps or locations of logistically organized groups.

These general observations on the two basic classes

of hunter-gatherer sites carry archaeological implications for site composition. If we assume either single episodes of occupation or repeated occupation for the same range of activities per site, then the nature of both features and assemblages at the sites should: 1) reflect the past activities performed there, and 2) allow us to classify the sites into either maintenance or extractive types.

Tables II-6-8 offer data on the features and assemblages found at the Upper Paleolithic sites in the study area while Tables III-3 present data on the organic remains. Using them for reference, we can translate the general observations on settlements outlined above into the following archaeological predictions for the different site classes that may be present in the study area.

A. Extractive or Special Purpose Camps/Locations

1. Lithic Workshops that should lack any features and have assemblages related to initial lithic processing. There should be little or no food remains as well as no evidence for the exploitation of nonfood taxa. The sites themselves should be small and show short term occupation by small task forces.

2. Hunting and Collecting Camps are sites that should be both smaller in size and show shorter duration of occupation than base camps. They should show occupation by smaller groups of individuals and lack such features as dwellings, storage pits, and sizeable hearths found at base camps. Since we are dealing with logistically organized

hunters and gatherers who harvested food in large quantities and may have also been collecting bone in volume, we can predict the presence of two types of fauna procurement camps in the study area--one used in active hunting and the other in collecting practices. The assemblages at both should contain a smaller number and more limited variety of tools than at base camps, and these should be related to the procurement and possibly to initial processing of food at hunting camps and to the procurement of bone in collecting camps. Since active hunting should have required a greater use of tools than collecting, more tools should be found at hunting camps.

Faunal remains should be sparcer at these sites than at base camps as well as reflect the presence of just one or two taxa. No evidence for the exploitation of nonfood species should be found at either of these types of procurement locations.

B. Base Camps

These large-sized sites should contain the widest array of features such as dwellings, hearths, and storage pits. The archaeological assemblages should contain a variety of tools associated with diverse maintenance activities as well as show the presence of exotics, jewelry, and of art. The size of the occupying group should be larger when compared to those occupying extractive or special purpose camps. Food remains should show greater abundance (MNB, MNI, kcals) as well as a greater variety

of taxa exploited. Evidence for the exploitation of non-food species should be present as well. Lastly, we should expect finding base camps occupied during different seasons.

In generating these archaeological expectations I assumed single episodes of occupation or reoccupation for the same range of activities per site. Both archaeological data and ethnographic evidence, however, show that in the real world these assumptions are untenable. Binford (1982b), as I have already noted in the previous chapter, has documented regular reoccupation of sites by different groups for different purposes. Thus, what was a Nunamiut food extraction location subsequently can become a base camp, then either be abandoned or occupied again as a special purpose camp, and so on. He further states that:

> ...By the same token, we can expect that some locations, particularly special purpose sites, may exhibit little if any change in the functional characteristics of site use in spite of organizational change in the cultural system and/or shifts in its regional positioning (Binford 1982b: 19).

The Nunamiut are not alone in such behavior. McCartney (1979) in describing Thule sites in Alaska, repeatedly documents the temporal changes in settlement function for the sites with whale bone dwellings--first as base camps and then, after abandonment, as quarry or extraction camps for the procurement of whale bone itself.

The data on the Central Russian Plain Upper Paleolithic

sites also strongly suggest that at least some of the sites were occupied more than once. First, as I noted in Chapter V in a discussion of ambiguous data on the season of occupation of such sites as Mezin and Suponevo, evidence exists that these sites may have been occupied in different seasons. Hearths, separated by thin loess or colluvium layers from underlying storage pits have been found over some pits at Dobranichevka (Shovkoplyas 1972) and Mezin (Shovkoplyas 1965a). Pidoplichko (1976) reported finding bone charcoal over one Mezhirich storage pit as well. As noted in Chapter II, the possible existence of more than one cultural layer in at least a part of the site has been suggested for Gontsy, Kirillovkaya, Mezhirich and Mezin. Shovkoplyas (1951) has proposed that two types of settlements, one long and one short term, may have existed at Suponevo, while Pidoplichko (1976) has suggested a similar dual occupation for Mezhirich.

It is also unclear if all parts of the Upper Paleolithic sites were occupied at the same time. This question has received little attention in Soviet literature and a working assumption of most researchers has been that the entire area of the sites was occupied simultaneously (see Boriskovskii 1953; Velichko et al. 1981, for example). Sergin (1974b) used evidence of regular site layout at such sites as Dobranichevka, Mezin, and Radomyshl' to argue for a synchronic occupation. Shovkoplyas (1965a) on the other hand, while arguing for long term occupation of Mezin, wrote

that different parts of the site may have been occupied in sequence. Similarily, Pidoplichko (1976) speculated that the occupants of Mezhirich lived at the site for a while before constructing mammoth bone dwellings. Voevodskii (1952a), in noting the presence of separate clusters of debris at Chulatovo II (see Figure II-10) allowed for the possibility of diachronic occupation at the site also. Recently, Leonova (1977) has indirectly addressed this question at Chulatovo II and Dobranichevka. She examined both the nature of archaeological remains (features and lithics) as well as looked at the spatial distribution of different lithic categories at a number of Upper Paleolithic sites on the Russian Plain and included these two Central Russian Plain sites in her sample. In the course of her work she also proceeded to conjoin different lithic pieces that came from a single core, nucleus, or tool, and to note the distances at which these conjoinables were found.

Leonova's plotting of conjoinables at Chulatovo II is presented in Figure VI-1 and shows that out of the 156 objects that could be fitted together, 153 were found in adjoining squares less than a meter from each other. The longest distance at which conjoinables was found was approximately 12 meters. She outlined three concentrations of archaeological remains at Chulatovo II which showed strong spatial segregation and concluded that the question of synchronic occupation of all three areas still remained open.

Leonova was less successful at conjoining Dobranichevka lithics because of the methodology employed in excavating the site (see Chapter II). She was just able to conjoin two burins with their spahls found during the 1967 excavation of complex 1. They were found more than ten meters apart but well within the area of the complex itself, and their relatively short distance from each other did not conclusively show synchronic occupation of the different complexes. Leonova's spatial analysis of the distribution of cultural remains at Dobranichevka indicated the presence of four nonoverlapping complexes. She concluded that the question of synchronic occupation of the four at Dobranichevka still remains open also.

Lastly, Gladkih (1973, 1977) also indirectly considered the occupational sequence or synchrony at Dobranichevka. Working with traditional tool classes as well as with stylistic criteria, he examined the different proportions of tool classes found at the four complexes and concluded that a great similarity exists in the assemblages of all four. He interpreted this to suggest a more or less synchronic occupation for the entire site.

In brief then, data from the Central Russian Plain indicates both 1) a possibility of multiple occupations of some of the sites, as well as 2) leave open the question of synchronic occupation of the total areas of the sites.

In summary, this discussion of both ethnographic data and archaeological realities indicates that we can very

rarely, therefore, anticipate finding evidence for single or even uniform occupations of any site and should expect to find a superimposition of mixed occupations that will yield a great deal of contradictory data on the nature of past behavior at the sites.

Finally, a second and perhaps more serious caveat should be kept in mind when generating ethnographically derived implications for archaeological sites of past cultures. The problem is two fold and one difficulty comes from what Wobst (1978) has termed "the tyranny of the ethnographic record". Since we generate expectation from ethnographic observations, we can only recognize those patterns that conform to the record. Such cultural uniformitarianism puts us in danger of either omitting from consideration or totally misunderstanding those past behaviors for which we have no present-day analogues. Secondly, we should always remember that no ethnographic data come from "pristine" groups, as Leacock (1954) and Schrire (1980) among others have repeatedly pointed out. The ethnographic data we have on hand is on groups and cultures that have been affected to varying degrees by contact with complex state societies and the market system, and are a part of what Wallerstein (1974) has termed "the world system".

These caveats direct us as archaeologists to be most flexible in applying our ethnographically derived models to data from the past and to allow for a great deal of deviation in the fit between the two. Likewise, when

warranted, we should allow for the existence of settlement types in the past without recognizable present day analogues. Failing this, we just illustrate what is known historically, and are in danger of creating Paleolithic clones of either the Netsilik, or Nunamiut, or Ojibwa, or of some other ethnographic group currently in vogue in the literature.

II. DATA FROM THE CENTRAL RUSSIAN PLAIN

The data I will use in this chapter on the features and assemblages found at the sites have been presented in Tables II-6-8 and III-3 and described per site in Chapter II. Most values found in these tables represent estimates derived from the literature as well as from my examination of extant collections and such archival data as field notes. In some cases, such as for Mezhirich and Mezin, where full lists of excavated lithics have been published, the values quantify exactly the numbers found. In other cases, a category that includes most of the sites, values in the tables are the best estimates I could arrive at.

In working with features found at the sites some arbitrary decisions also had to be made on quantification. This is because neither large storable pits nor mammoth bone dwellings were recognized as such prior to the late 1920s-early 1930s. As a result, subsequent researchers do not agree on just how many dwellings and storage pits were found at such sites as Gontsy, Kirillovskaya, and Suponevo. I have, therefore, decided to treat the estimated numbers found as a range and to use mean values in all calculations.

Similarily, since stratigraphic controls in many cases are the deciding element in distinguishing between very large storage pits and small bone dwellings, the identification of pits or dwellings at sites excavated prior to the 1930s remains problematic (e.g., Kirillovskaya with no storage pits or Timonovka I).

As noted before, the human groups who occupied the sites during the Upper Paleolithic period were logistically organized hunters and gatherers who left behind a number of sites that vary greatly in both the features and assemblages found. They range from such sites as Bugorok with no features and an abundance of lithics to elaborate sites with multiple features and diverse assemblages as Mezhirich and Mezin. In considering the 29 sites in the study area, I have selected to compare them in terms of general attributes outlined below and to base my typology on data from the in-situ sites. The basic assumptions I employ in using these attributes for site classification are that: 1) there is a behavioral correlation, however muted, between material remains found at sites and past human behavior, 2) that a greater variety of material remains at some sites indicates a greater variety in the behavioral repertoire at those sites, and 3) that observed patterning of archaeological remains at some sites reflects past patterning in behavior (but see Binford 1982b). As noted previously, I expect to find evidence for greater behavioral variety at base camps than at special purpose extractive camps and have outlined

in the introduction of this chapter the kinds of behavior and artifacts I anticipate for the different site classes.

A. Attribute Selection

The attributes selected for consideration can be broadly divided into three categories: assemblages, site characteristics, and features. The first grouping includes anything portable and some items in this category were found at all of the sites. The second refers to geographic and stratigraphic attributes of the sites--such as location, site size, and the thickness of the cultural layer. The third category includes such immovable attributes as mammoth bone dwellings, hearths, and storage pits that were found at only some of the in-situ sites.

In some cases attributes were defined as raw counts (from Tables II-6-8, III-3). In others, reported quantities were subjected to simple statistical manipulations such as residualization (via the calculation of Pearson's Correlation Coefficients and subtraction of the dependent proportions), arcsine transformations, calculation of ϕ values of association, and comparisons through the Difference of Means tests. All of these procedures have been previously presented and used in Chapter V (see pages 370-372).

The assemblage attributes I used in this chapter are divisable into objects and faunal remains and are as follows.

B. Objects

1. Density of Lithics. This value is defined as a mean number of all lithics found per square meter of each

site and was obtained by dividing the total number of lithics by the number of square meters excavated per site. These values, listed in Table VI-1, range widely and show higher values, in general, in northern sites. Difference of Means Tests in Table VI-2 indicate that northern sites have approximately eight times more lithics per square meter than do the southern ones ($z = 2.74$).

Overall density of lithics at sites can be affected by a number of variables including the length of occupation and/or group size as well as by general availability of raw materials themselves. In order to see if these observed interregional differences were due to group sizes or duration or occupation, I proceeded to examine the relationship between the thicknesses of cultural layers (listed in Table II-5) and lithic densities using Pearson's Correlation Coefficients. I assumed that the thickness of the cultural layer roughly reflected both the duration of occupation and group size. The resulting r-values for the area as a whole as well as for the northern and southern sites separately are listed in Table VI-3 and show that no strong relationship exists between them. I conclude from this that the differences in lithic densities at the sites can best be explained by the differential distribution of lithic resources in the study area.

In general, keeping interregional differences in mind, I assume that greater lithic densities at some sites reflect a prevalence of lithic production there and anticipate

finding higher densities at lithic workshops than at base or hunting and collecting camps.

2. Density of Lithic Tools. This value, also listed in Table VI-1, is defined as a mean number of tools per square meter of each site and was obtained by dividing the total number of stone tools found at a site by the number of excavated square meters. I assume that, as with the density of all lithics, greater densities of tools reflect more lithic workmanship at sites.

The density of stone tools at sites, however, can also be partially controlled by general lithic density. As Table VI-3 shows, a strong positive correlation does exist between general lithic densities and densities of tools at both the northern and southern sites (northern sites: $r = +0.68$; southern sites: $r = +0.92$). To control for that proportion of lithic tools directly related to general lithic densities, I proceeded to residualize tool density counts and take out of these values portions determined by lithic density itself. I residualized the northern and southern values separately. The resulting residual values in Table VI-4 represent that portion of tool densities that are associated with lithic manufacturing in general. I will use these residual values in all subsequent calculations.

3. Densities and Proportions of Nuclei. Density controlled counts for all nuclei and nuclei fragments found at the sites are listed in Table VI-1. I assume, after Leonova (1977) and Semenov (1968), that the presence of this

artifact type reflects past stone tool manufacturing activities. Given this, we can anticipate finding higher nuclei densities at lithic workshops than at either base camps or food and bone procurement camps.

Since the density of nuclei at sites can in part also be controlled by general availability of raw material, I first investigated the relationship between nuclei densities and general lithic densities. As Table VI-3 shows, high positive correlations were found in both parts of the study area (north: $r = +0.92$; south: $r = +0.80$, $p. = 0.1$). To control for that portion of nuclei present at the sites due to the general abundance of lithics, I residualized nuclei density values from general lithic densities separately at the northern and southern sites. These residual values are listed in Table VI-5 and will be used in all future calculations.

To evaluate the predominance of lithic manufacturing at the sites, as opposed to just the presence or absence of lithic manufacturing indicated by nuclei density residuals, I also calculated the proportional values for nuclei at the sites (i.e., the percent of nuclei in the total lithic assemblage). Since the resulting proportions are subject to various statistical distortions, I applied arcsine transformations to them and will use the transformed value listed in column 2 of Table VI-6 in all future calculations. In as much as these transformed proportions reflect the prevalence of nuclei in the assemblages, I anticipate

finding higher values at lithic workshops than at either base camps or hunting and collecting stations.

4. Blade to Nuclei Ratios. These values, listed in Table VI-7, were obtained by dividing the total number of blades and blade fragments by the number of nuclei found at the sites. Since the ratios represent proportions and as such are subject to statistical distortions, I applied arcsine transformations to the ratios and will use the transformed values (listed in column 4 of Table VI-7) in all future calculations. I offer these ratios as yet another gauge of lithic manufacturing activities at the sites, and suggest that we can anticipate lower blade: nuclei ratios at lithic workshops and higher ratios at sites with a wider array of maintenance activities. I assume that blades should be manufactured at lithic workshops, not used extensively there, and removed to other types of maintenance sites. At base camps, on the other hand, the wide array of maintenance activities performed should necessitate a far more extensive use of blades. We should, therefore, anticipate finding them in far greater numbers at these classes of sites.

5. End Scraper and Burin Densities. I have already discussed these values as well as the rationale for combining these two tool classes in Chapter V. As I noted in that discussion, the density of this tool category at the sites is also partially controlled by general lithic densities. Because high positive values were found for the

correlation coefficients of end scrapers and burins and general lithic densities, I residualized the density values for this tool category. The resulting values were presented in Table V-17. I consider them rough indicators of such maintenance activities as bone and hide work, and expect to find them at higher values at base camps than at any extractive locales.

As I have shown in Chapter V, specialized exploitation and processing of fur bearers was an important activity at some of the sites. Because some of these sites may have been special purpose extractive camps for the procurement and initial processing of fur bearers, I also proceeded to control for that portion of end scraper and burin densities at the sites that was associated with fur processing. The correlation coefficients between end scraper and burin residualized densities (residualized against general lithic densities) and fur bearer densities are listed in Table VI-3, while the new residual values themselves for the sites are in Table VI-8. I assume that these new values roughly reflect bone and wood manufacturing activities and anticipate finding these tools more often at base than at extractive camps.

6. Grinding Stones. As discussed previously in Chapter V, this class of tools is associated with both bone and ocher processing at the sites in the study area. Values for the numbers of these tools found at sites have been presented in Table V-1. As that table shows, the available

data is both in nominal and interval form. In order to have the largest sample possible in this chapter, I have elected to work just with the presence/absence of grinding stones at the sites. Since these items are associated with maintenance activities, I anticipate finding them more often at base than at extractive camps.

7. Worked Bone. Total numbers of worked bone (including bone tools, worked bone fragments, and all modified pieces of bone other than those clearly defined as portable art or jewelry) are listed in Table II-8. As that table shows, a wide range exists in the numbers of this attribute found at the sites. For the purposes of this chapter I have elected to define these values in two ways--1) for some calculations as density controlled counts of worked bone per square meter per site (listed in Table VI-1), and 2) as nominal data using just information on the presence or absence of worked bone at the sites.

Since, as Table VI-1 also shows, very different densities of bone in general have been found at the study sites (defined as MNB per square meter), and since it could be supposed that the frequency of worked bone may be sensitive to the overall amount of bone available at sites, I examined the relationship between the counts of worked bone per m^2 and MNB per m^2 of economically important taxa through the calculation of Pearson's Correlation Coefficient. The resulting r-value (all sites: $r = +0.08$, $p => 0.1$) suggests that densities of worked bone at the sites were

not significantly controlled by the availability of raw material itself. I interpret this to mean that the densities of this attribute can be used as indicators of the importance and/or frequency of bone manufacturing at the sites.

The category of worked bone itself, however, includes a wide range of implements such as points used in hunting implements, hoes and digging tools, piercers, awls, needles, and shaft straighteners that were used for a wide array of extractive and maintenance activities (see Filippov 1977; Polikarpovich 1968; and Semenov 1968, for example, on worked bone from the Central Russian Plain sites). The disparate nature of data recording, analysis, and reporting found in the literature did not permit me to segregate these different tool classes for a sufficient enough number of sites, and necessitated lumping these diverse tools and objects into one category. This lumping has combined evidence for very diverse activities, some of which could be anticipated to have taken place at extractive camps (e.g., manufacturing or sharpening of bone points on hunting implements), while others would have occurred more often at base camps (use of needles, piercers, and awls in sewing, for example). Thus it reduced the value of this attribute in distinguishing different site classes. In spite of this introduced ambiguity, I anticipate finding larger numbers of worked bone at base camps than at extractive camps.

As Tables II-7 and 8 show, a number of rare and diverse

artifacts have been found at some of the sites in the study area. These artifacts can be collectively assigned to two groupings: exotic lithics and decorative objects. The first group includes both nonlocal lithics as well as ocher, and as Table II-7 indicates, data on both the quantities of each type of exotic lithic found as well as the distances at which the nonlocal materials were procured are usually absent. I have arbitrarily decided to consider all materials originating from a distance of up to 25 kilometers as local (roughly estimating that as the distance covered in a one day trip) and those originating from longer distances as nonlocal. Where possible, I estimated these distances "as the crow flies"--linearily from base maps presented in Chapter II. In order to control for the disparity in the available data on exotic lithics, I coded each reported category of material (i.e., flint, mountain crystal, ocher, sandstone, and slate) assigning ϕ values to sites where the category is either absent or local in origin, and 1 where it is present and nonlocal in origin. The coded values per category are listed in Table VI-9. In all future calculations in this chapter I will treat exotic lithics both summarily as a single attribute as well as separately as two attributes of ocher and summarized nonlocal lithics. The two attributes are defined as follows.

8. Nonlocal Lithics. As a presence or absence value for all summarized nonlocal lithics reported at the sites.

9. Ocher. As a presence/absence measure per site.

When treating all exotic lithics as a single attribute (i.e., combined nonlocal lithics and ocher), three additional values, listed in Table VI-9, will be used. I have summarized the presence or absence of this attribute in column 6. Column 7 offers coded values of 0 for absence or for presence of only local materials and 1 for presence of nonlocal materials. Column 8 lists both coded and scaled values for the summarized data on exotic lithics and ocher using the values of 0 when no artifact was found in any of the five categories, 1 if found in one category, 2 in two categories, and so on.

Since no precise data exist in the literature on the nature of the artifacts fashioned from exotic lithic material, nor on the proportion of artifacts made of exotic material, I will, based on some rough quantifications from Dobranichevka, assume that they represent a small proportion of lithics at all sites. For Dobranichevka, Shovkoplyas (1972) and Shovkoplyas et al. (1981) reported that out of 700 lithic tools found, only about 25 (around 3.5%) were made of exotic mountain crystal. This assumption, however, may in future research be proven incorrect. Some anecdotal evidence in the form of excavator suppositions suggests that a great deal of lithic raw material at such Sudost' sites as Yudinovo may be nonlocal in origin (Polikarpovich 1968).

Because, one, no research has been done to date on the exact source of origin of lithics found at the sites, and,

two, no quantification exists on the concept of "local" (i.e., what distance is considered within the local environs of the sites and what distance is not), I have arbitrarily selected to assume that, unless otherwise stated and quantified, the lithic materials are local. Lacking data on tool types made from nonlocal lithics and therefore not able to correlate particular behavior with them, I will assume that the rate of use of these items is roughly proportional to: 1) the range of activities performed with them; 2) the size of the group using them; and 3) the duration of occupation by the group of the site. I also assume the existence of a direct relationship between the value of an object and the distance to the source where it was obtained. This implies that, all other things being equal, we should find greater numbers of nonlocal lithics at base rather than at extractive camps and should not find them at local lithic workshops.

While the range of activities for which ocher was used in the study area is still to be delimited, mammoth bones painted with ocher have been found at Mezhirich and Mezin (see Pidoplichko 1969, 1976) and ocher has been found in the few burials reported for the Upper Paleolithic Russian Plain at Sungir and at the Kostenki sites (see Bader 1978; Praslov and Roagachev 1982). Taking into account all the other possible uses that ocher may have been put to, such as tanning of hides, body decoration, use in healing practices, and so on, it is reasonable to presume that this

item would be used far more often at base camps and that we can anticipate finding very little, if any, ocher at extractive locales of any kind.

Summarily, I anticipate finding exotic lithics primarily at base camps where a large repertoire of non-extractive activities took place.

The second category--decorative objects--include amber, art objects, fossil marine shells, and jewelry. As with exotic lithics, I will treat these four groups of items both as individual attributes in some calculations as well as summarily as a single attribute. As Table II-8 shows, very disperate data exist on the amounts of each type of artifact found. To control for this I have elected to code each category singly as well as all the items summarily. When treated singly, the individual attributes will be defined and used as follows.

10. Amber. Varying amounts of disintegrating amber have been recognized and reported at Chulatovo II, Dobranichevka, Gontsy, Mezhirich, and Mezin. Pidoplichko (1976) has convincingly demonstrated that much of this amber was originally in the form of beads, but has also suggested that some of it may have been burned in hearths for the pleasant scent it released. While no definite studies have been done to pinpoint exactly the source of origin for this amber, Kornietz et al. (1981), Pidoplichko (1976), and Shovkoplyas et al. (1981) all stated that: 1) amber-bearing deposits are found along the right bank of

the Dnepr in the vicinity of Kiev, and 2) that this area, most probably, served as the source for the material found at the Upper Paleolithic sites. I have translated their observations into distance measures, estimated "as the crow flies" from base maps in Chapter II, rounded off to the nearest ten kilometers, and list them along with amber counts in columns 1 and 2 in Table VI-10. Since I assumed a positive relationship between distance and value, I also transformed raw amber counts so as to take into account the distances at which amber was found from the environs of Kiev.

These distance controlled values are listed in column 3. They were obtained by multiplying the number of items found by the distance to the source and then reduced by 100. Thus, Dobranichevka where 12 pieces were found that originated 130 km away, received a score of 15.6 in column 3. In the case of Gontsy where an unquantified value of "some" has been reported, I arbitrarily assumed that "some" is equivalent to 5 items, and assigned appropriate value in column 3. Finally, amber data were coded in column 4 with the codes being assigned as follows: 1 for values of less than 10 in column 3; 2 for values between 10-100; and 3 for those higher than 100. I will also use simple presence/absence information on amber at the sites in some calculations.

Using sited information on the possible uses of amber, I presume that it should be behaviorally associated with

maintenance activities and found at base rather than extractive camps.

11. Art Objects. Total counts of art objects, excluding anything wearable that I have classified as jewelry, found at the sites as well as their coded values are listed in Table VI-11. Coded values were obtained by assigning 1 to sites where less than 10 pieces were found; 2 to sites with 11-25 pieces; and 3 to those with over 26 items. In the case of Yudinovo, where only an unspecified value of "some" is reported, I arbitrarily assumed that "some" represents more than 10 items and assigned the code of 2 to the site.

As with other decorative items, I assume that art objects will be found at base camps rather than at extractive locales.

12. Fossil Marine Shells. Fossil Marine Shells representing a number of taxa have been found at Chulatovo II, Eliseevichi, Mezhirich, Timonovka I, and Yudinovo (see Table II-8). Most of them were found perforated and close to each other, suggesting to Soviet researchers that they were used as beads in necklaces and possibly bracelets (see Shovkoplyas 1965a). Some shells, however, both at Eliseevichi and Mezin, were found either not perforated or partially perforated indicating that they were also processed into beads at the sites (Polikarpovich 1968; Shovkoplyas 1965a). Motuz (1969), Rudenko (1957, 1959) and Shovkoplyas (1965a) indicate that the shells were mined

from both Karangat and Sarmatian marine deposits, and that the closest area where both deposits had surface exposure was in the far south of European Russia, near the shores of the Black Sea and the Sea of Azov. I have translated these observations into rough distance measures to the closest possible region in the south where shells could have been obtained, calculated from base maps in Chapter II and figured linearily "as the crow flies". These distances per site are listed in column 2 of Table VI-12. Assuming, as for other nonlocal materials, a direct relationship between the distance from which an object was procured and its value, I decided to incorporate information on distances and multiplied the raw numbers of shells found per site by the distance measures (then reduced the resultant figures by 100), and listed them in column 3 of the table. For example, for Chulatovo II where four shells were found originating at least 550 km away from the site, the value in column 3 was derived as follows: 4 x 550 = 2200, and then reduced by 100 to equal 22. Finally, in column 4, I coded the resulting distance-controlled measures using the value of 1 for sites where a score of 1-50 was observed; 2 for those with between 51 and 1,000; and 3 for sites where figures over 1,000 were observed in column 3. In the case of both Timonovka I and Yudinovo, where the reported raw numbers were given as "more than" values, I used the minimal value for the estimations and coded accordingly.

As noted above, unspecified but large proportions of

fossil shells were found perforated and were presumably utilized as beads. A high positive correlation coefficient ($r = +0.72$, see Table VI-3) was found between the shells and other items of personal adornment (termed "jewelry" in this work), and supports the interpretation that shells were used as jewelry. Therefore I anticipate that shells, as jewelry, should be found in significantly greater numbers at base rather than extractive camps.

13. Jewelry. I define this attribute to include a range of items such as perforated animal teeth, beads from long bones, bracelets, and pendants found at the sites. The raw values for this category of items is listed in Table VI-11 as are their coded transformations. In coding, I assigned the value of 1 to sites with less than 10 items; 2 where 11-20 were reported; and 3 when over 20 pieces were present. For Yudinovo, where the exact number of items is not specified, I assigned a coded value of 2 because both the literature on the site as well as my own inspection of some of the items found (housed at the Institute of History of the Byelorussian Academy of Sciences and in the State Historic Museum in Minsk) indicate that more than 10 pieces of jewelry came from the site (Polikarpovich 1968 on bone beads at Yudinovo).

I assume that the making and/or wearing of jewelry is behaviorally associated with a range of maintenance-type of activities, and therefore anticipate finding the attribute primarily at base camps.

Since I have assumed that all artifact classes termed decorative items should be behaviorally associated with maintenance-type of activities and projected finding them in greater numbers at base camps, I also evaluated the association of these objects at sites and the correlation between some categories of these objects. The individual test statistics for each measured relationship are listed in Tables VI-3 and 14, and can be summarized as follows:

	Amber	Art	Shells	Jewelry
Amber		-A	+A	-A
Art	-A		$-A_1$	+A
Shells	+A	$-A_1$		+C
Jewelry	-A	+A	+C	

Legend:
- \+ positive association or correlation;
- \- no association
- A positive association at sites, using raw counts
- A_1 positive association at sites, using coded data
- C positive correlation between artifact classes

While these relationships indicate some problems in classifying amber as a jewelry item exclusively and suggest that amber was used for other purposes as well, still they do roughly indicate a gross behavioral connection between these classes of artifacts. At the same time, however, I also suggest that they indicate the presence of two distinct behavioral complexes--one, involving exchange, associated with nonlocal materials such as amber and shells, and the

other, with art and jewelry made of locally available materials, that was associated with purely local display behavior. I will return to these observations at a later time when I consider Upper Paleolithic social interactions in the study area.

Finally, as indicated earlier, for some evaluations I will use the summarized data on all decorative items as a single attribute. Table VI-13 lists these values summarily in column 5 noting just the presence or absence of decorative objects, in column 6 offering scaled values with 1 being assigned if either none or only one category of items was found at the site (i.e., just amber, or just art), and 1 given to sites where items were present in 2 or more categories. Column 7 presents a third coding system for these categories and assigns values of 0-4 based on the total number of categories that the items were found (e.g., Mezin with amber, art, shells, and jewelry is given 4 while Chulatovo II with amber and shells received 2).

Since I have assumed that both exotic lithics and decorative items are associated with a range of non-extractive behavior and, therefore, expect to find them at base camps, I also tested the validity of these assumptions by investigating the association of these two summarized attributes at the Central Russian Plain sites. This was done in two ways--first using just presence or absence data for each attribute (columns 6 and 5 in Tables VI-9 and 13 respectively). Both tests showed the two summed attributes

associated at the sites and produced values of ϕ = +0.56 (presence/absence) and 0 = +ϕ.67 (scaled codes) (see Table VI-14).

C. Faunal Remains

Information on the economically important taxa found at the sites will be used as attributes in the following manner.

14. Number of Taxa Exploited is defined as the total number of species utilized per site regardless of whether hunted or collected (see Table III-3).

15. Number of Taxa Exploited as Food is also derived from Table III-3 but modified to include only those species that I consider actively hunted in the north and south (see Chapter V for a discussion of hunting and collecting). In this discussion I will consider each individual species of fish and birds as a unit and not combine them into summed taxa as done in Chapter V.

16. Summarized MNI and MNB values for Food Species were defined in Chapter V as measures of density per meter square of either MNIs or MNBs. The individual values per site can be found in Tables V-6. As I showed in that chapter, food taxa, quantified as both MNIs and MNBs were found at high and low densities at the sites. In this chapter I will just use these "high" and "low" density categories (see Chapter V for a discussion, justification, and derivation of these differences).

Given the assumption about the division of activities between base and extractive camps, I anticipate finding:

1) a greater number of economically important taxa, 2) a greater number of food species, and 3) higher MNI and MNB values for summarized food taxa at base camps than at extractive camps.

17. Densities of Fur Bearers. This attribute is based on the data presented in Chapter V (see Table V-6) and will be used in two ways: 1) evaluated simply by the presence/absence of this taxon (i.e., summarized fur bearers), and 2) as density controlled values for the MNI/m^2 of all fur bearers found at the sites. In the second case I will define the attribute as either "high" or "low" density values per site. The rationale for such a division, as well as justification through testing, have been presented in Chapter V.

As I have shown in the previous chapter, the presence of fur bearers at the sites resulted from at least two behavioral complexes: need for clothing as well as specialized exploitation of these species for furs in quantities above simple consumer needs. As noted there, some sites may have served as initial procurement and processing stations for fur bearers. This evidence, taken in toto, indicates that we can, therefore, anticipate finding fur bearers at high densities both at extractive camps used for procuring this resource as well as at base camps occupied by larger sized groups.

18. Kcals Densities are defined, as in Chapter V, as a total caloric value per square meter of each site obtained

from the taxa exploited as food. This attribute will be used in this chapter, as in Chapter V, at two ranges--one omitting all mammoths from consideration and the second including half of the mammoths present at each site. As I have shown in Chapter V, the sites in the study area can be divided into tow groups on Kcals: those with high and those with low values (at both value ranges--with no mammoths and with half of the mammoths included).

The description of these calculations, their justification, and evaluation can be found in Chapter V. In this discussion I will use the "high" or "low" density estimates as attributes.

Given the assumptions about subsistence behavior of logistically organized hunters and gatherers discussed above, in theory at least, we can anticipate finding high Kcal values at both base camps as well as at some extractive locations, especially at those where provisioning for storage took place. I have argued in Chapter V, however, that procurement behavior in the study area did not include much initial processing of food resources before they were taken to the sites. This observation in turn implies that we should not find evidence for extensive use of mass procurement hunting camps in the area, and can be translated into archaeological predictions that high Kcal values will be found at base camps and low ones at extractive locales.

D. Site Profiles

Attributes that can collectively be subsumed under the

term site profiles offer another set of measures for classifying the sites in the study area. They include such characteristics as the thickness of the cultural layer, location and size of the sites, and the season at which the sites were occupied. This set of attributes, however, is the most problematic of all examined here. The thickness of the cultural layer can be affected by a number of diverse behaviors including the duration of occupation, frequency of reoccupation, and group size, as well as by a number of depositional or taphonomic variables.

Since, as noted in Chapter II, most of the sites have not been fully excavated, the size of a site is also a problematic measure. Site location, as I have shown in Chapter V, is probably most directly related to the season of occupation, and, as such, useful in secondary refinement of a classificatory scheme. Finally, the season of occupation is also suitable only as an attribute to refine a typology rather than to create one. In general, then, I have elected to use this set of attributes not for initial classification but only for secondary elaboration or corroboration. These attributes are delimited as follows.

19. Season of Occupation has been estimated for the sites in Table V-32. These estimates--cold or warm weather months--will be used as such in this chapter as well.

20. Site Location. Data on the location of sites vis-a-vis the floodplain has been presented in Chapters II and IV where I have shown that sites with mammoth bone

dwellings and/or storage pits tend to be found close to the rivers while those without them are located further up in elevation. This information will be used in comparing different site types to each other.

21. Thickness of the Cultural Layer is defined for sites found in-situ either as a high or a low value. These values were obtained by comparing northern to southern sites as well as comparing sites with features to those without them through the Difference of Means Tests (see Table VI-15). This comparison, as illustrated in Figure VI-2, showed considerably thicker cultural layers at some sites than at others, and did not show either regional or classificatory (i.e., differences between sites with features and without them) differences between the sites. In general the observed differences can be summarized as follows:

A. "High" Cultural Layer Thickness at: Berdyzh, Bugorok, Fastov , Khotylevo II, Kositsa, Radomyshl', Suponevo, and Yudinovo

B. "Low" Cultural Layer Thickeness at: Chulatovo II, Dobranichevka, Gontsy, Eliseevichi, Pushkari I, Pushkari II, Mezhirich, Mezin, Timonovka I and II, and Zhuravka.

As noted, since a number of independent factors can be suggested to account for differential thickness of the cultural layers, I will not use this attribute for initial classification but only to examine regional differences and in changes of settlement types and settlement patterns through time.

E. Features

The last category of attributes to be considered consists of features and includes mammoth bone dwellings, bone charcoal, hearths, small pits, large storage pits, and mammoth bone heaps or accumulations not identified as dwellings.

22. Mammoth Bone Dwellings. As noted before, since dwellings as such were only recognized by archaeologists in the study area in late 1920s, the numbers of dwellings found at sites excavated before that decade have been subsequently estimated through various reconstructive efforts. Data on the numbers of dwellings either found or estimated per site have been presented in Table II-6. In this chapter I will use these data at times as nominal and work with just the presence/absence of dwellings at the sites.

Table VI-16 lists both the numbers of dwellings reported for each site as well as estimates of the interior floor space for each reported dwelling. As this table indicates, two groups of dwellings have been found at the sites--those averaging less than 13 m^2 and those with over 20 m^2 in area. As Table VI-17 shows, the difference between these sizes is significant ($z = 12.21$) and we can divide the sites on dwelling size as follows:

A. Only small dwellings: Dobranichevka, Radomyshl'

B. Only large dwellings: Gontsy(?), Eliseevichi, Kirillovskaya, Suponevo, and Yudinovo

C. Both small and large dwellings: Mezhirich and Mezin.

These data are summarized in columns 2 and 3 of Table VI-16, while column 4 offers mean values for the total number of dwellings found or identified per site.

The third definition of this attribute that I will use is the estimation of labor invested in the construction of the dwellings per site. This figure, along with the difference in dwelling sizes, will be used extensively to classify sites with dwellings into two types. To arrive at labor investment values I performed the following calculations:

(a). First, I obtained from the literature (where possible) a total list of mammoth skeletal elements used in each dwelling. These were available in tabulated form only for dwellings #1-#3 at Mezhirich (Pidoplichko 1976). Those for dwelling #4 were taken from my 1978 and 1979 field notes. Mezhirich data is presented in Table VI-18.

(b). Table V-12 presented weights of the different mammoth skeletal elements. These values were multiplied by the number of each element per dwelling per site, and the total weights of bone per dwelling per site are listed in Table VI-19. Data on the skeletal elements per dwelling at Dobranichevka, Gontsy, and Mezin were culled out of the literature and, at best, represent minimal estimates. Although the bone weights offered in this table are rough estimates, they do pattern consistantly to show a positive correlation between the size of the dwelling (interior area) and kilograms of bone used in its construction ($r = +0.79$,

$p = <0.1> 0.05$).

(c). Using data on man hours of labor for transporting and erecting of earth works and stone monuments from Coles (1973, 1979), Table VI-20 offers man-day estimates for the assemblage of bone and the construction of dwellings per site. The values used assumed, after Coles (1973:73, 1975: 138-139): 1) a total transport of 500 kilograms (over a distance of 750 meters) per man per day, as well as 2) 250 kilograms per man per hour for a five hour work day (i.e., 1,250 kg of bone per man per day) as a rate for the construction of the dwellings. These values were then translated into labor estimates per dwelling for a group of 10 and 20 men. Entry C in Table VI-20 summarizes both of these estimates and offers the total labor investment per dwelling per site for Dobranichevka, Gontsy, Mezhirich, and Mezin.

(d) Since firm data on skeletal elements per dwelling were available only for a few dwellings at a few sites, in order to include maximal sizes in my estimates, I then proceeded to calculate mean labor investment values for the assemblage and construction of small and large dwellings. This was done by first deriving a mean weight of 4,815 kg of bone for small dwellings and a mean weight of 15,721 kg for the large ones. These mean values were then multiplied by the number of small and large dwellings reported for the sites (columns 3 and 4, Table VI-15) and summed as a mean total of kilograms of bone per site (column 5). Note that these mean estimates are different from the actual values

observed at Mezhirich and that the actual kilograms there (63,567) are larger than the value derived by this calculation (51,978 kg). This transformation of Mezhirich data from real into mean values was done to be able to work with comparable values at the largest possible number of sites.

(e). Lacking data on skeletal elements and their total weights for most of the sites, I also had to arrive at mean labor estimates to use on mean kilogram estimates per site. The mean value of kilograms of bone moved (through either assemblage or construction) per man per site was obtained by dividing the man/day estimates at the quantified sites by the values for bone weights at these sites. For example, at Table VI-20 shows, the 8,209 kg in dwelling #1 at Dobranichevka represent 2.3 days of labor of 10 men and give an estimated value of moving about 357 kg of bone per man per day (370 kgs for 10 men, 7140 kgs for 20 men per day).

(f). Using then this mean estimate of 357 kg per day as the amount of labor per man per site, I calculated the length of time it would have taken both 10 and 20 men to construct the dwellings at the sites and offer these estimates in columns 6 and 7 in Table VI-16.

Finally, given my assumptions about the differences in activities performed at base and extractive camps, I anticipate finding mammoth bone dwellings only at base camps.

23. Large Storage Pits. Data on both the number of

large storage pits as well as their volume per site have been reported in Table V-4. In this discussion I will use both information on the presence/absence of storage pits as well as their numbers at sites, and will assume that this attribute will be found exclusively at base camps and not at extractive locales.

24. Small Pits. As discussed in Chapter V, a number of both exterior and interior small pits, variously identified as possible post holes, roasting pits, and caches, have been found at three of the sites: Gontsy, Pushkari I, and Yudinovo. Small exterior pits have been reported at Chulatovo II, Mezin, Pushkari I, and Timonovka II. While it is impossible at present to associate these small pits with any one specific behavior, the interpretations offered for these pits all suggest that we can anticipate finding them more readily at base camps. For the purposes of this discussion, small pits will be evaluated either as present or as absent at the sites.

25. Bone Charcoal. Because both a number of sites in the study area have been either severely disturbed or redeposited, as well as because of the disparate sizes of excavations at the sites, I have included the presence or absence of severely burnt bone or bone charcoal at the sites as an independent attribute in this chapter. This attribute however, will be noted only when present at the sites where no definite hearths have been reported. I will assume that charcoal is behaviorally associated with some form of food

processing, and therefore anticipate finding it at both food procurement as well as base camps.

26. Hearths. In Chapter V, I presented data both on hearth volume in cubic meters per site as well as on the density of hearths at the sites in terms of square meters per hearth (see Table V-30). Both of these qualities will be used in this chapter and are illustrated in Figures VI-3 and 4. As these figures show, the presence of hearths at the sites is associated with the presence of storage pits. The tests of this association showed $\phi = +0.75$ while a value of $\phi = +0.56$ was obtained for the association of hearths and mammoth bone dwellings (see Table VI-14).

A comparison of mean differences in hearth volume at the northern and southern sites did not show a significant difference ($z = 1.75$), but large differences were observed in the mean hearth volume between sites with storage pits ($x_1 = 1.91$) and without them ($x_2 = 0.40$, $z = 2.25$). Similarily, large differences were observed in mean hearth volume between the northern and southern sites with storage pits ($z = 2.37$). A comparison of hearth volume between these categories of sites indicated the presence of the following two groups of sites:

A. High Volume Sites: Berdyzh, Mezin, Suponevo

B. Low Volume Sites: Chulatovo II, Dobranichevka, Pushkari I, Mezhirich

For the purposes of this chapter I will assume that, all other things being equal, hearth volume roughly reflect the

length of stay at the sites and will use the "high" and "low" volume estimates to define this characteristic of hearths in the study area.

Similarily, as Figure VI-4 shows, differences can also be observed in the density of hearths at the sites. I have quantified this value as square meters per hearth per site. Using the Difference of Means Tests, significantly greater densities of hearths were found at the northern sites ($z = 3.18$, see Table VI-17) as well as observed between sites with mammoth bone dwellings and sites without them ($z = 1.86$, $p = 0.06$). Likewise, northern sites with dwellings had considerably more hearths than their southern equivalents ($z = 6.14$). At the same time, no differences in hearth densities were found between northern sites with storage pits and without them ($z = 0.14$). If, for the purposes of a discussion, we assume that the number of hearths at sites is positively related to the number of occupants, the regional differences noted above appear to indicate that greater numbers of people occupied northern sites. I have, however, argued previously (see a discussion on indoor vs outdoor hearths in Chapter V) that data at some northern sites, especially at those with dwellings, suggest that: 1) those sites do not represent single occupations, and 2) that the sites may have had some disparate occupational episodes during both warm and cold weather months. Because of this, I suggest that for now, lacking controls on the reoccupational sequences at the sites, we should not inter-

pret the differences in hearth densities as unequivocably indicating larger group sizes at northern sites. All that can be concluded, at present, is that some sites show larger numbers of hearths present than others, and that the following two groups are present in the area:

A. High Density of Hearths at: Berdyzh, Mezin, Pushkari I, Suponevo, Timonovka II, and Yudinovo in the north; Fastov and Zhuravka in the south

B. Low Density of Hearths at: Chulatovo II in the north; Dobranichevka, Gontsy, and Mezhirich in the south.

In general, assuming single occupational episodes at the sites, I anticipate finding greater hearth volume at base camps, while the density of hearths should be either very much lower or hearths absent altogether only at lithic procurement camps. I will use both these attribute characteristics primarily to confirm and refine site typologies delimited on other attributes, as well as to estimate population size and duration of occupation at the sites.

27. Bone Heaps. As Table II-6 indicates, surface accumulations of mammoth bone not identified as dwellings or storage pits have been reported at some of the sites in the study area (e.g., Mezin and Timonovka I, II). While I will not use this attribute singly, I will include it in cumulative calculations of all features and facilities found at the sites.

28. Summed Facilities and Hearths. This cumulative attribute includes the sum total of all dwellings, large

storage pits, and bone heaps found at the sites and is listed in column 1 of Table VI-21. A second value for the total of all dwellings, large storage pits, bone heaps, and hearths at the sites is listed in column 2 of the same table. To control for the disparate sizes of excavations at the sites, I have transformed these figures into density controlled counts per meter square per site and list them in columns 3 and 4 of the same table. Since the features summarized as a single attribute were found at only some of the sites, this attribute will be only examined at those sites where features have been found.

I assume, as I did for each feature singly, that 1) facilities and hearths should be found only at base camps, and 2) that larger numbers of them at some base camps reflect the presence of additional behavioral elements at these sites (either greater numbers of activities, greater numbers of people, or greater duration of occupation).

III. METHODOLOGY

A wide array of approaches to classification is present in the literature ranging from those that rely on the presence or absence of particular crucial attributes to sophisticated approaches that use aggrandizing principles and create significant and discreet attribute clusters. As I have noted previously, perhaps the single most serious problem with the data from the Central Russian Plain is our inability to either separate discreet occupational episodes at the sites, or to be certain that any one site represents

a single occupation. A strong possibility of reoccupation can be expected to introduce a great deal of ambiguity into the archaeological record in the form of diverse attributes related to very different and exclusive behavioral repertoires. This archaeological reality necessitates that a possibility of reoccupation be taken into account when constructing a typology for the sites in the study area.

The object of this chapter is to recognize a set of site types each of which possess certain distinct attributes. My approach to recognizing these types is both monothetic and polythetic. Both approaches will be used because of the hierarchical ordering present in the relationship of some attributes to each other. First, some attributes, especially features, are positively associated with each other and found together only at some of the sites. This includes mammoth bone dwellings, storage pits, and bone heaps. Because of historical problems of recognizing and distinguishing dwellings, pits, and bone heaps, I have elected to use the presence/absence of storage pits and/or dwellings as a monothetic trait. Since, as I showed in Chapter V, the presence of storage pits at the sites is strongly associated with the presence of dwellings (ϕ = +0.60, see Table V-2), the use of such a combination of features as a diagnostic attribute will not introduce too great a distortion into the discussion.

The presence of storage pits at sites, as Table VI-14 shows, is also positively associated with the presence of

hearths (ϕ = +0.75). A comparison of the distribution of attributes classified as assemblages, site characteristics, and features show consistant differences between sites with storage pits and/or dwellings and those without them. Thus, for example, as Table VI-17 shows, hearth volume is greater at sites with storage pits (z = 3.12), the distribution of art and jewelry is associated with storage pits (ϕ = +0.86) as is the distribution of marine shells (ϕ = +0.39), amber (ϕ =+0.36, p = 0.08), ocher (ϕ = +0.43) and grinding stones (ϕ = +0.33, p = 0.06) (see Table VI-14). Likewise, worked bone is found in far greater numbers at sites with storage pits (z = 3.11).

Different site characteristics can also be noted for sites with storage pits and/or dwellings. I have already stated in Chapter II that these sites are predominantly located on the floodplains themselves, and in Chapter V showed that they were all occupied during cold weather months.

Finally, while only a very small number of sites in the study area have been fully excavated (see Table II), Dobranichevka, Kirillovskaya, and Mezin are all much larger in size than Fastov and Zhuravka which lack dwellings and storage pits.

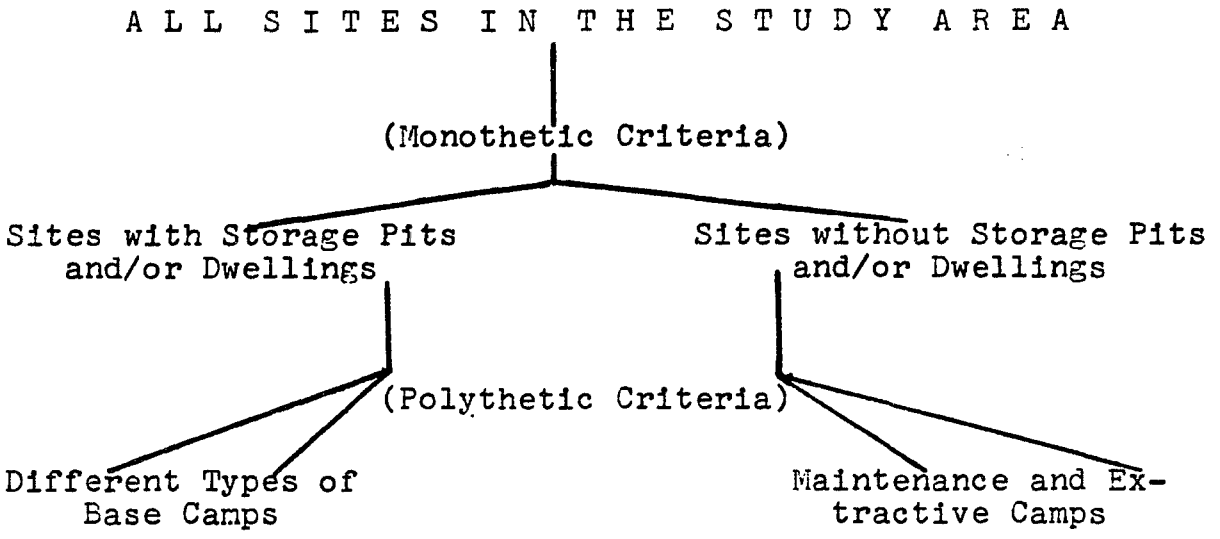
In brief, then, the first separation of sites into groups will be done using the presence or absence of storage pits and/or dwellings as a diagnostic feature. In an earlier discussion, defining hunter and gatherer site

types I associated the presence of features with base camps, it is reasonable to assume here that the sites with storage pits and/or dwellings will represent some sort of base camp while those without them should include other site types as well.

Tables VI-22 and 23 present the distribution of the relevant attributes at these two groups of sites. Within each of these groupings all further subdivisions into site types will be done polythetically--no single attribute or feature will play a deciding role. Sites belonging to the same type may share a specific set of attributes but will not be required to share a particular one.

Within each of these two groups the range of activities performed at the sites as evidenced in the presence of different attributes will be examined with the general expectation that 1) camps for lithic procurement will show activities related only to the acquisition of raw material, 2) hunting camps will show activities related to procurement and possible initial processing of food and collecting camps activities related to procurement of bone; and 3) base camps will exhibit the widest range of activities related to various maintenance tasks.

In summary, the classificatory scheme I will use can be illustrated as follows:



Various statistical tests will be used as the basis for dividing the distribution of the attributes between the different types of sites. Because of sample size problems these comparisons will be done between the following categories of sites: 1) with storage pits and/or dwellings and without them, 2) northern and southern categories of sites, and 3) when warranted, between sites with high and low densities of a particular attribute. The statistical manipulations used include the Difference of Means Test, Pearson's Correlation Coefficients, Tests of Association (ϕ) and the Fisher's Exact Test. All of these have been both described and used previously in Chapter V as well as in the definition of some attributes in this chapter. As before, finite population corrections have been applied where appropriate. In addition, I will also calculate Correlation Coefficients using Kendall's tau and covert the

the values to z scores (Thomas 1976:406-413) as well as the Difference of Median Test (Zar 1974:114-115).

Relevant test statistics will be reported in the text itself while sample sizes, mean values, and probabilities can be found in the cited tables. All reported test figures will be significant at/or less than the 0.05 level and I will cite higher probability estimates in the text in cases where the test statistic is important but p. estimates exceed the 0.05 level.

In all cases I will use data from the in-situ sites to define site types and will add the disturbed or totally redeposited sites only after the initial type itself has been delimited. Finally, since regional north-south differences affected the distribution of some attributes at the sites, these regional differences will be evaluated in all cases and controlled when necessary (e.g., in the density of lithics and lithic tools per site, for example, where all northern sites show these attributes present at higher values because of the proximity of superior lithic outcrops in the north).

IV. TYPES OF SITES ON THE CENTRAL RUSSIAN PLAIN

A. Sites Without Storage Pits and/or Dwellings

As noted, I anticipate finding both maintenance and extractive camps in this category, and interpret the distribution of attributes within this group of sites, illustrated in Table VI-22, to show the following types present.

1. Lithic Workshops. I have idnetified sites exhibiting the presence of only lithic assemblages, predominantly made of locally available materials as well as 1) the presence of nuclei in high densities, 2) low blade:nuclei ratios, and 3) low end scraper and burin densities (double residualized against lithic densities as well as against the density of fur bearers) as lithic workshops. As Table VI-22 shows, these sites lack grinding stones, exotic lithics and decorative objects, worked bone, hearths, and small pits. They show the presence of very small numbers of exploited taxa, a narrow range of species exploited as food, and low MNI and MNB values for food taxa. While no data exist on the kcals found at these sites, we can anticipate them to be low as well.

I have classified Bugorok and Klyusy, and provisionally, pending future excavations, Korshevo I and II as lithic workshops. Lithic workshops are all located in the northern region of the study area and were, as Table VI-22 shows, all occupied during the warm weather months.

2. Hunting or Collecting Extractive Camps. The scarcity of sites showing unequivocable evidence of having served as either hunting stations or collecting stations for bone do not permit me to treat these two distinctive types separately. It is only with much additional research, one that will take into account taphonomic factors, that we will be able to separate the two types of camps. While no in-situ site can be firmly assigned to this mixed type of

extractive camps, I interpret the attribute distribution at Kurovo and Novo-Bobovichi to indicate that the two sites were used for food or bone procurement. Both show low variety in species exploited as food as well as low MNI and MNB values for all food taxa. Aside from the remains of one wolf bone at Kurovo, fur bearers are absent at both of these sites. Available data on the nuclei proportions and blade to nuclei densities indicate little lithic manufacturing at the sites. Both lack exotic lithics, decorative objects, grinding stones, worked bone, and small pits.

As noted before, Novo-Bobovichi has been interpreted by Gromov (1948) as a remnant of a Late Pleistocene mammoth bone cemetery that was possibly exploited by Upper Paleolithic groups in the area. Kurovo, with its greater variety of exploited taxa and low lithic densities suggests use as a hunting station. Finally, both sites indicate warm weather occupation.

3. Base Camps. The presence of a far greater diversity of attributes including worked bone, grinding stones, ocher, some exotic lithics and decorative objects, as well as the presence of either hearths (at the in-situ sites) or bone charcoal (at redeposited or disturbed sites) all indicate that Chulatovo II and Zhuravka, as well as probably Chulatovo I, Kositsa, and Novgorod-Severskii represent remains of warm weather base camps. The differences observed in the lithic tool densities, as well as nuclei densities between the northern and southern sites classified as warm weather base

camps, conform to the general northern pattern of 1) greater lithic density, and 2) more intensive lithic manufacturing at these sites.

All five of the sites show a presence of numerous taxa exploited as well as a variety in species used and food. Kositsa with evidence for the exploitation of only two taxa appears not to conform to this general pattern. I suggest, however, that both future research at the site, as well as an archaeozoological examination of faunal remains will reveal a broader mix of exploited species than reported in Table VI-22. Nonfood taxa, namely fur bearers, have been reported at Chulatovo I and II, Novgorod-Severskii and Zhuravka and indicate some fur processing maintenance activities there.

As noted above, hearths have been found at both in-situ sites of Chulatovo II and Zhuravka. In addition, Voevodskii (1952a) has suggested that the discreet clustering of remains at Chulatovo II as well as the presence of small pits at the sites (possibly remains of post holes), suggest the existence of light-weight surface dwellings or tents. Sklenar (1975, 1976) has suggested a possible use of surface tents at Zhuravka. Finally, Pidoplichko (1947), among others, has suggested that man inhabited rock shelters at Novgorod-Severskii. These observations and suggestions imply that dwellings were present at these warm weather base camps.

4. Mixed Occupations. Three sites, Pogon and Pushkari

II in the north, and Fastov in the south, show ambiguous evidence in attribute distribution in Table VI-22, which I interpret to mean that the sites may have been occupied as different site types. It will be recalled from Chapter II that the close proximity of Pogon and Pushkari II to each other, as well as the very limited extent of excavated areas (63.3 m^2 and 58 m^2 respectively) at each site leave the relationship of these sites to each other as well as to nearby Bugorok and Pushkari I unclear. As I suggested in that chapter, at present it is not at all clear if the four should be treated as independent sites, parts of one or more larger sites, or if some of them should be classified as sites at all.

If we assume that Pogon and Pushkari II are independent sites, as I have done for the purposes of this discussion, they both appear to indicate disparate sets of behavioral complexes which I have associated with different types of sites. At Pogon, general low densities of tools and of end scrapers and burins, high nuclei densities, low proportions of nuclei, and low blade:nuclei ratios all indicate that extractive activities associated with lithic procurement took place at the site. On the other hand, the presence of exotic lithics, ocher, and of bone charcoal suggest that some maintenance activities were performed there as well. The prevelance of lithics in Pogon's assemblage and the sparcity of attributes associated with maintenance activities lead me to classify this site primarily as a lithic workshop.

The very presence of attributes related to maintenance activities at the site, however, suggest more than one occupational episode for the site.

Lithic remains at Pushkari II show low tool as well as end scraper and burin densities. Pushkari II, as Pogon, shows low proportions of nuclei and low blade:nuclei ratios--all of these attributes indicate activities related to lithic manufacturing. At the same time ocher, grinding stones, and bone charcoal have been found at the site--attributes I have associated with activities other than extractive. Faunal remains at Pushkari II show both the presence of fur bearers, as well as a wide variety of exploited taxa. As Table VI-22 shows, seven economically important species and four food species have been identified at the site. Kcal values calculated, both excluding all mammoths and including only half of the mammoths, show high values for the site. In brief, faunal remains at Pushkari II conform more closely to the pattern observed in the distribution of these attributes at base camps. As I noted in Chapter V, data considered as seasonal indicators lead to contradictory conclusions about the season that Pushkari II was occupied, and Table VI-22 assigns an ambiguous cold-warm season of occupation to the site. This ambiguity conforms to the general pattern of contradictory attribute distribution at Pushkari II and leads me to suggest that the site may have been occupied both as a lithic workshop at one time, as well as a base camp at some other period. I cannot resolve

the ambiguity in the seasonality projected for the site. If Pushkari II was at some point in time occupied as a base camp, then the lack of features such as storage pits and mammoth bone dwellings there indicate that it would have been a warm weather occupation. This leaves cold weather as the season when the site was used as a lithic workshop--an explanation that is unsatisfactory since the season of occupation has been primarily determined on the basis of the exploited fauna found at the site and lithic workshops should not contain faunal remains.

Finally, data from Fastov are also ambiguous and indicate both lithic manufacturing as well as specialized hunting at the site. The site shows a surprisingly high density of lithic tools present for a southern site, as well as 1) a high density of nuclei, 2) low blade:nuclei ratios, and 3) low proportions of nuclei. In toto, I take this attribute distribution to indicate that lithic tool manufacturing took place at Fastov . At the same time the absence of fur bearers as well as 1) a low variety in exploited taxa, 2) a low variety in taxa used as food, and 3) low kcal values, suggest that it may have served as an extractive camp for the procurement of food. Pidoplichko and Shovkoplyas (1961), as well as Boriskovskii and Praslov (1964), have identified Fastov as just such a short term hunting station. I argue here, however, that its faunal and lithic attributes, as well as its relatively thick cultural layer, point to: 1) either the fact that the site was

occupied more than once, or 2) that as yet unidentified local geomorphological factors favored a higher degree of lithic manufacturing than found at hunting stations, or finally, 3) that the high density of lithic tools and nuclei at the site are all behaviorally associated with resharpening, repair, and manufacturing of hunting weapons. Quite clearly only additional research on the lithic remains at Fastov will resolve the noted ambiguity. I suspect, however, that the third interpretation, namely that evidence for lithic work at the site is related to the production of hunting tools will ultimately be proven correct. With this in mind, I have classified Fastov as primarily a hunting station used in the procurement of either only horses or horses and mammoths.

Sites without storage pits and/or dwellings share the following site characteristics in common: 1) they are located at various elevations but off the floodplain (see Table II-5); they show a predominance of warm weather occupation; and 3) they tend to be smaller in size (but see projected maximal sites sizes listed in Table II-5). Finally, while they, like sites with storage pits and/or dwellings, show a range in the thickness of their cultural layers, no consistant patterning could be observed in cultural layer thickness between these two categories of sites (ϕ = +0.11, see Table VI-14). This suggests, although equivocably, that either the length of occupation or the number of reoccupations did not differ at these two groups of sites. I will return to this observation and examine it in greater detail after

presenting a site typology for all of the sites and examining the questions of population size and the length of stay at the different types of sites.

B. Sites with Storage Pits and/or Dwellings

As I have argued earlier, all of the sites included in this category show the presence of a large variety of attributes and represent remains of base camps. The distribution of assemblages, features, and site characteristics found at these sites is presented in Table VI-23. Also as noted, the following attributes were predominantly found in this category of sites: 1) worked bone ($z = 3.11$); 2) art and jewelry ($\phi = +0.86$); 3) shells ($\phi = +0.39$); 4) amber ($\phi = +0.36$, $p = \phi.08$); 5) ocher ($\phi = +0.43$); and 6) grinding stone ($\phi = +0.33$, $p = 0.06$) (see Tables VI-2 and VI-14). In addition to showing the cooccurrence of storage pits, hearths, and mammoth bone dwellings at these sites, this category of sites also show greater hearths volume ($z = 3.12$), and in both the north and the south, sites with storage pits and/or dwellings have more numerous hearths ($z = 13.13$ and $z = 5.45$ respectively, see Table VI-17).

I have already argued that while the question of single or multiple occupations of these sites has not received much attention in the literature, data on hand at least for Mezin and Suponevo, as well as possibly for Dobranichevka, Gontsy, and Mezhirich suggest that the sites were occupied more than once. It is also unclear if various reoccupations were functionally alike. As Binford (1982b) has pointed

out, base camps can and do become extractive locales and vice versa. Given this ambiguity, we should, therefore, anticipate finding some unclear patterning in the distribution of attributes as these sites as well.

Taking the presence of the two most visible and diagnostic attributes--storage pits and mammoth bone dwellings--we can discern the presence of three groups of sites among the in-situ ones listed in Table VI-23. They are:

1) Sites with both Dwellings and Storage Pits: Berdyzh, Dobranichevka, Eliseevichi, Gontsy, Radomyshl', Mezhirich, Mezin, Suponevo and Yudinovo

2) Sites with Dwellings but without Storage Pits: Kirillovskaya, Pushkari I

3) Sites with Storage Pits but without Mammoth Bone Dwellings: Khotylevo II, Timonovka II, I.

The second group, with dwellings but no storage pits, while appearing anamolous, I suspect in reality belong to the first group. I would argue that Kirillovskaya and Pushkari I lack storage pits because of archaeological biases. In the case of Kirillovskaya, lack of stratigraphic controls and the failure of 19th century excavators to recognize these features is probably to blame. Pushkari I, located on the heavily utilized Pushkari promontory, was both never cored for additional nearby features, and, I suspect will yield storage pits in future excavations. Based on these considerations I have decided to include these sites

in the first group of sites with both dwellings and storage pits.

Finally, large MNI counts of mammoths (17-22) found at the totally redeposited Yurovichi, suggests that either dwellings and/or storage pits were originally present at the site as well.

Using data on hand depicted in Table VI-23, I suggest that we can recognize the presence of at least three types of base camps among these sites. In considering the distribution of assemblages between the sites, however, regional north-south differences should be kept in mind in the patterning of lithic remains as they cross-cut and overshadow any and all other differences between the sites. Specifically, since I have already discussed the presence and use of superior lithic outcrops in the north and the use of locally available cobble flint in the south, and shown that this difference affected the interregional densities of lithics at the sites, this factor can also be expected to have had an affect on the distribution of lithics at sites with storage pits and/or dwellings in the north. While I have attempted to control for much of this effect through residualization in attribute definition, in this discussion I argue that the distribution of any lithic attribute should be evaluated separately at the northern and southern sites. For example, as Table VI-23 shows, low overall densities of lithic tools are observed for all but Khotylevo II and Timonovka I in the north, while they are found at low

densities only in Mezhirich in the south. Likewise, since we have no lithic workshops in the south, the consistently high blade:nuclei ratios at southern sites noted in column of Table VI-23 contrast with the low ratios observed at such northern sites as Pushkari I and Timonovka I.

Keeping these regional differences in mind, I suggest that we can distinguish the following types of base camps present in the study region: simple or complex.

I will begin by examining sites where both dwellings and storage pits have been found. There, simple base camps show the presence of both storage pits and swellings, as well as have surface bone accumulations and hearths like their more complex equivalents but have these features present in smaller numbers. Table VI-21 defines these summarized feature counts as density controlled measures of facilities per square meter per site (column 3) as well as summarized values for facilities and hearths per square meter per site (column 4). I have eliminated both Berdyzh and Kirillovskaya from consideration because, in the first case data are unclear on both the exact nature as well as on the number and sizes of the features found, and in the second, the features assigned to Kirillovskaya by Pidoplichko (1969) came from his reconstruction of the site from 19th century archival sources and can be expected to include numerous omissions and errors. A comparison of the differences in mean densities of facilities only (i.e., storage pits, dwellings, and bone heaps) between sites with

dwellings show significantly higher density present at Eliseevichi, Mezhirich, Mezin, Suponevo, and Yudinovo than at Dobranichevka, Gontsy, Pushkari I, and Radomyshl' ($z = 1.97$). An even larger difference is observed when mean densities of both facilities and hearths are calculated for these two groups of sites ($z = 2.59$).

A similar division of sites into two groups can be observed if we use labor investment as a measure. Thus, if we compare the number of days ten men had to labor to assemble and erect dwellings at these two groups of sites we see more than two times the effort invested at Eliseevichi, Mezhirich, Mezin, Suponevo and Yudinovo than at Dobranichevka, Gontsy, Pushkari I, and Radomyshl' ($z = 4.40$; Table VI-17).

While impossible to quantify, additional labor investment to the one used in this discussion can also be postulated at some of the complex sites. Both Rogachev (1970) and, indirectly, Polikarpovich (1968) have noted that some kind of patterning or bone sorting can be observed in the construction of at least one dwelling at Yudinovo. As Kornietz et al. (1981) reported, and as can be observed in Figure II-18, bone sorting is also evident at Mezhirich. Dwelling #1 features outside facing or "retaining walls" made of mammoth skulls and of 95 mandibles stacked one on top of the other in a herringbone "chin down" pattern. In dwelling #2 these facings or outside walls are of long bones. In dwelling #4 different sections of the outside walls are made up of different skeletal elements and

sectionally reflect the other dwellings at the site. As I have reported elsewhere, Gladkih noted an additional fascinating detail in the construction of the 4th Mezhirich dwelling--the use of mirror imagery and repetition in the construction of the outside wall (Soffer 1981). For example, the mandible section features two rows with "chin down", then a row with "chin up", then a row with "chin down" again. In an adjacent section a skull is bracketed on the left and on the right side with identical sequences of scapula-scapula-pelvis. The same rhythmic repetition is also seen in the placement of the vertebrae and of skeletal elements next to them. As noted, I have not translated these observations into quantified estimates of man-days of labor; they do, however, strongly suggest that the estimation I do use represent just minimal ranges of labor employed in constructing the dwellings.

Likewise, significantly greater numbers of decorative items have been found at the sites with more labor and facilities. A comparison of mean art and jewelry counts show 86 times as many of these items at complex base camps ($z = 3.72$). In fact, as Table VI-11 shows, high values for art and jewelry can only be observed at these sites.

At the same time that this group of artifacts, requiring a good deal of labor but locally available raw materials, are found at complex base camps, nonlocal exotic materials--amber and fossil marine shells in particular--show a more ambiguous distribution. I have

demonstrated previously that the distribution of all of these artifacts is associated at the sites but it could be argued, however, that this association was a result of different and unrelated behavior which just happened to cooccur at particular sites. In order to test such a hypothesis--that the two sets of decorative items, one made of local and one of exotic materials, were behaviorally related--I proceeded to calculate a Kendall's tau correlation coefficient between them and used data only from the in-situ sites showing the presence of any of these items. To do so, coded values for these objects in Tables VI-10-13 were transformed and recoded as follows: 1) the coded values for amber and shells (columns 4, Tables VI-10 and 12) and for art and jewelry (columns 2 and 4, Table VI-11) were added and listed in columns 1 and 3 of Table VI-24; 2) these summarized coded values were then divided by 2, since objects could be found in either one or two categories; and 3) to control for the differences in the sizes of excavations at the sites, these divided values were then further divided by square meters excavated for each site. The resulting density controlled and summarized coded values can be found in column 2 for amber and shells and in column 4 for art and jewelry (Table VI-24). These values were then ranked and the resulting tau value of +0.24 transformed into a $z = 1.09$ score. As Table VI-25 shows, the correlation between these two groups of decorative objects is not significant at the 0.05 level which I interpret to indicate

that the two sets of objects--those of local material that required a good deal of labor and those of exotic material--were associated with two distinct behavioral complexes. I argue that decorative objects of local material were related more to intragroup signaling of status, while those of exotic materials, while possibly also used as status markers, were more closely associated with intergroup or regional exchange networks.

Using data in Table VI-23, I argue also that the distribution of the densities of fur bearers, MNI and MNB counts of food taxa, as well as kcal values show similar patterning and are found at high densities at complex base camps and at low densities at simple base camps. Due, however, to the early date of excavation of Suponevo, periglacial disturbances at Eliseevichi, and the incomplete reporting of faunal data from Yudinovo (as well as the fact that it is still undergoing excavation), this patterning is less clear than for the distribution of facilities, labor investment, and of decorative items. Thus, high densities of fur bearers are found only at Eliseevichi, Mezhirich, and Mezin. High kcal values (including half of the mammoths in calculations) exist at Eliseevichi, Mezhirich, and Mezin and high MNI and MNB values for all food taxa at Mezhirich and Mezin.

As I have demonstrated in Chapter V, fur bearers were objects of specialized exploitation and are found at some sites in quantities well above those that can be projected

for purely utilitarian consumer needs. It will be recalled that the three sites with singificantly higher densities of fur bearers were identified to be Eliseevichi, Mezhirich, and Mezin. These sites, as noted above, are also the locales where high densities of both local as well as exotic decorative items were found. To test if this cooccurrence was fortuitous or because fur bearers and decorative items were a part of the same broad behavioral repertoire of status demarcation and/or regional exchange, I proceeded to calculate Kendall's correlation coefficients between fur bearers and decorative objects. Data on both the summarized density controlled values of MNIs per square meter for arctic foxes and hares, as well as for all fur bearers, are presented in columns 5 and 6 of Table VI-24 respectively. I calculated tau and z scores for the following pairs of attributes: 1) summed amber and shell values and summed arctic fox and hare values; 2) summed amber and shell values and summed vlaues for all fur bearers; 3) summed art and jewelry and summed arctic fox and hare values; and 4) summed art and jewelry values and summed values for all fur bearers. The resultant scores are listed in Table VI-35. Ranking for all tests was done only for those sites where at least one of the two attributes tested for the correlation were present.

As the tau values and z scores in Table VI-25 indicate, decorative objects made of exotic material (i.e., amber and shell) were highly correlated with both foxes and

hares and all fur bearers (both tau values were +0.40 and both z scores 9.09). Much weaker positive correlations were found between decorative objects of local materials (art and jewelry) and either summed fox and hare densities (tau = +0.34, z = 1.62) or densities of all fur bearers (tau = +0.26, z = 1.24) and these were not significant at the 0.05 level. I interpret these tests to indicate that while amber and shells were a part of the same exchange network as furs or pelts, art and jewelry made of local material did not figure prominently in such networks. I conclude that: 1) both status demarcation and exchange figured far more prominently in the behavioral repertoire at complex than at simple base camps; 2) emphasis on status demarcation is seen primarily at complex base camps; and 3) long distance exchange involving exotic materials and urs is behaviorally associated with complex base camps.

While I have demonstrated clear patterning in the distribution of attributes that can roughly be equated with social, and possibly ideological, behavior and found much greater evidence for such behavior at complex base camps, this clear patterning cannot be observed when we consider the distribution of attributes related to everyday subsistence and/or maintenance needs. Thus, while lithic tools tend to be found at low densities at the complex base camps (e.g., Eliseevichi, Mezhirich, and Mezin), they are also low at the northern site of Pushkari I, and consistantly high at the simple southern base camps. While high blade:

nuclei ratios are found at all southern sites, they are high only at northern complex sites and low at other northern sites. Data on end scraper and burin densities is equally ambiguous. As suggested before, I interpret the lack of clear patterning among these attributes to be a result of both the distribution of quality raw materials inter-regionally, as well as historic or prehistoric factors of limited significance to this discussion.

Finally, a lack of clear patterning can be observed in the densities of worked bone as well. First, a comparison of mean densities of worked bone between the sites with and without storage pits showed that bone working primarily went on at sites with storage pits ($z = 3.11$). Bone working appears to have been more important, in general, in the north. A comparison of mean densities of worked bone between northern and southern sites with storage pits yielded a z value of 1.60 ($p = 0.09$). Similarily, values for end scraper and burin densities residualized from lithic density in general, as well as from fur bearer densities (column , Table VI-23) which I have associated with bone working, show more intensive bone work in the north with high densities found only at Mezhirich.

Faunal remains similarily show conflicting patterning. While a comparison of mean number of economically important taxa found at sites shows approximately two times the variety at the complex base camps ($N = 12$, $x_1 = 14.60$, $x_2 = 7.86$, $z = 3.54$, $p = 0.009$), a comparison of mean numbers of

species exploited as food does not show a significantly smaller value at the simple base camps ($N = 12$, $x_1 = 7.40$, $x_2 = 4.29$, $z = 1.66$, $p \Rightarrow 0.10$).

I conclude this discussion by suggesting that we can identify the existence of both simple and complex camps amongst the sites with storage pits and dwellings and classify these sites as follows:

1. Simple Base Camps: Berdyzh, Dobranichevka, Gontsy, Kirillovkaya, Pushkari I, Radomyshl', and in all probability Yurovichi.

2. Complex Base Camps: Eliseevichi, Mezhirich, Mezin, and probably Suponevo, and Yudinovo.

I suggest that the differences between the two types of cold weather camps does not lie in basic maintenance--subsistence related activities, but rather in the sphere of behavior associated with social and possibly ideological factors. It could, however, be argued that what I have identified as complex base camps in fact were not base camps at all but possibly special locales for ritual or ceremonial activities. I will delay evaluating this hypothesis until all the sites have been typed and questions of population size and duration of occupation examined.

Lastly, three sites with storage pits but without dwellings have been found in the study area: Khotylevo II, Timonovka I and II. Data from all three, as shown in Chapter II, are problematic. As discussed, Khotylevo II is still undergoing excavation and complete information on the

features and assemblages found there has not been published. As I have argued in Chapter V, Soviet researchers assign this early Desna site to a spatially distant Kostenki culture. My analysis of faunal remains found there also showed Khotylevo II to be anomalous (see Chapter V). The distribution of features and assemblages at this site appears to broadly conform to that identified at base camps but while these distributions are similar to those found at other sites with storage pits and/or dwellings, stylistically, the lithic and bone assemblages as well as art objects show great differences (see Zavernyaev 1978, for example). Khotylevo II, for example, has yielded a number of female Venus figurines only found at the eastern Kostenki and Avdeevo sites. Likewise, the distribution of features on its living floor is far more similar to those at Kostenki I-1 and 2, and Avdeevo than to the Desna sites (see, for example, floor plans in Velichko et al. 1981 for a comparison). At present, all that can be said about Khotylevo II is that it represents some sort of a base camp with an unclear season of occupation and unclear cultural affinities. Because of this I will not include this site in the discussion of the Upper Paleolithic settlement system in the study area.

Timonovka I and II, as I have indicated in Chapter II, may not be two separate sites, but represent a sequential occupation of the Timonovka promontory. While they have been traditionally treated as two sites in the literature

(a practice that I also adopted for this work), Grehova in Velichko et al. (1977) has hypothesized that a part of the promontory, including sections of both Timonovka I and II, was occupied first and that a second reoccupation sequence (or a continuation of occupation at a slightly later time period) took place at other sections of Timonovka I. Such an interpretation of the relationship of the sites to each other, while intriguing, has, however not been empirically proven and the question whether just one or two sites existed in the Late Pleistocene remains open.

Treating the two as separate sites, we see that a good deal of lithic manufacturing went on at both. Data in Table VI-23 indicate a somewhat higher rate of original tool making at Timonovka II, with low lithic tool densities, than at Timonovka I with high densities of this attribute. Data on nuclei densities, with high values at Timonovka I and low ones at Timonovka II, contradict this conclusion. The low blade:nuclei ratios at Timonovka I likewise argue for tool manufacturing there. High densities of end scrapers and burins associated with hide and bone processing at both sites indicate bone working at both. This is also confirmed by high densities of worked bone found at both sites. Both sites also show the presence of grinding stones, ocher, and art, and the absence of jewelry and amber. A small number of marine shells (~ 9) have been found at Timonovka II.

As Table VI-23 indicates, the distribution of features

at both sites is comparable--both have large storage pits, hearths, and surface bone heaps. On these attributes, both Timonovka I and II, other than lacking mammoth bone dwellings, are indistinguishable from simple base camps I discussed previously. As other simple base camps with storage pits, Timonovka I and II show occupation during the cold season and have low densities of fur bearers, kcals, and MNB and MNI counts of food taxa.

What distinguishes these two sites from others I have classified as simple base camps are the number of species exploited as food. As Table VI-23 shows, only two food species have been found at the sites. A comparison of mean numbers of taxa exploited as food at sites I have identified as simple cold weather base camps to those at Timonovka I and II show significant differences ($N = 8$, $x_1 = 4.29$, $x_2 = 2.0$, $z = 4.73$, $z = 0.0001$). A similar difference can also be observed between the mean numbers of food taxa at warm weather base camps and Timonovka I and II ($N = 8$, $x_1 = 6.67$, $x_2 = 2.0$, $z = 1.76$, $p = 0.08$). At the same time, no differences in mean densities of economically important taxa can be found between simple cold weather base camps and Timonovka I and II ($N = 9$, $x_1 = 7.86$, $x_2 = 6.50$, $z = 0.96$, $p = 0.25$) or between warm weather base camps and Timonovka I and II ($N = 8$, $x_1 = 11.33$, $x_2 = 6.50$, $z = 1.27$, $p = 0.18$). The low variety of food taxa at Timonovka I and II is indistinguishable from the numbers of food species observed at sites I have classified as hunting or collecting

locales (i.e., Fastov , Kurovo, and Novo-Bobovichi). A Difference of Means test between mean numbers of food taxa at these two groups of sites showed a z-value of 1.22 (N = 5, x_1 = 2.0, x_2 = 1.67, p = 0.19).

I interpret the distribution of attributes at Timonovka I and II to indicate that these two sites were base camps where a great deal of hunting and food provisioning went on. This, together with information that both were occupied during cold weather months, in turn indicates that they represent yet another type of base camp where processing and cacheing of one or two abundant food resources took place. While data on the exact content of the storage pits at both sites is missing, and the role of mammoths in Upper Paleolithic diets unclear, it is tempting to speculate that both sites were base camps associated with intensive exploitation of reindeer. This species, as can be seen in Table V-6, is the only one other than mammoths, actively procured at the sites. Since I have postulated previously that reindeer in the study area would have been optimally hunted during cold weather months from fall to spring (see Table III-21), we can combine now this observation together with my suggestion that storage pits were excavated during warm weather months to arrive at the fall season as the most likely time for hunting and storing of reindeer.

Data on the densities of fur bearers found at Timonovka I and II, however, indicates that the fall season was not the only time the Timonovka promontory was occupied. It

will be recalled that in Chapter V I showed high densities of arctic foxes and wolverines present at Timonovka II. Data on arctic foxes from other sites indicate that they were taken in late winter-early spring months. Assuming this taxon was taken during the same season at Timonovka as well, we can then conclude that Timonovka II was occupied in late winter-early spring. Thus, faunal evidence on hand broadly support Grehova's hypothesis about the occupation sequence at Timonovka I and II, and indicate that Timonovka I was probably a fall provisioning base camp while Timonovka II a late winter-early spring base camp, possibly subsisting on provisins cached in the fall.

This argument was based on the assumption that Timonovka I and II represent two distinct sites--an assumption that may not be valid. In Chapter II, I discussed Grehova's hypothesis that some mammoth bone dwellings may have existed there which were subsequently destroyed and the remains dislocated by periglacial phenomenon (Grehova in Velichko et al. 1977a). The small variety of food taxa found there, however, argue against such a hypothesis.

It could also be argued that Timonovka I and II were exactly what other simple cold weather base camps looked like before mammoth bone dwellings were erected on them, and that the lack of dwellings at these two sites is due to some unknown prehistoric factor. In other words, that the Upper Paleolithic occupational sequence during cold weather months was one that at the onset of colder weather: 1) first

saw the establishment of provisioning base camps where active hunting and storage went on, as well as intensive gathering of mammoth bone for construction (hence the surface bone heaps), and 2) that the construction of the dwellings themselves took place later in the fall. In this scenario, Timonovka I represents the locus of such an early fall settlement, where the construction of dwellings either never took place, or took place and the dwellings were subsequently destroyed after the site was abandoned. In the first instance, the inhabitants would have left the site, wintered in mammoth bone dwellings elsewhere, and returned to the area with the onset of warm weather to use up the stored resources. In the second instance, they wintered over in the now destroyed dwellings and remained in the area until spring. Unfortunately, data on hand do not permit me to fully evaluate these conflicting scenarios. The faunal record on the food species found appear to favor the second reconstruction, and I, therefore, will classify Timonovka sites as a second type of simple cold weather base camps: hunting base camps.

In summary then, I have outlined the existence of the following types of sites in the study area during the Late Pleistocene:

1. Lithic Workshops -- warm weather:
   Bugorok, Klyusy, as well as Korshevo I
   II, Pogon, and Pushkari II.

2. Hunting Camps -- warm weather:
   Fastov , Kurovo.

3. Collecting Camps -- warm weather: Novo-Bobovichi.

4. Simple Base Camps:

   A. warm weather: Chulatovo II, Zhuravka, as well as Chulatovo I, Kositsa, Novgorod-Severskii and Pushkari II.

   B. cold weather: Berdyzh, Dobranichevka, Gontsy, Kirillovskaya, Pushkari I, Radomyshl', and Yurovichi.

5. Hunting Base Camps: Timonovka I, II.

6. Complex Base Camps -- cold weather: Eliseevichi, Mezhirich, Mezin as well as Suponevo and Yudinovo.

7. Anomalous: Khotylevo II base camp.

V. ESTIMATES OF POPULATION SIZE AND DURATION OF OCCUPATION

Questions about the size of groups occupying sites and about the duration of occupation are found often in the literature and present perhaps the thorniest questions on hand. Numerous approaches have been offered by researchers to answer these questions, ranging from now classic caloric values of White's (1953) to equally popular values offered by Naroll (1962) for the relationship of dwelling space per individual. A persistent problem faced by archaeologists applying these formulas has always been to separate information on population size from that on the length of occupation.

Recently Yellen (1977) has offered a sophisticated way of controlling for this problem by dividing the site into the central and peripheral portions and having the areal values in the center reflect group size and those in the

periphery the duration of occupation. While this refinement certainly represents an improvement on ready-made recipes of the past, it still is based on an assumption of a single episode of occupation. This assumption clearly cannot be made for the sites on the Late Pleistocene Central Russian Plain.

In spite of my strong reservations about the validity of estimating population sizes and duration of occupation for the sites in the study area, I will now undertake just such an exercise both because the establishment of tenuous parameters is of heuristic value, and because such parameters should be considered at least before outlining a settlement pattern for the study area. Because of my reservations about each single method for estimating either population size or length of stay, I will examine these variables using an array of approaches, and, as before, look for evidence of patterning.

As noted, a number of approaches exist in the literature, but with the exception of White's (1953) caloric approach, either offer ways of estimating population size for very mobile hunters and gatherers (e.g., Weissner 1974, Yellen 1977) or for those groups residing in dwellings regardless of their subsistence practices (e.g., Cook and Heizer 1968; Naroll 1962). Since the sites in the study area fall in both categories, I will basically follow such a division in my discussion, and first examine data from cold weather base camps with dwellings and with or without

storage pits, then work with data from warm weather base camps without any of these features, and finally consider Timonovka I and II without dwellings but with storage pits.

I will begin, however, by considering and dismissing population estimates derived from the size of sites.

A. Population Estimates from Site Size

I have presented site sizes for those few sites that have been fully excavated, as well as estimates of maximal sizes for sites only partially excavated in Table II-5. Column 1 in Table VI-26 lists the most reliable of these. I have eliminated from consideration all cases, such as Eliseevichi and Yudinovo, where huge discrepancies exist between what has been excavated and what is postulated as maximal site size, as well as data on redeposited sites. In the case of Timonovka I, where maximal site size is given as a range from 2,400-3,200 m^2 I have used a mean value of 2,800 m^2.

Table VI-26 offers three estimates of populations per site--in column 2 using Yellen's formula, in column 3 Weissner's, and in column 4 on a ratio of square meters per individual I derived from Leroi-Gourhan and Brezillon's (1972) Pincevent study. The values found in the columns have been derived as follows.

1. Using Yellen's Formula: Yellen (1977), based on his work with the !Kung San, has offered the following formula for estimating population at sites:

$$Y = 6.43 + 1.15X$$

where Y is the area of the central core of the site and x represents the total number of inhabitants. While his deliniation of this center core was based on the comparison of artifact densities found in the center and in the periphery, lack of appropriate provenience data for the sites in the study area necessitated a relaxation of Yellen's requirements. Table VI-27 offers approximate areas fro the complexes delimited at Dobranichevka, Mezhirich, Mezin, Timonovka I and Timonovka II. Values for Dobranichevka have been taken directly from Leonova (1977), while those for Mezhirich and Mezin represent my own approximations of the area taken up by the dwelling itself and its immediate surroundings. Values for Timonovka I and II were taken from Velichko et al. (1977). Column 2 in Table VI-27 lists population estimates for each complex. Summarized population estimates for each site are listed in that table as well as in column 2 of Table VI-26.

2. Using Weissner's Formula: While Weissner (1974), using again !Kung San data, has demonstrated a logarithmic relationship between group size and living area at sites, her formula, as Price (1978) has noted, is applicable only to sites between 50-250 square meters in area and for groups not numbering above 25 individuals. Again, relaxing many of Weissner's requirements, and roughly assuming maximal floor space of 10.8 m^2 per individual for groups of 25 and above (Weissner's ratio for a group of 25), population sizes can be calculated for the sites and are offered in

column 2 of Table VI-26.

3. Using Data from Pincevant: Leroi-Gourhan and Brezillon (1972) have identified the remains of three temporary dwellings in section 36 at Pincevant, and postulated that each was occupied by a family of about five individuals. Knowing that the total site is approximately 600 m^2 in area, and given their assumptions that the three dwellings were occupied simultaneously, we can, therefore, determine a ratio of 40 m^2 per person at Pincevant.

I have applied this ratio to the data from the Central Russian Plain sites and the resulting population sizes are listed in column 4 of Table VI-27.

This table shows that widely varying estimates can be obtained depending on what approach in estimating population size is used. Along with this, rationale for preferring one estimate among the four possible ones is lacking. In brief, these two factors render this approach useless for estimating population sizes at the study sites. The resulting range in group size values probably resulted from not controlling for the number of reoccupations, as well as because spatial relationships (i.e., man/area) for groups larger than the !Kung San were not included.

B. Estimates for Sites with Dwellings and/or Storage Pits

1. Population Size. Another approach to estimating group size found in the literature is based on the relationship of dwelling space per individual. Two ratios figure prominently in the English language literature: 1) Naroll's

(1962) 10 m^2 per person, derived from a survey of agricultural groups, and 2) Cook and Heizer's (1968) 6.1 m^2 per person, based on a survey of aboriginal California populations (the metric value here is my own conversion and simplification of their more complex version expressed in inches).

Soviet archaeologists, on the other hand, without ever discussing the empirical basis for their assumptions, have used 1-3 m^2 per person in their estimates (see Bibikov 1969; Pidoplichko 1969, 1976; Shovkoplyas 1965a, for example). This ratio is in fairly close accord with those reported by Watanabe (1972) for the sedentary Ainu. He reported that dwellings averaging about 5 m^2 in area were occupied by a single nuclear family of about five people. Similar ratios can also be obtained from Nelson (1971) for the Bering Straits Eskimo. For them, I have calculated an average of 2.5 m^2 per person for winter houses and 2.8 m^2 per person in summer ones. Ives and Sinopoli (1979--1980) report mean house size of 38 m^2 for a group of 20 among the Kaska--again yielding a ratio of 1.9 m^2 of house floor space per individual. Balikci's (1970) data indicate approximately 4 m^2 per person in Netsilik winter houses, while the ratio for Siberian Nganasan can be estimated at about 1.6 m^2 per person from Chard (1963). Although not systematic or exhaustive, this brief survey of house floor space per individual in various Holarctic hunter-gatherer groups supports the range of 1-3 m^2 per person used by Soviet

researchers. It is this range that I will rely on heavily in my ensuing discussion.

Table VI-28 presents population estimates for each site with dwellings in the study area using the three approaches discussed above. Column 1 lists the size of excavated area per site and column 2 the summarized value for square meters of dwelling space per site--this value was obtained simply by adding all the dwelling floor space per site. In cases where a range for the number of houses was listed in Table II-6, mean values were used. Similarily, mean values were used if the area listed per dwelling was quantified as a range. For example, in the case of Yudinovo, the value of 91.4 m^2 in Column 2 of Table VI-28 was obtained in the following manner:

A. Number of dwellings listed in Table II-6: 3-4, mean = 3.5.

   Area per dwelling listed in Table II-6:

   dwelling #1 -- 20-43 m^2 = mean of 31.5 m^2
   dwelling #2 -- about 24 m^2 = mean of 24.0 m^2
   dwelling #3 -- 20-28 m^2 = mean of 24.0 m^2
   dwelling #4 -- 20-30 m^2 = mean of 25.0 m^2

   Mean dwelling area = 26.1 m^2

B. Mean area per dwelling of 26.1 m^2 x mean number of dwellings 3.5 = 91.4 m^2 of dwelling floor space for the site.

Columns 3-6 in Table VI-28 give population size estimates per site using Naroll's, Cook and Heizer's, and Soviet ratios respectively. Column 6 lists the mean number of people (rounded off to the nearest individual) at the site

based on estimates using 1 - 3 m^2 of floor space per person.

In order to select among these estimates, it would be useful to briefly examine some ethnographic data on north latitude groups. The following village sizes have been reported for Holarctic populations of hunters and gatherers:

GROUP	VILLAGE SIZE	REFERENCE
A. Alaska		
Bering Straits Eskimo (w & s)	20-125	Nelson 1971
Central Eskimo (w & s)	mean 33	Boas 1964
Kaska (w & s)	about 20	Ives & Sinopoli 1979-1980
Netsilik (w)	50-100	Balikci 1970
Point Barrow Eskimo (w)	mean 30	DeMontmollin 1979-1980
B. Siberia		
Bering Straits-East Cape (n.d.)	250	Nelson 1971
Giliyak (w & s)	50-100	Black 1973
Nganasan (w)	38-45	Chard 1963

LEGEND: w -- winter
s -- summer
n.d. -- no data

As these village sizes show, population size estimates for the Central Russian Plain sites derived either from Naroll or Cook and Heizer ratios are way to low to be logically viable. The size ranges derived through the use of 1-3 m^2 of floor space per individual come closer to ethnographically reported sizes of co-residential units. I have, therefore, elected to use the estimation derived from the ratio of 1-3 m^2 per individual in all future calculations.

2. Duration of Occupation. While I have shown in

Chapter V that all of the sites in the study area, both those with and without storage pits and/or dwellings, were temporary occupations, it is of some interest to see if the duration of this seasonal occupation can be roughly estimated, and to evaluate whether warm weather sites were occupied for shorter periods of time than cold weather ones. I offer three ways of approaching the problem of duration of occupation--through kcal values at the sites, through the volume of lithics discovered, and through the use of Yellen's formula for the size of the outer or peripheral area of the site. All three approaches share numerous problematic assumptions that I have mentioned earlier. For example, kcal values per site reflect, in all probability, just a portion of what was consumed there, and the effects of group size vs. duration of occupation cannot be separated out. The use of lithic densities as an indicator makes a number of unproven assumptions including a uniform rate of lithic deposition per man, as well as assuming that there is a direct relationship between the rate of lithic deposition and duration of occupation. Yellen's (1977) formula, Number of Days of Occupation = 0.1 area of periphery + 1.87, is based both on a careful deliniation of the periphery at sites using distribution of artifacts and on evidence from single occupation sites. I use these approaches in my discussion not because they will accurately reflect lengths of stay, but rather to derive some parameters for this variable which will be useful both for intersite

comparisons as well as for our understanding of the settlement system in the study area.

a. Kcal data. Table VI-29 offers estimates for the duration of occupation of the sites using kcal values per square meter per site. The basic assumptions used in constructing this table are: 1) group size ranges fall within the parameters obtained through the use of 1-3 m^2 of dwelling space per individual, and 2) a daily caloric requirement of 2,400 kcals per individual. Two groups of estimates are offered in this table--one assuming minimal group size per site (i.e., 3 m^2 of dwelling space per individual or 0.33 individuals mer m^2; section A in the table), and the other assuming maximal sized group per site (i.e., 1 m^2 of dwelling space per individual; section B in the table). Within each section (a--minimal group size; B--maximal group size) two kcal values were considered, one that excluded all mammoths and the other which included half of the mammoths per site.

Columns 1 and 6 in Table VI-29 list estimated numbers of individuals per square meter per site. These were obtained by dividing the excavated area per site by the number of people who occupied the site (column 5 in Table VI-28). For example, a minimal population of 19 individuals was postulated for Berdyzh. Since 350 m^2 have been excavated there, we can derive a value of 0.05 people per m^2. If, on the other hand, the site was occupied by a maximal size group of 57, the value for individuals per

square meter of the site would be 0.16. These two values are listed in columns 1 and 6 for Berdyzh. Given these densities of individuals per square meter per site, and assuming a uniform requirement of 2400 kcals per individual per day, I then estimated the required kcal per individual per square meter of each site. These are listed in columns 2 and 7 in Table VI-29. These values were obtained by simply multiplying persons per m^2 by 2400 kcals.

Values offered in columns 3-5 and 7-11 in this table estimate how long a given sized group (minimal sized in columns 3-5; maximal size in 7-11) could have been fed on the kcal per m^2 of the site (presented previously in Table V-13). The kcal values used included only those food taxa I projected as being actively hunted in the area, and two values for kcals were used--without any mammoths, and including half of the mammoths per site.

Duration of occupation estimates based on kcal values again show a very wide range, and point to the difficulty of using these values for any estimations before the problematic role mammoths played in Upper Paleolithic diets is resolved. Thus, for example, a minimal sized group of 19 individuals could have remained from 1.4 months to 5.5 years at Berdyzh, or a maximal sized group from 0.9 months to 4.1 years at Mezhirich, depending on whether or not mammoths are included in the calculations. Clearly the magnitude of such ranges take this method of estimating duration of occupation, outside the useful sphere, even if

used only for heuristic purposes. I suggest, therefore, that this approach, like estimating population size from the area of the site, is of little value for understanding the demographic and temporal variability of the study sites.

b. The rate of lithic deposition. Another way of approaching the problem of duration of occupation at the sites is to use the densities of lithics per square meter as a rough indicator. As noted, such an approach necessarily makes a number of unproven assumptions yet is one that can potentially yield some interesting, though speculative, results. Taking the reliable Pincevent data reported by Leroi-Gourhan and Brezillon (1972) as a starting point, I proceeded to calculate a rate for lithic deposition per man per months per square meter. A total of 16,040 pieces of lithics were found at the 600 m^2 excavated at Pincevent, giving a density of 26.7 lithics per square meter. The excavators suggested that Pincevent was occupied for about five months and, dividing the reported lithic density per square meter by 5, we obtain a value of 5.34 lithics deposited per month. Finally, since Pincevent may have been occupied by three nuclear families (total of 15 individuals), and assuming one flint maker per family, we can estimate a deposition rate of 1.78 lithics per man per month as a rough measure.

Some will argue that this permutation is an exercise in futility which will serve no useful archaeological pur-

pose since it is based on information from just one site. I offer it here as an interesting exercise that can be used on the Central Russian Plain data and the resulting estimates can then be compared to others derived from independent data to see if any patterning can be discerned. Such an approach has not been used widely in the literature because of the number of assumptions that must be made to use it. Spiess (1979) used a much higher value of 0.7 lithic per man per day (21 per man per months) for Abri Pataud, and based them on his observation of the rate of lithic production (10.2 per man per month) for the Dorset Eskimo. I have elected to use a much lower value derived from Pincevent data so as to favor longer estimates in the duration of occupation.

Column 1 in Table VI-30 lists lithic densities found at the study sites. I have previously argued: 1) that, in general, lithic densities at northern sites are about eight times greater than at the southern ones, and 2) that this was probably due to the ready availability of superior flint outcrops in the north. In order to control for this phenomenon, I proceeded to divide lithic densities at northern sites by a factor of eight and list these new density values per site in column 2. Then, using a rate of 1.78 lithics per man per months, I calculated the duration of occupation of the sites--in the A group of columns (3-6) using minimal group size estimates and in the B group (columns 7-10) using the maximal group size estimates. The

basic assumptions made for all these calculations was that the sites were occupied by a nuclear family numbering five individuals, and each of which had one flint knapper. The number of families and number of flint knappers are listed in columns 4 and 8, for the minimal and maximal sized groups respectively.

Values for the duration of occupation (in months) listed in columns 5 and 8 were derived first by multiplying the number of knappers by 1.78, and then by dividing the lithic density per square meter of the site by that value. I offer two estimates for the duration of occupation for each sized group in Table VI-30; one derived from densities reported as is (column 1) and the other controlling for the greater availability of raw material at the northern sites (i.e., using density of lithics /m^2 listed in column 2). For example, at Eliseevichi in Table VI-28 I estimated from 13-40 inhabitants. If we consider the minimal size (i.e., 13 people--3 families), we can suppose that 3 knappers were at work depositing a total of 5.3 lithics per m^2 per month. Using the lithic density of 128.4 /m^2 reported for Eliseevichi in column 1, and dividing it by 5.3 lithics we can obtain the duration of occupation of approximately 24 months reported for the site in column 5. Likewise, if we use the value of 16.05 lithics per square meter in column 2 (obtained by dividing 128.4 by 8), we get a length of stay of 3.1 months listed in column 6 for Eliseevichi.

As this table indicates, if we control for the greater

availability of raw materials in the north, the length of stay at all sites is less than a year. In fact, the longest stay for a minimal group is observed at Pushkari I, and is a little over nine months. While I agree that both the range in the estimated duration of occupation per site is wide (e.g., from 24 to 1.1 months at Eliseevichi depending on what assumptions are made), and that the required assumptions are problematic, I would also argue that, overall, the data both 1) indicate temporary sedentism, lasting a few months, at the sites (from 1-4 months at the sites if controlling for raw material availability in the north, and 4-13 months if not taking this factor into account), and 2) conform to my conclusions about the seasonal occupation of the sites reached in Chapter V.

c. Size of peripheral areas. Table VI-31 lists estimated duration of occupation obtained from the application of Yellen's formula presented previously. Size of the peripheral areas at Chulatovo II, Dobranichevka, Timonovka I and II were obtained by subtracting the central areas presented in Table VI-27 from the total excavated area at each site (Table VI-28, column 1). Thus, Dobranichevka's periphery, for example, was obtained by adding the areas for each complex (total = 588 m^2) and subtracting it from the 2,000 m^2 excavated. The estimates for Fatov were obtained by subtracting 32 m^2 on which Shovkoplyas (1956) reported the densest concentration of remains from the total 220 m^2 excavated.

Lengths of stay obtained through this method are in overall accord with those derived from the rate of lithic deposition, and show ranges from 1 to about 5 months at cold weather base camps; 2 months at Chulatovo II occupied in warm weather; and less than 20 days at Fastovo, a hunting station.

C. Population and Duration of Occupation at Sites Without Dwellings and/or Storage Pits

Three in-situ sites, warm weather base camps Chulatovo II and Zhuravka and the hunting station Fastov , will be considered below. Table VI-32 summarizes estimates for both the duration of occupation and group size at these sites. Since, as noted before, no conclusive proof exists that the three concentrations of remains at Chulatovo II and Zhuravka and two at Fastov reflect synchronic occupation, I have calculated both estimates per concentration per site. The area of each concentration at Chulatovo II was calculated from Leonova's map (Figure VI-1), and includes all squares where the observed lithic density was above $1/m^2$. Areas listed for Fastov and Zhuravka, where no maps of lithic distribution are available, were estimated by dividing the total area of the site by 2 and 3 respectively. Densities of lithics per square meter per cluster per site are offered in column 2, while columns 3 and 4 list kcals per cluster both excluding all mammoths and including half of the mammoths.

Population sizes per cluster obtained using Yellen's formula are in column 5, and using Weissner's in column 6.

In computing the latter, I used the total size of each cluster at Chulatovo, but only 90% of the area for Fastov and Zhuravka (see Price 1978 for a discussion of sizes of areas to use for the Weissner formula).

Columns 7 and 8 list the duration of occupation (in days) at sites using population sizes in columns 5 and 6. These values were obtained by: 1) taking the size of the estimated population per complex (using either Yellen or Weissner derived figures), 2) multiplying this population value by 2,400 kcals per individual, and 3) then dividing the observed kcals per cluster by that multiple. This operation was performed twice, once using kcals per complex without any mammoths, and the second time including half of the mammoths. For example, at Chulatovo II's complex #1, using group size of 30 obtained from Yellen's formula, I calculated a daily requirement of 72,000 kcals for the group. If we assume that no mammoths were eaten, then the 728,365 kcals reported for the complex in column 3 would have fed the group for about 10 days (listed in column 7 of the table).

Columns 11-16 estimate the duration of occupation at these three sites using a deposition rate of 1.78 lithics per man per month presented earlier. Again, two values are listed for the number of flint knappers per complex per site--one based on group size estimated using Yellen's and the other using Weissner's formula. Columns 13 and 14 list the duration of occupation without controlling for the

greater availability of flint at Chulatovo II, while those in 15 and 16 do control for this factor.

The values for both group size and length of stay in Table VI-31 show a wide range--from 42 to 240 individuals at Zhuravka, for example, who stayed from 0.4 to 2.1 months on lithic densities, and from 1-4 days on kcals. While these ranges do not permit me to establish firm parameters for either one of these variables, they can be used for a comparison with the values obtained for sites with mammoth bone dwellings.

In general, I suggest that the data indicates considerably shorter duration of occupation at warm weather base camps (1-3 months?) than at their cold weather equivalents. Estimates for Fastov broadly conform to the expectations for hunting stations and show both smaller group size as well as shorter length of stay than at base camps.

D. Estimated for Sites Without Dwellings but With Storage Pits

Finally, Table VI-33 presents temporal and demographic estimates for Timonovka I and II. Total area at the sites is listed in row 1. Rows 2 and 3 offer total kcals available, while row 4 presents estimates on the duration of occupation previously discussed and listed in Table VI-31. Rows 5 and 6 divide the kcals by the number of days the sites were occupied (i.e., by the value in row 4). Using the assumed requirements of 2,400 kcals per man per day, Rows 7 and 8 estimate how many individuals would

have been sustained at the sites given the available per diem kcals.

Rows 9 and 10 present lithic densities per square meter, first as reported, and secondly dividing these densities by 8 to control for greater availability of lithic resources in the north.

Since estimates for group size in rows 7 and 8 showed improbable ranges of 1-79 individuals at Timonovka I and 21-731 at Timonovka II, I decided to forego using them for calculating lengths of stay. Instead, I arbitrarily assumed that five flint knappers were at work at each site and calculated lengths of stay using this figure--in row 11 using the observed lithic densities per site, and in row 12 using densities reduced by a factor of eight. While these estimates are not meant to represent any past reality, they do broadly conform to the pattern observed at other cold weather base camps, and indicate that the two sites were also occupied temporarily.

E. Summary and Conclusions

It should be reinterated that all of the calculations offered in this section, whether for population size or for the duration of occupation do not claim to represent past realities. As noted in the beginning of this discussion, I am well aware of a myriad of problems associated with such calculations. I do believe, however, that "unreal" as all of these values are, they may be equally "unreal" for all they types of sites, and, therefore, may ultimately be

useful heuristic devices for camparing the different site types to each other. To this end, Table VI-34 lists both mean population and length of stay estimates for the sites. All the values in this table are even further removed from "reality" as they are mean values derived from various calculations offered in the previous four tables. Thus, columns 1 in the table offer mean population sizes per site. Those for sites with dwellings and/or storage pits represent mean values from Table VI-28, while those for sites without these features are summarized mean values from Table VI-32. In the latter case, mean numbers were obtained by estimating mean values for both Yellen and Weissner derived numbers. Thus, at Chulatovo II where estimates in column 5 of Table VI-32 have a population of 99 individuals, and in column 6 more than 20, the two were combined and the resulting mean number of 60 was entered for the site in Table VI-34. In the case of Zhuravka, population size obtained using Yellen's formula--240 individuals--seemed unacceptably high, and I have elected to use the estimate of 42 individuals in Table VI-34 that was obtained using Weissner's formula.

Columns 2 in Table VI-34 list mean duration of occupation based on a set rate of lithic depositon. They were obtained by simply adding the two ranges per site in Tables VI-30 and 32, and are based on reduced lithic densities at all northern sites. Thus, for example, for Chulatovo II the two values for the duration of occupation

(columns 15 and 16 in Table 32) of 9.5 and 5.6 months were added, the result was divided by two, and the mean value of 8 months entered in column 2. In the case of Dobranichevka, values for duration of occupation by the minimal sized group in column 6 of Table VI-30, were added to those for the duration of occupation by the maximal sized group in column 10 of the same table, the resulting figure was divided by 2, and entered in column 2 of Table VI-34 as 0.55 months.

Columns 3 represent duration of occupation at the two groups of sites based on kcals per site excluding mammoths, while columns 4 give these estimates if half the mammoths are included. Columns 5 offer mean values for columns 3 and 4, i.e., estimated duration of occupation based on kcal values between no mammoths and half mammoths. Columns 6 list duration of occupation if the estimates derived from lithic rate of deposition are combined with estimates based on kcals that exclude mammoths--in other words, the addition of values in columns 2 and 4 divided by 2. Finally, columns 7 list estimates for the duration of occupation based on the addition of estimates from lithic deposition (column 2) to those from mean kcal values with mammoths (column 5), i. e., the addition of columns 2 and 5 and division of the resulting figures by 2.

Duration of occupation at Timonovka I and II was not done in this manner because a different approach was used previously in estimating both these variables at the sites.

No estimates are offered for the size of population at Timonovka I and II because those listed in Table VI-33 appear totally unrealistic. The duration of occupation for both (i.e., 5.3-7 months for Timonovka I; 5.3-1 months for Timonovka II) represent mean lengths of stay based on the rate of lithic deposition for the first value and on the duration of occupation estimated using Yellen's formula for the second (see rows 4, 11, and 13 in Table VI-33).

Having thus obtained estimates for both duration of occupation and group size at the sites, I proceeded to evaluate possible differences in both variables between the different types of sites--the resulting test statistics are listed in Table VI-35. Comparison of mean population sizes at cold and warm weather base camps ($z = 1.27$), as well as between simple and complex cold weather base camps ($z = 0.03$) showed no significant differences present. Similarily, no differences were found in population numbers of simple cold weather and warm weather base camps ($z - 1.64$). I conclude, therefore, that no seasonal aggregations can be projected for the Upper Paleolithic Central Russian Plain, and that similar sized coresidential units remained together both during cold and warm weather.

Comparing the duration of occupation at these three types of base camps, no differences were observed if the values used for comparison excluded mammoths (values in columns 6 in Table VI-34) either between cold weather and warm weather base camps ($z = 1.05$), or between simple cold

weather and warm weather base camps (z = 0.97). No differences were observed in the duration of occupation of simple and complex cold weather base camps (z = 0.25) using values in column 6 of Table VI-34 either (i.e., those where kcal estimates excluded all mammoths).

When, however, duration of occupation estimates did include mammoths (values in column 7, Table VI-34), cold weather base camps showed a considerably longer occupation (z = 3.97) than warm weather ones, as did simple cold weather base camps when compared to warm weather base camps (z = 3.21). Using these values, no differences, however, were observed in the duration of occupation between simple and complex cold weather base camps (z = 1.17).

These conflicting results once again underscore the difficulty of establishing any demographic or temporal parameters for site occupation until the role of mammoths in the diet is clearly established.

In spite of this ambiguity, I argue that consistant patterning in test results does indicate: 1) that cold weather base camps, both simple and complex, were occupied for about the same length of time, and imply that 2) this variable was not responsible for the complexity observed at some cold weather base camps. Estimated lengths of stay at warm weather base camps consistantly indicate shorter duration of occupation than at either of the two types of cold weather base camps.

The question of just how much longer cold weather camps

were occupied, unfortunately, cannot be adequately answered with the data on hand because mean differences vary depending on what values are used. Thus, while a comparison between simple cold and warm weather base camps on kcals (including mammoths) indicate three times longer stays at cold weather camps, a comparison of all cold weather camps to warm weather ones showed seven times longer occupation at cold weather camps. Intuitively, I suggest that "reality" lies somewhere between these two estimates and offer stays of about 6 months at cold weather camps, and of about 1 to 1.5 months at their warm weather equivalents.

Although I have argued previously against too strict an adherence to ethnographic models when evaluating Late Pleistocene cultures, it is interesting to compare the emerging Upper Paleolithic settlement pattern to ethnographic data. Having briefly surveyed Holarctic cultures of recent hunters and gatherers, I suggest that data on the Bering Straits Eskimos as described by Nelson (1971) are more similar to the Central Russian Plain pattern than others. He reported the following sizes for warm and cold weather villages:

VILLAGE NAME	COLD-WARM WEATHER	POPULATION	NUMBER OF HOUSES
Ignituk	cold	120	n.d.
Kushungil	cold	100	20
Razbinsky	cold	about 125	25
Starikwikhpak	cold	40	n.d.
Ukagamiut	?	20	n.d.
Karaligamiut	cold & warm	100	n.d.
Cape Espenberg	warm	30	5
Point Hope	warm	300-400	2-10
Hotham Inlet	warm	600-800*	18
East Cape (Siberia)	n.d.	250	54

LEGEND: * -- a special trading camp
n.d. -- no data

As Nelson described them, Bering Straits groups lived in large sized aggregations both during the winter and summer months, and the two types of settlements were either very close to each other (within a kilometer or two), or, at times, even concentric--summer dwellings being located on one side of the village and witner ones on another. This pattern appears rather similar to the Central Russian Plain one when size differences between the coresiding units are considered. While groups around the Bering Straits lived in considerably larger groups in the villages, there was no dispersal into smaller sizes in summer months. Although Nelson offered no information on the duration of occupation of summer villages, climatic factors would suggest that in northern latitudes where warm weather months are much shorter than the cold weather ones, summer villages would

be occupied for shorter time periods. Black (1973) reported the same pattern for Siberian Gilyak while Chang (1962) traced similar seasonal settlement stability among a number of circupolar societies in both Siberia and Alaska.

The Central Russian Plain data appear to conform to this general pattern of year-round, large sized coresidential units who remain at winter settlements longer than at summer ones, and who do not show dispersal in warm weather months. I have not yet, however, resolved the question of relative mobility for the Central Russian Plain Upper Paleolithic hunters and gatherers whether they had one cold weather and one or more warm weather base camps and will address this question below.

VI. THE SETTLEMENT SYSTEM ON THE UPPER PALEOLITHIC CENTRAL RUSSIAN PLAIN

Two problems remain to be considered and resolved before I can present my model for the settlement system in the study region: 1) the relationship of simple and complex cold weather base camps to each other, and 2) possible regional differences in both site types, duration of occupation, and group sizes between the northern and southern sites. I will begin by taking another look at the cold weather base camps.

A. Simple vs Complex Base Camps

While I have demonstrated previously that real differences exist between imple and complex cold weather base camps, I have only eluded to possible explanations to account for the observed differences, including the possibility that

what I have identified as complex base camps were not such at all but represent some sort of special gathering places for trade, ritual activities, etc.

Ethnographic data on Bering Straits groups can be used to generate yet another explanation for the observed differences--that what I identified as complex base camps were sites that included some sort of ritual or men's club houses, where a great deal of nonsubsistence behavior went on, which, in site-level analysis, would make these sites appear different and more complex. Nelson (1971) describes special ritual dance houses present in some winter villages. These dance houses were considerably larger than residential houses and locales of nonsubsistence behavior--no food was cooked there, no one lived there, no maintenance activities were performed there, etc. Using Nelson's data presented thoughout his monograph, I have roughly estimated the mean size of these dance houses to be 54 m^2, while the reported winter houses averaged 12.5 m^2, and summer ones ranged from 3-28 m^2. While no systematic estimates could be obtained from Nelson on the relationship of number of houses per village and number of dance houses per village, he does suggest that larger villages had more of these special houses (kashin) than did the small villages. Since I have previously indicated that both small and large mammoth bone dwellings are found at winter base camps in the study area, it could then be argued that the large ones were not residential structures but some sort of ritual

constructions. Assuming such a function for the large houses, one could then proceed to argue that complex base camps simply had such dwellings and the simple ones did not.

While data on hand are far from both firm and adequate to properly evaluate these two hypotheses, some evidence can be brought to bear on the two. First, if we argue that the complex base camps were not base camps at all but some sort of special gathering places, we can derive the following archaeological implications: 1) that there will be a noticeable difference in the densities of such subsistence related attributes as lithic, lithic tools, in the percentages of specific tool types, in densities of worked bone, etc., at these special gathering sites; 2) that there will be a difference in the duration of occupation of these sites, with base camps being occupied longer than special gathering locales; and 3) that special gathering locales should have larger population sizes than base camps. The data on hand presented both in Tables II-6-8, as well as discussed throughout this chapter, do not meet the expectations necessary to identify Eliseevichi, Mezhirich, Mezin, Suponevo, and Yudinovo as nonbase camps. No differences were found either in population sizes or duration of occupation between these two groups of sites. Taking regional differences in lithic use into account, complex base camps have been shown to have comparable densities for both tools, in general, as well as for specific tool types.

Overall, Table VI-23 shows no difference in the range of activities performed at the two types of sites. In fact, I have shown that densities of worked bone are higher at complex base camps as are the densities of kcals, indicating both more manufacturing of bone implements, as well as more intensive procurement of food resources. Observed higher densities of fur bearers at complex sites also argue for more intensive exploitation of these taxa at these sites. In summary then, data on hand do not support the hypothesis that complex base camps were not base camps but special purpose gathering locales.

The second hypothesis, namely that some of the dwellings at the sites were not residential but ritual constructions, and that they may have been found at only some of the sites, is more difficult to evaluate because the type of data necessary for a dwelling to dwelling comparison is generally not available for the study sites. As I have noted, both small and large sized constructions have been found but their distribution does not pattern according to the predictions of this second hypothesis. Thus, for example, while both large and small dwellings have been found at Mezhirich and Mezin (both identified as complex base camps), and only small dwellings unearthed at Dobranichevka and Radomyshl' (identified as simple base camps), data from Eliseevichi, Gontsy, Kirillovskaya, Suponevo and Yudinovo do not conform to the patter. These sites have yielded only large sized constructions. Since it could be argued that the last

group represents sites either excavated very early, before dwellings were recognized (Gontsy, Kirillovskaya, Suponevo), or severely disturbed ones (Eliseevichi), or still undergoing excavation (Yudinovo), and that, therefore, the reported sizes and numbers of dwellings there are, at best, "guesstimates", I decided to compare the distribution of some attributes between the different complexes at the two sites most recently excavated for which such data could be obtained: Mezhirich and Dobranichevka. These comparisons are presented per complex per site in Table VI-35. Each complex listed for the sites represents a combination of dwelling and outside work area. I use the complex as a unit of analysis because the excavators, Pidoplichko (1976) and Shovkoplyas (1972) used such subdivisions in their reports. While the data in this table are far from adequate in some cases--for example, the distribution of art, amber, ocher, and bone could not be estimated per complex for Dobranichevka--they still do indicate no radical differences in the densities of attributes at the different complexes. At Mezhirich, in fact, maintenance related attributes such as flint densities, densities of end scrapers and burins, and tool densities, are higher in complexes 1 and 2 with large dwellings than at #3 with a small dwelling. At the same time, complexes 1 and 2 feature higher densities of art, amber, and ocher. Nor are the differences in densities of subsistence-related attributes at three Mezhirich complexes significantly greater than between the four

Dobranichevka complexes with small dwellings.

Finally, while similar quantification could not be presented for Mezin, Shovkoplyas (1965a) did report that art objects were found in dwellings 1, 2, 3, and 5 at the site. This distribution shows again no association of decorative objects with larger sized dwellings (at Mezin numbers 1, 3, and 5 are large).

I conclude, therefore, that data on hand also do not support the hypothesis that large sized dwellings were some sort of special activity locales where behavior unrelated to subsistence took place and that these types of dwellings were located at just some of the winter base camps. It is not the dwellings themselves that were different, but rather the sites. Eliseevichi, Mezhirich, Mezin, Suponevo, and Yudinovo were locales where a set of activities above and beyond subsistence needs took place, and these activities occurred there more intensively than at the other base camps. I have already discussed evidence for special planning and sorting in the construction of dwellings at Mezhirich and possibly Yudinovo. This, along with evidence for the use of rhythm and symmetry in the construction of both individual dwellings as well as in the relationship of the structural elements of the different dwellings to each other argue for site rather than dwelling-centered behavior.

I have shown that these sites were locales where status demarcation was important (art and jewelry distribution), as well as repositories of goods involved in ex-

change networks (amber, shell, fur bearers). This behavioral complex reflects both intra- as well as intergroup social relationships and can be identified as people centered.

At the same time, and at the same sites, we also have evidence of behavior associated with ideology. I have noted above elaborate site planning with Mezhirich and possibly Yudinovo as evidence of this. While it could be argued that painted mammoth skulls, scapulae, and pelvises found at Mezhirich (see illustrations in Pidoplichko 1976) and Mezin (illustrated in Shovkoplyas 1965a) were also used in personal status signaling--I suspect they were more closely allied with ideomatic behavior. Bibikov (1981) has suggested that remains of a number of percussion instruments were found at both sites although his postulation of Upper Paleolithic rhythm bands have not been widely accepted (Semenov 1978, personal communication). I can neither firmly prove the association of these attributes with ideology nor state whether such behavior was related to corporate or cosmic ideologies (most probably to a combination of the two). I argue, however,that it is precisely this sort of behavior that distinguishes complex from simple base camps. In brief, I identify two spheres of behavior at complex sites above those related to subsistence needs: social and ritual.

I am also unable, at present, to clearly define the sorts of activities carried on at these complex sites nor to exhaustively delimit the behavioral differences between

simple and complex base camps. I find no similar pattern in the hunter-gatherer ethnographic literature to draw on for analogy, and would argue that in these five sites we have evidence for unique Upper Paleolithic behavior for which we may have no clear present day equivalents.

On the other hand, it may well be that both simple and complex base camps represent two ends of a continuum--just as some Bering Straits villages are larger, have numerous dance houses, and are residential locales of rich and esteemed men. Recognition of some of the attributes at the study sites is clearly related to the work of particular excavators. Thus, for example, Pidoplichko, a paleontologist, was able first to identify amber at the sites he excavated or participated in the excavation of. This attribute, in fact, was only reported at those sites where he had worked. As noted in Chapter III, similar fate befell the quantification of mammoths. Those sites where paleontologists were involved in excavations have quantified counts of this taxon--those without their participation don't. It may well be that archaeological bias itself is responsible for some of the differences I have noted between simple and complex base camps.

Secondly, before fully understanding the differences between these two types of cold weather base camps, we have to have much finer chronological controls than are available now. It is tempting, for example, in looking at the location of these complex sites in the study area, to

speculate that they may have been some sort of hunter and gatherer "central places" (see Figure VI-5). If the four northern ones spanned a long period of time and only one existed during any one time period, then we would have a rather neat pattern of one complex site in the south and one in the north at some point in time. Certainly, if Eliseevichi and Yudinovo on the Sudost' and Mezin and Suponevo on the Desna were not contemporary, then they are most interstingly and regularily situated along the Desna-Sudost' water courses. If Mezin, for example, was the earliest in time, as some have speculated (see Shovkoplyas 1965a), it would have been located in the center of the study area. If Mezhirich was then a contemporary of either one of the three other northern complex sites, then they would have each been located at the edges of the study area and so on.

Since I have outlined a linearized settlement pattern for the study area after the Valdai maximum, such positioning of complex sites may have been related to linearization itself. Although linear settlement patterns have received far less attention in the archaeological literature than hexagonal latices, both Flannery (1976) and Reynolds (1976) have addressed the question and pointed out some regularities governing site location in linear systems. They hypothesize that initial sites will be located in the center of linear regions and subsequent ones at regular intervals "upstream" and "downstream" from the first one. Their work

is based on early agricultural settlements in Mesoamerica where extensive river trade was an important factor. A fairly regular distribution of complex sites along water courses on the Late Pleistocene Central Russian Plain seems to pattern similarily and may have been conditioned also by transport requirements.

All of these speculations, however, as tantalizing as they are, represent less than "just so stories" at the present time, and must await further research before they can be examined and evaluated in detail. I will return and take a closer look at the special behavior that went on at some of these sites as well as speculate on social implications of settlement linearization in a subsequent chapter of this work.

B. Regional Differences in the Distribution of Site Types

As I have discussed in Chapter I, the history of Paleolithic research in the study area has been such that the northern region, especially along the Desna and Sudost' valleys, saw a longer period of intensive research than did the southern one. This factor undoubtedly greatly affected the archaeological record discussed in this work and must be considered when evaluating possible regional differences in either the nature of sites found or in the proportions of the different types.

At the completion of locational analysis in Chapters II and IV, I suggested that clustering of sites with mammoth bone dwellings in northeastern and southwestern quadrants

may indicate the presence of two different social groups in the area with different settlement systems. I will now return to these observations and evaluate them with data on both site types, their distribution, their demographic parameters, as well as look at the temporal variability in the duration of their occupation. The following breakdown can be observed in the distribution of sites per region between the north and the south:

	NORTHERN SITES N=23*	SOUTHERN SITES N=7
TYPE OF SITE:	PERCENT	PERCENT
1. Lithic Workshop	26	0
2. Hunting & Collecting Stations	9	14
3. Warm Weather Base Camps	22	14
4. Cold Weather Base Camps Hunting--Base Camps	9	0
5. Cold Weather Simple Base Camps	13	58
6. Cold Weather Simple Base Camps including Timonovka I and II	22	58
7. Cold Weather Complex Base Camps	17	14
8. Anomalous--Khotylevo II	4	0

LEGEND: * -- Pushkari II counted twice, both as a lithic workshop and a warm weather base camp.

At first glance, the above breakdown tends to suggest that larger proportions of southern sites are cold weather base camps. I would argue that this disparity reflects archaeological bias. Thus, as can be expected given the

history of research in the area, we have both a greater number of different sites in the northern archaeological record (seven types as opposed to four in the south), as well as a greater ratio of high visibility sites in the south (those with mammoth bone constructions). A comparison of the distribution of mammoth bone dwellings in the study area, for example, showed them to be more numerous in the south ($z = 2.28$, Table VI-17). This, again, is due to archaeological bias.

A comparison of the distribution of various attributes does reveal some regional differences present. Thus, as noted, far higher densities of lithics, lithic tools, and tool classes in general are found at northern sites. I have already demonstrated that these differences were, in all probability caused by the greater availability of superior block flint in the north. While Table VI-2 showed lower blade to nuclei ratios present in the northern sites than in their southern equivalents ($z = 2.04$), no differences in these ratios were found when the same types of sites were compared to each other (north vs south sites with storage pits: $z = 0.29$; northern vs southern high ratio sites: $z = 0.59$). A comparison of northern to southern low ratio sites yielded a significant difference ($z = 3.02$), indicating, again, that the distribution of the ratios was also conditioned by the nature of raw materials available.

Similarily, no overall interregional differences

were found in the densities of worked bone ($z = 0.60$), but more sites with high densities of worked bone were found in the north. Since, however, bone working went on at base camps (in Table VI-2 identified as sites with storage pits, $z = 3.11$), and since lower proportions of sites in the north belong to this category than in the south, I suspect that, in reality more bone processing did go on at northern sites.

As noted, no interregional differences were observed in either available kcals, in the duration of occupation, or in population sizes at the sites. Table VI-2 also shows that no differences exist in the densities of art, jewelry, or amber when the later was coded and the distance to the source or origin was controlled (column 3, Table VI-10). Overall, as Table VI-36 depicting the Difference of Median Tests indicates, no north-south differences were found in the distribution of: 1) all decorative items that have been dimensionally scaled and coded (column 7, Table VI-13), and 2) coded values of exotic lithics and ocher (column 8, Table VI-13). Data on the distribution of marine shells however, when the value was coded and controlled for distance (i.e., values in column 3, Table VI-12) did show considerably higher densities present in the north ($z = 1.71$, $p = 0.09$; comparison of high density sites to low density sites with the high density sites found in the north only yielded $z = 2.09$; comparison of north to south densities at low density sites resulted in $z = 2.80$ (see Table VI-2).

I will show in the following chapter of this work that distribution of marine shells was, at least in part, controlled by various exchange networks that spanned the study area during the Upper Paleolithic. Because of this, I do not interpret the higher densities of shells in the north as reflecting a difference in settlements patterns, but rather would argue that social relationships responsible for their distribution are not relevant to this discussion.

I have already discussed in Chapter IV the fact that Soviet researchers have not been able to systematically distinguish any stylistic differences either in lithics, worked bone, or art and decorative objects, found in the north and in the south. While Gladkih (1973) has argued for a greater stylistic similarity between lithic assemblages at Mezhirich, and Dobranichevka that found between these two southern sites and Mezin, he did not interpret this to signify a synchronic existence of two style zones in the area. He suggested that it is the chronologic factors that were, most probably, responsible for differences he observed between Mezin and the two southern sites. Problematic as stylistic criteria are for the definition of cultural regions and by the extension of social groups, the inability of Soviet researchers over a 100 year period to distinguish such differences between northern and southern sites indicates that, in all probability, no differences of this sort existed (see the disagreement between Hodder 1981 and Wobst 1977, in particular, on

the significance of stylistic differences in general). I suggest that, in fact, we are dealing with groups very similar to each other, who were socially connected and I extend this to support my conclusion that no large scale differences existed in the settlement system in the north and in the south.

Three attributes related to the nebulous variables of duration of occupation and group size do show consistant interregional differences. They are thickness of the cultural layer, the density of hearths per square meter per site, and hearth volume measured in cubic meters per site. I have already noted that all three are an end product of a number of factors related to both past human activity as well as to local geologic processes. If we roughly equate both the thickness of cultural layer and hearth volume with the duration of occupation at sites (and/or number of reoccupations) then the consistantly higher values found for these attributes in northern sites appear to show that northern sites were either occupied longer or more often than their southern equivalents. Thus, for example, a comparison of cultural layer thickness at northern sites with thick cultural layers of their southern equivalents show northern sites having 1.5 times thicker layers ($z = 5.5$, Table VI-15). Similarily, northern sites without storage pits with thick cultural layers had significantly thicker deposits than their southern equivalents ($z = 2.0$). Table VI-17 also shows that northern

sites with storage pits had about four times as much hearth volume as southern sites (z = 2.37). This consistant patterning of data appears to indicate some interregional differences present in the settlement system.

If, for the sake of argument, we assume that the density of hearths at sites roughly reflect population size (assuming that a given hearth will be able to accommodate only a limited number of people, and that if such a number is exceeded then a second one will be lit). We can also speculate that consistantly higher densities of hearths observed at northern sites may indicate that greater numbers of people occupied these sites. For example, while southern sites yielded mean densities of one hearth every 226 meters, in the north hearths were found every 95 meters (z = 3.18, Table VI-17). Northern sites with dwellings had about three times as many hearths as southern sites (z = 6.14), while no interregional differences were found in the densities of hearths at sites without dwellings (z = 0.10).

Since, using other data (e.g., kcals), I have already argued that no differences can be observed in either duration of occupation or size of the occupying group between the north and the south. The seeming contradiction offered by hearth and cultural layer thickness data merit a closer examination. I have previously noted that some northern sites classified as cold weather base camps may have been occupied more than once (e.g., Mezin and Suponevo). While logically we should expect that all of the sites, especially

those with numerous features, resulted from more than one occupation only at special procurement camps. I would argue that such reoccupation sequences have been observed at northern sites precisely because they were more frequent there. It could be argued that since much of our knowledge of Mezin and Suponevo come from archival reconstructions, recognition of reoccupation at these sites is posthumous and speculative at best. I suspect, however, but am unable to clearly demonstrate, that somewhat greater mobility did exist in the north and that: 1) the greater number of site types recognized in the north; 2) the existence of unique hunting base camps occupied during cold weather months only in the north (e.g., Timonovka I, II); 3) the existence of lithic workshops only in the north, and finally, 4) the speculation of multiple occupation for some northern sites, all do support my argument for greater mobility in the north.

This greater mobility was, at best, a quantitative one that did not significantly differentiate the settlement system of the north from that of the south. I suggest that data presented in this chapter strongly argue for the existence of a single pattern in the settlement of the study area. The observed interregional differences represent local variations of this pattern. Variations that could have resulted from a number of factors including: 1) possibly greater population densities in the north (if we assume that site numbers very roughly reflect population

densities, 2) shorter time during which the majority of food resources were available in the north (see Chapter III for a discussion of seasonal behavior of major food resources), 3) because of closer proximity to the Scandinavian ice sheet, or even 4) because of greater linear circumscription in the north, that, in combination with the first two factors may have resulted in more frequent returns to particular locales. Quite clearly this question cannot be resolved without finer chronological controls, paleoenvironmental reconstructions, and better stratigraphic controls in future excavations of sites. Pending such future research, I suggest that the record indicates a great deal of interregional similarity and speaks for the existence of one settlement system in the study area, albeit with some north-south variability.

C. The Settlement System

1. Cold Weather Months. Hunters and gatherers who inhabited the Central Russian Plain during the Upper Paleolithic period spent cold weather months settled on or near river floodplains in base camps with numerous features and mammoth bone dwellings. Coresident groups at such camps numbered from about 30 to 60 individuals (6-12 families). Data on floor space in winter mammoth bone dwellings suggest occupation both by single as well as multiple families (2-3 families at most).

Some of these coresident units occupied simple base camps while others lived in camps where a great deal of additional nonsubsistence related behavior went on. While

no unabmiguous data exist on the exact duration of occupation of these cold weather base camps, I argue that sedentism extended over a number of months (six?), but was not year round.

Although the archaeological record has yielded no examples of cold weather extractive camps, such locations probably existed as satellites to the base camps and may be revealed in future work. Since cold weather months were spent living off stored foods provisioned in late summer-early fall months, I would expect these satellite camps to be very ephemeral, and related to opportunistic exploitation of some particular available resource such as willow ptarmigan, hare, etc.. Because of the small size and portability of such food resources, little archaeological debris would have been left at these sites and they would have no archaeological visibility. Some procurement of lithics may have occurred in the north during cold weather months, and lithic workshops used during the cold weather may be discovered. Since, however, the type of data which indicates seasonality (i.e., flora and fauna) is generally lacking at lithic workshops, our chances of discovering such workshops and identifying them to cold weather occupation also appear very slim.

2. Warm Weather Months. With the onset of the short warm season, coresident groups on the Upper Paleolithic Central Russian Plain moved into summer base camps. This relocation, however, did not involve abandonment of the

region and was highly localized. With the onset of both river break-up and marshing up of river valleys, residential settlements were relocated higher up in elevation above the floodplain and set up close to winter base camps. Using data reported by Nelson (1971) for the Bering Straits, and considering possible multi-seasonal occupations at Mezin and Suponevo, I also suggest that in some cases summer base camps may have been located adjacent to winter ones.

Warm weather base camps appear to have been inhabited by groups of similar size as cold weather ones. No seasonal aggregation and dispersal can be observed for the study area during the Upper Paleolithic. Since we only have two clear warm weather base camps in our sample, I cannot firmly establish whether they were occupied for the whole season (2-3 months), or if more than one weather camp was used per season. Data from Zhuravka with low kcal values and low lithic densities argue for the latter, while those from Chulatovo II for the former interpretation. It may well be that interregional differences existed in the duration of occupation of summer base camps and that northern camps were occupied longer than the southern ones. Since we can expect that migratory as well as social behavior of food taxa would have affected the duration of sedentism in summer months, and since I have argued in Chapter III that the north saw an influx of food taxa (particularily of mammoths) only during the warm season, data from Zhuravka and Chulatovo II may reflect more food and greater

sedentism in the north and more mobility in the south during the summer months.

Mobility, as has been amply noted in the literature, is not only a group specific phenomenon but also varies per age grade as well as per sex (see Watanabe 1968, 1978a, for example). The presence of summer occupied lithic workshops, hunting stations, and collecting locales in the archaeological record indicates that such variability existed druing the Upper Paleolithic as well. The existence of such sites implies that, while a group of 40-60 (8-12 families) was settled in summer base camps, special task forces occupied satellite extraction camps for the procurement of raw materials, food resources, etc.

In the beginning of this chapter I argued that while cold weather months were spent living off stored provisions, greater opportunistic exploitation and immediate consumption of food resources occurred during warm weather months. In a sense, if we accept Binford's (1980) distinction between foragers and logistically organized hunters and gatherers as viable, we can interpret the data from the Central Russian Plain to indicate the prevalence of foraging behavior during warm weather months and of logistical organization during the cold ones.

At some point during summer months, perhaps with the onset of colder weather, or, more likely with the appearance of abundant gregarious herbivores in the area, a third type of base camp was occupied where group efforts

were directed towards the procurement and storage of food resources for overwintering camps. It is unclear at present if these hunting base camps were spatially distinct occupations, or just temporal sequences which, in most cases, turned into overwintering camps. As noted, I favor this interpretation for Timonovka I and II--namely, that they are prehistoric "accidents" where for some reason the normal occupational sequence was interrupted.

D. Diachronic Changes in the Settlement System

Sample size problems come to the fore when attempting to compare the nature of sites occupied early to those dating to the second period of occupation after the Valdai maximum (i.e., after 18,000 B.P.). Of the four sites possibly occupied early, only three are in-situ. Of these three, Khotylevo II does not fit the general pattern for the area. Only one of the early sites, Radomyshl', is located in the south. Such a sample size clearly is dangerous to rely on and to draw conclusions from.

I have already discussed that: 1) a smaller population of hunters and gatherers may have occupied the study area prior to about 20,000 B.P.; 2) this population was predominantly located in the north; 3) the early sites were located further from the river valleys than the late ones, indicating a lack of linear circumscription during the early period of occupation; 4) subsistence practices during the early period were focused on the exploitation of a smaller number of taxa and directed to the gregarious

herbivores, and 5) the procurement practices during the early period did not show the intensification observed at the late sites.

The site typology I presented also shows that the early sites, with the exception of the anomalous Khotylevo II, all represent simple cold-weather base camps. Since only one type of early site is found in the archaeological record, I must necessarily restrict diachronic comparisons to looking just at this type.

First, the presence of only one site type in the record of early sites in no way signals a difference in settlement system prior to the Valdai maximum but rather points to the operation of archaeological bias. Cold weather base camps, because of their features, have such inordinately high archaeological visibility that we should expect these sites to be most frequent in the record. Lithic workshops are notoriously hard to date, and it may well be that some of those known in the study area were used during the early period as well. Food extraction camps, as noted, would leave such ephemeral marks on the landscape that, as a norm, they can be expected to escape archaeological detection. Thus, taking archaeological and taphonomic biases into account, it is not surprising that the three early sites, Berdyzh, Radomyshl', and Yurovichi, are winter base camps.

What is significant, however, when comparing early to late cold weather base camps, is the total absence of

the complex type among the early sites. It could be suggested that complex early sites were substantially different from the late ones, and that perhaps the anomalous Khotylevo II is such a site. I have argued, however, that Khotylevo II with its abundant art and worked bone, as well as its unique living floor, is a part of another cultural system, and that it is intrusive in the study area. I argue here that Khotylevo II is not a part of the early settlement system in the area and should not be seen as an early complex base camp. To mitigate sample size problems, however, I have included data from this site in the comparisons discussed below.

Comparison of early to late sites can be done using only some of the attributes outlined in the beginning of this chapter. This is because data are missing on the counts of different tool types found at the early sites. I will, therefore, restrict my comparison primarily to features, site profiles, and use whatever comparable data are available on artifacts. Table VI-37 summarizes these comparisons which are as follows:

1. Features. While early sites have both large and small dwellings and the number of dwellings per site does not show a change through time ($z = 1.01$), a diachronic comparison of storage pits and hearths does show chronological differences. As will be recalled from Chapter V, about three times as many storage pits were found at the late sites ($z = 1.87$, Table V -5). A comparison of mean

hearth volume and mean densities of hearths per site does not show change through time ($z = 0.05$ comparing all early to late sites; $z = 1.36$ early sites with storage pits vs late sites with storage pits--see Table VI-37). Noticeably greater volume of burnt material, however, is present in the hearths of early sites. Thus, as can be seen in Table VI-37, all early sites have about four times more hearth volume than all late sites ($z = 40.0$), as do early sites with storage pits when compared to their late equivalents ($z = 16.12$).

Similar patterning is observed in the thickness of the cultural layer. Early sites in general have 1) layers twice as thick as their late counterparts ($z = 5.0$); 2) early sites with pits have much thicker cultural layers ($z = 3.5$); 3) northern early sites with storage pits have more than late northern sites with pits ($z = 4.25$); and 4) the one early southern site with storage pits, Radomyshl', has about twice as thick a cultural layer as late southern sites with these features ($z = 5.0$). If we accept the proposition that the thickness of the cultural layer roughly reflects either the duration of occupation and/or frequency of reoccupation, than this repeated patterning indicates that early sites were occupied either longer and/or more frequently than the late sites. I will return to this hypothesis after comparing the distribution of other attributes through time.

2. Assemblages. I have already noted in Chapter V that no chronological differences can be observed in the kcals

available at the sites if half of the mammoths are included in the calculations. If mammoths are totally excluded, early sites appear to have a bit less kcals available, but this difference is not significant (see Table V-14 and V-15). Faunal data has also indicated that no specialized exploitation of fur bearers was practiced during the early period of occupation. Fur bearers, when found at the early sites, all were present in low densities (see Chapter V).

A comparison of general lithic densities (taking into account the noted difference in the availability of raw material between the regions), as Table VI-37 shows, indicate that a considerably greater number of stone tools were found at the late sites. Thus, for example, all late sites have about five times as many lithics as early sites ($z = 2.03$), and late northern sites with storage pits about six times as many as their early equivalents ($z = 2.59$). If we assume a steady rate of lithic deposition per knapper through time, these test figures suggest that a greater number of lithic workers occupied the late sites.

Densities of stone tools, on the other hand, produce reverse patterning and show that about six times as many stone tools are found at the early sites, both in the north ($z = 5.77$) as well as in the south ($z = 4.83$) (using values that have been residualized against general lithic density separately for the north and the south--see previous discussion in this chapter). If we again assume that the rate of tool production is roughly sensitive to chronological

factors (i.e., the longer people stay at a site the more tools they will use up) then this patterning is in accord with the one observed for the thickness of the cultural layer as well as for hearth volume through time.

Data on the densities of worked bone found at the early sites is available only for the anomalous Khotylevo II. I have already pointed out that this attribute is associated with storage pits, and shown that more worked bone is found at complex base camps than at their simple cold weather equivalents. Worked bone was found in very high densities at Khotylevo II, as Table VI-37 shows, this one early site had twice as many worked bone pieces as late sites with storage pits ($z = 2.25$). I argue, however, that this difference is not a significant chronological marker because Khotylevo II is a very unique site that has a number of attributes, including art objects, not found at other early sites. Unfortunately, since no quantified data on worked bone is available for either Berdyzh or Yurovichi (no worked bone has been found at Radomyshl') I am unable to evaluate the changes in worked bone densities through time. Some bone working apparently did go on at the early sites but whether this activity intensified through time must await further research.

The most apparent differences that can be noted between the early and late sites are in the distribution of attributes I have previous termed exotic lithics and decorative objects. These have been found primarily at late sites. Only art and ocher occur at early sites. Art objects, as

Table VI-23 indicates, have been reported at both Khotylevo II and Yurovichi. While no differences can be observed in the mean numbers found at the northern early and late sites ($z = 0.62$), art objects have only been found at the late sites in the south. Since art shows a bimodal distribution at the study sites, being found in both high and low densities it is interesting to compare art densities at both the high and low density sites through time. These comparisons show that considerably more art is found in both late high density ($z = 1.91$) as well as low density sites ($z = 2.42$, see Table VI-37). In general then, data on hand indicate an intensification in the production and use of art objects through time.

Other attributes belonging to the category of decorative objects--amber, marine shells, and jewelry--have only been found at the late sites in both regions of the study area. The same is true for exotic lithics. Ocher, on the other hand, is present in the same proportion of early (50%) and late (60%) sites.

In summary then, we see that both art and ocher were associated with behavior that existed in the study area during the entire period of occupation, while behavior associated with the procurement, production, and use of jewelry, shells, amber, and nonlocal lithics only came to the fore during the late period of occupation. It is not surprising, therefore, given the strong relationship between these objects and complex base camps discussed earlier,

that the lack of these objects at early sites cooccurs with the absence of complex sites.

Since no warm weather base camps dating to the early period of occupation have been found in the study area, I cannot address the issue of different settlement patterns prior to the Valdai maximum. I would argue that, given the general similarities observed between all sites, we should for now assume that such warm weather occupations were not significantly different during the early period. I would anticipate finding both smaller sizes of coresidential units occupying such early sites, but not expect much difference in the duration of their occupation. In general, since I have postulated milder climate prior to the Valdai maximum with longer warm seasons, I would anticipate finding more of these warm weather occupations for the early period simply because the warm season itself was longer.

Finally, turning to the most nebulous "guesstimates" presented in this chapter--population size and duration of occupation--a comparison of mean population densities between the early and late sites show no differences present ($z = 0.32$) but appear to indicate, using values both that exclude mammoths (column 6, Table VI-34) as well as those that include some mammoths (column 7, Table VI-34) that late sites were occupied longer. These conclusions run counter to those reached on cultural layer thickness, hearth volume, and lithic density data. Since they are based on the most speculative values presented in this chapter, I place the

least significance of conlusions based on their manipulation and will dismiss them from this argument.

3. Conclusions. Sample sizes used as comparative units were small, and within this small sample a comparison of different attributes generated a good deal of contradictory conclusions. The main factor responsible for these contradictions has not been controlled. I identify this factor as my inability to distinguish demographic variability from temporal variability at the sites and to separate out variables directly related to group size and group size alone, from those related to the duration of occupation. In addition, the vary nature of the archaeological data has limited my chronologic comparisons to just one site type.

Nonetheless, I interpret the data presented above, ambiguous as it may be, to suggest that it is the duration of occupation which is most responsible for the observed differences. Three attributes considered: hearth volume, cultural layer thickness, and lithic densities, all indicated longer stays at early sites. Assuming that early sites were occupied longer, we can then interpret the lack of differences in kcals through time as indicating that larger numbers of people occupied later sites. In brief, I see smaller groups staying longer at early cold weather base camps and larger groups staying a shorter period of time at late cold weather base camps.

In this argument I am assuming the same frequency of reoccupation through time--an assumption that clearly may

explanations that can be generated using evidence on hand. I offer it as a tentative one only, a sort of working hypothesis that will require a great deal of additional work for either substantiation or refutation. I would argue, however, that both an increase in storage as well as in the density of lithics observed at later sites support such an interpretation of an increase in coresident unit size through time.

Using these conclusions about demographic as well as temporal changes in site occupation, we can postulate an increased mobility through time in general. I have already suggested that northern sites may have been reoccupied more frequently and that more site types existed in the north than in the south--both of these observations testify to greater mobility in the north. This is especially evident if we control for time and look at only the late sites. A similar pattern, though less clear because of sample size problems, can be observed in the south where we have more site types in time as well.

This increase in mobility through time coincided with the linear circumscription I postulated for the area after the Valdai maximum. If I am correct, and later groups in the study area were more mobile in a linearily circumscribed environment--then we should expect to find 1) a considerably greater number of late sites that look alike, 2) find them in a similar locale, and 3) find them located closer to

each other than during the early period. In other words, it is possible that the population increase I postulated for the area through time may have simply resulted from a change in the demographic arrangement in the area and not from any real increase in pooulation. The resolution of this question, af forth so many others this discussion has raised, must also await future research.

If we assume both greater mobility and an increase in the size of coresident groups through time, we can next generate a series of new social problems related to: 1) information flow (Moore 1979), 2) the maintenance of mating networks (Wobst 1974, 1976), as well as to 3) the maintaining of egalitarian social relationships (Johnson 1982) that would have faced Upper Paleolithic hunters and gatherers on the Central Russian Plain after the Valdai maximum. I will address these issues in the next chapter of this work and argue that it is precisely the solutions to these problems that are responsible for the proliferation of 1) non-maintenance related artifacts, 2) specialized exploitation of fur bearers, and 3) the rise of complex base camps seen in late settlements on the Central Russian Plain.

I conclude this discussion by underscoring that the single most visible and diagnostic difference in the study area through time is the absence of complex cold weather base camps during the early period. This absence, together with the absence of all of the attributes associated with them including exotic materials, intensive labor investment

in the construction of dwellings, and probably of communal ritual behavior, clearly indicates that a change in the settlement system did occur through time.

It could be argued that archaeological bias alone is responsible for this. However, since it is more likely to be more real and significant, the type of attributes missing at early sites have the highest archaeological visibility, as well as being perennial archaeological favorites, their absence cannot be explained by invoking excavator bias alone.

In short, as with subsistence practices discussed in Chapter V, what we see with settlement during the 15,000 years of occupation is a continuation of the basic pattern--one that sees modification and elaboration but does not show any radical breaks through time.

VII. CONCLUSIONS ABOUT THE SETTLEMENT SYSTEM ON THE CENTRAL RUSSIAN PLAIN

In this chapter I have presented an analysis of the settlement system extant on the Central Russian Plain in the Late Pleistocene. The delimited site typology showed an existence of a seasonally distinct settlement pattern with cold weather base camps occupied by logistically organized groups who lived off stored food supplies during the cold weather months in settlements near the river floodplains that were occupied for approximately six months. While similar sized groups occupied warm weather base camps, subsistence organization during the warm season turned

more towards opportunistic foraging and returned to logistical organixation only in the late summer-early fall months when provisioning for overwintering camps was undertaken. These warm weather settlements were located fairly near to the cold weather base camps, and no long distance movements were undertaken seasonally. While the archaeological record suggested greater task force mobility during the warm season, similar mobility was also projected for task forces during the cold weather months.

An examination of regional differences in settlement types led me to conclude that basically a similar pattern is found throughout the study area and to see regional differences as local variations only. A comparison of settlement types, and by extention of the settlement system through time, also indicated the predominance of continuity over the entire 14,000 year period of occupation. The most notable difference observed--the appearance of complex base camps--was interpreted as showing a modification and elaboration through time. I have suggested that this elaboration is most directly traceable to a postulated change in the social relations on the Central Russian Plain and singled out the following variables as the most important for this change:

1. Linearization of the settlement system through time
2. Increased mobility through time
3. Increased size of the coresident units through time

I have suggested that these three variables were systemically related to each other and argue that it is the social problems created by the interaction of these three variables, as well as the solutions for these problems that are responsible for the observed changes in the settlement system through time. I have indirectly suggested that both increased status demarcation as well as regional interactions through long-distance exchange networks were two of the solutions tried by Upper Paleolithic inhabitants of the Central Russian Plain after the Valdai maximum, and will examine these in detail in the following chapter of this work.

CHAPTER VII

SOCIO-POLITICAL INTEGRATION ON THE UPPER PALEOLITHIC CENTRAL RUSSIAN PLAIN

I. INTRODUCTION

In Chapter V I focused on variables that related to man-land relationships through time and enumerated a set of environmental conditions that affected Late Pleistocene populations in the study area. Human adaptation, however, as has been widely pointed out in the literature, involves not only man-land relationships, but man-man relationships as well. These socio-political relationships affect subsistence practices, settlement locations, as well as socio-political integration and ideological behavior.

Noting, after Flannery (1972), that all systems must exchange not only energy and matter but also information, Root (1983:200) states:

> The direction, frequency, and intensity of information flow structures both man-man and man-land interactions. Information, thus, may be seen as a common denominator of human interaction, and social processes, such as subsistence-settlement arrangements, are mediated by information exchange on a regional basis.

Bender, in criticizing the ecological approach inherent in man-land focus as an explanation for subsistence-settlement patterns, writes that:

> ...for gatherer-hunter studies...the failure to consider the social impetus behind much human strategy has made it difficult to understand why human, in contrast to other animal,

> societies have developed along so many different historical trajectories (Bender 1982:1).

Her theoretical orientation in looking at hunter-gatherer economies is:

> ...that at both intra- and inter-regional levels it is the analysis of social relations - seen as to some extent, the determinants of technological process, but also acting within the constraints imposed by techno-environmental factors - that permits an explanation of origins and change (Bender 1982:24).

The socio-political component in hunter-gatherer adaptation has received, however, a good deal less attention in both the archaeological and ethnographic literature than the ecologico-economic one (see Binford 1982b, Jochim 1976; Lee and DeVore 1968; Winterhalder and Smith 1981, for example). As a result, our theoretical constructs, as well as inferential machinery, for examining socio-political organization through the archaeological record have been under explored. While this is not the place for an examination of the root causes for this, it is relevant to lay a part of the blame on the simplistic application of general evolutionary paradigms popular in archaeology in the last 20 years. In general evolutionary schemes of Fried (1967), Sahlins (1972), and Service (1962), the accent was placed on modal behavior for each level of economic, social, or political integration. Additional problems have been generated by coupling the evolutionary schemes based on subsistence behavior to those based on social and political organization. As Price (1981) points out, hunter and

gatherer adaptation thus became equated with a "simple, small, and mobile" paradigm. This coupling and the resulting paradigm are increasingly coming into question. Sheehan (1983), for example, argues for the existence of hierarchical and perhaps even ranked organization among some Alaskan coastal groups. The ethnographic reality of sophisticated and complex Northwest Coast societies has always put under question the representativeness of the "simple, small, and mobile" perspective (see Ames 1983 with references, for example). In brief, given the prevalence of such a focus in hunter-gatherer studies and models (see Jochim 1976 and White 1980, for example), in this work I have elected not to evaluate data against a pre-existant model, but rather to construct one for socio-political integration only after evaluating the pertinent data base.

Recently, influenced in some cases by the early and mid-1970's work of Flannery (1972), Wilmsen (1970, 1972, 1973), and Wobst (1974), and in others by Marxist or neo-Marxist throty, a number of researchers including Bender (1978, 1981, 1982), Conkey (1980), Moore (1979, 1983), Root (1981, 1983), and Weissner (1982a, b, 1983), have begun systematically examining the social component in hunter-gatherer adaptations. The results of this approach, to date, have been both thought provoking and promising, albeit not without serious problems. Of these, perhaps the most pressing one for archaeology is the relationship of theoretical constructs to the material correlates of these constructs. As both Hodder's (1978, 1979)

and Weissner's (1983) work is clearly pointing out, the phenomenon of equifinality is ever present in all attempts to firmly connect social messages to their material expressions. Both of these researchers conclude that although social information is contained in material culture, the correspondence is far from straightforward.

In brief then, while the focus of this chapter will be on the social and political relationships of upper paleolithic groups in the study area viewed both as one component of their adaptation strategies and also as a set of variables responsible for some of the changes that occurred, the lack of inferential machinery does not permit me to either 1) perform an exhaustive examination of these variables, or 2) come to any unequivocal conclusions. This chapter, then, will consider some aspects of socio-political relationships and offer a modification to the subsistence and settlement model presented in Chapter V. The refinements will be tentative ones - a series of plausible "just so stories" that can be tested in the future as well as used to generate new directions for research.

II. ASSUMPTIONS AND METHODOLOGY

Data presented in the first six chapters of this work clearly indicate that we are dealing neither with small, nor simple foraging groups but rather have an example of complex upper paleolithic hunter-gatherer adaptation. Since I have shown that the economic behavior of these groups was fairly complex (e.g. storage economy, specialized exploitation of

fur bearers, the presence of long distance exchange networks, etc.), we can also anticipate finding evidence for socio-political complexity in the study area as well. In this discussion I assume, after Flannery (1972:409), that complex adaptive strategies have both a greater segmentation (the amount of internal differentiation and specialization) as well as a hierarchization of their sub-systems than do simple strategies. Thus, in this work, the term complexity describes an entity, economic or socio-political, that consists of many inter-related parts, some of which are in a hierarchical relationship to each other. I also assume that a complex hunter and gatherer adaptation can be seen archaeologically in sizeable co-residential units, technological innovations, the presence of multiple facilities, decorative and exotic objects, intensive resource procurement and preservation, ritual activity, etc. The connection between economic and demographic complexity on the one hand, and socio-political on the other has received strong theoretical and empirical backing in the literature. Bender (1978, 1981), for example, has pointed to a relationship between intensification in procurement and storage practices and social relationships. Johnson (1982, 1983) has demonstrated a positive relationship between the size of co-residential units, increase in information flow, and increasing complexity of social organization. Conkey (1980), Wobst (1977), and Weissner (1983) have demonstrated the relationship between stylistic variability and man-man relationships.

Binford (1968) and Cohen (1977), among others, have pointed to a relationship between the demographic component and more complex hunter-gatherer adaptation. Finally, Bender (1978, 1981) and Testart (1982), among others, have pointed to a relationship between the demographic component and more complex social relationships.

The aspects of socio-political organization that I will examine in this chapter can be sub-divided into three categories: 1) social networks, 2) socio-political relationships, and 3) ritual or ideological behavior. In each case, after outlining the theoretical basis and archaeological implications, I will examine archaeological data on hand pertinent to the question. After presenting the data on these aspects, I will delimit socio-political organization for each period of occupation and examine the differences between them.

III. SOCIAL NETWORKS

Exchange of information, as noted previously, is a vital component of all human adaptations. Ample ethnographic evidence indicates that information exchange fulfills both economic and demographic needs: it keeps hunter-gatherer groups informed both on the availability and location of resources, and helps distribute them advantageously across the landscape. Information, as Moore (1983) and Root (1983) have pointed out, is transmitted along social networks, and these networks extend well beyond the co-residing groups themselves. Such networks, by pooling subsistence risk over a large area, function also to reduce risk (see Colson 1979

and Weissner 1982a, b, for example). Wobst (1974, 1976) has pointed out that social networks fulfill mating requirements and serve as channels along with mates are exchanged. Finally, according to Bender (1981), these social or alliance networks underwrite social reproduction.

A. Exchange Networks

Flannery (1972) has noted that exchange conveys information and that regular exchange networks, therefore, can be seen as establishing permanent information channels. Root (1983) justifies the connection between information networks and exchange by stating that material flows accompany the flow of information. This perspective on exchange permits us to view material remains relating to exchange as archaeological correlates of past social and information networks.

The empirical existence of such networks has been amply documented for ethnographically known hunters and gatherers (see Boas 1964, Butinov 1960, Nelson 1971, Weissner 1982a, b, and Yegoyan 1972, for example). Archaeologically, the past existence of such networks can be inferred from the presence of non-local goods and materials at the sites. Such evidence however, may be ambiguous. Ethnographic evidence shows that non-local materials can also be either procured in the course of a group's annual rounds or obtained by specially organized expeditions for exotics. This indicates that the mere presence of exotic materials at sites does not, ipso facto, signal past exchange.

Similar ambiguities exist on the route and mode by which

exotic materials move through exchange networks. Both occasional trade partner exchange (e.g. San hxaro) and trading centers have been reported for hunters and gatherers (see Boas 1964, Butinov 1960, Nelson 1971, Weissner 1982a, b, for example). Plog (1977) has outlined a number of characteristics that should be noted when studying or modeling exchange networks--they include the diversity and size of the network, the directionality and symmetry involved, as well as whether or not centralization is evident. Recent archaeological attention to exchange networks, most notably by Renfrew (1977) and Ericson (1977), has produced various fall-off curves symptomatic of different sorts of exchange mechanisms. While both Hodder (1980) and Renfrew (1977) have warned that specific curves may, in fact, mask very different behavioral patterns, the two distribution patterns potentially most relevant to this discussion are what Renfrew (1977) has termed "Down-the-Line" and "Directional" models. For the first case, Renfrew (1977:72) writes that:

> When a community is available only at a highly localized source or sources for the material, its distribution in space frequently conforms to a very general pattern. Finds are abundant near the source, and there is a fall-off in frequency or abundance with distance from the source.

In the second case, directional exchange, various sociopolitical factors operate to obliterate the decrease with distance effect and produce evidence for preferential supplies in large quantities of exotic materials at locations other than those that can be predicted by distance consider-

ations. In brief then, it is both the presence of exotics as well as their distribution across space that must be taken into account when reconstructing past exchange behavior.

Data on non-local materials found at the study sites, as discussed in Chapter VI indicate that two categories of materials are present: non-local lithics and decorative objects that include amber and fossil marine shells. Each will be considered in turn.

1) Lithics

Non-local lithics including flint, sandstone, slate, and mountain crystal have been found at a number of study sites (see Table VI-9). As I noted in Chapter VI: 1) no research has been done, to date, on the exact source of origin of these materials, and 2) no data exist on the exact nature of artifacts made of non-local lithics. Anecdotal evidence suggests that exotic lithics were not used differently than locally available ones. Shovkoplyas (1955, 1962, 1965c) in describing the tools fashioned of mountain crystal at Dobranichevka does not find any differences between them and tools made of local flint. Gladkih (1973), likewise, sees no difference between the tools fashioned from mountain crystal either at Dobranichevka or at Mezhirich and those made from local materials.

Shovkoplyas (1965a) wrote that the closest source for mountain crystal found at the southern sites of Dobranichevka, Gontsy, and Mezhirich lies in the vicinity of Smela, located about 150 km. south of Dobranichevka. As Figure VII-1 shows,

Smela is some 100 km. southeast of Mezhirich and 150 km. south of Gontsy. Shovkoplyas (1978 personal communication) also listed two more distant regions for this material--Volyn' to the northwest of the sites and the Donetsk Basin to the southeast. Pidoplichko (1969) noted that occurrence of mountain crystal near the city of Zhitomir, located some 300 km. to the east of the sites. While the exact source of the mountain crystal found at the sites still remains to be demonstrated, both Pidoplichko and Shovkoplyas considered the Smela region as the most likely one. Finally, finished tools, unworked fragments, and waste flakes of mountain crystal have been found at Dobranichevka--suggesting that the material arrived at the site in unretouched form and was fashioned into various blades and scrapers at the site.

Polikarpovich (1968) reported similar information for the manufacturing of tools from non-local lithics at Yudinovo. In fact, he wrote that all Yudinovo lithics were non-local in origin. Abramova (1983, personal communication) sees a great similarity between Yudinovo flint and the highly diagnostic superoid quality Desna flint and suggests that Yudinovo flint may have been obtained from Desna outcrops. If she and Polikarpovich prove to be correct in future research, then flint used at Yudinovo would have come from at least 60 km. south-southeast of the site.

While information on the source of non-local lithics at the sites is far from satisfactory, it does support my interpretation that non-local lithics, in all probability, were

procured directly by the inhabitants of the sites--the relative proximity of the source areas suggests that the distances involved could well have been within the ranges of the annual rounds. Non-local lithics, as Table VI-9 shows, have been found at both simple and complex base camps, as well as at sites I have classified as lithic workshops. Such a distribution strongly argues for the utilitarian role of exotic lithics in upper paleolithic economies. Such an interpretation is further supported by the utilitarian use made of exotic lithics. In summary, I argue that the procurement and use of non-local lithics in no way differed from the behavior associated with local materials, and suggests that, like locally available materials, exotic lithics were obtained by direct procurement. Pending evidence to the contrary, I suggest that such direct procurement, most probably, occurred during the group's annual rounds.

2) Amber

As I noted in Chapter VI, varying amounts of amber, originating probably from the vicinity of Kiev, have been found at Chulatovo II, Dobranichevka, Gontsy, Mezhirich, and Mezin. Coded and distance scaled values for this material are listed in Table VI-10 (see the discussion of scaling and coding in Chapter VI). We know that some amber was fashioned into beads but the poor condition of amber at the sites precludes us from knowing whether such bead manufacturing went on at the sites or if amber beads arrived in finished form (see illustrations of amber in Pidoplichko 1969, 1976). As I

noted in Chapter VI, amber was also probably used for non-decorative purposes.

Assuming after Shovkoplyas et al. (1981), Kornietz et al. (1981), and Pidoplichko (1976) that amber bearing deposits in the vicinity of Kiev were the source for this material, we can note an interesting pattern of amber distribution in the study area. Table VI-10 presents the raw amounts found, distances to the Kiev source, as well as distance-controlled and coded values for this material at each site. The distribution of amber in relation to source area is illustrated in Figure VII-2. Coded values both in Table VI-10 and Figure VII-2 that take into account the distance to the source, in general conform to Renfrew's (1977) "Down-the-Line" model of non-directional exchange. Sites closest to the source have larger quantities of amber than do those further away. This distribution of amber is illustrated in Figure VII-4. Thus, Mezhirich, located some 100 km. south of Kiev has over 348 pieces of amber (coded value of 3), while the more distant site of Chulatovo II, located about 260 km. from Kiev, has only one piece (coded value of 1).

While the distribution of amber does conform to Renfrew's model, such a conformity does not exclude the possibility that amber was procured directly. Since I have projected only seasonal sedentism at the study sites, it is also feasible that amber could have been obtained in the course of annual rounds. While, to my knowledge, no definitive theoretical or empirical studies exist on the relation-

ship of distance to quantity of material obtained by direct procurement, one can theorize a similar pattern of fall-off as observed in the "Down-the-Line" model of exchange. As will be shown below, however, this second interpretation is less likely, and amber probably reached the more distant sites via non-directional or "Down-the-Line" exchange.

Finally, it is significant to note that amber has been found only at base camps--being present at both simple and complex ones, as well as at both cold and warm weather ones. As both Table VI-10 and Figure VII-2 indicate, the nature of base camps (simple or complex) does not influence the amount of amber found. For example, a simple warm weather base camp Chulatovo II, has approximately the same amount as the complex Mezin cold weather base camp. Likewise, simple base camps located closer to amber sources (i.e. Gontsy and Dobranichevka) have more amber than a complex Mezin base camp located further away. This patterning suggests that amber was associated with behavior at base camps per se and not especially involved with behavior only at complex base camps. This differs markedly from the distribution of the other exotic decorative material--fossil marine shells.

3) Fossil Marine Shells

Marine shells, belonging to a number of taxa (discussed in Chapter VI) have been found at six sites in the study area (see Table VI-12). Soviet researchers indicate that these shells were, in all probability, obtained from Karangat and Sarmat marine deposits located considerably south of the

study area, near the shores of the Black Sea and the Sea of Azov (Motuz 1969, Polikarpovich 1968, Shovkoplyas 1965a). Data on the raw amounts of shells found as well as on distance scaled and coded values are listed in Table VI-12. The same information and source area are illustrated in Figure VII-3. As noted in Chapter VI, shells were used as beads or pendants, and both perforated and unperforated shells have been found at the sites, indicating that the processing of shells into items of personal adornment took place at the sites themselves.

While the more abundant occurrence of amber at the southern sites near the source area argues that amber procurement and exchange was more important for southern sites, the occurrence of fossil marine shells indicates that their procurement and use was more important in the north. Thus, as Table VI-12 shows, greatest numbers of shells are found at the more distant northern sites than at the southern ones. Likewise, while shells in the north come from both simple and complex base camps (e.g. Chulatovo II and Eliseevichi), in the south they are only found at the complex base camp Mezhirich. As both Figure VII-3 and Table VI-12 show, complex northern base camps (i.e. Elizeevichi, Mezin and Yudinovo) have a great deal of fossil marine shells while both complex southern and simple northern ones have considerably smaller numbers of shells. I conclude, therefore, that a very different behavior was associated with the procurement and distribution of shells than of amber--behavior that

conforms more closely to Renfrew's model of "Directional" exchange than to the non-directional one postulated for amber (see Figure VII-5).

The question of just how shells found at Eliseevicho, Mezin, and Yudinovo got to the sites is an interesting one that, unfortunately, cannot be answered with any certainty at this time. Two possible mechanisms can be proposed: 1) "Down-the-Line" exchange and accumulation or hoarding at complex base camps, and 2) specially organized procurement expeditions to obtain the shells. The distribution of shells at the sites argues against the first hypothesis--if unworked shells were exchanged to and processed at complex base camps, we should find much larger quantities of them at Mezhirich. I suspect, therefore, that the second mechanism operated on the Upper Paleolithic Central Russian Plain--namely, procurement expeditions to the Sarmat and Karangat deposits were organized at northern complex base camps from time to time to procure the shells. The shells were then processed into jewelry at these camps. The distribution of shells depicted in Figure VII-5 supports such an interpretation. It also suggests that the distribution of shells across the study area was controlled by the northern complex base camps--shells from these sites then found their way to simple northern base camps as well as to complex southern ones.

Such a hypothesis carried with it a number of implications about the social relationships, relationships of production, as well as about control of labor in the study

area. We can suspect that the organization of such procurement expeditions would have required both control and coordination. Assuming a rate of travel of 25 km. per day, a round trip from Mezin would have taken at least 40 days in travel time alone. From Yudinovo the travel time involved would have been a little under two months (52 days). The occurrence of such expeditions suggests the existence of some sort of specialization and division of labor beyond simple age and sex lines. Shell collectors involved in such expeditions would have had to both be free from subsistence-related pursuits, supplied with some provisioning for the trip, and finally be persuaded to take such a trip in the first place. While such long-distance procurement expeditions are known in the ethnographic literature and have been reported for Australian as well as for northern latitude hunters and gatherers (see Boas 1964, Butinov 1960, or Thompson 1949, for example), I would argue that this behavior during the Upper Paleolithic, together with other examples of complex socio-political relationships I will discuss below, argue for the existence of greater complexity than found among ethnographically known simple hunters and gatherers.

4) Conclusion and Implications

Soviet researchers have long noted the presence of non-local materials at the Upper Paleolithic sites in the study area but have, by and large, explained the origin of such materials as stemming from residential mobility (see Pidoplichko 1968, 1976, Shovkoplays 1965a--but also see

Masson 1976). This explanation is especially curious since the same investigators also claimed fairly long residential sedentism at the sites (see pp.467,Chapter V).

The presence of non-local materials including lithics and shells has been documented for a number of European Upper Paleolithic sites--but the explanation for their presence at the sites has been either ignored, anecdotal in nature, or a subject of heated debates (see Hemingway 1979, Hemingway and Bahn 1982, Taborin 1972, for example). Kozłowski (1972-1973) invoked residential mobility to explain the occurrence of non-local lithics at Czech, Hungarian, and Polish Paleolithic sites.

Data on the exotics from the study area presented in this work clearly demonstrate that not only did exchange networks exist during the Upper Paleolithic period, but also that various mechanisms were in operation. Since, however, such a conclusion carries with it a number of social and political implications that deviate from our usual perceptions of Upper Paleolithic hunters and gatherers, let me briefly reiterate the arguments for such an interpretation. First, given the projected settlement system for the study area, one with only limited local residential and logistical mobility, the source areas postulated for different exotic materials argues against their direct procurement. Simply put, the exotics come from too many directions and from too great a distance. For example, while amber sources may have been within the annual range of Mezin or Chulatovo II

residents, shell procurement would have taken them well beyond areas covered by annual residential moves. Likewise, multi-directionality of source areas for Dobranichevka exotics (i.e. amber from the north and mountain crystal from either the south or west) argue against mobility as the sole explanation for the presence of exotics there. I do acknowledge that some of the exotic materials, namely lithics, in all probability were obtained via residential mobility. Neither distances from which they came nor the utilitarian use to which they were put permit invoking more complex explanations than residential mobility.

Secondly, the existence of clear, distinct, and disparate patterning in the distribution of amber and shells indicates that exchange rather than direct procurement is a better explanation for the distribution of these items. While it could be argued that the fall-off curve for amber presented in Figure VII-4 could have also been generated by direct procurement, a hypothesis of direct procurement requires a greater presence of amber at all sites close to the source. This, however, is clearly not the case in the study area--Kirillovskaya located right at the source or Fastov, 60 km. from the source, have no amber. Quite clearly, then, it is social mechanisms and not proximity alone that regulated the flow of amber, and non-directional exchange explains the distribution of this material better than does a hypothesis of direct procurement.

As noted earlier, directional exchange appears the best

explanation for the distribution of marine shells. I have pointed out previously that the occurrence of amber and shells is strongly associated at the sites (see Table VI-14) and suggested that these two non-local items were behaviorally connected and separated from behavior associated with the use of art and jewelry made of local materials (see Chapter VI). Also, as I showed in Chapter VI, specialized procurement was correlated with the procurement of amber and shells (see Table VI-25). I interpreted the various test results obtained and discussed in Chapter VI as indicating that furs or pelts were a part of the same exchange network as amber and shells. Thus the occurrence of yet a third item--furs or pelts--which were both obtained through specialized procurement and moved across the area through exchange, further strengthens my argument for the existence of multiple and complex exchange networks in the study area during the Upper Paleolithic.

The types of items that moved along these exchange networks can be best described as non-utilitarian status or luxury goods. It could be argued furs or pelts were utilitarian items. I suggest however, that since fur bearers were available in and exploited over the entire study region, their inclusion in the exchange networks satisfied more social than utilitarian needs.

The movement of exotic goods through Upper Paleolithic exchange networks carries a number of social implications. Pires-Ferreira and Flannery (1976) term long distance trade

in exotics a form of "foreign relations". As such, they regularize and direct social and economic relations with more distant groups. Aside from carrying implications for inter-group relations, the use of exotics also carries implications for intra-group relations. Rowlands (1982) writes that since locally available materials are equally available to all, because of this, they are less than optimal as status markers. Exotics, on the other hand, by their scarcity and costliness, are better suited for status demarcation. Bender (1981, 1982) indicates that alliances sustained by exchange networks also carry with them a potential for manipulating the relations of production in egalitarian societies. Her observations imply that once we notice the presence of exotic goods in hunter-gatherer economies, we should search for other evidence of emerging inequality. Some of this evidence would include disparity in the volume and distribution of storage facilities at the sites as well as evidence for specialization in production. As I will show in a later section of this chapter, such evidence is present at the study sites--albeit often in ambivalent form.

It is interesting to note that the nodes of long distance exchange, as delineated by the distribution of amber, shells, and the abundance of fur bearers co-occur at locales where some evidence for organized ritual activity is also present (see the discussion of complex base camps in Chapter VI). This co-occurrence, rather than being fortuitous, is clearly to be expected. Dalton (1977), Flannery (1976),

Jochim (1981), and Wilmsen (1972a) have noted that exchange activity and ritual activity are intimately connected in pre-market systems. Exchange activity sustains ritual activity and ritual activity, in turn, provides the ideological rationale by which social groups justify themselves. Because both types of behavior co-occur at the Upper Paleolithic complex base camps, and in light of ethnographic data that characterize hunter-gatherer exchange behavior as ceremonial or ritual in nature (see Dalton 1977, Jochim 1981), I suggest that the long distance exchange in the study area was probably also ceremonial or ritual in both its nature and its overt manifestation.

Halstead and O'Shea (1982) argue that exchange networks may be confronted with problems of inflation. To maintain the value of goods, two solutions would be selected for: 1) removal of goods from circulation, and 2) the creation of hierarchies of valuables. The second solution would favor the incorporation of exotic goods into exchange networks. The first, in turn, would find expression in burial and possibly in the destruction of goods. As I have shown above, exotic goods were indeed an integral part of Upper Paleolithic exchange networks on the Central Russian Plain. While, to date, no chaches of exotics nor burials with exotics have been found in the study area, the famed burials at Sungir, located some 650 km. to the northeast, have produced evidence for just such "dumping" behavior. I will return to this data below when I examine the social relation-

ships among the Upper Paleolithic hunters and gatherers on the Russian Plain.

Lastly, it is most significant to emphasize that evidence for long distance exchange networks comes only from the late occupied sites. As will be recalled from previous chapters, both specialized procurement of fur bearers as well as marine shells and amber have been found only at sites occupied after the Valdai maximum. If we accept this observation as accurately reflecting past realities and not as an archaeological phenomenon, then the origin of long distance exchange must be examined. As will be shown below, its rise can best be understood as a response to both geographic factors (the linearization of the settlement system) as well as to changing social relationships in the area through time.

B. Stylistic Variation

The presence of stylistic variation in Upper Paleolithic lithic assemblages from the study sites has been noted and widely discussed in the literature (see the discussion in Chapter IV). Stylistic variation in lithics has long been used by Old World archaeologists to classify sites into different archaeological cultures. This approach, as I noted both in the introductory chapter as well as in Chapter IV, has been singularly unsuccessful in delineating traditional archaeological cultures in the study area. This "stulistico-cultural" impasse--namely the inability of researchers to agree on the significance of observed inter-site variability

--can be attributed to the narrowness of the assumptions traditionally used in stylistic classification and systematics. I argue, after Wobst (1977), that more fruitful and interesting results can be gained if style and stylistic demarcation are viewed as functional parts of adaptive complexes.

In this work, after Weissner (1983:256), I define style as "formal variation in material culture that transmits information about personal and social identity". Since it can be expected that the imprinting of stylistic information on items of material culture require additional labor input, and given that for much of the Pleistocene such stylistic imprinting is absent from the archaeological record, a logical next question is just when did such imprinting arise, as well as why it arose in the first place. Proceeding from theoretical considerations, Wobst (1977) has predicted that signalling of group identity or group membership via stylistic demarcation will arise with closure of mating or alliance networks--i.e. when corporate identity comes into being. For Wobst (1977) and Conkey (1980) after him, social closure could only develop in Late Pleistocene after certain population density thresholds were crossed and such signalling of social identity was advantageous for groups exploiting high return resources, where co-operation of large work groups was required. More recently, Hodder (1978, 1979), has focussed on the conditions under which group identity is signalled, and has demonstrated that such signalling is

favored under conditions of inter-group competition. Weissner (1983), on the other hand, has argued that ecological stress can also initiate such signalling.

More importantly, Weissner (1983) has demonstrated that two very distinct types of identity signalling can be imprinted on material cultures amblemic and assertive. She, after Wobst (1977), defines emblemic style as:

> Formal variation in material culture that has a distinct referent and transmits a clear message to a defined target population about conscious affiliation or identity... Most frequently its referent will be a social group... (Weissner 1983:257).

She defines assertive style as:

> ...Formal variation in material culture which is personally based and which carries informative supporting individual identity, by separating persons from similar others as well as by giving personal translation of membership in various groups... It has no distinct referent as its support... (Weissner 1983:258).

Her separation of emblemic and assertive styles is based on her work with simple egalitarian hunter-gatherers--the Kalahari San. If we consider possible permutations of stylistic messages among more complex hunters and gatherers, we can, in theory, envision additional causes for stylistic demarcation. For example, in groups where clear positions of status exist, such positions may also be signalled through stylistic variation--such roles as religious specialists or hunt leaders could be signalled through stylistic variation. In such groups we can anticipate finding emblemic styles proclaiming both corporate "we are the XXX" identity, as well as "I am the ritual specialist of the XXX" corporate-assertive

identity. While a consideration of yet another source of stylistic messages may be theoretically important when dealing with complex hunters and gatherers, our poor empirical understanding of the material correlates of different style messages make such concerns at present at least, fairly academic. Hodder (1979, 1981) and Weissner (1983) have clearly shown that ambivalence is the norm in the relationship of message and its manifestation in material culture, and argued that much more work needs to be done on identifying which attributes carry what stylistic message. Among the San, for example, different attributes on a given item can simultaneously carry different social messages, and, what is even more unfortunate for archaeologists, the same attribute can signal different messages through time.

If we consider style and stylistic demarcation as a functional part of an adaptation complex, we can then anticipate that once a need arises for conveying corporate identity through style, such information will be stylistically imprinted across a number of media. Such redundancy, as Moore (1983) has pointed out, would be favored both to insure that the message gets received and to validate the message. Recent work on style imprinting suggests that the following media may carry such information: lithics, art and engravings, jewelry, and structural features of sites (see Conkey 1980; Hodder 1979, 1981; Weissner 1983; and Wobst 1977, for example).

Two of these media, lithics and art and engravings, have

long been the focus of Soviet archaeological interest and research. As I pointed out before, they, along with most of their Old World colleagues, have intuitively assumed that stylistic similarity in lithics reflected archaeological cultures. While the relationship of such archaeological cultures to any ethnographic groupings remained a moot point, work on lithic assemblages from the Dnestr and Don Upper Paleolithic sites generally did lead to the recognition of different cultures, each with distinct lithic assemblages (see Davis 1983; Efimenko 1938; Grigor'ev 1970; Klein 1968, for example). The sites from the study area presented a far more thorny problem for Soviet researchers. While some sort of consensus of opinion exists on the cultural identity of lithic assemblages from the sites I have placed in the early period of occupation, no such consensus exists on the assemblages from sites occupied after the Valdai maximum. Thus, most Soviet researchers today assign both Berdyzh and Khotylevo II lithics to the Kostenki-Avdeevo culture, see Radomyshl' as having no cultural analogues, and note similarities of Yurovichi lithics to those from Eliseevichi (see Budko 1967b; Lazukov et al. 1981; Shovkoplyas 1965a; Zavernyaev 1978, 1981, for example).

Assemblages from sites occupied between 18,00 BP and 12,000 BP, on the other hand, are interpreted very differently. In fact, with the exception of Grehova (1970; 1983 personal communication) and Grigor'ev (1983), Soviet researchers, by and large, describe each site as having

unique stylistic and therefore cultural features. They either claim archaeological cultural status for each site or lump all of them into a rather amorphous category of the Desna-Dnepr cultural co-tradition (see Gladkih 1973; Shovkoplyas 1965; Dolukhanov 1982). Grehova (1970), working with materials from Desna and Sudost' sites, has been the only specialist claiming to recognize local style similarities on the level of distinct archaeological cultures. Grigor'ev (1983), on the other hand, has departed from his previously held position that the lithic assemblages from Dnepr-Desna sites represent a regional co-tradition, and now argues that with the exception of Berdyzh, Khotylevo II, and possibly Klyusy, no archaeological cultures proper can be delineated in the study area (see Grigor'ev 1970 and compare with Grigor'ev 1983). He does place Berdyzh and Khotylevo II into the Kostenki-Avdeevo culture.

A study of art and engravings has similarly failed to produce clear cut distinctions in the area. Zavernyaev (1978, 1981) has shown that portable art from Khotylevo II can be classified into a recognized cultural style--it belongs to the Kostenki-Avdeevo tradition. While both whole and fragmented classic "Venus" figurines and engravings were found at Khotylevo II, other Dnepr-Desna sites contain very site specific portable art--of a type that does not find duplication at other sites (see Figure VII-6).

A study of engraving motifs on bone at the Dnepr-Desna sites has led both Abramova (1962, 1966) and, more recently,

Marshack (1979) to identify complex geometric motifs, linear marks, and fishlike or "diamond" designs as characteristic for the Central Russian Plain. It should be noted, however, that with the exception of Marshack's (1979) recent work on decorative systematics on the Upper Paleolithic Russian Plain, no analytic research has been done on the subject of styles in art and engraving. Abramova's (1962) monograph on Upper Paleolithic art from the USSR was largely descriptive and only distinguished European from the Asiatic zone.

Finally, Soviet researchers, while noting a similarity in dwelling construction at the Dnepr-Desna sites, do not see this attribute reflecting archaeological culture, but rather similar economic modes of life (see Dolukhanov 1982; Gladkih 1977a; Shovkoplyas 1965a).

In summary then, traditional stylistic analysis of lithic and art assemblages from the sites in the study area has failed to delineate clear cut local archaeological cultures--this is especially true for the late period of occupation of the Central Russian Plain.

A careful examination of the data on hand, however, does reveal some interesting patterning which can best be understood in context of social networks. This patterning is especially visible if the sites are divided according to the period of occupation, as well as when each medium (i.e. lithics, art, engravings, jewelry, site layout, and architectural details in dwelling construction) is considered separately. This patterning is summarized in Table VII-1.

In this table, the presence of significant local cultural differences is denoted by a +, and the absence of them by a -.

The chronological division of sites into just two categories--those occupied early and late--presents some problems. As discussed earlier, first, our sample of early sites is both very small and their dating problematic. A more serious problem for this discussion, however, is presented by Khotylevo II. As I have pointed out both in Chapters V and VI, the site is anomalous and does not fit the Dnepr-Desna settlement pattern. Its lithics, art, and worked bone bear strong similarity to the assemblages from the Kostenki-Avdeevo Upper Paleolithic sites lying to the southwest. It is the only early site that has yielded art, and, with the exception of one clear piece from Yurovichi, all examples of engraved bone from the early sites also come from Khotylevo II. The site's living floor, with a plethora of hearths and various sized pits, and an absence of mammoth bone constructions, likewise comes closer to Kostenki-Avdeevo sites than to either cold or warm weather Dnepr-Desna base camps. In brief, Khotylevo II appears to belong to another archaeological culture, and was probably a part of a different settlement system. I have decided to control for such a possibility by both including the site as well as excluding it from consideration in Table VII-1. I include it in my sample because: 1) my hypothesis that it was a part of a more eastern settlement system remains to be investigated and

proven, 2) its relationship to another early site, Berdyzh, remains unclear--Berdyzh lithics have also been identified as belonging to the Kostenki-Avdeevo culture, and lastly, 3) its inclusion does give us a broader perspective on stylistic variation on the whole Upper Paleolithic Russian Plain.

Comparing stylistic variation from the early sites to those occupied late per medium, I note both a change in the media used to signal corporate identity through time as well as a reduction in the number of distinct corporate groups occupying the area. Specifically, these changes are as follows:

1) Lithic Assemblages at the early sites, both including and excluding Khotylevo II, show a great deal of stylistic variability. Both Shovkoplyas (1965a) and Grigor'ev (1970), clearly distinguished Radomyshl's lithics into a separate early archaeological culture. Yurovichi lithics are said to be stylistically similar to Eliseevichi (Budko 1967). Berdyzh stone tools resemble the Kostenki-Avdeevo ones, as do the lithics from Khotylevo II. Stone tools from the late sites, on the other hand, have not been classified into agreed-upon local cultures. While the criteria used by Soviet researchers in either assigning assemblages to different archaeological cultures or in pointing to similarities between assemblages from any two sites remain problematic (see Klein 1973), they are not the main issue here. I suggest that the fact that Soviet researchers note such similarities for the assemblages from early sites and,

by and large, fail to note them for the late ones is itself significant. I argue, therefore, that some stylistic signalling, however ambiguous, is present in the lithics from early sites, and absent from those sites occupied after the Valdai maximum.

2) Art

(a) Figurative

Portable art depicting human forms has been found and identified as such as Eliseevichi, Khotylevo II, and Mezhirich (see Fig. VII-6). In addition, the 17 "phallic" figurines, more than 6 "birds", and 5 pieces transitional between the two found at Mezin have now, by and large, been classified as stylized female figurines (see Shovkoplyas 1965a; Marshack 1981, personal communication). Likewise, Shovkoplyas (1972) has identified the badly weathered amber and sandstone artifacts from Dobranichevka as fragments of female figurines.

As Table VII-1 shows, this traditional carrier of stylistic information is absent from the early sites if Khotylevo II is omitted from the sample, and very significantly present if it is included. Both whole and fragmented classic "Venus" figurines have been found at Khotylevo II, and as noted, are stylistically similar to those from the Kostenki-Avdeevo sites. Figurative art depicting either female or generic human form found at the late sites, on the other hand, has all been notably site specific in style (see Figure VII-6). Thus, while the Mezin collection of "birds"

and "phallic" forms is said to be an abstracted representation of the female, the same gender identification cannot be made for the three anthropomorphic forms from Mezhirich, nor, despite Shovkoplyas' views to the contrary, can it be safely made for the two pieces from Dobtanichevka (see Figure VI-6, and Shovkoplyas 1972: Fig. 9). In brief, figurative art from the site occupied late appears to be site-specific in style and does not seem to 1) reflect coherent style zones, nor 2) demarcate bounded corporate identity.

(b) Engraved and Painted Objects

While engraved and painted motifs found on bone at the study sites have not been a subject of systematic regional analysis until recently, Marshack's 1979 study did confirm the general observations made by Abramova (1962, 1966) and reported by Klein (1973) that complex geometric linear and "diamond" motifs prevail at the study sites. An exception to this pattern is again found at Khotylevo II--where the engraving motifs bear a much stronger resemblance to those from the Kostenki-Avdeevo sites (Zavernyaev 1981; Gvozdover 1983, personal communication). Comparing engraved motifs from early sites to those from the late ones, we again see the presence of distinct local differences at the early sites if Khotylevo II is included in the sample. The piece from Yurovichi, published by Budko (1967), bears the fishlike or "diamond" motif characteristic of the Dnepr-Desna design repertoire, while objects from Khotylevo II mirror Kostenki-Avdeevo design elements. At the late sites, while different

sites show some individual preference for particular geometric or linear motifs, these differences are less significant than the general prevalence of complex geometric motifs. This is especially evident if we compare two engraved plaques of ivory found at Eliseevichi and at Mezhirich illustrated in Figure VII-7. Kornietz (1978, personal communication), unaware of the existence of the Eliseevichi plaque, has identified the Mezhirich piece as possibly representing the first "map". Marshack (1979), on the other hand, focusing on the sequential placement of different motifs on each plaque, claimed that neither represents a conscious composition. He wrote that both pieces contain a series of ritual markings which were made over an indefinite period of time. In his argument for sequential ritual marking of these plaques, Marshack failed to note what for me is the most important feature of both plaques--their conceptual similarity. I offer both plaques here as an illustration of the unity in the Dnepr-Desna and Sudost' design repertoire. Both contain very similar elements, show great conceptual likeness to each other, and can be seen as material expressions of very similar ideational concepts.

Finally, mammoth crania, mandibles, scapulae, and pelvises decorated with red ocher linear designs have been found both at Mezhirich in the south and at Mezin in the north. Again, while showing some specific differences, both exhibit great overall similarity in design motifs.

In brief then, this discussion has shown the existence

of redundant local style differences in decorative pieces at the early sites and an atomization of this distinct local differentiation at the late sites. The late sites, while showing some overall conceptual similarity, exhibit site-specific style in decorated objects. In time we see regional or local style zones collapse and decorated objects appear to signal messages other than those of bounded corporate identity.

At the same time that significant local stylistic differences (both in figurative and decorated objects) decrease in time, the amount of these objects found at the sites greatly increases. As I indicated in Chapter VI and illustrated in Table VI-38, considerably more art has been found in both late high density sites (nearly double the amount, $z = 1.91$, $p = 0.06$) and late low density art sites (18 times more, $z = 2.42$, $p = 0.02$) than at the early sites (see Chapter VI for a discussion on the separation of sites into high and low density ones).

3) Jewelry

Equally striking differences can be observed in the behavior of items of personal adornment through time. As I noted in Chapter VI, this class of objects has been found only at the late sites, where it is heavily concentrated at complex base camps. Jewelry pieces found at the late sites include a usual assortment of shell and amber beads, elongated beads made of wolf long bones, tie-on bracelets from mammoth ivory, ivory pendants, perforated carnivore canines

presumably worn as pendants or beads, as well as decorated bone pins. While no regional study has been made of these objects to date, and no analysis exists on the similarity and differences between jewelry from the study area and that from the Kostenki-Avdeevo sites, visually little or no difference can be seen between the two. Also, it appears that items of personal adornment from the entire study region are very similar stylistically to each other. Thus, pending future information to the contrary, I argue that this mode was not one that carried significant stylistic information during the Upper Paleolithic on the Central Russian Plain.

4) Site Structure

As I demonstrated in Chapter VI, late sites in the study area show no regional north-south differences in site structure, and I interpreted this to indicate that they were a part of the same settlement system. As Table VII-1 shows, if Khotylevo II is included in the sample, this is not the case for the sites occupied during the early period. While Berdyzh, Radomyshll, and probably the redeposited Yurovichi conform to the Dnepr-Desna pattern, Khotylevo II is startlingly different. Root (1983) has argued that site structure should more directly reflect a subsistence-settlement system rather than more abstract social phenomena. If this is so, then the difference in the site structure of Khotylevo II, once again very similar to Kostenki-Avdeevo sites, may indicate a different and more eastern pattern. Thus, as with style motifs in art and lithics, significant

local differences present at the early sites disappear in the site structuring of the late ones.

5) Architectural Details

In Chapter VI I described architectural details discovered at Mezhirich. These include the use of such principles as mirror imagery and symmetry in dwelling 4. I also noted that similar selective patterning may have been present in some of the dwellings at Yudinovo excavated by Polikarpovich and Bukdo. Abramova (1983, personal communication) reports finding evidence of symmetrical patterning in the use of mammoth crania in the Yudinovo dwelling that she and Grehova are currently excavating. While the exact significance of this patterning remains unclear, I suggest that it can be seen as stylistic encoding of information in architecture. After Fritz (1978), I argue that at Mezhirich and Yudinovo we have a case of information encoding in space and in building medium that transmits both a secular and, probably, a sacred message. The style is clearly emblemic and the message corporate at both sites. I further argue, that at least at Mezhirich, similar encoding of stylistic information can be also seen at the level of the site itself. As I noted in Chapter VI, both the first and the second dwellings there feature purposefully sorted mammoth skeletal elements (e.g. in dwelling #1-mandibles, in #2 long bones), while the fourth dwelling sectionally reflects both the first and the second dwellings. I suggest that similar site-wide transmission of emblemic information should be expected to

occur at other complex base camps in the study area. Finally, stylistic information in architectural mode is absent at the sites occupied during the early period.

6) Conclusions

A cursory look at chronological differences in stylistic behavior depicted in Table VII-1 appears to indicate an overall decrease in stylistic signalling through time. While distinct local style differences have been noted for both lithics and site structuring at the early sites, both become muted and disappear at the late ones. The same can be observed for both figurative and decorated art. Price (1981) has suggested that a change in the amount of stylistic signalling should reflect a change or a variation in social complexity. Wobst (1977) has argued that greater amount of style signalling reflects greater complexity. Taking both these arguments into account, one could conclude that we are witnessing a decrease in social complexity in the study area through time. Such a conclusion, however, is greatly at odds with the changes noted in the subsistence and settlement patterns discussed in previous chapters.

I suggest, however, that this seeming contradiction is not real but a byproduct of the scale of analysis used. This is because one can argue for a decrease in social complexity through time only if one assumes an equal value for any and all stylistic signalling. This argument presupposes that it is the sheer redundancy, as expressed in the number of modes through which style messages are transmitted, that reflects

social complexity or simplicity. But, as Root (1983) has recently cogently argued, not all modes of stylistic signalling are equal in social significance. In her analysis of the social costs of information processing among egalitarian groups, she distinguished two types of information encoding--in the curated mode (i.e. artifacts) and in the non-curated mode (i.e. features). She predicts that the second, non-curated mode, found in such features as dwellings, storage pits, etc., should contain little or no stylistic information as well as show little, if any, concentration of surplus labor in egalitarian societies. Root expects that in such societies curated items with style messages, those that transmit information of a corporate nature, would be homogeneously distributed over a region and found in concentrations at aggregation sites only.

Root's distinction between the curated and non-curated mode of style imprinting, as well as her association of each of these modes with social relationships, is of interest to this discussion. Media carrying stylistic information at the study sites, as noted, include both curated and non-curated categories. A comparison in the use of these categories as carriers of stylistic information through time indicates the following: 1) the presence of great redundancy in stylistic encoding on curated objects during the early period, and 2) a reduction in both the redundancy (i.e. the number of media used) and stylistic signalling in curated objects at the late sites. The redundancy in style messages signal the presence

of at least two archaeological cultures in the area during the early period of occupation. Berdyzh and Khotylevo II on lithics, and Khotylevo II on art can be seen as local analogues of the Kostenki-Avdeevo culture. The stylistically different lithics from Radomyshl' and Yurovichi as well as the engraved piece from Yurovichi appear to indicate the presence of another cultural pattern in the area. Such redundancy in stylistic signalling of group identity is absent in the curated items from the late sites. In brief, what we are seeing in time is an erasure of some social or corporate message that was transmitted through curated items prior to 20,000 BP.

At the same time that curated items show a decrease in style imprinting through time, late sites exhibit an increase in style imprinting on non-curated items, mostly clearly seen in architectural detailing at Mezhirich and Yudinovo. This is accompanied by a significant increase in the amount of art as well as the appearance of jewelry and exotics at the sites. These curated decorative items do not appear to carry any corporate message or emblemic style on them, and I suspect that information is not imprinted on them but signalled by their very existence or presence--i.e. figurines, shells, or beads are themselves the symbols rather than how they are carved or decorated.

I argue that the observed change in stylistic signalling through time indicates the following pattern of change. During the early period of occupation emblemic style was

present in curated objects and single corporate identity of different social groups. Some of these groups, those inhabiting Khotylevo II and possibly Berdyzh for example, may not have been independent social entities but parts of larger social configurations settled to the east and southeast of the study area. During the late period, curated items lost their signalling power as emblemic markers of local corporate identity. I have argued in both Chapters V and VI, that the study area during the late period of occupation appears to have been inhabited by two groups and that these groups were not socially independent but a part of the same social network. The lack of any localized concentration of style imprinting observed in curated items from the late sites clearly supports such an argument. During the late period corporate identity was signalled through non-curated features. The proliferation of stylistically indistinct art and decorative items, as well as of exotics and jewelry at complex base camps argues for their use as status markers--carriers of corporate but assertive information.

If, for the purposes of this discussion, we assume that the data from early sites (including Khotylevo II) accurately depict realities, then the observed differences in style behavior through time indicate either a change in social organization through time or the existence of at least two distinct social groups with different subsistence practices and settlement systems during the early period of occupation. In light of my analysis of the changes in subsistence

practices and settlement systems, I suspect the second of these to be more accurate. I tentatively suggest that the anomalous Khotylevo II was in reality a part of an adaptive complex of hunters and gatherers settled east of the study area--those whose sites have been traditionally classified as belonging to the Kostenki-Streletskaya and Kostenki-Avdeevo cultures. I further suggest that this eastern adaptive strategy may have featured greater residential mobility and an aggregation-dispersal pattern of social integration. It is this system that utilized curated objects as carriers of emblemic style. It well may be that the art-rich anomalous Khotylevo II base camp in reality represents an aggregation site of this eastern strategy.

The second subsistence-settlement pattern present during the early period, was located in the study area proper and is represented by Berdyzh, Radomyshl', and Yurovichi. This adaptive system featured a logistically organized subsistence strategy and a storage economy. In time this system intensified and, under conditions of reduced mobility selected for by both logistical organization and storage economy, underwent social intensification as well. Curated items no longer signalled generalized corporate identity, and some increasingly began signalling intra-group status differences. It is the non-curated features that took on the role of carrying corporate identity information--this identity was region-wide and not localized. While this hypothesis is speculative, it does appear to have some support in data on the social organization to be presented below.

IV. SOCIO-POLITICAL RELATIONSHIPS AND ORGANIZATION

Suitable evidence on socio-political relationships and organizations is notoriously hard to come by in prehistoric archaeology of hunters and gatherers, and ambiguous to boot. First, as Root (1981, 1983), Moore (1979, 1983), and Wobst (1974, 1976, 1977) have pointed out, this is because the site-specific focus of much of prehistoric archaeology does not recover the type of information necessary for the reconstruction of this sub-system. These authors advocate a regional approach--one that while undoubtedly far more promising, also leaves gaps in the data base. It is both a fine grained site-specific focus as well as a coarser grained regional one that are necessary when considering questions of socio-political relationships.

In this work I have used a regional approach in which each site was the unit of analysis. While I selected this approach because of the nature of the archaeological record and archaeological recording in the area, by using the site as a unit of analysis, I omitted from consideration finer intra-site differences in the frequency and distribution of archaeological remains. Because of this, I have effectively eliminated a good deal of potential information on socio-political relationships from this work. In this discussion, I will limit myself to looking at just the following three aspects of socio-political relationships: 1) group size and group dynamics, 2) relationships of production, and 3) settlement function size. First I will examine the relation-

ship of the sizes of co-residential units, information flow, and complexity of socio-political organization. Second I will focus on questions of specialization in production and on the control of labor. Lastly I will compare simple and complex cold weather base camps to each other in terms of their settlement function size.

Since I see socio-political organization as a functional component of an adaptive strategy, I also view the structuring of such organization as a solution to existing environmental, demographic, economic, and social problems. So far I have outlined the following variables that have a bearing on socio-political organizations:

1) A subsistence economy based on storage. In such an economy individual or family mobility does not offer a solution to potential social problems as it does in foraging economies organized non-logistically. In addition, as I pointed out in Chapter V, the procurement and storage of seasonally abundant subsistence resources create certain labor demands that both reduce the mobility option for individual families as well as facilitate potential manipulations and control of labor.

2) In Chapter VI I documented some evidence, albeit ambiguous, for smaller group size and, possibly, longer lengths of stay at the early sites and larger group size and shorter stay at the late sites. However, as Tables VI-34 and VI-38 show, the mean size of co-residential units during both the early and late periods were fairly sizeable.

3) I have documented both in Chapters III and V an increase in the environmental stress during the late period of occupation. In Chapter V I argued that this increased stress partially selected for both intensification in procurement practices and in storage. Riches (1979), using data from the Northwest Coast, has recently argued that environments with increasing productive uncertainty bring increasing need for the control of manpower. His argument can be extended to include a comparison of more stable and more fluctuating environments--and to argue, that given a particular logistically organized subsistence strategy, periods with greater environmental stress would select for more control of labor than those under less stress.

A. Group Dynamics

Johnson (1983) has brought forth convincing ethnographic and historical evidence to show that group size and complexity of socio-political organization are directly related. Discussing the increase in social strain between individuals with an increase in group size, he writes:

> Scalar stress in non-hierarchical groups is an exponential function of organization size, and small increments in size may result in large increments in scalar stress... (Johnson 1983:8).

He identifies information processing overload as the mechanism that may constrain the size of co-functioning or co-residing groups, and points out that

> ...there is some kind of organizational threshold in groups of approximately 6 individuals (Johnson 1983:1).

Making a distinction between the size of organizational units in social systems (i.e. individual, nuclear family, extended family, etc.) Johnson goes on to note that for hunters and gatherers organized into nuclear families, this scalar stress threshold empirically surfaces when the number of nuclear families exceed about 11 (over 35 individuals). He identifies three types of potential social responses to scalar stress that include: 1) group fission, 2) expansion of basal or organizational unit size (i.e. the change from the nuclear family to the extended one), and 3) hierarchization and the development of specialized positions of leadership. Johnson concludes his analysis by stating that:

> What we cannot do is predict for classes of systems which specific response to scalar stress has the highest probability of occurrence and why this should be so... (Johnson 1983:45).

Given the size of co-residential units I projected for the study area, we can anticipate that problems of scalar stress were operating on the Upper Paleolithic Central Russian Plain. One of the solutions to this stress, mobility, was not a viable one for groups in the study area. Data on hand suggest that the other two solutions--increase in basal unit size and hierarchization--were adopted at various points in time. My argument against the viability of the mobility solution is based on the subsistence practices and storage behavior. Given this organization, mobility, at best, was an ad-hoc solution. The settlement pattern outlined for both the early and the late period, indicates that the type of

solution to scalar stress did not involve residential mobility on the level of individual families and did not result in an aggregation-dispersal pattern suggested for other Old World Late Pleistocene-Early Holocene groups (see Conkey 1980; Jochin 1976; Spiess 1979; White 1980, for example). While undoubtedly an occasional family did move out of an unpleasant base camp situation from time to time, it was hierarchization and the increase in the size of the household that were institutionalized as societal responses to scalar stress.

While I have documented the absence of mobility or fission as a solution, it is more difficult to convincingly document the two solutions I argue were employed. The data on hand are both nebulous and can be used to argue for very different interpretations if each source is taken individually. I suggest, however, that the sum of the evidence, taken in toto, does warrant such hypotheses.

1) Hierarchization

I define hierarchization here as vertical differentiation in socio-political roles and see it as an introduction of specialized leadership or decision-making positions (see Johnson 1977, 1983; Lightfoot and Feinman 1982). The existence of such leadership roles in societies is expected to be clearly marked both directly by items of material culture, as well as indirectly. Indirect evidence for the existence of hierarchical status positions would include the evidence for specialization in production or activity differentiation, for

control of labor, as well as for control of resources (see Brown and Plog 1982, Lightfoot and Feinman 1982; Peebles and Kus 1977; Price 1981, for example).

a) Status Demarcation

Fried (1967) distinguished two ways that positions of status are obtained in society--through achievement and through ascription. He associated the first recruitment process with simpler egalitarian societies and the second with more complex tribal and chiefdom formations. Following his lead many archaeologists have attempted to distinguish and monitor these two types of status as a way of gauging the simplicity or complexity of a given group under study.

Archaeological evidence for status demarcation, however, is notoriously ambivalent, inconclusive, and the mere fact that status is marked in the archaeological record does not speak of the presence of hierarchization in past human behavior. Since it can be expected that all social systems will have some status positions--what is of interest in questions of social differentiation is the presence or absence of hierarchization in status positions. Direct archaeological correlates of status mentioned in the literature include exotic materials, items of personal decoration that bear evidence of costly labor investment, and ritual paraphanalia. These materials, in and of themselves, however, do not indicate status hierarchization. For example, the differential distribution of elaborate burials with voluminous grave goods have been interpreted as signalling

hierarchization of status. As Bender (1982) has pointed out however, messages from the grave can be most equivocal, and grave goods can signal both status reached only in death as well as that earned in life. In the ensuing discussion I will limit myself to examining evidence for hierarchical behavior in general, and omit from consideration questions of how individuals were recruited to fill particular status positions (i.e. if through individual achievement, through inheritance, through some ritual process, etc.).

Data from the study area do indicate that such artifacts as art, jewelry, and especially exotic amber and shells probably functioned as status markers. While these items, as shown, were found in far greater numbers at complex base camps, no evidence can be brought to argue for their unequal distribution within these sites. To date no burials of any kind and no caches of valuables have been found in the study area itself. The few Upper Paleolithic burials known for the Russian Plain all come from Sungir and Kostenki sites lying to the northeast and southeast of the study area. While I have argued previously in Chapter VI that sites belonging to the Kostenki-Streletskaya and Kostenki-Avdeevo cultures all probably belong to a different settlement system than the one in the Dnepr-Desna basin, I will not turn to burial evidence from this eastern part of the Russian Plain because it does have a bearing on the issue at hand. I argue here that this data is relevant both because Khotylevo II was probably a part of that adaptation strategy, as well as because mortuary

behavior in evidence there does reveal some interesting, although speculative, patterning of relevance to the study area proper. I will also include data on the three Sungir burials in my sample because Sungir has been classified by Bader as belonging to the Kostenki-Streletskaya or Kostenki-Sungir culture (see Bader 1978; Sukachev et al. 1966).

The five sites with human internments from the Upper Paleolithic Russian Plain are presented in Table VI-2, which also includes demographic breakdown of the buried individuals and the accompanying burial inventories. Extant radiocarbon dates for the sites are offered in the last column of the table. In spite of the very small sample of burials for a time period that appears to have spanned some 25,000 years, I suggest that two factors related to status demarcation are significant in these data. First, if we divide the burials into chronological sub-divisions of early and late as done for the study area, we note that burials accompanied by grave goods data only to the early period--before 20,000 BP. The two burials dating to the late period, Kostenki II and Kostenki XIV contain no grave goods.

The nature of the grave goods found in early burials is the second relevant issue. Note that while varying amounts of labor investment are suggested by the goods, from moderate at Kostenki XV to very costly in the burials of the adult male and two adolescents at Sungir, the vast majority of burial goods were made of locally available materials. Bader (1978; and in Sukachev et al. 1966) reported that while

over 10,000 beads were found in the three Sungir internments, distributed approximately equally between the deceased, less than ten of them represent perforated shells and the rest were made of mammoth ivory. The shells used as decoration derive from fresh water species of Unio and Ostrea and could have been obtained locally (Chepalyga 1983, personal communication; Sukachev et al. 1966). Bader (1978) also reported finding an unspecified number of both finished beads as well as bead blanks, presumably in the process of being fashioned into beads, on the living floor at Sungir. This suggests that bead manufacturing went on at the site itself. Both Bader (1978) and Abramova (1962) divided the Sungir beads into four very standardized and uniform categories: 1) small rectangular ones with holes in the center that measured approximately 13 mm x 9 mm x 5 mm, 2) miniaturized versions of the first type with slightly more rounded corners that measured about 1 mm all around, 3) oval or rectangular larger beads with holes near one of the outside edges, and 4) a handful of tubular beads. Bader noted that the first type was by far the most prevalent.

Using data from Coles (1979) on the rate of bone bead manufacturing, and assuming that each Sungir bead would have taken approximately 15 minutes to manufacture (including preparing ivory blanks, cutting pre-forms, cutting and then drilling the holes, etc.), I estimate that over 2,500 man-hours of labor are reflected in beads alone in the three Sungir burials. Bader (1978) has argued that Sungir repre-

sented a single episode of summer to fall occupation.

If we assume this interpretation to be correct, translate it into days of occupation, and assume a five-month stay at the site (i.e. 150 days), then the labor investment in bead making carries a number of implications for both specialization in production as well as for at least a partial control of labor. I define specialization in production as differentiation in activities engaged in and performed beyond the level of simple task segregation by age and sex. Assuming a 6 hour work day per individual, Sungir beads represent 417 days of work for one man, 42 days for 10 men, and full-time bead manufacturing during the entire length of stay if 3 men were involved in bead manufacturing. The standardization of bead size and shape noted by Bader, although not confirmed by any empirical studies to date, suggests that beads were not manufactured by a large number of individuals but rather produced by a few specialists. If beads were produced by a small group of individuals, then the relatively short duration of occupation at Sungir argues for either full time or fairly close to full time specialization in bead making.

On the other hand it is possible, and more likely, that Sungir does not represent a single occupational episode and that the beads found in the three burials were not all made over a 5 month period. The noted standardization in bead shapes and sizes still argues for their manufacturing by a limited number of bead makers. The amount of labor put in by

them, whether done over a 5 month period or over a longer span of time, still was invested in just three of the burials. This labor investment and standardization, in turn, imply that bead manufacturers were 1) supported while producing them, 2) persuaded to devote some portion of their working time to this task, and 3) persuaded to contribute their products to the grave inventories of just three individuals buried at Sungir.

In addition to all the beads, the three Sungir burials also contained rich inventories of bone and ivory objects that included the famed long spears (one over 2 m in length), an animal figurine, four carved shaft straighteners, as well as pendants, bracelets, and pins. Thus the 2,500 man-hours of labor I projected for bead making represents just a fragment of labor involved in the manufacturing of Sungir grave goods.

I interpret the Sungir data as implying that status hierarchization was in existence on the Russian Plain some 24,000 years ago and that some individuals, regardless of their age, occupied higher positions of status than others. Thus, at Sangir, both a 7-9 year old boy and a 9-12 year old girl received as many grave goods as an adult male buried with them. Bender (1982) has recently argued that the seeds of social inequality may lie in the control of access to social and ritual knowledge. In light of her observations, I suspect that the association of labor investment with the ritual act of burial at Sungir indicates that social differ-

ences marked in the burials were associated with some sort of ritual control. While much work remains to be done to ascertain the exact nature of these high status positions, the age of the two adolescents buried elaborately at Sungir argue for such an interpretation. It is also interesting to note that the three deceased at the site all border full and productive adult status--the youngsters are sub-adult and the male is aged. I thus argue that these burials suggest an association of high status positions with the control of ritual knowledge and that this control was taking place on the Russian Plain during the early period of occupation.

Sites dating younger than 18,000 BP, on both the Russian Plain as a whole and in the study area itself, have not yielded any examples of burials accompanied by burial goods. At the same time, the study sites, and especially complex base camps, contain a variety of exotic and special items that I have indirectly associated with status demarcation. I argue here that if we accept the role of exotics and decorative objects as status markers, then both their restricted distribution at complex base camps, as well as their association with long-distance exchange networks suggests that, in time, positions of status were no longer associated with ritual mortuary behavior, but also with the behavior of the living. Such an emerging "secularization" is most clearly seen in the long-distance exchange networks that spanned the area during the late period. While these exchanges were, in all probability, heavily cloaked in sacred

justification and ritual, they were clearly also affairs of the living, manipulated and controlled by just some of the living.

b) Relationships of Production

(1) Specialization

My examination of burials indicated that some specialization in production may have been present during the early period of occupation. Data from the late sites in the study area proper, indicate an increase in this specialization through time. While it can be argued that specialized bead production, if it existed, may have existed well east of the study area, data presented previously both on the specialized exploitation of fur bearers as well as on the procurement of exotic materials come from the study area itself. In addition to exotics and fur bearers, I suggest that specialized production of blades can also be projected from the data on hand. Information on the numbers of blades and blade fragments and nuclei per site has been offered in Table VI-7 along with blade:nuclei ratios and arcsine transformed values for these ratios (see Chapter VI for a discussion of these transformations). I have shown that two types of sites can be found during the late period of occupation--those with high ratios of blades:nuclei where 4 times as many blades: nuclei are found as well as those with low ratios ($N = 18$, $z = 5.04$, $p. = 0.0001$, see Table VI-2). I have also identified sites with low blade:nuclei ratios as those where blade manufacturing predominated and those with the high ratios as

sites where blade use predominated. Ten sites shown in Table VI-7 have low ratios: Chulatovo I, Chulatovo II, Fastov, Kurovo, Novgorod-Severskii, Bugorok, Pogon, Pushkari I, Pushkari II, and Timonovka I. The regional north-south breakdown on the distribution of high and low ratio sites per area shows that of the 19 sites in the north, 10 (53%) have low ratios and 9 (47%) high ratios. In the south, 1 (17%) site has a low ratio and 5 (83%) high ratios of blades:nuclei. The sizeable presence of blade manufacturing sites in the north is to be expected, given the localization of superior flint outcrops in the north. It will be recalled from Chapter VI that all lithic workshops recognized are located in the north.

Sites with low ratios have, by and large, been identified in Chapter VI as warm weather occupations. The only exceptions to this are Pushkari I and Timonovka I, both of which I have classified as simple base camps occupied during the cold weather months. Table VII-3 presents the results of various comparisons in the distribution of blades:nuclei ratios between the different types of sites. While no regional north to south differences were observed between the high ratio sites ($N = 8$, $z = 0.47$, $p. = 0.36$), a significant difference is present between the north and south low ratio sites ($N = 10$, $z = 2.69$, $p. = 0.01$). I explain higher ratios in the north as resulting from greater availability of superior outcrops and less economy in its use in the north. If we remove the known lithic workshops from our sample, because

these are predominantly found in the north and reflect just the geomorphological realities rather than human behavior, we see that no regional differences can be observed between northern and southern sites ($N = 15$, $z = 1.38$, $p. = 0.15$). At the same time, significant differences can be seen between low ratio non-workshop sites in the north and in the south ($N = 6$, $z = 2.77$, $p. = 0.008$), and no differences between the southern Fastov with low blade:nuclei ratio and northern lithic workshops ($N = 3$, $z = 1.84$, $p. = 0.07$). No differences in the ratios can be observed between cold weather northern and southern base camps ($N = 8$, $z = 0.96$, $p. = 0.25$), but a very significant difference exists between warm weather northern and southern base camps ($N = 4$, $z = 13.19$, $p. = <0.0001$). Finally, no differences were found either between the ratios of northern cold and warm weather base camps ($N = 7$, $z = 1.11$, $p. = 0.22$) or between southern cold and warm weather base camps ($N = 5$, $z = 0.96$, $p. = 0.25$).

Since I have previously argued in Chapter VI that 1) no significant differences existed in the sizes of co-residential units between the warm and cold weather base camps, 2) a full range of procurement and manufacturing activities went on at both cold and warm weather base camps, and 3) northern warm weather base camps may have been occupied longer than their southern equivalents (or a subject of more reoccupation), the magnitude in the differences of blade:nuclei ratios between northern and southern warm weather base camps appear most interesting. In this

discussion I assume a steady year-round demand for blades that would be about equal at both northern and southern warm weather and cold weather base camps and would vary only as a result of either population numbers of duration of occupation. Given this assumption, I interpret the prevalence of low blade:nuclei ratios at northern warm weather base camps as suggesting specialized procurement and production but not use of blades at these locales. These regional differences become even more pronounced if we add northern lithic workshops occupied in warm weather months to our northern sample ($N = 8$, $z = 28.62$, $p. = <0.00001$).

The possible existence of at least seasonal specialization in blade production at warm weather northern sites leaves open the question of the final destination of these blades. I suggest that some of these blades may have found their way through exchange networks to southern sites. Such possible seasonal specialization suggests additional labor demands for the curation and transport of blades. In this discussion I leave open the question whether this specialization was seasonal for the whole co-residential unit (for a particular age and sex category within this unit), or if it was individual specialization by just a few members of the unit. Quite clearly, all of these questions will have to be considered before I can unequivocally demonstrate specialization in blade production on the Upper Paleolithic Central Russian Plain. In addition, and more importantly, the source of origin of both northern and southern lithics will have to

be firmly established. I argue here that the evidence I have presented, while both ambiguous and inconclusive, does indicate a possibility of specialization in blade manufacturing, and that more significantly, it only comes from sites occupied late in the study area.

Finally, in all three examples of possible specialization in production during the late period, I have only been able to demonstrate this specialization per site rather than per individual or per household. Admittedly, such site specific accumulation could also have resulted from cultural and social practices unrelated to specialization in production. I also realize that the sample sizes I worked with are quite inadequate and that my chronological controls are problematic. In spite of all these problems both in the data base as well as in methodology, I argue that I have made a reasonably strong case for at least some specialization in production and that I have demonstrated an increase in such specialization through time.

(2) Control of Labor and of Resources

While part-time specialists are known from the ethnographic literature on hunters and gatherers, the ability to control labor has traditionally been seen as a feature of hierarchically organized sedentary groups (see Lightfoot and Feinman 1982 or Peebles and Kus 1977, for example). Admittedly, we do have ethnographic evidence for control of labor from complex and non-egalitarian hunters and gatherers (e.g. the Northwest Coast), and Bender's (1978, 1982) work

clearly indicates that nascent forms of labor control should be anticipated when working with any but the simplest hunter-gatherer groups.

Archaeological data from the study area on both storage pits and on the construction of mammoth bone dwellings indirectly argue for the existence of some sort of control of labor on the Upper Paleolithic Great Russian Plain. Specifically, if we assume that unequal distribution of resources accompanies hierarchization, then the distribution of storage pits at some of the sites can be brought in to bear on the discussion. Unfortunately information on the contents of storage pits is most incomplete and does not permit me to compare storage volume per dwelling or per site to each other. Data however, are available on the location of the pits at some of the sites in relationship to the different dwellings at these sites--these are illustrated for Radomyshl' in Figure II-24c, and for Dobranichevka in Figure II-11c.

The identification and distribution of storage pits at Mezin is a more difficult problem. As I noted in Chapter II, Shovkoplyas actually excavated only one of the five possible dwellings extant at the site, and his plan for the site presented in Figure II-19c illustrates his archival reconstruction of dwelling complexes 2 to 5. On his plan, published in his 1965 monograph, Shovkoplyas did not depict the location of the 7-8 pits he excavated because five of them lay directly below the hearths that surrounded dwelling #1, and the others were found in some cases up to 60 cm.

below what he considered to have been the living surface of the site. The location of these pits is illustrated in Figure VII-8.

Compounding the problem at Mezin is the fact that Shovkoplyas did not reconstruct any pits surrounding dwellings 2 to 5. On his floor plan he did denote the presence of bone accumulations or bone heaps around some of these dwellings. Since he was working with archival field notebooks and excavator diaries that, in some cases, dated back to the beginning of the twentieth century, where data on the vertical provenience of the finds was lacking, it is understandable that Shovkoplyas demured from considering bone accumulations as storage pits. As Table II-6 indicates, both surface bone heaps as well as storage pits are present at other sites in the study area--a fact that also does not permit an assumption that any past excavation of bone accumulations, ipso facto, had unearthed storage pits.

If, for the purposes of this discussion, we assume, as I have done heretofore, that only 7-8 pits were present at Mezin, then 6 out of these were located in a semi-circle from 1-2 meters from dwelling #1. If, on the other hand, we include surface bone accumulations surrounding dwellings 2 through 5, then the total of 19 surface and/or subterranean bone accumulations depicted in Figure VII-8 are associated with the following dwellings:

dwelling number	total number of associated bone accumulations
1	9
2	2
3	4 (?)
4	2 (?)
5	none

I have placed question marks after estimates for dwellings #3 and #4 because their proximity to each other does not permit a clear distinction in the association of at least two bone accumulations. One to two storage pits and one bone accumulation depicted in Figure VII-8 were found on the periphery of the site not associated with any one of the dwellings.

For Gontsy Sergin (1983) has demonstrated conclusively that the 5-6 storage pits excavated at the site all bracketed just one of the two possible dwellings found at the site (Figure II-13C shows three of these pits, Sergin's 1976 through 1981 work on two other pits around this dwelling have not been published yet and are not included in this figure). Finally, Grehova (1983, personal communication), who is currently preparing a monograph on Eliseevichi, after working with archival sources, states that the more than five storage documented at the site also surrounded only one of the dwellings there (see Figure II-12C, Grehova is arguing that the dwelling surrounded by pits was located in squares a-D 36 to 38).

Past excavations at Mezhirich, unfortunately focused on unearthing the dwellings themselves and not on investigating the living floors adjacent to the dwellings. Because of this past bias we simply do not know how many storage pits were

located at the site nor how they were distributed. Current work at the site is uncovering large areas of the living floors adjacent to dwelling #4 and should, in time, supply information pertinent to this discussion.

Comparing the distribution of storage pits to dwellings at these sites shows that three patterns are present:

1) central location of the pit between the dwellings at Radomyshl'
2) fairly equitable distribution of pits around the dwellings at Dobranichevka
3) clustered distribution of pits predominantly surrounding one dwelling at Mezin, Gontsy, and Eliseevichi.

As I noted in a discussion of storage pits in Chapter V, the chronological change in pit use throughout the life of a site or dwelling resulted in some pits containing solid packed bone while others held remains of just a few bones suspended in a loss matrix at the time of excavation. Sergin (1983) has likewise suggested that at least during the last stages of occupation at some sites, some pits may have been refuse pits while others served as storage facilities.

If we assume that all of the pits initially served as storage facilities and some turned into refuse pits only later, then the distribution of pits at the late sites suggests that an unequal distribution of resources existed at some sites. This become especially apparent if we compare pit location at Radomyshl', occupied early, to that at the

late sites. The central location of Radomyshl's pit argues for open, visible, and equal access to stored resources for all the inhabitants of the site. Resources at Dobranichevka, on the other hand, were distributed around each dwelling, and this distribution implies a restriction of access to the pits limited to the residents of the dwelling only. The fairly similar numbers and sizes of pits surrounding each Dobranichevka dwelling imply that, while access to resources was controlled by each household, the amount per household was fairly equal. The concentration of 6 of 7-8 Mezin pits (or of 9 out of the total of 17 heaps and pits) around one dwelling suggests that household #1 at Mezin controlled more than their fair share of the resources at the site. Similar interpretations can be suggested for Gontsy and Eliseevichi as well.

A chronological comparison in pit distribution through time appears to suggest that control of resources changed from open and accessible to all to fairly equal but restricted to each household at simple base camps (i.e. Radomyshl' and Dobranichevka). In other cases, most clearly seen at complex base camps such as Mezin and Eliseevichi, in time resources may have come not only under the control of each household or dwelling, but also became unequally distributed among the households.

I am aware that the problematic and ambiguous nature of my data base, as well as the unit of analysis I used in this exercise, are all fairly controversial and that pit location

alone is a poor indicator of unequal resource distribution. A number of different behavioral sequences totally unrelated to the control of resources could also have produced a same pattern. A multiple re-occupation of some dwellings and singular occupations of others, for example, could have resulted in more pits around those dwellings that were re-occupied more frequently. It could be also argued that since I assumed a mean value of $2m^2$ of dwelling space per person in my population estimates per site (see Chapter VI), that larger dwellings were occupied by larger numbers of people. If more people lived in the larger dwellings, then it can be anticipated that larger dwellings would have had more storage pits associated with them. The magnitude of the differences in pits and/or bone heap distribution between the dwellings at Mezin argues against population size as the only determinant of pit distribution. Mezin dwelling #1 measured 20 m^2 in area and had 6 storage pits and 9 pits and heaps around it, while dwelling #3, measuring 28 m^2, had no pits and only 4 bone heaps around it. This information however, come from only one site, and while being suggestive, does not eliminate alternate hypotheses. As before, I argue that while the distribution of storage pits around dwellings alone is not sufficient enough a proof of unequal distribution of resources, this evidence together with data from other sources does warrant such a hypothesis to be proposed. I see this possible unequal distribution as yet another indirect indication that social and economic hierarchization was taking

place on the Upper Paleolithic Central Russian Plain.

Lastly, additional indirect evidence for hierarchization can be also observed in the architectural construction at complex base camps. I suggest that both site planning evident at Mezhirich (i.e. the conceptual unity in the selection and use of the different mammoth skeletal elements per dwelling) as well as in the use of the principles of symmetry, mirror imagery, and rhythmic repetition at Mezhirich and Yudinov argue for seeing these sites as Late Pleistocene combinations of both public works and monumental architecture.

While the contemporaneiety of the dwellings at these sites is till to be clarly demonstrated, Pidoplichko (1976) has noted that bones belonging to the same mammoth were used in different dwellings at Mezhirich. This fact together with the site wide planning evident at Mezhirich argues for seeing Mezhirich at least, as a conceptual and architectural entity that came into being as a total entity. Similar patterning, as I noted earlier, appears present at Yudinovo as well, and I suspect that it was also present at the other complex base camps excavated earlier. If we take human labor as a gauge, we can see that three times as much labor went into the construction of these complex base camps as into the construction of simple base camps (see Figures VI-16,17). While the 14.5 days of labor for 10 men I postulated for Mezhirich and 16 days for Mezin do not approach the kinds of massive labor investment estimated for monumental architecture of more complex societies (see Coles 1979, for example),

I argue here that they are indeed impressive investments for hunters and gatherers, and qualify as examples of Late Pleistocene monumental architecture. Although we do not know of ethnographic equivalents for Mezhirich and Yudinovo, it does not mean that such architectural feats were not a part of hunter-gatherer adaptation in the past. The recently discovered Whalebone Alley on Yttygran Island in Siqlluq Bay, located off the Bering Straits and dating to the XVII century Eskimo occupation, indicates that such monumental constructions may have been more frequent for hunters and gatherers in the past than we have suspected.

Both the labor investment seen at such sites as Mezhirich and Yudinovo, as well as the stylistic encoding of social information in these constructions indicate behavior more compatible with hierarchically organized societies than with egalitarian ones. As both Peebles and Kus (1977) and numerous investigators after them have pointed out, this sort of directed mass labor investment is an archaeological equivalent of social complexity beyond that modeled for egalitarian groups. The planning and labor co-ordination necessary for such projects as Mezhirich, implies that some form of leadership was in existence and suggests a hierarchical socio-political organization. Thus, I offer data on Mezhirich and Yudinovo constructions as yet another line of evidence for hierarchization in the study area during the Upper Paleolithic--particularly during the late period of occupation.

In conclusion then, in this section I have suggested that: 1) possible specialization in the production of beads, procurement of exotic materials, in the exploitation of fur bearers, and in the production of blades went on in the study area, 2) status positions were marked by decorative objects and exotics, 3) there may have been an unequal distribution of resources at some of the sites as measured by the rotation of storage pits and bone piles, and 4) Late Pleistocene equivalents of monumental architecture existed in the area. I have interpreted the sum total of this evidence to indicate that hierarchization was present in the area, that this social differentiation was more readily seen during the late period of occupation, and that a secularization of hierarchical positions can be observed through time. I have also shown that both clearer and more redundant evidence for hierarchization comes from the late period of occupation. It is during this second period that we see hierarchization associated with an unequal distribution of resources and with mass labor efforts in monumental architecture.

2) Increase in the Size of Basal Units

Johnson (1983) has noted that an increase in the size of the basal organizational unit is another systemic solution to problems of scalar stress. He notes that in simple human social systems this can mean changing from the nuclear family to the extended family as a basic co-residential and co-operating unit. Archaeological data from the study area indicate that this second solution may have also been

instituted during the late period of occupation. In Chapter VI I both estimated a mean value of 2 m^2 of dwelling space per individual and showed that two sizes of dwellings were present at the sites: large ones measuring over 20 m^2 and small ones under 13 m^2 in area. Table VI-38 showed that there was no significant difference in the numbers of dwellings found at the sites through time ($N = 11$, $z = 1.01$, $p. = 0.24$). A comparison of mean dwelling size between simple and complex base camps showed that the 21.52 m^2 observed at complex base camps was significantly greater than the 15.63 m^2 per dwelling at simple base camps ($N = 36$, $z = 2.03$, $p. = 0.05$). I have already noted previously that complex base camps were an inherent feature of the late period of occupation and that these types of cold weather occupations were not found among the early sites.

At the same time that both early and late cold weather base camps contain both large and small sized dwellings (see Table VI-16), large sized dwellings are strongly associated with the late period of occupation (ϕ coefficient of association = +0.41, $p. = 0.02$ calculated by Fisher's Exact Test). In fact, if we eliminate the problematic Berdyzh second dwelling from consideration (the area given for this dwelling in Table VI-16 is a questionable 45 m^2), we see that all of the large sized dwellings date only to the late period. I interpret this increase in dwelling size through time to indicate a change in the size of the co-residential units. I further suggest that this increase in size can be best

understood as a change from the nuclear family to the extended family as a minimal unit of social and economic organization. It is interesting to note that these extended families, presumably occupying the large sized dwellings, are especially associated with complex base camps. As Table VI-16 shows, all of the complex base camps have large sized dwellings. At the same time, however, large sized dwellings are also found at what I have identified as simple base camps (e.g. Gontsy, Kirillovskaya). At other simple base camps, such as Dobranichevka and Pushkari I, only small sized dwellings have been reported. This unclear patterning in the distribution of large sized dwellings appears to indicate that extended families were not a feature of just complex base camps, but an integral organizational unit for the hunters and gatherers on the Great Russian Plain after 18,000 BP.

It can be argued that an increase in dwelling size need not reflect an increase in the size of the family, but could just reflect hierarchization itself. Specifically, given hierarchization of status positions in the study area, we could anticipate that families of higher status individuals could have resided in larger dwellings than families of low status ones. Data on the dwelling size and on the distribution of storage pits and bone heaps at Mezin, for example, could be used for just such an argument--one that sees the Mezin dwelling #1 occupied by a nuclear family of a high status individual who controlled a good deal of the resources

stored at the site. In order to evaluate these two hypothetical explanations--1) that large sized dwellings housed families of high status individuals, or 2) that larger sized dwellings housed larger extended families--I examined the relationship between house area and numbers of interior hearths. If we assume that there is a rough relationship between a number of occupants and the number of interior hearths per dwelling, then we should find no relationship between house size and hearth numbers if the first hypothesis is correct. A positive relationship between these two variables, in turn, would favor the second hypothesis.

Table VII-4 lists both dwelling sizes as well as the numbers of hearths found per dwelling per site. In this table I have treated Pushkari I as a site with three small dwellings and listed area estimates for Yudinovo dwellings #1 and #2 as mean values (see Table II-6 where areas for these dwellings are given as ranges). Similarly, I listed 1.5 hearths present in the Suponevo #2 dwelling where 1-2 interior hearths were reported. Pearson's Coefficient of Correlation between areas of dwellings and hearth numbers can be found in Table VII-5. As that table indicates, there is a strong positive correlation between these two variables at the sites occupied late in the study area ($N = 20$, $r = +0.61$, $p. = 0.01$). A positive correlation also exists between these two variables if we include both early and late sites in the calculation, although data from the one early site, Berdyzh, lower both the correlation ($N = 22$, $r = +0.40$) as well as the

level of significance (p. = <0.1 > 0.05). Information on Berdyzh, however, as I noted before (see Chapter II), is quite problematic and Budko's (in Budko et al. 1969a, 1971) reconstructions of dwelling areas may be quite erroneous. Overall, I interpret the test results reported above as confirming the second hypothesis--that larger sized dwellings were occupied by larger numbers of people than the small ones. The association of large sized dwellings with more numerous hearths with the late period of occupation indicates that, an increase probably occured through time in the size of the basal unit of socio-economic organization.

Although Johnson (1983) offered both hierarchization and an increase in basal unit size as equally viable and separate solutions to problems of scalar stress, data from the study area suggest that an interesting sequential relationship may exist between them.

B. Settlement Hierarchies

In a discussion of settlement types on the Upper Paleolithic Great Russian Plain in Chapter VI, I have shown that different types of base camps existed in the study area and that some showed a wider range of activities than others. In this section I will examine the significance of these differences as they relate to socio-political integration. Johnson (1977) has suggested that a range in activities can be used as a measure of the relationship of sites or settlements to each other and has termed this measure settlement function size. A comparison of the same type of sites to

each other in function size can reveal whether sites are in a hierarchical relationship to each other or are each other's exact equivalents. For Johnson, as well as for Peebles and Kus (1977) and Renfrew (1983), clear cut settlement hierarchies are characteristic of ranked societies, while egalitarian ones are expected to show a lack of such structuring in regional settlements.

Data on settlement types in the study area clearly indicate a seasonal difference in function size--cold weather base camps show a wider range of activities present than do the warm weather ones. Storage behavior, for example, is only evident at cold weather base camps, as is the specialized procurement of fur bearers, and site-wide architectural planning. While such seasonal differences in activities performed find analogues in the ethnographic record of egalitarian groups (see, for example, Mauss 1966), the differences observed between the activities at simple and complex cold weather base camps suggest the existence of settlement hierarchies and dictate a closer look at the functional relationship of these two types of sites to each other.

Summarizing briefly the evidence on these differences, discussed both in Chapter VI and this chapter, I noted: 1) a much greater density of status goods, 2) specialized procurement of fur bearers, 3) evidence for planned architectural constructions, and 4) the presence of larger sized basic socio-economic units at complex base camps. As I noted in

Chapter VI, no differences were found in subsistence-related behavior between these two types of cold weather base camps. Complex base camps differed from simple ones because additional social and ritual behavior was in evidence there. In brief, I identified complex base camps as 1) the nodes of long-distance exchange networks, 2) residential locales of high-status individuals, 3) residential locales of extended families, as well as 4) locales of elaborate architectural activities requiring the co-ordination of sizeable labor forces. Given these differences, it could be argued that the co-existence of both simple and complex cold weather base camps indicates a hierarchical relationship between these sites, and, indirectly, suggests that we are observing a presence of ranked socio-political organization in the area.

Working primarily with "small and simple" paradigms, archaeologists dealing with hunters and gatherers have implicitly assumed the absence of any hierarchization in settlements (see Binford 1982b; Jochim 1976; Price 1981, for example). In fact, however, a brief look at the ethnographic literature on logistically organized north-latitude groups reveals that significant differences are present in settlement types. Thus, for example, both Spencer (1959) and Nelson (1971) describe the co-existence of both small and large winter villages. The latter had greater numbers of wealthy individuals, had more dance houses, and hosted more often various large festivals such as the Messanger Feast or the Great Feast of the Dead. We can anticipate that such

settlements would leave behind a richer and more diverse archaeological record than the small villages and that these differences would reflect ritual behavior as well as economic differentiation at the larger villages.

Arguing theoretically, Wobst (1974, 1976) has shown that in egalitarian societies distributed hexagonally over the landscape, centrally positioned groups would have locational advantages in both mate and information exchange. Flannery (1976a) and Reynolds (1976) have shown that in linearized settlement systems travel distance alone would favor centrally located settlements and would result in their being larger. As Johnson (1977:492) wrote:

> I suspect that initial differentiation of settlement function size may often be related to social and only indirectly to subsistence factors.

We can translate all of these observations as indicating an innate advantage to central location, one that would be expressed in material correlates and function size. Finally, Johnson (1977) identified these central settlements as nodes of exchange, ritual behavior, and residences of high status individuals.

In light of both ethnographic and theoretical evidence, I conclude that: 1) functionally differentiated settlements can and do exist among egalitarian groups, and 2) that the mere presence of settlement differentiation is an insufficient measure of non-egalitarian socio-political organization in prehistoric groups.

Data from the study area indicate that complex cold

weather base camps are only known from the late period of occupation, after strong linearization of the settlement system had taken place. Figure VI-5 depicts the location of these late complex base camps. As noted in Chapter V, depending on different chronological assumptions, various hypothetical explanations can be offered for the distribution of these sites. Lacking firm chronological controls, however, I can offer little beyond speculation about the synchronic relationship of these sites to simple cold weather base camps. Quite clearly, given the linearization of the settlement system, one can argue that linearization itself selected for this differentiation--in other words, that complex base camps represent just fortuitously located sites. This explanation, however, does not take into account data on social differentiation found only at complex base camps. As I noted earlier in this chapter, high status individuals residing at these camps appear to have been able to partially control labor, exchange, and ritual behavior. Since both such controls and the residence of high status individuals was localized at complex base camps, this can be used as evidence of settlement hierarchization--albeit only if one assumes a contemporaneiety of occupation at both simple and complex sites. It is possible, on the other hand, that complex base camps reflect very temporary and rare prehistoric behavioral events that were not permanently associated with particular types of sites. Such situational association would have also produced the sort of archaeological patterning found in the

study area. Quite clearly the issue cannot be resolved at present and must await future chronological information. This is because a synchronic existence of hierarchically related or nested settlements must be demonstrated--something that cannot be done today.

While the demonstrated existence of 1) social hierarchization, 2) differential distribution of resources, 3) public works or monumental architecture, and 4) long-distance trade suggests that we are indeed dealing with hierarchically organized groups, this evidence is suggestive rather than conclusive at present. Simply stated, I suggest that we are monitoring something akin to a middle ground between egalitarian and ranked socio-political organization in the archaeological record of the study area after 18,000 BP. At times, this hierarchical organization may have been coupled with economic inequality as well. At present, however, given standard evolutionary models for subsistence behavior and socio-political organization, I cannot claim with any certainty either egalitarian or ranked organization on the Upper Paleolithic Central Russian Plain. Rather, what this chapter is repeatedly indicating, is a set of Upper Paleolithic economic, social, and political behavior too complex for egalitarian groups, as we have modeled them, and too simple for ranked societies. I will return to these issues of theory versus archaeological record in the concluding chapter of this work.

V. RITUAL BEHAVIOR

Past ideologies and ritual behavior is possibly the most difficult of all to document unequivocally. The material correlates of this behavior, ones Binford (1962) terms idiotechnic artifacts, are very elusive and have been the subject of great abuse in archaeology. This variable has received the least attention from archaeologists and very little work has been done on identifying clearly and unambiguously the material correlates of this behavior. All too often we have tended to categorize all unidentified objects as ritual or cult artifacts.

In this discussion I will assume, after Rappaport (1971) that ideological beliefs are manifest in ritual activity. I will therefore focus on material correlates of ritual activity as these appear in the archaeological record of the study area. Ethnographic literature on ritual behavior of hunters and gatherers documents a range in behavior from simple one-person curing ceremonies to more complex and more organized communal ritual feasts (see, for example, Boas 1964; Nelson 1971; or Spencer 1959). Archaeological data reveal a myriad of other ritual activities in the past that are poorly understood today--such as those associated with the construction and function of Eskimo Whalebone Alley in the Bering Straits reported by Arutyunov et al. (1982), or bison kills in the high plains investigated by Frison (1978).

Ritual behavior, as Flannery (1976a) and Rappaport (1971) have discussed, functions on multiple fronts--it reinforces

group solidarity, regulates man-land relationships, transmits social and ecological information, helps redistribute resources, etc. Rappaport (1971) noted that rituals, aside from serving integrative functions, also maintain and perpetuate social asymmetry. He wrote:

> ...To invest social conventions with sanctity is to hide their arbitrariness in a cloak of seeming necessity (Rappaport 1971:36).

Root (1981) has gone on to suggest that ritual acts both hide and legitimize inequality. Bender (1982) states that the ability to manipulate ritual knowledge carries with it a potential to control both production as well as social reproduction. Thus it is clear that ritual behavior functions along two trajectories--the sacred and the secular. The roles it plays in the secular realm are the ones that we can expect to see and recognize in the archaeological record (but see Hodder (ed) 1982 for differing views). I will focus on the effects of ritual behavior on the secular realm and consider some of the recognizable material correlates of ritual practices in the study area.

As noted earlier, archaeological evidence for ritual behavior is difficult to delimit. Implements associated with ritual behavior, while often fairly distinct in the ethnographic present, become muted in the archaeological record. While archaeologists in the past have claimed ritual status for a given category of items, time and additional research tended to reveal the uncertainty of such identification (e.g. the history of "bâton des commandement", debates over the

function of cave art, etc.). Some Soviet researchers have claimed ritual status for particular artifacts found at the study sites. Bibikov (1981), for one, has insisted that both the ivory bracelets as well as painted mammoth bones at Mezin were ritual musical instruments. The anecdotal foundation for such claims, as well as our inability to adequately evaluate such hypotheses at present, lead me to eliminate from this discussion all possible partable ritual artifacts. Instead, I will focus on two features traditionally identified with the ritual and ideological spheres: burials and monumental architecture (see Binford 1971 and Fritz 1978, for example).

In a previous discussion of both burials and monumental architecture, I treated them as conveyors of corporate information. Here I will also consider them material expressions of invested labor. After Root (1981, 1983) I see burials as "dumps" of controlled labor. While both burials and monumental architecture certainly reflect the ability to control or marshall labor, I argue that they differ in the manifestation of such control. I suggest that, in the case of burials, labor control is visibly exercised during the internment ritual itself, but is then taken out of public view and concealed. The burial of this labor investment effectively decreases the conscious realization of social asymmetry. In short, elaborate or rich burials spotlight hierarchical social relationships prior to and during the internment itself. This public manifestation is then

concealed from everyday view under the ground. Such practices, when not accompanied by visible and permanent above-ground reminders (e.g. menhirs, stelae, or earthworks) I would argue, are associated with early stages of hierarchization in socio-political relationships. I argue that, given societal strains that accompany social asymmetry noted by Keene (1983), hierarchical social differentiation initially will be less overt than after such differentiation becomes fully entrenched in the social matrix. Such differentiation will be revealed and sanctified during occasional events or ceremonies but will not be present and apparent in everyday life. I, therefore, suggest that burials present ideal ceremonial events for marking of this incipient social differentiation--they are occasional events which leave no above-ground permanent reminders of social differentiation.

Monumental architecture or public works, on the other hand, are permanent visual reminders of social differentiation. They are expected to occur after social differentiation has been fully established and possibly after it became accompanied by some degree of economic differentiation as well. Following Flannery's (1976a) and Drennan's (1976) distinction between ad hoc or situational and regular or time-dependent rituals, I would argue that burials are situational rituals while monumental architectural projects reflect time-dependent ones.

Burial data from the Russian Plain presented in an earlier section of this chapter suffer both from small sample

size as well as distance from the study area proper. As noted earlier, internments dated to the early period of occupation show a much greater labor investment than do the late burials. I interpret this as showing an association of ritual behavior and fairly incipient social differentiation. These early burials reflect the ability of some individuals to manipulate and control ritual and social knowledge. This ability was visibly demonstrated in a ritual context, but the end product--the internment--removed its manifestation from daily life. The miniscule size of the burial population, one totally inadequate to have equitably met the needs of the entire population, indicates that the internment ritual was selectively bestowed only on a very small part of the population. This, in turn, argues for the association of status positions with the ability to control both ritual knowledge and ritual behavior.

While sites occupied early do not show any visible above-ground evidence for the co-operative labor of numerous individuals, late sites, particularly complex base camps, do indicate such practices. Gladkih and Kornietz (1983) have convincingly argued that the highly patterned architectural details seen both in individual dwellings, as well as in the relationship of the dwellings to each other at Mezhirich, reflect past aesthetic and ritual behavior. If we accept Mezhirich (and possibly Yudinovo) constructions as examples of past ritual behavior, then we see that ritual behavior and co-ordinated labor efforts at these late sites became far

more permanently visible than in burials. I argue that the building of these sites represents public ritual actions that required an impressive amount of planning and co-ordination. They differ from earlier burials, which also required sizeable labor investment, because they were above-ground and more visible, and as such they functioned as daily reminders of social asymmetry for the group occupying the sites.

I further suggest that this transition in the manifestation of social asymmetry from underground and covert to above ground and overt could only come about after status differentiation had passed the incipient stage and had become firmly rooted in the social matrix. While it could be argued that the man-hours of labor invested in early burials (I estimated 2,500 man-hours for one aspect at Sungir, for example), and in these public constructions (a maximum of 1,080 hours at Yudinovo--see Table VI-16) at late sites indicate greater labor at the former, I contend that visibility itself is the crucial variable here.

Furthermore, I interpret the sum total of chronological changes in socio-political organization and in the nature of ritual activity as suggesting that, in time, individual manipulation and control of ritual behavior became embedded in corporate ritual behavior. If, for the purposes of this discussion, we assume that both burials and public works were some sort of rites of passage, then we can monitor a change in time from individually centered rites revealed in

burials to group or corporate sites manifest in monumental constructions.

Much of this discussion, admittedly, is highly speculative and should be taken as an indication for future direction in research. Nonetheless, given the data on hand, I would argue that groups occupying the Central Russian Plain after the Valdai maximum were co-ordinated through corporate rituals and corporate ideologies. I further suggest that the emergence of ritual focus from under the ground was systemically related to greater social complexity. While, clearly, it is impossible to reconstruct exactly what form the rituals at such sites as Mezhirich took, whether they validated status positions or marked the rites of passage of some category of individuals, they appear to have been both more corporate as well as marked more visibly and permanently than the Late Pleistocene landscape.

In conclusion, this discussion has indicated a possible trajectory that ritual behavior followed through time in the study area. The speculated changes, while open to much debate, in general do correlate with the changes noted in subsistence behavior and more notably in socio-political organization.

Lastly, while differing from each other, both early burials and late constructions do indicate a marking of particular place. Bender (1982) has recently argued for the "importance of place" in prehistory, suggesting that this permanent association of a group with a particular location

may have been an important feature of complex hunters and gatherers. Such permanent marking of the landscape, either through burials or through more permanent and visible constructions bespeaks of certain territorial fidelity and of permanence of association between group and territory. I have argued here also that an increase in the marking of this association can be observed through time.

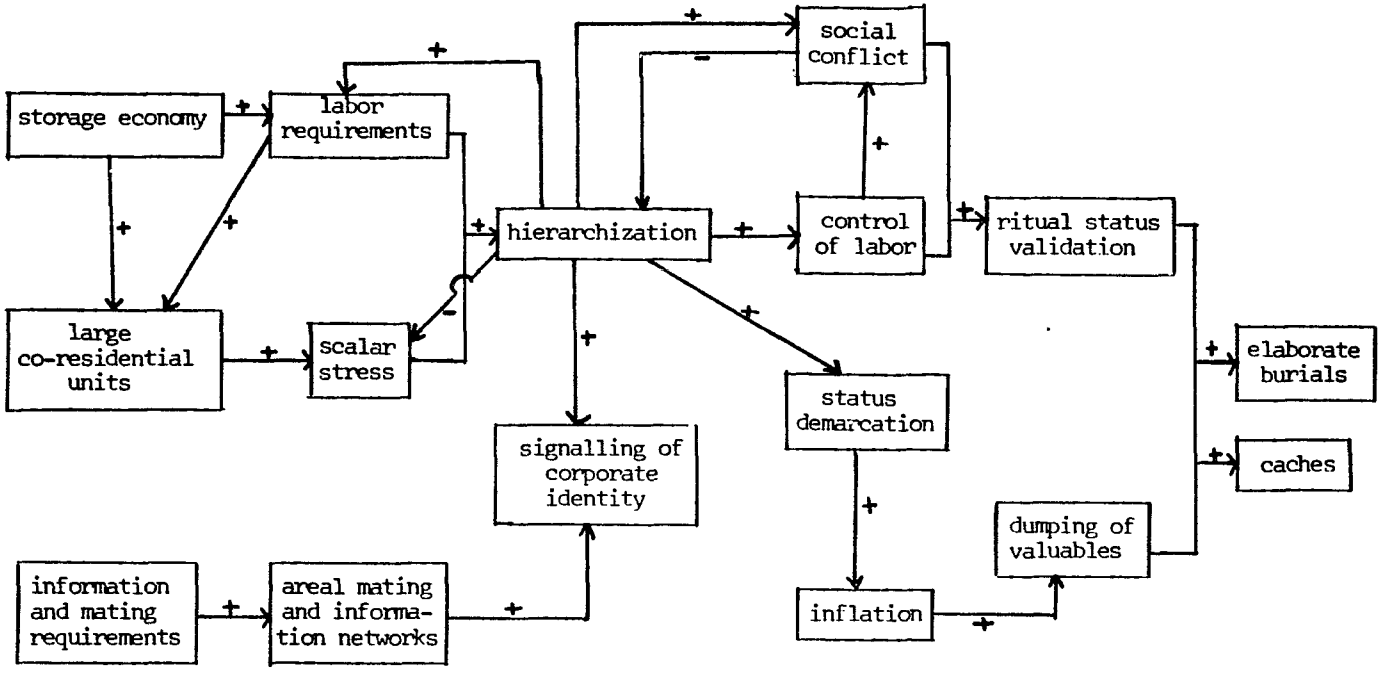
VI. SUMMARY AND CONCLUSIONS

This chapter has examined some aspects of socio-political integration on the Upper Paleolithic Central Russian Plain. The discussed components by no means constitute an all-inclusive list of important features--rather, they should be seen as an entreé into the complex and changing social matrix of Upper Paleolithic adaptations. I have shown that significant changes in man-man relationships can be monitored in the area through time. The nature and consequences of these changes are depicted in the following two diagrams--the first, for the early period of occupation, and the second for the period after the Valdai maximum.

A. The Early Period

In Chapters V and VI I demonstrated that the subsistence practices in the study area: 1) involved large co-residential units, 2) were logistically organized, and 3) were based on storage. The model I offer suggests that it is the existence of non-curated storage economy that selected for larger co-residential units. At the same time this economy also generated specific labor requirements--as

Figure A: MODEL FOR SOCIO-POLITICAL INTEGRATION BEFORE 20,000 B.P.



I argued in Chapter V, sufficient numbers of people had to be available to 1) dig the storage pits, 2) procure storable resources, 3) process the resources, and 4) lay away supplies for the cold season. This intrinsic and permanent need for manpower both maintained large co-residential units as well as resulted in scalar stress. Given the nature of the subsistence practices and storage, fissioning or dispersal was not a viable solution to scalar stress on the Great Russian Plain. I suggest that this scalar stress was alevi-ated by hierarchization--which, in turn, established high status individuals who served as labor co-ordinators and information processors.

As with all human groups, hunters and gatherers occupy-ing the study area prior to 20,000 BP, in addition to requiring energy from the environment, had also certain information and mating requirements. These requirements were met by regional mating and information networks. During the early period of occupation, these networks were fairly closed social systems, and signalled their corporate identity through curated objects such as lithics, art, engravings, etc.. It is a moot point whether this emblemic signalling arose as a byproduct of population density (suggested by Wobst 1977), or as a reaction to social or ecological stress proposed by Hodder 1979, 1981 and Weissner 1983). What is germane to the discussion is the fact that at least two such corporate groups were present in the study area between 26,000 and 20,000 BP.

In this model I suggest that hierarchization also would have selected for emblemic signalling. This is because high status individuals were socially differentiated within a particular group and it would have been to their advantage to both maintain and signal the corporate cohesion of the group. These high status individuals generated a need for particular goods that marked their social differences. As shown in this chapter, they probably supported some specialization in the manufacturing of such status items as beads. Since the type of control over production these individuals held was, at best, partial, and since status goods were made of local materials, we can anticipate that there may have also existed problems in restricting access to these goods. Being made of locally available materials, the goods both could have been manufactured by anyone as well as emassed by anyone. In addition to this, and more importantly perhaps, high status individuals also had to deal with problems of inflation or bead saturation. After all, without some means of controlling bead volume, these individuals would have found themselves oversupplied with beads and the craft specialists would have been confronted with a diminishing demand for beads. I suggest in this model that problems of this sort were resolved by burying large numbers of beads with the deceased.

It can also be anticipated that hierarchization, in addition to solving problems of scalar stress, generated new ones of social asymmetry and social conflict. Keene (1983),

for example, notes that the introduction of specialists brings for the social asymmetry at great social costs. I suggest that these social costs, manifest as conflicts, selected for ritual validation of status positions. I further argue that the mode selected to express this status validation was also one that helped cope with both the problem of inflation and of usurpation of status goods. The mode, evident in the archaeological record of the Russian Plain prior to 20,000 BP, was one of ritual burial. Both Root (1983) and Brose (1978) have argued for precisely this kind of a solution to similar social problems--theoretically in the first instance, and for the prehistoric Eastern Woodlands in North America in the second. Root (1983) also suggested that caches are another solution for problems of inflation in valuables. While these have not been found in the study area, their existence can be anticipated. I would suspect, however, that if caches are found, they will also have a heavy ritual connotation to them and contain such status goods as jewelry, portable art, fine and exotic flint pieces, etc..

In this model I argue that positions of high status during the early period of occupation were closely allied with the control and manipulation of ritual knowledge, and that this is exhibited in the burial data.

Finally, as I discussed previously, since much of the data for socio-political relationships came primarily from east of the study area, it well may be that the model offered

above is more applicable to an eastern social system that occupied areas around the Don and Sejm rivers.

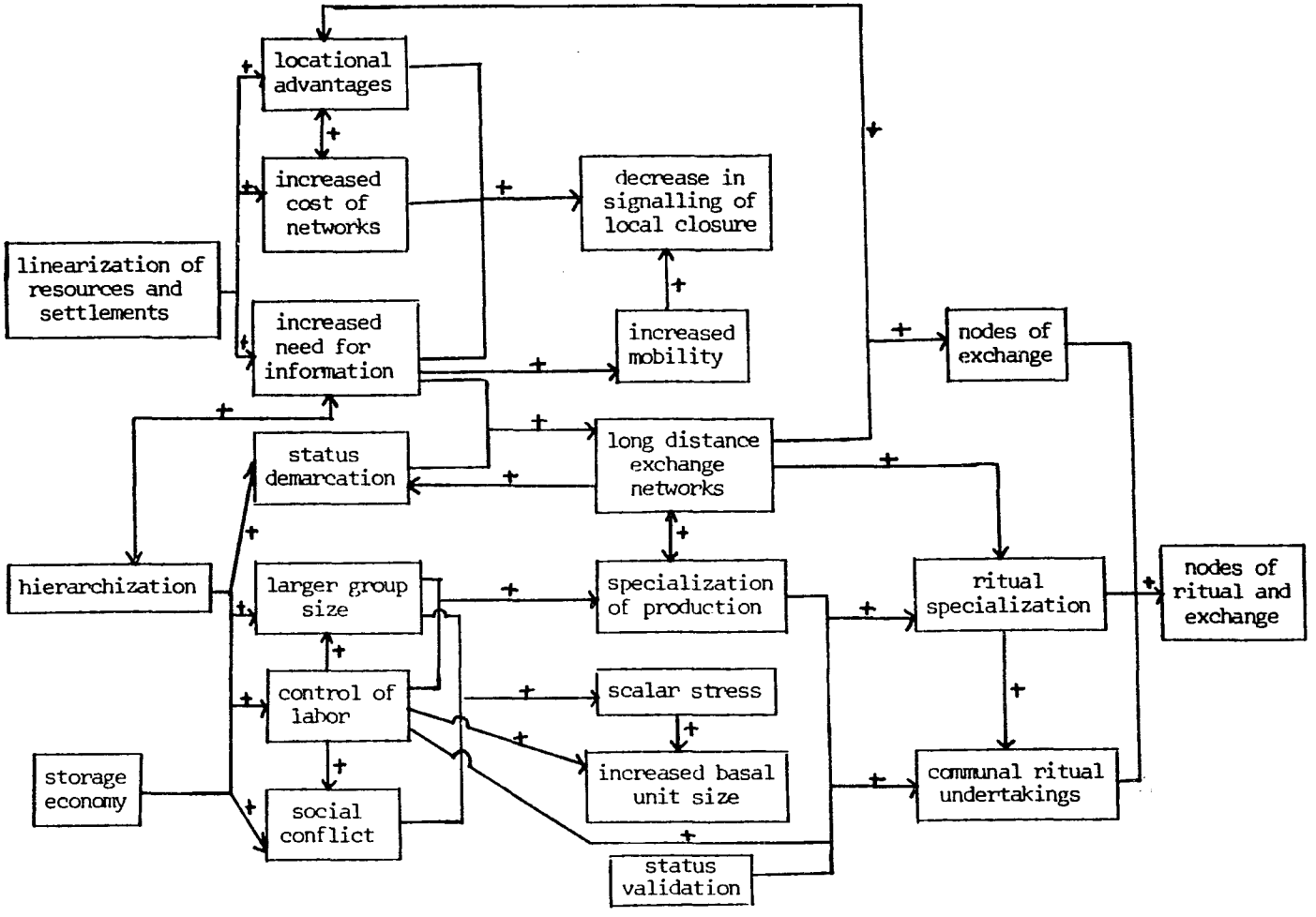
In brief, the ethnographic reconstruction I offer for the early period is one that has local autonomous and hierarchically organized social groups. High status positions in this system were occupied by ritual specialists who marked their status through an abundance of personal adornments. In all probability, these individuals are analogous to the "elders" in the ethnographic record--individuals who possess a great deal of authority, can commandeer labor for ritual purposes, but have no economic advantages over the remainder of the population.

B. The Late Period

Man-man relationships for the late period of occupation are depicted in the flow chart in Figure B below. Even though the archaeological data show an approximately 2,000 year hiatus in the occupation of the Central Russian Plain between the early and late periods, I would argue that hierarchization was already a "given" during the late period.

As discussed in Chapter V, non-portable storage was an inherent feature of subsistence practices during the late period as well. The new variable in my model, one not present during the previous period, was the linearization of the settlement system. I have argued in Chapter V that this linearization was a response to the linearization of the resources during the period of climatic fluctuations between 18,000-12,000 BP. A linear settlement system carries with it

Figure B: MODEL FOR SOCIO-POLITICAL INTEGRATION AFTER 18,000 B.P.



a number of features related purely to geometric and geographic factors. As numerous authors have argued, centrally located settlements have locational advantages in linear systems. Wobst (1976) and Moore (1979) have shown that a linearization of the settlement system increases the cost of maintaining mate and information networks. This is because in linear systems the distances between the central and outlying settlements are much greater than in hexagonally positioned ones. Since the linearization of settlements in the study area was related to an increase in environmental variability and unpredictability, I would argue that it was also accompanied by an increased need for information. This need was to monitor greater linear expanses both in the northern and southern extentions of the study area. For example, I have argued for the north-south migration of the main food resources during the post-Valdai period. Such linear resource mobility would require tracking or monitoring over longer distances. The model offered here posits that all three of these factors, locational advantages of some groups, the increased cost of maintaining social networks, as well as an increased need for information, would jointly select for decreasing local autonomy and result in a decrease of local emblemic encoding of corporate information in curated objects.

Increased need for information would, in this perspective, both select for a slight increase in mobility noted at the late sites, as well as re-enforce hierarchization. The

presence of high status individuals with their requirements for restricted status goods, as well as the increased need for information, would favor the development of long-distance exchange networks. These ties would both provide the needed information as well as supply exotics for status demarcation.

Hierarchization, in and of itself, as Bender (1981, 1982) has argued, would 1) favor an increase in the size of the co-residing unit, and 2) allow for the manipulation and control of labor. Control of labor (even a partial one) together with larger group sizes, in turn, would further select for an expansion of specialization of production--some of this specialized production would have been directed towards fueling the long-distance exchange networks. Larger group size, noted at the late sites, together with social conflict stemming from hierarchization, would create additional scalar stress. I argue here that both this added scalar stress, as well as labor demands exerted by hierarchization would, in turn, have favored the expansion of basal unit sizes and resulted in a change from the nuclear to the extended families.

Whether this increase was universal or occured primarily among the families of high status individuals remains to be investigated. Bender (1981, 1982) has hypothesized that high status individuals would exert greater demands on household production and thus stimulate a growth in the sizes of all households. Sahlins (1972), on the other hand, has noted that families of "big men" and petty chiefs are more

productive and larger. Data from the study area are ambiguous on this question--they suggest, however, an association of larger households and status. Thus, for example, at simple cold weather base camps such as Dobranichevka, we have only small households, while at Mezin or Mezhirich, the locus of high status individuals, we have both small and large households. The resolution of this question, like that of many others raised in this chapter, must await further work on temporal and spatial relationships between simple and complex cold weather base camps.

Since status differentiation during the late period appears to have been associated with an unequal distribution of resources as well--we can anticipate that this social and economic asymmetry would have generated added social conflict. It would have selected for some ritual or cultural means of validating the favorable positions enjoyed by some individuals. I argue here that the means employed were ritual in nature. In this model I see high status individuals overtly as ritual specialists. I furthermore argue that such leaders both controlled and manipulated the long-distance exchange networks.

While I have suggested that status during the early period was marked by personal adornments made of local materials, it was the exotics that most clearly signalled status after 18,000 BP. I argue here that the partial control over labor exercised by high status individuals during the early period selected for visual display of this

control--thus an abundance of beads, lances, bone jewelry, and ornaments of ivory at early burials. During the late period, on the other hand, both a greater control over labor (see in the increase of specialization of production) as well as an increased need for information (and thus for an expansion of exchange networks) selected for the use of exotics as status markers.

In the model for socio-political integration after 18,000 BP I also indicate that the need to 1) control labor, 2) maintain supra-regional long distance ties, and 3) validate status differences jointly selected for the development of public works and resulted in Pleistocene examples of monumental architecture. I argue here that ritual validation of status differences occured in the context of communal architectural undertakings. The resulting constructions, in turn, both carried encoded emblemic messages of corporate identity and, at the same time, bore a highly visible and permanent witness to the control over labor and information enjoyed by high status individuals. The occurrence of such architecture in both the northern and southern parts of the study area argues for the consolidation of both areas into one corporate social matrix.

The locational advantages enjoyed by some settlements are expressed in the archaeological record by the concentration of exchange goods and monumental architecture at these locations. Since both exchange and construction were innately connected to ritual, evidence for all three is found

localized at the same sites--complex cold weather base camps.

It is both tempting and, at the same time, impossible to offer an ethnograhic analogue for the late period of occupation of the Central Russian Plain. On the one hand, the model I presented is reminiscent of social relationships and settlement patterns of north latitude hunters-gatherers exploiting sea mammals or fish. Thus, the resemblances of this model to such groups as the Bering Straits Eskimo, or even to groups who resided along the Northwest Coast. This similarity is not surprising--I did turn to these more complex groups in an attempt to understand the data from the study area. These data indicated that the subsistence practices and settlement systems were far from the "simple, small, and mobile" paradigms currently employed for Late Pleistocene hunters and gatherers.

While these ethnographic analogues serve a purpose, they also come from groups with subsistence based on marine resources--either sea mammals or fish. Data from the study area, on the other hand, clearly indicate that whatever social complexity was achieved, it was embedded in subsistence strategies based on the exploitation of terrestrial resources. Many authors have stated that this coupling of social complexity with a reliance on terrestrial resources should be expected for prehistoric hunters and gatherers who occupied non-marginal environments (see Price 1981; Jochim 1981; or Mellars 1983, for example). Others, like Schalk (1977) and Sheehan (1983) have cogently argued that the high

degree of reliability assigned to marine resources may be illusory. Schalk's (1977) discussion of the exploitation of anadromous fish along the Northwest Coast, indicates that the accepted connection between rich and reliable fish resources and social complexity among hunters and gatherers is unwarranted, and the cause and effect relationship between the two has to be re-examined.

The stability and reliability of terrestrial resources was certainly augmented by storage practices in the study area. Binford (1982b), Testart (1982), and Jochim (1981), among others, have argued that storage is a technical means for regulating resource reliability and predictability. Thus, both the non-marginal location of the study area as well as the technology of Upper Paleolithic groups added to the operational richness of the Upper Paleolithic resource base. Given this techno-environmental context, the noted complexity of socio-political organization should come as no surprise.

The social, political, and ritual complexity seen at the late sites, especially at complex base camps, is reminiscent of Eskimo winter villages where various large festivals were held (see Boas 1964; Mauss 1966; Nelson 1971; Spencer 1959, for example). I suspect that ethnoarchaeological research among such groups as the Bering Straits Eskimo would present an archaeological picture not too dissimilar to the one observed in the study area during the late period of occupation. At the same time, however, much more work remains to

be done on the relationship of complex to simple cold weather base camps, before we can offer a clear ethnographic model for the Upper Paleolithic. At present, we have no archaeological analogues for monumental architecture among Late Pleistocene hunters-gatherers. While such behavior has been associated with sedentary ranked or tribal societies (see Peebles and Kus 1977 or Renfrew 1982), I would argue that sedentism is not a necessary and sufficient cause for such behavior. Data from the study area indicate that the Great Russian Plain lacked full-time sedentism, yet did have such examples of public works. Examples of such behavior among hunters and gatherers of the historic past are rare--but Whalebone Alley, discussed previously, offers us just such an example.

In brief, I suggest that the Upper Paleolithic Great Russian Plain, after 18,000 BP, was peopled by hierarchically organized groups who had some degree of status hierarchization that was associated with ritual roles. The groups were not fully sedentary and exhibited both residential and logistical seasonal mobility. I would also argue that, even though they meet a number of criteria for trival or ranked societies suggested by Peebles and Kus (1977) and Renfrew (1982), Late Pleistocene groups on the Central Russian Plain should not be seen as such--but rather reflect a level of socio-political integration in between egalitarian band and ranked tribal society. I will address this issue--data vs. models--in greater detail in the concluding chapter of this

work.

Finally, the most important conclusion I reach from this analysis is that the trajectory of culture change as seen through social complexity varies depending on the time scales used for monitoring it. Using geological or archaeological periods as a measure of time (e.g. the Pleistocene, or all of the Paleolithic), one could argue for a directional and cumulative increase in social complexity through time. This pattern of linear, directional, and progressive change in culture appears quite different on finer time scales, however. This chapter, for example, has documented a fluctuational trajectory for culture change. The two patterns of complexity I described, one for the early and the other for the late periods, represented ecological and social solutions to problems of adaptation. In both periods we did not see a further evolution in complexity, but rather witnessed a collapse. The early period, as noted, was followed by an approximately 2,000 year period when the area was either totally or predominantly uninhabited. The second period of occupation also did not lead to a steady increase in complexity--it just led to the early Mesolithic, a time of much greater residential and logistical mobility as well as smaller group size in the area (see Dolukhanov 1982 on the Mesolithic period on the Russian Plain).

Given these patterns, I would argue, after both Bender (1982) and Friedman (1979), that the observed changes in socio-political integration should be seen as fluctuational

in nature. Fluctuations have been documented for sedentary groups and we accept such oscillations as the norm in history as well as in later prehistory (e.g. the numerous rises and falls of the early state in the Near East). I close this discussion by suggesting that fluctuations in socio-political complexity were also an intrinsic feature of hunter-gatherer adaptations in the past--an argument that I will expand in the concluding chapter of this work.

CHAPTER VIII

CONCLUSIONS AND IMPLICATIONS

I. INTRODUCTION

As can be surmised from the preceding chapters, the Central Russian Plain during the Late Pleistocene was an important part of the European Upper Paleolithic oikumene--one inhabited by groups of hunters and gatherers with a complex repertoire of behavior. In this concluding chapter I will first briefly take stock of what has been modeled heretofore and examine the significance of my conclusions in light of the following concerns:

1) Future evaluations of the proposed models; the implication of the proposed models, and directions for future research
2) Central Russian Plain data and models in context of the Upper Paleolithic European continent
3) Adaptations on the Central Russian Plain and our theoretical constructs

II. DATA AND MODELS

As I stated in the introductory chapters, two major objectives guided my research. On the one hand, since original data on the sites was not available to Anglophones and, when published in Russian, was located both in the Soviet Union and in the West in hard to obtain publications, I wanted to present as complete a compilation of information

as possible. On the other hand, my second major objective was to examine and model human adaptation strategies in the study area that operated from some 26,000 BP to approximately 12,000 BP. These two objectives, one descriptive and compilaroty, and the other analytic, shaped the form of this work. The two were achieved through disperate means. Data were gathered through archival and library research in the USSR over a period of some nineteen months as well as through active fieldwork and research visits to a number of the sites.

The methods I used to analyze data and to model human behavior consisted of delineating explicit hypotheses and testing them via a set of simple statistical procedures described in detail in the pertinent chapters of this work.

The overall contents of this volume can be summarized as follows:

A. The Data

Chapters II through IV presented available data on twenty nine major Upper Paleolithic sites excavated on the Central Russian Plain to date. The overall geology, geomorphology, and stratigraphy of the area was discussed in Chapter II. Geographic and stratigraphic information per site was also presented in that chapter as were archaeologic profiles of the sites. These profiles included a history of excavations, a listing of inventories and features found, and a presentation of available floor plans.

Chronologic questions were considered in detail in

Chapter IV which included an analysis of various dating schemes (both relative and chronometric). Six new unpublished C 14 dates calculated by the Queens College Radiocarbon Laboratory for the study sites were likewise presented in that chapter. Chronological ordering of the sites proposed in Chapter IV indicated that the sites dated to two disparate periods of occupation--one early, between about 26,000 and 20,000 BP (before the Valdai maximum), and the other late, from about 18,000-12,000 BP, after the maximum.

Paleoenvironmental data available both on the study area as well as on the sites themselves were both presented and evaluated in Chapter III. They included information on pollen, microfauna, molluscan fauna, and ichtyofauna. Geomorphologic data, climatic reconstructions, and models of the Late Pleistocene landscape were likewise presented and evaluated in Chapter III.

B. Human Adaptation Strategies

1. The Environmental Given

The nature of data available on Late Pleistocene environments showed at the onset that the scale used in all models and reconstructions was of a very gross nature, and one totally unsuitable for questions of human adaptations. Geomorphologic and paleontologic information indicated that the archaeological record spanned over four major climatic periods: the Bryansk Interstadial; the cooling period between 24,000 and 20,000 BP; the Valdai maximum itself (20,000-18,000 BP); and the period after the glacial maximum

from 18,000 to approximately 12,000 BP.

Using paleontologic and geologic evidence I argued that while broad climatic and environmental trends indicated the existence of a cold periglacial landscape during the entire Upper Paleolithic period of occupation, it was the climatic and environmental differences between the habitats before and after the Valdai maximum which were crucial to human adaptation. I suggested that during the early period of occupation, the climatic trend was one of gradual long-term deterioration, going from warmer and moister interstadial conditions at about 26,000 BP to colder and more arid conditions at the onset of the glacial maximum at 20,000 BP. This gradual change in climate was in sharp and significant contrast to the rapid climatic oscillations that occured in the area between 18,000 and 12,000 BP. This late period saw fluctuations from warmer and wetter to colder and drier conditions approximately every 1,000 years. Since, however, oscillations with a duration of 10^3 years are on a time scale too gross for an evaluation of adaptation responses by living organisms, I broke them down into smaller time scales and modeled their short term climatic profiles. I suggested that each oscillation was "saw-toothed" in nature, featured rapid climatic deterioration or amelioration, a slow period of recovery, and confronted living organisms with climatic stress for periods of 100 - 200 years.

Next I proceeded to both consider and model the disparate effects that climates of the early and late periods

had on the food resources in the study area. Spatial and temporal distribution of major food taxa were modeled. These models indicated that important chronologic differences were present which included 1) a linearization of resources along the river valleys, and 2) greater seasonal and long-term fluctuations in both the abundance and the distribution of resources after 18,000 BP. Finally, it was argued that these differences suggested that greater resource stress existed in the area after the Valdai maximum than from 26,000 to 20,000 BP.

Using present-day ecological analogues, in Chapter III I also modeled the seasonal distribution of economically important resources and predicted the optimal time of the year for their harvesting.

The basic conclusions I reached after an examination of the paleoecology of the study area during the entire Upper Paleolithic period were that 1) while the Central Russian Plain supported abundant food resources, these resources were very patchily distributed across the study area and found in large concentrations during some times of the year only--specifically in or near the floodplains during cold weather months, 2) the majority of resources used both for food and for clothing probably undertook seasonal north-south migrations along the river valleys, and 3) this variability in the distribution and abundance of resources was especially significant during the late period of occupation. It was concluded that the Late Pleistocene landscape was not one of

relative stability and abundance during the entire Upper Paleolithic period of human occupation, but one with greater stability and less resource stress during the early period and with a decrease in this stability and an increase in stress after 18,000 BP.

Since extant literature in general has characterized Late Pleistocene populations on the Central Russian Plain as mammoth-hunters, in Chapter III I also undertook a detailed look at the demographics and paleoecology of this taxon. I concluded that this species would have been under extreme demographic stress during the period of climatic oscillations--one that would have brought population numbers of mammoths down to catastrophically low numbers without any human interference at all. Using modeled population estimates for mammoths, information on mammoth skeletal elements found at the study sites, and independent data on the age-sex composition of mammoths from the Berelyoh mammoth-bone cemetery, I concluded that our assumptions that 1) mammoths were the major food resource, and that 2) all mammoths were procured by active hunting and taking of herds during the Late Pleistocene, are unwarranted.

While my reconstructions of Late Pleistocene landscapes and modeling of resource behavior allowed for a subsequent examination of human adaptation strategies, they also highlighted the existence of a number of important and unresolved problems that must be considered in future research. Two major areas in need of attention are 1) a refinement of

assemblages to evaluate the role that active hunting played in the procurement of some resources.

2. Human Behavior

Having modeled the Late Pleistocene "ecological given", I proceeded to look at human adaptations in the study area. I divided the Upper Paleolithic period of roughly 14,000 years into an early and a late period of occupation and noted a hiatus in occupation from 20,000-18,000 BP (during the Valdai maximum itself). I used the systemic approach in looking at human adaptation and assumed that Upper Paleolithic cultural systems consisted of a number of interrelated sub-systems including the economic, the socio-political, etc.. The economic variable or sub-system as manifested in subsistence practices served as an initial entry into the adaptation system.

(a) Subsistence practices

An examination of faunal remains found at the study sites showed that the Central Russian Plain was occupied during the entire Upper Paleolithic period by logistically organized hunters and gatherers who 1) exploited seasonally abundant and aggregated resources, and 2) used extensive non-portable storage strategies. Their subsistence practices centered on the exploitation of large sized gregarious herbivores including some mammoths, steppe bison, horses, and reindeer.

My analysis also showed that a number of serious problems

exist and must be resolved before we can characterize the Late Pleistocene subsistence base with certainty. Foremost among these, as noted above, is the delimiting of the exact role that mammoths played as a food resource. Using paleontologic as well as archaeologic faunal evidence, I argued that both mammoths and reindeer were not only hunted but also "collected"--i.e. that skeletal elements of both these taxa were gathered and used by Upper Paleolithic groups. I suggested that clearly such gathering could have occured without active hunting being involved at all. Mammoth bone, used as raw material for construction, for implements, as well as for fuels, may have very well come from mammoth cemeteries. Reindeer antlers, an important raw material for implements, likewise may have, at times, been procured through collection of shed antlers.

While we can monitor a general continuation of similar subsistence strategies during the entire period of occupation, a comparison of data between the early and late period showed an intensification through time in procurement of both food and non-food resources. Thus 1) greater numbers of some gregarious herbivores were found at the late sites, 2) a greater number of taxa, including solitary and small sized species, occured at the late sites, and 3) more storage went on after the Valdai maximum. An evaluation of different hypotheses suggested that this intensification and diversification, most probably, was a response to the linearization of resources after 18,000 BP.

A comparison of exploitation of fur bearers between the early and late periods indicated that 1) an intensification in this procurement occured through time, as well as 2) specialized procurement arose during the late period of occupation. This specialized procurement of fur bearers was associated with the rise of exchange networks in the area.

(b) Settlement systems

Using a number of disparate data sources, I considered and modeled the settlement systems on the Upper Paleolithic Central Russian Plain. I began by considering the question of year-round vs seasonal sedentism at the sites. Using independent variables which included geographic, faunal, and feature data, I concluded that all of the sites were seasonal occupations and did not represent year-round residential locales. A comparison of various data bases indicated that three sources of information: the Diversity Index, avifauna and ichtyofauna, and the altitudinal location of sites above the floodplain, were the most consistent and appropriate indicators of the season of occupation at the sites.

Twenty eight independent variables, including geographic information as well as data on site inventories and features, were used to classify the Upper Paleolithic sites in the study area into the following site types:

cold weather occupations	warm weather occupations
complex base camps	simple base camps
simple base camps	lithic workshops
hunting base camps	hunting stations
	collecting stations

A consideration of groups size and of length of stay at the sites, while admittedly beset by serious epistomological and methodological problems, in general indicated that 1) sizeable groups, probably numbering over 30 individuals, co-resided at both warm and cold weather base camps during the entire period of occupation, 2) smaller numbers of people may have occupied earlier sites but remained there longer, and 3) larger numbers of people who stayed for shorter periods of time inhabited base camps during the late period of occupation. I also concluded that the settlement patterns during both periods of occupation were ones with long occupational episodes during cold weather months at base camps located on or near the floodplains. During this time of the year co-residential units lived off stored resources. With the onset of warm weather, co-residential units moved in toto short distances, but off the floodplains, and occupied warm weather base camps. Thus, I hypothesized that the settlement system of Upper Paleolithic hunters and gatherers on the Central Russian Plain did not feature seasonal aggregation-dispersal pulsations but instead was one where 1) large sized co-residential units remained together during the entire year, and 2) seasonal residential mobility occured over short distances only.

Chronologic as well as regional geographic comparisons indicated that 1) the northern section of the study area was more extensively (possibly exclusively) occupied during the early period, but that these settlements were not linearized

along the river valleys, 2) both the north and south were occupied during the late period of occupation and settlements were linearized along the floodplains, 3) while some regional north-south differences were noted, these differences did not indicate different settlement patterns but were rather "variations on a theme", and 4) the major chronologic difference in the types of settlements and in the settlement systems was the absence of complex cold weather base camps during the early period of occupation.

Finally, a comparison of complex cold weather base camps to their simple cold and warm weather equivalents indicated that the differences between these settlements were not related to utilitarian behavior but rather lay in the sphere of social and political relationships as well as in ideological behavior. Eliseevichi, Mezhirich, Mezin, and possibly Suponevo and Yudinovo were identified as complex cold weather base camps inhabited during the late period of occupation.

(c) Socio-political integration and ideology

The socio-political integration of Upper Paleolithic groups was examined and modeled through time. The model for the early period, depicted on p. 735, suggests the presence of some activity differentiation as well as the existence of some form of nascent social hierarchization. I argued that prior to 20,000 BP both leadership and activity differentiation were heavily associated with ritual behavior. I also argued that stylistic signalling in different media suggested that the area was occupied by more than one social group

during the early period of occupation. This early period was followed by a 2,000 year hiatus when the Central Russian Plain, like river valleys both to the east (the Don), and to the west (the Dnestr), was either totally devoid of human inhabitants or occupied very sporadically and sparsely.

After 18,000 BP I suggested we could monitor the emergence of a different, and perhaps more complex, pattern of socio-political integration. The causal relationships responsible for this, depicted on p. 740, included such phenomena as hierarchical organization, unequal distribution of resources, long-distance exchange networks, the rise of extended families as a basic socio-economic unit, increased activity differentiation, as well as the development of Late Pleistocene examples of public works/monumental architecture.

The reconstruction of socio-political relationships offered in this work are meant as suggestive and not definitive ones. Admittedly the data my hypotheses and models are based on are both very sparse and often anecdotal in nature. Available information on the early sites suggests that one out of the four sites is anamolous to the area, and may well have been a part of an adjacent, more eastern, system. Thus, some serious scalar problems may exist in my delimitation of the study. Problematic as my hypotheses may be, they do carry a number of test implications that can be evaluated in future research. Thus, for example, future work on the exact source of origin of exotic materials found at the sites can evaluate my hypothesized exchange networks.

Likewise, the existence of an unequal distribution of resources I noted can be evaluated with data on the distribution of inventories between the different dwellings at the sites. Future work on the measurement, quantification, and inter-site distribution of blades and beads can evaluate the existence of activity segregation suggested in this work. Rigorous, extensive, and quantified analyses of portable art, engravings, and of decorative objects, something not done heretofore, will go a long way towards evaluating my conclusions about the number of social groups present in the study area through time.

In summary, I offered the following ethnographic reconstructions for the socio-political integration extant on the Central Russian Plain during the Upper Paleolithic period:

(1) Early period

The study area prior to 20,000 BP was occupied by more than two locally autonomous social groups. Positions of high status were probably occupied by ritual specialists who were perhaps analogous to the "elders' in the ethnographic record. These individuals possessed authority, could commandeer labor for ritual purposes, but did not have economic advantages over lower status individuals.

(2) Late period

The Central Russian Plain after 18,000 BP was peopled by hierarchically organized groups who had some degree of status differentiation associated with ritual behavior. Individuals

occupying high status positions had economic as well as social advantages over the rest of the population. While nuclear families formed the basic socio-economic unit prior to 20,000 BP, after 18,000 BP extended families increasingly became the basal organizational unit. The Central Russian Plain during this period of occupation was settled by at least two social groups--these, however, were not autonomous entities but parts of a larger social matrix which spanned the entire study area and, probably, had ties to populations in adjacent river valleys as well.

III. PROBLEMS OF TEMPORAL AND OF SPATIAL SCALING

In the course of this work a set of temporal and spatial problems emerged that can best be characterized as scalar in nature. These problems are not relevant only to this study, but, as Marquardt (1983) has cogently argued, germaine to all our attempts to reconstruct past human behavior. He notes that:

> Observations of sociocultural lifeworlds come to us not as "totalities", but as apparently patterned facts at particular spatial and temporal scales (Marquardt 1983:14).

Thus, for example, one spatial scale may be appropriate for questions about regional interactions and quite another for questions about status differentiation. In many instances, due to the nature of the archaeological record, these conditions were not met in this study. I argue that scalar problems must be first recognized, considered, and resolved

before future work on Late Pleistocene adaptations can progress.

Problems of appropriate temporal scales come to the fore in any archaeological reconstructions. Taking as an example the socio-political integration modeled in this work, if one just looked at the period between 18,000 and 12,000 BP, one could argue for increasing complexity through time. If, on the other hand, one looked at the area over a longer period of time, say 30,000 years, then it becomes apparent that no steady directional increase in complexity can be observed, and that what is present is a pattern of fluctuations in complexity. Thus, for regional studies of human adaptation through time, both appropriate and multiple scales must be used. It is germaine to examine in greater detail scalar problems revealed in the course of this work. I will first focus on temporal and then on spatial problems of scaling.

A. Temporal Scaling

Our hypothesized man-land relationships clearly are heavily dependent on the temporal scale selected for analysis. Thus Mellars (1983), Dolukhanov (1982), and Velichko et al. (1981a) who took the entire Upper Paleolithic period of occupation in the Perigord in the first case and on the Russian Plain in the second and third, as a single climatic and paleoenvironmental unit, argued for stable and highly productive habitats which allowed for stable and complex adaptations in both regions of the Old World. David (1973), on the other hand, taking smaller time units as his base,

argued for demoraphic and cultural fluctuations in southwestern France during the Upper Paleolithic. In this work I also broke down the long time span of Late Pleistocene occupation and have argued that paleoenvironmental data did not support seeing the Upper Paleolithic as a long period of stability but instead indicated that fluctuations existed in climates and habitats.

We are just beginning to establish some time controls in the study area. The C 14 dates available for the sites, listed in Table IV-8, are quite clearly inadequate for many questions explored in this work. By using the region rather than the site as my analytic universe, I assumed a rough contemporaneity for at least some of the sites, as well as for all portions of a given site. The sort of contemporaneity deemed adequate in his work, however, is, in fact, inappropriately gross. For example, in the course of this work I implicitly assumed that some of the different types of sites were contemporaneous and parts of the same settlement system--e.g. simple and complex cold weather base camps. Binford (1983), using Nunamiut data, has argued that logistically organized hunters and gatherers are quite mobile when their location is viewed in longer time scales. He reported that the length of stay of a Nunamiut group in any one residential core area lasts approximately 10 years, after which they move to a completely new territory. He indicated that at any one time such a group has available to them approximately four times the territory that it is currently

using and that, therefore, there is a cyclical pattern of land use. He offered a figure of 22,000 km^2 as the area that a group of 36 Nunamiut would utilize during their lifetime (Binford 1983:205). These observations suggest that the settlement patterns I projected for the Upper Paleolithic Central Russian Plain have been generated by behavior different from that which I assumed. Lacking fine tuned chronologic controls, I cannot argue with certainty that any two sites in the study area were contemporary and not sequential occupations.

I suggest that the kind of fineness of chronological controls called for by Binford's (1983) work, however, will probably never be available to researchers working with Pleistocene groups. While we may never know with total certainty that any two sites were occupied at the same time, a refinement of chronologic controls will get us a bit closer to reconstructing past behavior--albeit these reconstructions will always remain what Leach (1973:768) has called "well-informed guesses".

B. Spatial Scales

In previous discussions, I noted that disparate spatial scales are necessary when one investigates past human adaptations. In this work I selected the site itself as the unit of analysis and a particular drainage system as the analytic universe. In selecting the site rather than a structural component of the site as a basal unit, I immediately eliminated information pertinent to some questions raised in this

work. Such information as the contemporaneity of occupation of the different parts of a site, as well as data on possible differential distribution of assemblages and features at the sites were effectively excluded. Yet a discussion of socio-political relationships clearly required these kinds of information. My decision to use the site itself as a basal unit was predicated by the nature of information available. For the vast majority of past excavations in the study area information on intra-site variability is forever irretrievable. Thus, some of the hypotheses on socio-political integration offered in this work can be tested only with data on storage pit content and on the distribution of features and artifacts obtained from ongoing excavations at such sites as Mezhirich and Yudinovo.

In classifying the sites in the study region I encountered an anomalie--the site of Khotylevo II. This site, as noted in Chapters V-VII, did not fit the Dnepr-Desna pattern at all, and was deemed more similar to sites found along the Don which Soviet researchers assign to the Kostenki-Borschevo culture. Sites along the Don, however, also contain at least two anomalies: Anosovka II (Kostenki XI) and Kostenki II (for their description see Klein 1969, Praslov and Rogachev 1982). Both of them have round or oval mammoth bone dwellings and storage pits characteristic of the sites in the Dnepr-Desna basin. While neither Soviet nor Western scholars have treated these two Kostenki-Borschevo sites as regional anamolies, I suspect that the presence of

Khotylevo II on Desna and of Anosovka II and Kostenki II on Don indicate that neither river valley was a closed self-contained social universe during the Upper Paleolithic. The location of these sites outside of their own "cultural" regions argues for the use of an additional spatial scale to the one employed in this work. Specifically, the location of these anamolous sites argues for the need to look at the entire Russian Plain when asking questions about socio-political relationships (see Figures I-2,VIII-1).

It is even more important to use a larger spatial scale that includes the entire Russian Plain when considering change in socio-political integration through time. I argued that at least two settlement patterns were present in the study area during the early period of occupation. I went on to suggest that one of these was characteristic of a more eastern region--i.e. of the Don basin. I hypothesized that 1) Khotylevo II was a part of this more eastern system, and 2) that groups inhabiting the Don region may have had an aggregation-dispersal pattern of social integration. This hypothesis, in turn, suggests that groups along the Don may have had greater residential mobility and may have "mapped-on" to resources more than the groups in the study area (see Binford 1982b for a distinction between "mapping-on" and logistical organization). While it may be tempting to suggest that one adaptation pattern existed along the Don and another with greater residential and social stability year round along the Dnepr-Desna, the presence of the anomolous

sites in each of the regions indicates that adaptations in both regions may have been more complex and not independent of each other. To understand the relationship of Don and Dnepr-Desna groups to each other--whether geneologic or coterminous, we must both firmly control chronology and take the whole Russian Plain as our analytic universe.

Different chronologic assumptions clearly can give us different scenarios. For example, if the anomolous sites are located where they are due to time alone, then given the greater number of early sites along the Don, we can suspect that human settlements on the Central Russian Plain at the onset of the Upper Paleolithic some 35,000 years ago, saw denser populations along the Don. Khotylevo II, therefore, may have been a most western outpost of this population (see Praslov and Rogachev 1982 for the chronology of the Don sites). Khotylevo II dates well after the earliest Upper Paleolithic sites on the Don--is it, therefore, a relic of expanding or moving Kostenki-Borschevo groups? If so, did these groups change from "mapping-on" strategies to logistical organization in their subsistence pursuits after reaching the Desna and leave behind sites typical of the Central Russian Plain? Long distance migrations have been proposed for Upper Paleolithic groups on the Russian Plain by Grigor'ev (1968). He argued that groups coming from Austria and Czechoslovakia (from the Willendorf and Pavlov cultures) went eastward across the Russian Plain, settled along the Don, and developed the Kostenki-Borschevo and Kostenki-

Avdeevo cultures. His scenario can be expanded to suggest that discendants of these groups, after settling along the Don, expanded westward and settled along the Desna and subsequently along the Dnepr as well. This prehistoric scenario, while accounting for Khotylvo II and the noted Kostenki-Borschevo influences in Berdyzh lithics,leaves the origin or affiliation of Kostenki II and Anosovka II unexplained. Both appear to date to the late period of occupation, after 18,000 BP (see Boriskovski and Dmitrieva 1982; Rogachev and Sinitsyn 1982). Are they a result of yet another and later eastern move of some Dnepr-Desna groups?

On the other hand, if chronology cannot be evoked, and I suspect that it will prove an unsatisfactory causal variable, then how do we explain the anomalous sites in both regions without considering them as parts of the same large social and analytic universe?

Clearly none of these issues or speculations can either be considered or resolved without taking the entire Russian Plain as a unit of analysis. They can also not be considered given chronologic controls available today. I have raised these questions both to qualify models presented in this work as well as to indicate some directions for future research should take.

IV. THE CENTRAL RUSSIAN PLAIN MICROCOSM AND THE EUROPEAN UPPER PALEOLITHIC OIKUMENE

This work offers a reconstruction of both culture history and human adaptation strategies extant over a particular time period in a particular part of the Old World Upper Paleolithic oikumene. It is therefore germaine to consider how this dynamic microcosm fits into what we know about the whole of Upper Paleolithic Europe.

Numerous authors have claimed a unique status for groups who inhabited the Perigord region of southwestern France during the Upper Paleolithic, and have considered that region as the center of Upper Paleolithic development (see, for example, Mellars 1983 or Jochim 1983a). In general, these claims rest on a number of observations and assumptions including 1) the density of the sites found, 2) the high archaeological visibility of these sites, and 3) especially on the high volume of artifacts and features recovered (e.g. cave art, portable art, beautiful Solutrean blades, etc.). Important historical factors in large part responsible for this view are 1) that Paleolithic research began very early in France, 2) that excavations were conducted most intensively and systematically in the Perigord, and 3) that systematized classification schemes for Upper Paleolithic lithic inventories were proposed by French researchers (see Wobst and Keene 1982 for a somewhat ascerbic but important discussion of these points). Yet if one examines what we know about human adaptations in Perigord, one is struck by

the dearth of human focus in archaeologic research there. As White (1980) and Audouze and Leroi-Gourhan (1981) have pointed out, much of French research employed and still employs the geo-chronological type-fossil approach and focuses on questions of 1) technology in tool manufacturing, 2) on stylistic variability in lithics, and 3) on the significance of observed lithic variability. In this approach, where lithics in a particular stratigraphic context are the analytic universe, other sites, regardless of their locations, are only of interest if their lithics are similar. If they are, then the two sites are considered members of the same archaeological culture (see Smith 1966, for example).

Another direction of research in Paleolithic archaeology, one I see as an offshoot of the lithic focus, has been a concern with features. Thus numerous studies exist, some quite detailed and exhaustive, on the behavior of such features as dwellings or of Upper Paleolithic art through time and space (see Sklenar 1975, 1976; Leroi-Gourhan 1965a, for example). These studies, like their lithic counterparts, focus research interest on object rather than on human behavior.

Human behavior began interesting archaeologists working in France in the late 1960's and early 1970's. This resulted in a number of valuable monographs such as those by Leroi-Gourhan and Brèzillon (1972) and by Movius (1977). They, however, dealt with human behavior at a particular site rather than within a particular region. By accounting for

what a particular small group of hunters and gatherers did in a cave or rock shelter for two or three months some 15,000 years ago, they explained only moments in prehistory.

When researchers expanded their focus beyond a specific site, a compilation of site descriptions resulted where the only connection between the sites considered was their proximity to each other in the published volume (see for example, Bhattacharya 1977). At the same time that these object and site-specific foci were the norm of the day, other discussions tended to leap across questions of human behavior to grandiose scales of analysis that used huge time spans and broad, in some cases continent-wide expanses of space as arenas of social interaction (see Gamble 1982, 1983, for example).

In this discussion I have focused primarily on the state of Upper Paleolithic research in France because France has been the "law-giver" and role model for archaeological research in the rest of Europe. Our understanding of Upper Paleolithic human adaptations in the rest of Europe, with a few site-specific exceptions, is not much better (see Rust 1937, 1958 on Magdalenian occupations of Germany). As in France, research elsewhere has focused on technological and stylistic classificatory schemes of lithics as a delimitor of archaeological cultures--i.e. on analytic universes strangely devoid of human actors.

Thus what we know about the Upper Paleolithic period in Europe today can be characterized as knowledge about 1) the

behavior of lithics through time, 2) human behavior at a particular rock shelter or open air site over all of 3-5 months of occupation, 3) grandiose pan-European mating networks, and 4) large scale migrations of populations to the Perigord refugia (see Sonneville-Bordes 1960; Movius 1977; Gamble 1982, 1983; and Jochim 1983 respectively). In brief, we have on the one hand details of objects through time and space, and on the other, little if any functional understanding how the creators and users of these objects lived. In summary, there is a huge gap in our knowledge about human adaptations during the Upper Paleolithic period in Europe--both in France and elsewhere.

The filling of this crucial gap has been the primary aim of researchers working in Europe over the last 10-15 years. Their work is bringing forth models, in which Late Pleistocene man and not flint is the focus. Thus, for example, Clark and Straus' (1983) work in Spain examined man-land relationships in Cantabria and White (1980) considered ecological variables and the perception and use of these variables by Upper Paleolithic groups in the Perigord region. Interest in paleoenvironmental reconstruction is strongly felt in Europe today. But, as White (1980:30) noted:

> Environment and culture in French archaeology have most often been studied and presented as separate entities with little concern for the relationship between the two.

This observation can be extended to the treatment of man-land relationships in the rest of Europe as well. Researchers are now increasingly focusing on this relationship--albeit,

perhaps, to the exclusion of the second equally important component of human adaptation: the social matrix or man-man relationships.

Pertinent data on socio-political relationships is clearly available, and some, like Conkey (1982) have begun examining Upper Paleolithic art from the Franco-Cantabrian region as an entry point into this social component of human adaptation. Others, like Bahn (1977) and Taborin (1972) have once again focused on exotics at the sites. These interests hopefully will develop into systematized considerations of factors responsible for the long distances that some of these artifacts apparently moved.

Social and ideological concerns have surfaced in the work of Freeman and Gonzalez-Echegaray (1981), whose excavations at El Juyo may have uncovered an Upper Paleolithic ritual site. The relatively rich burial data from Europe has consistently been the focus of archaeological interest--unfortunately this interest has centered only on denoting the variability in burial behavior, and not on the functional relationship of particular behavioral units with populations living at any one point in time or place (see Harrold 1980 with references).

While the analytic universe selected by each of these research directions is disparate and promising, it is unfortunate that, to date, we still have very little middle range research about the subsistance and settlement patterns. Many of my European colleagues, no doubt, would counter that the

data on hand do not permit anything beyond a description treatment of the sites and inventories, and that such "anthropologizing" of archaeological concerns is a purely New World and a "New Archaeology" fashion. I, in turn, would argue that even though data are far from satisfactory in any part of the Old World, they are both 1) sufficient for initial model building, and more importantly, that 2) we will only obtain better data if we ask new questions and become aware of the sort of data we need to answer them with. I would also argue that even if one rejects "anthropologizing" of archaeological research, one still must accept the need for making man and his specific adaptation as the center of our analysis if we expect to produce any semblance of culture history that is broader than the history of objects.

Numerous important questions remain to be asked both about particular culture histories per region, as well as about processes of change during the Upper Paleolithic period in Europe. These questions, however, cannot be meaningfully raised until we have some comprehension of how different groups made a living in different parts of Europe during the different periods of the Late Pleistocene.

In this work, using just 180,000 km^2 of European space, I have argued that 1) we can monitor changes in social organization through time, and 2) that these changes should not be considered directional but rather fluctuational in nature. Such an interpretation of the data carries a number of test implications that can be evaluated with information

from other parts of Europe to see if such fluctuations were local pre-historic phenomena or if they reflect universal patterns. For example, if we expand our Upper Paleolithic analytic universe to include data from Central Europe, we can also see evidence for socio-political complexity west of the Dnestr. The archaeological record of Upper Paleolithic Czechoslovakia includes complex and disparate sites with elaborate features and inventories (e.g. Dolni Vestonice and Pavlov sites). These sites, dating to about 25,000 BP, in some aspects (inventories) resemble sites along the Don (see Grigor'ev 1970, 1979; Klima 1976; Sklenar 1977). Their features, as well, perhaps, as the subsistence practices employed resemble more those of the Central Russian Plain after 18,000 BP. Czechoslovakia after the glacial maximum, however, seems to have been occupied by less complex hunters-gatherers, ones who left behind far more ephemeral marks on the landscape than their Pavlovian predecessors (see Sklenar 1977, for example).

Thus, by taking Central and Eastern Europe as a whole, we can detect what appear to be two disparate periods of complex hunter and gatherer adaptation--one at about 25,000 BP and the other at about 15,000 BP. We also seem to monitor these complex adaptations at disparate locations--at 25,000 BP in Czechoslovakia and on the Central Russian Plain after 18,000 BP (see Figure VIII-1).

If we expand our analytic universe to include all of Europe, and for the purposes of the discussion use the

abundance of art as an indicator of cultural complexity, we again see the existence of disparate periods is such complexity. In France, as Leroi-Gourhan (1965a) and Jochim (1983) have pointed out, the abundance of portable art peaks at two time periods: the Aurignacian-Perigordian (30,000-22,000 BP) and after 18,000 BP during the Magdalenian. Bosinksii (1976) has noted the presence of three periods with abundant art in Germany as well--one perhaps earlier than 30,000 BP, the second before 20,000 BP (at about 24,000 BP?), and the last at about 13,000 BP. Assuming that intensification in art production and art use roughly reflect intensification in some aspects of social behavior, the existence of these disparate periods in such activity argues for fluctuational rather than directional changes in social behavior and complexity.

Researchers, using disparate variables as the determinant ones, have interpreted these patterns differently. Jochim (1983) and Grigor'ev (1968, 1970) have argued that demographic shifts and population movements were partially responsible for the uneven abundance of art during the different segments of the Upper Paleolithic. Gamble (1982) on the other hand, used the spatial distribution of abundant portable art to argue for chronological shifts in corporate awareness among Late Pleistocene populations. Thus, both in-situ developments and migration have been proposed as likely causes. Clearly, given our present understanding of stylistic signalling, we cannot claim the significance of any

variable as the one responsible for the distributions of art across Upper Paleolithic time and space. It is probable that different processes may have produced similar patterns of distribution--i.e. that, once again, we may have the phenomenon of equifinality operating on the archaeological record.

At the same time, if these two or three peaks in the abundance of Upper Paleolithic art do signal peaks in some form of social behavior, then we must ask why these peak periods occured. While intuitively I favor looking at local developments as the more likely progenitors of change, I would also argue that we should not offhand dismiss hypotheses about demographic shifts either. Given ethnographic data on both short and long distance movement of hunters and gatherers, we cannot totally dismiss population movement as a possibly important variable during the 25,000 years of Upper Paleolithic occupation in Europe. In light of the stormy history that population migration has had as an explanation for change in the archaeological record, it is not surprising that today we favor looking at in-situ developments over migration. This bias, however, should not be allowed to totally dominate our paradigms. Population movements undoubtedly did occur in the past--this is implied by the ethnographic record.

The archaeological record we have on hand calls for looking at long-distance population and/or resource movement. I find it highly curious, for example, to look at adaptation

strategies in Upper Paleolithic Central and Eastern Europe alongside the paleontological record on the distribution of large sized gregarious herbivores. In Czechoslovakia we see a subsistence based on the exploitation of these taxa coupled with cultural complexity at about 25,000 BP. After 18,000 BP groups in Czechoslovakia switched to a primary dependence on reindeer and left behind evidence for simpler cultural patterns (see Sklenar 1977). On the Russian Plain, particularly along the Dnepr-Desna valleys, we see a subsistence based on large gregarious herbivores together with analogous complex cultural patterns present after 18,000 BP. In light of these co-occurances, I wonder how the movement of complexity from west to east through time is related to the extinction front and/or movement of large gregarious herbivores. Vereschagin (1979) has called the grouping of Late Pleistocene large sized gregarious herbivores which includes mammoths, rhinoceri, bison, and horses, the "mammoth faunal complex". Martin (1982) has offered a west to east trajectory for the extinction of this faunal complex. On the surface the two trajectories--one for the location of the mammoth faunal complex and the other for evidence of complexity in hunter-gatherer adaptations seem to overlap rather nicely in time. Is their co-occurance purely fortuitous? How are the two related?

Admittedly the record from the Kostenki-Borschevo sites is less clear. There, we appear to have a steady occupation from perhaps as early as 30,000 BP to the onset of the

Holocene, albeit with a noted hiatus between 20,000-18,000 BP (see Praslov and Rogachev 1982). Judging by burial data presented earlier, we can suspect that some sort of social complexity existed along the Don before 20,000 BP. After 18,000 BP we have such sites as Anosovka IT and Kostenki II with mammoth bone dwellings and storage pits indicating possible complexity in adaptation as well. What we do not know is how these sites are related to other very different looking sites along the Don, as well as to their look-alikes along the Dnepr-Desna, It is interesting to note that sites along the Don dating after the Valdai maximum have much larger numbers of mammoths than those that were probably occupied before the maximum. Thus Borschevo II (Boriskovskii and Dmitrieva 1982a), Anosovka II (Rogachev and Popov 1982), and Kostenki II (Boriskovskii and Dmitrieva 1982) contain over 20, 39, and over 28 mammoths respectively (for MNI estimator per taxon at the Kostenki-Borschevo sites see Vereschagin and Kuzmina 1977). Sites probably occupied before the Valdai maximum, on the other hand, have 7 mammoths present at most (see Vereschagin and Kuzmina 1977). At present we do not know either 1) what role mammoths played in subsistence practices at the Don sites, or if 2) the increased utilization of mammoths through time was primarily spurred by social requirements (e.g. increased use of mammoth bone for construction for example). Given this record, however, I would argue that their greater use during the late period of occupation, whether a result of hunting or of gathering,

probably indicates that more mammoths were available (whether in live or buried form) along the Don after the Valdai maximum. If this was so, then we may have yet a third example of co-occurence of the mammoth faunal complex with a particular type of complex hunter-gatherer adaptation.

In summary, what this discussion has shown is that much similarity exists between Upper Paleolithic data from the study area and information available from other parts of Europe. I have indicated that information on the abundance of such artifacts, art, and exotics, on rich and elaborate burials, etc. can stimulate questions of a social nature. Likewise, different patterning of these data during different periods of the Upper Paleolithic should generate questions about culture change through time. I have also argued, however, that before we can begin asking social questions, we must first work with smaller scales of time and space and understand human adaptations at a given moment in a given area of Upper Paleolithic Europe. As McGuire (1983) noted, before explaining change, we must first have a functional or systemic model of the phenomenon itself that does or does not change. Sad to say, after more than 150 years of research, we still have very few such models in Europe.

V. THE DATA AND OUR THEORETICAL CONSTRUCTS

It is important at the close to consider how various issues discussed throughout this work relate to broad theoretical concerns in anthropology and in anthropological archaeology. The relationships between archaeological

research and theoretical issues in any work, including this one, are both multiple and complex. Taking this work as an example, it is clear that the issues raised were all derived from a specific body of theory. The relationship between theory and particular research is not unidirectional, however. Various relationships between different systemic variables noted throughout this volume all carry implications for our theoretical constructs about hunter and gatherer adaptation.

I have directly and indirectly referred to a number of theoretical issues. Three that stand out as important are: 1) uniformitatian assumptions, 2) causal primacy or problems of the "prime mover", and 3) the nature of our theoretical constructs about hunters and gatherers and about culture change. Each of these issues has a significant and problematic bearing both on this work as well as on all our attempts to reconstruct past lifeways.

A. Uniformitarian Assumptions and the Analytic Universe

Ever since Binford's (1962) early call to make archaeology diachronic anthropology, archaeologists responding to this call, along with new and very fruitful paradigms have also inherited a veritable Pandora's box of problems. This is because in treating the archaeological record as a buried analogue of the ethnographic one, we have assumed that knowledge obtained from ethnographies will be a suitable key for deciphering the past. This basic tenet which underlies the rationale behind anthropological archaeology is, of

course, based on uniformitarian assumptions. Employing such assumptions, we claim that we can know the distant past because it was not all that dissimilar to the present and to the recent past. Wobst (1978) warned of the dangers and pitfalls of such cultural uniformitarianism. More recently Bailey (1983:3) wrote that:

> ...the most influential restraint on prehistoric research and one which in some measure contributes to the other factors already discussed, is the paralysing ambiguity of uniformitarian orthodoxy.

Throughout the body of this work, especially in Chapters VI and VII where I dealt with settlement types, settlement systems, and with questions of socio-political integration, I repeatedly argued that some features of the adaptation systems extant in the study area during the Upper Paleolithic had no present day analogues. My interpretation of complex cold weather base camps with their examples of monumental architecture is an apt case in point. We have no ethnographic analogues for them. Another example that can be brought forth is the complex socio-political and economic behavior I modeled for the area, one that was based on the exploitation of terrestrial resources. While we can find ample suggestions in the literature that complex hunter-gatherer adaptations based on the exploitation of such resources could have existed in the distant past, we have no ethnographic record of such patterns. Thus, part of the data from the study area cannot be understood through ethnographic analogies. It must be considered as reflecting a range of

behavior that is not documented among recent hunters and gatherers. Groups who inhabited the Central Russian Plain were clearly not like the Netsilik, the Nunamiut, or the Ojibwa, nor were they like the Eskimo around the Bering Straits whom I turned to for rough analogues. They had a different adaptation--one that undoubtedly had much in common with adaptations of known north latitude hunters and gatherers, but was also one that had its own important unique features. My brief consideration of data from adjacent regions of Upper Paleolithic Europe, most notably Czechoslovakia, suggests that adaptations on the Central Russian Plain may have had their closer analogues in the distant past.

In brief, I am not arguing against the use of any uniformitarian assumptions whatsoever, but rather suggesting that our present day assumptions about hunters and gatherers are based on a narrow range of behavioral variation available to us in the ethnographic record. It is not the principle of uniformitarianism itself that is at fault, but rather that the universe that we draw on for analogy is too narrow. By denoting different adaptation patterns in the past, ones for which we have no known analogues, we are expanding this universe. Thus archaeological research adds to our knowledge of the range in hunter and gatherer behavior. These additions need not, and will not, only mirror what is already known, but will offer us examples of the unknown. In summary, uniformitarian assumptions, based as they are on incomplete

analytic universe, should be used with great care in prehistoric archaeology.

B. Prime Movers Both Overt and Covert

Recently in discussing the "state of the art" in studies of culture change, Gould (1983) described it as one where two paradigms--the evolutionary and the transformational ones--are battling it out for supremacy. Under the first, he meant paradigms based on evolutionary ecology, and under the second paradigms based on considerations of societal dielectics. Examples of ecological evolutionism referred to in this work include, for the Old World, the work of Hayden (1981) and Jochim (1976, 1981). The transformationalist viewpoint is expressed by Bailey (1983), Bender (1982), Friedman (1979), and Root (1982).

While each of these researchers would vociferously argue that they are indeed not advocating the primacy of their variable--ecological or social--as the "prime mover", I contend that, in effect, that is precisely what they are doing, albeit in muted terms. Thus, when Bender (1982:4) writes that:

> The theoretical orientation of my paper is that at both intra- and inter-regional levels it is the analysis of social relations--seen as, to some extent, the determinants of technological progress, but also acting within the constraints imposed by techno-environmental factors--that permit an explanation of origins and change.

I posit that she is arguing for the acceptance of the social variable as a prime mover. Likewise, Hayden (1981:520) in writing that:

> I shall argue that cultural ecology provides the most productive framework for explaining these terminal Pleistocene transformations ...this periodic resource stress was the most important motive for patterned, directional change...

is in fact arguing for the ecological component, or man-land relationships, as the prime mover.

It could be argued that these researchers are just forcefully underscoring the need to look at a particular variable more closely than done heretofore and not advocating a "prime mover" approach. I would claim, in retort, that the very existence of two directions or paradigms in and of itself argues for our favoring prime movers in our explanations, and that such disparate directions arise from our tendency to oversimplify problems of human adaptation.

While such disparate approaches are suitable for dealing with theoretical issues and theory building in general, I suspect that their utility diminishes for empirical work which focuses on specific adaptations at a particular time and place. Clearly both ecological and social concerns are indispensible for a reconstruction of past adaptations. Yet few voices have been raised to argue for such synthetic direction of empirical research. One of these, Marquardt (1983), has called for archaeology to become synthetic processual anthropology, one that includes both a consideration of the ecological-evolutionary rationalism as well as historic materialism.

In this work I considered both the ecological and socio-

political components of Upper Paleolithic adaptation strategies. Neither component was given preference and their intricate interrelationship was underscored. Thus, this work is neither purely an exercise in prehistoric cultural ecology nor of prehistoric materialism. It is an amalgam of both. The fact that the ecological variable received greater attention should not be taken as a tacit indication of the primary of this component. Such an allocation of attention just reflects our greater facility for reconstructing this component--it is a reflection of the history of research, and no more. The equally important socio-political variable received less attention both because our methods for reconstructing these relationships lag behind, as well as because data on multiple scales of time and space necessary for a consideration of this component are far more sparce and problem laden.

C. Central Russian Plain Data and Our Theories

Two disparate theoretical issues have been repeatedly touched upon in this work--our modal constructs about hunter and gatherer adaptation and trajectories along which culture change occurs. Throughout this volume I have noted the apparent ill fit between our theoretical constructs and the data from the study area. It is germaine, therefore, to briefly look at the causes behind this apparent lack of fit, and to see if this is due to faulty theorizing or a result of erroneous use of theories.

Our anthropological theories about the organization of

culture and about culture change, be they based on subsistence behavior as in Sahlins (1972), on social organization as in Service (1962), or on political organization as in Fried (1967) are both directional and evolutionary in nature. In addition, and more importantly perhaps, all of them deal with huge blocks of time as well as with modal behavior.

Taking modal behavior as the first issue, we can, after Price (1981), state that the equation of a hunting and gathering way of life with a "small, simple, and mobile" adaptation is no longer valid. It is certainly true that following Man The Hunter Symposium in 1966, many archaeologists did tend to adopt the San as models of typical hunters and gatherers. More recently, however, a number of researchers have focused on distinguishing two sub-types in economic behavior of hunters and gatherers. Thus we have Binford's (1982b) foragers and logistically organized groups, Tesart's (1982) groups with and without storage, and Woodburn's (1980) groups with immediate or with delayed returns on invested labor. These differences are held to carry numerous implications for socio-political integration (both real and potential), as well as for the archaeological record that the two types of hunters and gatherers will leave behind (see especially Binford 1982b).

Given the archaeological record of Late Pleistocene-early Holocene Europe, it is not surprising that we are now arguing that it is the second more complex type of hunters and gatherers, ones with logistical organization, who

inhabited the Old World is prehistory. If this is so, and the data presented in this work certainly support such a conclusion, then what do we do with our past theoretical constructs? How valid or useful are they today?

I would argue that the fault lies with our appreciation of theoretical insights and suggest that our problems of theory vs. data are a result of faulty use of both scales and models. I suggest first that we have been at fault in adhering too strictly to modal behavior outlined in our evolutionary models. Modal behavior presented in Fried (1967), Sahlins (1972), or Service (1962) is a heuristic device and not an empirical yardstick. In stressing the mean or modal points within their analytic universes, they in no way denied the existence of behavioral continua. Data on these ranges have always existed. We have had ethnographic information on such complex hunters and gatherers as the Ainu, the Bering Straits Eskimo, and the Northwest Coast groups. Yet even with these data, we still favored seeing the San as our prototypic hunters and gatherers.

Secondly, we also failed to consider that faulty coupling of disparate variables diminished the value of our models. As I noted earlier in Chapter VII, each of the three researchers who offered evolutionary schemes modeled disparate components of culture--the political, the economic, and the social. They did not claim that developments within their selected components were synchronized to those in all other sub-systems of culture. Problems arose with our

theoretical constructs after we tried to firmly conjoin and synchronize these developments. By equating foraging behavior with egalitarian socio-political relationships, i.e. by cementing together mean behavior of each to the other, we eliminated the range of variability present in each construct individually.

A second major theoretical issue drawing criticism today is the notion of directional progress inherent in all our evolutionary models, whether based on cultural ecology or on the tenets of historic materialism (Marquardt 1983). In this work I moved away from seeing change as directional progress and have argued for the existence of fluctuational cyclicity. Such cyclicity in socio-political integration is advocated by both Bender (1982) and Friedman (1979). Marquardt (1983:11) wrote that:

> The fact that some socioeconomic systems evolve into more complex forms while others "fall", or devolve into simpler ones is not hard to comprehend; archaeological evidence for such "rises" and "falls"/"collapses" is known in abundance.

I have argued that while on one scale we could monitor some progressive and directional change in socio-economic complexity in the study area, a broader spatial and temporal scale revealed the presence of fluctuations in complexity. Thus whatever social complexity has been monitored on the Upper Paleolithic Central Russian Plain, it did not directly lead to greater complexity through time. Ultimately it just led to the early Mesolithic--a time of simpler adaptation strategies than seen during the preceding period (see

Dolukhanov 1982 on the Mesolithic record of the area). It could be argued, albeit with numerous and glaring problems, that drastic climatic changes at the end of the Pleistocene may have aborted such an evolution in complexity. These arguments, however, cannot be offered for the archaeological record in Czechoslovakia. What we have there is a case of complexity in adaptation at about 25,000 BP, and a simplification of this complexity after 20,000 BP. In the study area proper, the observed 2,000 year hiatus in occupation during the glacial maximum likewise undermines a notion of a steady and directional increase in complexity through time. My argument about this observed patterning points to the importance of fluctuations in complexity as the norm. I argue that when we look at human adaptation on time scale smaller than those of archaeologic or geologic time periods, we can see 1) fluctuations in complexity and 2) that these fluctuations are not necessarily directional.

As the data from the study area have suggested, directional increases in cultural complexity can be claimed only on some time scales. I would, therefore, argue that both the phenomenon of cultural complexity or simplicity and their interpretations change depending on the scale used for their analysis. In discussing some broad issues, for example, the general trajectory of culture change over the entire period of hominid history, where broad scales on the order of geologic periods are appropriate, we can see directional, progressive evolutionary change. For concrete questions of

culture history and human adaptation, where finer chronologic scales are appropriate, this work has argued for a lack of such directional patterning to change. Instead, I argued for oscillatory change. I would argue that the trajectory of culture change at one time scale appears directional, but on others consists of an amalgamation of multiple fluctuations, some progressive and others not. This argument is similar to the one I presented for interpreting Late Pleistocene climatic profiles. In the case of climatic fluctuations, I showed that profiles could be seen either as linear and progressive, if large time periods were taken as units of analysis, or oscillatory, if finer time scales were considered. I argue therefore, that much of our present discourse about the general applicability and validity of evolutionary models comes from a confusion of time scales.

It should be also noted that our debates about the patterning and trajectories of cultural evolution to some degree echo the debates among biologists and paleontologists about the nature of evolutionary change in general --whether this process occurs gradually or through a pattern of long periods of fluctuating stasis followed by bursts of rapid change. The first model, one advocated by Darwin (1859) and his followers, sees a steady process of minor and cumulative change through time. The second, advocated by Eldredge and Gould (1972) argues for seeing the evolutionary process as one of punctuated equilibria. In many ways our models of culture change, especially those grounded in cultural

ecology, mirror the Darwinian model of biologic evolution. Models offered by such transformationalists as Friedman (1979), on the other hand, appear to come closer to puctuated equilibria. I would therefore argue that, having taken from 19th century natural sciences the very concept of evolution, we find ourselves today indirectly reflecting their theoretical disagreements as well.

Given all these problems associated with our theoretical models, one may well ask both if our constructs serve any purpose at all, or if all these problems have made them less than useful. I suggest that the debate about the validity of our models does not reflect the inherent faulty nature of our models, but rather our mis-use of these models as empirical yardsticks. I see our theoretical constructs, be they on general cultural evolution or on specific evolutionary sequences, as heuristic devices that roughly outline patterns but in no way impose them on the data base. Archaeological research, especially one dealing with the deep recesses of prehistory, cannot be expected to illustrate our theoretical models. It should, however, both evaluate them as well as augment or expand them. In summary then, this work, rather than seriously questioning our models, has just drawn attention to extant but often ignored aspects in our theoretical constructs.

VI. CONCLUSION

As I stated in the introductory chapter, two major purposes of this work were to examine the culture history of the Central Russian Plain during the Late Pleistocene,as well as to evaluate the reasons for change noted in the archaeological record. Given the nature of this record in the area, and the focus of previous research there, these objectives could only be met by modeling human adaptation strategies and social systems at different points in time. In doing so I inadvertantly raised more questions, and possibly created more problems, than were resolved in this work.

Some Soviet colleagues have argued that while models offered in this work and hypotheses generated are interesting, they are premature because of the problematic nature of the data base itself. While I am the first to acknowledge that the data I worked with are far from adequate and leave a great deal to be desired, I am also convinced that our only hope of obtaining better data in the future rests on realizing the need for them. This realization, in turn, can only come if we ask the kinds of questions that call for improved data. Thus, while I acknowledge that many of my hypotheses are tenuous, I argue that in focusing on human behavior on the Upper Paleolithic Central Russian Plain, I have offered an explanation for the archaeological record more plausible than existed before, as well as suggested directions for future research to take.

The models I offered require a great deal of testing in the future both for their evaluation and refinement. They are speculative, but they also represent the first efforts to look at human adaptations on the Central Russian Plain. This work also is an example of middle-range research so badly needed for Late Pleistocene Europe--research which takes a region as its focus and attempts to model the utilization of that region by living populations of hunters and gatherers. I suggest that this type of research, above the level of the site itself as the analytic universe, and below continent-wide concerns, is what those of us working in Old World Paleolithic should be now doing. I agree that the data are of poor quality, that numerous problems exist with our assumptions and methodologies, and that, as Leach (1973:768) noted, our modeled constructs will never be able to go beyond "well informed guesses". But without this focus we will not have better data, we will never realize the problems with our assumptions nor generate work to overcome them, and finally, at least our guesses will be more interesting and better informed than those of our predecessors.

ILLUSTRATIONS

FIGURE I-1. ADMINISTRATIVE MAP OF THE RUSSIAN PLAIN

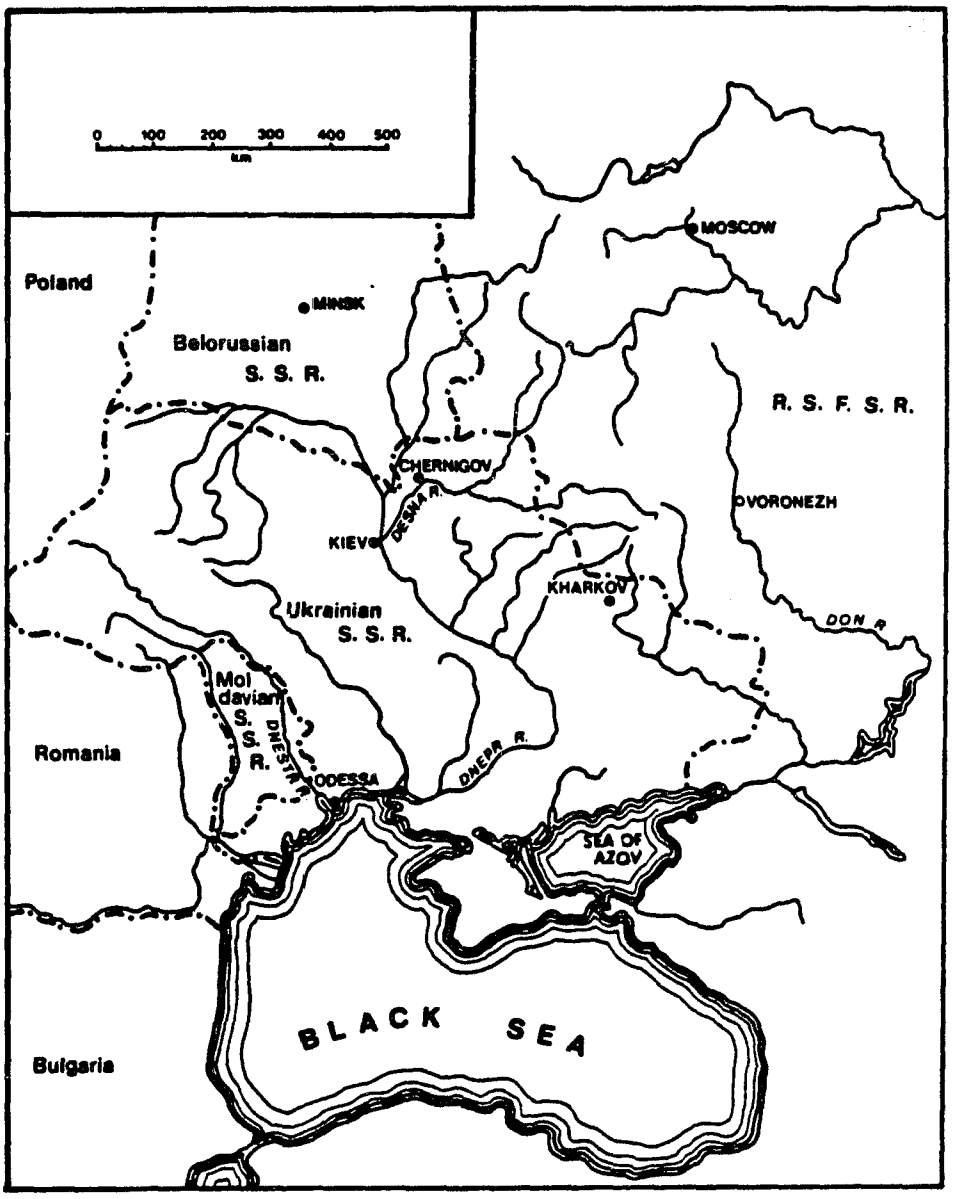
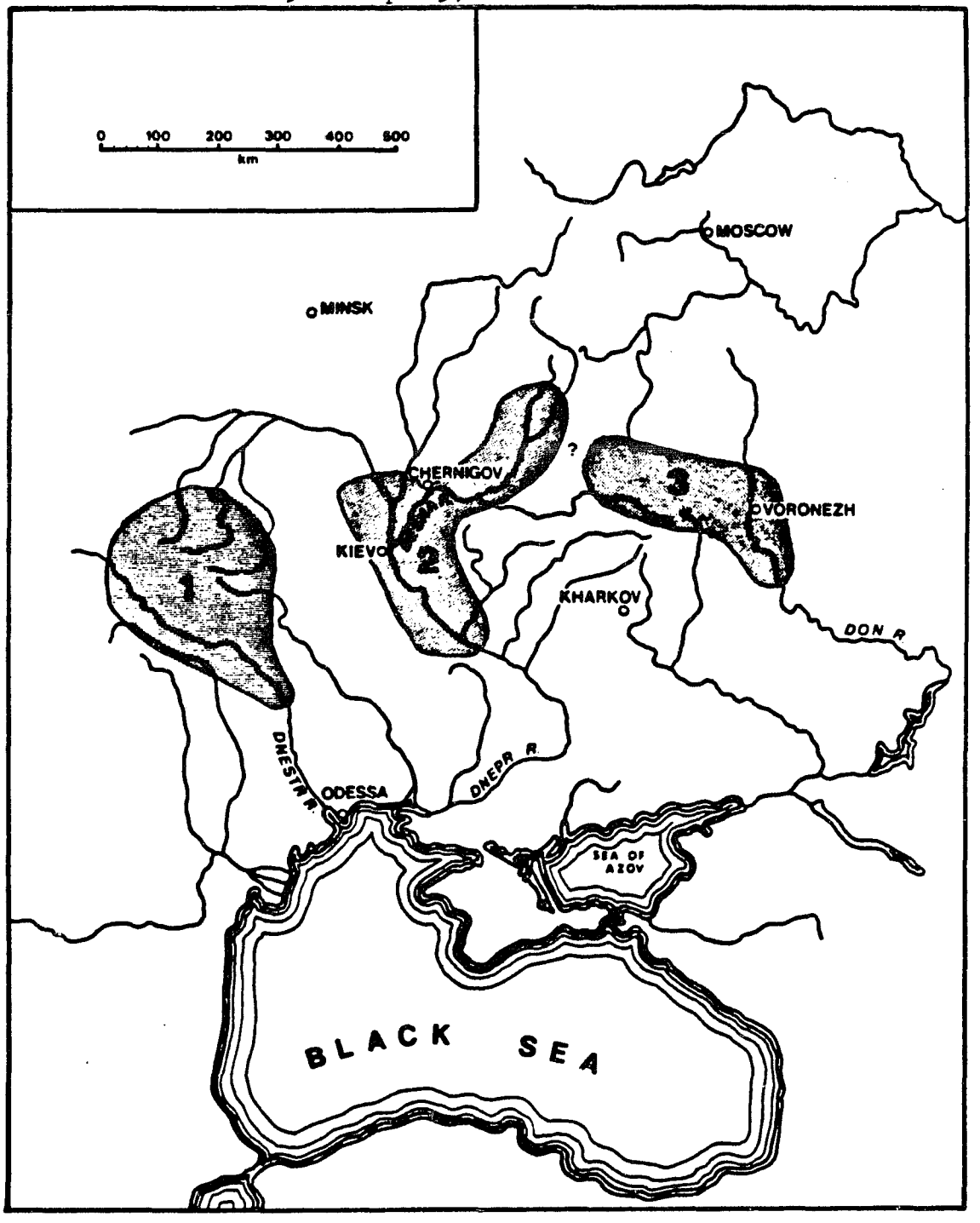


FIGURE I-2. UPPER PALEOLITHIC SITES ON THE RUSSIAN PLAIN (after Gerasimov and Velichko 1982:Map 15)



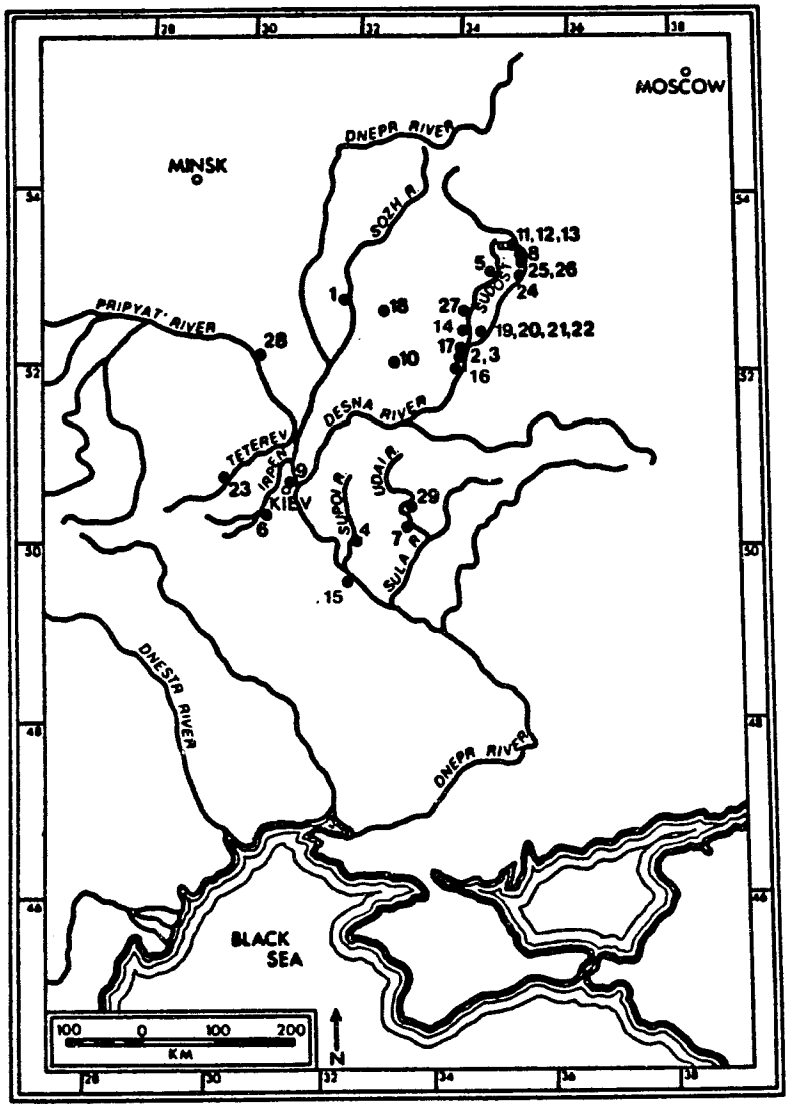
LEGEND:

1 - Sites assigned to the Molodova culture

2 - Sites of the Central Russian Plain

3. Sites assigned to the Kostenki-Avdeevo and Kostenki-Borschevo cultures

? - boundaries unclear

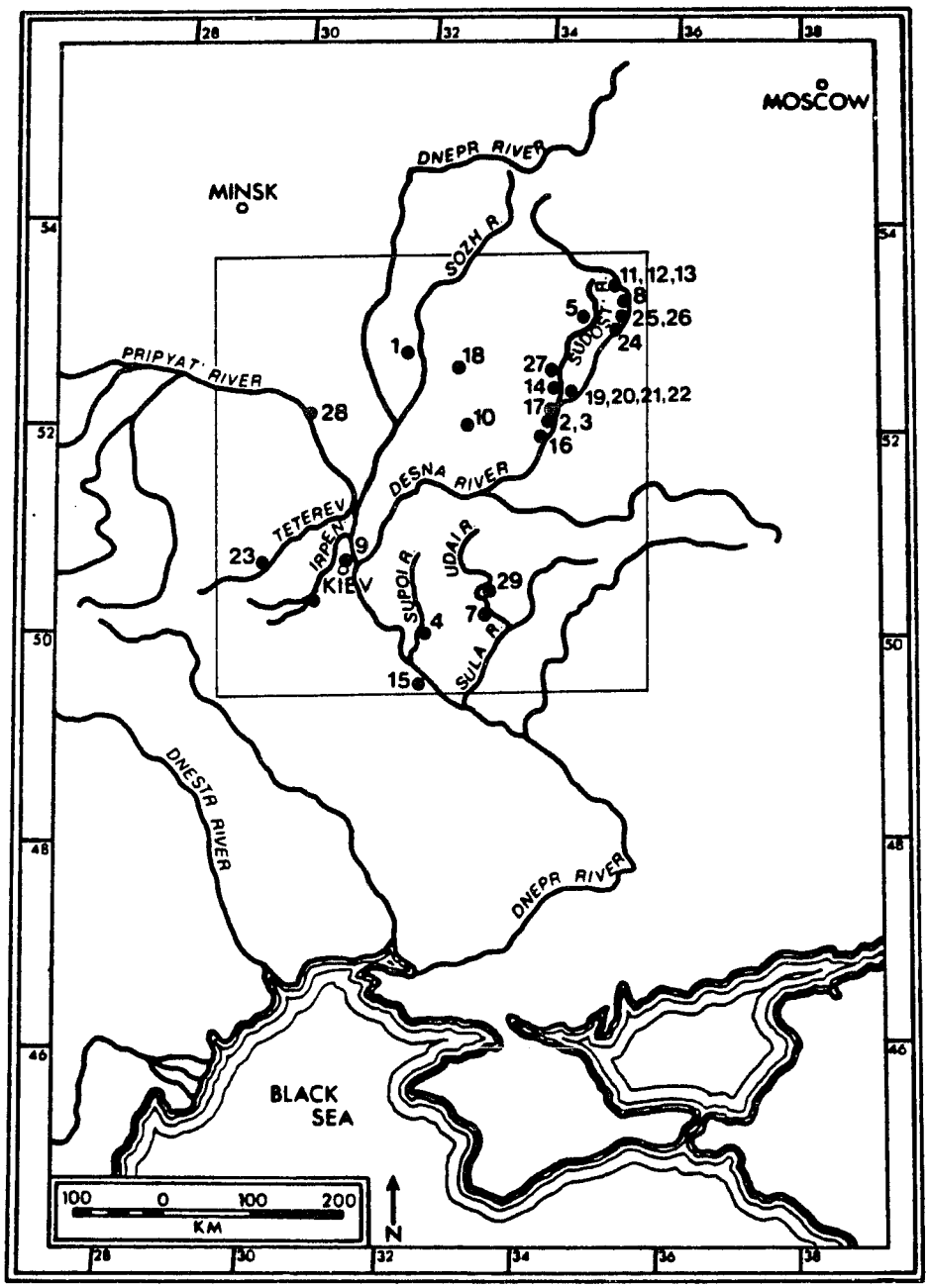


LEGEND:

1 Berdyzh
2 Chulatovo I
3 Chulatovo II
4 Dobranichevka
5 Eliseevichi
6 Fastov
7 Gontsy
8 Khotylevo II
9 Kirillovskaya
10 Klyusy
11 Korshevo I
12 Korshevo II
13 Kositsa
14 Kurovo
15 Mezhirich
16 Mezin
17 Novgorod-Severskii
18 Novo-Bobovichi
19 Bugorok
20 Pogon
21 Pushkari I
22 Pushkari II
23 Radomyshl'
24 Suponevo
25 Timonovka I
26 Timonovka II
27 Yudinovo
28 Yurovichi
29 Zhuravka

FIGURE II-1. UPPER PALEOLITHIC SITES ON THE CENTRAL RUSSIAN PLAIN

FIGURE II-2. THE STUDY AREA



Dimensions of the study area: ~ 180,000 km^2

FIGURE II-3. GEOMORPHOLOGY

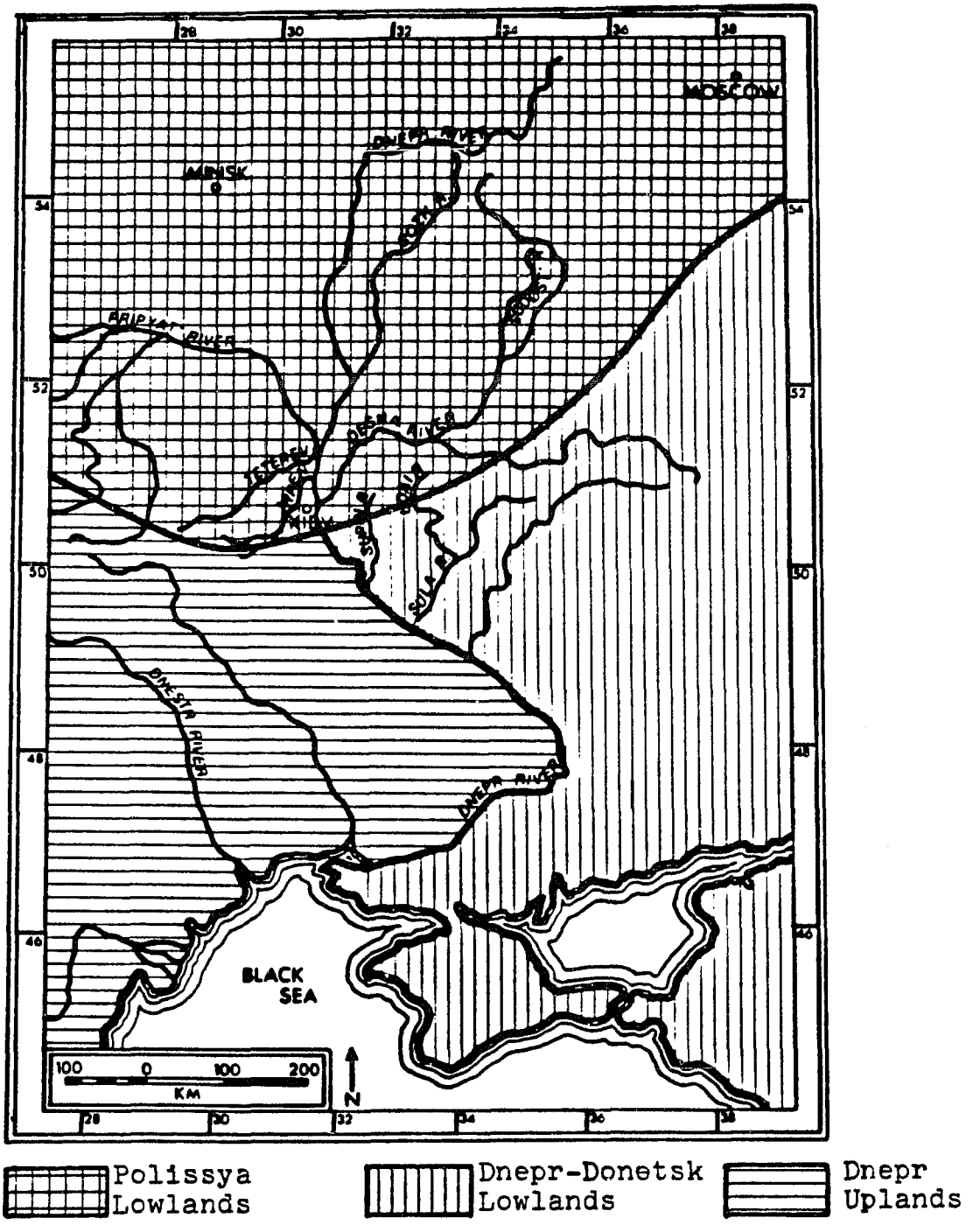
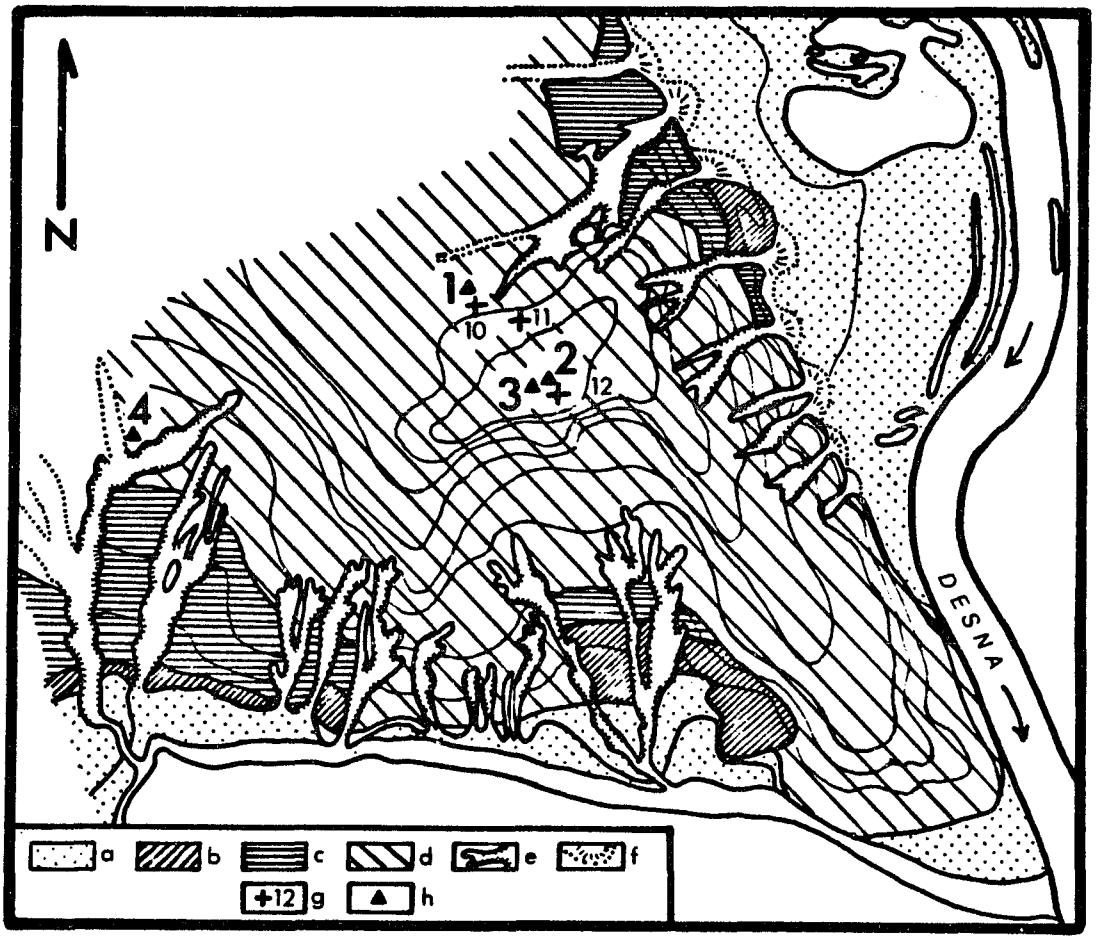


FIGURE II-4. GEOMORPHOLOGY OF PUSHKARI GROUP OF SITES
(after Velichko 1961:Fig. 38)



a Floodplain
b First Terrace
c Second Terrace
d Plateau
e Growing Ravines
f Past Ravines
g Bore Holes
h Sites
1 Pushkari I
2 Pogon
3 Bugorok
4 Pushkari II

FIGURE II-5. MAXIMAL EXTENT OF VALDAI GLACIATION (after Gerasimov and Velichko 1982: Map 1; Grosswald 1980:Fig.7)

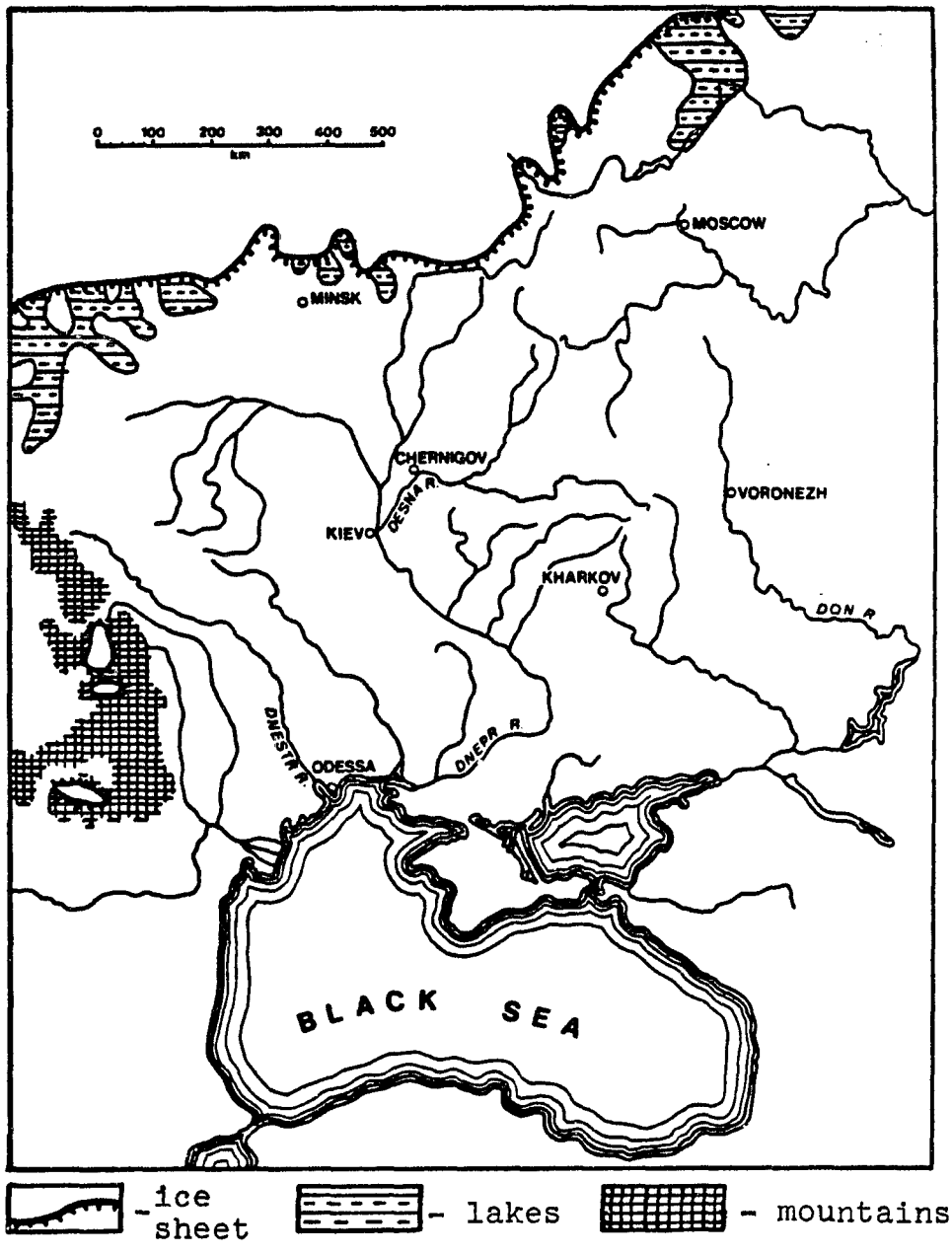


FIGURE II-6. RECESSIONAL INTERVALS OF VALDAI GLACIATION (after Chebotareva 1969a:Fig.3)

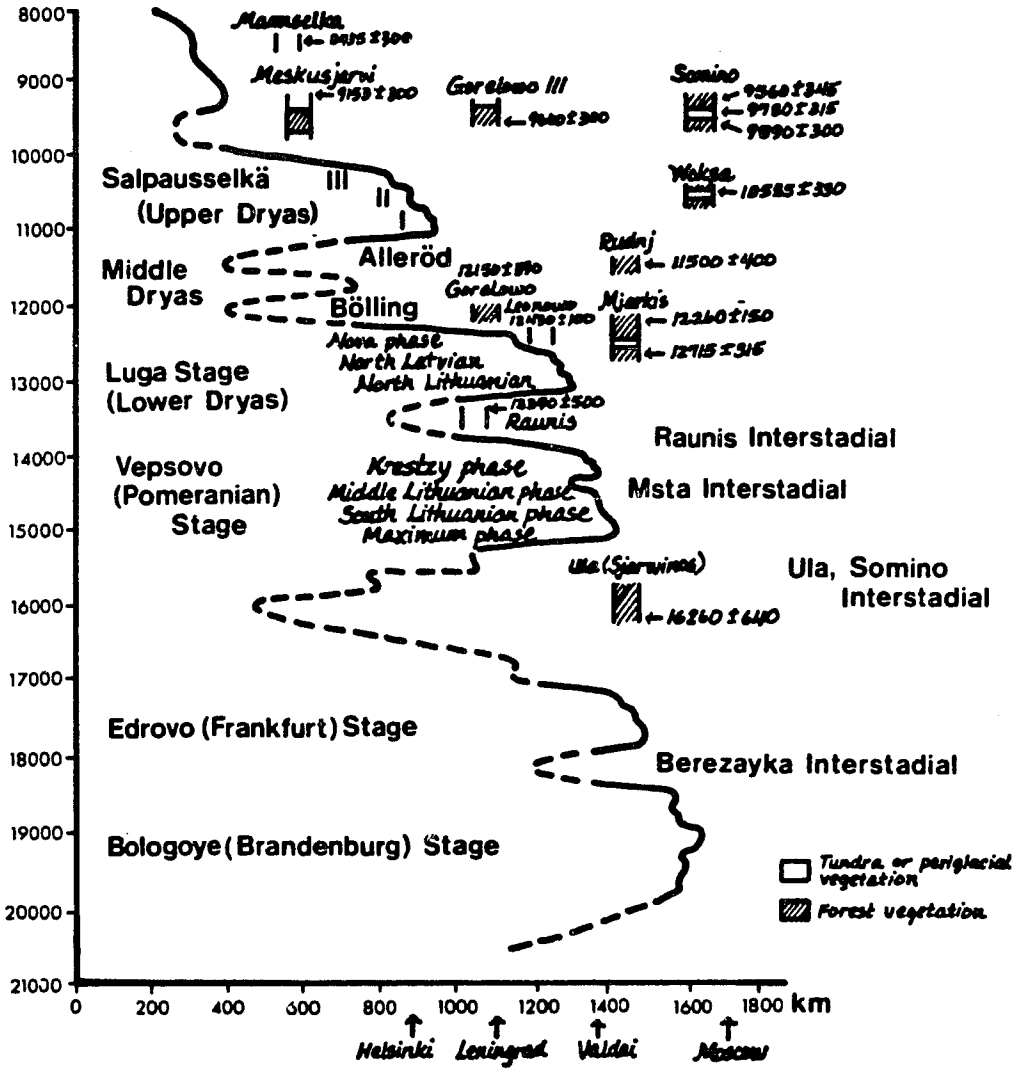


FIGURE II-7. LATE PLEISTOCENE STRATIGRAPHY AND GEOCHRONOLOGY
(after Velichko et al. 1969b:Fig.8)

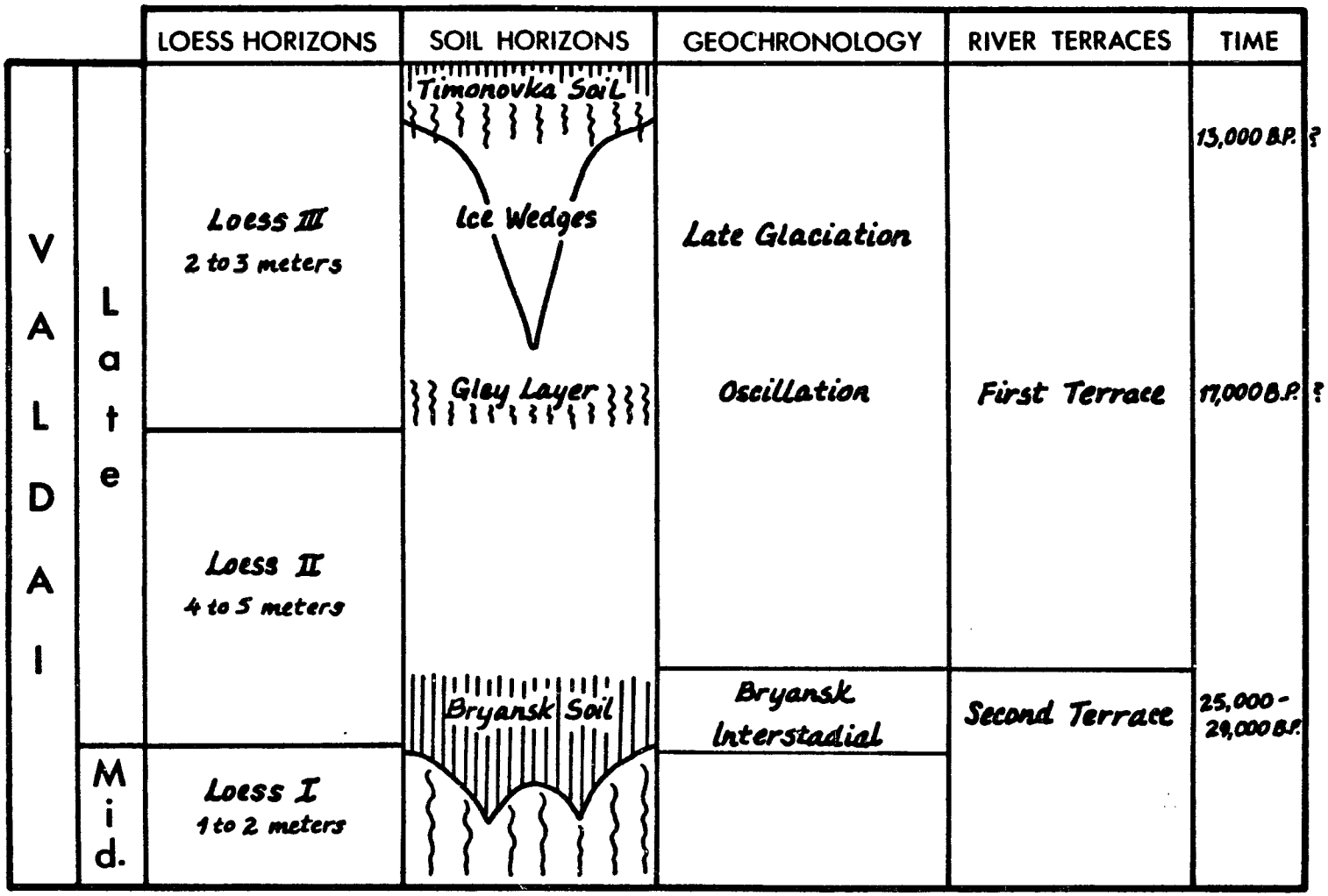
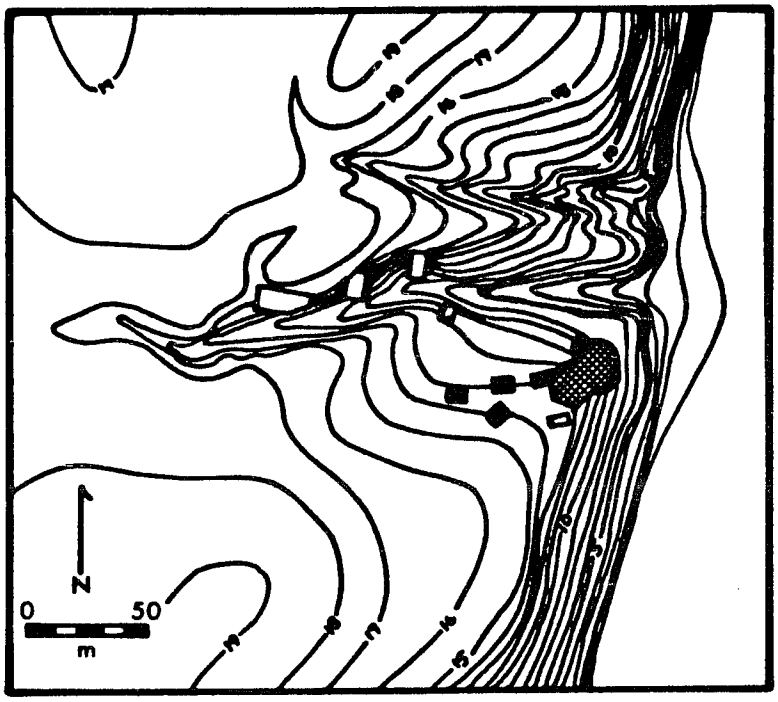
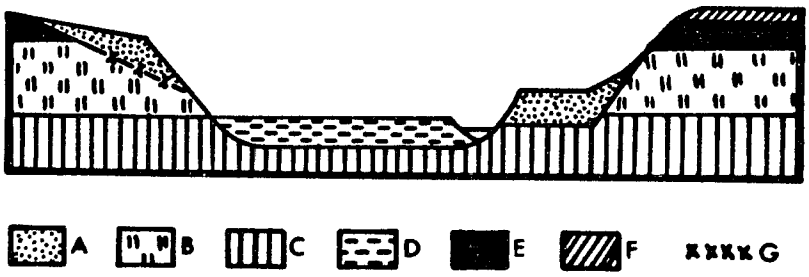


FIGURE II-8. BERDYZH

A. GEOMORPHOLOGY (after Kalechitz 1972:Fig.19)



B. STRATIGRAPHY (after Gromov 1948:Fig.79)



LEGEND:

A--sands
B--deposits under the moraine
C--bedrock
D--floodplain deposits
E--moraine
F--loam
G--cultural materials

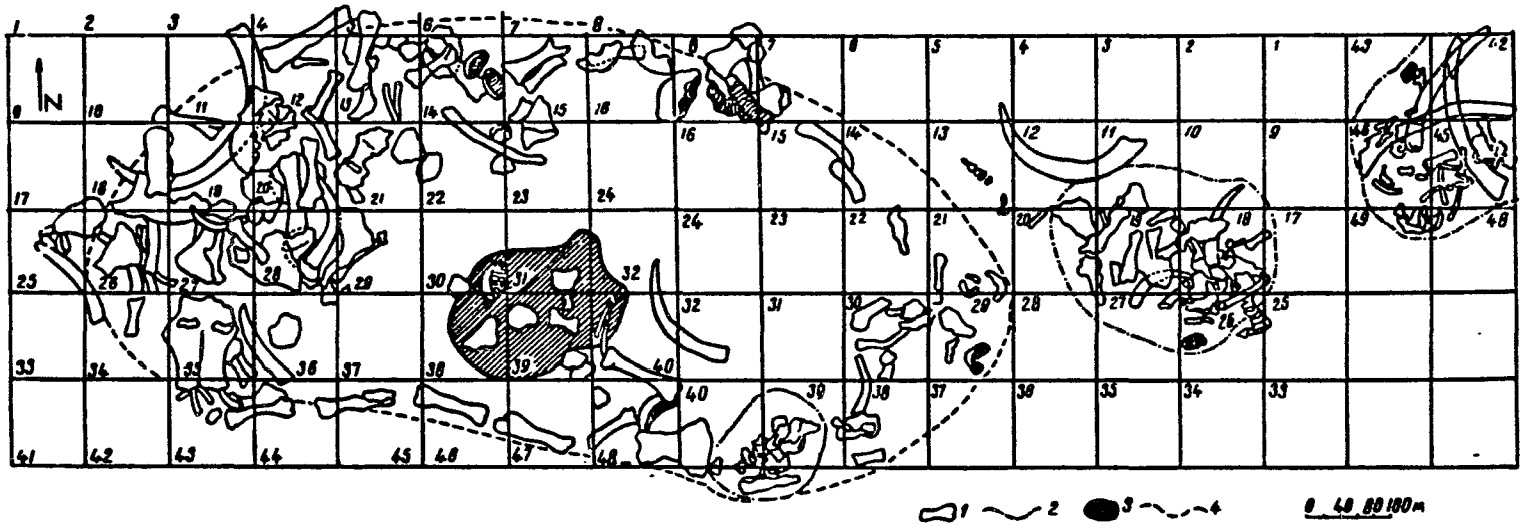
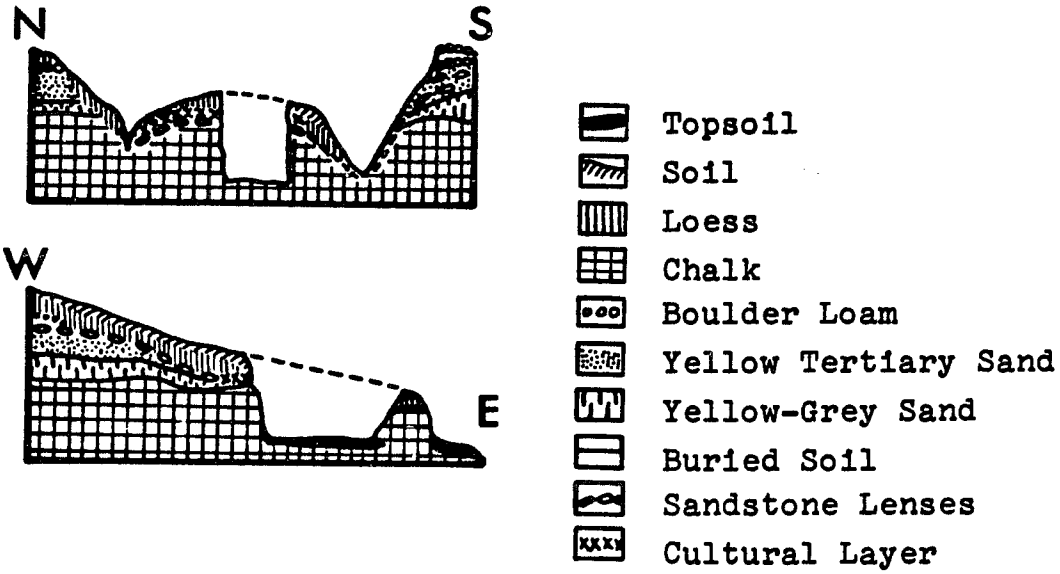


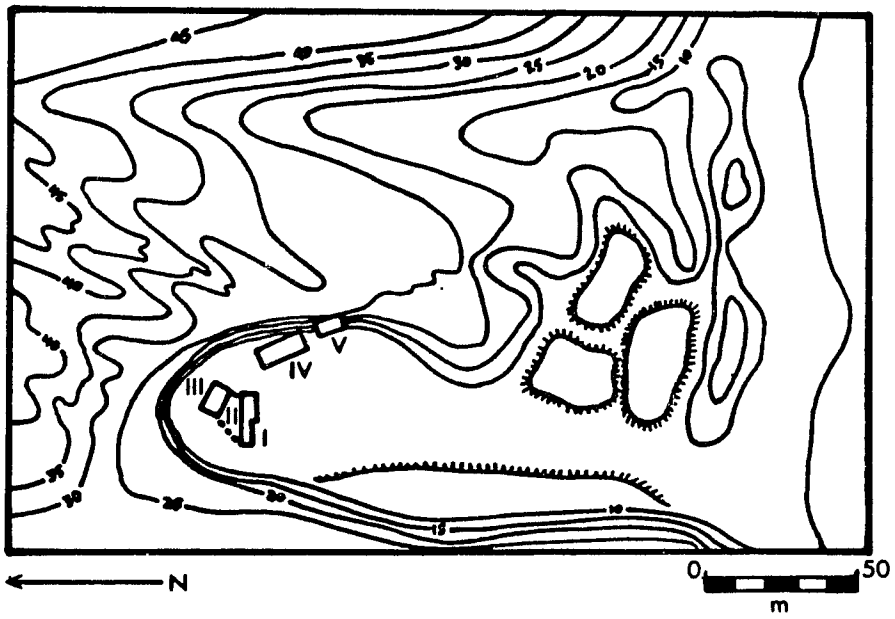
FIGURE II-8C. BERDYZH EXCAVATION 1938-39
(after Polikarpovich 1968:Fig. 10)

LEGEND:
1 -- Mammoth Bones
2 -- Outline of Storage Pits
3 -- Hearth and Ash Spots
4 -- Outline of Dwelling

FIGURE II-9. CHULATOVO I
(after Pidoplichko 1947:
Figs. 1 and 2)



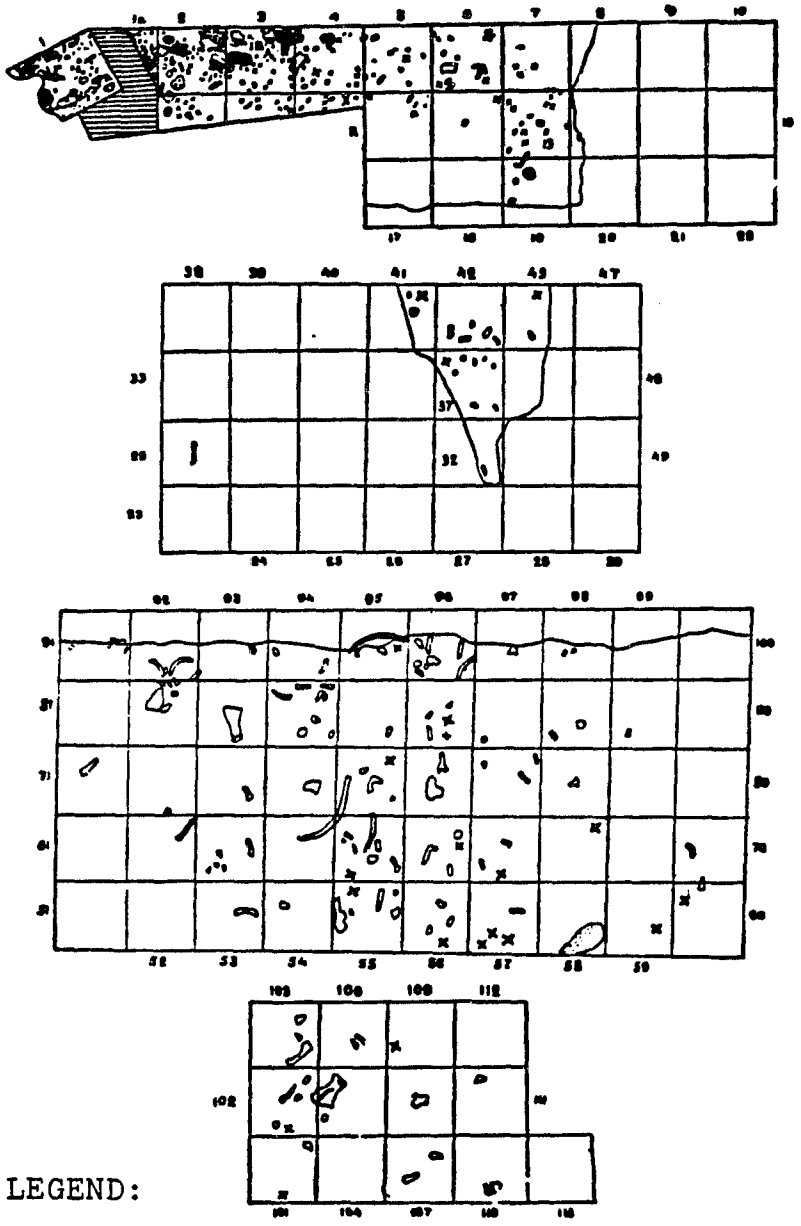
A. STRATIGRAPHY



B. GEOMORPHOLOGY

I - V -- Excavations

C. EXCAVATIONS AT CHULATOVO I
(after Pidoplichko 1947a:Fig.3)



LEGEND:

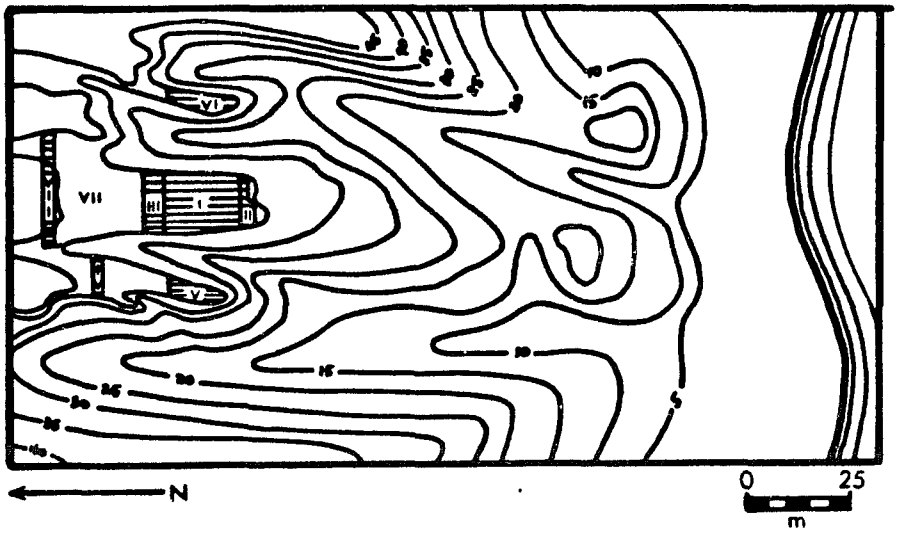
xx--flint

--bones

--sandstone slabs

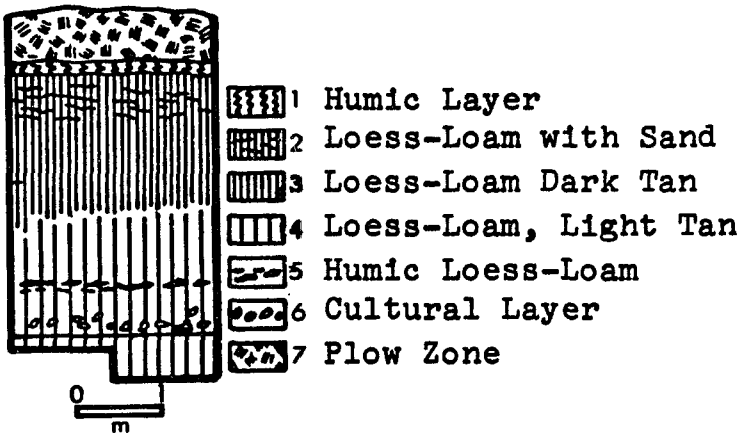
--ash spots/hearths (?)

FIGURE II-10. CHULATOVO II



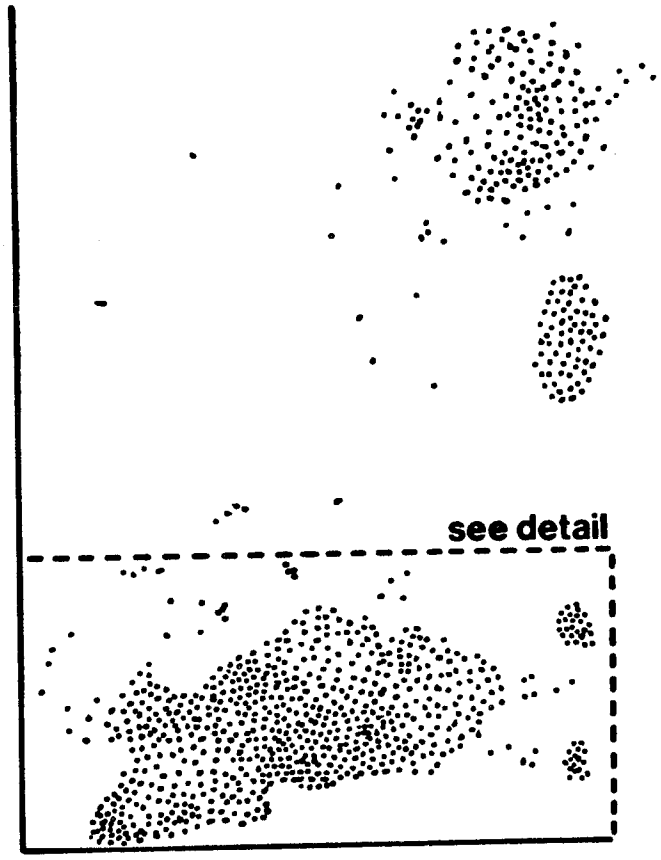
A. GEOMORPHOLOGY (after Voevodskii 1952a:Fig. 1)

I - VI -- Excavations

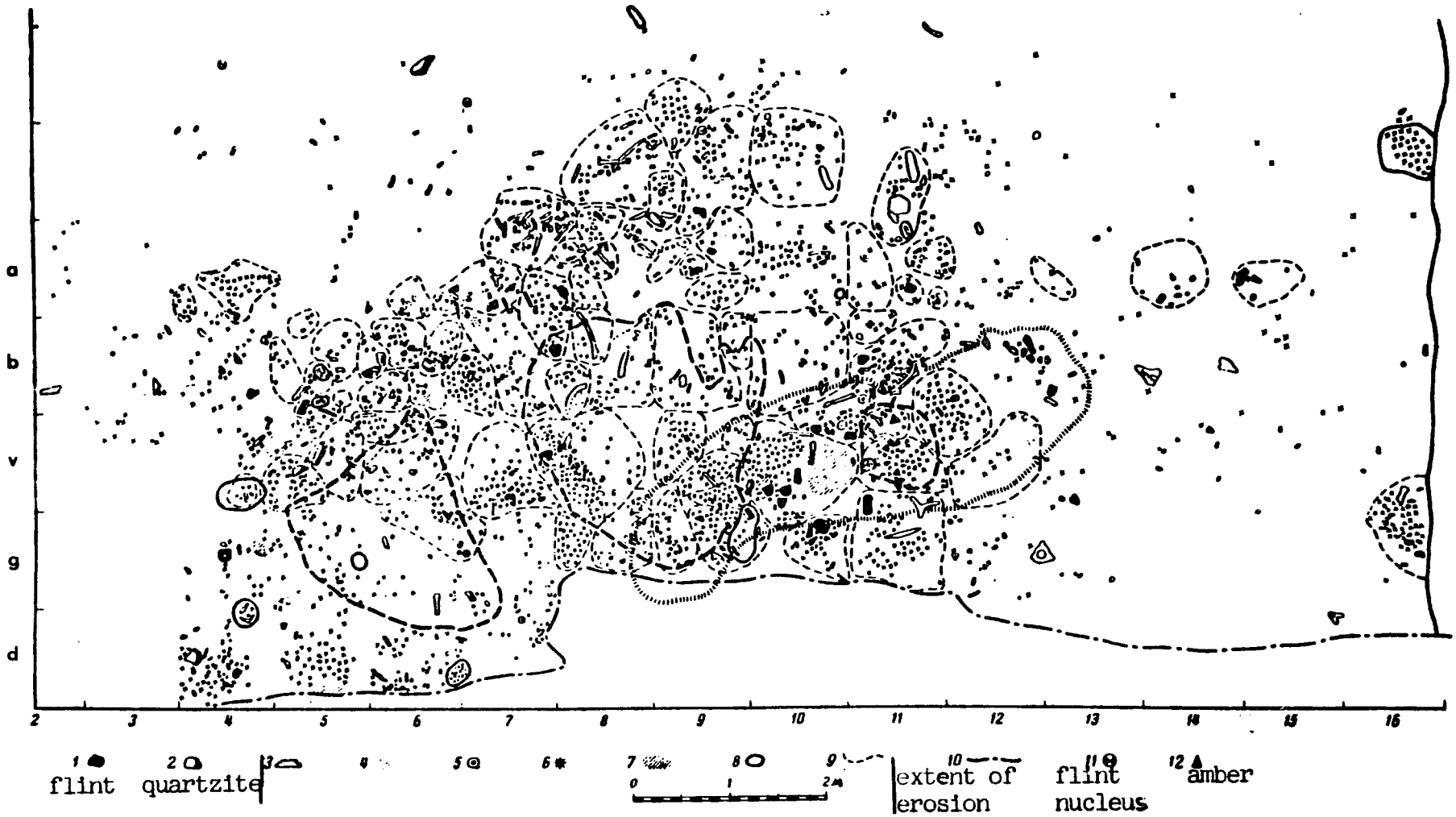


B. STRATIGRAPHY (after Velichko 1961:Fig. 36)

C. DISTRIBUTION OF CULTURAL REMAINS
(after Leonova 1977:Tab.19)



D. DETAILS OF CHULATOVO II EXCAVATION

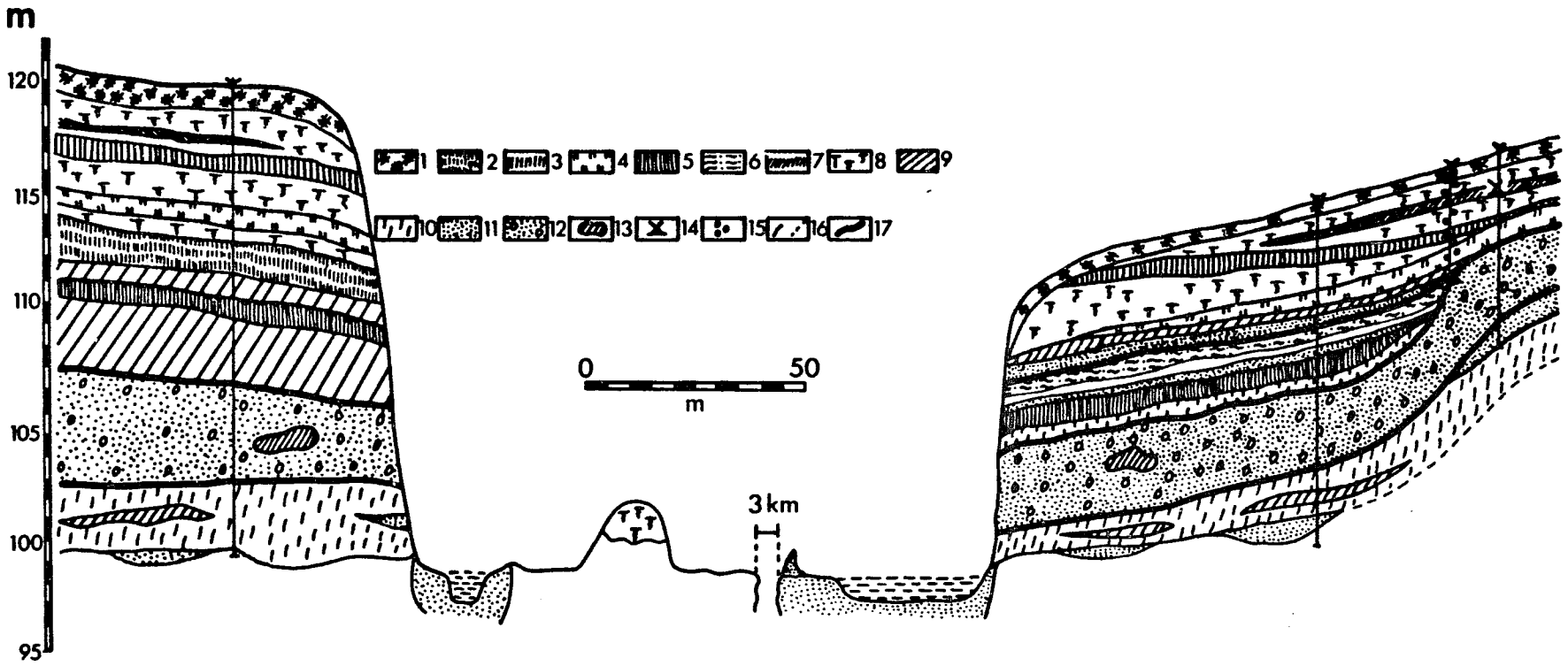


3--bone 4--ocher 5--shell 6--charcoal 7--chalk slab 8--pit 9--border of complex

FIGURE II-11. Dobranichevka

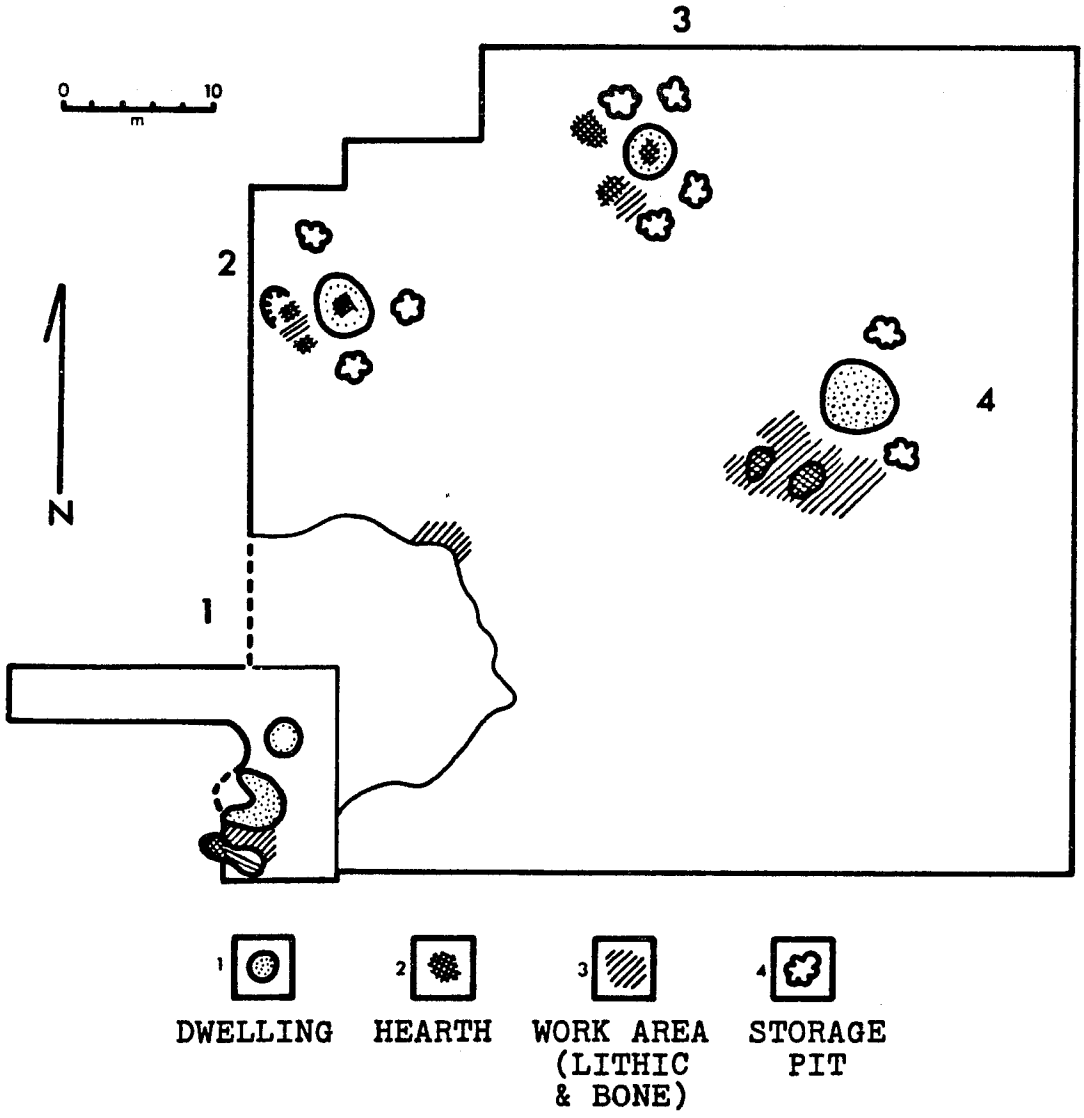
LEGEND:

1-Chernozem
2-Dark Grey Forest Soil
3-Grey Forest Soil
4-Dark Brown-Grey Forest Soil
5-Grey-Brown Soil
6-Meadow Soil
7-Embryonic Soil
8-Loess
9-Loam
10-Sandy Loam
11-Sand
12-Boulder Loam (Moraine)
13-Boulders
14-Cultural Layer
15-Pollen Cores
16-Stratigraphic Boundaries
17-Erosional Boundaries



A. GEOMORPHOLOGY AND STRATIGRAPHY OF SUPOI VALLEY
(after Pushkevich and Dubnyak 1978:Fig. 1)

FIGURE II-11b. DOBRANICHEVKA EXCAVATION
(after Leonova 1977:Fig. 44)



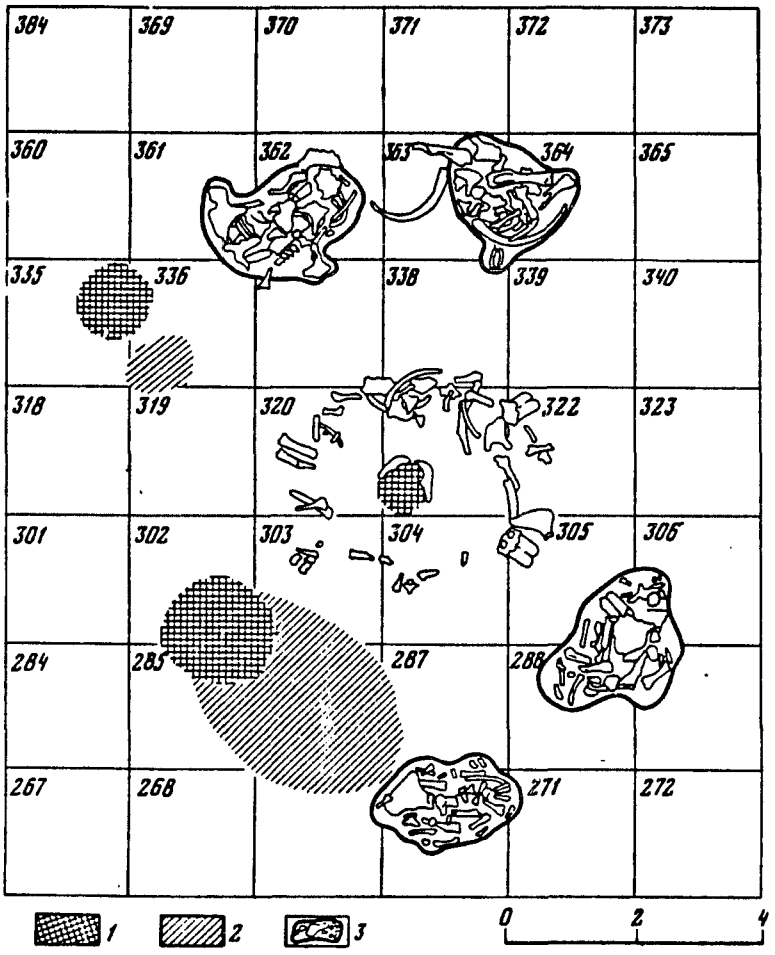


FIGURE II-11c. DOBRANICHEVKA COMPLEX #3 (after Shovkoplyas et al. 1981: Fig. 29)

LEGEND:
1 -- Hearth
2 -- Bone and Lithic Work Area
3 -- Storage Pit

FIGURE II-12. ELISEEVICHI

A. PLAN OF EXCAVATIONS

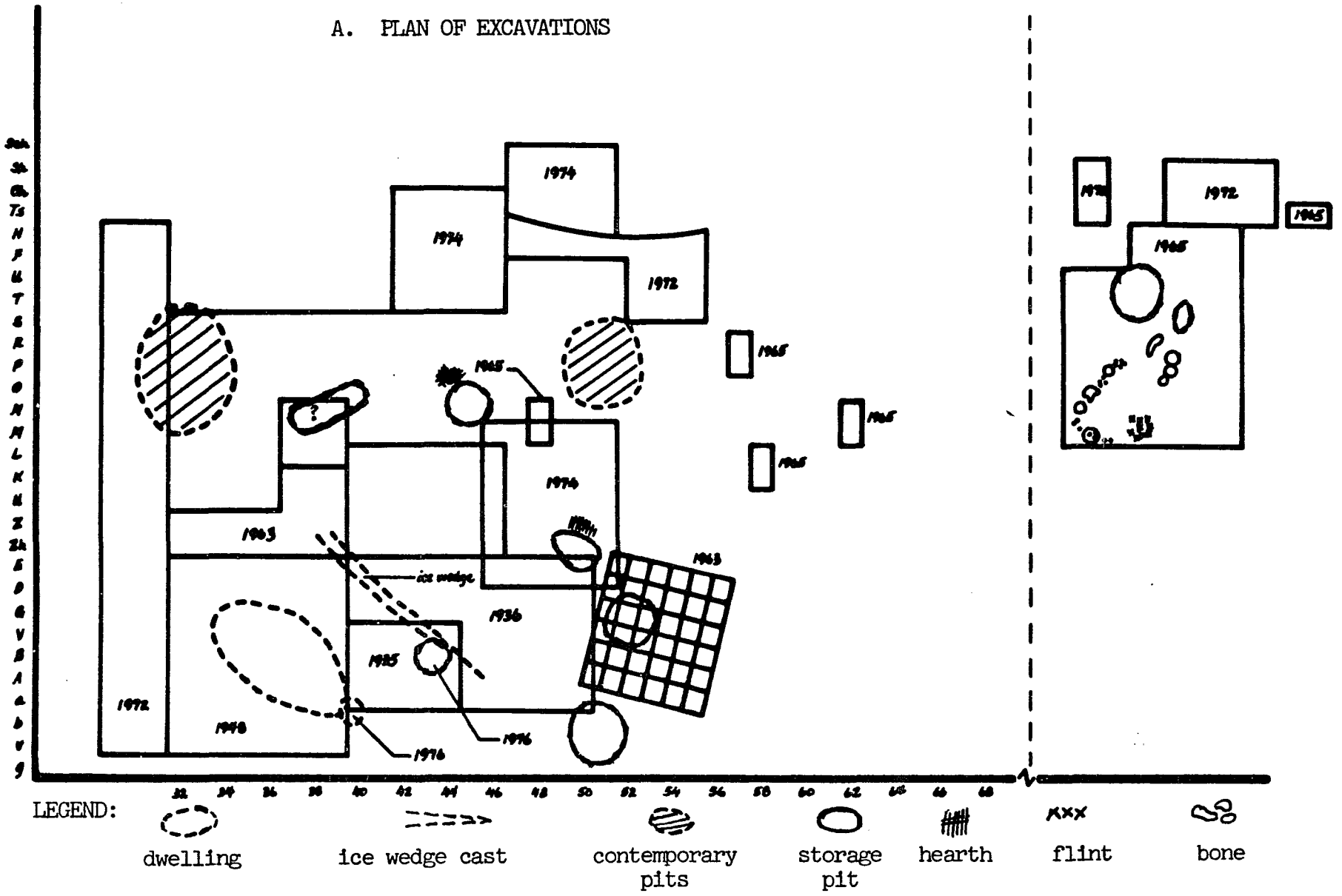
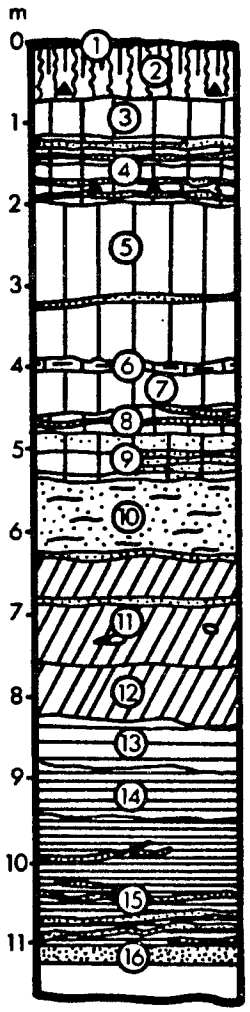


FIGURE II-12. ELISEEVICHI

B. STRATIGRAPHY
(after Velichko 1961:Fig. 56)

1-Humic Layer
2-Sandy Loam--Light Grey
3-Sandy Loam--Light Brown
4-Layering of #2 and #3 with cultural layer at a depth of 1.90-1.95 m
5-Loess-like Sandy Loam
6-Sandy Loam--Grey/Brown
7-Sandy Loam, Loess-Like
8-Sand
9-Sandy Loam-Light Grey
10-Sandy Loam--Brown-Grey
11-Loam--Brown-Grey
12-Loam--Greyish
13-Clay--Marly, Compact
14-Clay--Marly, Light
15-Clay--Marly, Light with Sand Lenses
16-Sand--Dark Grey



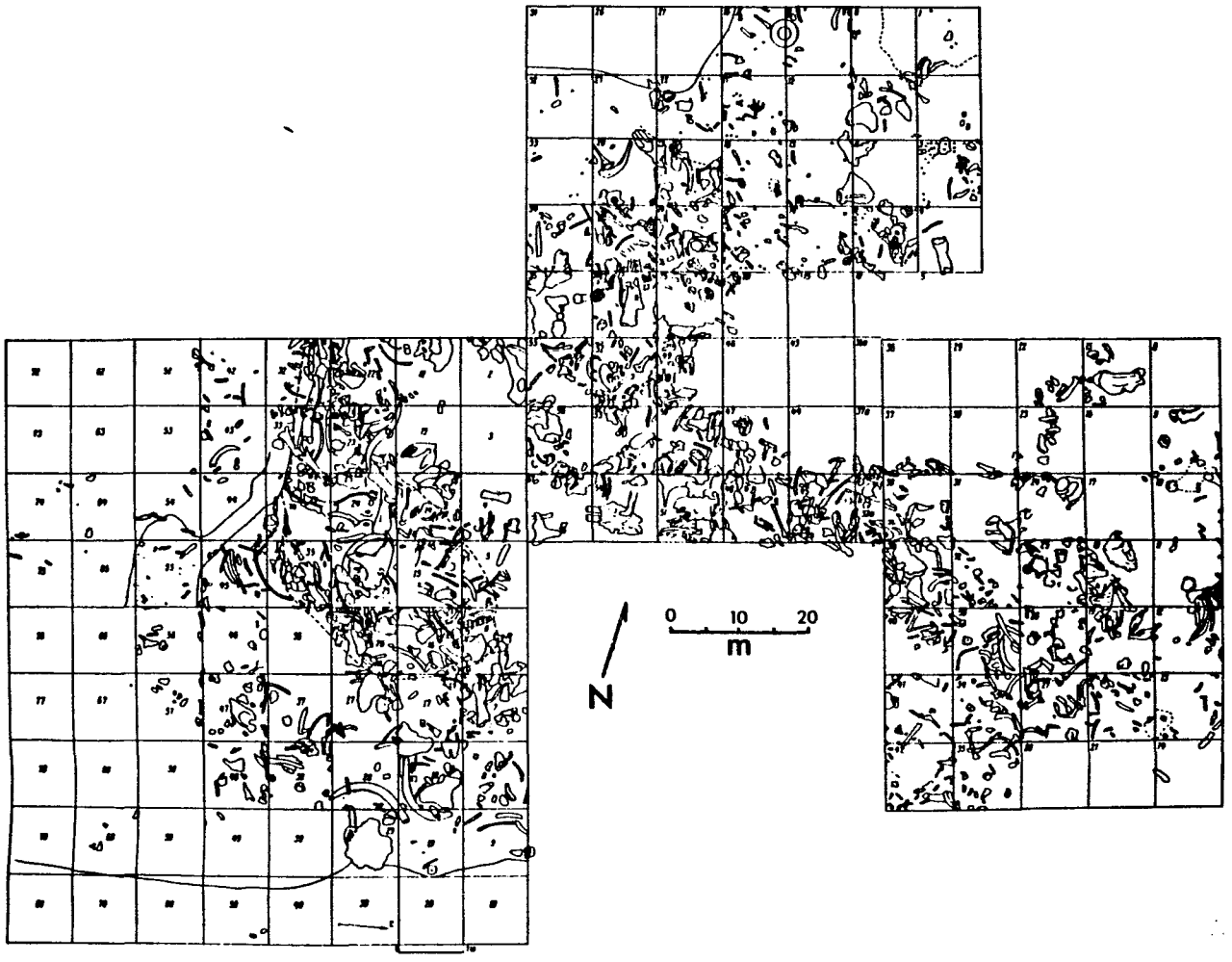
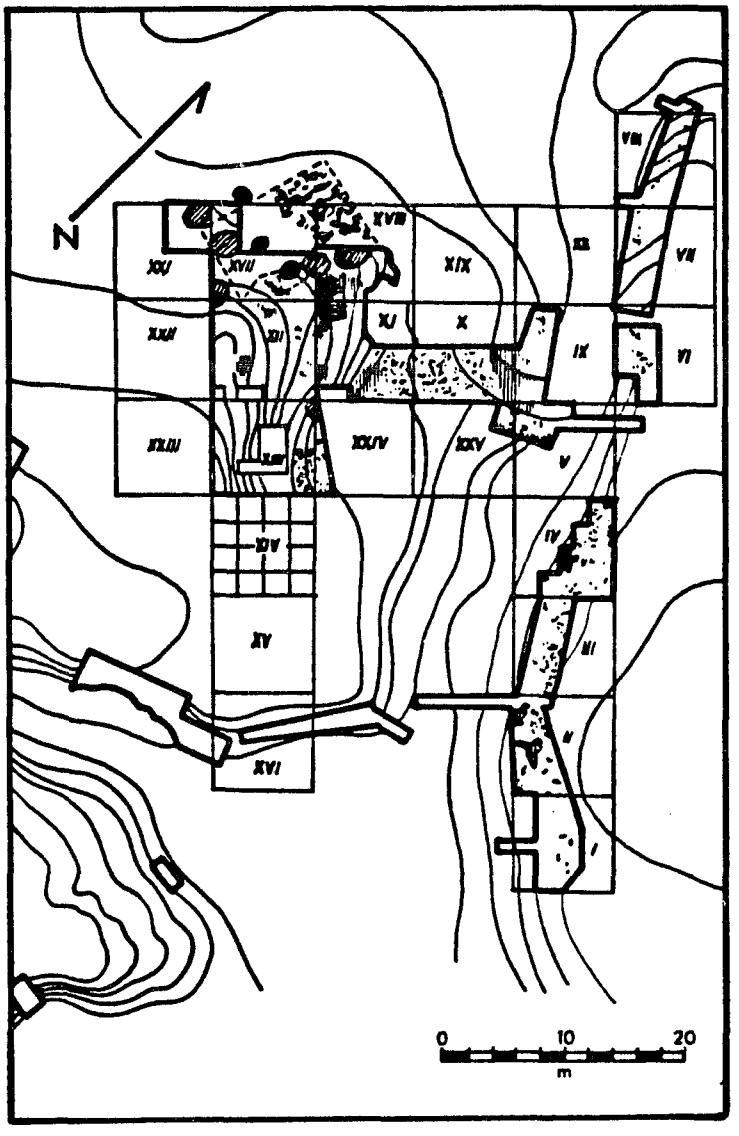


FIGURE II-12c. ELISEEVICHI 1935-1948 EXCAVATIONS
(after Polikarpovich 1968 Foldout Map)

FIGURE II-13 GONTSY

A. PLAN OF EXCAVATIONS
(after Levitskii 1947:Fig.9)



LEGEND: PITS CULTURAL REMAINS I-XXIII EXCAVATIONS

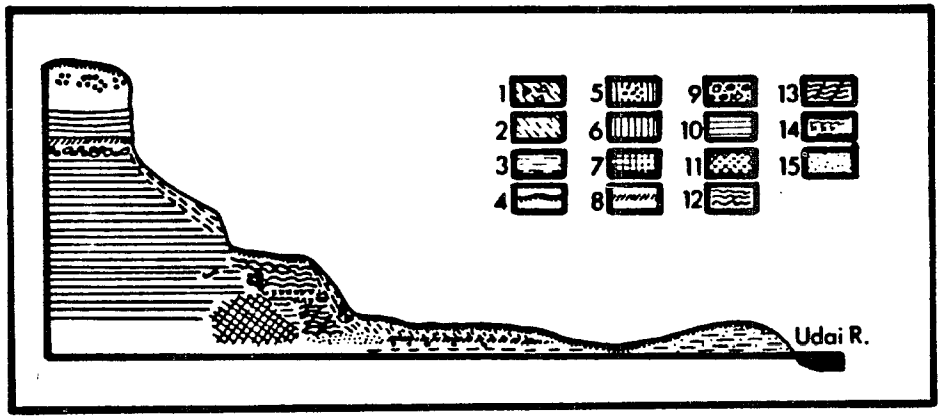


FIGURE II-13b. STRATIGRAPHY OF UDAI RIVER, RIGHT BANK
(after Pidoplichko 1969:Fig. 13)

LEGEND:
1 -- Soil Creep
2 -- Delluvial Ravine Deposits
3 -- Alluvial Deposits
4 -- Present Day Soil
5 -- Loess With Burrows
6 -- Pale Yellow Loess
7 -- Brown Loam
8 -- Fossil Soil
9 -- Boulder Clay
10 -- Stratified Pale Loam
11 -- Pliocene Clay
12 -- Bandy Loam
13 -- Dislocations
14 -- Cultural Layer
15 -- Stratified Sand

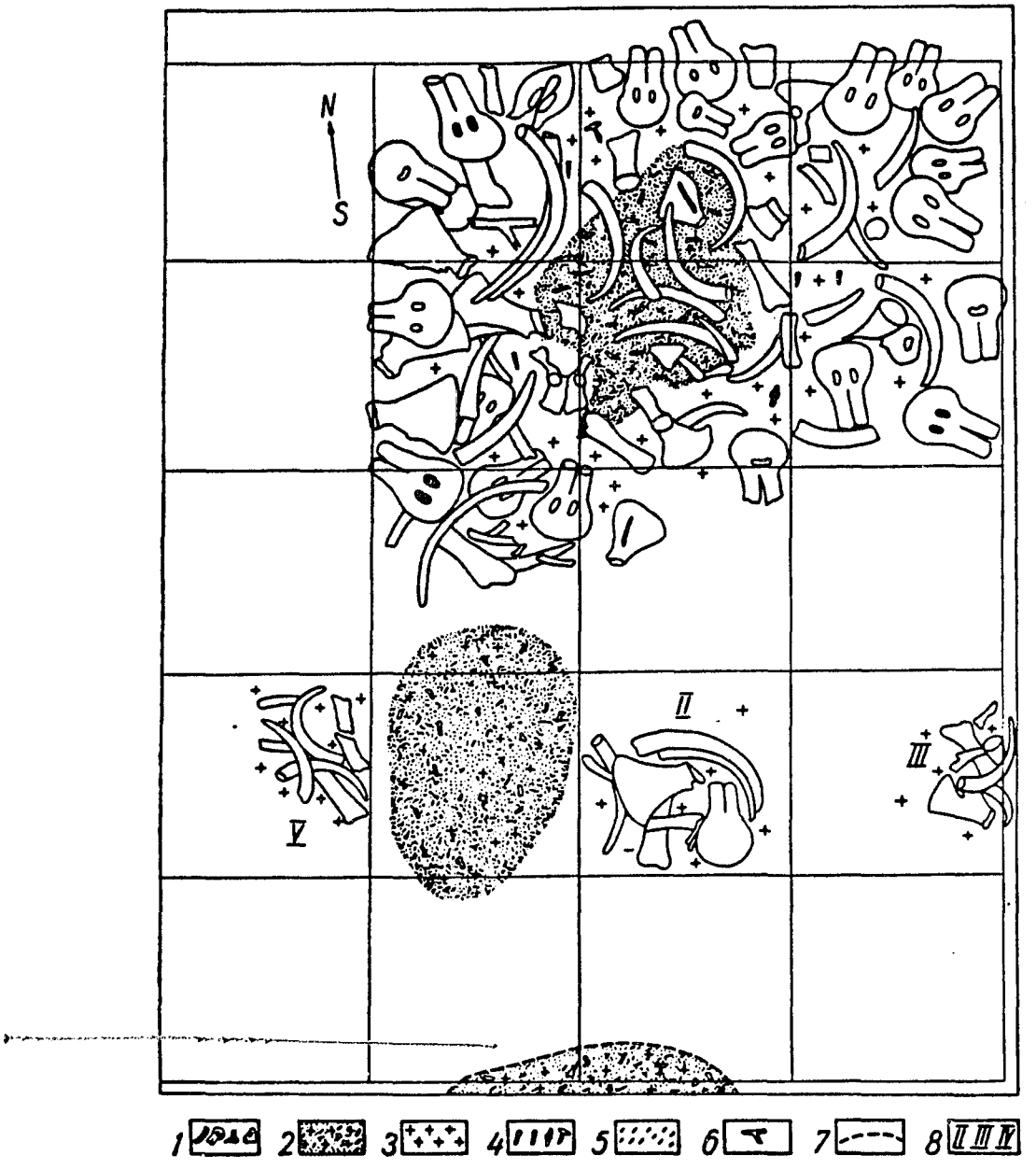
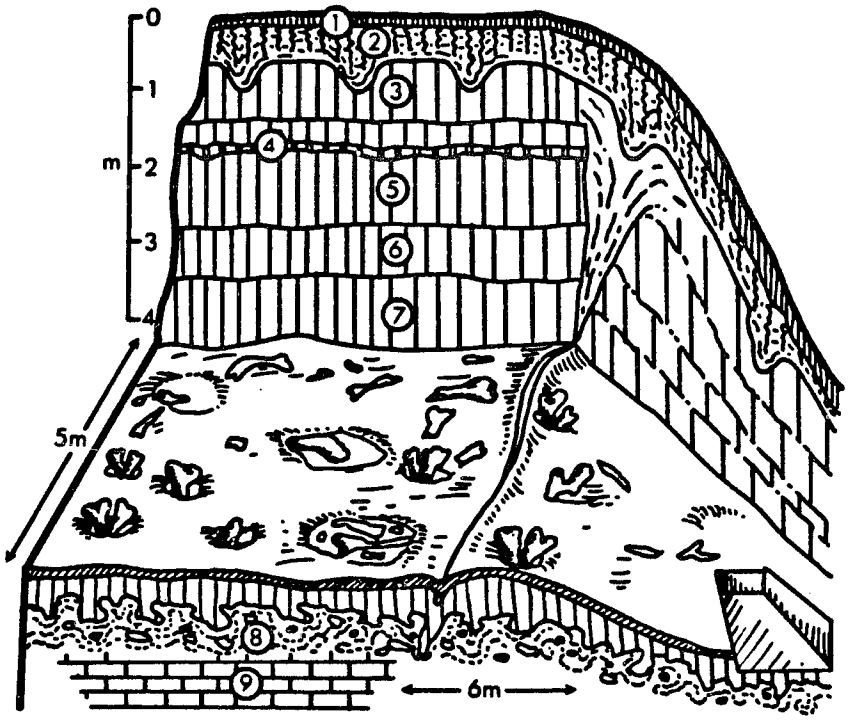


FIGURE II-13c. GONTSY MAMMOTH BONE DWELLING RECONSTRUCTION
(after Pidoplichko 1969:Fig.14)

LEGEND:

1--Mammoth Bones
2--Ash Lense
3--Flint
4--Worked Bone
5--Bone Charcoal
6--Reindeer Antler
7--Destroyed Ash Lense
8--Storage Pits

FIGURE II-14. Khotylevo II
(after Velichko et al. 1981: Fig. 17)

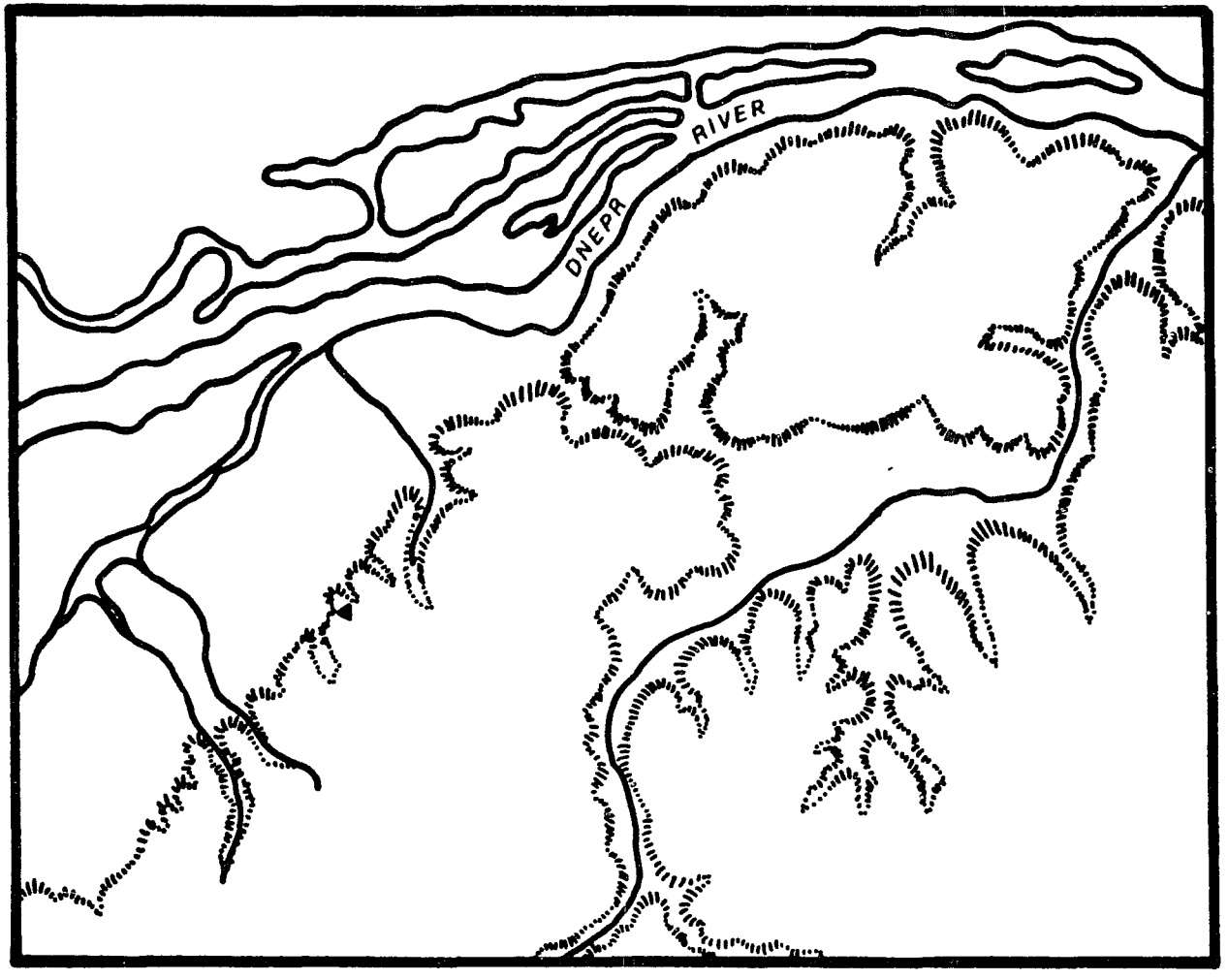


LEGEND:

1 -- Humic Layer
2 -- B Horizon
3 -- Loess-Sandy Loam
4 -- Faint Humic Layer
5 -- Loess-Sandy Loam
6 -- Loess-Sandy Loam, Faintly Banded
7 -- Heavy Loess-Sandy Loam with Sand Lenses
8 -- Loam
9 -- Marl

FIGURE II-15. KIRILLOVSKAYA

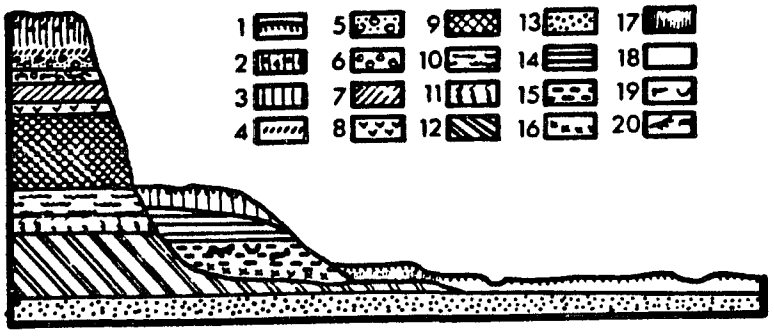
A. GEOGRAPHIC LOCATION (after Pidoplichko 1969:Fig. 3)



LEGEND: ▲ Location of the Site

FIGURE II-15. KIRILLOVSKAYA

B. STRATIGRAPHY (after Pidoplichko 1969:Figure 4)



1 Present Day Soil
2 Loess with Burrows
3 Loess
4 Fossil Soil on Boulder Clay
5 Boulder Clay
6 Banded Boulder Loam & Sand
7 Brown Clay
8 Mottled Clay
9 Poctava Sand
10 Kharkov Sand
11 Sandy Clay
12 Kiev Marl
13 Buchaksky Sand
14 Loess Sandy Bedded Loam
15 Clayey Stratified Sand
16 Cultural Layer
17 Alluvial-Delluvial Deposits
18 Alluvium
19 Bones of Megafauna
20 Separate Bones of Reindeer and Musk Ox (?)

(?) No Musk Ox Reported in Faunal Assemblage of the Site.

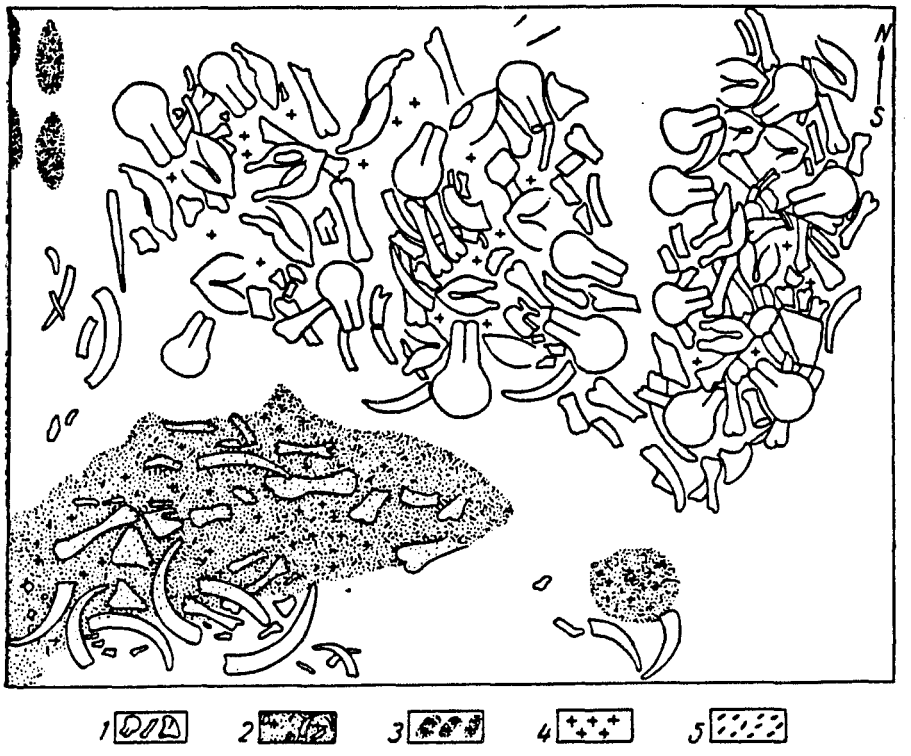


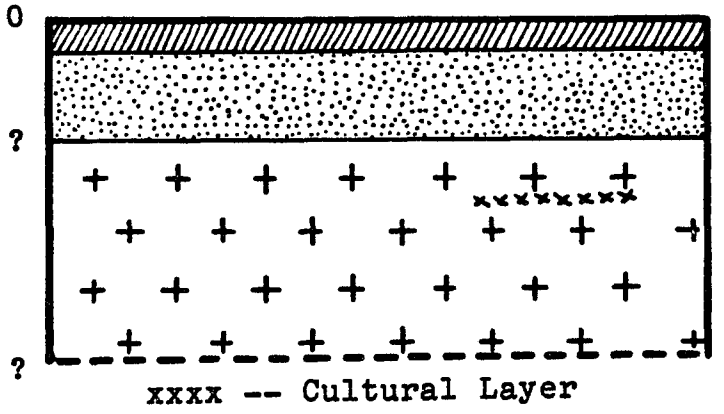
FIGURE II-15C. PARTIAL RECONSTRUCTION OF KIRILLOVSKAYA CULTURAL LAYER (after Pidoplichko 1969:Fig. 8)

LEGEND:

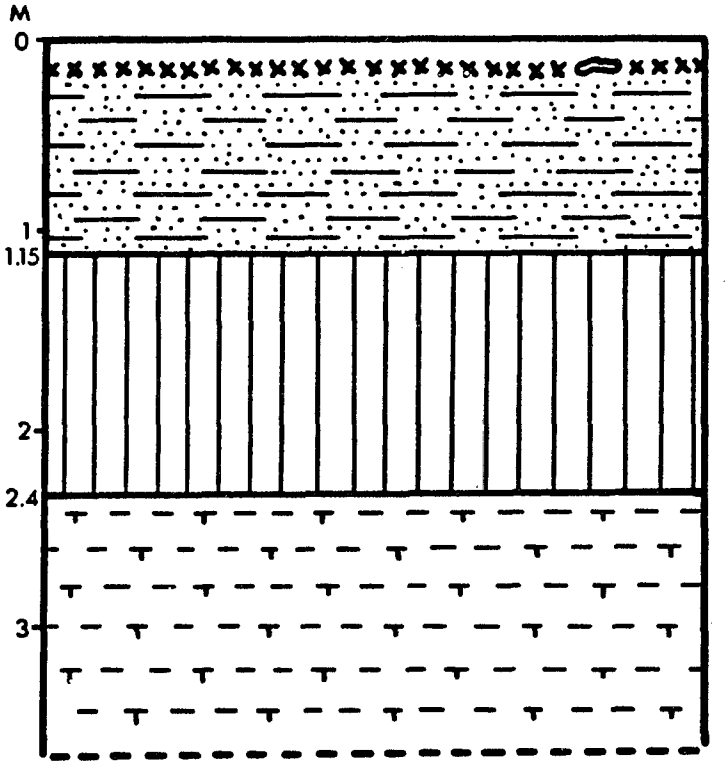
1 -- Mammoth Bones
2 -- Ash Lenses
3 -- Ash Spots (Former "Upper Layer")
4 -- Flint
5 -- Bone Charcoal

FIGURE II-16.

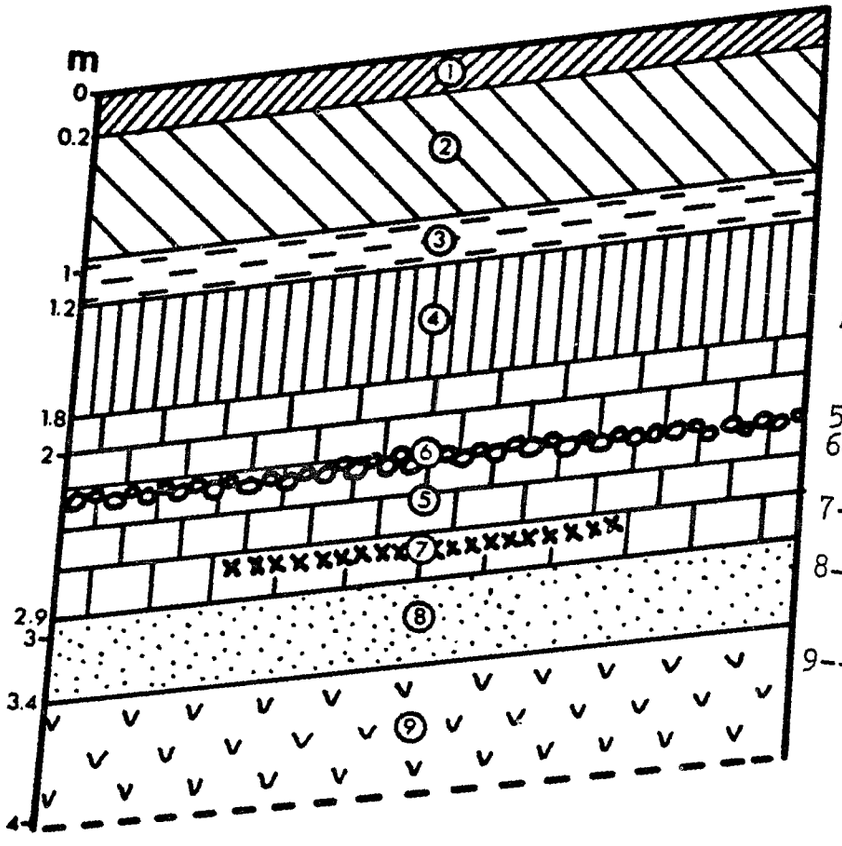
A. KLYUSY STRATIGRAPHY



B. KOSITSA STRATIGRAPHY



NW FIGURE II-17. KUROVO SE



A. STRATIGRAPHY

LEGEND:
1--Present Day Soil
2--Yellow Loess
3--Fossil Soil
4--Laminated Loam--Sandy Loam
5--Loam
6--Turf-Like Horizon
7--Cultural Layer
8--Light Brown Loam
9--Light Grey Loam

B. CULTURAL LAYER
(after Polikarpovich 1968: Fig. 77)

LEGEND:
1 -- Flint
2 -- Bones



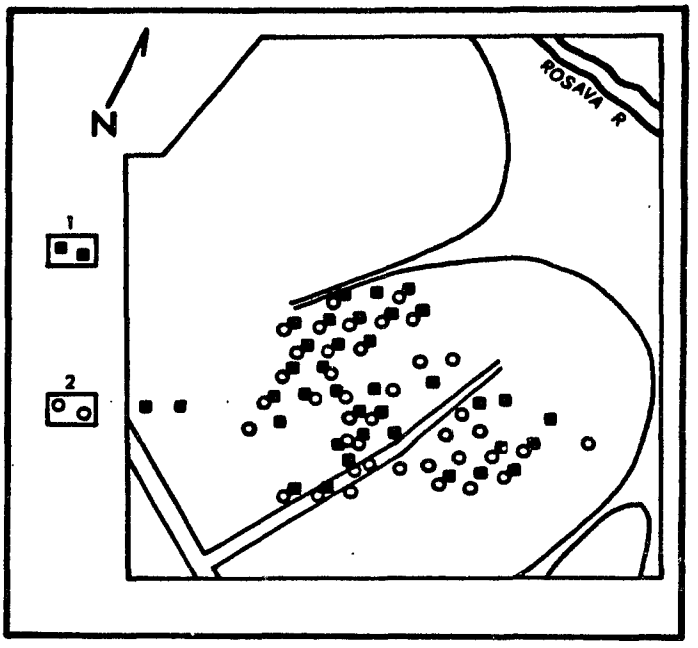


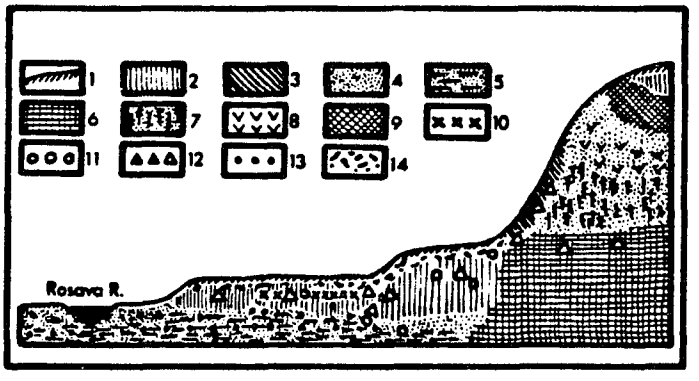
FIGURE II-18 MEZHIRICH

A.LOCATION
(after Pidoplichko 1976:Fig.3)

LEGEND:

1--Contemporary structures

2--Bore holes



B. STRATIGRAPHY
(after Pidoplichko 1976:Fig. 5)

LEGEND:

1--Soil
2--Loess,Loess-Like Loam
3--Delluvium
4--Alluvium
5--Relic Stratified Alluvium
6--Paleogene Deposits
7--Kharkov Sand
8--Poltava Sand
9--Clay
10--Cultural Layer

FIGURE II-18C. MEZHIRICH EXCAVATION PLAN

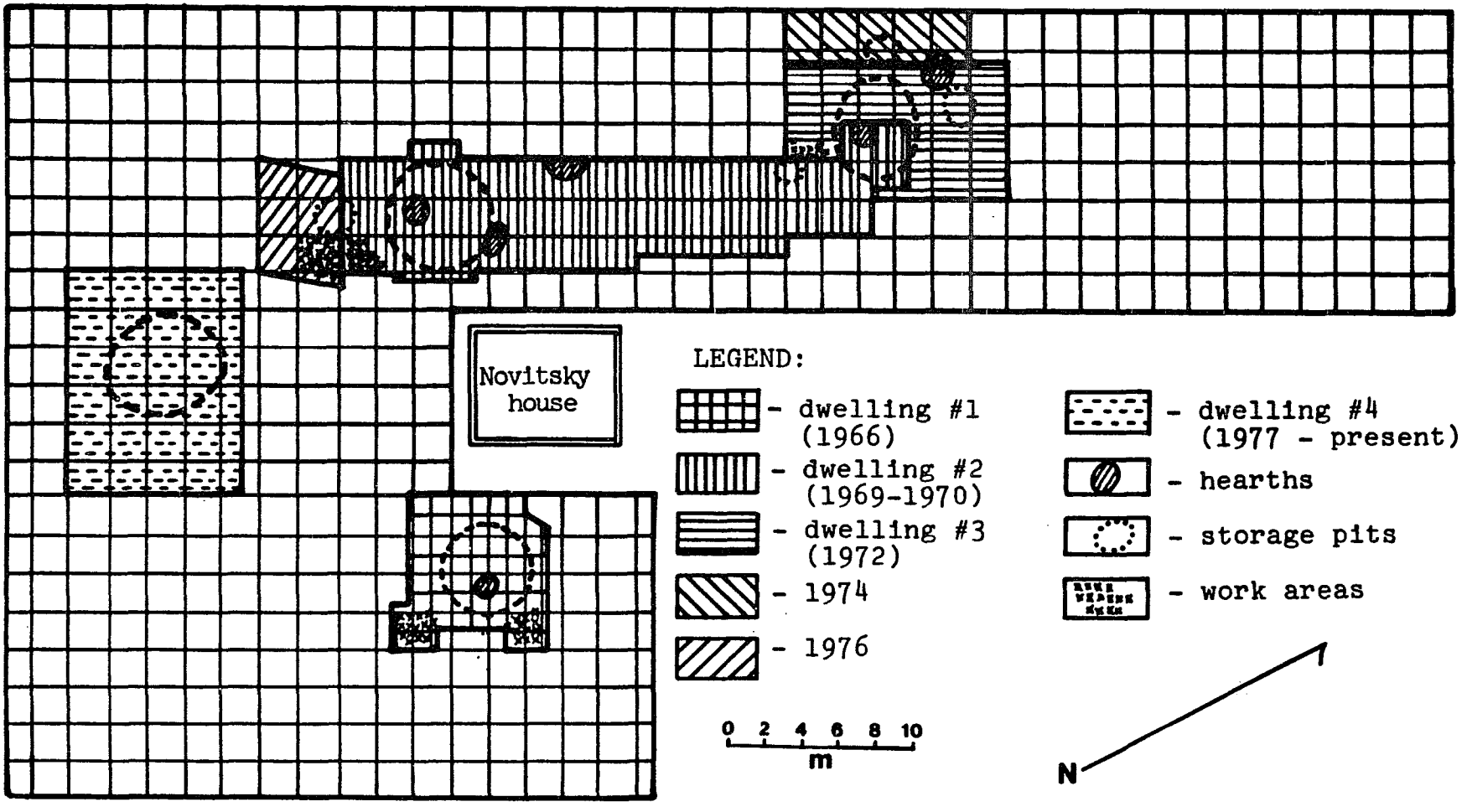
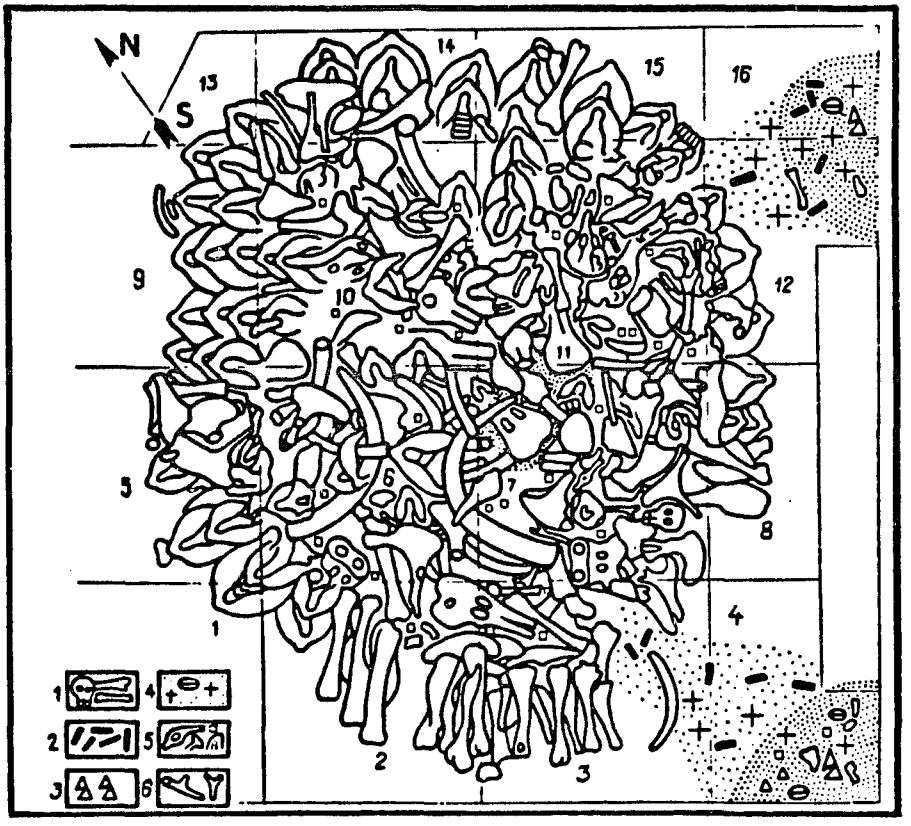


FIGURE II-18D. MEZHIRICH DWELLING #1
(after Pidoplichko 1976:
Fig. 18)

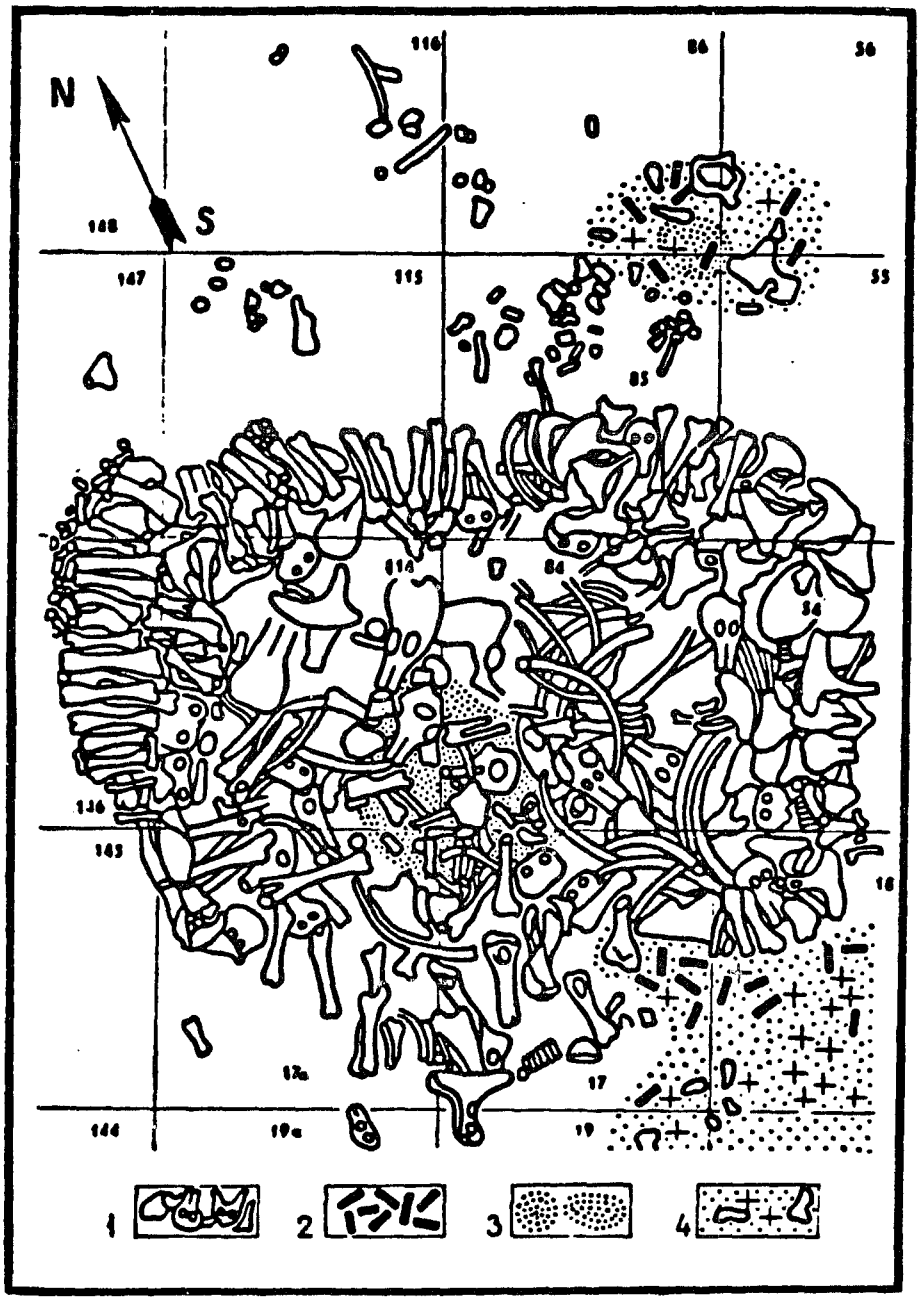


LEGEND:

1 -- Mammoth Bones
2 -- Hearths and Ash Lenses
3 -- Bone Charcoal
4 -- Worked Bone
5 -- Marine Shells
6 -- Reindeer Antlers

FIGURE II-18E. MEZHIRICH DWELLING # 2

(after Pidoplichko 1976:Fig.19)



LEGEND:

1 -- Bones

2 -- Bone Charcoal

3 -- Hearths

4 -- Work Areas Near Hearths

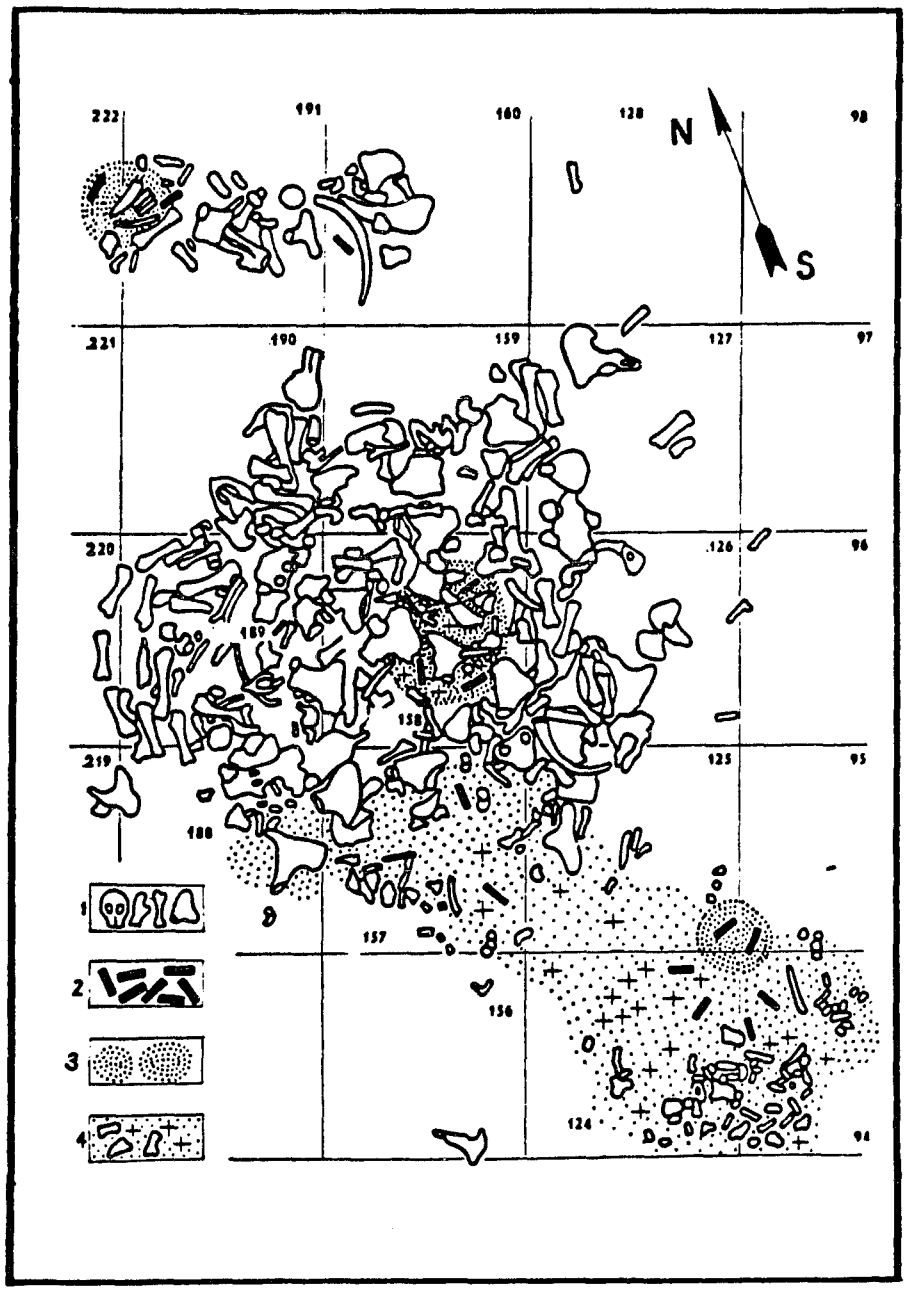


FIGURE II-18F. MEZHIRICH DWELLING #3
(after Pidoplichko 1976: Fig. 20)

LEGEND:
1 -- Mammoth Bones
2 -- Bone Charcoal
3 -- Hearths
4 -- Work Areas Near Hearths and Pit

FIGURE II-18G. MEZHIRICH DWELLING # 4

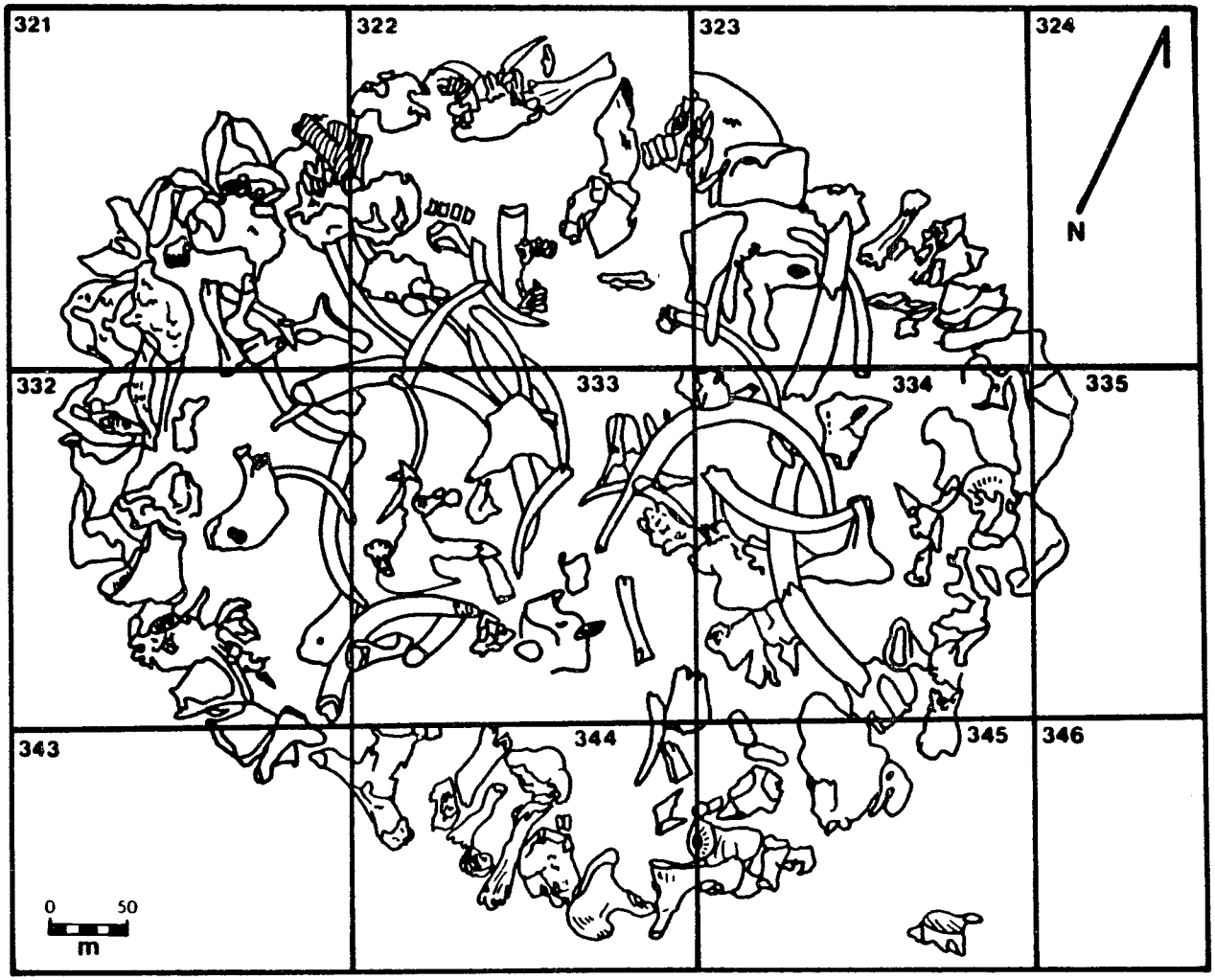
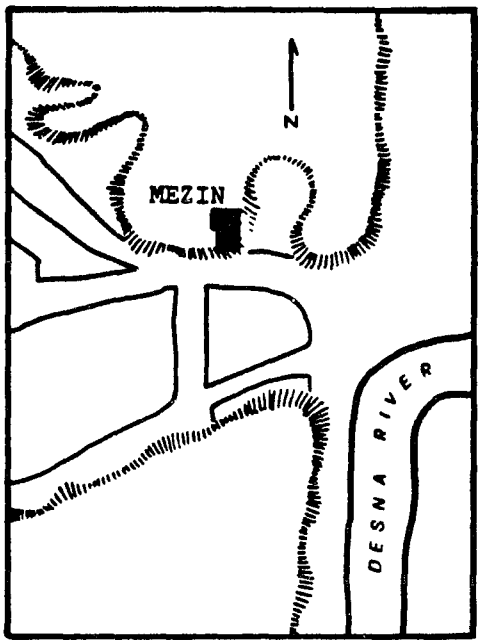
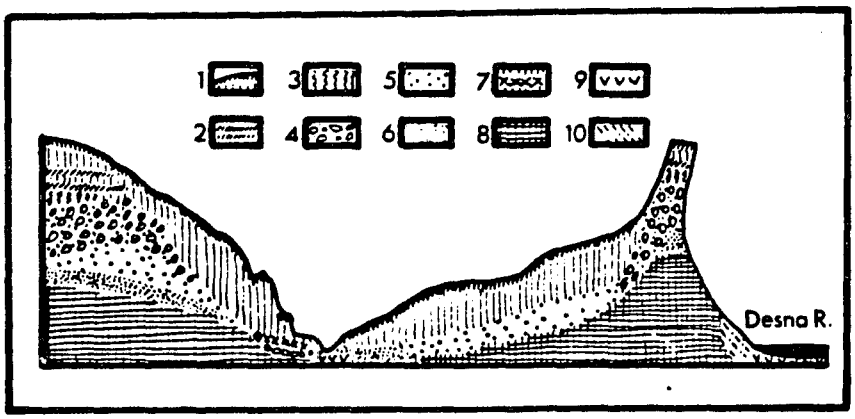


FIGURE II-19. MEZIN



A. LOCATION OF THE SITE (after Boriskovskii 1953: Fig. 116)



B. STRATIGRAPHY (after Pidoplichko 1969:Fig. 25)

LEGEND:

1 -- Loess and Present Day Soil
2 -- Fossil Soil
3 -- Stratified Loam
4 -- Boulder Clay
5 -- Redeposited Paleogenic Sand
6 -- Sand
7 -- Cultural Layer
8 -- Chalk
9 -- Alluvium
10 -- Delluvium

FIGURE II-19 C. PLAN OF THE EXCAVATION
(after Shovkoplyas 1965a:Fig.15)

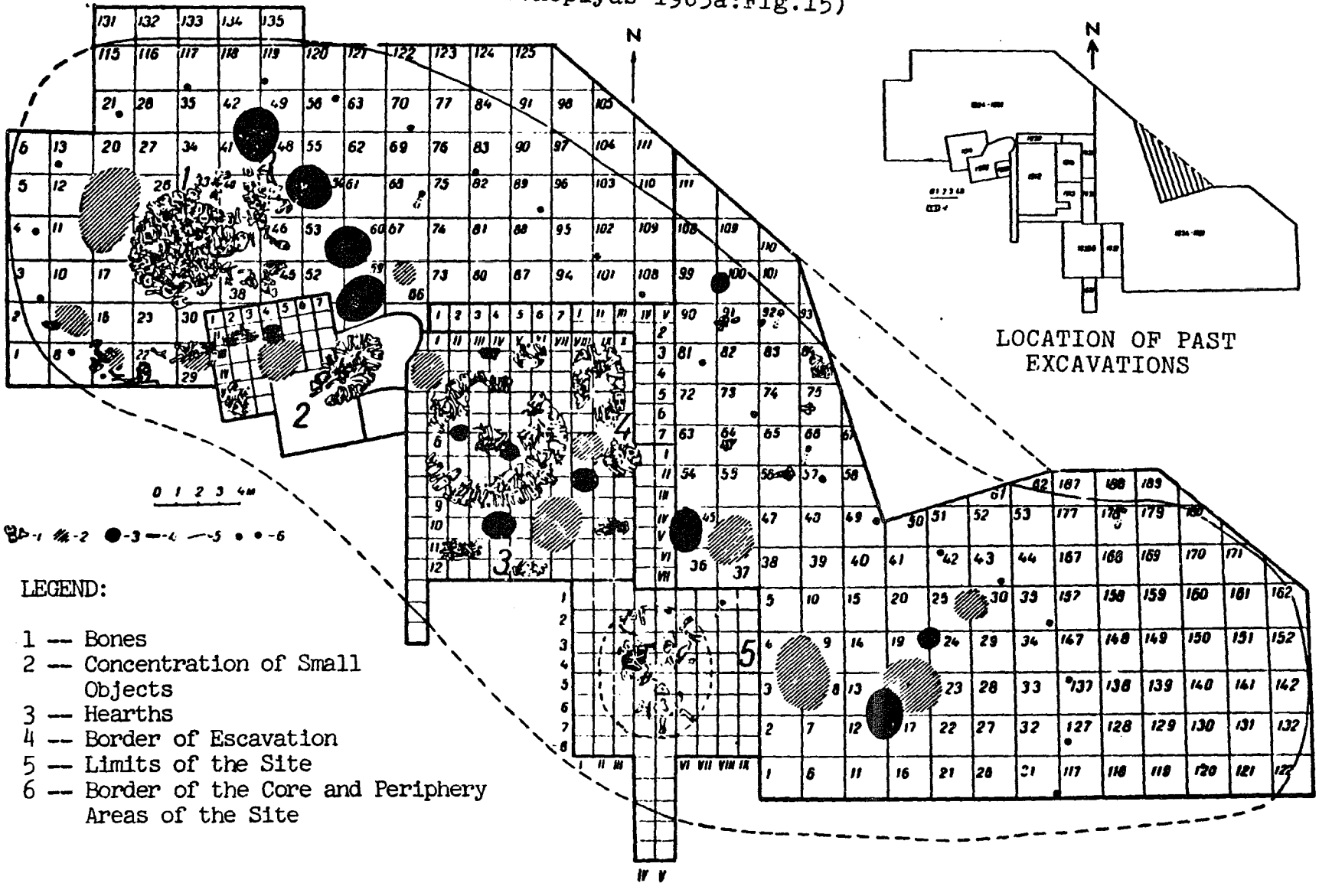
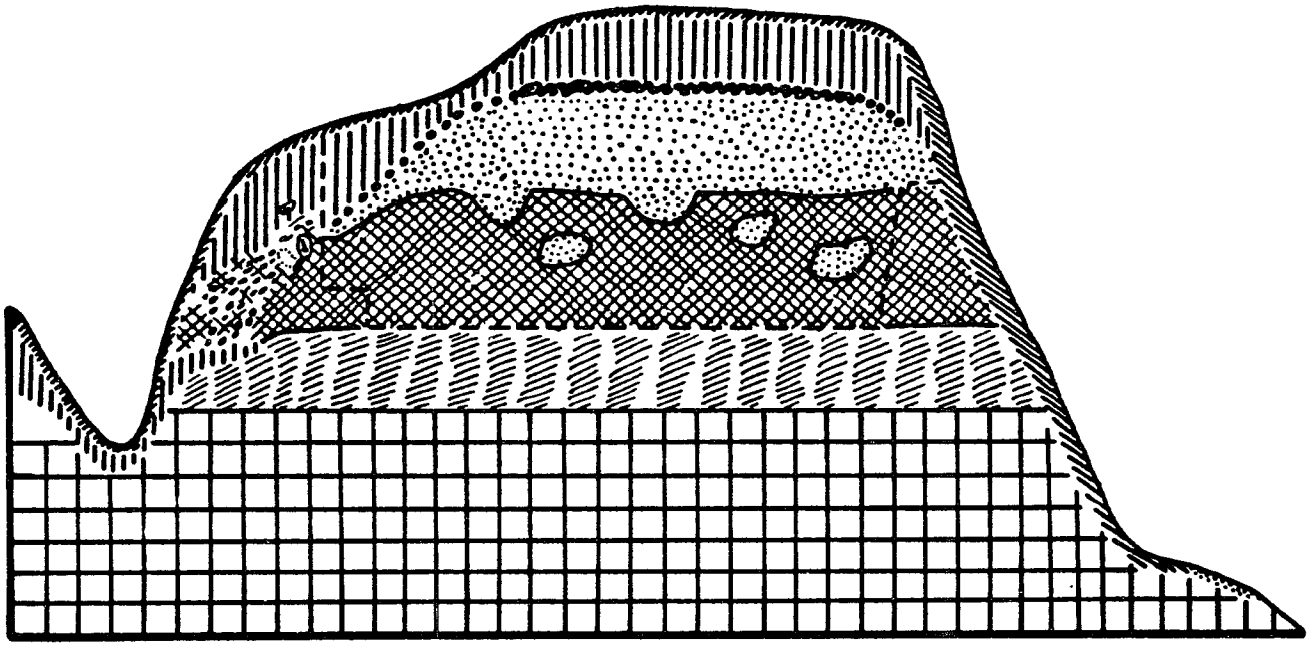


FIGURE II-20. NOVGOROD-SEVERSKII

A. STRATIGRAPHY (after Pidoplichko 1947:Fig. 6)



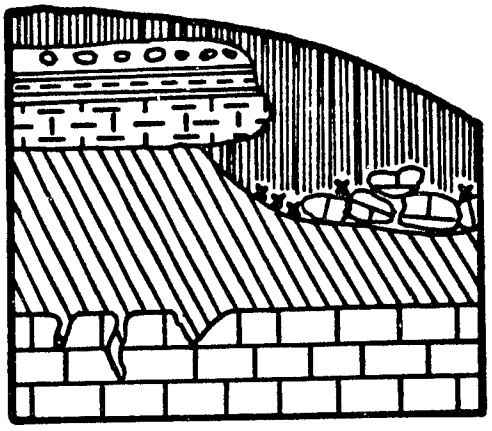


FIGURE II-20B. NOVGOROD-SEVERSKII CULTURAL REMAINS (Boriskovskii 1953:Fig.148)

LEGEND: X -- Flints

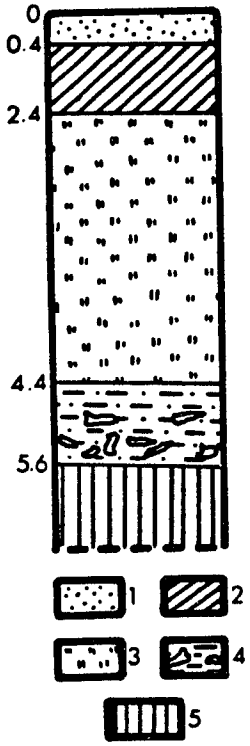
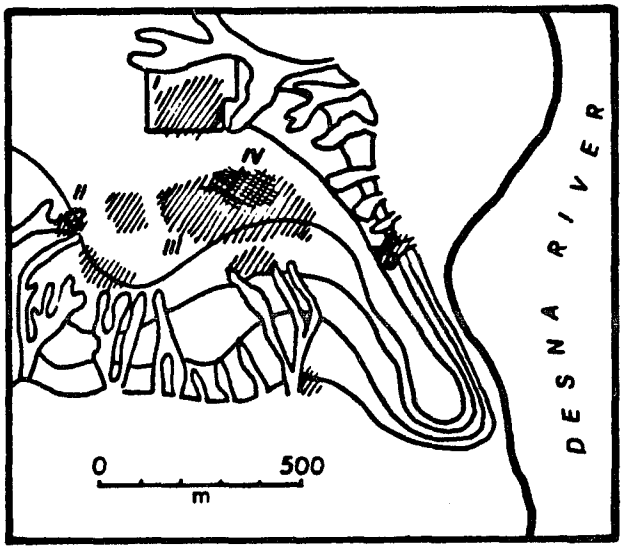


FIGURE II-21. NOVO-BOBOVICHI STRATIGRAPHY (after Gromov 1948:Fig. 82)

LEGEND: 1 -- Present Day Soil
2 -- Brownish Loam
3 -- Yellow-Brown Loam
4 -- Cultural Layer
5 -- Loess-Like Loam

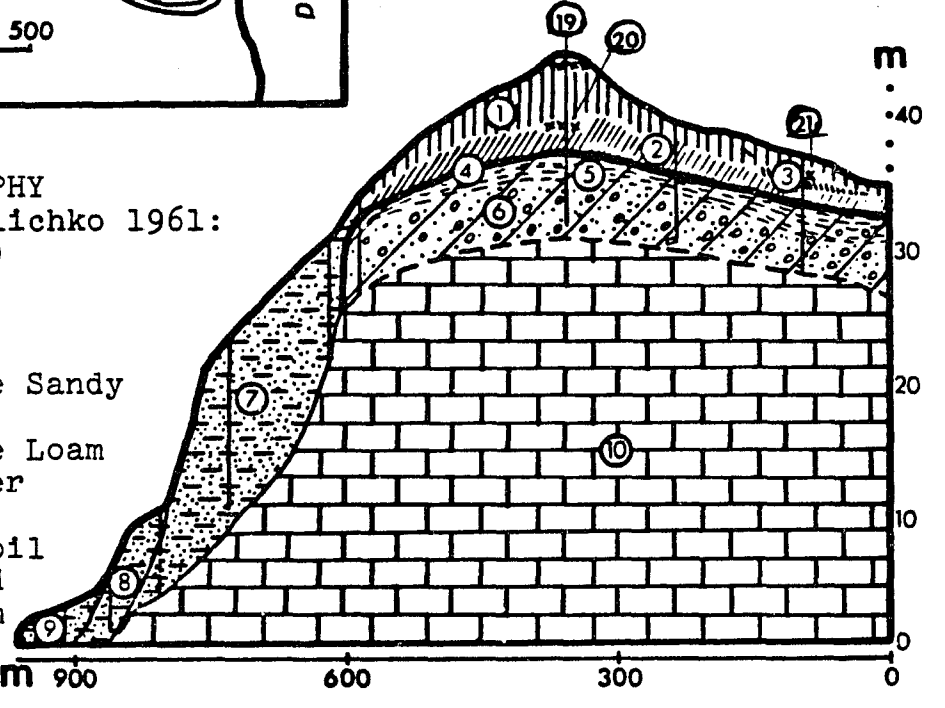
FIGURE II-22. THE PUSHKARI SITES



A. LOCATION
(after Boriskovskii 1953: Fig. 87)

LEGEND:
I. Pushkari I
II. Pushkari II
III. Pogon
IV. Bugarok

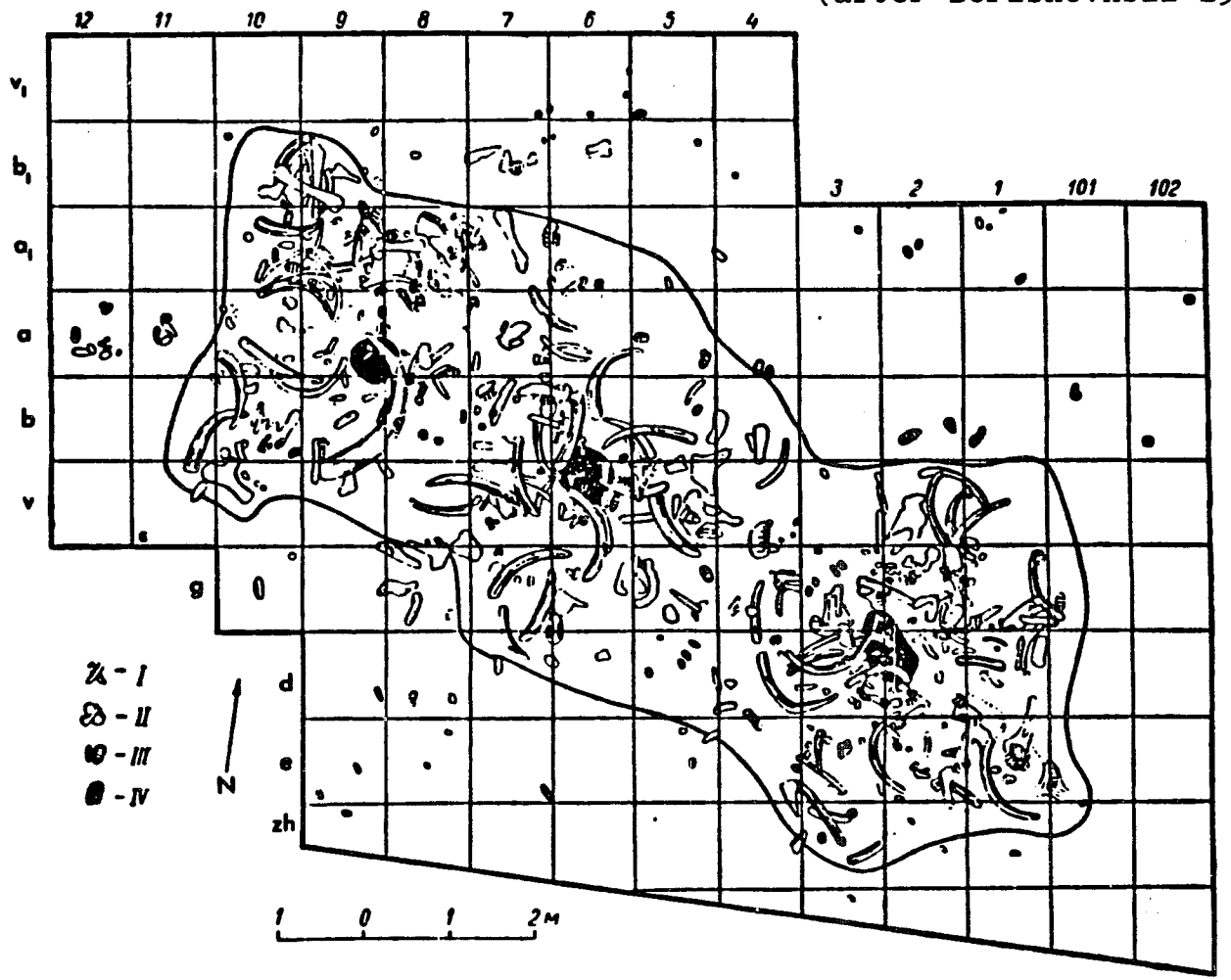
B. STRATIGRAPHY
(after Velichko 1961: Fig. 39)



LEGEND:

1 - Loess-Like Sandy Loam
2 - Loess-Like Loam
3 - Humic Layer (Glayed?)
4 - Buried Soil
5 - Stratified Sandy Loam
6 - Moraine Loam
7 - Second Ravine Terrace (Stratified Sandy Loam)
8 - First Ravine Terrace (Stratified Sandy Loam)
9 - Ravine Bottom (Loam and Sandy Loam)
10 - Chalk
19 - Bugorok
20 - Pogon
21 - Pushkari I

FIGURE II-22C. PUSHKARI I (EXCAVATIONS II-1937-1939)
(after Boriskovksii 1953:Fig.89)



LEGEND:
1- Tusks II- Mammoth Bones III- Mammoth Teeth IV- Hearths

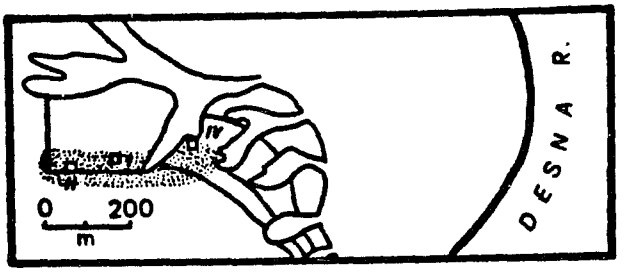
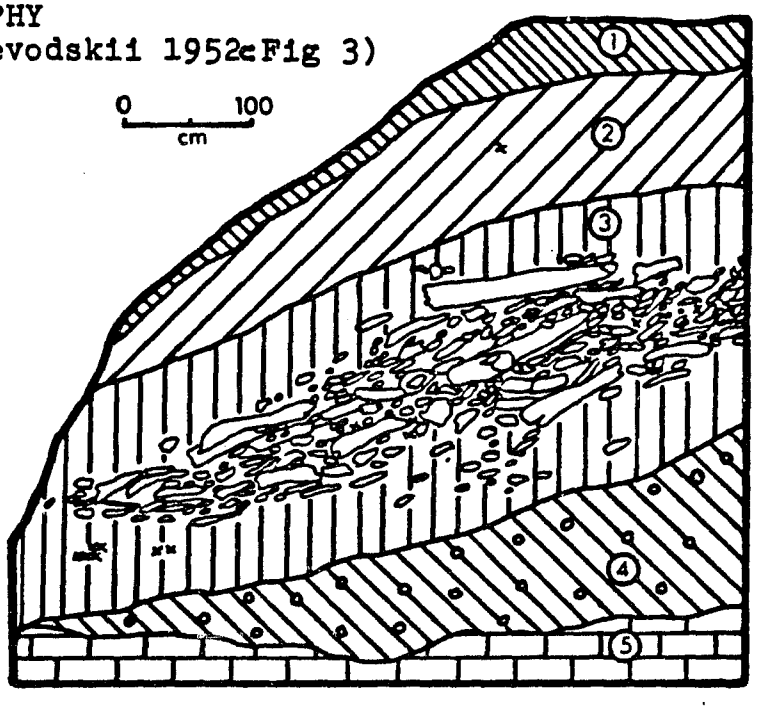


FIGURE II-22D.
PUSHKARI I
(excavations 1932-1937)
(after Boriskovskii 1953: fig. 88)

(Dotted Area--Possible Extent of the Site)

FIGURE II-23. PUSHKARI II

A. STRATIGRAPHY
(after Voevodskii 1952c Fig 3)



LEGEND:

1 - Present Day Soil
2 - Delluvial Loam
3 - Loam with Traces of Colluvium and Ravine Alluvium
4 - Moraine
5 - Chalk
X - Flint

FIGURE II-23B. PUSHKARI II EXCAVATION
(after Voevodskii 1952c:Fig.2)

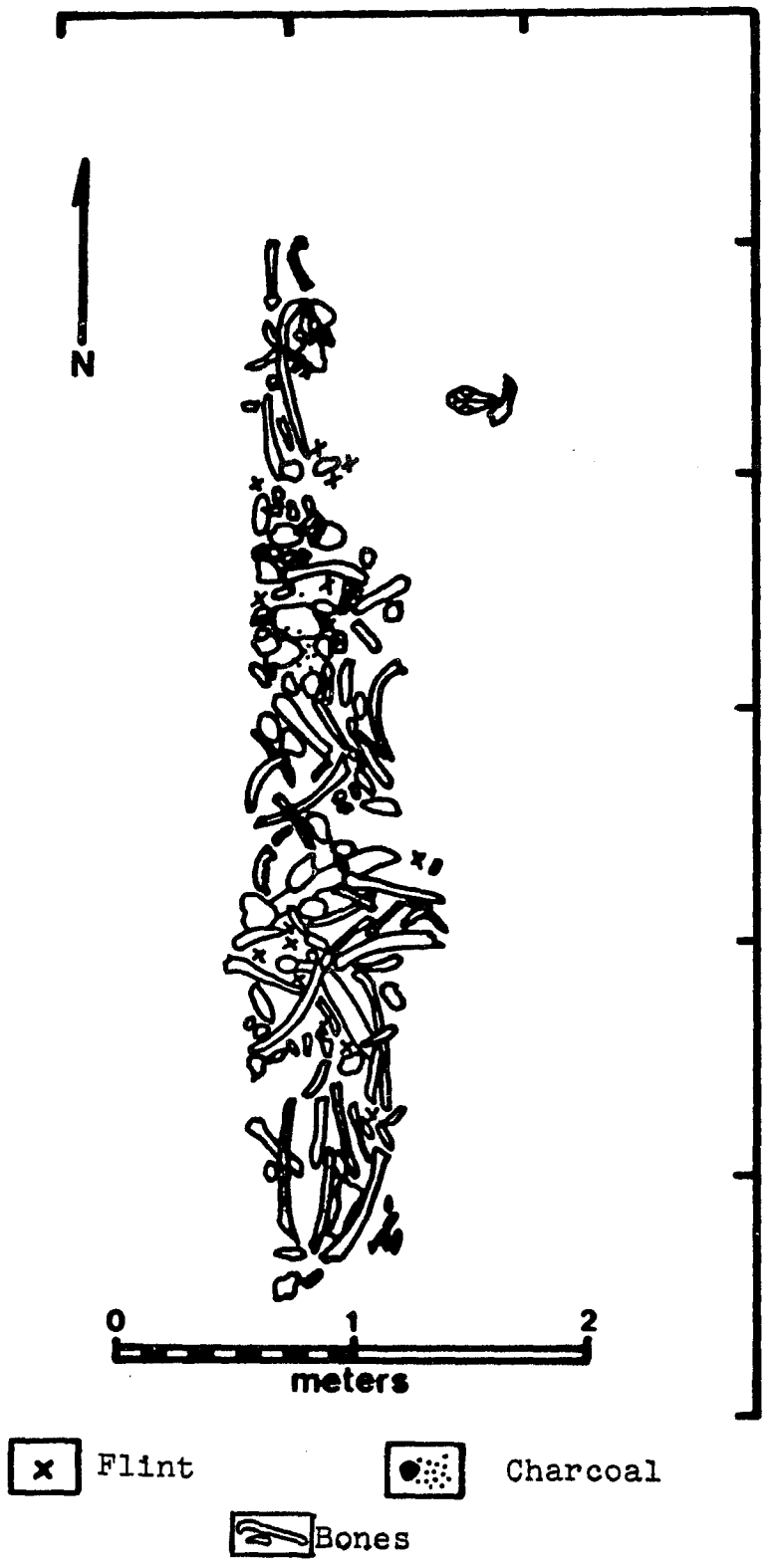
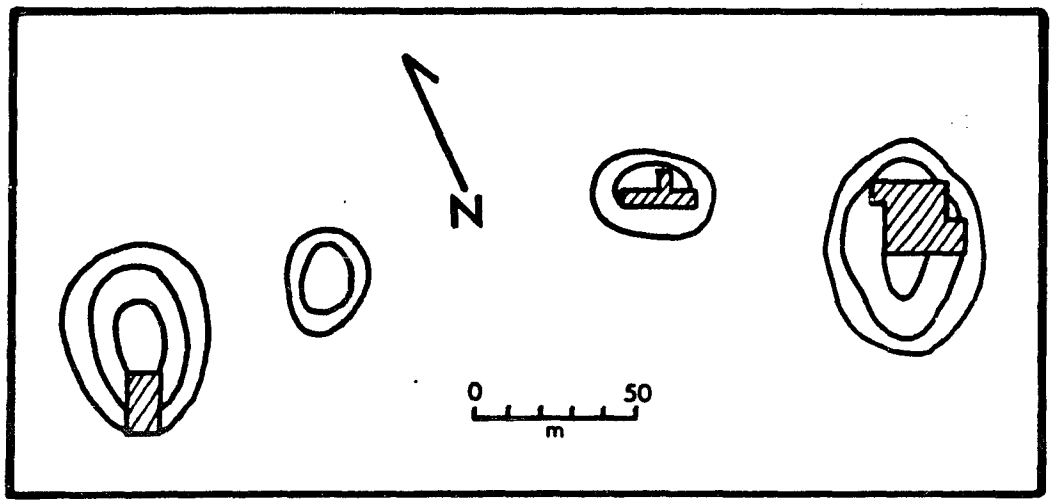
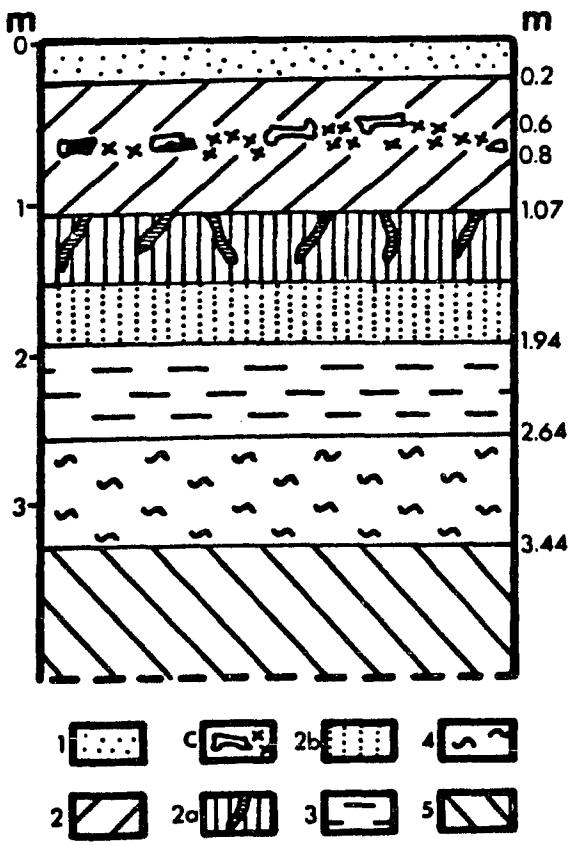


FIGURE II-24. RADOMYSHL'



A. LOCATION (after Shovkoplyas 1964:Figure II)

Shaded Areas-- Excavated Portions of Hilocks



B. STRATIGRAPHY
(drawn after Pidoplichko and Shovkoplyas 1961, p. 82 description)

LEGEND:

1 - Present Day Soil

2 - Loam

2a- Loam with Burrows and Concretions

2b- Loam with Limestone Veins

3 - Burried Soil

4 - Sand

5 - Boulder Clay

C - Cultural Layer

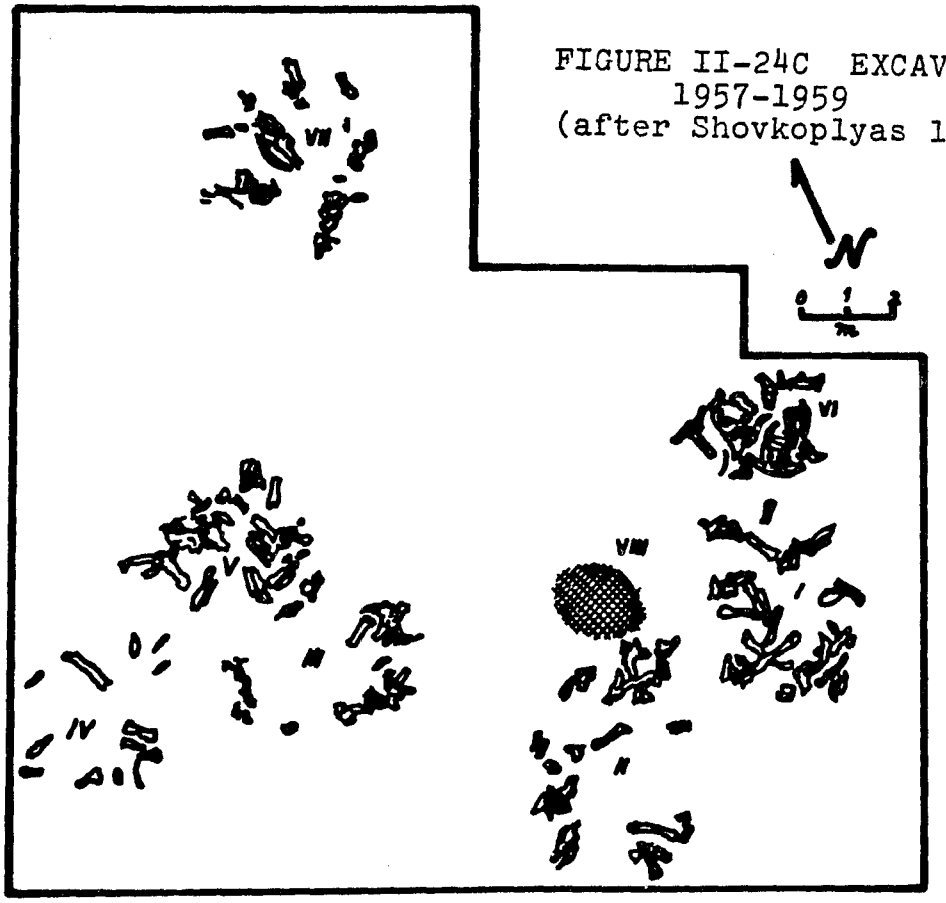


FIGURE II-24C EXCAVATION
1957-1959
(after Shovkoplyas 1964:Fig.3)

LEGEND:

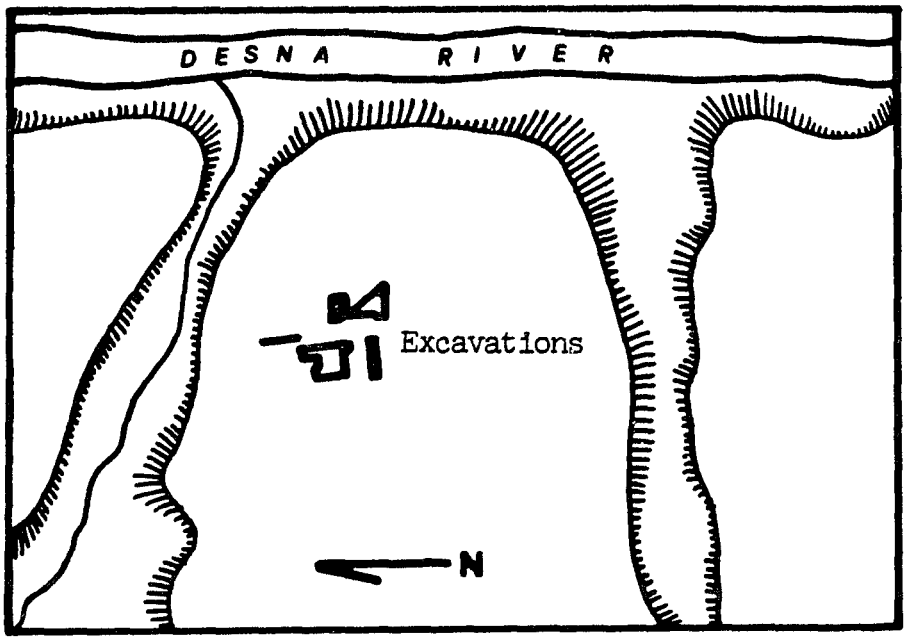
I-IV,VII- Mammoth Bone Dwellings

VI- Storage Pit

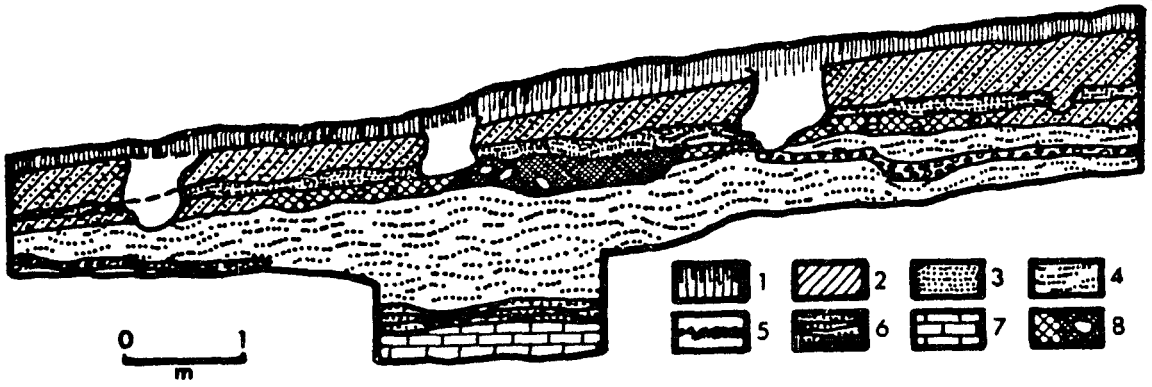
VIII- Flint Working Area

FIGURE II-25. SUPONEVO

A. LOCATION (drawn after Shovkoplyas 1951:Fig. 3)



B. STRATIGRAPHY
(after Velichko 1961: Fig. 52)



LEGEND:

1 - Present-day Soil
2 - Loamy Sand
3 - Light-Grey Sand
4 - Laminated Sand
5 - Chalk Fragments
6 - Green-Gray Loamy Sand
7 - Chalk
8 - Cultural Layer

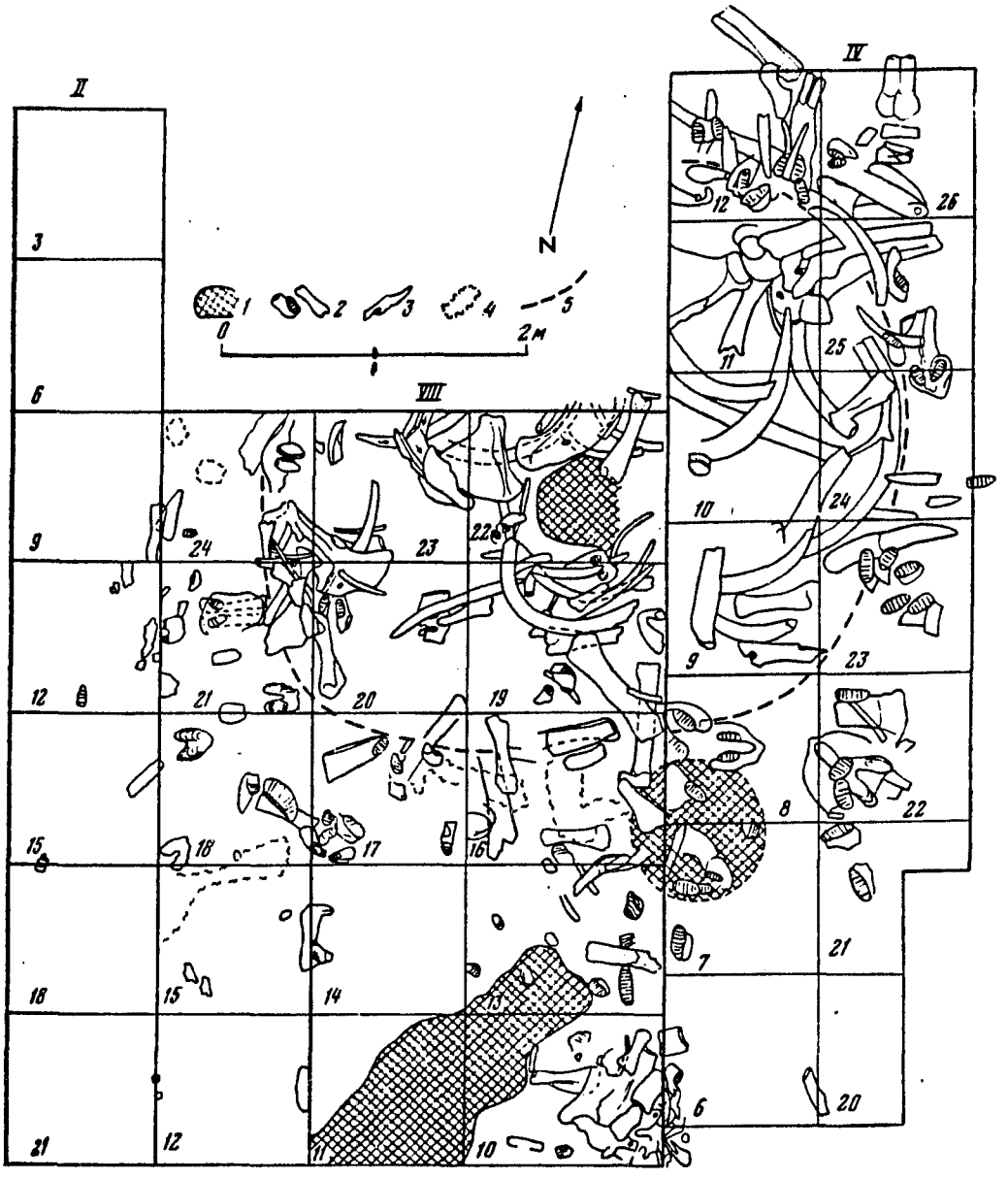
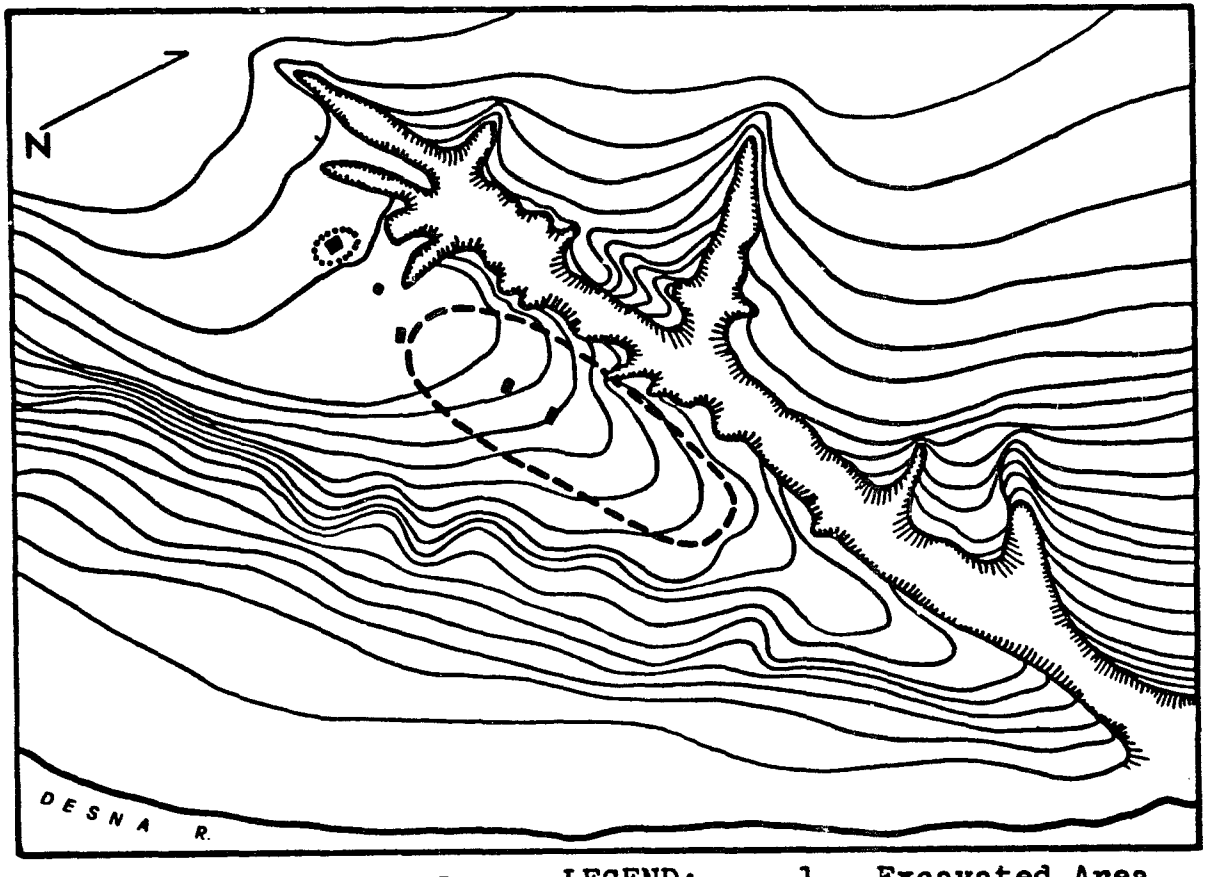


FIGURE II-25C. SUPONEVO
(after Sergin 1979:17)

LEGEND:
1 - Hearths + Charcoal Lenses
2 - Mammoth Bone
3 - Mammoth Bones with Holes
4 - Disintegrated Bones
5 - Dwelling Area

FIGURE II-26. TIMONOVKA SITES

A. LOCATION (after Velichko et al. 1977a:Fig. 7)



LEGEND:

1 - Excavated Area

2 - Timonovka I

3 - Timonovka II

B. STRATIGRAPHY
(after Velichko et al. 1981:Fig.20)

LEGEND:
1 - Humic Layer, Present Day
2 - Humic Layer, Relic Timonovka Soil
3 - Colluvium
4 - Colluvium
5 - Loess
6 - Mezin Soil Complex
7 - Sands
8 - Rock Detritus
9 - Delluvial Deposits
10 - Present Day Alluvium
11 - Diatomaceous Clay
12 - Chalk
13 - Senomanian Sand
14 - Ice-Wedge Casts
15 - Cultural Layer

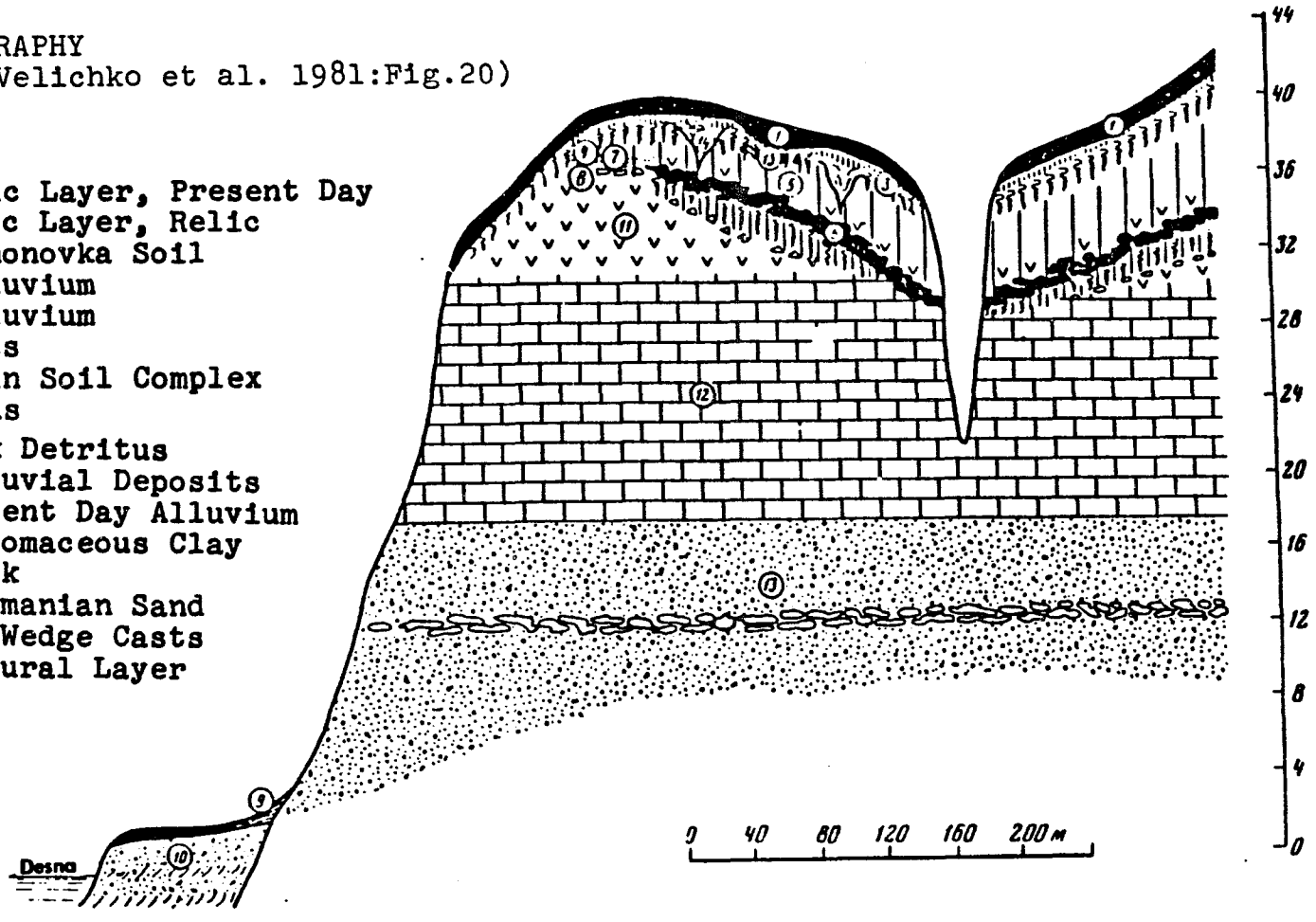
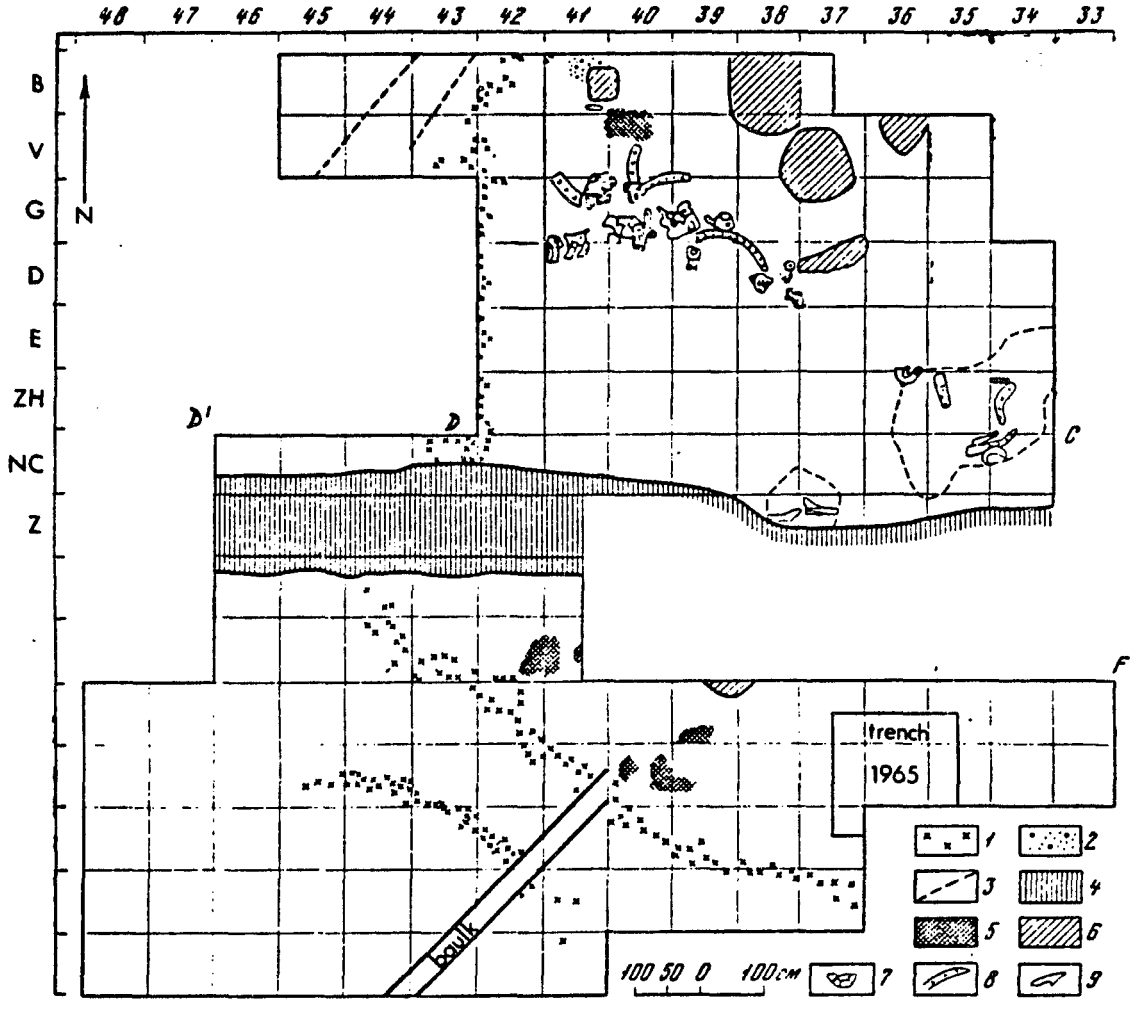


FIGURE II-26C. TIMONOVKA II
(after Velichko et al. 1977a:Fig. 32)



LEGEND:
1 - Extent of Cultural Layer Around Casts
2 - Colored Spot
3 - Storage Pits
4 - Construction Trench
5 - Ash Spots
6 - Present Day Disturbed Areas
7 - Mammoth Skulls
8 - Mammoth Tusks
9 - Bones

FIGURE II-27. YUDINOVO

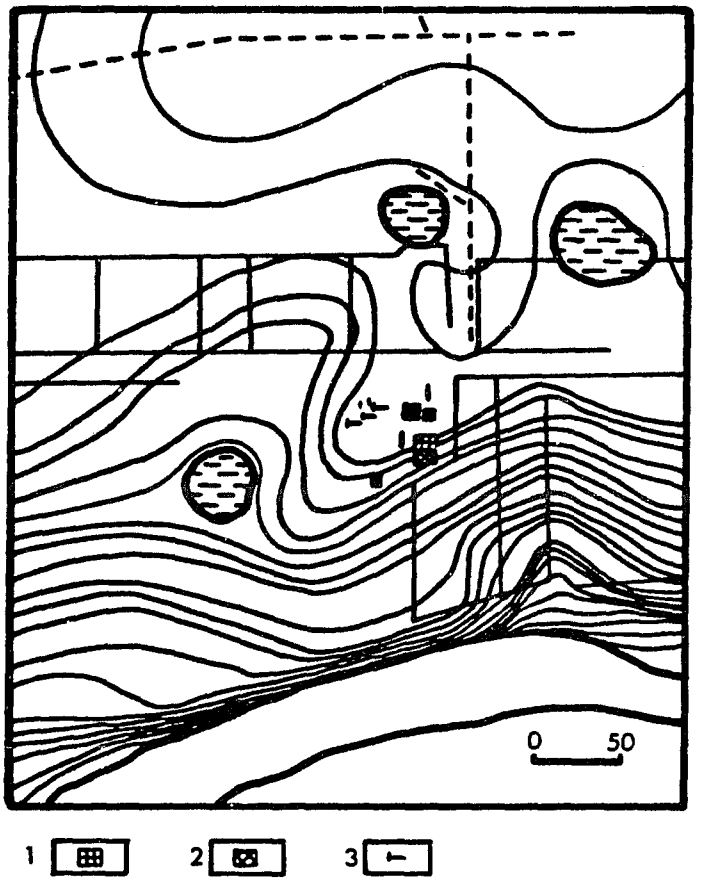
A. LOCATION (after Kaletchitz 1972:Fig. 26)

LEGEND:

1 - 1947 Excavation

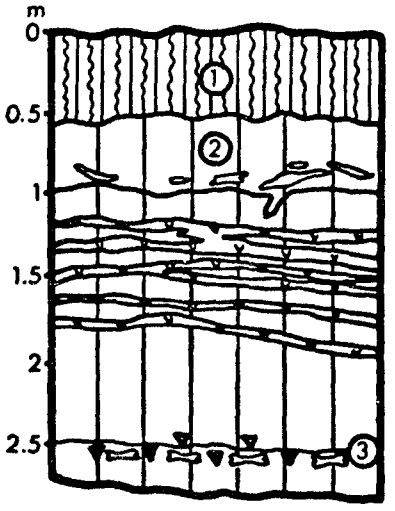
2 - 1961 Excavation

3 - Trenches

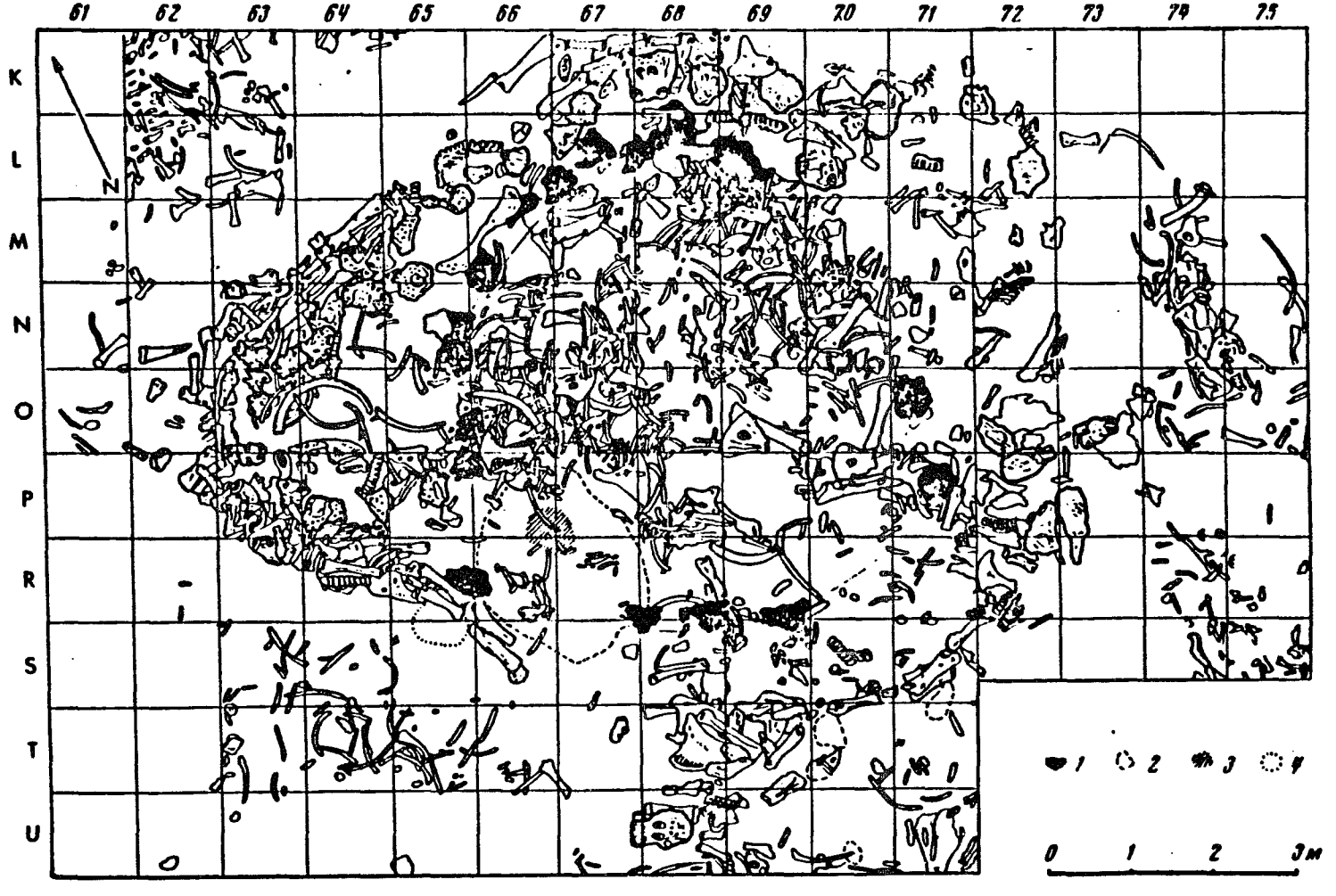


B. STRATIGRAPHY (after Velichko 1961:Fig. 55)

LEGEND: 1 - Humic Layer
2 - Sandy Loam
3 - Cultural Layer



C. YUDINOVO I -- EXCAVATION 2 (1947, 1961) (after Sergin 1974:237)

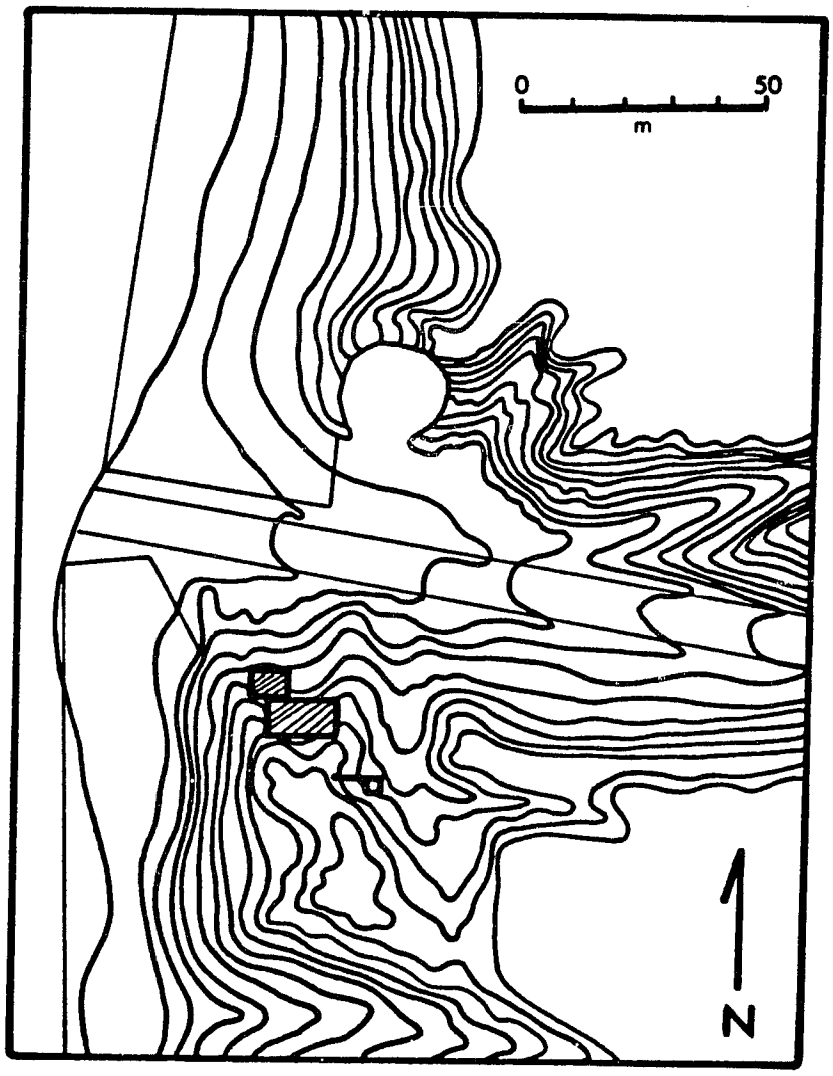


LEGEND: 1--Mammoth Skulls 2--Ash Lenses

3--Hearth 3--Contemporary Pit

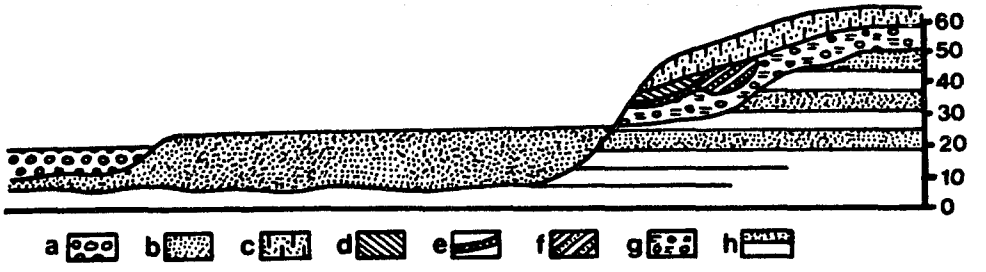
FIGURE II-28. YUROVICHI

A. LOCATION (after Kalechitz 1972:Fig. 16)



LEGEND: Shaded Areas -- Excavations

B. STRATIGRAPHY (after Gromov 1948:Fig.83)



LEGEND:

a - Present day Alluvium

b - Loess-like Sands

c - Laminated Sands

d - Cultural Material

e - Rubble and Gravel Layer

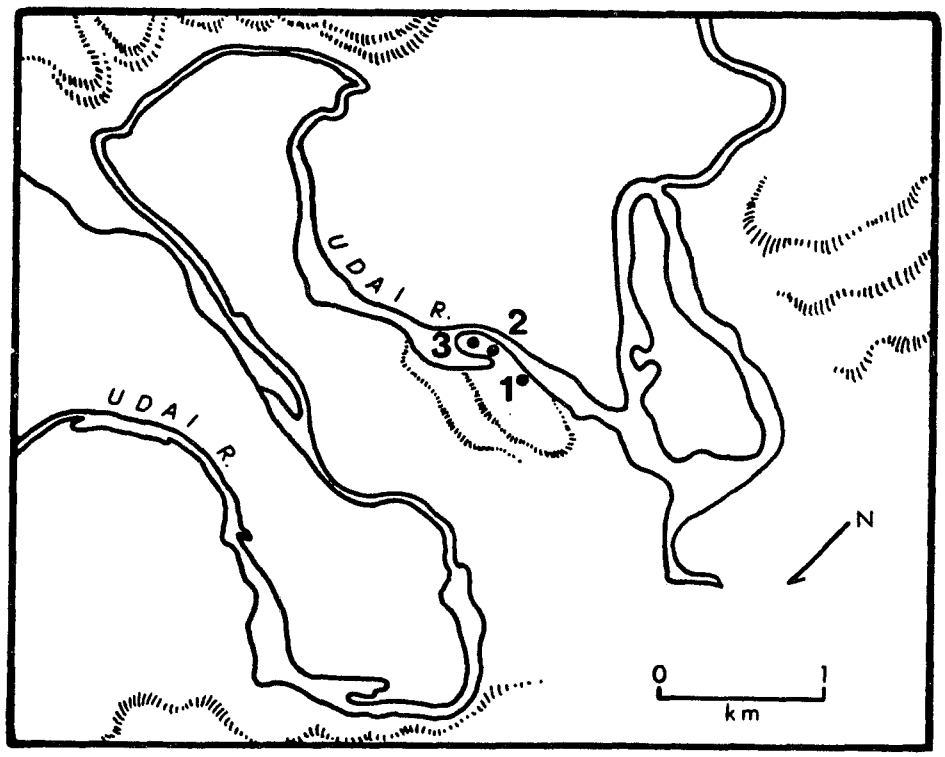
f - Fluvioglacial Laminated Sands

g - Moraine

h - Fluvioglacial Sands

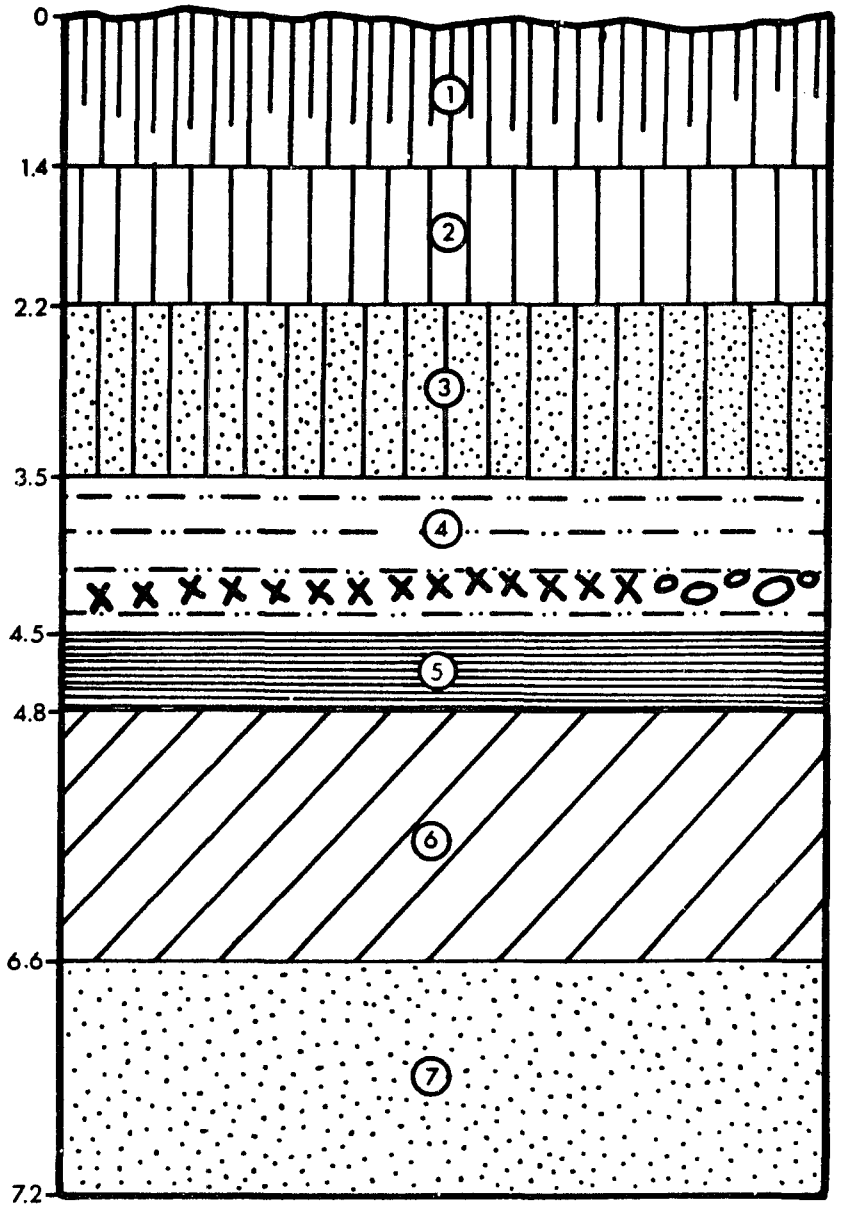
FIGURE II-29. ZHURAVKA

A. LOCATION (after Gromov 1948:Fig. 34)



LEGEND: 1 -3 -- Excavations

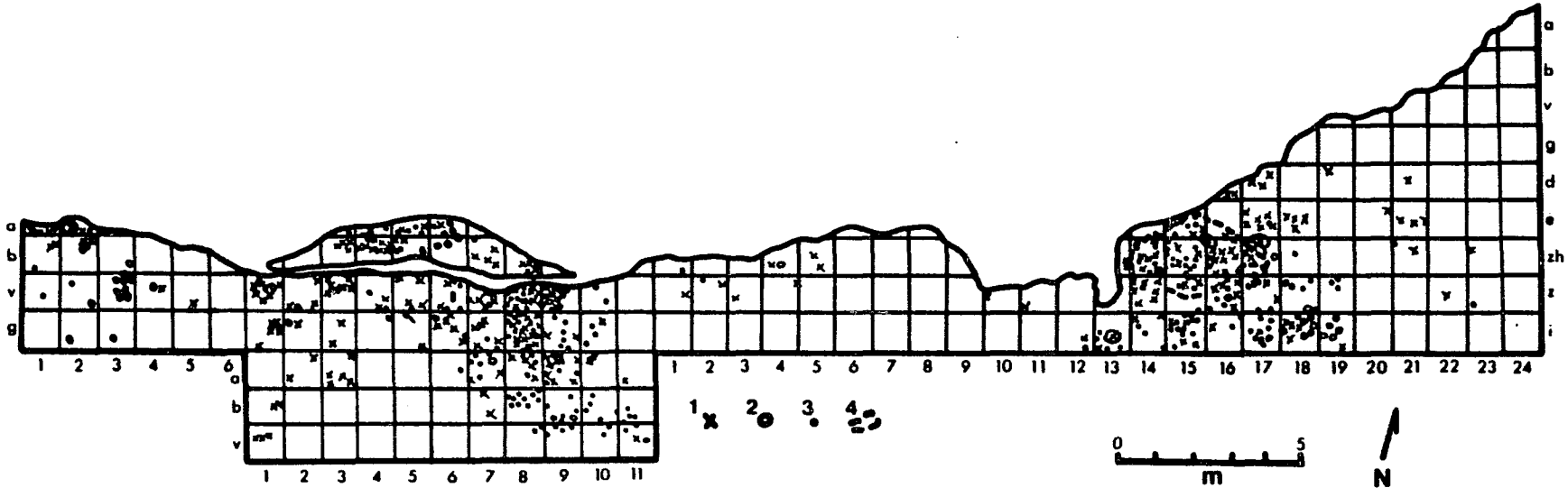
FIGURE II-29. ZHURAVKA



B. STRATIGRAPHY (drawn after Boriskovskii and Proslov 1964 and Gromov 1948)

LEGEND:
1 - Present Day Soil
2 - Porous Loess with Burrows
3 - Sandy Loess
4 - Laminated Loess-Like Loam
5 - Laminated + Glayed Loam
6 - Laminated Sandy + Loess-Like Loam
7 - Sand

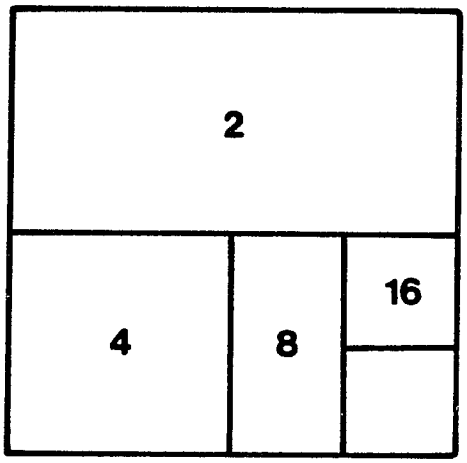
FIGURE II-29 C. ZHURAVKA EXCAVATIONS
(after Boriskovskii and Praslov 1964:Table XXXI)



LEGEND:

1 - Flint 2 - Bones 3 - Bone Fragments 4 - Boundary of the Concentration of Cultural Remains

FIGURE II-30. SIZE AND LOCATION OF QUADRANTS
THE DIMENSIONAL ANALYSIS OF VARIANCE



LEGEND: BLOCK SIZES:

Total Area	--	180,000 km^2
2	--	90,000 km^2
4	--	45,000 km^2
8	--	22,500 km^2
16	--	11,250 km^2

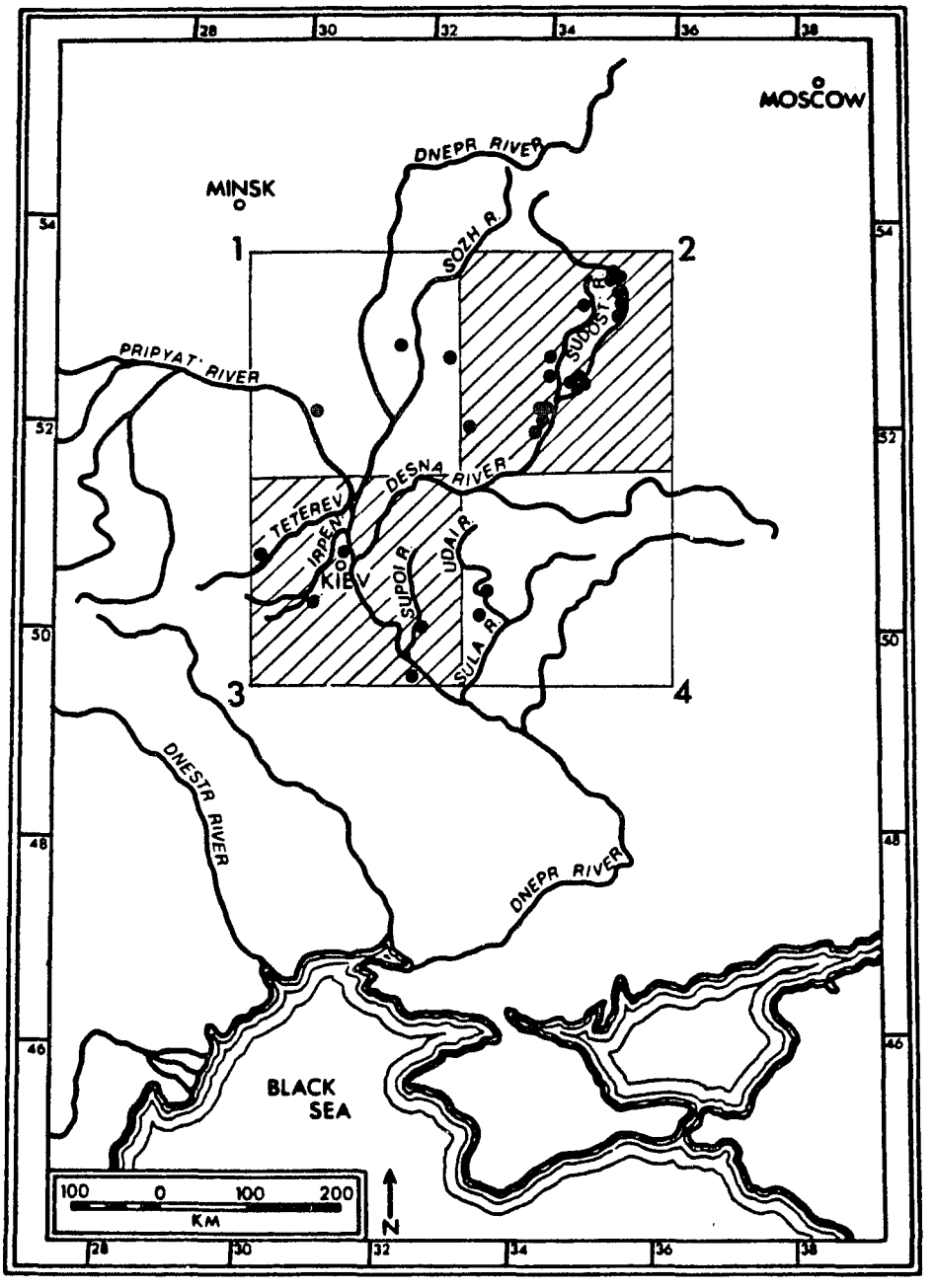


FIGURE II-31A. FIRST ORDER CLUSTERING--ALL SITES (Dimensional Analyses of Variance--Blocks 2, 3--"Block Size 4")

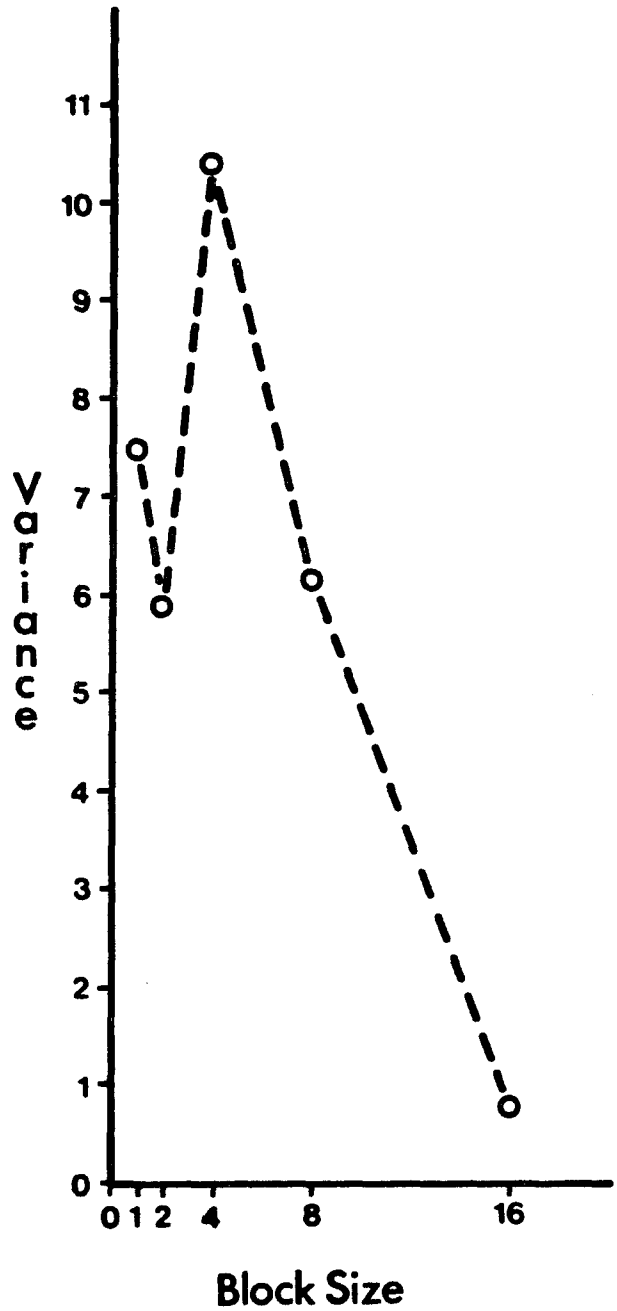


FIGURE II-31B. DIMENSIONAL ANALYSES OF VARIANCE (ALL SITES)

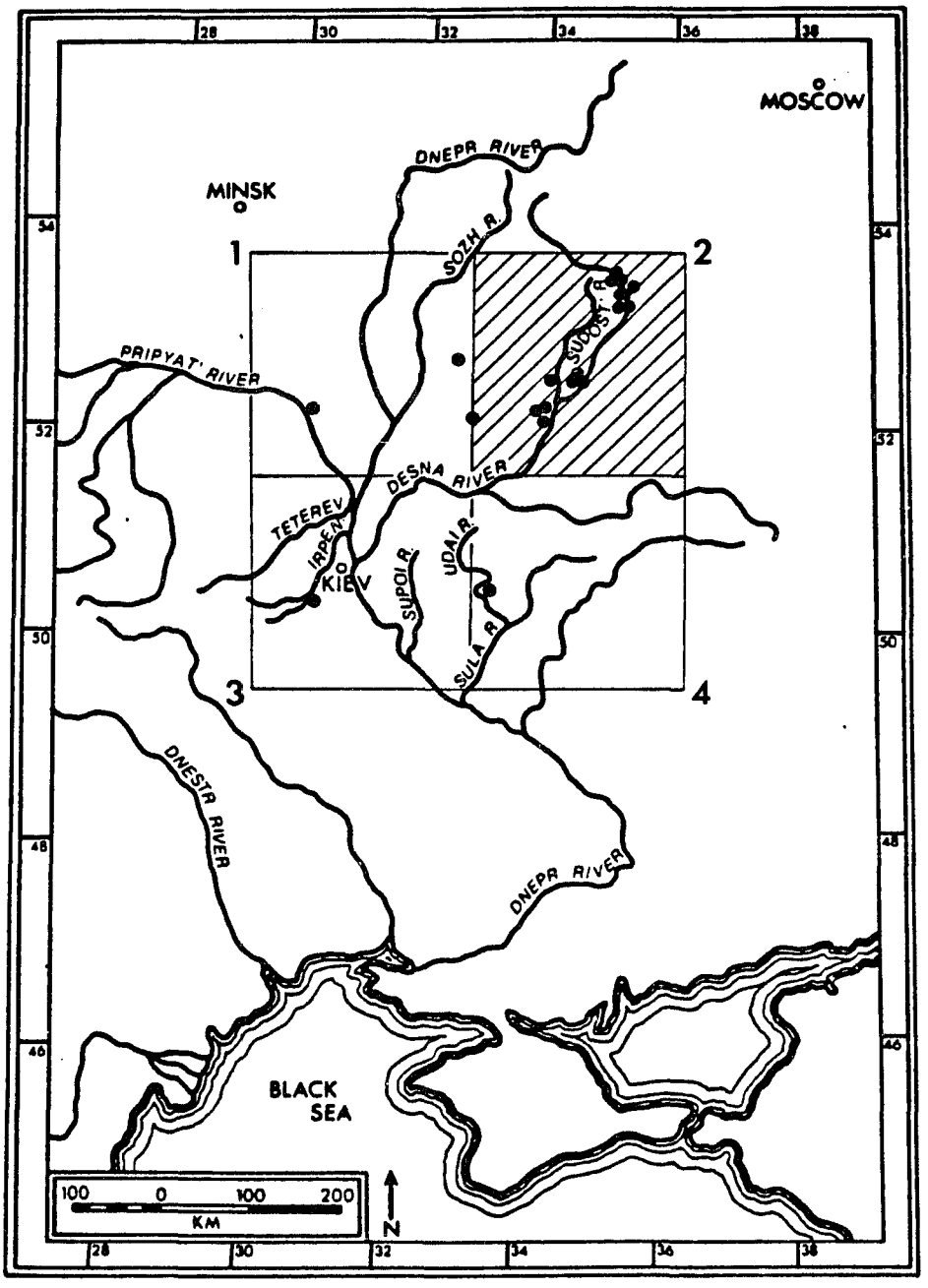


FIGURE II-32A. FIRST ORDER CLUSTERING OF SITES WITHOUT DWELLINGS
(Dimensional Analyses of Variance--Block 2 "Block Size 4")

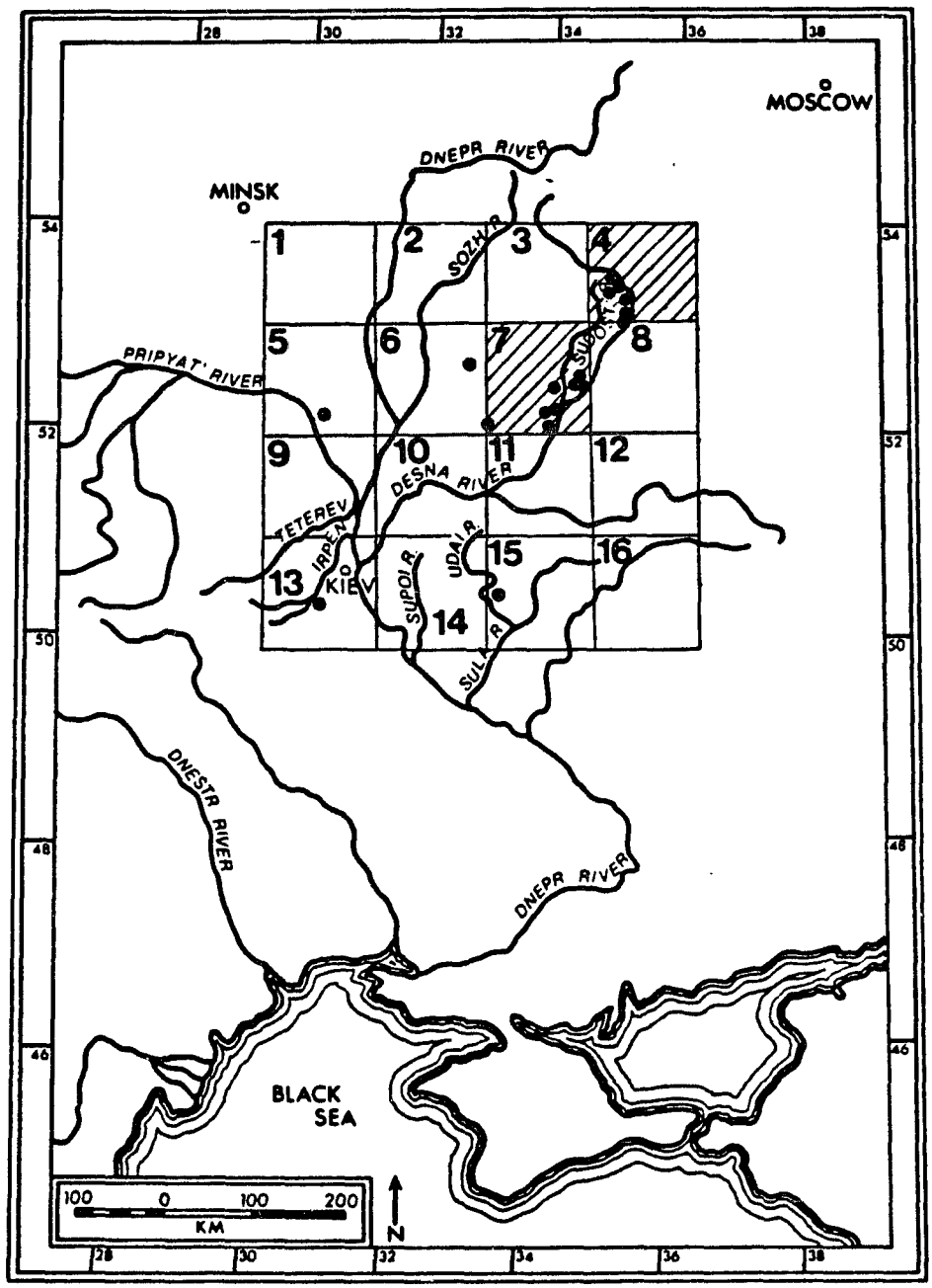


FIGURE II-32B. SECOND ORDER CLUSTERING--ALL SITES (Dimensional Analyses of Variance--Blocks 4, 7--"Block Size 16")

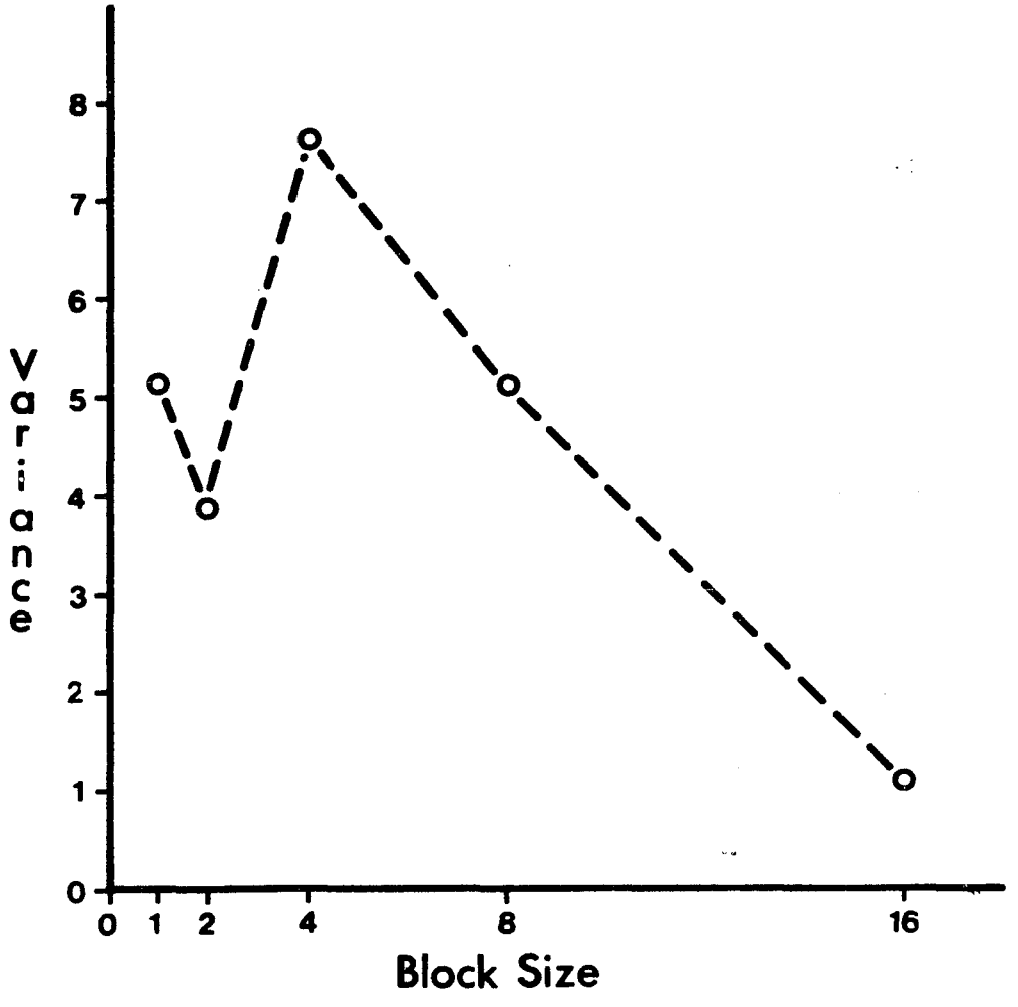


FIGURE 32C. DIMENSIONAL ANALYSIS OF VARIANCE
(Sites Without Dwellings)

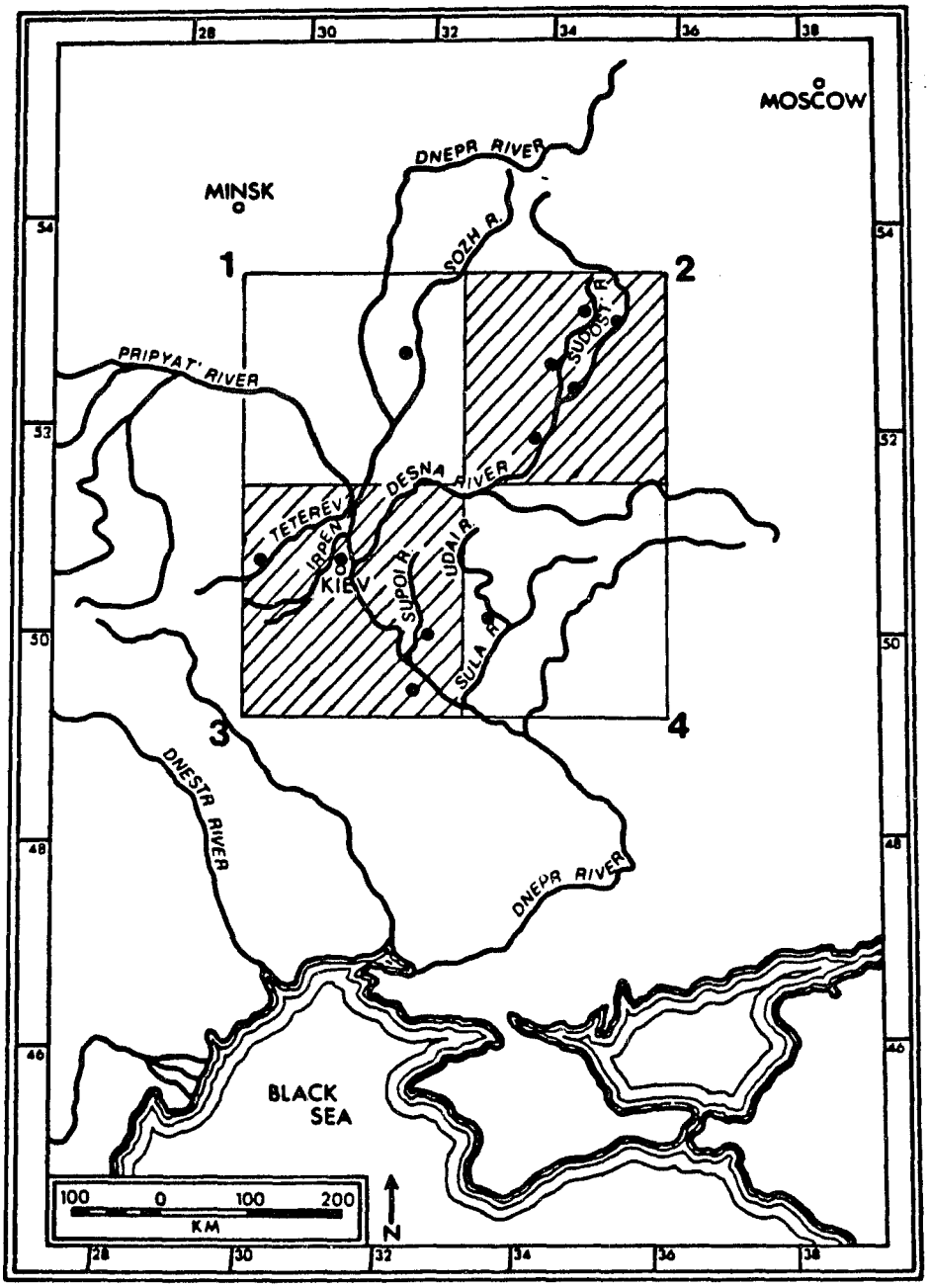


FIGURE II-33A. FIRST ORDER CLUSTERING OF SITES WITH DWELLINGS
(Dimensional Analyses of Variance--Quadrants 2,3--"Block Size 4")

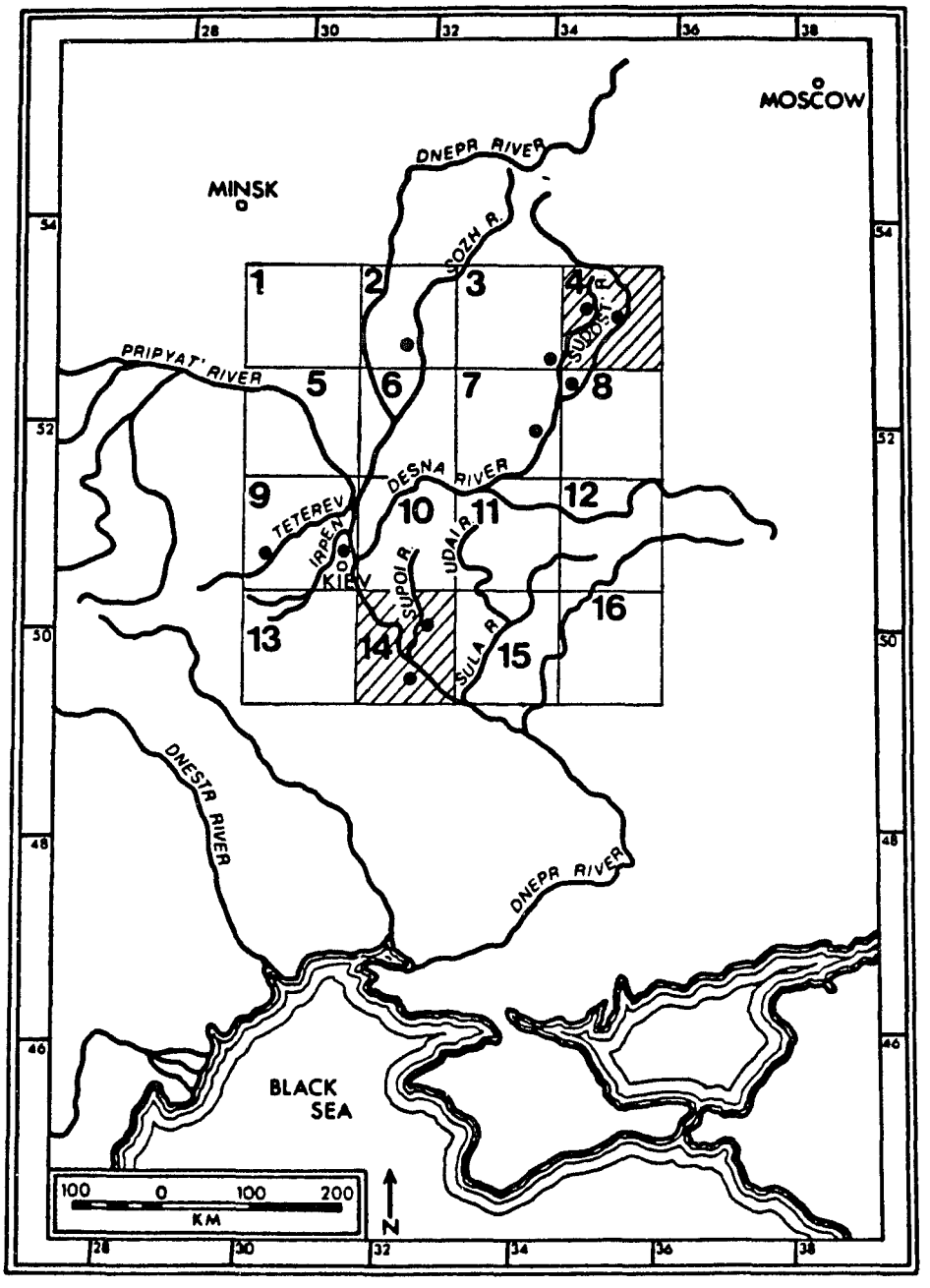


FIGURE II-33B. SECOND ORDER CLUSTERING OF SITES WITH DWELLINGS
(Dimensional Analyses of Variance--Quadrants 4, 14--"Block Size 16")

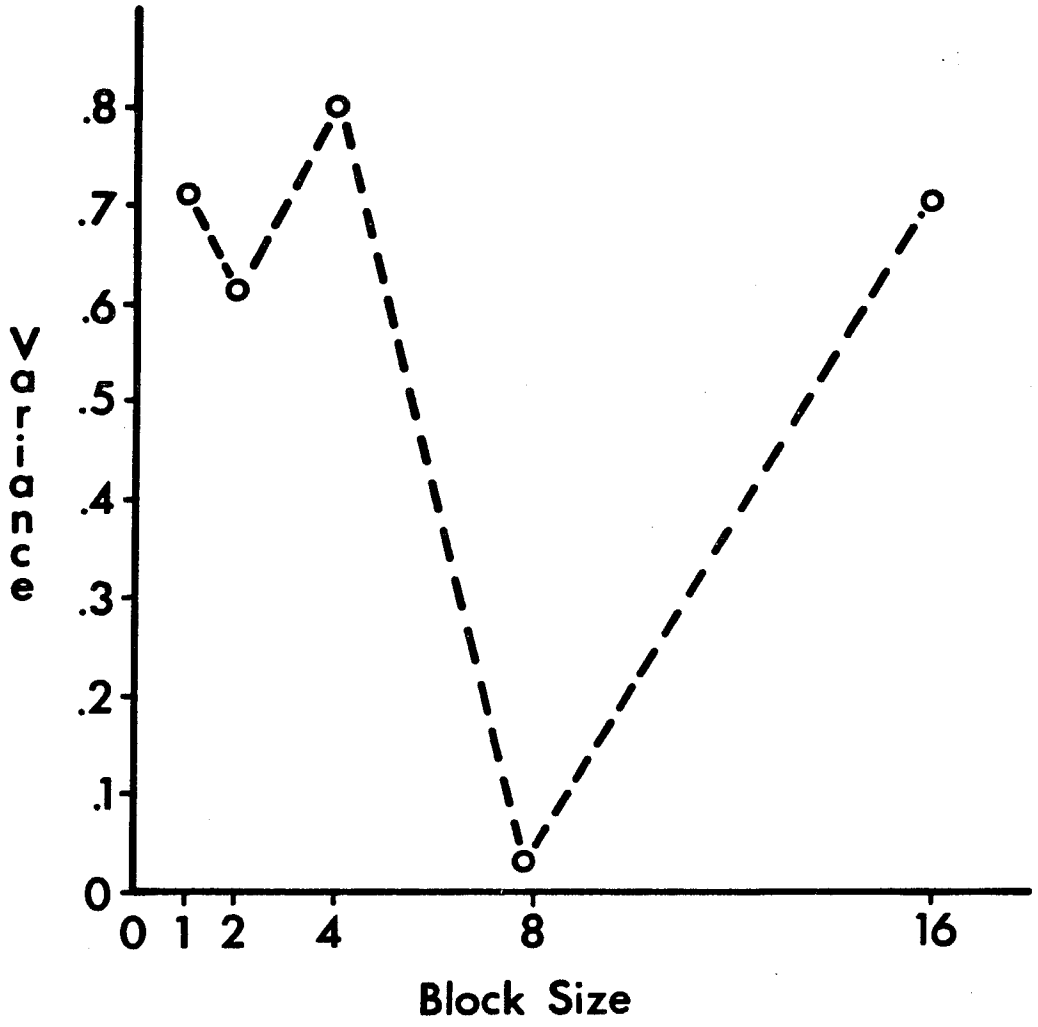


FIGURE II-33C. DIMENSIONAL ANALYSIS OF VARIANCE
(Sites With Dwellings)

FIGURE III-1. EXTENT OF PERMAFROST ON THE RUSSIAN PLAIN DURING VALDAI GLACIATION (after Velichko 1977b:Maps 14,15)

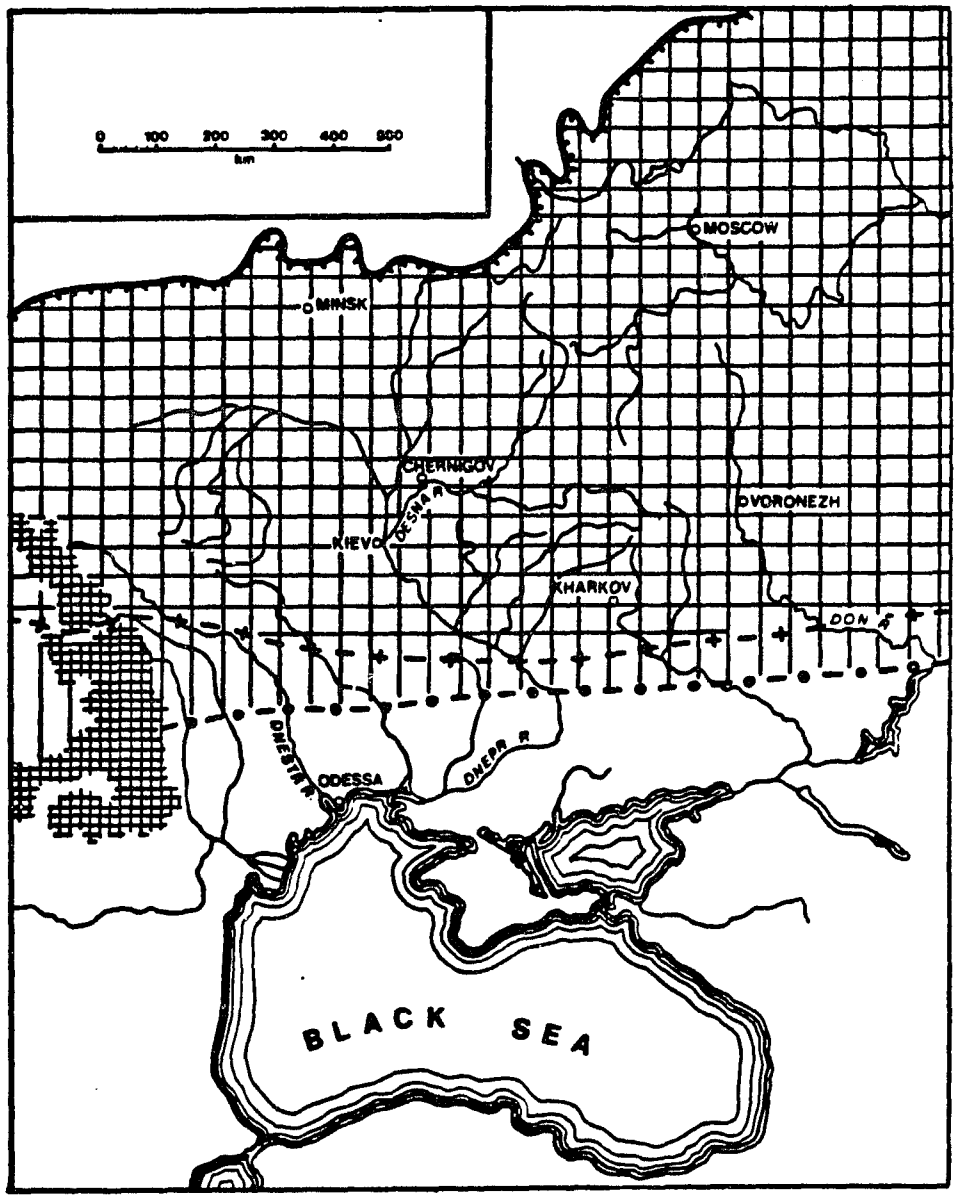
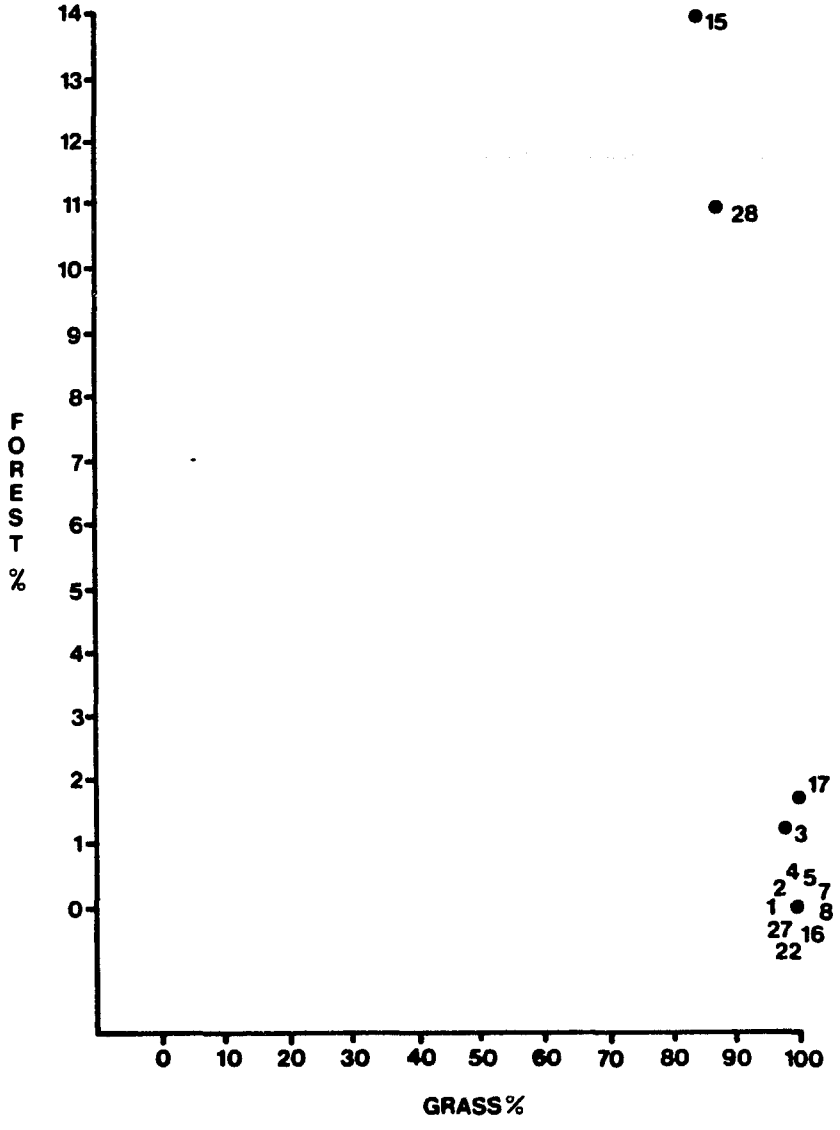
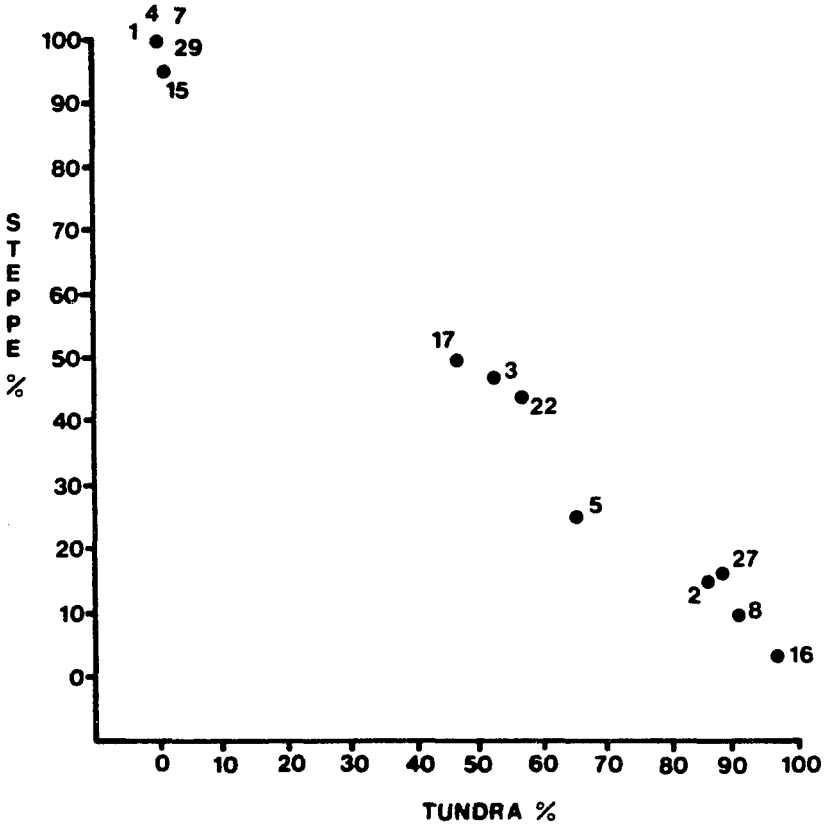


FIGURE III-2. THE COMPOSITION OF RODENTS AT THE STUDY SITES *



*-numbers on graph indicate sites (see Fig. II-1)
-percentages of forest and grassland taxa calculated per site on MNI,MNB,and species composition listed in Table III-5.

FIGURE III-3. THE COMPOSITION OF RODENTS AT STUDY SITES *



*- numbers on graph indicate sites (see Fig.II-1)
- percentages of tundra and steppe taxa calculated per site on MNI,MNB, and species composition listed in Table III-5.

FIGURE III-4. POLLEN FROM BRYANSK SOIL DEPOSITS
(after Grichuk 1969c:p.455)

SITES:	Arapovichi	Mezin	Priluki	Vyazovok	Gun'ki	Kamenka	Molochnaya	Kostenki I	Kostenki XVII
Total contents of arboreal pollen - %	45	70	44-70	58-74	8	18-43	10-22	12-35	15-50
Picea	+	-	+	+	-	-	-	+	+
Pinus (P.silvestris)	+	+	+	+	+	+	+	+	+
Betula (B.pubescens & B. verucosa)	+	+	+	+	+	+	+	+	+
Alnus	+	+	+	+	+	+	-	+	+
Carpinus (C.betulus L.)	+	+	-	-	-	+	-	+	+
Corylus (C.avellana)	+	+	+	-	+	-	+	+	+
Quercus (Q.robur)	+	+	+	+	+	+	+	+	+
Ulmus	-	+	-	+	+	-	+	+	+
U. campestris & U. laevis	-	-	-	-	+	-	-	-	+
Tilia (T.cordata Mill.)	-	+	+	+	-	+	+	+	+
Tilia platyrhylica	-	-	-	-	-	-	-	-	+
Acer	-	-	-	-	+	-	-	-	-
Fraxinus	-	-	-	-	-	-	-	-	-
Elaeagnus sp.	-	-	-	-	+	-	-	-	+

LEGEND: + present - absent

FIGURE III-5. POLLEN FROM DOBRANICHEVKA
(after Shovkoplyas et al.1981:Fig.28)

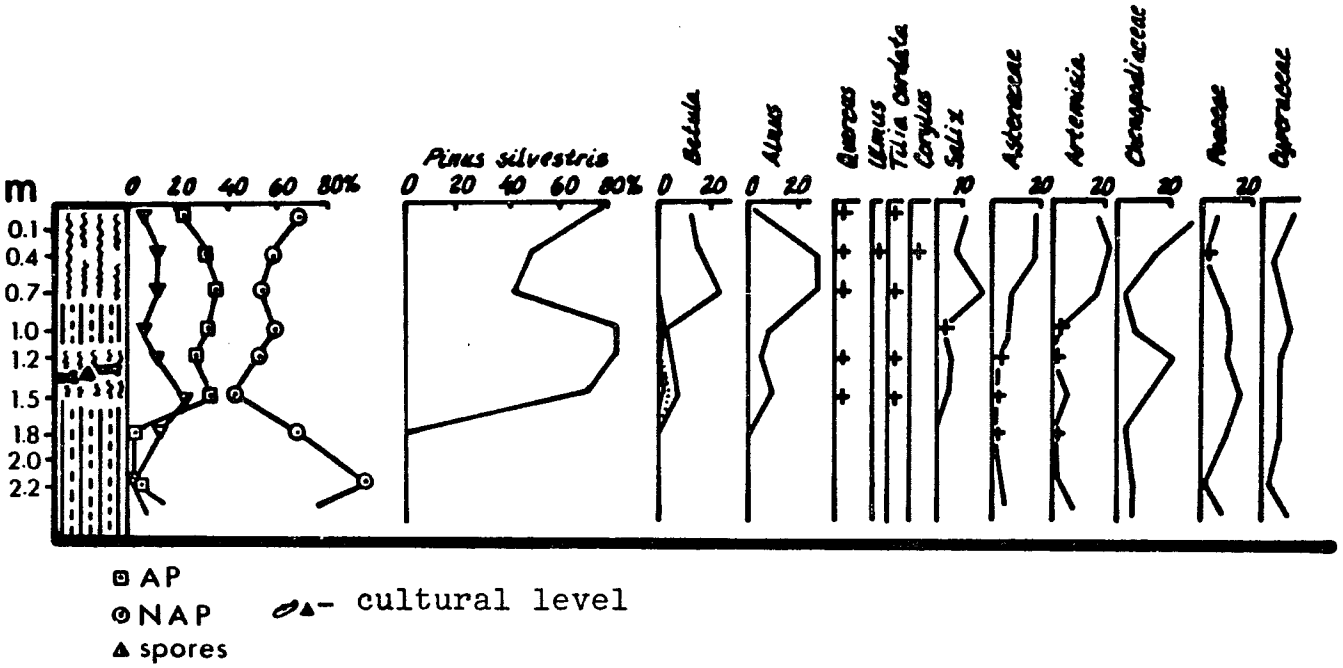


FIGURE III-6. POLLEN FROM KHOTYLEVO II
(after Velichko et al.1981b:Fig.19)

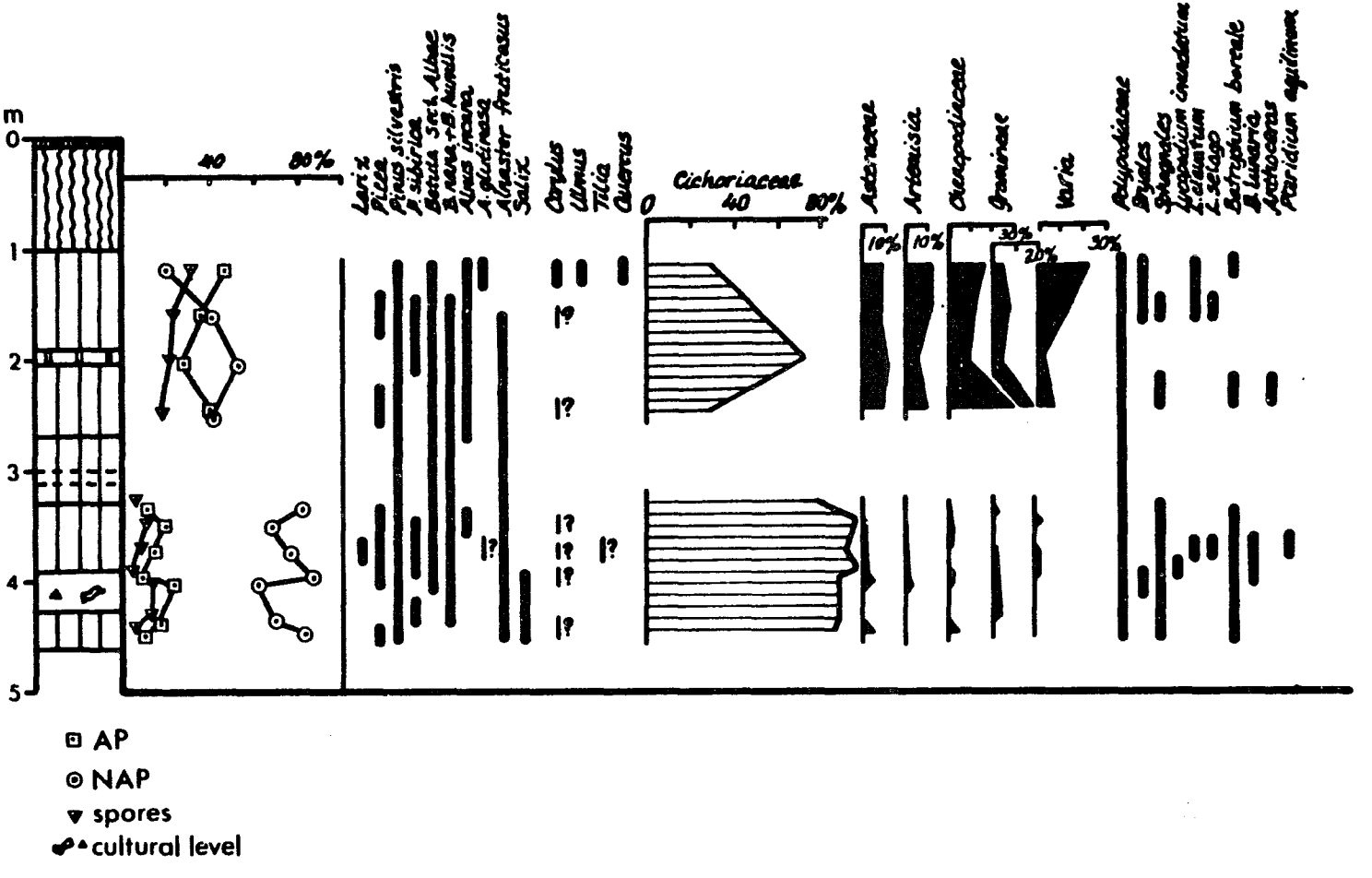


FIGURE III-7. POLLEN FROM MEZHIRICH
(after Kornietz et al.1981:Fig.33)

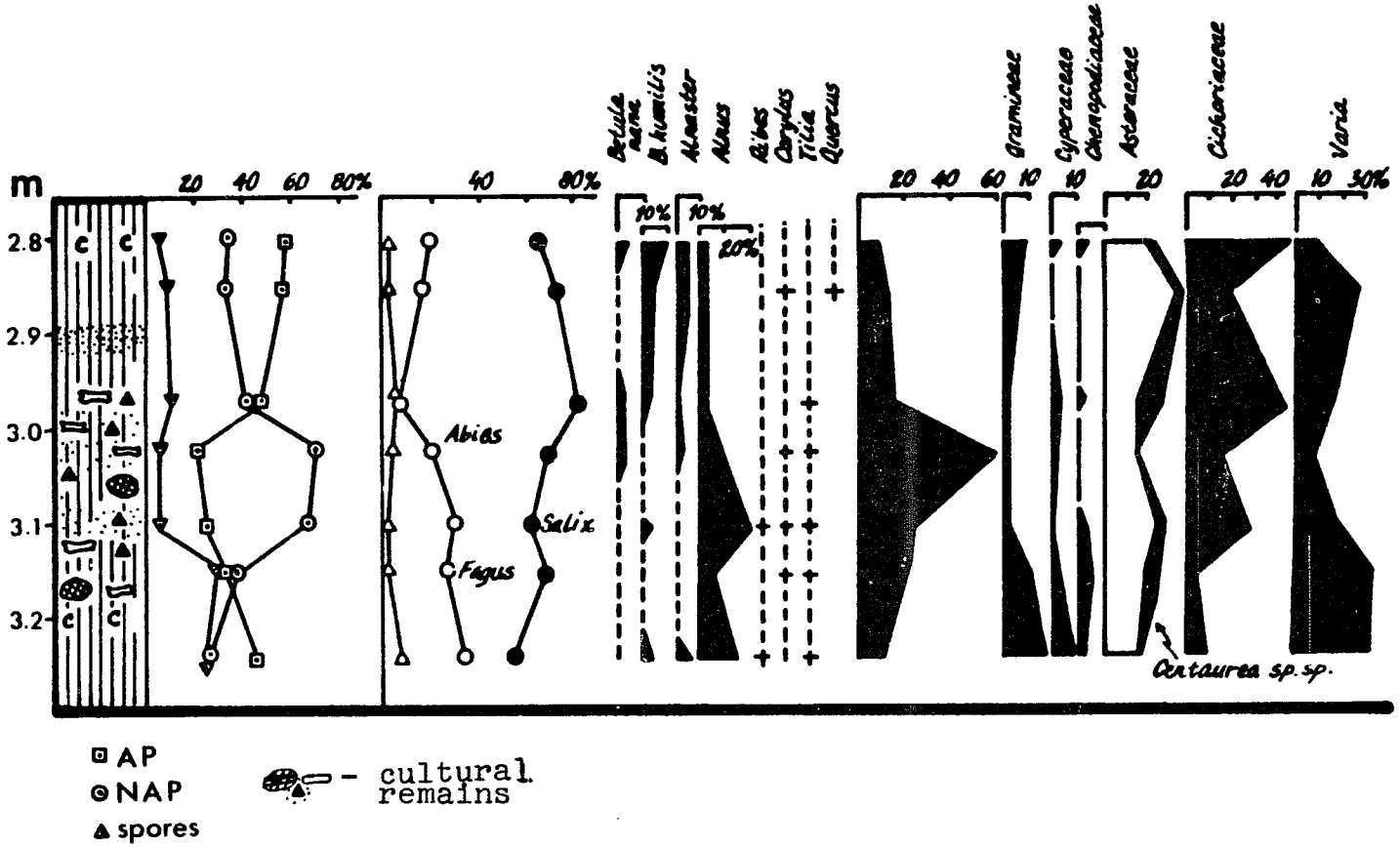


FIGURE III-8. POLLEN FROM TIMONOVKA II
(after Velichko et al. 1981b:Fig.21)

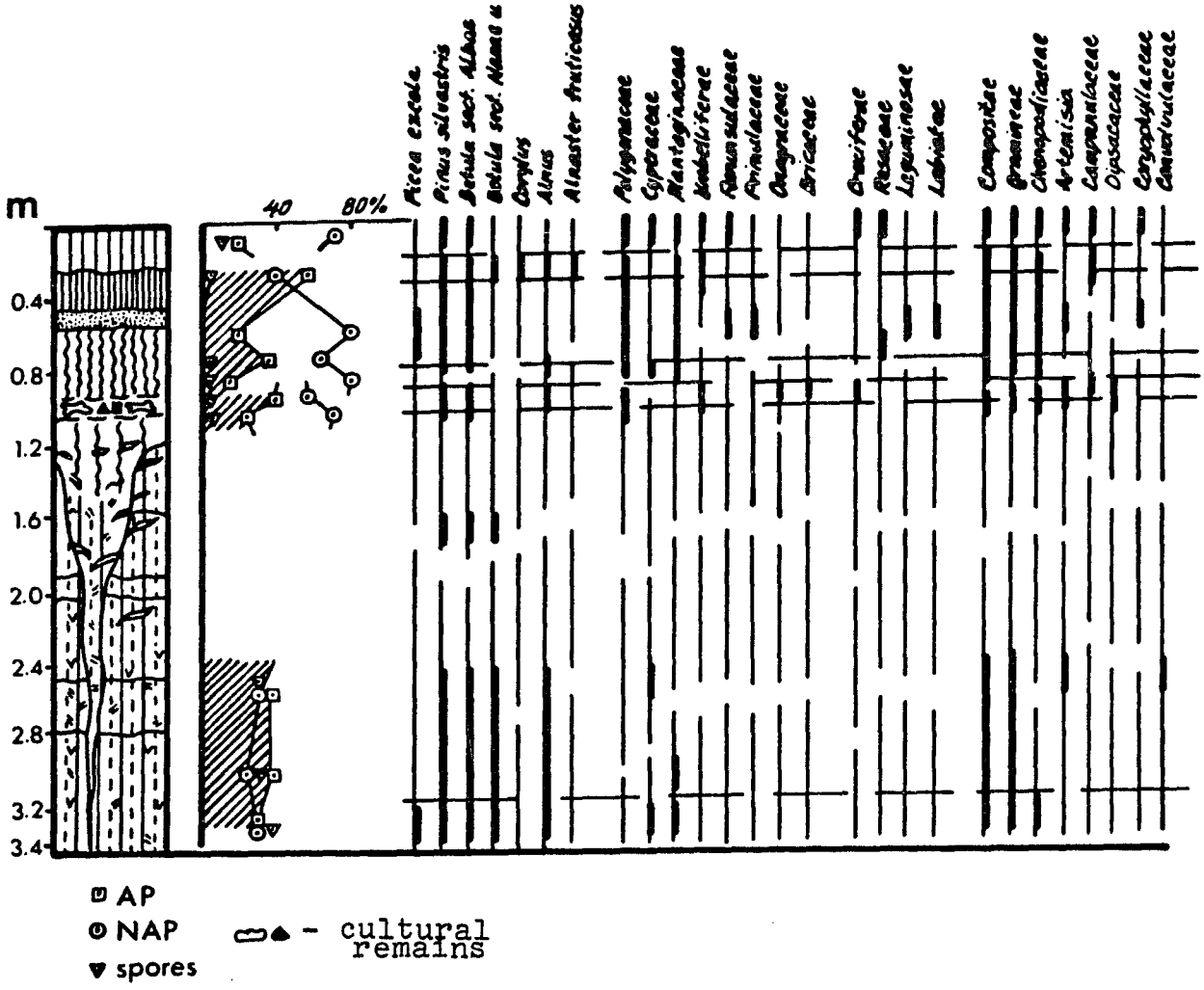
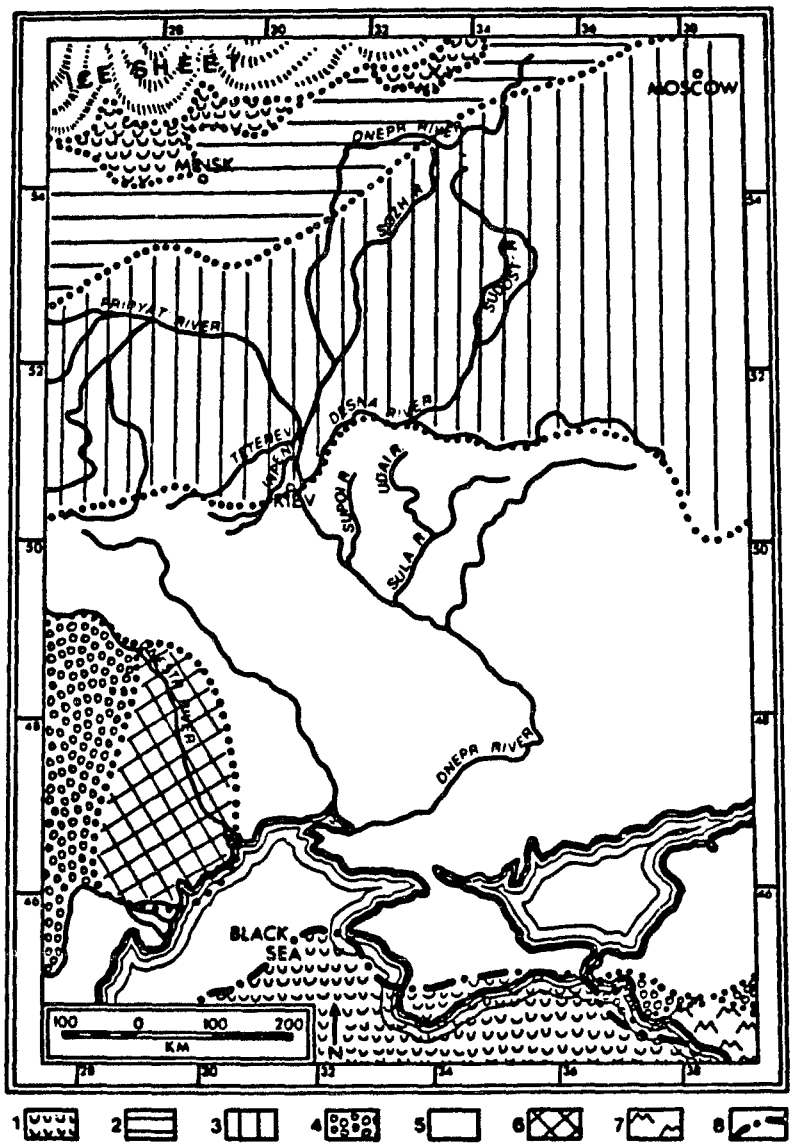


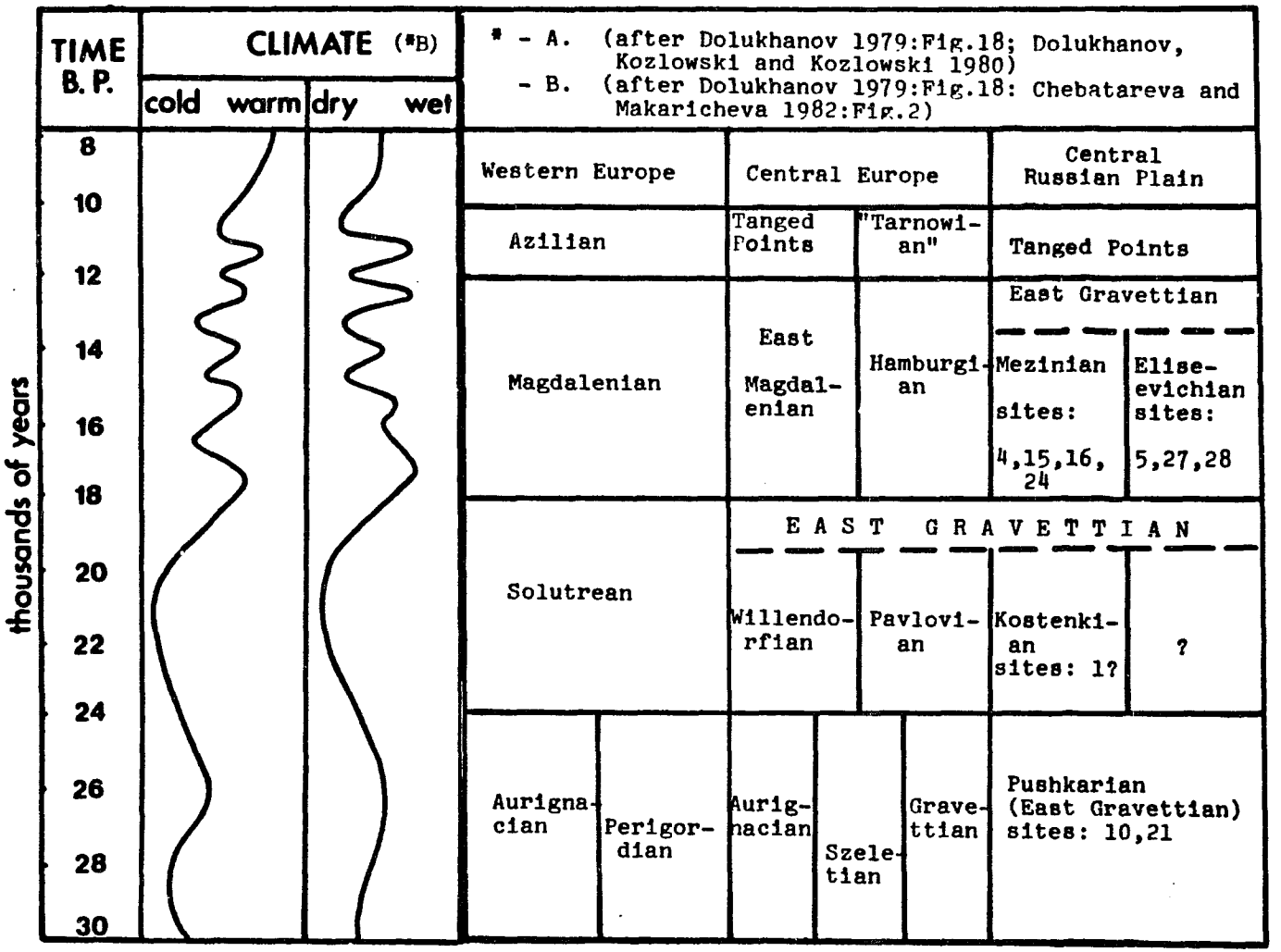
FIGURE III-9. VEGETATION ON THE CENTRAL RUSSIAN PLAIN DURING LATE VALDAI COLD MAXIMUM (after Grichuk 1982:Map 10)



LEGEND:

1 - Water bodies
2 - Shrub tundra-steppe
3 - Periglacial forest - - steppe
4 - Mixed forest
5 - Periglacial steppe
6 - Southern periglacial forest-steppe
7 - Mountain areas
8 - Limit of New Euxine Sea

FIGURE VI-1. STYLISTIC GEOCHRONOLOGY OF THE UPPER PALEOLITHIC (*A)

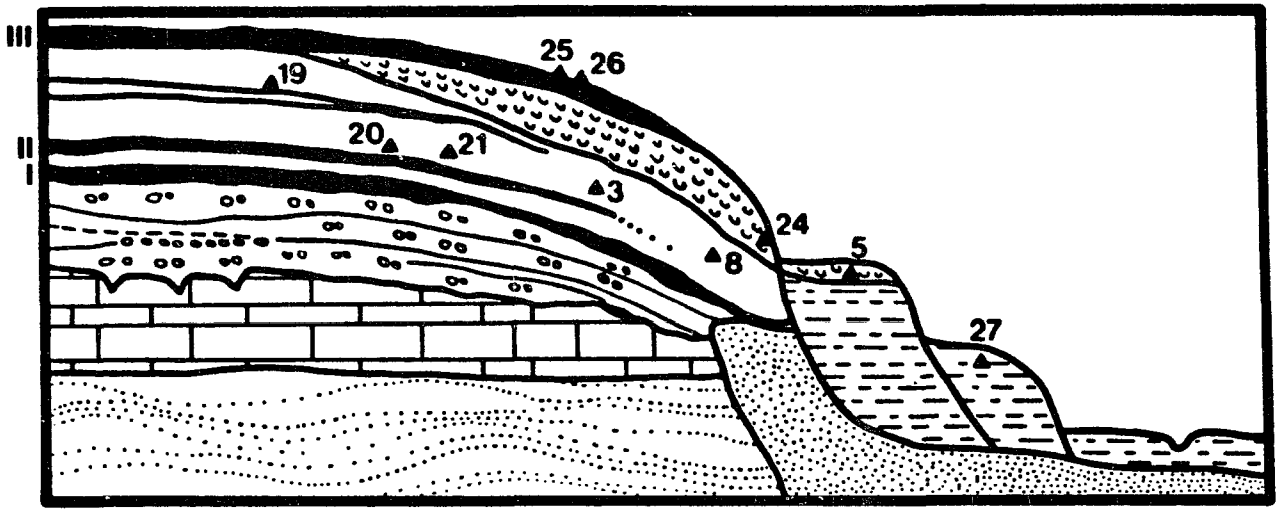


* - A. (after Dolukhanov 1979:Fig.18; Dolukhanov, Kozlowski and Kozlowski 1980)
- B. (after Dolukhanov 1979:Fig.18: Chebatareva and Makaricheva 1982:Fig.2)

Western Europe		Central Europe		Central Russian Plain	
Azilian		Tanged Points	"Tarnowian"	Tanged Points	
Magdalenian		East Magdalenian	Hamburgian	East Gravettian: Mezinian sites: 4,15,16,24	East Gravettian: Eliseevichian sites: 5,27,28
Solutrean		EAST GRAVETTIAN: Willendorfian	Pavlovian	Kostenkian sites: 1?	?
Aurignacian	Perigordian	Aurignacian	Szeletian	Gravettian	Pushkarian (East Gravettian) sites: 10,21

note: sites numbered as per Fig.II-1

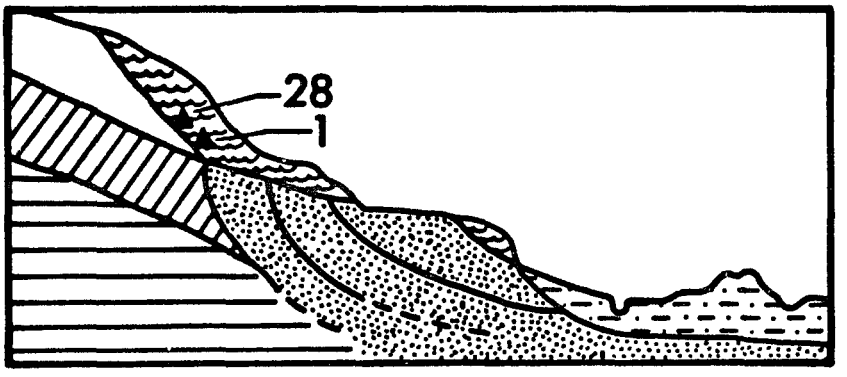
FIGURE IV-2. GEOLOGIC AGE OF UPPER PALEOLITHIC DESNA AND SUDOST' SITES (after Velichko 1961; Klein 1973; Kurenkova 1978)



- Buried Alluvium
- Alluvium
- Upper Cretaceous Sand
- Early and Middle Pleistocene Deposits
- Upper Cretaceous Limestone
- Gley Layer
- Reworked Loess--Colluvium
- Relic Soils:
  - I - Mikulino
  - II - Bryansk
  - III- Timonovka

- ▲3 Chulatovo II
- ▲5 Eliseevichi
- ▲8 Khotylevo II
- ▲19 Bugorok
- ▲20 Pogon
- ▲21 Pushkari I
- ▲24 Suponevo
- ▲25 Timonovka I
- ▲26 Timonovka II
- ▲27 Yudinovo

FIGURE IV-3. GEOLOGIC AGE OF UPPER PALEOLITHIC SOZH AND PRIPYAT' SITES
(after Isaenko 1968: Fig. 1)



Loess

Alluvium

Slope Deposits in Ravine

Buried Alluvium

Moraine

1 Berdyzh

Basal Strata

28 Yurovichi

FIGURE IV-4. LATE PLEISTOCENE CLIMATE* AND RADIOCARBON DATES** FROM THE SITES (* after Dolukhanov 1979:Fig.18; Chebatareva and Makaricheva 1982:Fig.2; ** see Table IV-8)

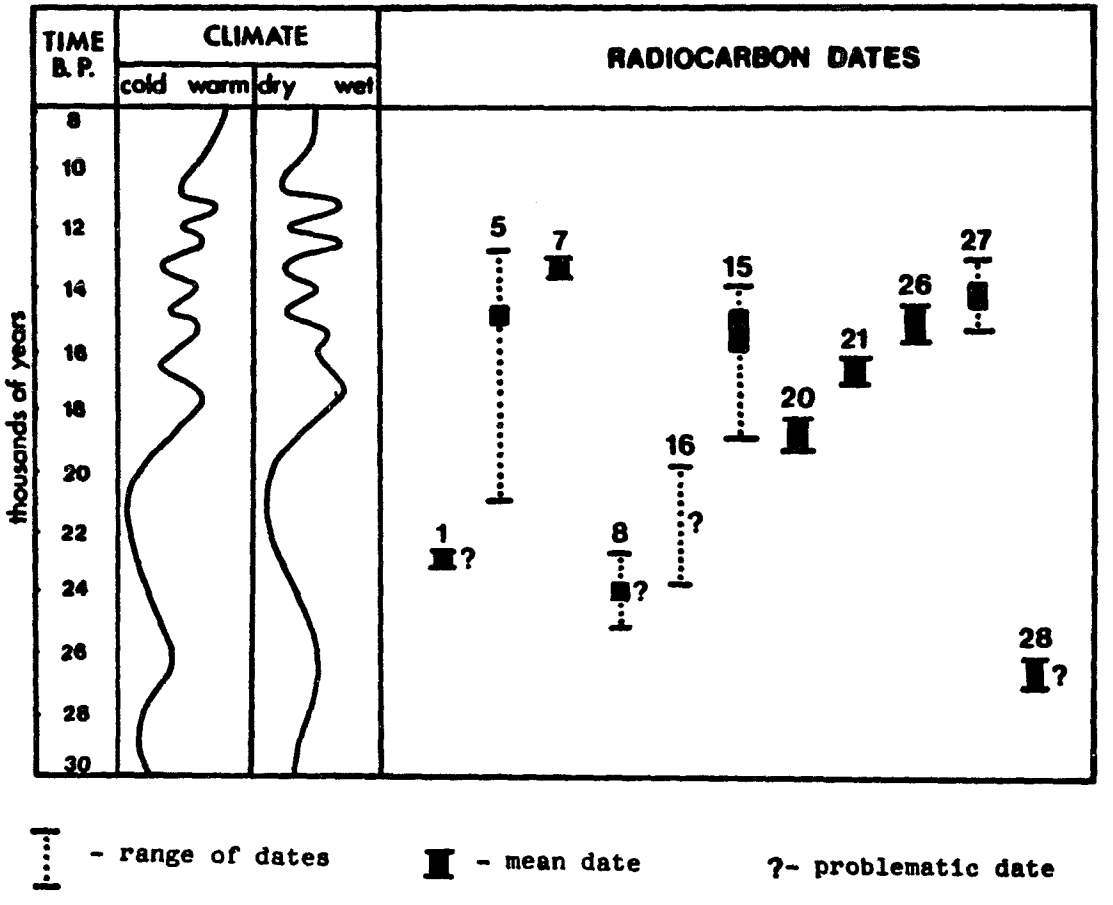
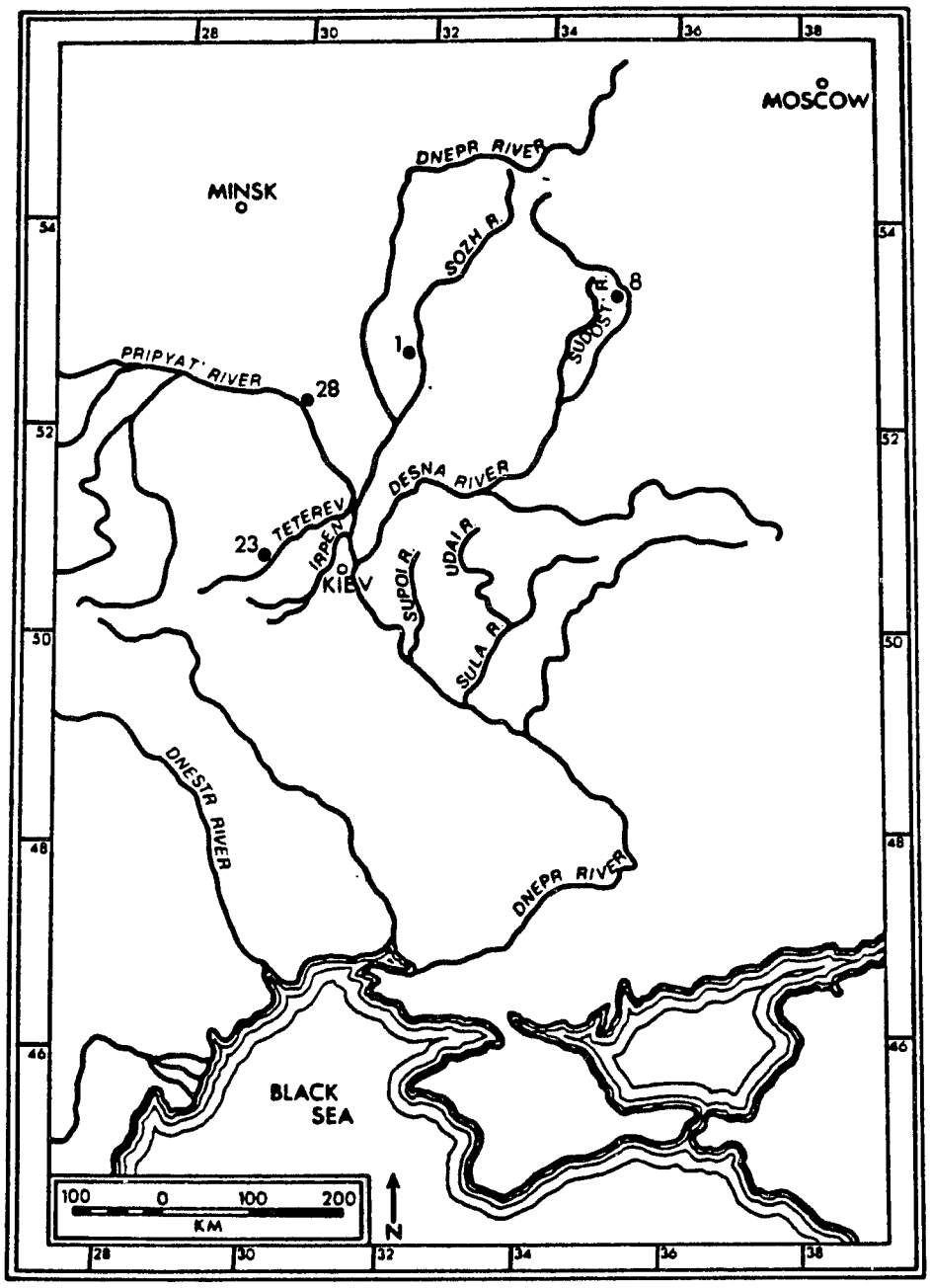
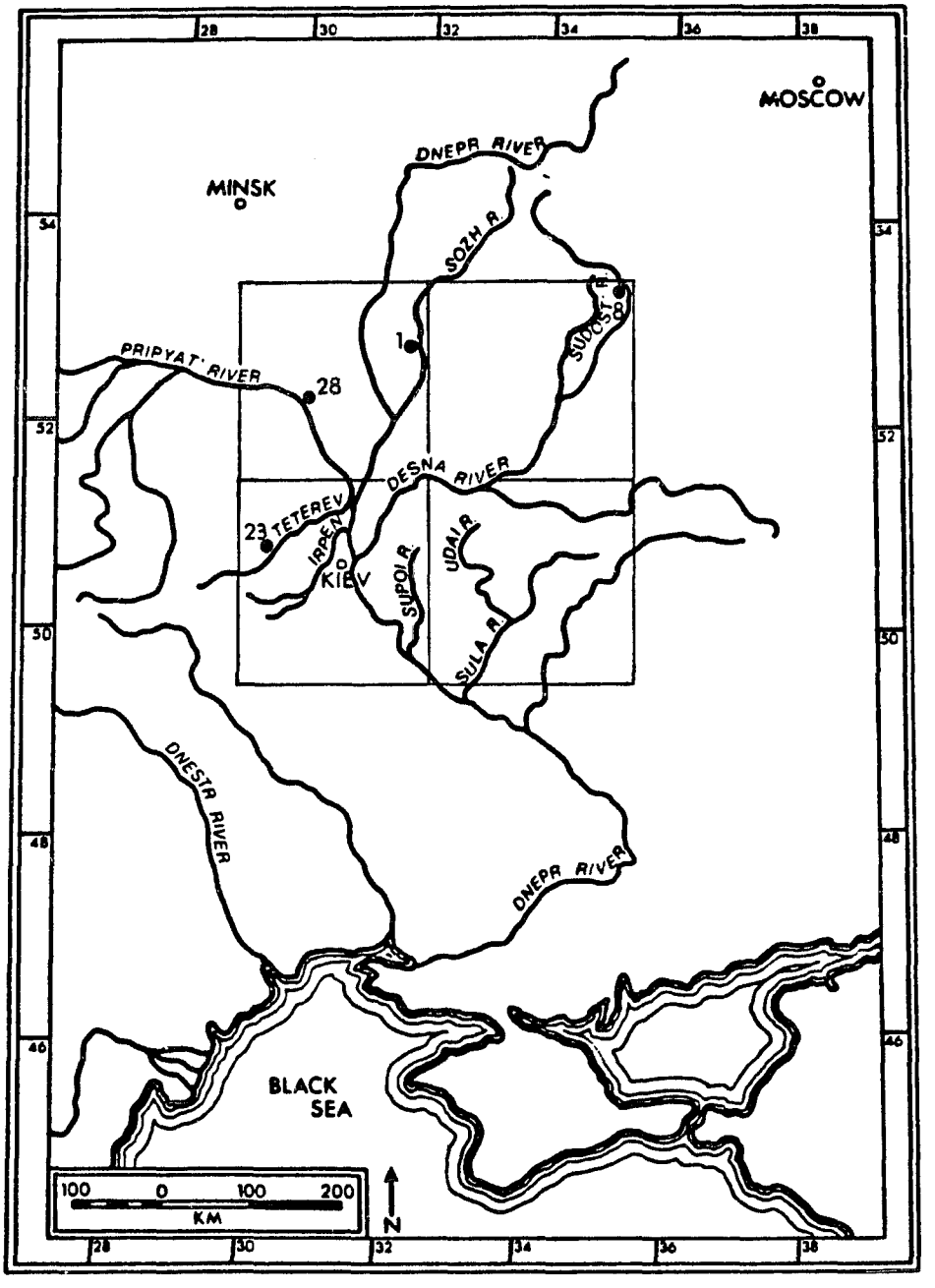


FIGURE IV-5. EARLY UPPER PALEOLITHIC SITES
ON THE CENTRAL RUSSIAN PLAIN



LEGEND:
1. Berdyzh
8. Khotylevo II
23. Radomyshl'
28. Yurovichi

FIGURE IV-6. EARLY SITES AND
"BLOCK SIZE 4" QUADRANTS



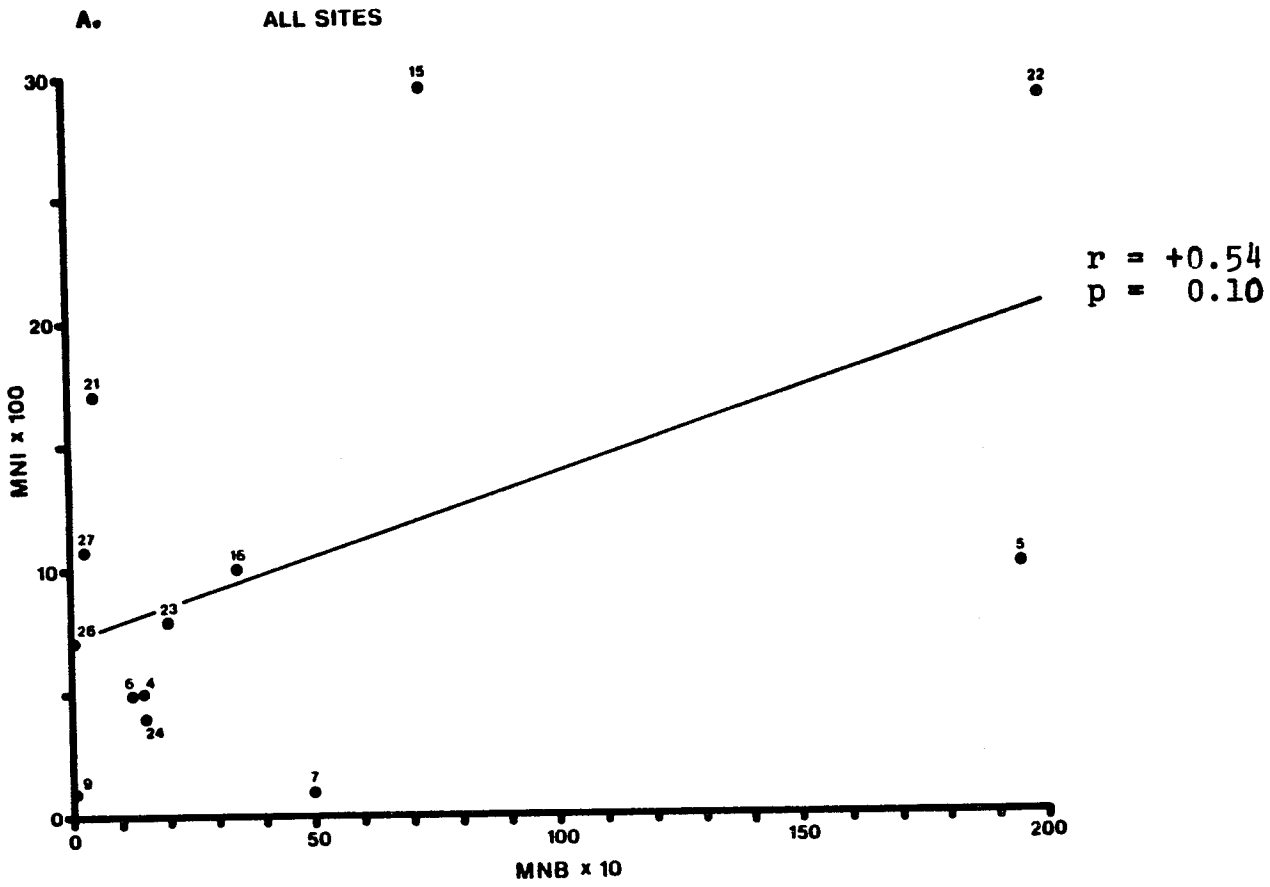
LEGEND:
1. Berdyzh
8. Khotylevo II
23. Radomyshl'
28. Yurovichi

Notes on Figures V-1 through V-28:

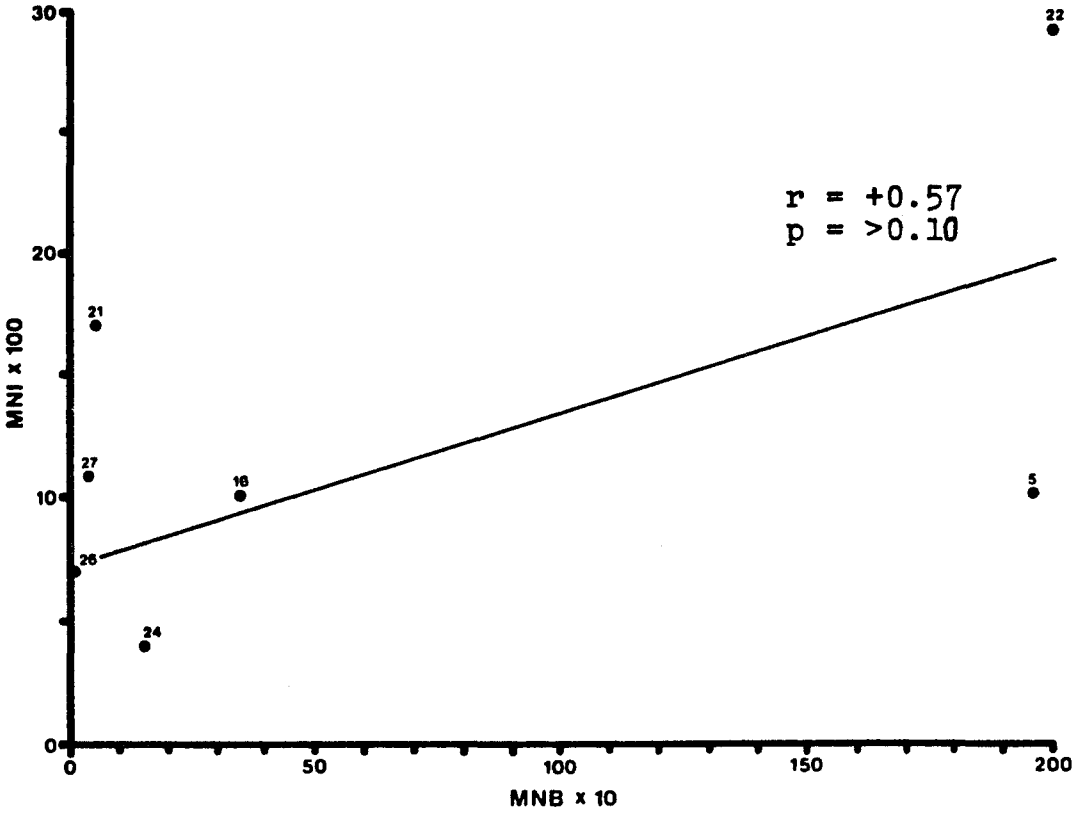
1. Figures V-1, V-2, V-4 through V - 14, V-16 through V-21, and V-26 through V-28 are Linear Regressions for faunal remains found at the study sites. In all these figures the values for Pearson's Coefficient of Correlation is indicated as r and the probability as p. Pertinent test statistics can be found in appropriate columns in Table V-8.

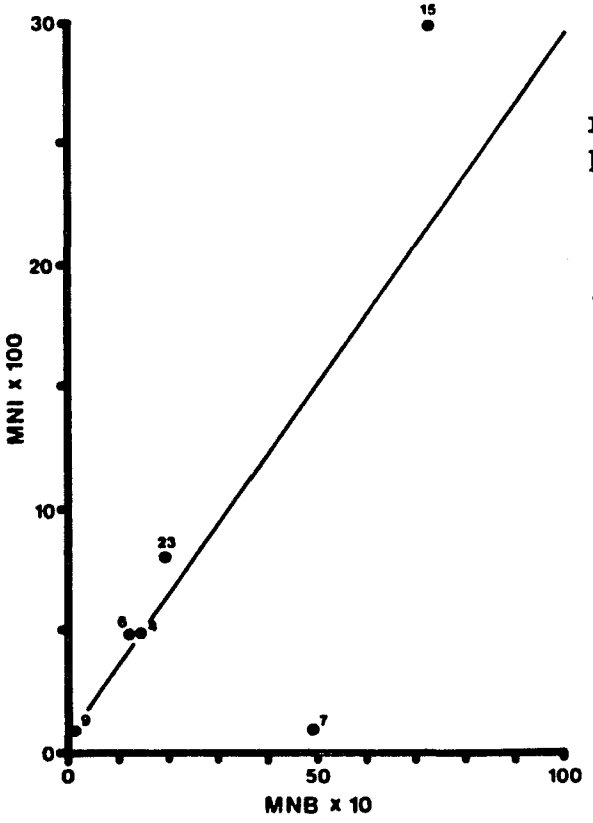
2. Numbers 1-29 adjacent to dots in all figures in this section denote sites numbered as per Figure II-1.

FIGURE V-1. REMAINS OF MAMMOTHS FOUND AT THE SITES



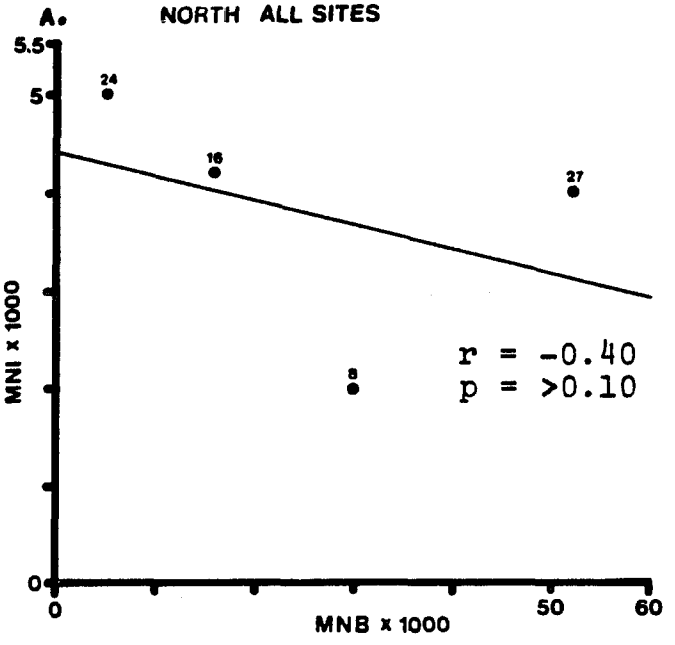
B. MAMMOTHS NORTH ALL SITES





C. MAMMOTHS SOUTH ALL SITES

FIGURE V-2. REMAINS OF STEPPE BISON FOUND AT THE SITES



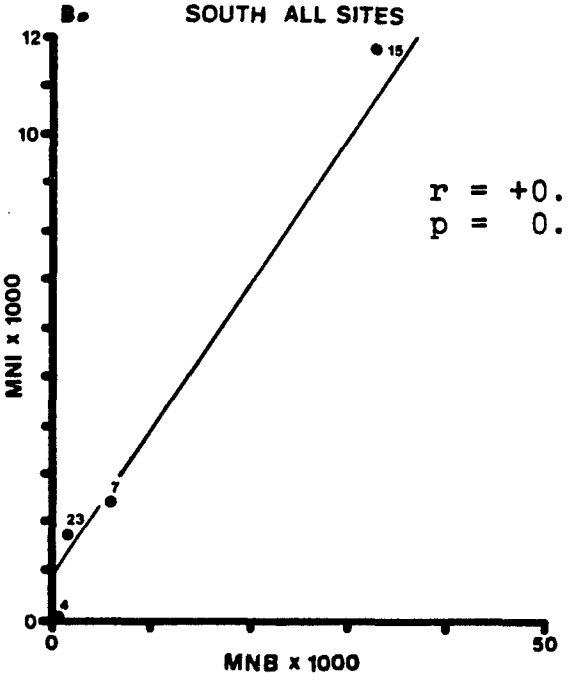


FIGURE V-3. RELATIONSHIP BETWEEN SIZE OF TAXA AND COEFFICIENTS OF CORRELATION

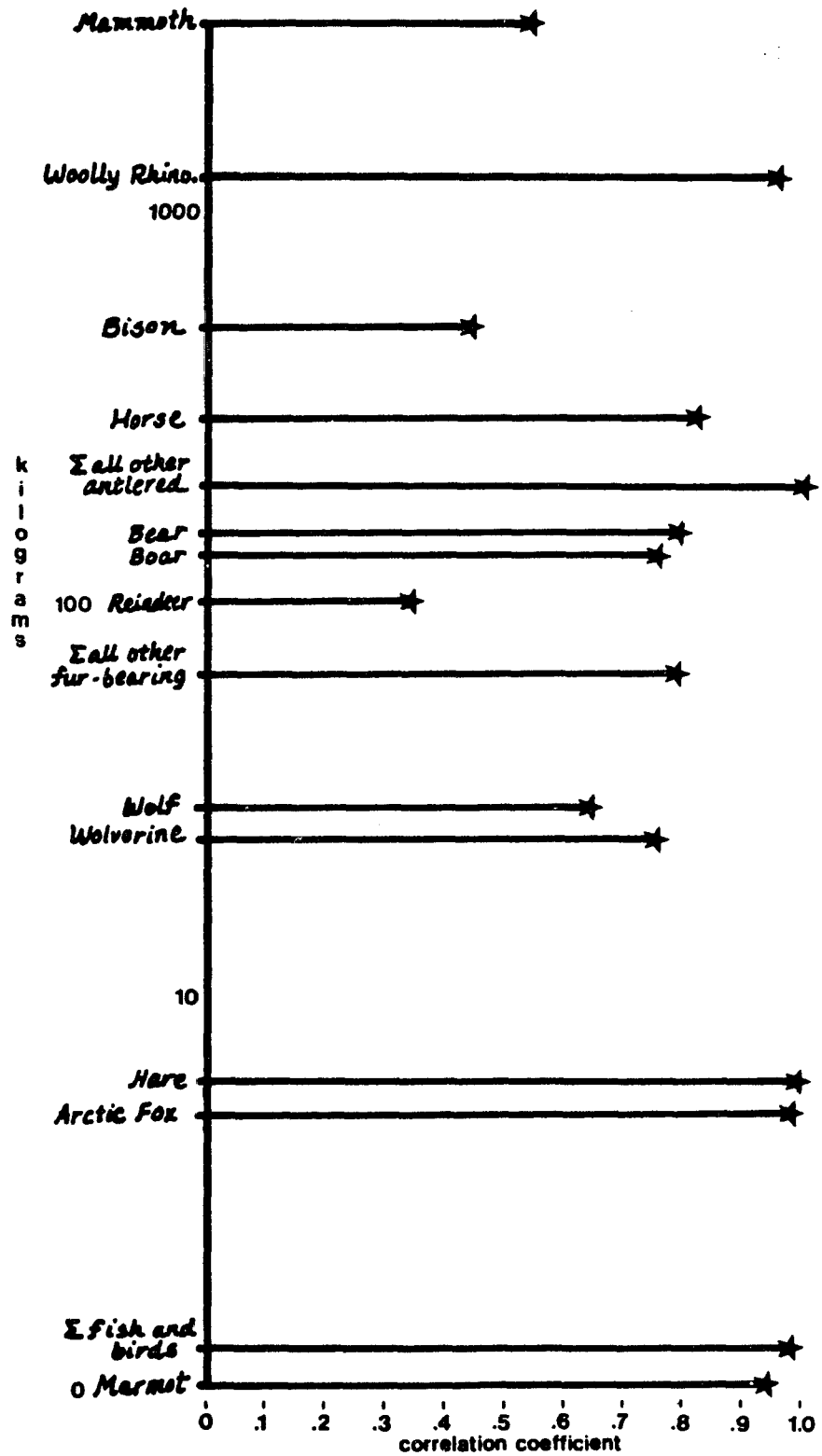
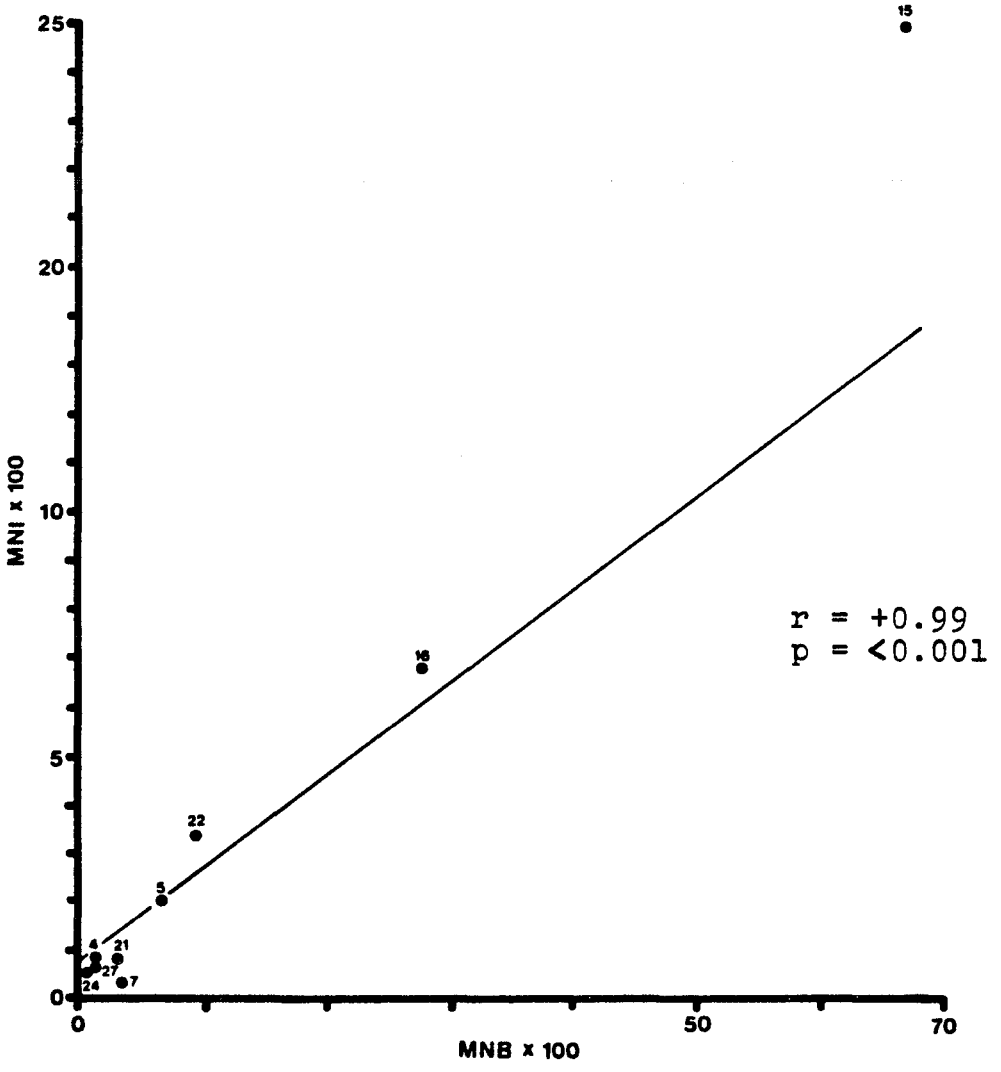
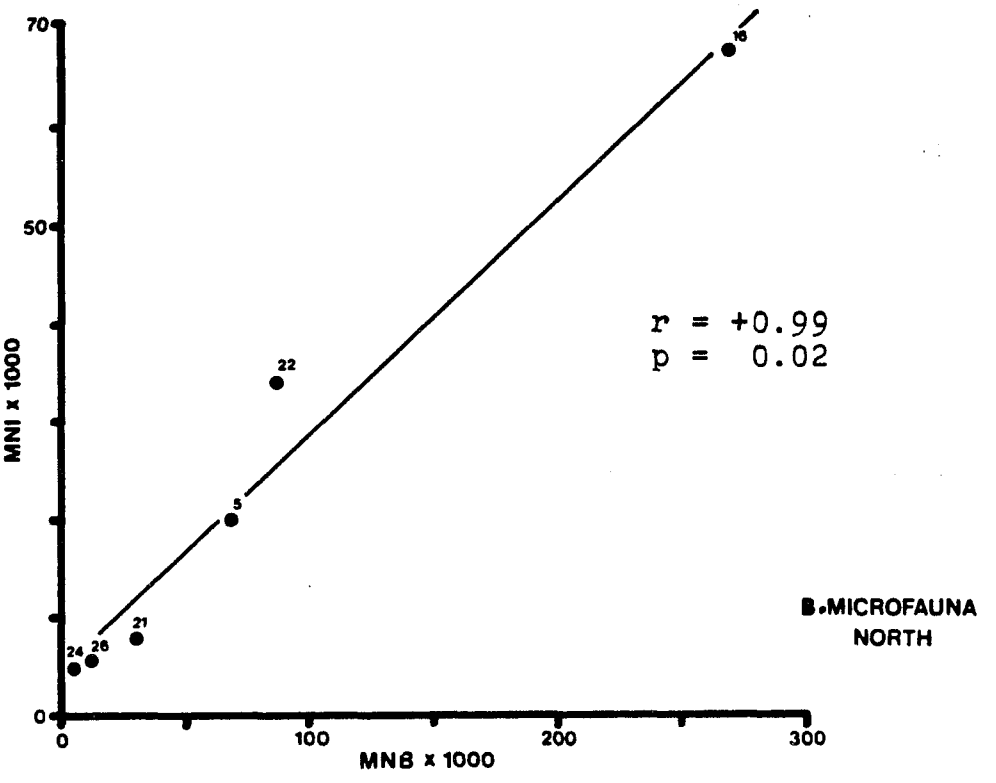


FIGURE V-4. REMAINS OF MICROFAUNA FOUND AT THE SITES

A. All Sites





B. MICROFAUNA NORTH

C. MICROFAUNA SOUTH

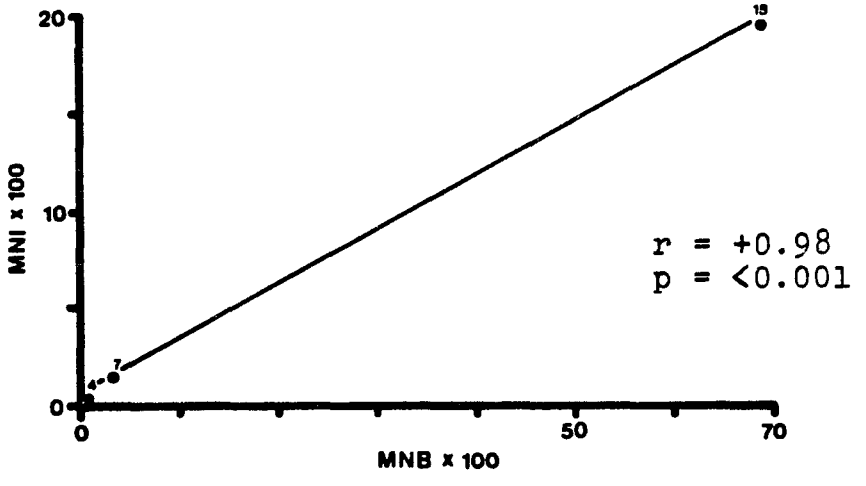
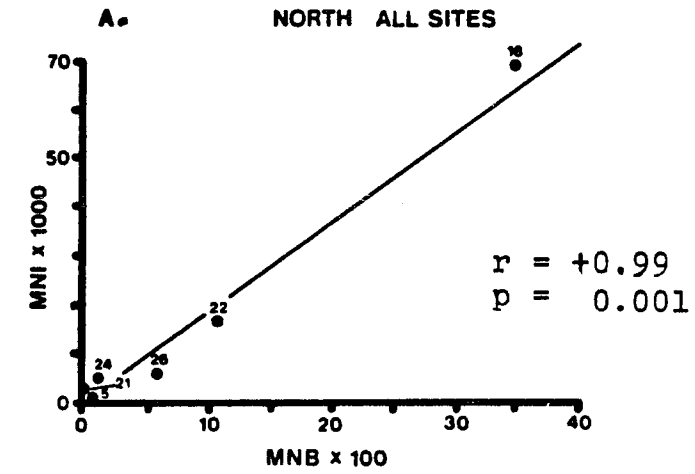


FIGURE V-5. REMAINS OF REINDEER FOUND AT THE SITES



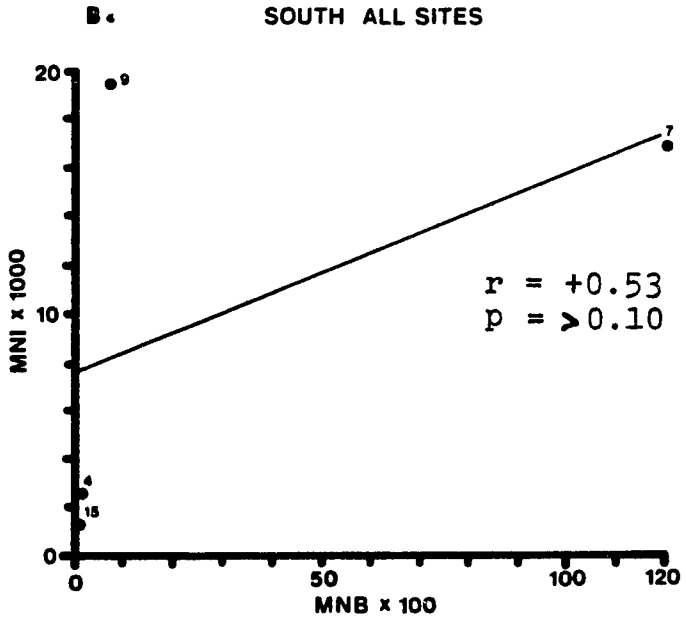


FIGURE V-6. REMAINS OF ALL OTHER ANTLERED TAXA FOUND AT THE SITES

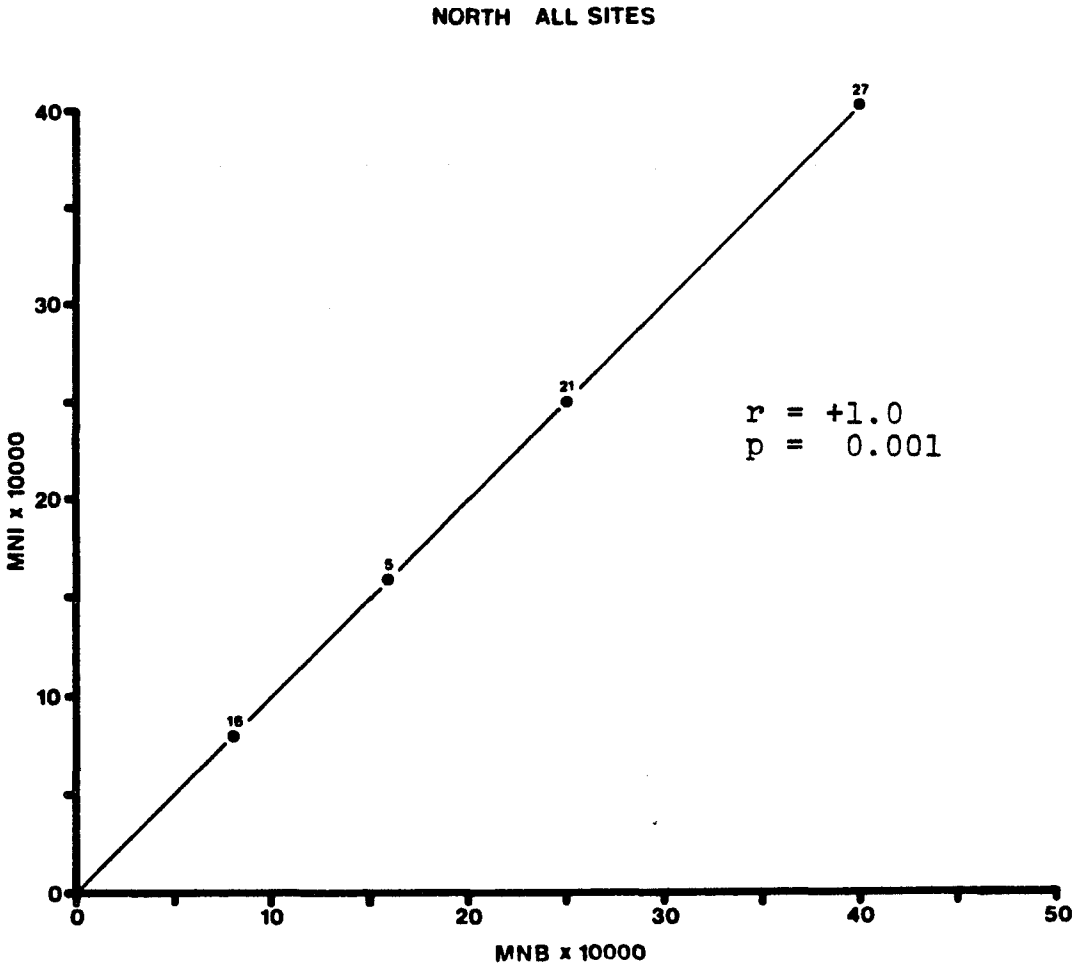
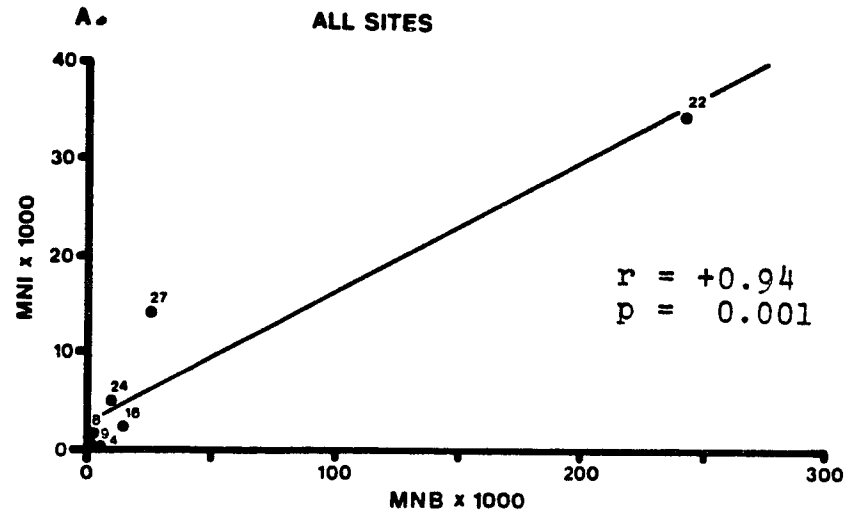


FIGURE V-7. REMAINS OF WOOLY RHINOCERI FOUND AT THE SITES



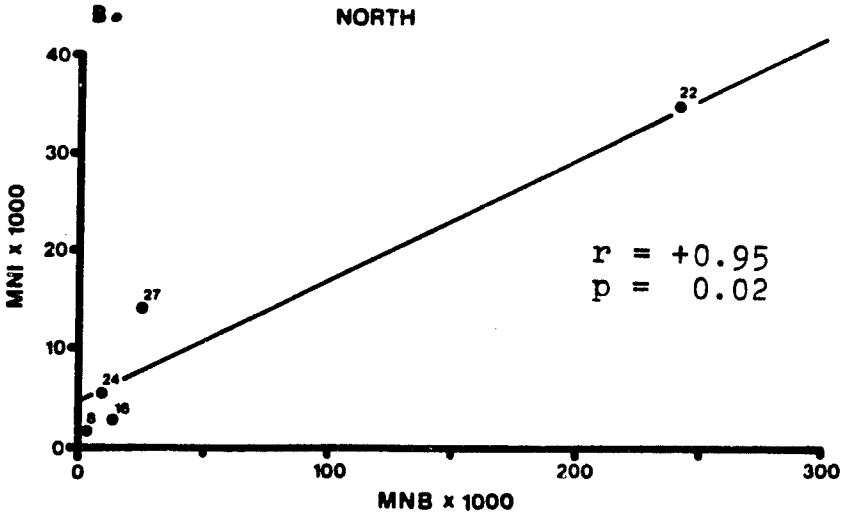
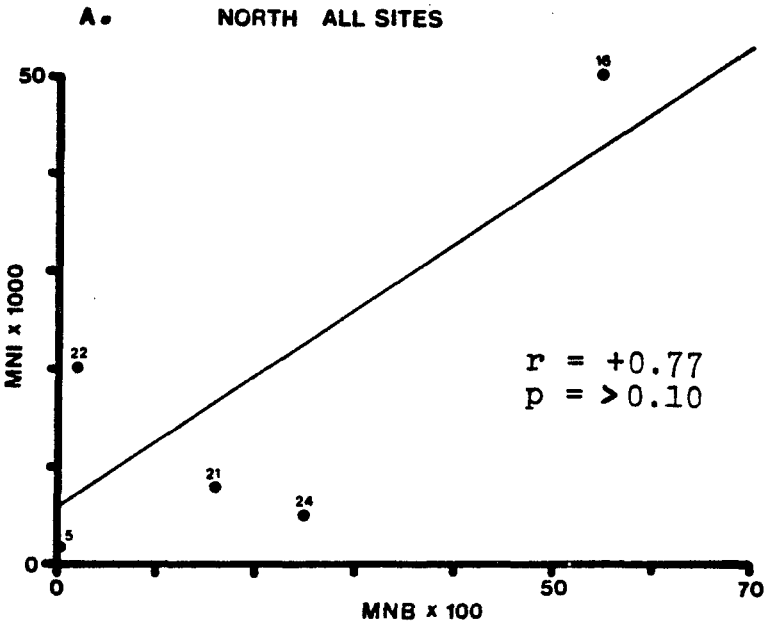


FIGURE V-8. REMAINS OF HORSES FOUND AT THE SITES



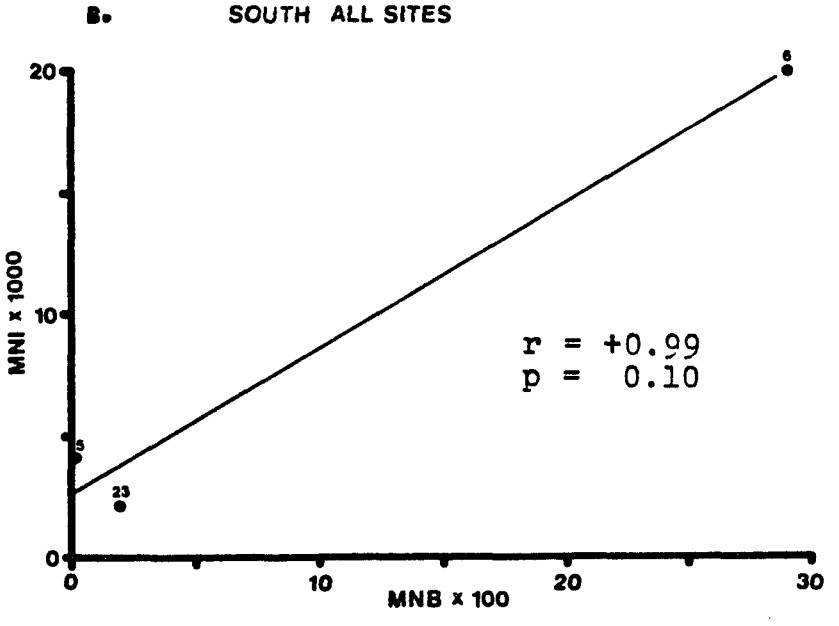


FIGURE V-9. REMAINS OF WILD BOAR FOUND AT THE SITES

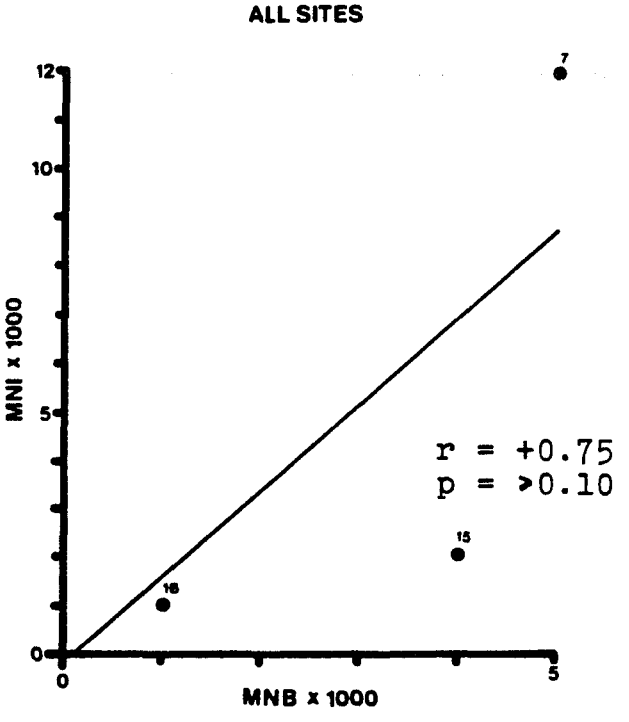
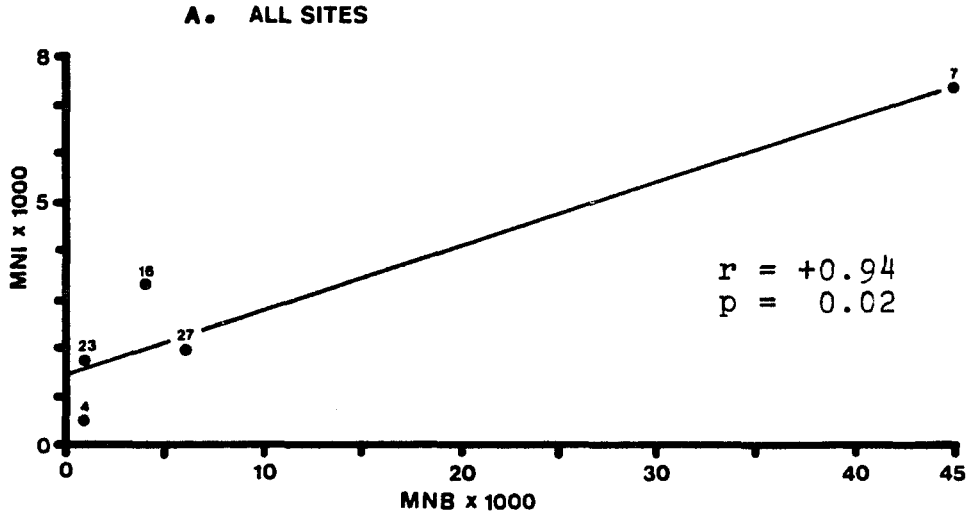


FIGURE V-10. REMAINS OF STEPPE MARMOTS FOUND AT THE SITES



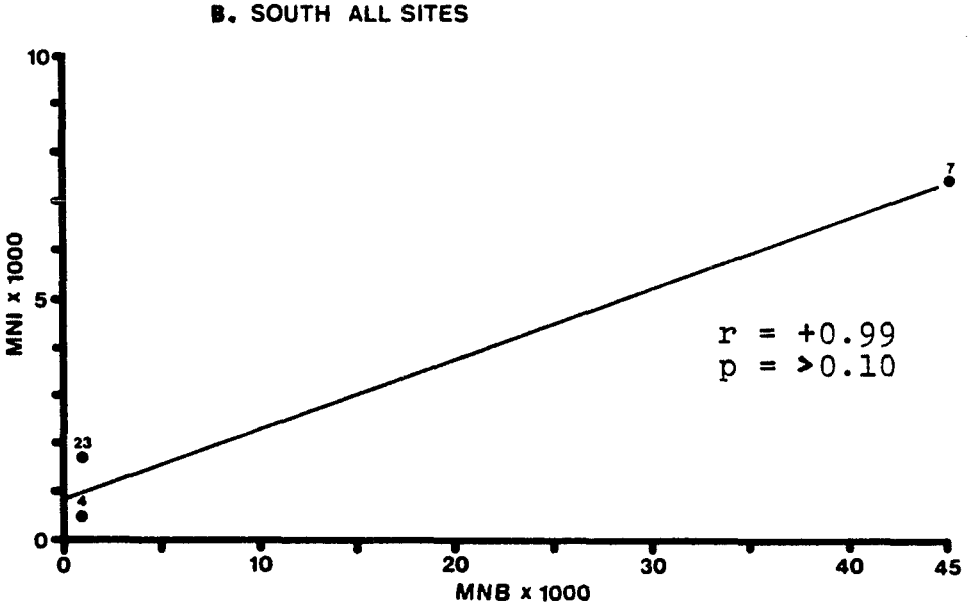
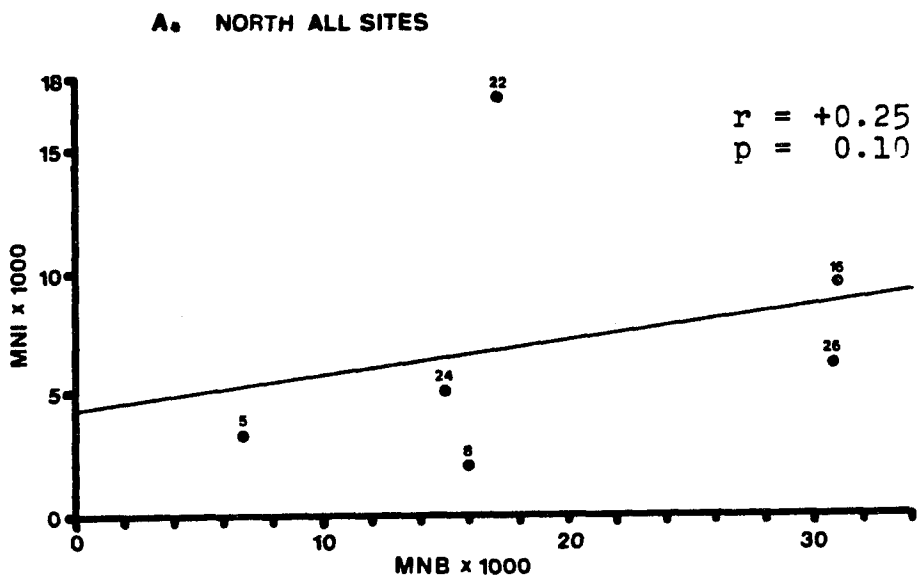
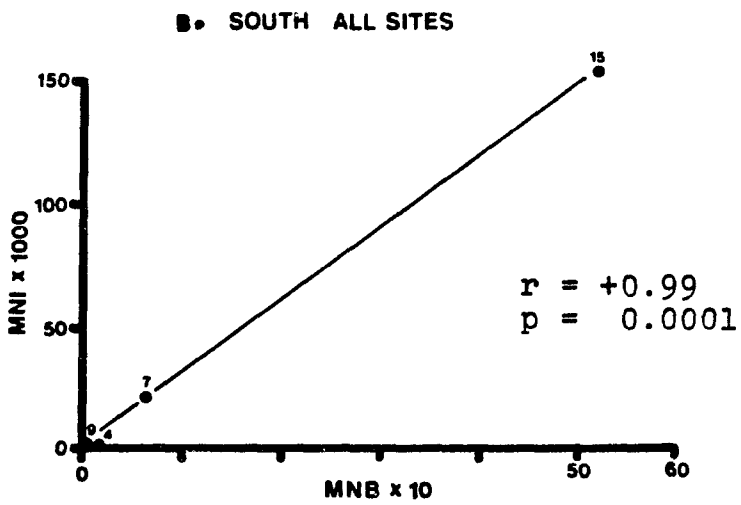
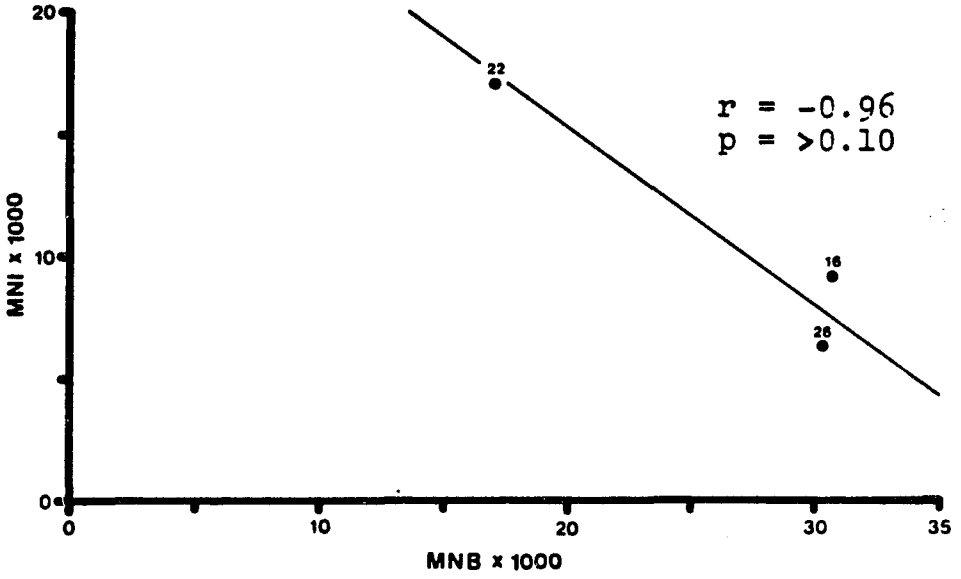


FIGURE V-11. REMAINS OF HARES FOUND AT THE SITES

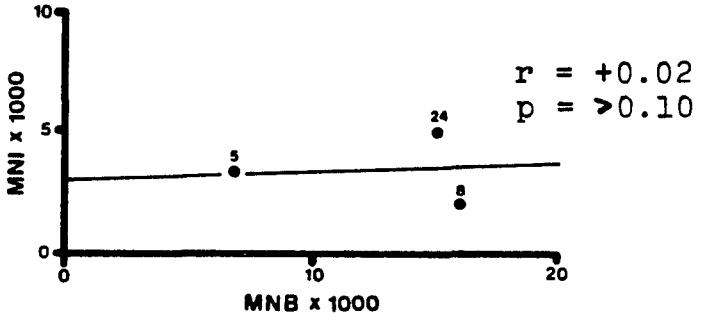




C. HARES NORTH HIGH DENSITY



D. HARES NORTH LOW DENSITY



E. HARES SOUTH LOW DENSITY

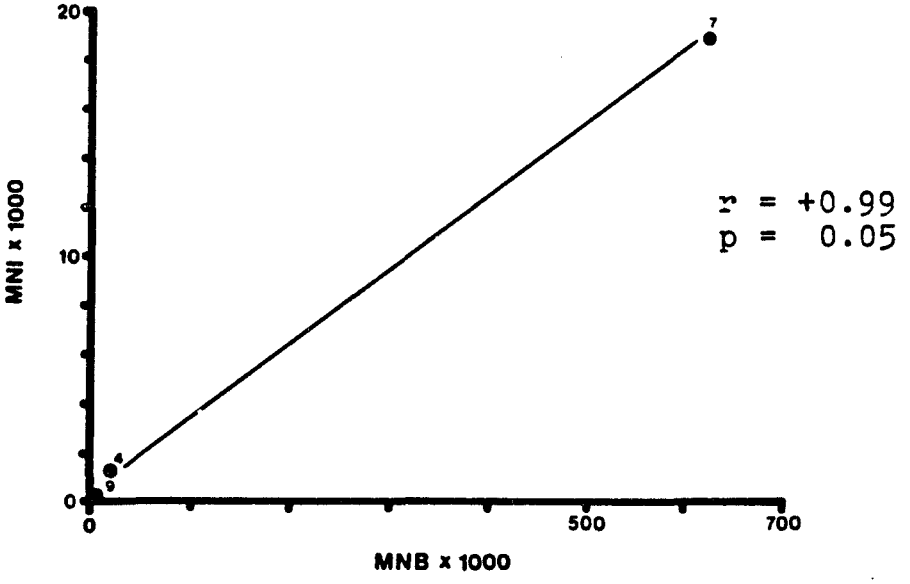


FIGURE V-12. REMAINS OF BIRDS FOUND AT THE SITES

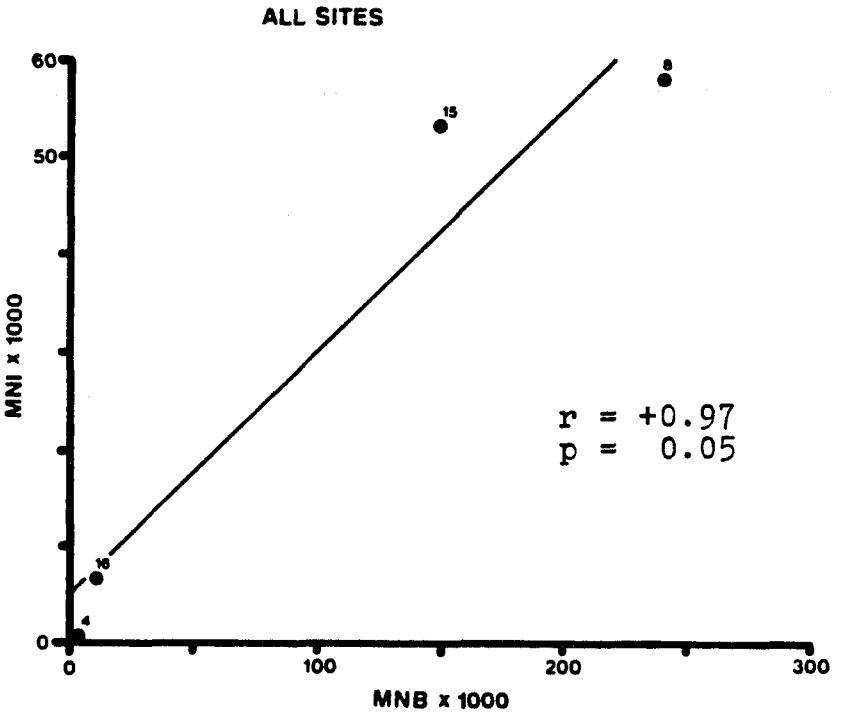


FIGURE V-13. REMAINS OF FISH FOUND AT THE SITES

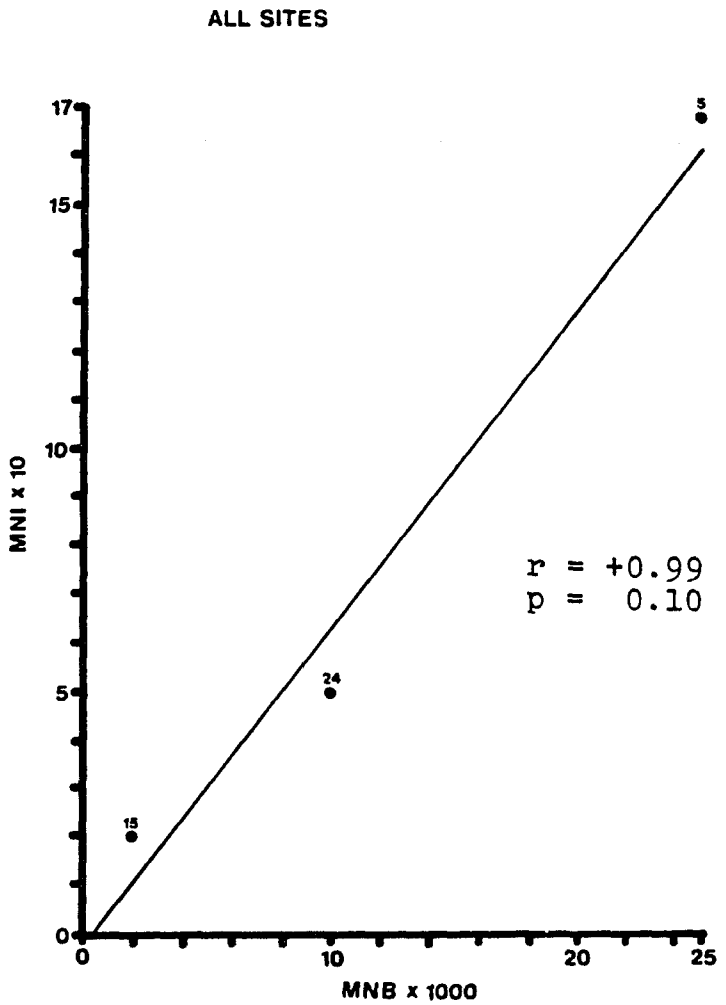


FIGURE V-14. REMAINS OF ALL TAXA USED AS FOOD FOUND AT THE SITES

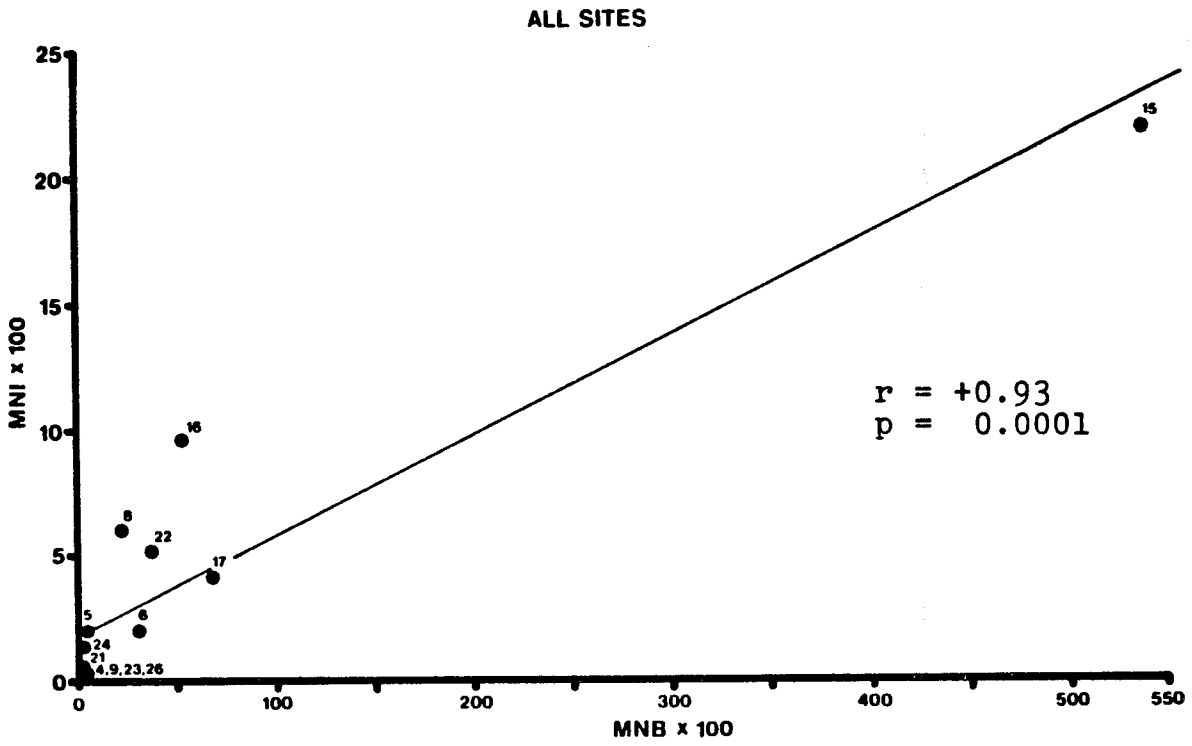
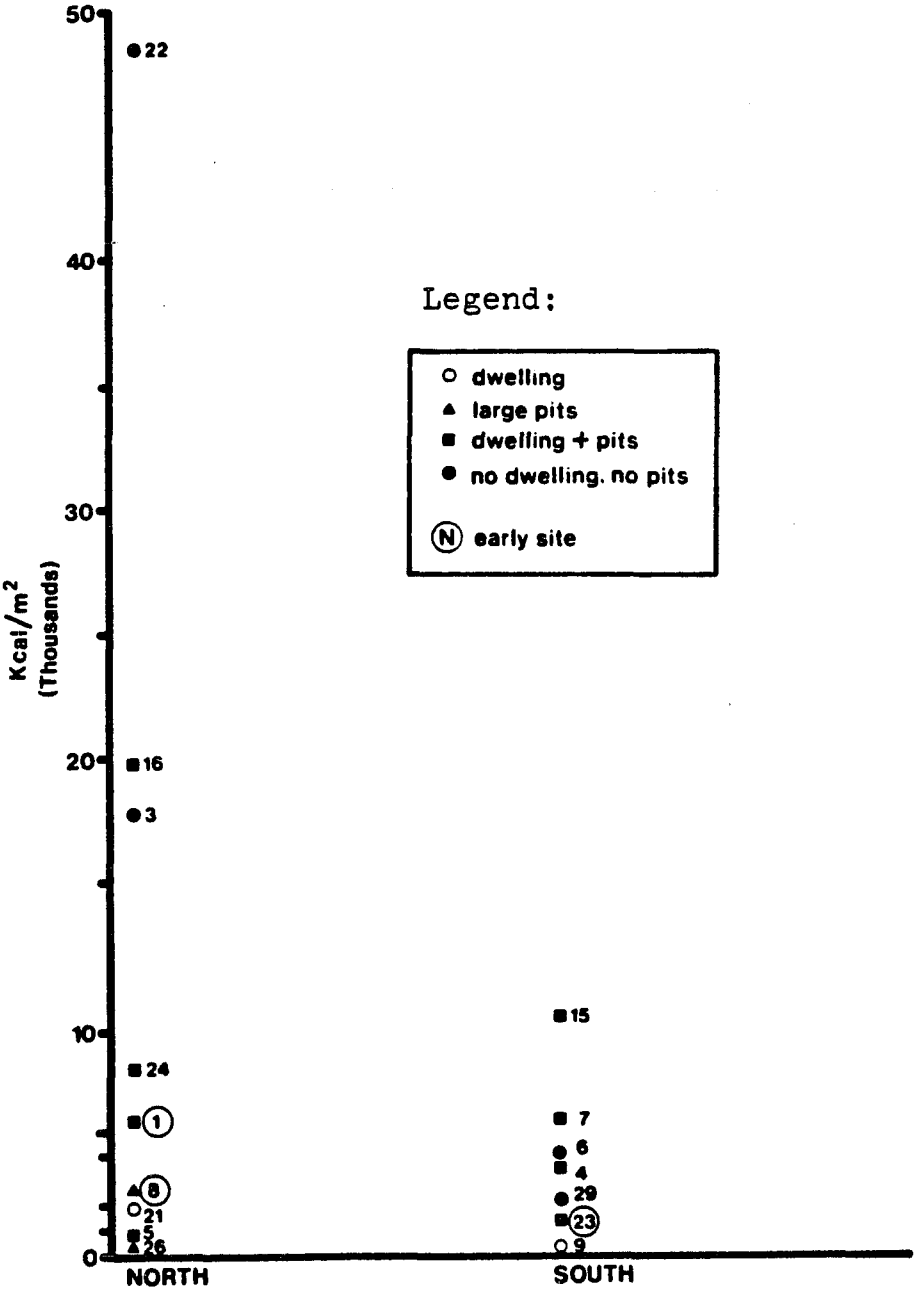


FIGURE V-15. DENSITY OF KILOCALORIES OF FOOD TAXA AT THE SITES

A. All Mammoths Excluded



B. Half Mammoth kilocalories included

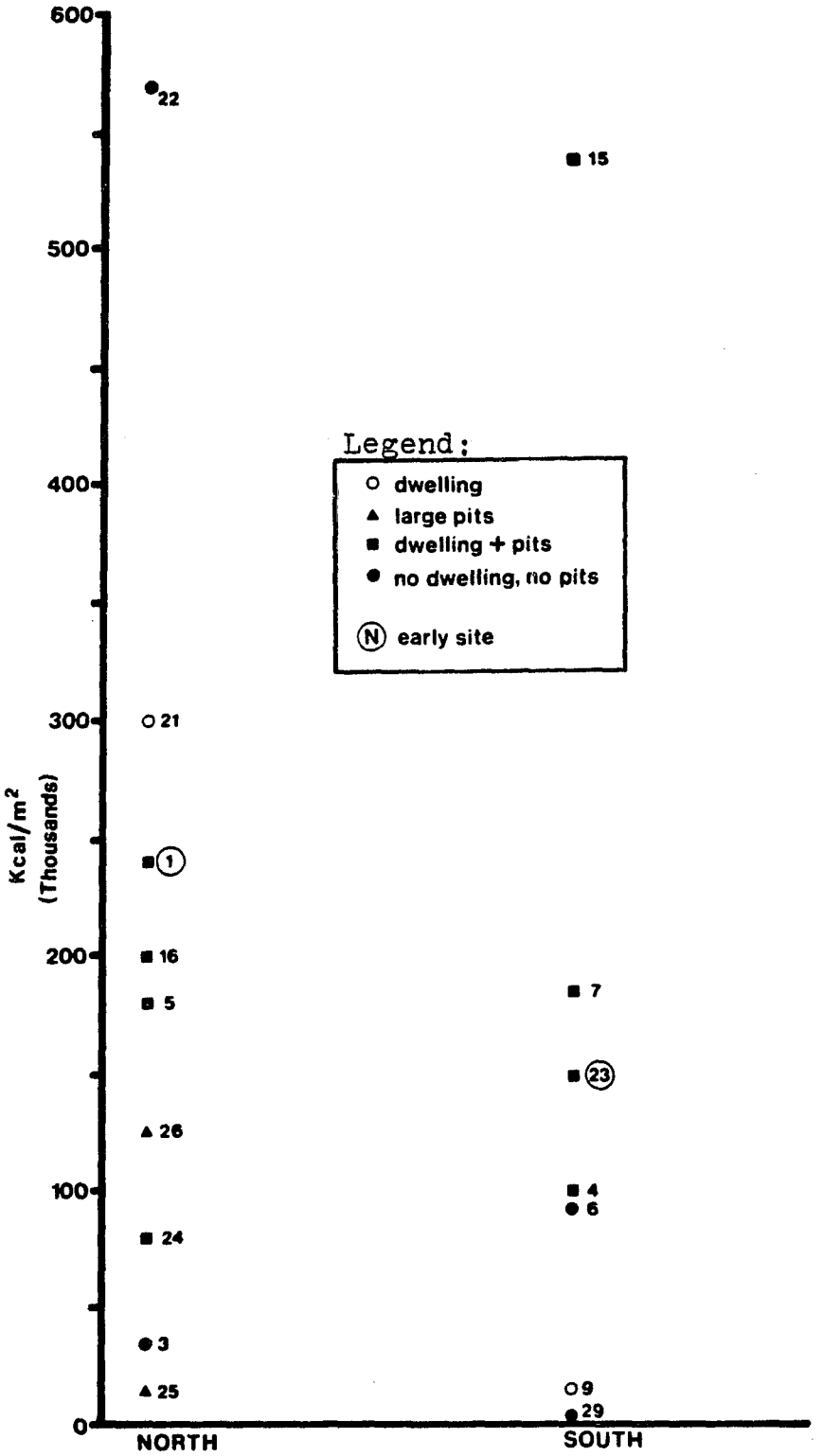
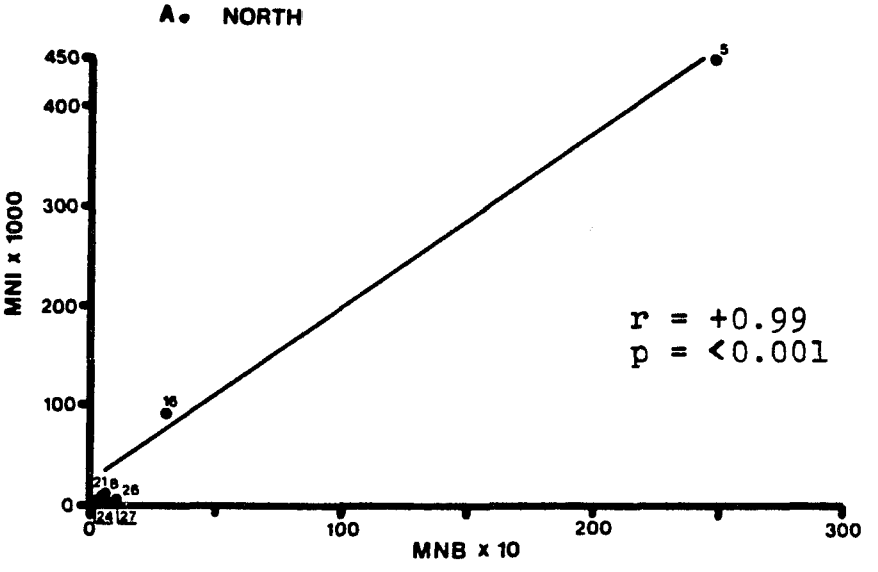
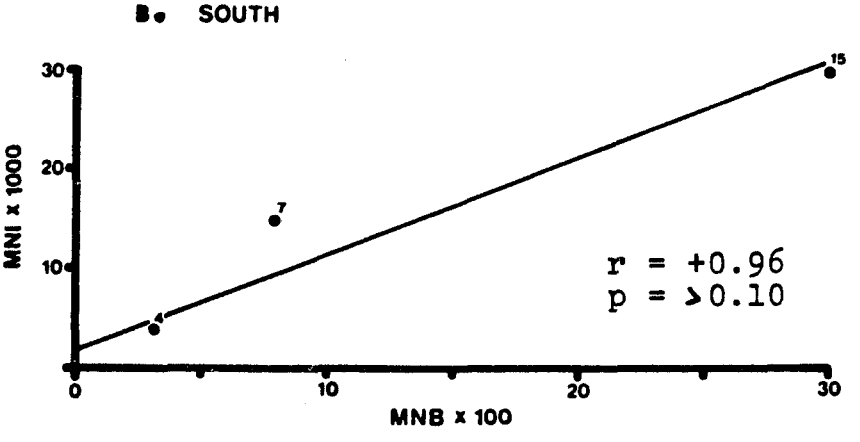
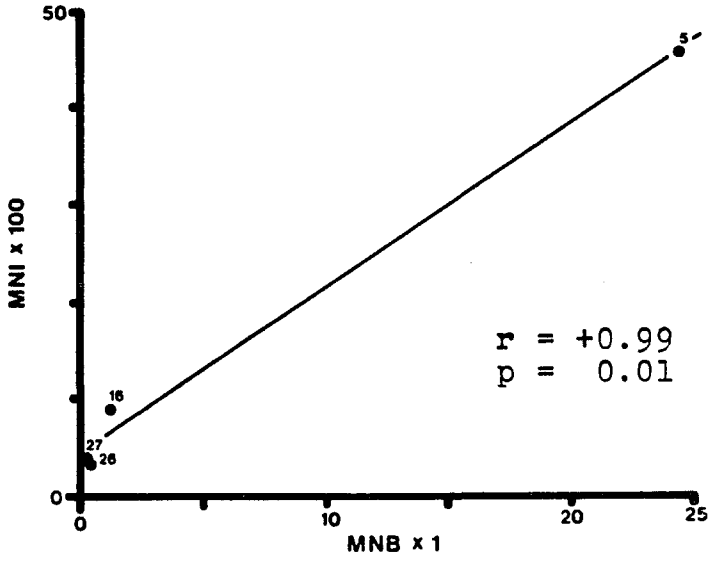


FIGURE V-16. REMAINS OF ARCTIC FOXES FOUND AT THE SITES





C. FOX NORTH HIGH DENSITY



D. FOX NORTH LOW DENSITY

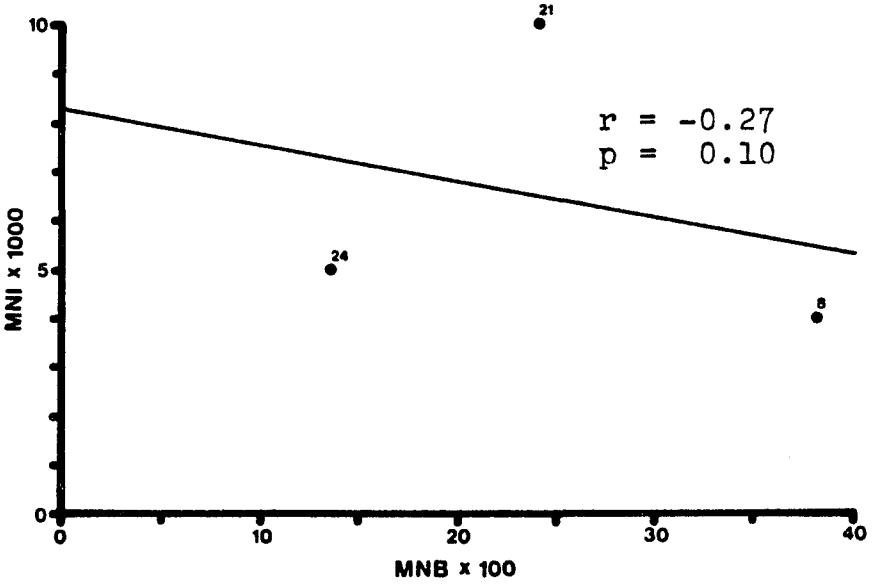


FIGURE V-17. REMAINS OF WOLVES FOUND AT THE SITES

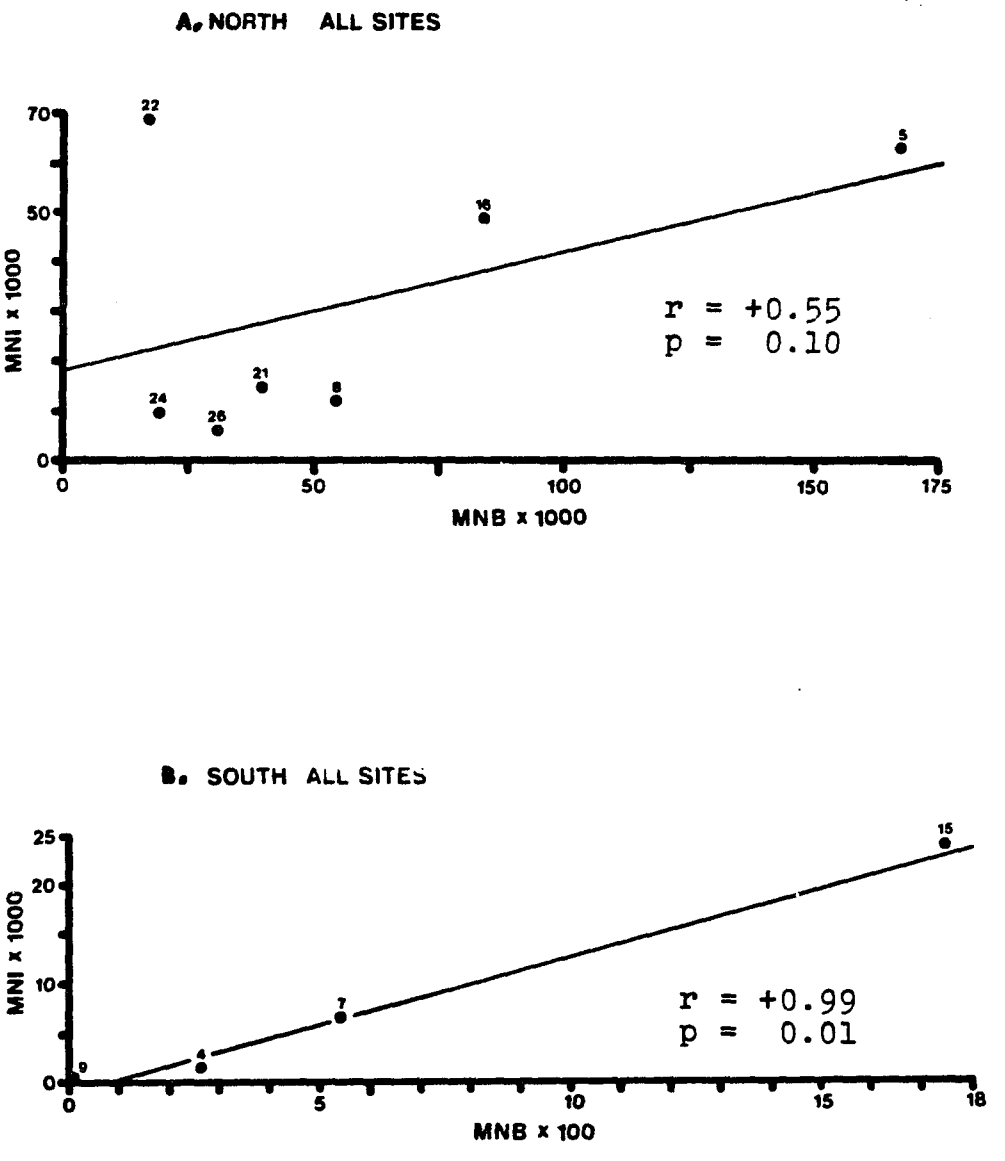


FIGURE V-18. REMAINS OF BEARS FOUND AT THE SITES

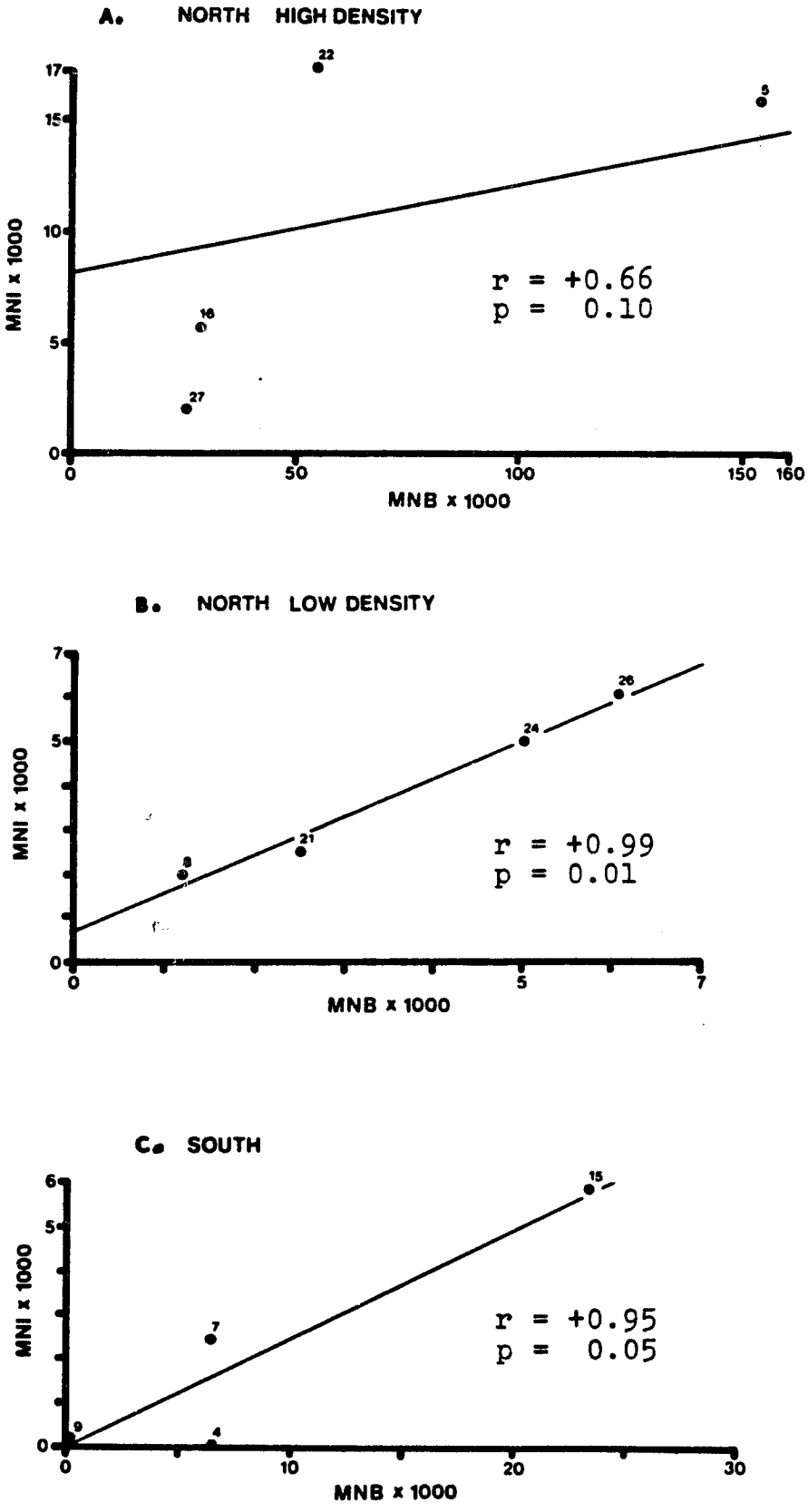
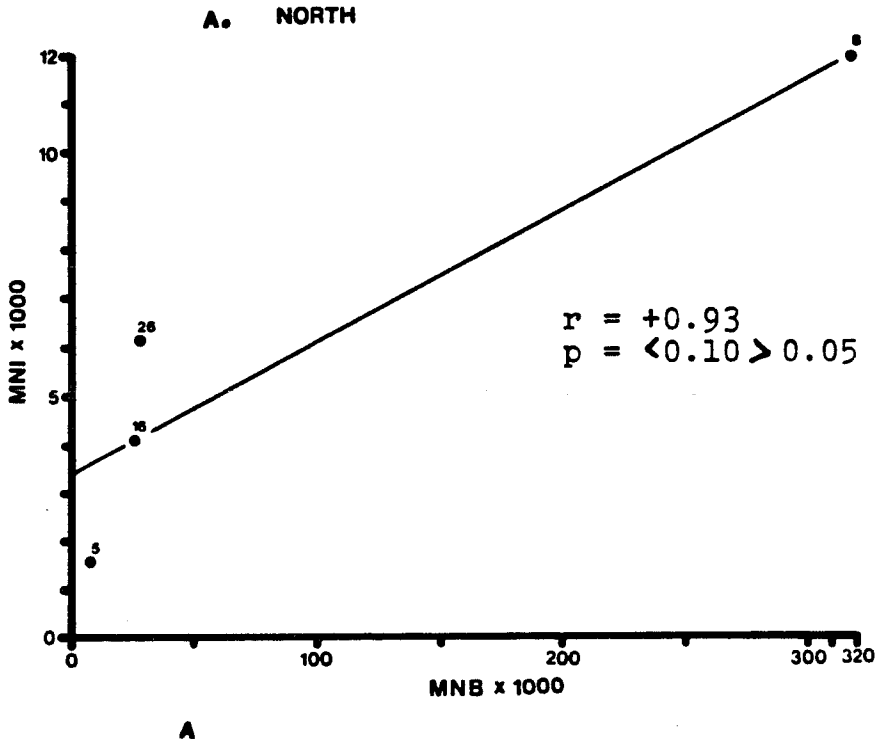


FIGURE V-19. REMAINES OF WOLVERINES FOUND AT THE SITES



A

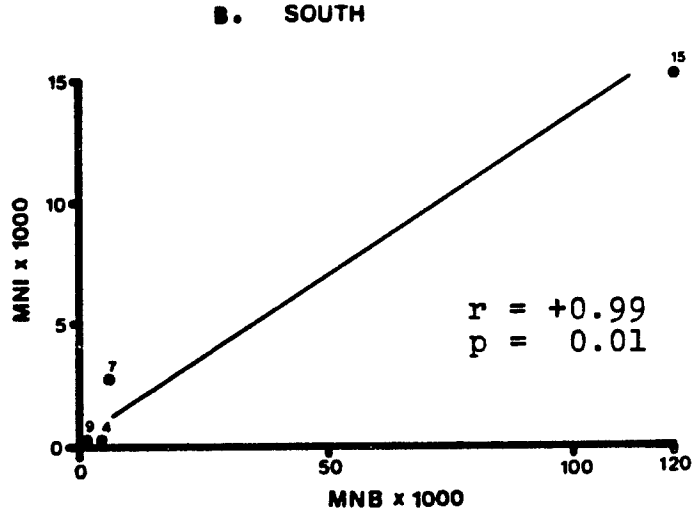


FIGURE V -20. REMAINS OF ALL OTHER FUR BEARING TAXA FOUND AT THE SITES

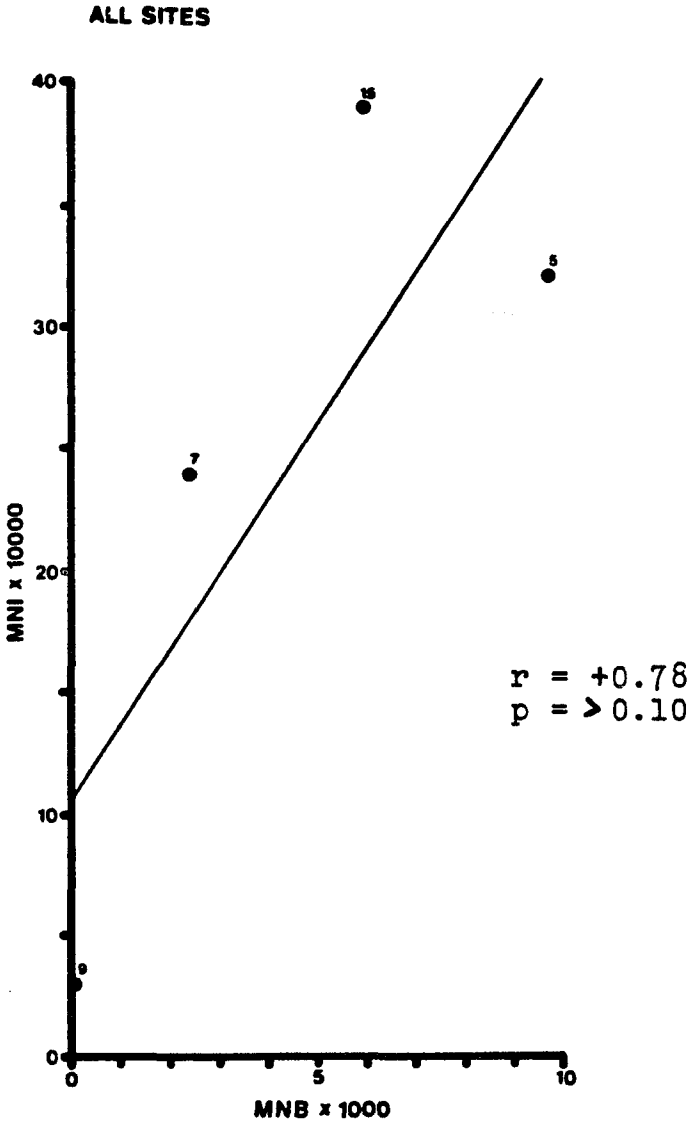


FIGURE V-21. RELATIONSHIP BETWEEN ARCTIC FOXES AND HARES FOUND AT THE SITES (caluclated on MNI densities)

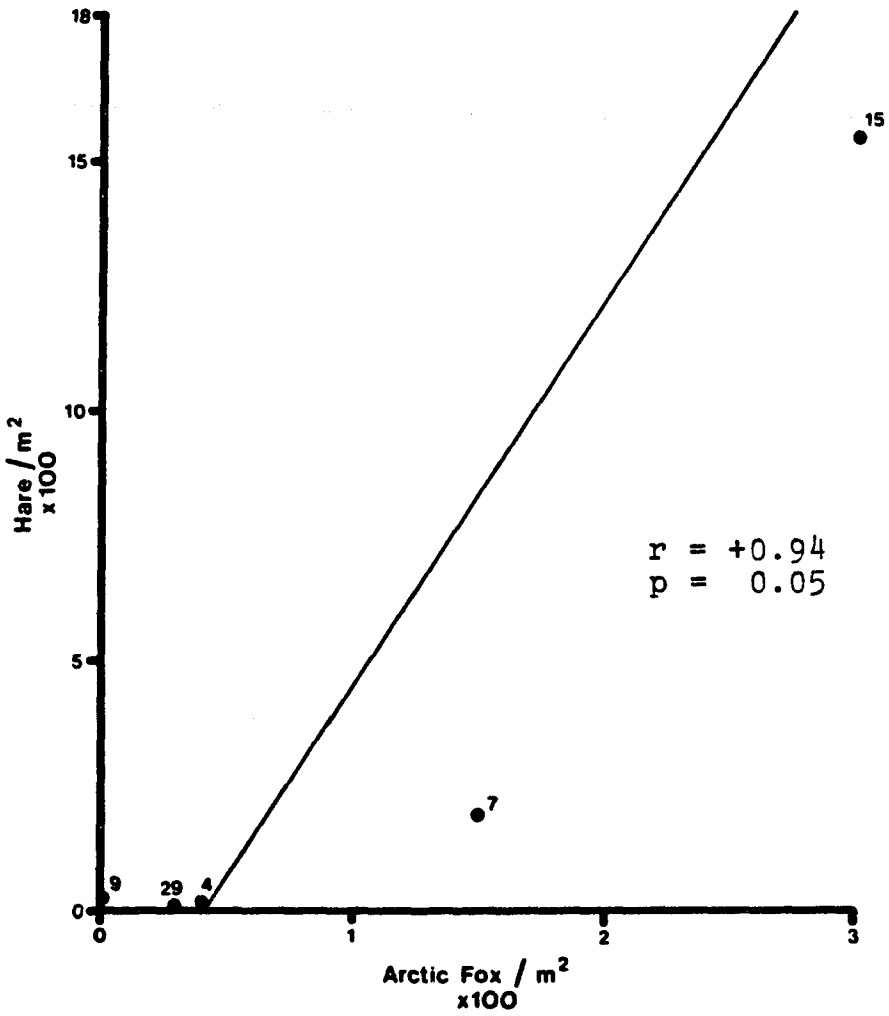
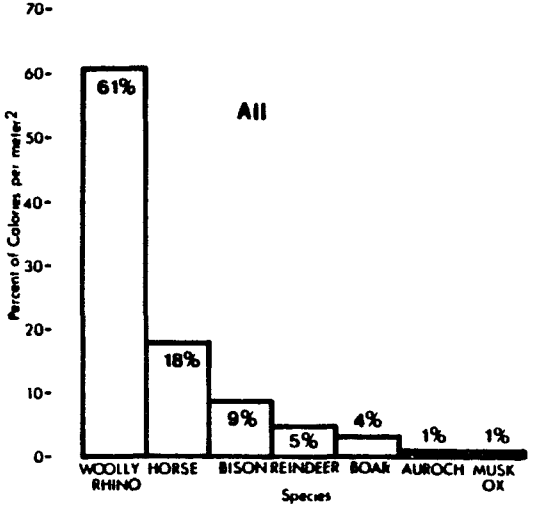
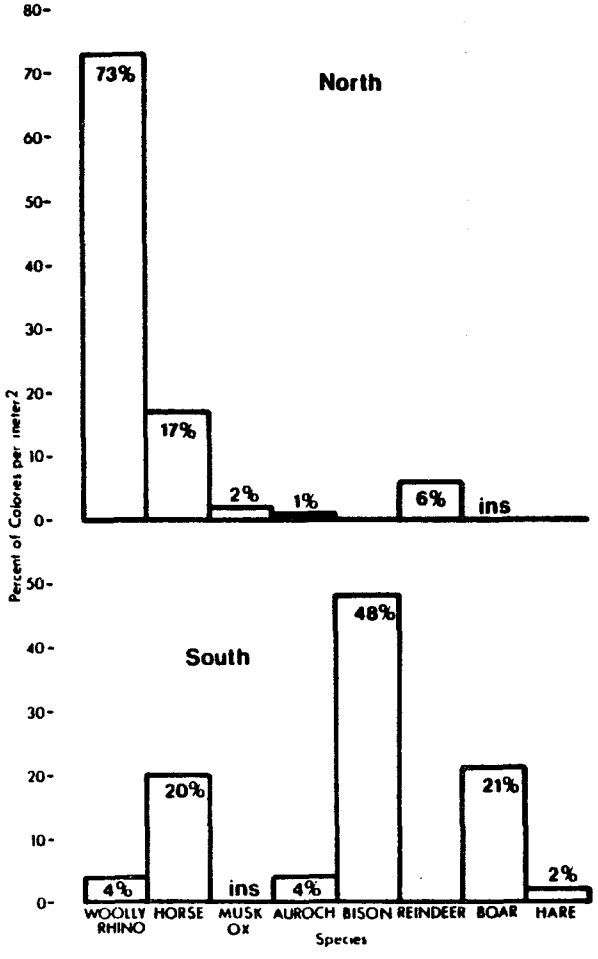


FIGURE V- 22. PERCENTILE CONTRIBUTION OF DIFFERENT TAXA TO KILOCALORIES AT THE SITES - MAMMOTHS EXCLUDED

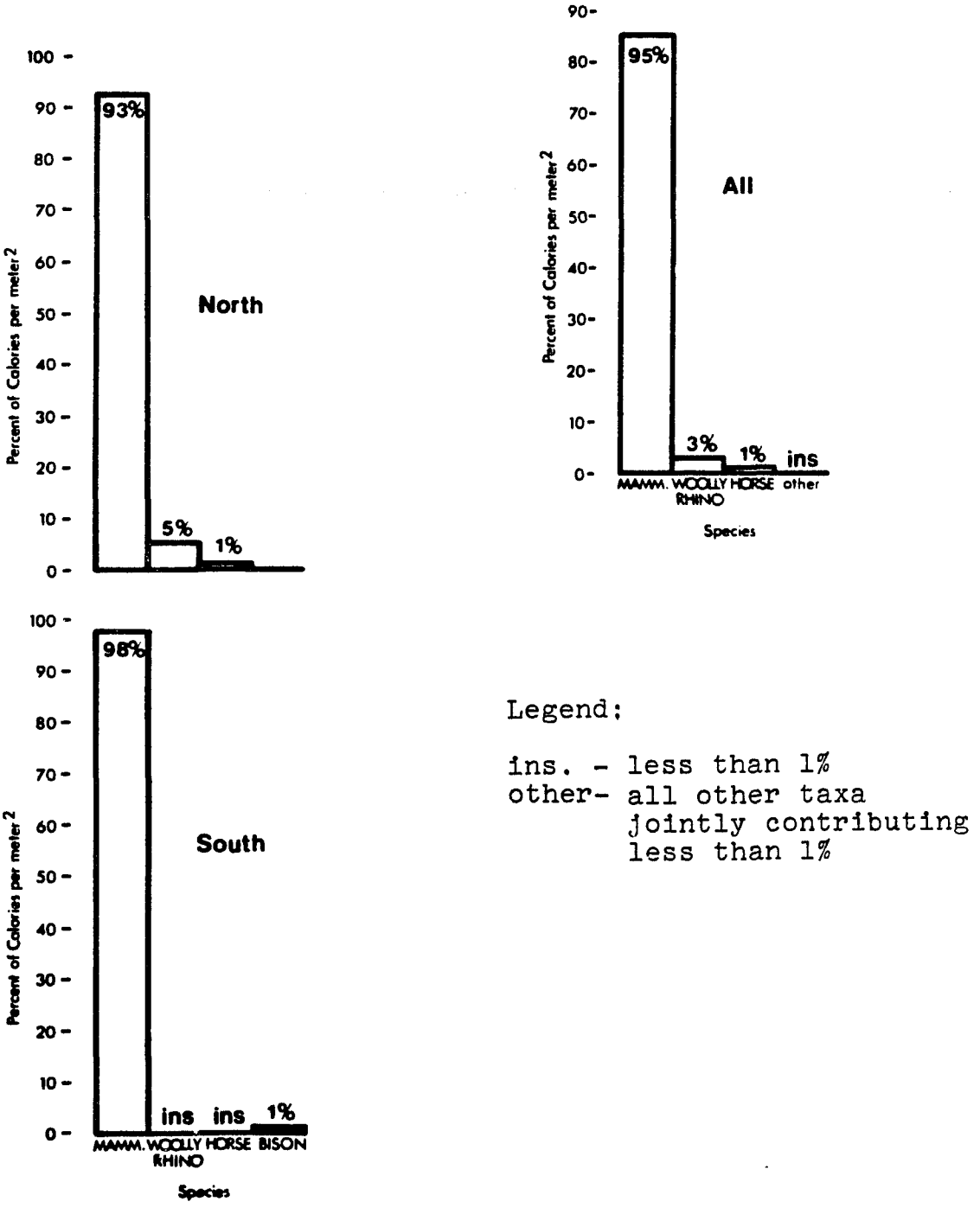




Legend:
ins. - less than 1%

Other taxa jointly contributing less than 1% excluded from all graphs

FIGURE V-23. PERCENTILE CONTRIBUTION OF DIFFERENT TAXA TO KILOCALORIES AT THE SITES - HALF OF THE MAMMOTHS INCLUDED



Legend:

ins. - less than 1%
other- all other taxa jointly contributing less than 1%

FIGURE V-24 REGIONAL DISTRIBUTION OF THE DIVERSITY INDICES AT THE SITES

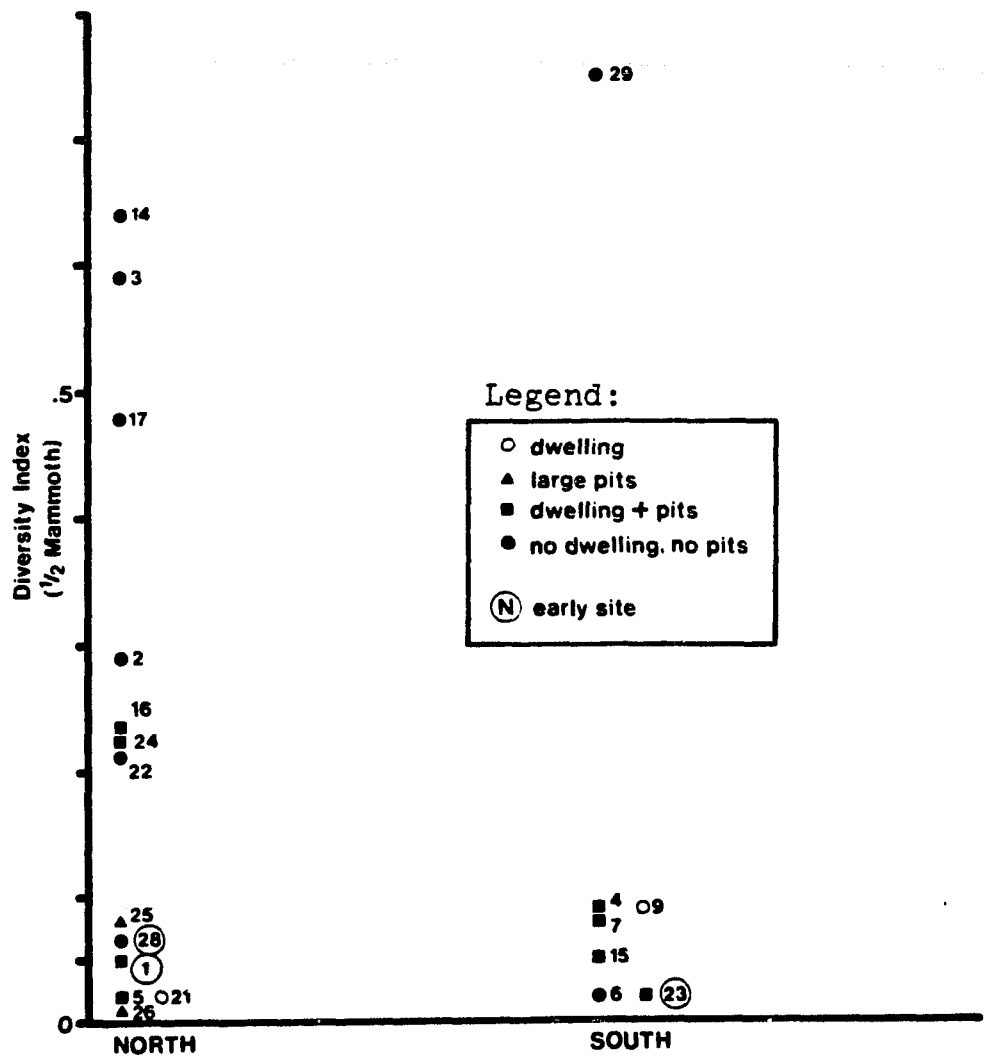
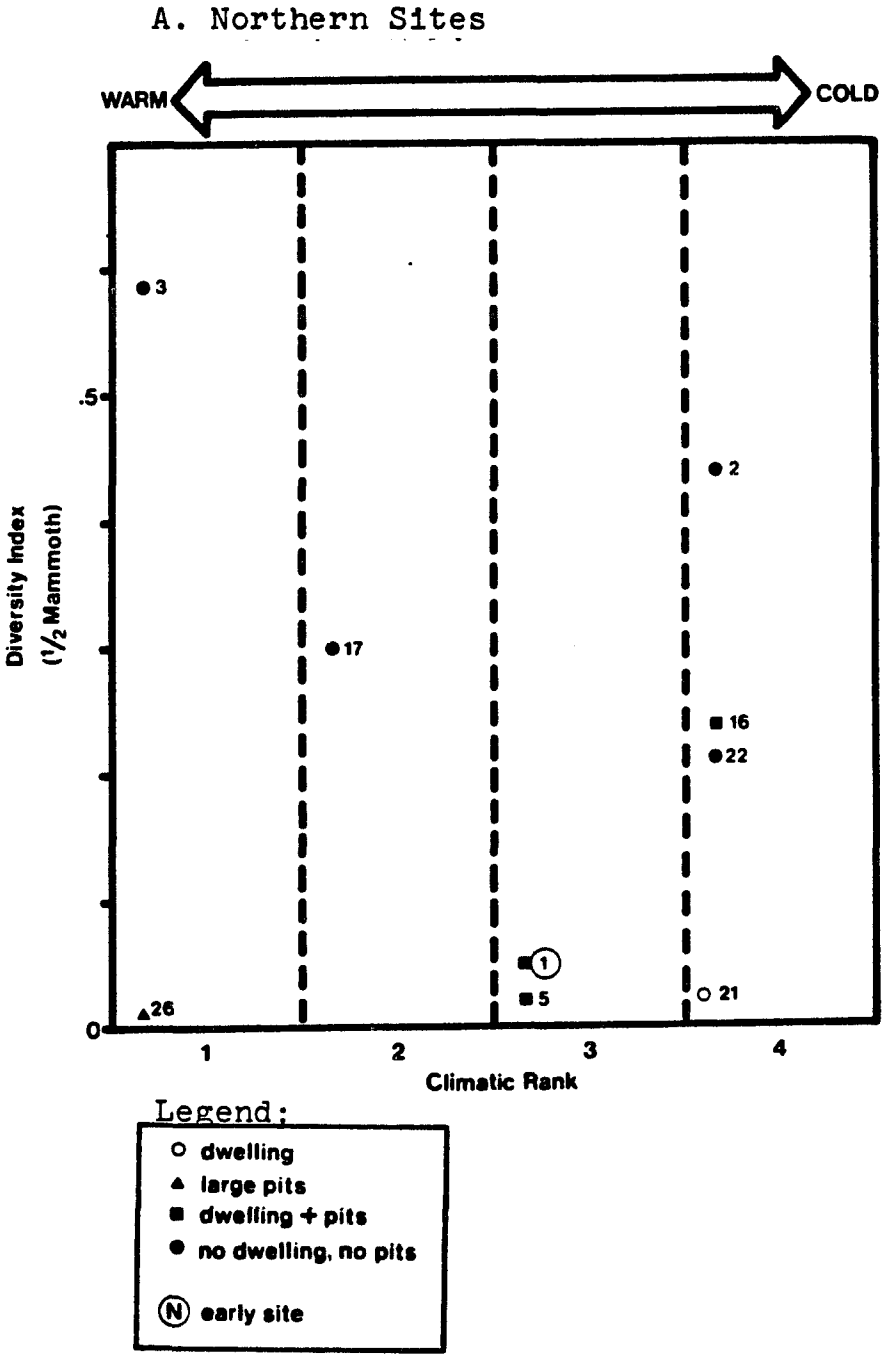
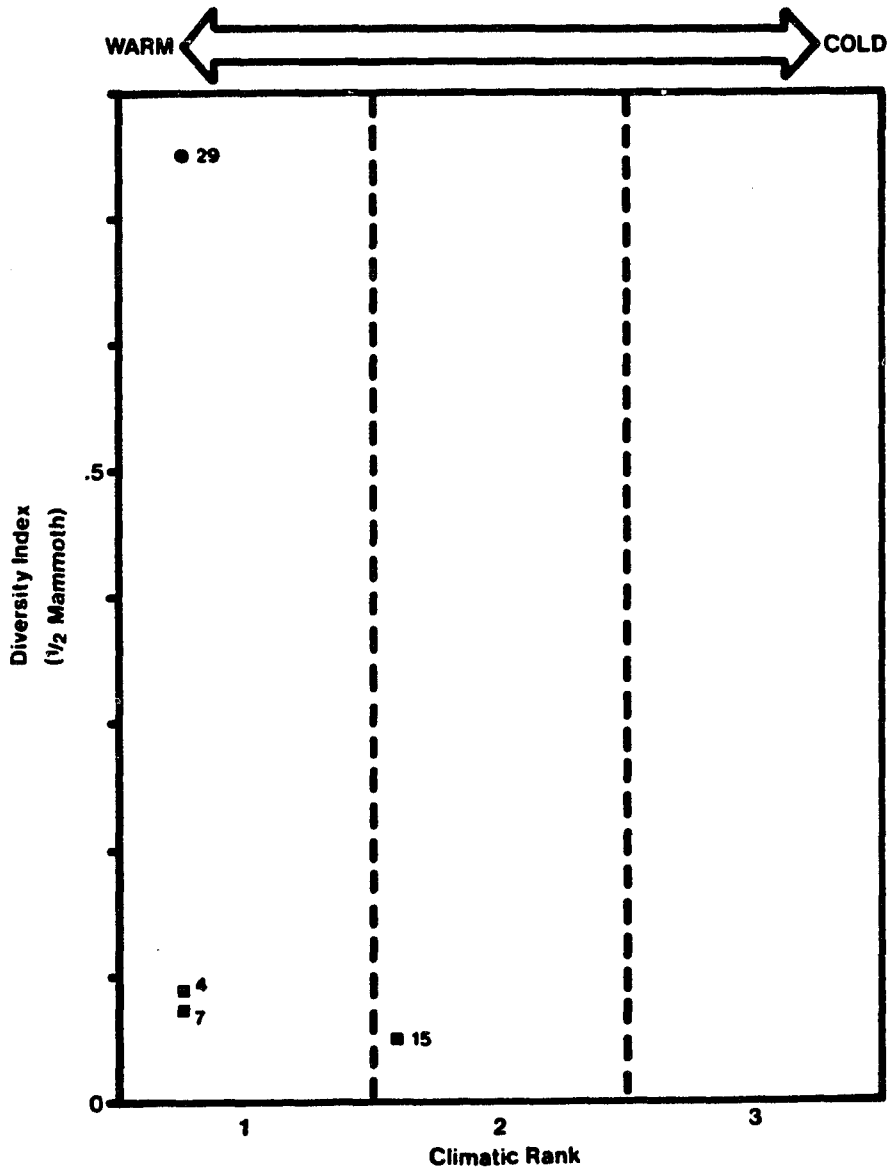


FIGURE V-25. DIVERSITY INDEX AND CLIMATIC RANKING OF THE SITES



B. Southern Sites



Legend:

- dwelling
- large pits
- dwelling + pits
- no dwelling, no pits
- (N) early site

FIGURE V-26. CO-OCCURRENCE OF MARMOTS AND ARCTIC FOXES AT THE SITES - MNI VALUES

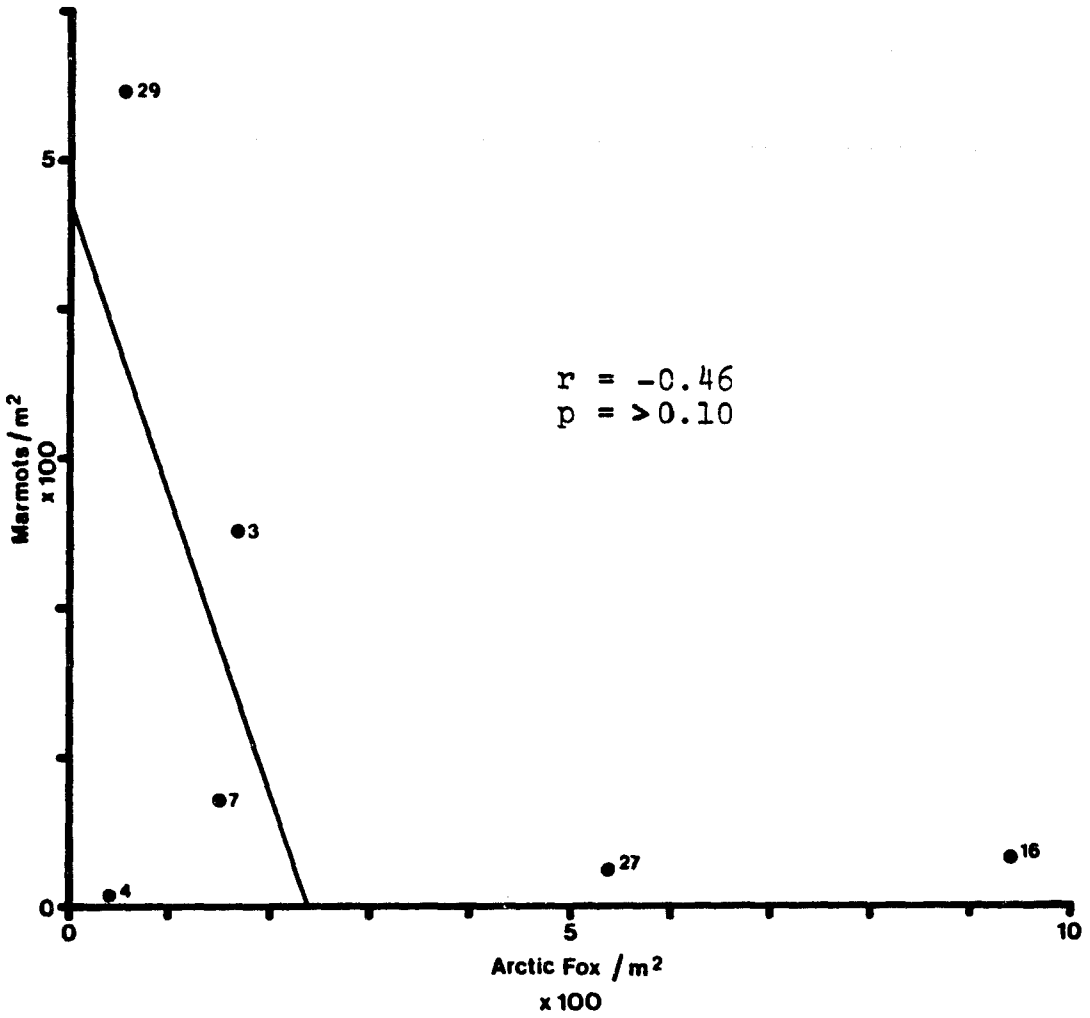


FIGURE V-27. CO-OCCURRENCE OF HARES AND PTARMIGANS AT THE SITES- MNI VALUES

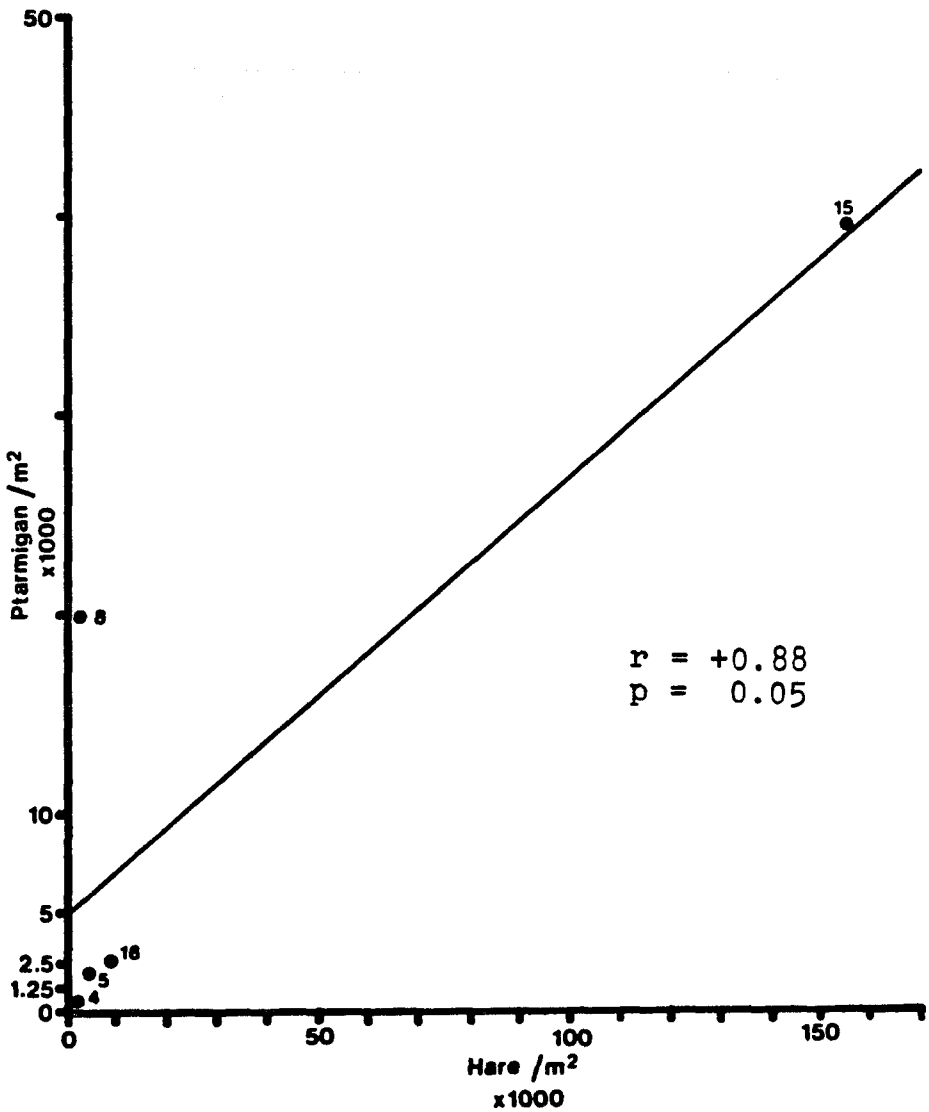
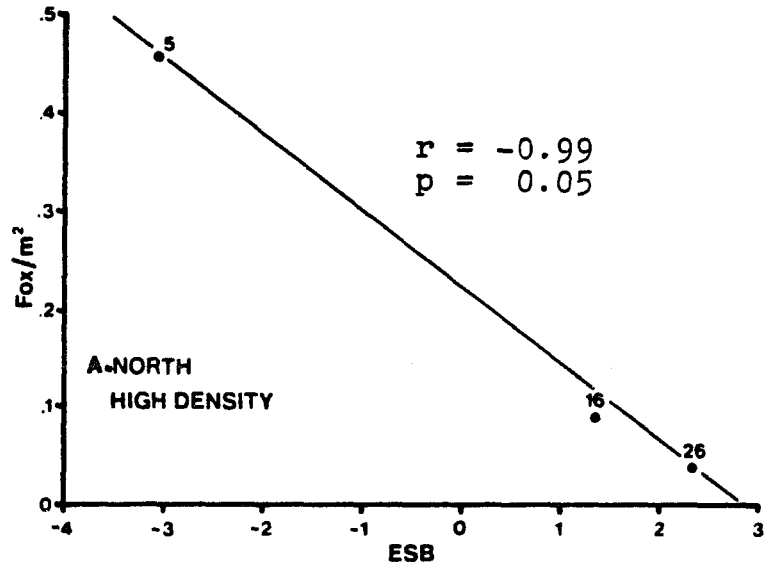
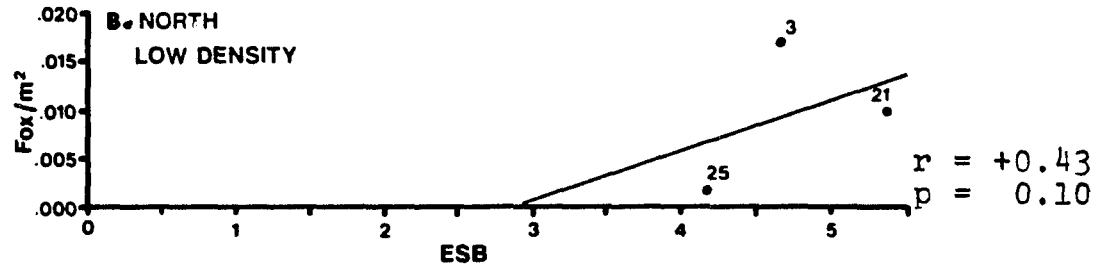


FIGURE V-28. CO-OCCURRENCE OF ARCTIC FOXES (MNI VALUES) WITH END SCRAPERS AND BURINS (RESIDUALIZED VALUES) AT THE SITES





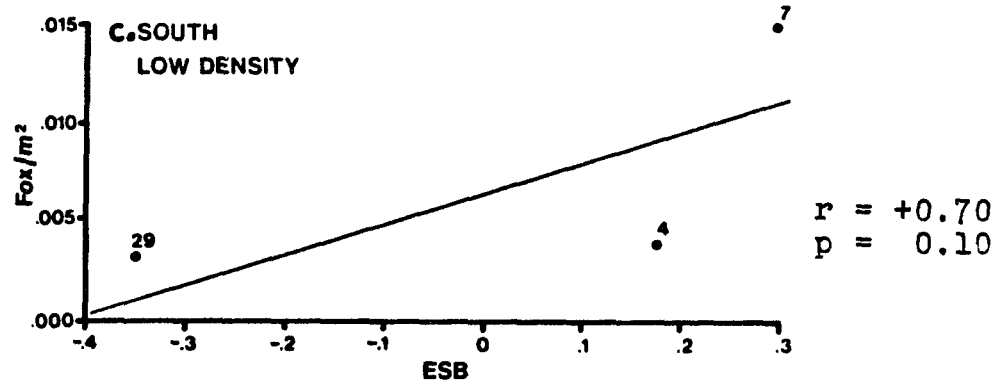


FIGURE VI-1. DISTRIBUTION OF CONJOINABLES AT CHULATOVO II
(after Leonova 1977:Table 3)

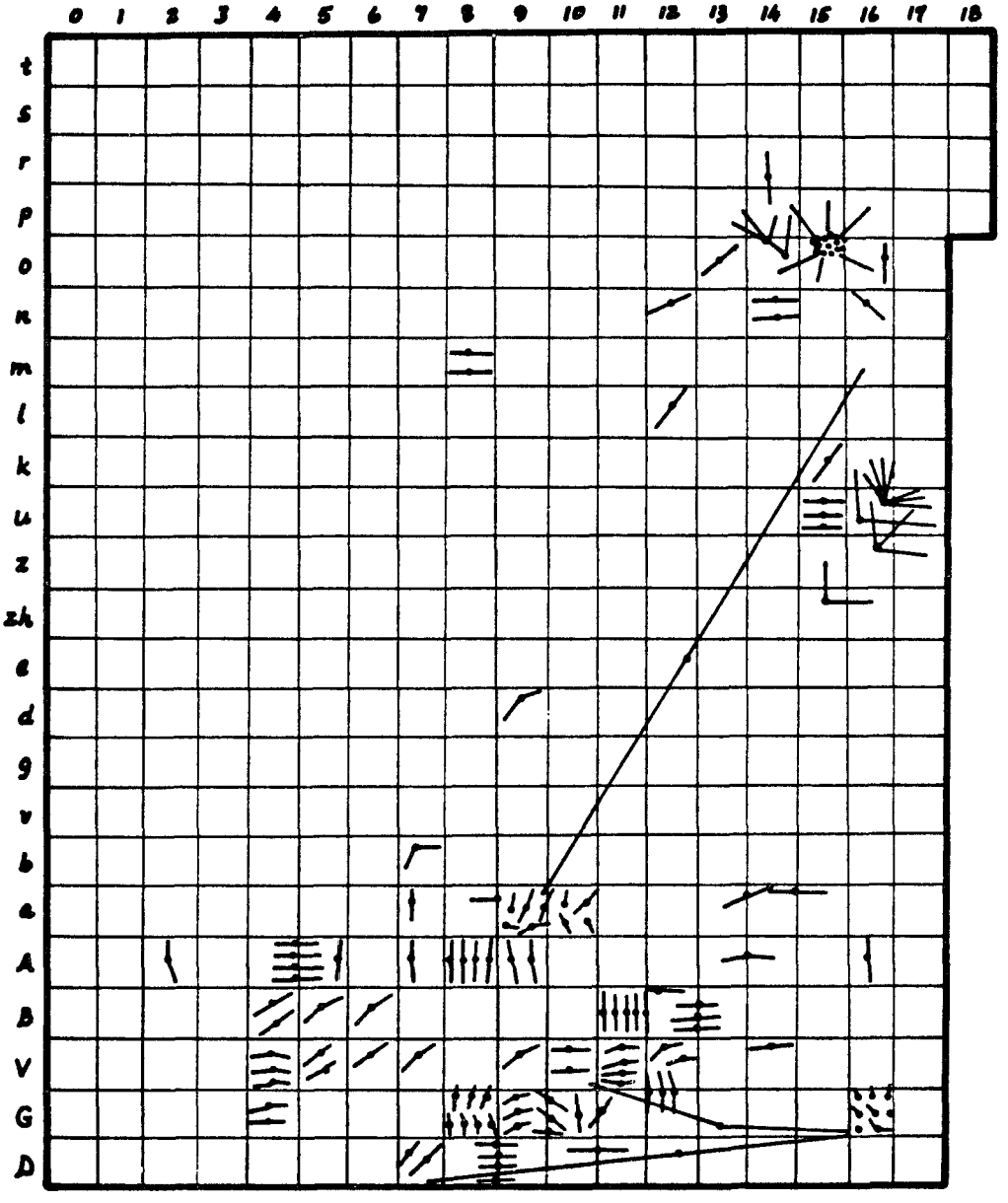


FIGURE VI-2. THICKNESS OF THE CULTURAL LAYER AT THE SITES

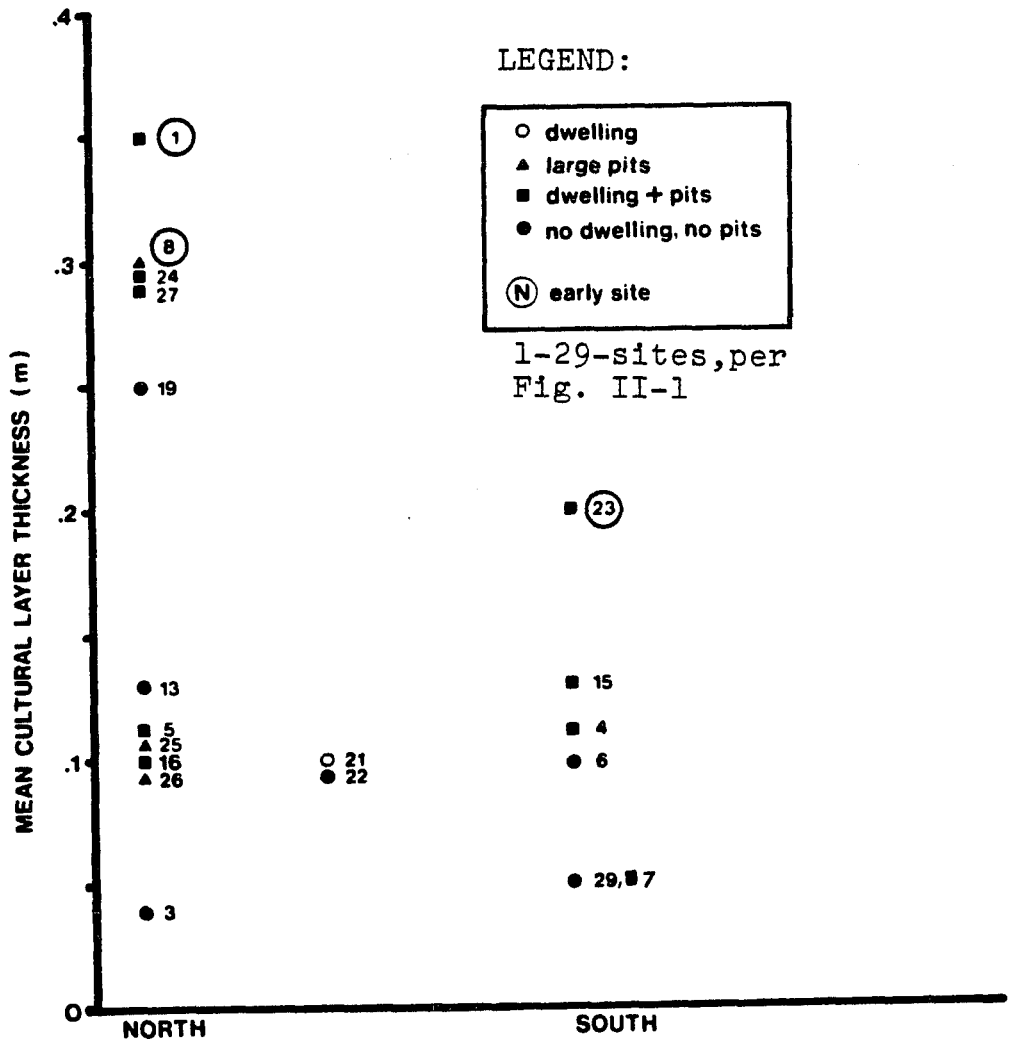
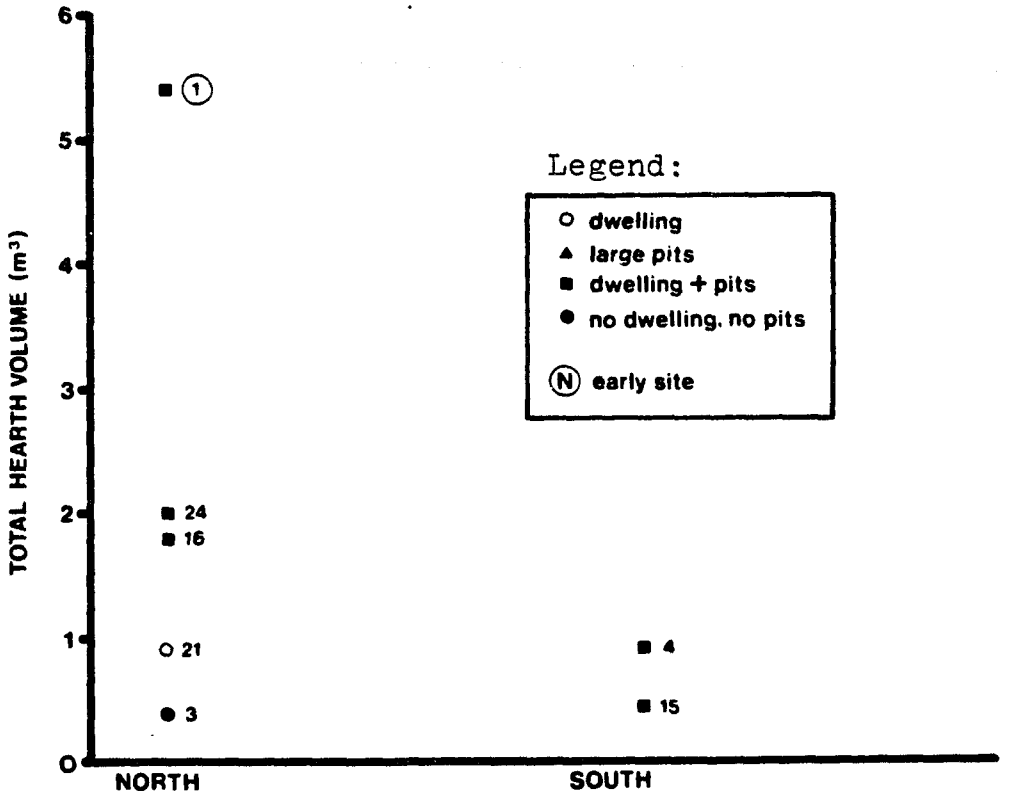
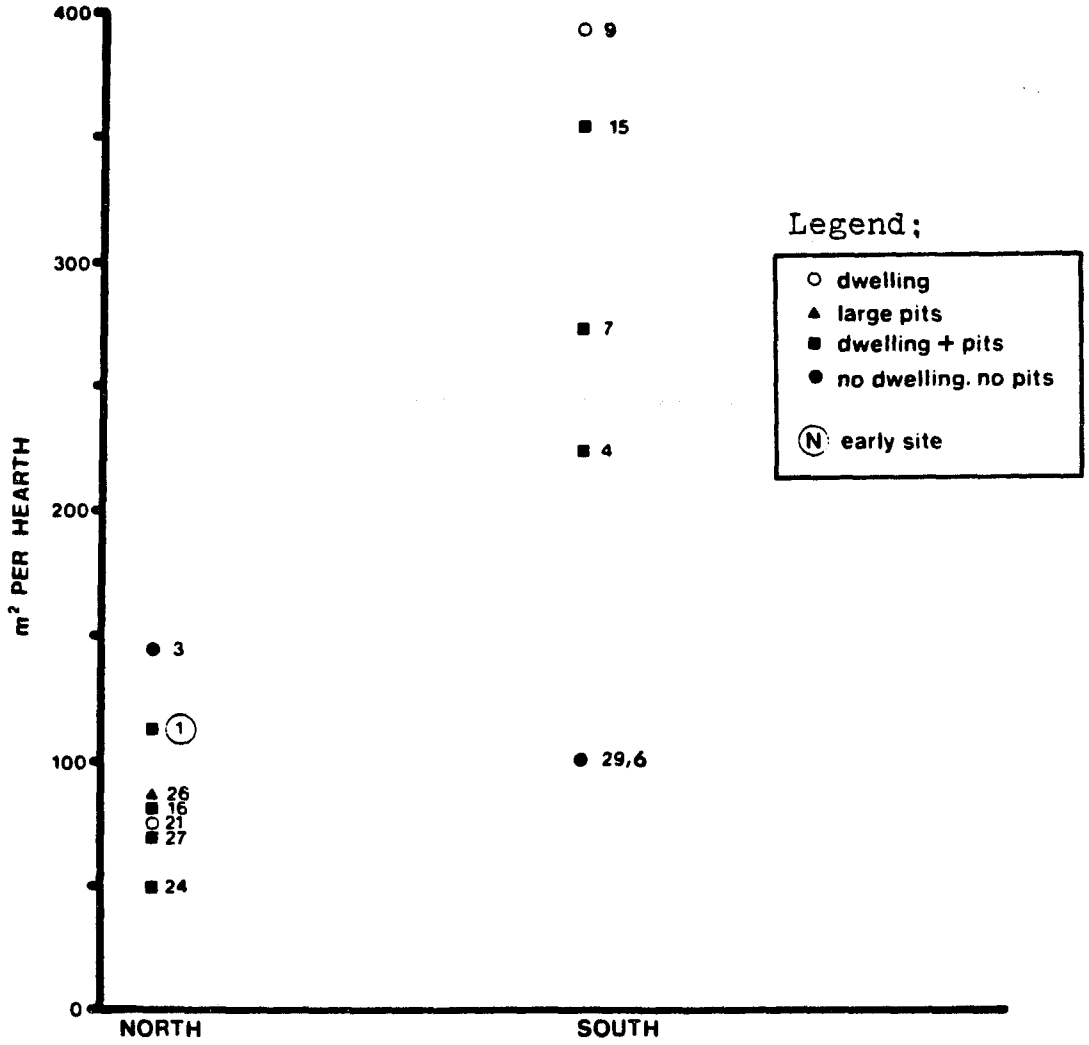


FIGURE VI-3. VOLUME OF HEARTHS AT THE SITES



1-29 - the sites,per Fig.II-1

FIGURE VI-4. DENSITY OF HEARTHS AT THE SITES



1-29 - sites,per Fig.II-1

FIGURE VI-5 LOCATION OF COMPLEX BASE CAMPS

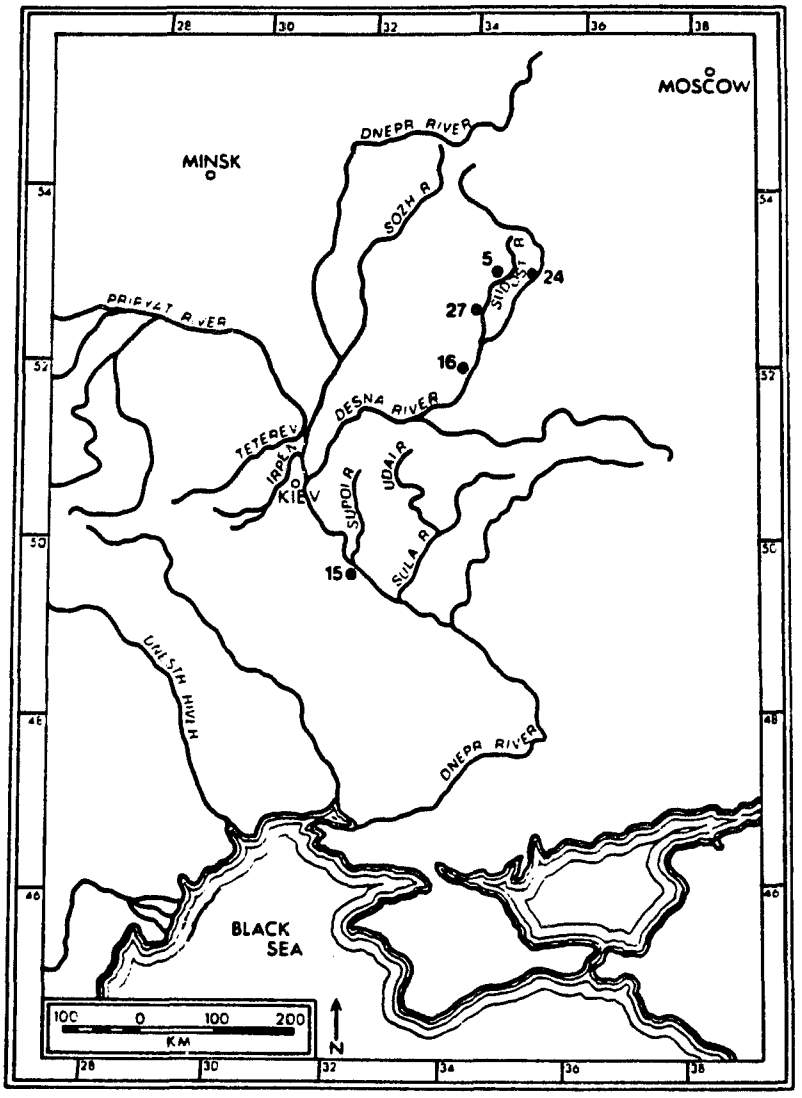
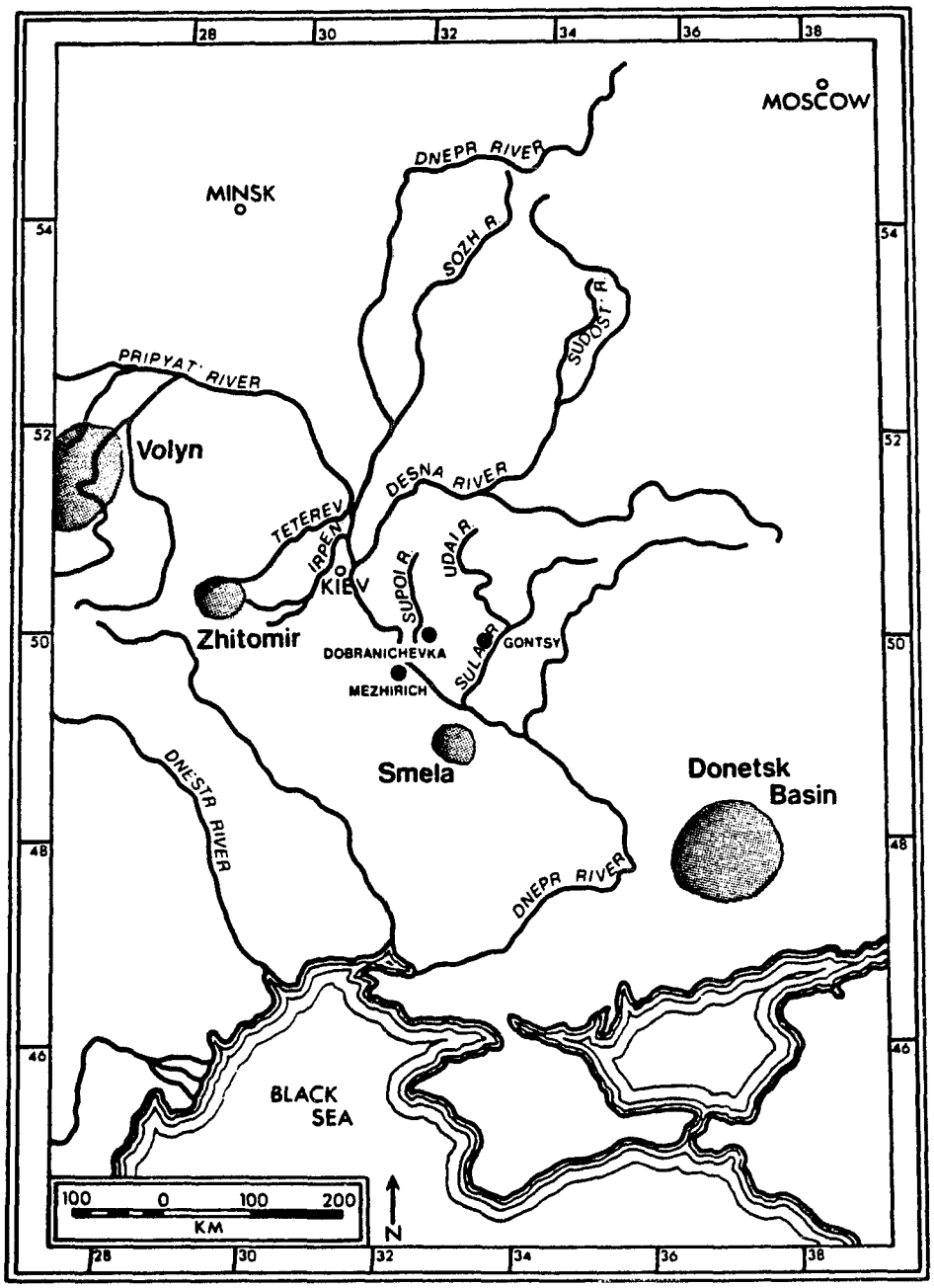


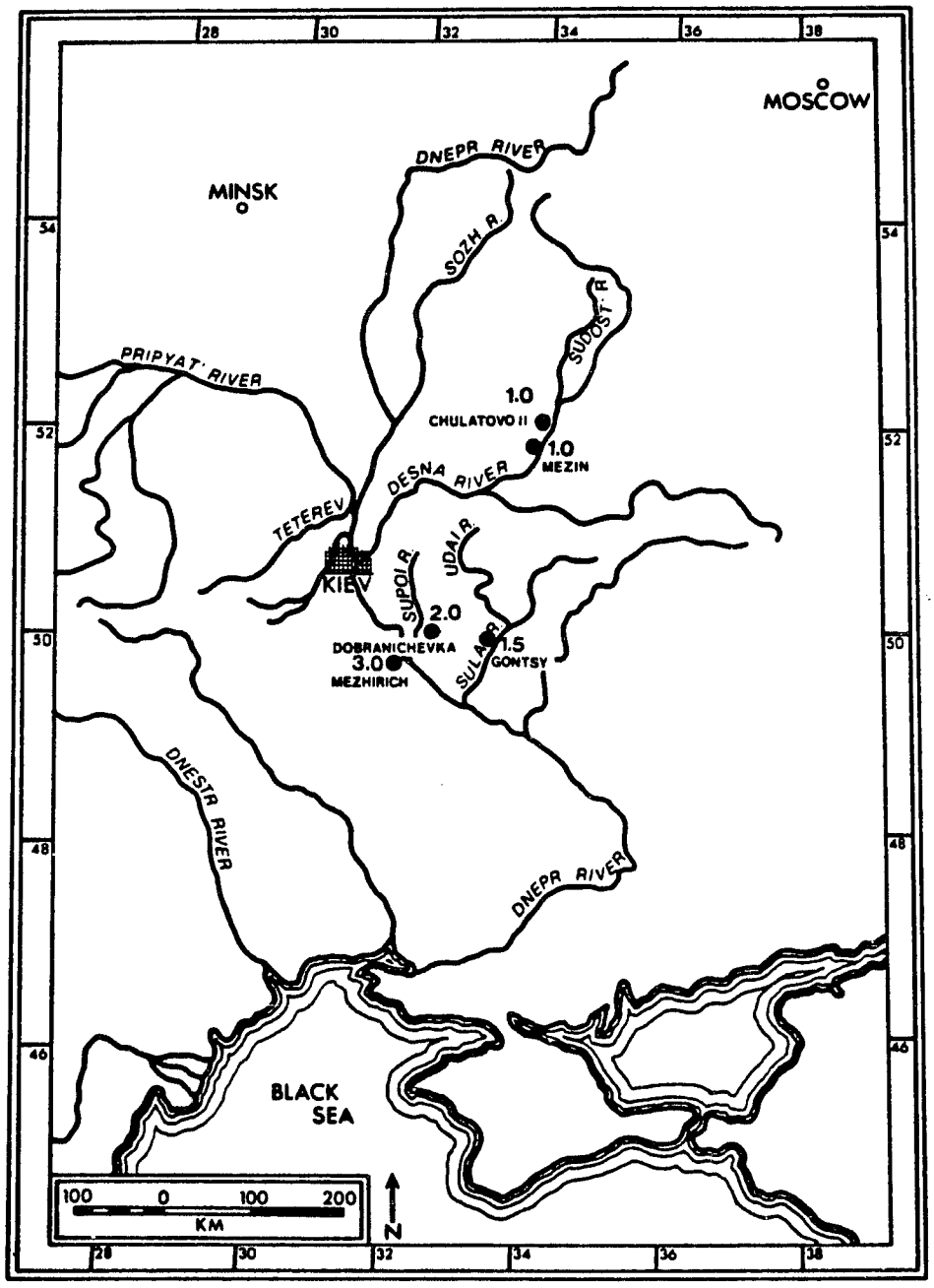
FIGURE VII-1. SOURCE AREA AND DISTRIBUTION OF MOUNTAIN CRYSTAL



- source area

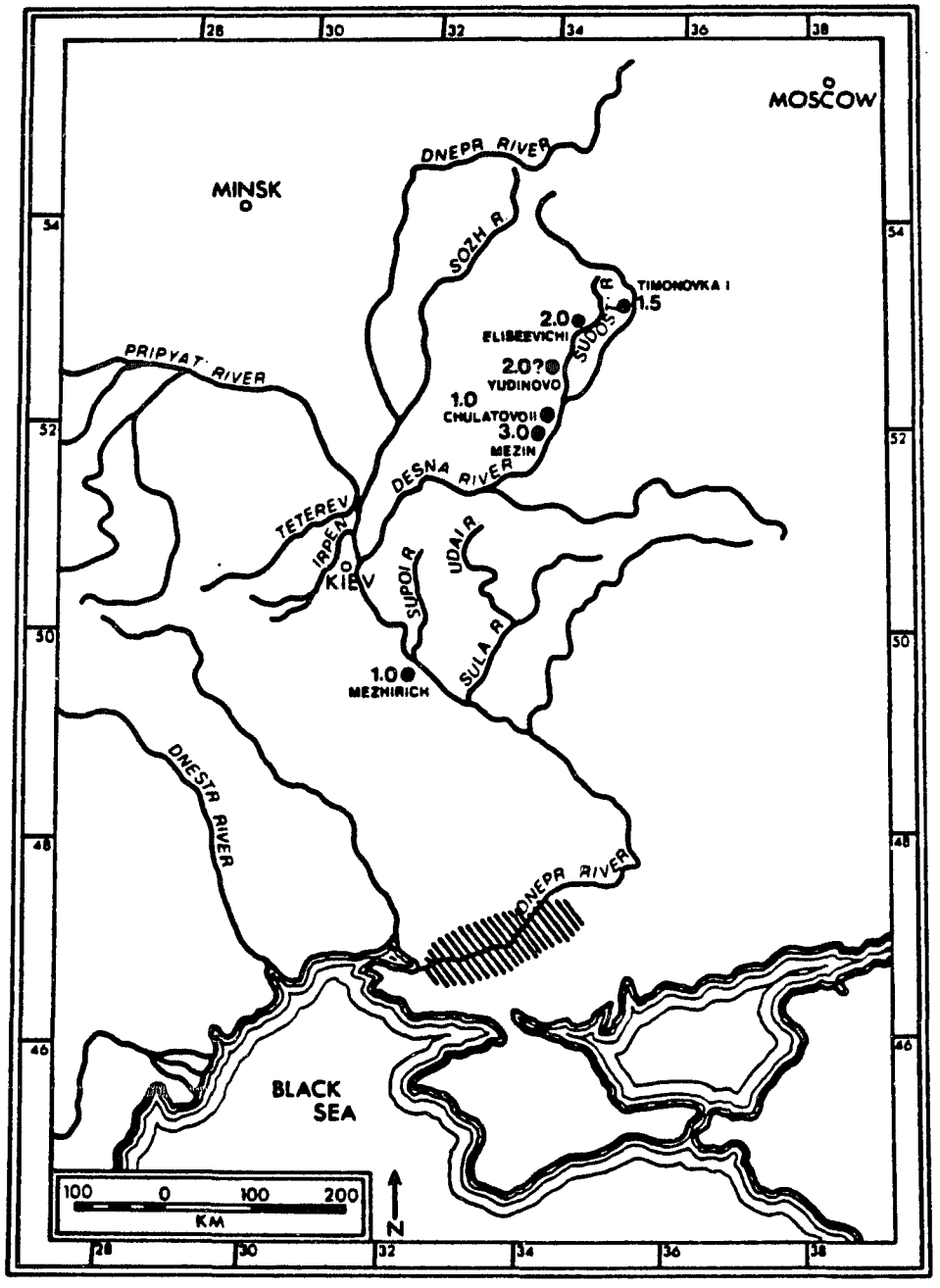
●- sites where found

FIGURE VII-2. SOURCE AREA AND DISTRIBUTION OF AMBER



▨ - source area

FIGURE VII-3. SOURCE AREA AND DISTRIBUTION OF FOSSIL MARINE SHELLS



▨ - source area

● - sites where found

FIGURE VII-4. FALL-OFF OF AMBER VOLUME AT THE SITES

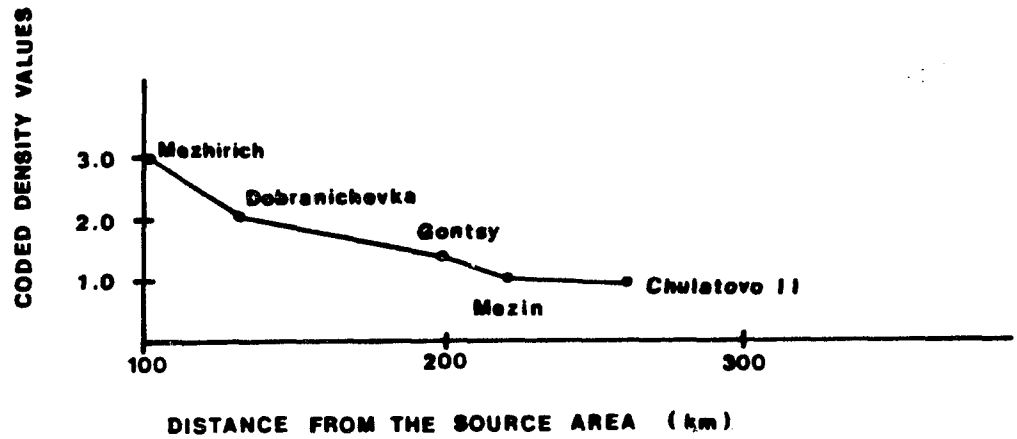


FIGURE VII-5. FALL-OFF OF SHELL VOLUME AT THE SITES

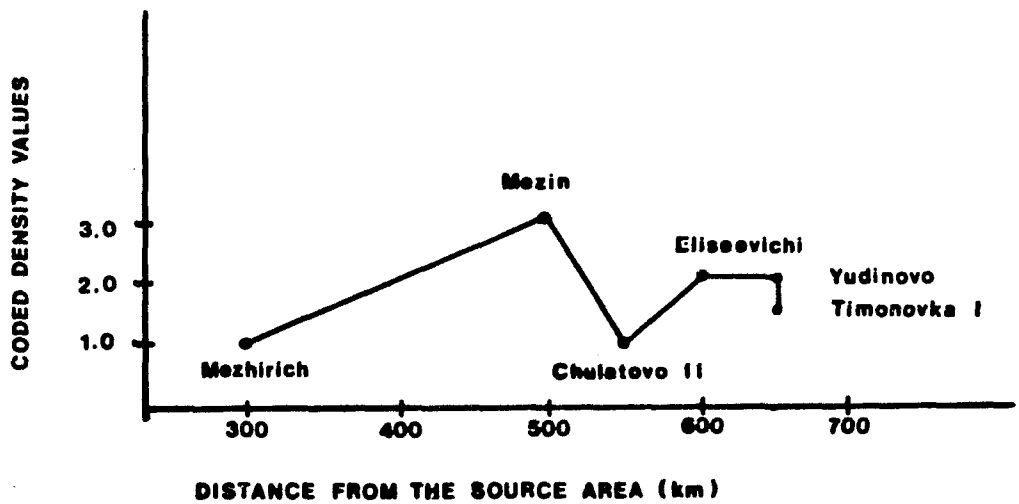
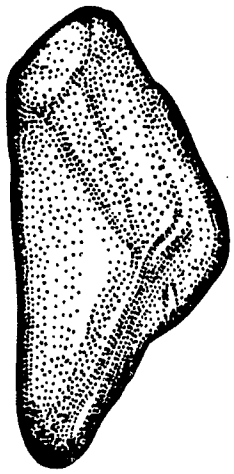


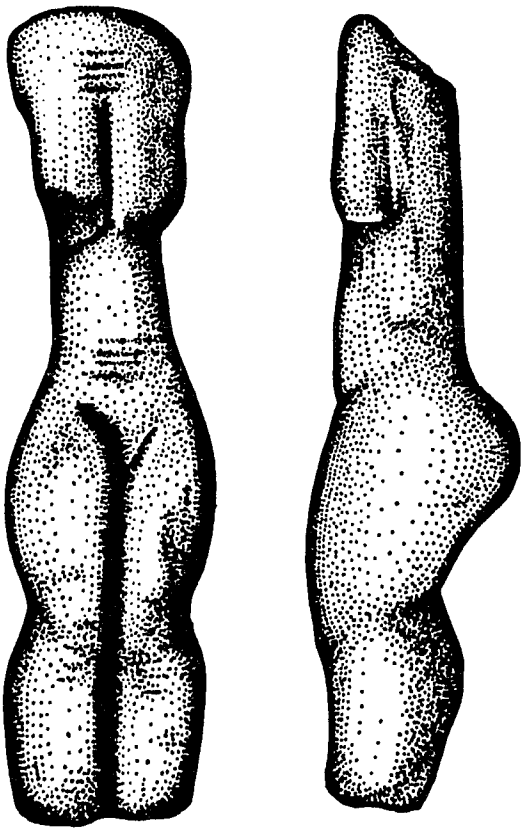
FIGURE VI-6. FIGURATIVE ART FROM THE SITES

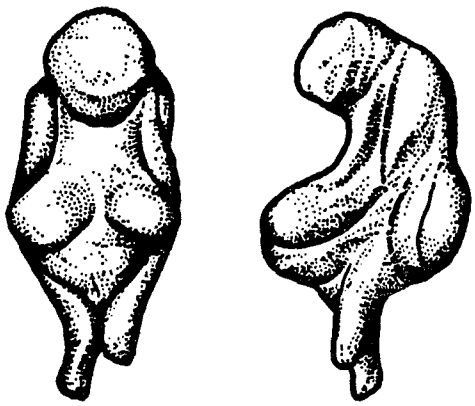
A. Dobranichevka

Sandstone "female figurine" (after Shovkoplyas 1972: Fig. 2)



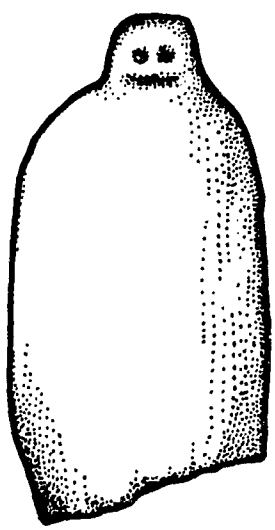
B. Eliseevichi

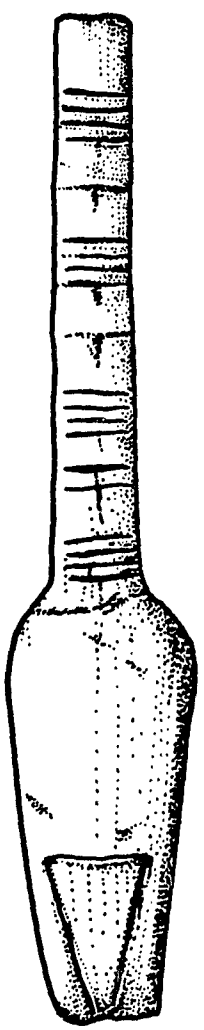




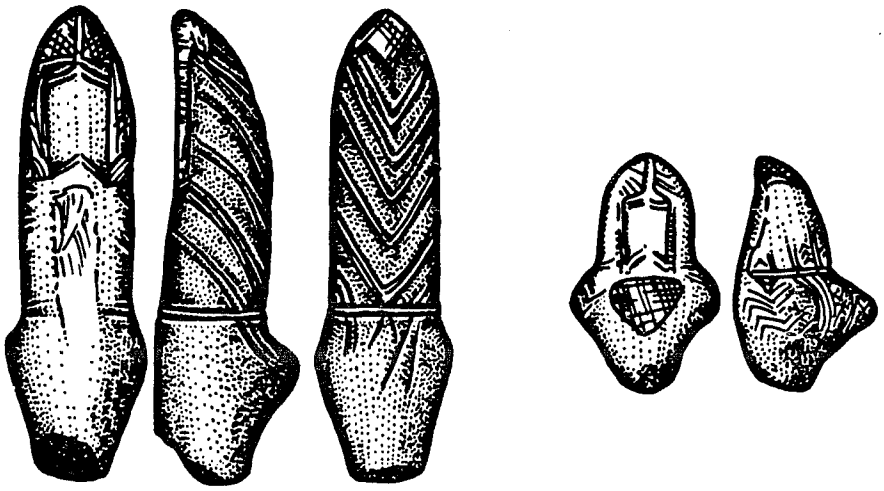
C. Khotylevo II
(after Zavernyaev 1978: Fig. 3)

D. Mezhirich



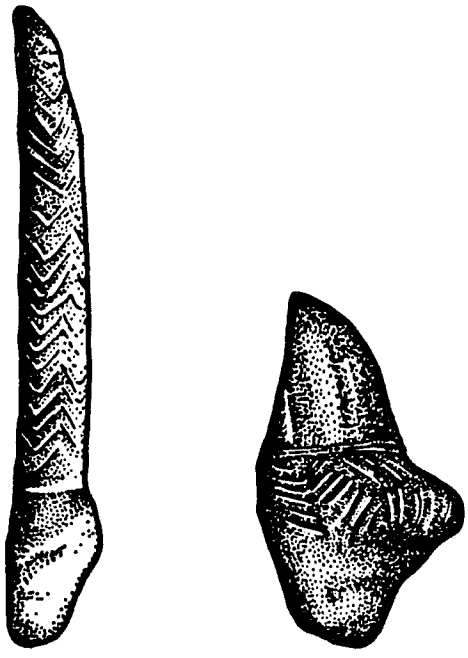


E. Mezin



(after Filippov 1983: Fig.2)

"phallic figurines" "birds"



(after Shovkoplyas 1965a: Figs. 58,59)

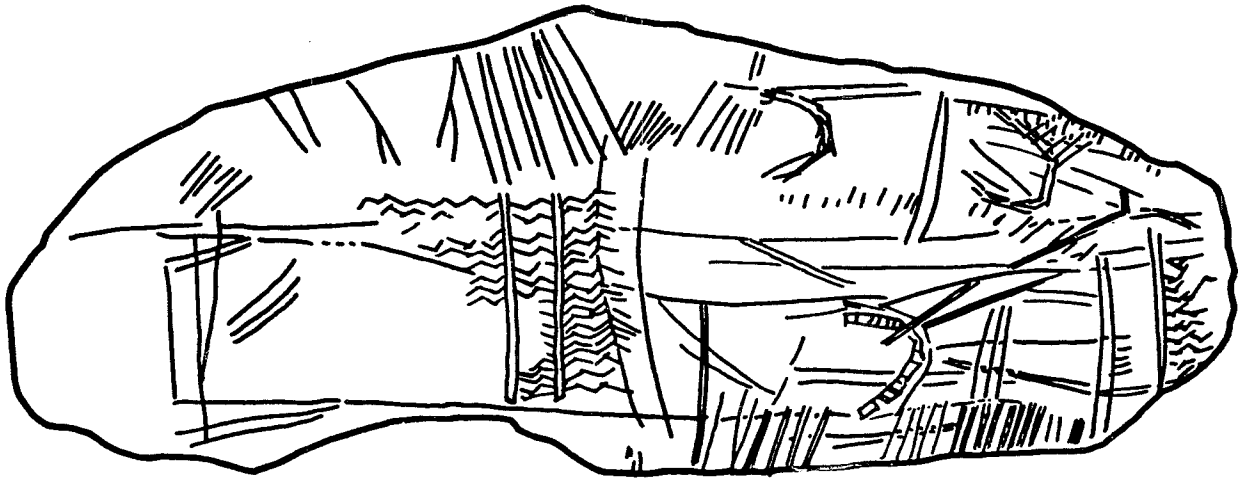
FIGURE VII-7. MAMMOTH IVORY PLAQUES

A. FROM MEZHIRICH



(about 4/5 natural size)

B. FROM ELISEEVICHI - Plaque # 8



(natural size)

FIGURE VII-8. DISTRIBUTION OF BONE HEAPS AND STORAGE PITS AT MEZIN

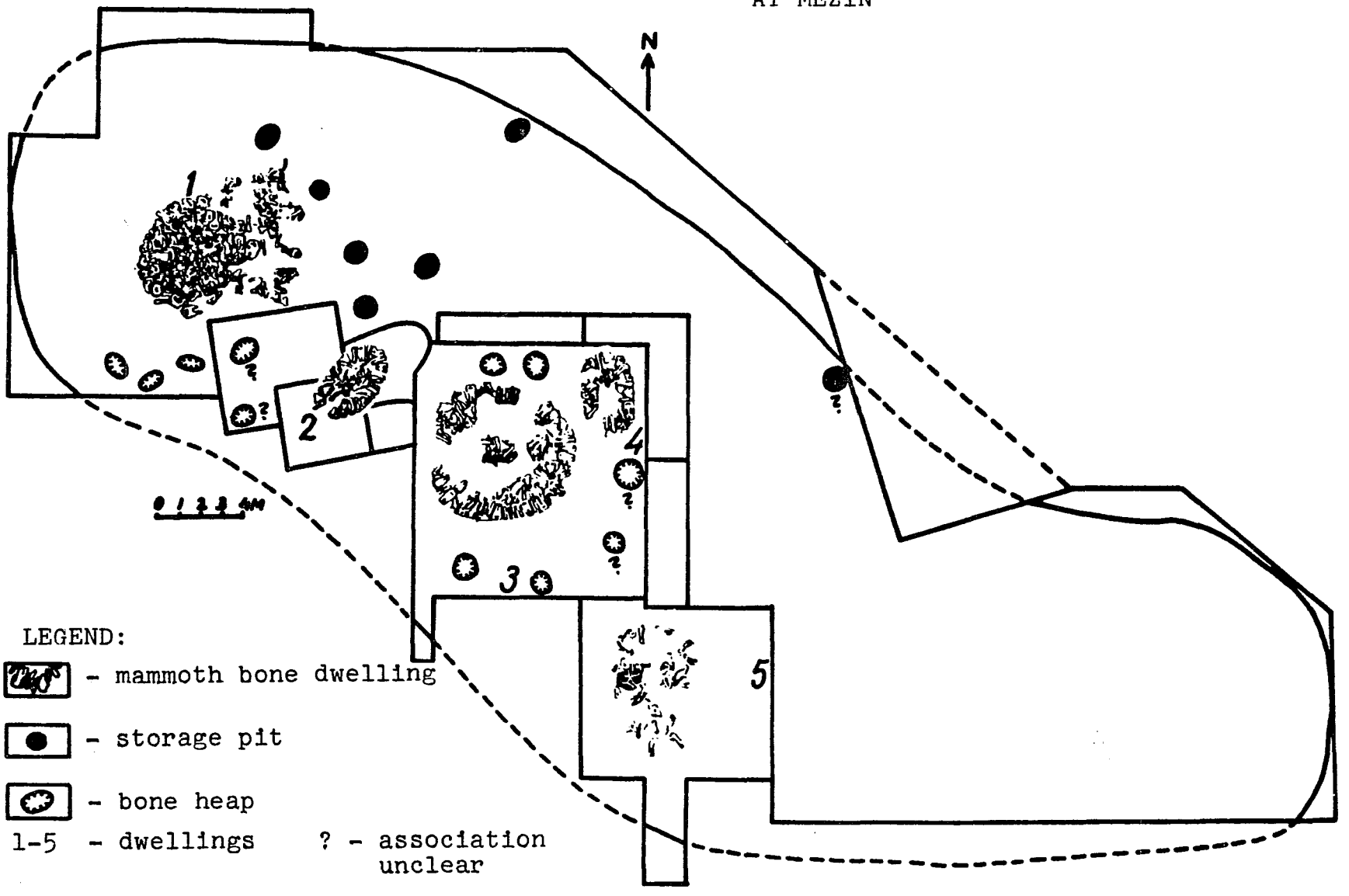
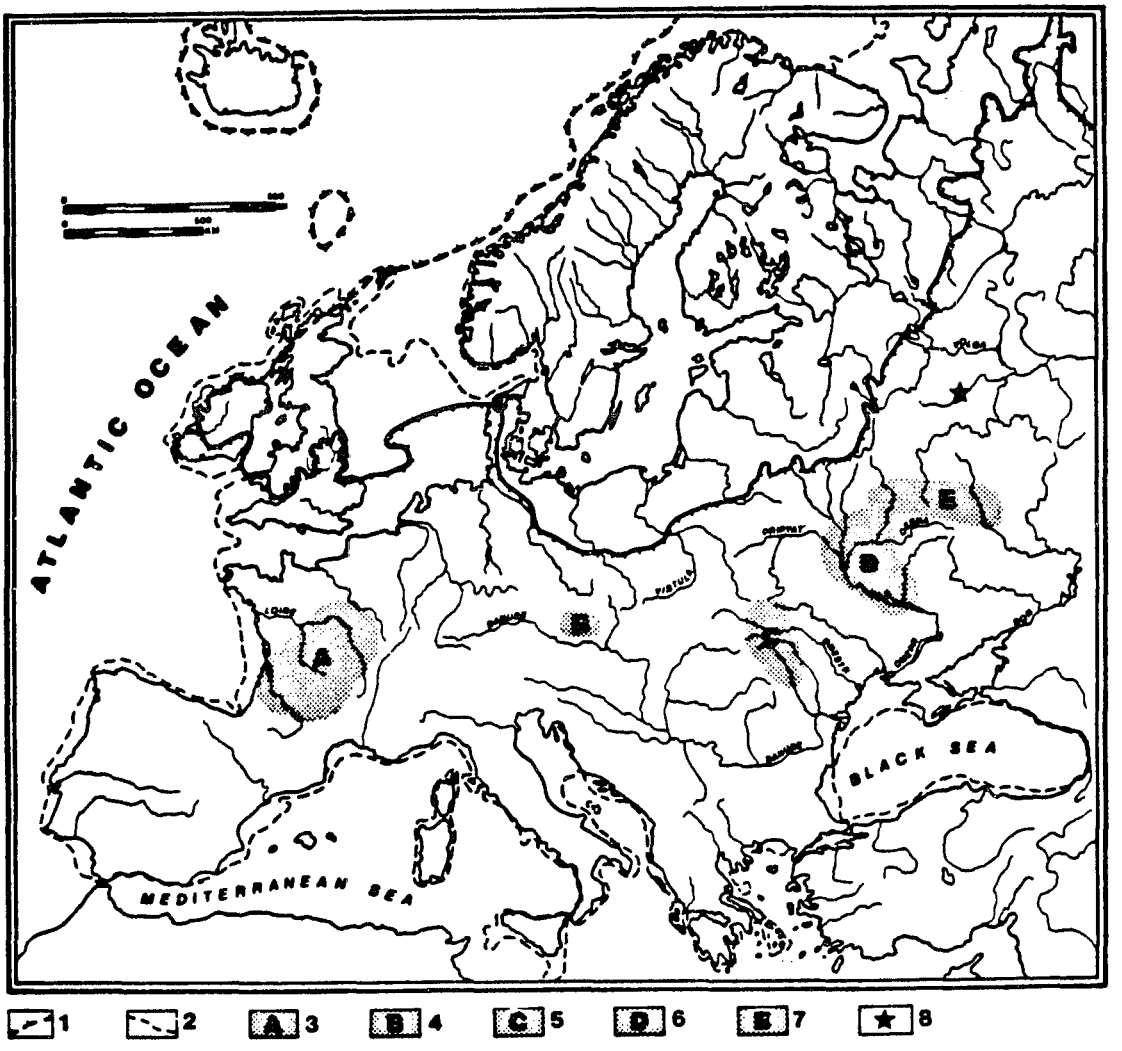


FIGURE VIII-1 UPPER PALEOLITHIC EUROPE
(after Praslov 1982:113)



Legend:
1 - Extent of Scandinavian ice seet at glacial maximum
2 - Europe after the retreat of glaciers
3 - sites in Southwestern France
4 - Pavlovian sites in Czechoslovakia
5 - sites of the Molodova culture
6 - sites on the Central Russian Plain
7 - sites of the Kostenki - Avdeevo culture
8 - Sungir

TABLES

TABLE II-1

HEIGHTS OF THE RIVER TERRACES ALONG THE DNEPR AND ITS TRIBUTARIES

RIVER	TERRACES			REFERENCES
	FIRST	SECOND	THIRD	
Dnepr	6- 8 m.	10-12 m.	15-20 m.	Voznyachuk & Budko 1969 Kornietz et al. 1981
Desna	10-12 m.	20-25 m.	30-40 m.	Velichko 1961: Velichko et al. 1981 Gromov 1948
Sozh	6- 8 m.	10-12 m.	14-17 m.	Voznyachuk & Budko 1969
Sudost'	6- 7 m. 8-12 m.	10-12 m. 15-18 m.	-- --	Gromov 1948 Velichko 1961.
Pripyat'	4- 6 m.	25-40 m.	--	Voznyachuk & Budko & Kaletchitz 1969 Geografiya Byelorussii 1977
Udai	20 m.	25 m.	60 m.	Gromov 1948

TABLE II- 2

EARLY AND MIDDLE VALDAI CHRONOLOGY

Time B.P.	Glaciation		After Zarrina et al. 1981; Dolukhanov 1982	After Velichko 1974
-30,000	V	M	Donekamp-Arcy mild	Dunayevo warming
		I	Shensk cold	Shenyanino cooling
	A	D	Kashino-Hangelo warm	Surazh warming
		D	Burgovo cold	Leningrad warming
-40,000				Kashin cooling
	L	L	Grazhdanskii Prospekt warm	Krasnogorsk warming
		E		Shestikhin cooling
-50,000	D		cold	Krutitsky warming
		E		Lapland cooling
	A	A		
-60,000		R	Broerup-Second Cheremian	Upper Volga warming
			cold	
	I	L	Amersfoort-First Cheremian	Kurgolov cooling
		Y	cold	
-70,000				

TABLE II-3
LATE WÜRM - VALDAI CHRONOLOGY

Time B. P.	After Dolukhanov and Pashkevich 1977	After Gerasimov 1969	After Grichuk, Mangushina, and Monoszon 1969	After Frenzel 1973	After Leroi-Gourhan 1965
	Dryas III s	Younger Dryas s	Younger Dryas s	Youngest Tundra s	
	Allerŏd i	Allerŏd i	Allerŏd i	Allerŏd i	
12,000	Dryas II s	Middle Dryas s	Middle Dryas s	Middle Tundra s	
	Bölling i	Bölling i	Bölling i	Bölling i	
	Dryas I s	New Fatonian i	Older Dryas i	Older Tundra s	
		Luga s			
14,000	Raunis i	Plyussa-Raunis i			stadial
		Vespovo s	Pomeranian s		
	Lascaux i	Somino-Ula i	Blankendorf i	Lascaux - Ula i	Lascaux i
16,000					
	Laugerie i				
18,000					Laugerie i
		Erdovo s	Frankfurt s		
		Berezaika i			
20,000		Belogoye s	Brandenburg s		Maximal cold
					Maximal cold
22,000					Tursac i
	Tursac i				
24,000		Bryansk i			
26,000			Paudorf i		
				Stillfried B - Arcy i	Legend:
28,000					i - interstadial
					s - stadial
30,000	Salpetriere i				

TABLE II-4

LATE PLEISTOCENE STRATIGRAPHIC TERM EQUIVALENCES FOR CENTRAL RUSSIAN PLAIN DEPOSITS

Time	Velichko's Late Pleistocene depositional sequence (Velichko 1962)	Veklich's Late Pleistocene depositional sequence (Veklich 1974)
HOLOCENE		
12,000 B.P.	Present Day Soil	Present Day Soil
L A T E	Relic Soil - Timonovka Soil	Relic Soil
	Loess III	Prichernomorskii Loess
P L E I S T O C E N E	Gley Layer	Dofinov Soil - Embryoniv Layer
	Loess II	Bug Loess
	Bryansk Soil	Vitochevskaya Soil
	Loess I	Udai Loess

TABLE II-5
GEOGRAPHIC PARTICULARS

	Oblast'	Rajon	N	E	River	Location of site	Distance from river today - m	Height above river today - m	Height above river at occupation - m	Area excavated - m²	Possible area of the site - m²	Orientation	Number of cultural layers	Condition of cultural layer	Nature of disturbance	Depth of the cultural layer from surface	Thickness of the cultural layer	Presence of mammoth bone dwellings	Numbers of mammoths	Nearest neighbor site (number)	Distance to nearest site
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1. Berdyzh	Gomel	Chechevskii	52° 50'	30° 58'	Sosh	P?,R,T-1?	60-70	6-12	n.d.	≈350	n.d.	NE	1?	IS?, D	S	1.5 - 10	30-40	+	45	18	85 km
2. Chulatovo I	Chernigov	Novgorod - Severskii	51° 50'	33° 07'	Desna	P, R	50-70	18-25	0-5	390	n.d.	SE	1	R,PR?	E,S	4.2 - 4.5	to 25	-	11	3	200-250 m
3. Chulatovo II	Chernigov	Novgorod - Severskii	51° 50'	33° 07'	Desna	P, R	100-125	35-40	15-20	≈1,000	2,000	S	1	IS,PD	E	2 - 2.5	2-5	-	13	2	200-250 m
4. Dobranichevka	Kiev	Tagodinskii	50° 03'	32° 40'	Toshanka	T-2,M	<50	16-17	n.d.	2,000	5,500	S	1	IS,PD	E	1.5 - 2.5	10-12	+	91	7,15	70 km
5. Klissovichi	Bryansk	Zhiryatinskii	53° 08'	33° 37'	Sudost'	T-2,M	5-10	11-12	0	623	5,000	E	1	IS,PD	P,E	1.2 - 1.9	10-12	+	60	13	30 km
6. Pastov	Kiev	Pastovskii	50° 05'	29° 55'	Unava	T-2,R	<10	12	n.d.	220	n.d.	n.d.	1	IS	-	3.2	10	-	11	9	60 km
7. Gontay	Poltava	Lubenskii	50° 10'	32° 49'	Udai	T-2	1,300	7-8	0	820	n.d.	S	1?	IS,PD	P?E	2 - 3.8	5-7	+	93	29	40 km
8. Khotylevo II	Bryansk	Bryanskii	53° 20'	34° 07'	Desna	P,M	<100 !	17	5-7	500?	n.d.	SE	1	IS,D	P	8 - 8.5	20-40	-	n.d.	11-13	12 km
9. Kirillovskaya	Kiev	Kievskii	50° 26'	30° 31'	Dnepr	T-2?, R? M	<100 !	n.d.	0	7,840	9,000 to 10,000?	E	1?	IS,PD, PR?	E,S	13.5-22.5	n.d.	+	70	6	60 km
10. Klyuay	Chernigov	Shorskii	52° 05'	31° 56'	Tsat	R	<100?	8-10	n.d.	1,300	over 20,000?	S	1	R?,IS?	n.d	n.d.	n.d.	-	n.d.	18,19 - 22	55 km
11. Korshevo I	Bryansk	Bryanskii	53° 21'	34° 09'	Korshevka	R,M	n.d.	n.d.	n.d.	25	n.d.	n.d.	1	IS,PD	E	n.d.	n.d.	-	n.d.	12,13	1 km
12. Korshevo II	Bryansk	Bryanskii	53° 21'	34° 09'	Korshevka	R,M	n.d.	n.d.	n.d.	60	n.d.	n.d.	1	IS,PD	E	n.d.	n.d.	-	n.d.	11,13	1 km
13. Kositsa	Bryansk	Bryanskii	53° 21'	34° 09'	Betovka	R,M	n.d.	n.d.	n.d.	125	n.d.	n.d.	1	IS,PD	E	0.5	10-15	-	n.d.	11,12	1 km
14. Kurovo.	Bryansk	Pogarskii	52° 32'	33° 17'	Sudost'	T-2,R?	200	n.d.	n.d.	248	n.d.	n.d.	1?	R?	E, S?	1.1	n.d.	-	1	19-22	25 km
15. Mashirich	Cherkassy	Kanevskii	49° 38'	31° 28'	Ros' and Rossava	T-2,R,M	≈200	9-10	1-2	508	over 10,000?	SE	1	IS	-	2.7 - 3.1	10-15	+	109	8	70 km
16. Mezin	Chernigov	Koropskii	51° 45'	33° 05'	Desna	T-2,R,M	100	6-16	0?	1,200	n.d.	S-SW	1?	IS,PD	E,S	1 - 8	to 10	+	116	2,3	18 km
17. Novgorod-Severskii	Chernigov	Novgorod - Severskii	52° 00'	33° 16'	Desna	P?,R,M	<1,000	30	10-15	238	n.d.	NW	1	D,R	E	6 - 7	n.d.	-	15	2,3	7 km
18. Novo - Bobovichi	Bryansk	Novo-Zybkovskii	52° 38'	31° 45'	Irput'	T?,R?	≈70	under water	10?	n.d.	n.d.	n.d.	1?	R	S,E	5 - 6	n.d.	-	11	10	55 km

TABLE II-5
continued

	Oblast'	Rajon	N	E	River	Location of site	Distance from river today - m	Height above river today - m	Height above river at occupation - m	Area excavated - m²	Possible area of the site - m²	Orientation	Number of cultural layers	Condition of cultural layer	Nature of disturbance	Depth of the cultural layer from surface	Thickness of the cultural layer	Presence of mammoth bone dwellings	Numbers of mammoths	Nearest neighbor site (number)	Distance to nearest site
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Pushkari Group:																					
19. Bugorok	Chernigov	Novgorod - Severskii	52° 51'	33° 18'	Desna	P,M	200	50	35-40	13.6	about 13,000?	S	1	IS,PD, R	E,P	0.3 - 0.5	20-30	-	n.d.	20-22	20 km
20. Pogon	Chernigov	Novgorod - Severskii	52° 51'	33° 18'	Desna	P,M	200	35-40	15-20?	63,3	about 40,000?	S	1?	D,R	E	0 - 5	n.d.	-	n.d.	19,21, 22	200 m
21. Pushkari I	Chernigov	Novgorod - Severskii	52° 51'	33° 18'	Desna	P,M	300	35-40	15-20?	400	about 30,000?	NW-SE	1?	IS	-	0.5 - 1.1	to 10	+	69	19,20, 22	200 m
22. Pushkari II	Chernigov	Novgorod - Severskii	52° 51'	33° 18'	Desna	P,M	200	35-40	15-20?	58	n.d.	SW	1	IS? PD?	S,E	1.7 - 4.4	to 10	-	17	19-21	200 m
23. Radogoshl'	Zhitomir	Radogoshl'-skii	50° 33'	29° 14'	Teterev	R?	≈3,000	2-3	4-5?	600	n.d.	N	1	IS	-	0.6 - 0.8	to 20	+	47	6	65 km
24. Suponevo	Bryansk	Bryanskii	53° 19'	34° 20'	Desna	T-2?,P, R	80-100	20-25	0	200	n.d.	E	1?	IS	-	0.7 - 0.9	to 30	+	7	25,26	2-3 km
25. Timonovka I	Bryansk	Bryanskii	53° 20'	34° 20'	Desna	P,M	≈200	38	18-23	1,178	2,400-18,000	SE	1	IS,PD	P	0.2 - 0.5	7-15	-	15	26	240 m
26. Timonovka II	Bryansk	Bryanskii	53° 20'	34° 20'	Desna	P,M	500	40	15-20	163	500	SE	1	IS,PD	E	0.6 - 0.8	5-15	-	12	25	240 m
27. Yudinovo	Bryansk	Pogarskii	52° 40'	33° 17'	Sudost'	T-2?,M	40-50	11	0	≈500	13,500 to 18,000	S-SE	1	IS	-	2.3 - 2.7	to 20-40	+	56	14	40 km
28. Turovichi	Gomel'	Kalinkovi-chskii	53° 47'	28° 41'	Pripyat'	T-2?,P? R?,M?	<2,000	30	n.d.	<300	n.d.	NW	1?	R	E,P	1.6 - 10	n.d.	?	15-20	1,9	140 km
29. Zhuravka	Chernigov	Varvanskii	50° 29'	32° 36'	Udai	T-2,M	≈250	8-12	0	330	n.d.	SW	1	IS,D	E	3.5 - 4.3	5-6	-	-	7	40 km

Legend: column 6: M-promontory, P-promontory, R-ravine, T-terrace ; column 14: IS-in situ, D-disturbed, P-partially, R-redeposited;
column 15: E-erosion, P-periglacial deformations, S-solifluction, ≈ - about

Notes: ° disagreement exists in the literature, see description of the site in chapter II.

TABLE II-6
FEATURES AT THE SITES

	MAMMOTH BONE DWELLINGS				HEARTHS					STORAGE PITS						Pits with bone constructions				WORK AREAS				OUTDOOR BONE HEAPS		References
					A. In Dwelling			B. Outside		A. In Dwelling				B. Outside						A. In Dwelling		B. Outside				
	number	shape	dimensions-m	area-m²	number	dimensions-m	volume-m³	number	dimensions-m	volume-m³	number	dimensions-m	volume-m³	contents	number	dimensions-m	volume-m³	contents	number	material	number	material	number	dimensions or size	number	dimensions or size	number	nature	
1. Bardysh	2	1) R? 2) O?	d= 4 m 11x5.2 m?	≈12.5 ≈45.0	2? 1?	n.d. d=2.0 depth= 0,7	n.d. 1.8	-	-	-	1?	0.5x0.4x0.5	0.2	bone	3	1) 1.1x1.6x0.6 2) 2.4x2.7x0.4 3) n.d.	0.8	large bone	1?	mammoth tusks	-		-		-		-		1,2,3
2. Chulatovo I	-							1-3?	0.75m² ± 0.01	0.008					-													4,5
3. Chulatovo II	-							7?	1-5 m² depth to 0.02	0.02-0.1					few	d= 0.15-0.25 depth=0.1-0.2	0.004 to 0.005	bone and burnt bone	-		-		3	5.0 x0.1	3 ?		-		6,7
4. Dobranichevka	4	1) R	d=4 m	≈12.5	-			1	d=2.0, depth= n.d.	n.d.	-				2	1)d= 2.0,depth=1.2 2)d= 2.0,depth=0.9	3.8 2.8	large bone burnt bone	-		-		1	d=3.0	-		-		8,9,55
		2) R	d=-m	≈12.5	1	d=1.0 depth= 0.2	0.2	2	1)1.8x1.4 x0.1 2)d=1.5, depth= 0.1	0.2 0.02	-				4	1)2.8x2.0x0.8 2)2.5x2.0x018 3)1.6x1.2x0.8 4)2.2x1.8x0.8	3.5 3.1 1.2 2.5	large bone large bone large bone large bone			-		1	d=3.0	-				
		3) R	d=-m	≈12.5	1	d=0.7 depth= 0.17	0.07	2	1)d=1.7, depth= 0.12 2)d=1.2, depth= 0.1	0.3 0.1	-				4	1)2.5x1.7x0.8 2)2.1x1.5x0.8 3)2.3x1.6x0.8 4)2.3x1.25x0.8	2.7 2.0 2.8 1.8	large bone large bone large bone large bone			-		2	1)d=1.0 2)4.0x 2.0	-				
		4) R	d=-m	≈12.5	-			2	1)1.0x 2.0x n.d. 2)1.0x 1.5x n.d.	n.d. n.d.	-				2	1)d=2.0,depth=0.8? 2)d=2.0,depth=0.8?	≈2.5 ≈2.5	large bone large bone					1	8.0 x4.0	-				
5. Eliseevichi	2?	1) R?	n.d.	≈20.0?	-			-			1?[a]		n.d.	worked bone	5	1)2.6x1.7x0.7 2)2.05x1.95x0.5 3)2.0x1.3x0.5 4) n.d. 5)1.53x1.0xn.d.[a]	3.9 0.8 1.02 n.d. n.d.	large bone large bone large bone large bone worked bone	2-3?	mammoth skulls?	n.d.	n.d.	2?	n.d.	1?		-		10,11,12,25
6. Pastov	-				-			2	n.d.	n.d.	-				-														
7. Gontsy	2?	both R? or G?	d= 5m	both=20.0	1	d=to 1.0?	n.d.	2?	n.d.	n.d.	3	1)d=to 0.4 depth=0.4 2)d=0.4, depth=0.1 to 0.2 3)d=0.4, depth=0.1 to 0.2	0.05 0.01 0.01	bone charcoal bone charcoal bone charcoal	6	1)d=1.5,depth=0.75 2)d=1.2,depth n.d. 3) n.d. 4)d=2.0,depth=0.6 5)d=2.0,depth=0.6	1.3 n.d. 1.0 1.9 1.9	large bone large bone large bone large bone large bone	-		-		6 1?	all to d=1.0 n.d.	>1 n.d.		- -		13,14 9,15,16,17

TABLE II-6
continued

	MAMMOTH BONE DWELLING				HEARTH: A. In Dwelling			HEARTH: B. Outside			STORAGE PITS: A. In Dwelling				STORAGE PITS: B. Outside				Pits with bone constructions				WORK AREAS: A. In Dwelling		WORK AREAS: B. Outside		OUTDOOR BONE HEAPS		References
	number	shape	dimensions-m	area-m^2	number	dimensions-m	volume-m^3	number	dimensions-m	volume-m^3	number	dimensions-m	volume-m^3	contents	number	dimensions-m	volume-m^3	contents	number	material	number	material	number	dimensions or size	number	dimensions or size	number	nature	
8. Khotylevo II	-				-			some	n.d.	n.d.	-				-		n.d.	n.d.	some?	n.d.	-		some	n.d.	some		-		18,19
9. Kirillovskaya	3+4?	R?O?	d= 9m	≈20.0?	some?	n.d.	n.d.	>20	depth 0.1-0.2	n.d.	n.d.	n.d.	n.d.	n.d.	n.d		n.d.	n.d.	-		-		>2	n.d.	n.d.		-		5,9
10. Klyuay	-				-			-			-				-				-		-		-		-		-		20,21
11. Korshevo I	-				-			-			-				-				-		-		2	n.d.	-		-		22,23,24
12. Korshevo II	-				-			-			-				-				-		-		-		-		-		22,23,24
13. Kositsa	-				-			-			-				-				-		-		-		-		-		22,23,24
14. Kurovo	-				-			-			-				-				-		-		-		-		-		25,26
15. Mezhirich	4	1) R	d=6.5m	24.0	1	d=0.5-0.7, depth= 0.1-0.2	0.04	1	d=0.9, depth= 0.15	0.1	-				-				-		2	n.d.	2	n.d.	-		-		9,27,28,29 and personal observations
		2) R	d=5m	20.0	1	d=0.6, depth= 0.2	0.06	2	1)d=0.8, depth= 0.02 2)d=0.8, depth= 0.04	0.01 0.02	-				1	d= 1.5,depth=1.4	2.5	large bone and cultural layer	-		1	n.d.	1	n.d.	-				
		3) O	d=2m	12.0	1	n.d.	n.d.	1	d=0.9, depth= 0.08	0.05	-				1?	d=1.0,depth=0.8	0.6	large bone and cultural layer	-		1	n.d.	1	n.d.	1				
		4) O	5.8m*4.6	≈20.0	n.d.	n.d.	n.d.	2	n.d.	n.d.	n.d.								-		n.d.		2	n.d.	2				
16. Mezin	2-5	1) R	d=5.5m	24.0	3? ash spots	d=0.5-0.7, depth??	0.003	4	1)2.5x2.0 x0.1	0.4	4	small	n.d.	post holes?	6	1)d=0.5,depth=1.0 2)2.0x1.5x1.0 3)d=2.0,depth=1.0 4)2.3x1.9x1.0 5)2.5x1.5x1.0 6)d=0.9,depth=1.0	0.2 2.4 3.1 3.4 2.9 0.6	large bone	-		-		4	1)=8.0 2)=3.0 3)=3.0 4)=2.0	1-3		-		9,30
		2) O	4.0x2.0	8.0	-			1	d= 1.0 depth= n.d.	n.d.	-				-	1 0x0.7x0.65?	≈0.5		-		-		1	≈4.0	2?				
		3) R	d= 6m	28.0	2 ash spots	d=0.5-0.7, depth??	0.003	-			-				-				-		-		2	1)=6.0 2)=4.0	5?				
		4) O	4.0x2.0	8.0	-			1	d= 1.0 depth= 0.3	0.2	some	small	n.d.	caches	-				-		-		1	≈2.0	2?				
		5) R	d= 6m	28.0	1 ash spot	d=1.0 depth??	0.008	3	1)2.5x1.5 x0.1 2)d= 1.0 depth= 0.02 3)2.0x1.5 x0.1	0.3 0.02 0.2	-				-				-		-		4	1)=7.0 2)=5.0 3)=4.0 4)=1.0	-				

TABLE II-6
continued

	MAMMOTH BONE DWELLINGS				HEARTHS								STORAGE PITS																	
					A. In Dwelling			B. Outside			A. In Dwelling				B. Outside				Pits with bone constructions				WORK AREAS				OUTDOOR BONE HEAPS		
	number	shape	dimensions-m	area-m^2	number	dimensions-m	volume-m^3	number	dimensions-m	volume-m^3	number	dimensions-m	volume-m^3	contents	number	dimensions-m	volume-m^3	contents	number	material	number	material	A. In Dwelling: number	A. In Dwelling: dimensions or size	B. Outside: number	B. Outside: dimensions or size	number	nature	References
17. Novgorod - Severskii	-				some charcoal			-			-				-				-		-		-		-		-		5,26,31
18. Novo - Bobovichi	-				-			-			-				-				-		-		-		-		-		
Pushkari Group																			-		-		-		-		-		25,26
19. Bugorok	-				-			-			-				-														
20. Pogon	-				-			-			-				-				-		-		-		-		-		5,32,33
21. Pushkari I	1? 3?	0? R?	12.0x4.0 d=4.0	≈38.0 ≈12.6 each	3	1)1.2x0.8 x0.1 2)2.5x1.2 x0.2 3)2.2x2.5 x0.1	0.2 0.2 0.1	2	1)d=1.5, depth= 0.1 2)d=1.0 depth= 0.1	0.2 0.1	≈50	d=0.1-0.2, depth to 0.1	≈0.007	post holes? some flint, charcoal, ocher, worked bone	3	d=0.25,depth=0.15	≈0.007	burnt bone and flint	-				many	n.d.	-		-		5,34 5,35
22. Pushkari II	-				-			some ash spots	n.d.	n.d.	-			-	-				-		-		-		-		-		5,36
23. Radogoshl'	5-6	1) O 2) O 3) O 4) O 5) O 6) R	3.0x5.0 3.0x5.0 4.0x3.0 4.0x3.0 4.0x3.0 d=4.0	≈12.5 ≈12.5 ≈10.0 ≈10.0 ≈10.0 ≈12.5	some	n.d.	n.d.	some	n.d.	n.d.	-				1	d=2.0,depth=1.0	≈3.14	large bone	n.d.				1	2.0x1.7	-		-		37,38,39
24. Suponevo	1-3 ?	1) R 2) O	d=5.5? 5.0x7.0?	≈23.76 ≈27.50	1-2?	1)d=1.0, depth= 0.2-0.3	0.2	2?	1)d=2.1, depth= 0.2-0.3 2)d=3.0, depth= 0.2	0.2 1.4?	-				1-2?	1)d=1.0, depth=0.95 2)n.d.	0.8 n.d.	n.d. n.d.	n.d.		n.d.		3? 4?	1)3.0x2.0 2)≈6.0 3)8m² 4)5.0x3.0	some		-		5,40,41,42
25. Timonovka I	?				some?			some	1)d=1.0, depth to 0.6	0.5 n.d.	- -				2?	n.d.	n.d.	large bone	?		-		1	2.7x1.3	?		-		43,44,45
26. Timonovka II	-				-			1-3 wash outs	depth to 0.1						3	1)0.1x0.1x0.1 2)d=2.0,depth=0.7 3)0.6x1.0x0.6	0.0007 2.2 0.3	post hole? large bone large bone	2?	mammoth skulls	-		2	n.d.	some		-		43,45

TABLE II-6
continued

	MAMMOTH BONE DWELLINGS				HEARTHS						STORAGE PITS								Pits with bone constructions				WORK AREAS				OUTDOOR BONE HEAPS		
					A. In Dwelling			B. Outside			A. In Dwelling				B. Outside								A. In Dwelling		B. Outside				
	number	shape	dimensions-m	area-m²	number	dimensions-m	volume-m³	number	dimensions-m	volume-m³	number	dimensions-m	volume-m³	contents	number	dimensions-m	volume-m³	contents	number	material	number	material	number	dimensions or size	number	dimensions or size	number	nature	References
27. Tudinovo	3? 4?	1) O	10.0x17.0[P] d=5.0-7.5	44.0? ≈20.0	2?	1)d=0.6 depth= 0.1 2) n.d.	0.04	5?	1)2.0x2.0 depth? 2)4.2x2.4 depth n.d. 3)5.4x3.0 depth n.d. 4)and 5) n.d.	n.d.	-				some?	association? n.d.		n.d.	n.d.		-		n.d.		some	n.d.	1 bone wall around dwelling #1 of 20 mammoth skulls		25,46,47,48 49,50,51 and personal observations
		2) O?	5.0x6.0	≈28.0	1	d=2.1, depth= n.d.	n.d.	-?			-				-														
		3) R?	d=5.0-6.0	20-28	-			-			11	d=0.05- 0.2 depth= 0.1-0.2	0.003	post holes?	-														
		4) R?	n.d.	20-30[P]	n.d.			1?	n.d.		n.d.				-														
28. Turovichi	-				-			1?	n.d.	n.d.	-				-						-						-		
29. Zhuravka	-				-			3? washed out	n.d.	n.d.	-				-						-			3?	d= 4.0	-		14,53,54

Legend: ? - uncertain; ≈ - about; R - round; O - oval; * - location inside/outside dwelling questionable, possibly the same pit; ** - all depth assumed to be 0.001 m.; a - association with any complex uncertain; b - dwelling #1 with outer walls; C - Shovkoplyas 1972 gives depths for pits around dwelling #2 as 0.5-1.0 m; Shovkoplyas et al. 1981 give all depths for pits around dwelling #3 as up to 1.0 m; d - diameter; E - not fully excavated; P - currently under excavation.

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TABLE II-7
LITHIC ASSEMBLAGES

A. Lithic Inventories

	Area excavated-m^2	Lithics found	Density of lithics-m^2	Tools found	Density of tools-m^2	% of all lithics	Lithic materials and sources			ocher	References
							Flint	sandstone	other		
1. Berdyzh	~350	~1,500	4.9	n.d.	n.d.	n.d.	n.d.	n.d.	-	-	6,35
2. Chulatovo I	390	1,200	3.0	42	0.10	3.5	L	-	-	-	1,2,3
3. Chulatovo II	~1,000	13,387	13.4	535	0.50	4.0	L	L	quartzite-L	+ L	4,9
4. Dobranichevka[§]	2,000	13,688	6.8	1,153	0.60	8.4	L	L	granite-L;gneiss-L; mountain crystal-E (a)	+ L	4,5,38
5. Eliseevichi	623	80,000[**]	128.4	~4,000	6.40	5.0	E?	E?	quartzite-L;granite-L; marl-n.d.	+ n.d.	6,7
6. Fastov	220	1,888	8.6	170	0.80	9.0	L	-	-	-	5
7. Gontsy	820	~3,000	3.7	~300	0.40	~10.0	L	-	hematite-n.d., mountain crystal-E; opaline-n.d.	+ n.d.	1,8
8. Khotylevo II	500	20,714	41.4	5,029	10.00	24.3	n.d.	n.d.	n.d.	+ n.d.	10
9. Kirillovskaya	7,840	> 4,000[***] 800[***]	0.5	~75	0.01	9.4	L	-	granite-L	-	1,11
10. Klyusy	1,300	10,500	8.1	~400	0.30	3.8	n.d.	-	-	-	12
11. Korshevo I	25	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	-	13,14
12. Korshevo II	60	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	-	13,14
13. Kositsa	125	2,500	20.0	250	2.00	~10.0	L	L?	quartzite-l?	+ n.d.	15
14. Kurovo	248	~25	0.1	2	<0.01	8.0	n.d.	n.d.	n.d.	-	6
15. Mezhirich	508	14,870	29.3	1,290	2.50	8.7	L	L	granite-L?,gneiss-L?	+ L	16,17
16. Mezin	1,200	113,238	94.4	4,429	3.70	3.9	L	-	mountain crystal-E slate-L?,granite-L, gneiss-L	+ L	18
17. Novgorod - Severskii	238	570	2.4	12	0.05	2.1	L	-	-	+ n.d.	1,19
18. Novo - Bobovichi	n.d.	1	n.d.	1	n.d.	100.0	L?	-	-	-	6

TABLE II-7 A
continued

	Area excavated-m^2	Lithics found	Density of lithics-m^2	Tools found	Density of tools-m^2	% of all lithics	Lithic materials and sources			other	References
							Flint	sandstone	other		
Pushkari Group											
19. Bugorok	13.6	4,197	308.6	268	19.70	6.4	L	-	-	-	1,20,34
20. Pogon	63.3	671	10.6	67	1.10	10.0	L,E	-	-	+ n.d.	1
21. Pushkari I	~400	160,000	400.0	~3,200	8.0	2.0	L	-	quartzite-L,slate-L?	+ E	1
22. Pushkari II	~ 58	85	1.5	2	0.03	2.4	L	-	-	+ n.d.	1,37
23. Radomyshl'	1,500(b) 600(b)	10,000	16.7	1,145	1.90	11.5	L,E	-	-	-	21,22
24. Suponevo	~200	~30,000	150.0	n.d.	n.d.	n.d.	L	n.d.	quartzite-n.d.,slate - n.d.	+ n.d.	1.23,24
25. Timonovka I	1,178(d)	110,095	85.0	10,447	8.90	10.4	L	n.d.	slate-E?, iron ore-n.d.,phosphorite-n.d.	+ n.d.	25,26
26. Timonovka II	163	13,932	85.5	632	3.90	4.5	L	-	-	+ n.d.	26
27. Yudinovo	~ 500	~12,500?	25.0(f)	n.d.	n.d.	n.d.	E ?	-	-	+ n.d.	6,27,28,39,40
28. Yurovichi	<300	n.d.	n.d.	~211	~0.70	n.d.	L	L ?	limestone-n.d.	+ n.d.	6,29,30
29. Zhuravka	330	3,700	11.2	77	0.20	23.3	L,E.	L ?	-	-	31,32,33

TABLE II-7
continued

B. Composition of Tools

	Axes and axe-like tools	blades and blade fragments-unretouched	blades and blade fragments -retouched	burins	burin spalls	combination tools (end scrapers and burins)	end scrapers	grinding stones and slabs	knives	Nuclei and nuclei fragments	piercers and points	push plane (rabot)	waste flakes and debitage	References:
1. Berdyzh	-	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	
2. Chulatovo I	-	60	4		28	-	-	-.	-	15	-	3	1,080	1,2,3
3. Chulatovo II	-	1,473	53	374	150	-	86	22	-	160	some(e)	-	11,178	4,9
4. Dobranichevka[a]	-	2,107	49	~182	-	-	~160	>1	-	~305	33	40	4,060	4,5
5. Eliseevichi	-	6,908	149	436	314	-	28	-	-	321	-	-	749?	6,7
6. Pastov	-	216	1	3	-	1	5	-	-	92	-	1	1,393	5
7. Gontsy	-	> 200	some	105	-	3	>150	some	-	13	some	-	n.d.	1,5,8
8. Khotylevo II	-	many	many	many	n.d.	some	many	-	-	n.d.	some	-	many	10
9. Kirillovskaya[aaa]	-	>180	~50	13	-	2	21	-	-	5	some	n.d.	> 210	1,11
10. Klyusy	-	some	some	some	some	some	some	-	-	n.d.	some	some	n.d.	12
11. Korshevo I	-	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	-	n.d.	n.d.	n.d.	n.d.	n.d.	13,14
12. Korshevo II	-	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	-	n.d.	n.d.	n.d.	n.d.	n.d.	13,14
13. Kositsa	-	>1,000	>90	>100	50	-	some	some	-	>30	some	-	> 500	15
14. Kurovo	-	3	1	1	-	-	-	-	-	1	-	-	n.d.	6
15. Mezhirich		5,461	123	575	297	29	84	~8	-	337	73	38	7,475	16,17,41
16. Mezin	17	14,828	317	2,659	3,021	143	714	~13	-	576	574	-	83,058	18
17. Novgorod - Severskii	-	>20	5	2	-	-	2	-	-	9(g)	2	1	n.d.	1,19
18. Novo - Bobovichi	-	-	-	1	-	-	-	-	-	-	-	-	-	6
Pushkari Group														
19. Bugorok	3	250	26	112	15	-	66	-	-	130	14	-	n.d.	1,20,34
20. Pogon	-	~100	8	18	5	-	6	-	-	24	13	-	n.d.	1
21. Pushkari I	~20	~15,000	~1,000	~160	~30	-	~250	some	~10	~3,200	~550	~30	n.d.	1
22. Pushkari II	-	11	1	1	-	-	-	1	-	17	-	-	26	37

TABLE II-7 B
continued

	Axes and axe-like tools	blades and blade fragments-unretouched	blades and blade fragments -retouched	burins	burin spalls	combination tools (end scrapers and burins)	end scrapers	grinding stones and slabs	knives	Nuclei and nuclei fragments	piercers and points	push plane (rabot)	waste flakes and debitage	References:
23. Radomyshl'	few	n.d.	many	many	-	some	some	-	-	many	many	1	10,000	21,22
24. Suponevo	n.d.	some	some	many	n.d.	n.d.	some	-	n.d.	some	>20	n.d.	n.d.	23,24
25. Timonovka I	-	6,895	109	4,714	>1,615	140	1,098	84	-	~3,000	304	-	n.d.	25,26
26. Timonovka II	-	n.d.	78	328	n.d.	10	180	some	-	215	41	-	n.d.	26
27. Yudinovo	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	6,27,28
28. Yurovichi	-	>70	>40	61	n.d.	-	91	some	n.d.	58	18	n.d.	n.d.	6,29,30
29. Zhuravka	-	200	34	18	20	-	1?	-	-	3	5	1?	3,400	31,32,33

References: 1. Boriskovskii 1953, 2. Pidoplichko 1947a, 3. Voevodskii 1947b, 4. Leonova 1977, 5. Gladkih 1973, 6. Polikarpovich 1968, 7. Grehova 1978: personal communication, 8. Levitskii 1947, 9. Voevodskii 1952a, 10. Velichko et al. 1981a, 11.Pidoplichko 1969, 12. Shovkoplyas 1967, 13. Tarasov 1976, 14. Tarasov 1977, 15. Tarasov 1981, 16. Pidoplichko 1976, 17. Kornietz et al. 1981, 18. Shovkoplyas 1965a, 19. Pidoplichko 1947b, 20. Voevodskii 1952b, 21. Shovkoplyas 1964, 22. Shovkoplyas 1965b, 23. Shovkoplyas 1950, 24. Shovkoplyas 1951, 25. Gorodtsov 1935a, 26. Velichko et al. 1977a, 27. Budko 1967a, 28. Budko 1969, 29. Ksenzov et al. 1977, 30. Budko 1967b, 31. Rudinskii 1928, 32. Rudinskii 1929, 33. Boriskovskii and Praslov 1964, 34. Gvozdover 1947, 35. Vozgyachuk and Budko 1969b, 36. Golomshtok 1938, 37. Voevodskii 1952b, 38. Shovkoplyas et al. 1981, 39. Yudinovo Archive, Archaeology Sector,Institute of History,BSSR; 40. Abramova 1983: personal communication, 41. Mezhirich field notes 1978-1983.

Legend: ~ - about; - none; + present; * Shovkoplyas opened up about 5,500 m^2 but information available only on about 2,000 m^2, data on Dobranichevka inventories comes only from complexes 1 and 3 (see description of the site and excavations in chapter II); ** Grehova 1978: personal communication stated that about 80,000 lithics were found in toto; *** Boriskovskii 1953 reported that over 4,000 lithics were found but only 800 could be found after the Second World War,thus all calculations in this table are done on the base of the 800 studied by Boriskovskii; (a) for potential sources see discussion in chapter VII; (b) Shovkoplyas opened up about 1,500 m^2 but described in print only 600 m^2,thus all calculations based on the smaller figure; (d) Excavated area after Velichko et al. 1977a; (e) assume some = ~20; (f) density estimate after Sergin 1977,1981c; (g) 3 "gigantoliths" counted as nuclei.

TABLE II-8

ORGANIC ASSEMBLAGES

	MNB - number**	MNB per m^2	MNI - number**	MNI per m^2	number of worked bone	worked bone per m^2	amber-number	art: number, material	jewelry	marine shells-number	MNB and lithics per m^2	MNI and lithics per m^2	References
1. Berdyzh	n.d.	n.d.	52	0.15	some	n.d.	-	-	-	-	n.d.	0.15	6,35
2. Chulatovo I	1,188	3.04	38	0.10	12	0.0300	-	-	-	-	6.10	3.20	1,2,3
3. Chulatovo II	n.d.	n.d.	124	0.10	6	0.0060	1	-	1 B?	-	n.d.	13.50	4,9
4. Dobranichevka*	2,949	1.50	116	0.06	9	0.0050	12	2 R,S	-	-	8.32	6.90	4,5,40
5. Eliseevichi	28,754	46.10	406	0.70	280	0.5000	-	1 M	8 A 24 B	105	174.57	129.10	6,7,41
6. Pastov	319	1.45	16	0.07	-		-	-	-	-	10.00	8.70	5
7. Gontsy	5,678	6.90	158	0.20	16	0.0200	some	-	2 Pe	-	10.60	3.90	1,8
8. Khotylevo II	1,393	2.80	47***	0.09***	300	0.6000	-	16 M	-	-	44.20	41.50	10,38,39
9. Kirillovskaya	455	0.06	79	0.01	1?	0.0009	-	3 M	-	-	0.60	0.50	1,11
10. Klyusy	n.d.	n.d.	n.d.	n.d.	-		-	-	-	-	n.d.	n.d.	12
11. Korshevo I	n.d.	n.d.	n.d.	n.d.	-		-	-	-	-	n.d.	n.d.	13,14
12. Korshevo II	n.d.	n.d.	n.d.	n.d.	-		-	-	-	-	n.d.	n.d.	13,14
13. Kositsa	2	0.02	2	0.02	-		-	-	-	-	20.00	20.00	15
14. Kurovo	50	0.20	5	0.02	-		-	-	-	-	0.30	0.10	6
15. Mezhirich	6,764	13.30	315	0.60	271	0.5000	348	15 M,R	16 A 2 P	3	42.60	29.90	16,17
16. Mezin	8,273	6.90	492	0.40	293	0.2000	1	40 M	44 B,A,Pe 2 Br	800	101.30	94.80	18
17. Novgorod - Severskii	1,463	6.10	222	0.90	3	0.0100	-	-	-	-	8.50	3.30	1,19
18. Novo - Bobovichi	n.d.	n.d.	11	n.d.	-		-	-	-	-	n.d.	n.d.	6
Pushkari Group													
19. Bugorok	n.d.	n.d.	n.d.	n.d.	-		-	-	-	-	n.d.	n.d.	1,20,34
20. Pogon	n.d.	n.d.	n.d.	n.d.	-		-	-	-	-	n.d.	n.d.	1
21. Pushkari I	517	1.30	85	0.20	5	0.0100	-	-	1 Pe	-	401.30	400.20	1
22. Pushkari II	205	3.50	27	0.50	-		-	-	-	-	5.00	1.50	37

TABLE II-8
continued

	MNB - number**	MNB per m^2	MNI - number**	MNI per m^2	number of worked bone	worked bone per m^2	amber-number	art: number, material	jewelry	marine shells-number	MNB and lithics per m^2	MNI and lithics per m^2	References
23. Radomyshl'	1,148	1.90	51	0.09	-		-	-	-	-	18.60	16.80	21,22
24. Suponevo	416	2.08	17	0.09	200	1.0000	-	2 M	14 B 1 Pe 1 P?	-	151.00	150.00	23,24
25. Timonovka I	n.d.	n.d.	24	0.02	147	0.1000	-	27 M	-	9	n.d.	85.00	25,26
26. Timonovka II	124	0.80	23	0.10	2	0.0100	-	1 M	-	-	86.20	85.60	26
27. Yudinovo	506	1.01	100	0.20	some	n.d.	-	some M	some	150	n.d.	n.d.	6,27,28,41
28. Yurovichi	387	1.30	18-23	0.06 to 0.07	4?	0.0100?	-	1 M	-	-	n.d.	n.d.	6,29,30
29. Zhuravka	n.d.	n.d.	23	0.07	-		-	-	-	-	n.d.	11.30	31,32,33

Legend:* Dobranichevka inventory only includes what found in complexes #1 and #3; ** MNB and MNI calculations in Table III-3; *** exclusive of mammoths -see Table III-3; A=amulet; B=bead;Br=bracelet; E=engraving;M=mammoth ivory; P=pin; Pe=pendant; R=amber;S=sandstone; ?=value uncertain;@=about.

References: 1. Boriskovskii 1953, 2. Pidoplichko 1947a, 3. Voevodskii 1947b, 4. Leonova 1977, 5. Gladkih 1973, 5. Polikarpovich 1968, 7. Grehova 1978: personal communication, 8. Levitskii 1947, 9. Voevodskii 1952a, 10. Velichko et al. 1981a, 11. Pidoplichko 1969, 12. Shovkoplyas 1967, 13. Tarasov 1976, 14. Tarasov 1977, 15. Tarasov 1981, 16. Pidoplichko 1976, 17. Kornietz et al. 1981, 18. Shovkoplyas 1965a, 19. Pidoplichko 1947b, 20. Voevodskii 1952b, 21. Shovkoplyas 1964, 22. Shovkoplyas 1965b, 23. Shovkoplyas 1950, 24. Shovkoplyas 1951, 25. Gorodtsov 1935a, 26. Velichko et al. 1977a, 27. Budko 1967a, 28. Budko 1969, 29. Ksenzov et al. 1977, 30. Budko 1967b, 31. Rudinskii 1928, 32. Rudinskii 1929, 33. Boriskovskii and Praslov 1964, 34. Gvozdover 1947, 35. Voznyachuk and Budko 1969b, 36. Golomshtok 1938, 37. Voevodskii 1952c, 38. Zavernyaev 1978, 39. Zavernyaev 1981, 40. Shovkoplyas et al. 1981, 41. Collections History Museum,Minsk and Institute of History,BSSR

TABLE II-9

STATISTICAL TESTS

A. Difference of Means Tests	N	$\bar{x}_1$	$\bar{x}_2$	z	p
1. Sites with mammoth bone dwellings vs sites without them - on numbers of mammoths	21	73.00	12.35	5.26	<0.0001
2. Sites with mammoth bone dwellings vs sites without them - on nearest neighbor distances	27	66.45	37.66	3.01	0.003
3. Sites with mammoth bone dwellings in the north vs those with them in the south	14	70.5	70.00	0.029	0.98
4. Sites without dwellings in the north vs sites with mammoth bone dwellings in the south	16	22.38	145.00	11.85	<0.0001

B. Chi Square Test of Association	N	df	chi square	p
Large accumulations of mammoth bones and dwellings in ravine and/or floodplains vs in non-ravine and/or floodplains locations	21	1	41.05	<0.001

TABLE II-10

DISTANCES BETWEEN SITES
(in kilometers)

	Berdyzh	Chulatovo I	Chulatovo II	Dobrandichevka	Eliseevichi	Pastov	Ontsy	Khotylevo II	Kirillovskaya	Klyusy	Korshevo I	Korshevo II	Kositsa	Kurovo	Mezhirich	Mezin	Novgorod-Severskii	Novo-Bobovichi	Bugorok	Pogon	Pushkari I	Pushkari II	Radomyshl'	Suponevo	Timonovka I	Timonovka II	Tudinovo	Turovichi	Zhuravka
Berdyzh	0	195	195	260	180	240	260	230	230	100	200	200	200	125	258	175	175	55	170	170	170	170	250	218	220	220	160	140	240
Chulatovo I	195	0	0.5	233	135	300	160	180	260	90	175	175	175	52	241	18	7	127	27	27	27	27	280	160	162	162	100	270	160
Chulatovo II	195	0.5	0	233	135	300	160	180	260	90	175	175	175	52	241	18	7	127	27	27	27	27	280	160	162	162	100	270	160
Dobrandichevka	260	233	233	0	325	140	70	387	132	200	390	390	390	282	70	220	235	275	250	250	250	250	186	360	362	362	322	220	90
Eliseevichi	180	145	145	325	0	420	280	45	355	160	30	30	30	85	362	150	130	140	108	108	108	108	390	28	30	30	50	320	265
Pastov	240	300	300	140	420	0	250	420	60	240	430	430	430	340	120	280	300	282	325	325	325	325	65	401	403	403	350	145	220
Ontsy	260	160	160	70	280	250	0	320	200	175	322	322	322	200	110	150	185	240	195	195	195	195	250	288	290	290	250	240	40
Khotylevo II	230	180	180	387	45	420	320	0	420	200	12	12	12	130	390	198	171	180	153	153	153	153	390	20	18	18	80	350	282
Kirillovskaya	230	260	260	132	355	60	200	420	0	240	430	430	430	290	100	220	265	282	285	285	285	285	70	413	415	415	325	140	145
Klyusy	100	90	90	200	160	240	175	200	170	0	190	190	190	100	217	85	85	55	55	55	55	55	242	198	200	200	120	175	145
Korshevo I	200	180	180	390	30	430	322	12	430	190	0	n.d.	n.d.	145	390	180	45	170	150	150	150	150	415	32	30	30	75	345	290
Korshevo II	200	180	180	390	30	430	322	12	430	190	n.d.	0	n.d.	145	390	180	45	170	150	150	150	150	415	32	30	30	75	345	290
Kositsa	200	180	180	390	30	430	322	12	430	190	n.d.	n.d.	0	145	390	180	45	170	150	150	150	150	415	32	30	30	75	345	290
Kurovo	125	52	52	282	85	340	200	130	290	100	145	145	145	0	282	60	45	100	25	25	25	25	325	113	115	115	40	280	185
Mezhirich	258	241	241	70	362	120	110	390	100	217	390	390	390	282	0	240	258	290	260	260	260	260	180	385	387	387	330	185	120
Mezin	175	18	18	220	150	280	150	198	220	85	180	180	180	60	240	0	25	120	45	45	45	45	260	178	180	180	105	260	145
Novgorod-Severskii	175	7	7	235	130	300	185	171	265	85	170	170	170	45	258	25	0	120	20	20	20	20	285	153	155	155	95	265	162
Novo-Bobovichi	55	127	127	275	140	282	240	180	245	55	170	170	170	100	290	120	120	0	120	120	120	120	290	178	180	180	100	180	215
Bugorok	170	27	27	250	108	325	195	153	285	55	150	150	150	25	260	45	20	120	0	0	0.2	0.4	325	133	135	135	63	260	180
Pogon	170	27	27	250	108	325	195	153	285	55	150	150	150	25	260	45	20	120	0	0	0.2	0.2	325	133	135	135	63	260	180
Pushkari I	170	27	27	250	108	325	195	153	285	55	150	150	150	25	260	45	20	120	0.2	0.2	0	0.2	325	133	135	135	63	260	180
Pushkari II	170	27	27	250	108	325	195	153	285	55	150	150	150	25	260	45	20	120	0.4	0.2	0.2	0	325	133	135	135	63	260	180
Radomyshl'	250	280	280	186	390	65	256	430	70	242	415	415	415	325	180	260	285	290	325	325	325	325	0	418	420	420	370	120	240
Suponevo	218	160	160	360	38	401	288	20	413	198	32	32	32	113	385	178	150	178	133	133	133	133	418	0	2	2	80	358	288
Timonovka I	220	162	162	362	40	403	290	18	415	200	30	30	30	115	387	180	150	180	135	135	135	135	420	2	0	0.2	90	360	290
Timonovka II	220	162	162	362	40	403	290	18	415	200	30	30	30	115	387	180	150	180	135	135	135	135	420	2	0.2	0	90	360	290
Tudinovo	160	100	100	322	55	350	250	80	325	120	75	75	75	40	330	105	95	100	63	63	63	63	370	88	90	90	0	280	180
Turovichi	140	270	270	220	320	145	240	350	140	175	345	345	345	280	185	260	265	180	260	260	260	260	120	358	360	360	280	0	209
Zhuravka	240	160	160	90	265	220	40	382	145	145	290	290	290	185	120	145	162	215	180	180	180	180	240	288	290	290	230	209	0

TABLE II-11

DISTANCES BETWEEN SITES WITH MAMMOTH-BONE DWELLINGS
(in kilometers)

	Berdyzh	Dobranichevka	Eliseevichi	Gontsy	Kirillovskaya	Mezhirich	Mezin	Pushkari I	Radomyshl'	Suponevo	Yudinovo
Berdyzh	0	260	180	260	230	258	175	170	250	218	160
Dobranichevka	260	0	325	70	132	70	220	250	186	360	322
Eliseevichi	180	325	0	280	355	362	150	108	390	38	55
Gontsy	260	70	280	0	200	110	150	195	256	288	250
Kirillovskaya	230	132	355	200	0	100	220	285	70	413	325
Mezhirich	258	70	362	110	100	0	240	258	180	385	330
Mezin	175	220	150	150	220	240	0	45	260	178	105
Pushkari I	1[illegible]0	250	108	195	285	258	45	0	325	133	63
Radomyshl'	250	186	390	256	70	180	260	325	0	418	370
Suponevo	218	366	38	288	413	385	178	133	418	0	88
Yudinovo	166	322	55	250	325	330	105	63	370	88	0

TABLE II-12

DISTANCES BETWEEN SITES WITHOUT MAMMOTH BONE DWELLINGS (in kilometers)

	Chulatovo I	Chulatovo II	Pastov	Khotylevo II	Klyusy	Kositsa*	Kurovo	Novgorod-Severskii	Novo-Bobovichi	Bugorok	Pogon	Pushkari II	Timonovka I	Timonovka II	Yurovichi	Zhuravka
Chulatovo I	0	0.25	300	180	90	175	52	7	127	27	27	27	162	162	270	160
Chulatovo II	0.25	0	300	180	90	175	52	7	127	27	27	27	162	162	270	160
Pastov	300	300	0	420	240	430	340	300	282	325	325	325	403	403	145	220
Khotylevo II	180	180	420	0	200	12	130	171	180	153	153	153	18	18	350	382
Klyusy	90	90	240	200	0	190	100	85	55	55	55	55	208	208	175	145
Kositsa*	175	175	430	12	190	0	145	170	170	150	150	150	30	30	345	290
Kurovo	57	57	340	130	100	145	0	45	100	25	25	25	115	115	280	185
Novgorod-Severskii	7	7	300	171	85	170	45	0	120	20	20	20	150	150	265	162
Novo-Bobovichi	127	127	282	180	55	170	100	120	0	120	120	120	180	180	180	215
Bugorok	27	27	325	153	55	150	25	20	120	0	0.200	0.200	135	135	260	180
Pogon	27	27	325	153	55	150	25	20	120	0.200	0	0.200	135	135	260	180
Pushkari II	27	27	325	153	55	150	25	20	120	0.200	0.200	0	135	135	260	180
Timonovka I	162	162	403	18	208	30	115	150	180	135	135	135	0	0.240	360	290
Timonovka II	162	162	403	18	208	30	115	150	180	135	135	135	0.240	0	360	290
Yurovichi	270	270	145	350	175	345	280	265	180	260	260	260	360	360	0	209
Zhuravka	160	160	220	382	145	290	185	162	215	180	180	180	290	290	209	0

Legend: * estimates for Kositsa also include those for Korshevo I and II

TABLE III-1

PRESENT DAY TEMPERATURES AND PRECIPITATION ON THE RUSSIAN PLAIN

City/ Locality	Annual Temperatures in °Celsius			Annual Precipitation in mm Per Year			Frost-Free Days Average	References
	Average	January	July	general	as snow	season of greatest precipitation		
Bryansk	+6C	-8,5C	+18C	560	150	summer	160	(Markova 1975: Table III)
Gomel	±6.5C	-6,5	+18,5C	600	200	summer	220	(Geografiya Belorussii 1977:30,253)
Kiev	7.0C	-6,5	+19,5C	622	190	summer	180	(Ukraina 1969: 270-273)

TABLE III-2

LATE VALDAI CLIMATE

	Temperatures-Celsius			Frost free days per year	Precipitation-mm		References
	January	July	annual averages		average per year	as snow per year	
1. BRYANSK INTERSTADIAL 25,000 B.P.							
a.	-30° - -40°	n.d.	n.d.	n.d.	600	200	Velichko 1973
b.microfauna	-16° - -18°	+18° - +20°	n.d.	n.d.	150-400	20-120	Markova 1975,1982
2. POST BRYANSK TIME 24,00-20,000 B.P.							
a.Khotylevo II	-17° - -18°	+17.0°	0.4	n.d.	300-400	60-120	Zelikson and Monoszon 1974
b.flora	-32.5°	+13.5°	n.d.	106.5	350	110	Velichko et al. 1981a
c.fauna	-18.0°	+17.0°	n.d.	106.5	350	110	Velichko et al. 1981a
3. VALDAI MAXIMUM 20,000-18,000 B.P.							
a.	n.d.	n.d.	-2° - -4°	n.d.	n.d.	n.d.	Frenzel 1973
b.	-32° - -35°	+8° - +12°	-9° - -14°	90 ?	60-110	20-120	Butzer 1976
c.microfauna	-30° - -40°	+16° - +18°	n.d.	n.d.	n.d.	n.d.	Markova 1975,1982
4. POST MAXIMUM 18,000-12,000 B.P.							
a.Chulatovo II	-12° - -18°	+16° - +20°	n.d.	n.d.	120-400	30-120	Markova 1975,1982
b.Mezin	-20° - -40°	+17° - +21°	n.d.	n.d.	60-500	20-120	Markova 1975,1982
c.Novgorod - Severskii	-13° - -16°	+22° - +23°	n.d.	n.d.	80-380	30-120	Markova 1975,1982
d.Timonovka II	-30° - -34°	+18° - +20°	-3° - -10°	80 - 100	200	50	Velichko et al. 1981b

Legend: - to; n.d.=no data

TABLE III-3
FAUNA AT THE SI
A. Economically Im

	S I T E													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
OSTEICHTYES														
Salmo sp. - salmon family														
MNB - number	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- percent of MNB[a]														
MNI - number														
- percent of MNI[a]														
Esox lucius - pike														
MNB - number	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- percent of MNB														
MNI - number														
- percent of MNI														
Cyprinidae sp. - carp family														
MNB - number	-	-	-	-	27(14)[a]	-	-	-	-	-	-	-	-	-
- percent of MNB					ins.									
MNI - number					14(7)[a]									
- percent of MNI					1.7									
Rutilus rutilus - roach														
MNB - number	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- percent of MNB														
MNI - number														
- percent of MNI														
Leuciscus sp. - chub or dace														
MNB - number	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- percent of MNB														
MNI - number														
- percent of MNI														
Abramis brama - bream														
MNB - number	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- percent of MNB														
MNI - number														
- percent of MNI														
Silurius glanis - cat fish														
MNB - number	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- percent of MNB														
MNI - number														
- percent of MNI														
Lota lota - burbot														
MNB - number	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- percent of MNB														
MNI - number														
- percent of MNI														
Lucioperca lucioperca - pike-perch														
MNB - number	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- percent of MNB														
MNI - number														
- percent of MNI														
Perca fluviatilis - perch														
MNB - number	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- percent of MNB														
MNI - number														
- percent of MNI														
Pisces sp. - fish														
MNB - number	-	50	-	-	-	-	-	-	-	-	-	-	-	-
- percent of MNB		4.2												
MNI - number		1												
- percent of MNI		2.6												
AVES														
Lagopus lagopus - willow ptarmigan														
MNB - number	-	-		1	1	-	-	80	-	-	-	-	-	-
- percent of MNB				ins.	ins.			5.6						
MNI - number				1	1			10						
- percent of MNI				0.9	0.2			21.3						
Lyrurus tetrix - black grouse														
MNB - number	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- percent of MNB														
MNI - number														
-percent of MNI														
Larus argentatus - silver gull														
MNB - number	-	-	-	-	-		34	-	-	-	-	-	-	-
- percent of MNB							2.4							
MNI - number							14							
- percent of MNI							30.0							
Larus ruditundus - black headed gull														
MNB - number	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- percent of MNB														
MNI - number														
- percent of MNI														
Gavia arctica - Arctic loon														
MNB - number	-	-	-	-	-	-	3	-	-	-	-	-	-	-
- percent of MNB							0.2							
MNI - number							2							
- percent of MNI							8.2							
Anas sp. - duck														
MNB - number	-	-	-	-	-	-	2	-	-	-	-	-	-	-
- percent of MNB							0.1							
MNI - number							2							
- percent of MNI							8.2							

TABLE III-3
FAUNA AT THE SITES
A. Economically Important

SITES##																		
11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
-	-	-	-	-	-	6 0.4 1 0.5	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	1 ins. - 0.3	-	10 0.7 2 0.9	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	3 0.2 1 0.5	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	2 0.1 1 0.5	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	3 0.2 1 0.5	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	1 ins. 1 0.5	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	1 ins. 1 0.5	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	2 0.1 1 0.5	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	1 ins. 1 0.5	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	1 ins. 1 0.5	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	200 19.9 25 11.2	-	-	-	-	-	-	2 0.5 1 5.9	-	-	-	-	-
-	-	-	-	66 1.8 21 6.7	14 0.2 7 1.4	21 1.4 5 2.3	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	5 ins. 1 0.3	-	1 ins. 1 0.5	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	1 ins. 1 0.5	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	1 ins. 1 0.3	-	31 2.1 13 5.8	-	-	-	-	-	-	-	-	-	-	-	-

TABLE III-3 continued

	SITES**													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Anser sp. - field geese														
MNB - number	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- percent of MNB														
MNI - number														
- percent of MNI														
Bucephala clangula - golden eye														
MNB - number	-	-	-	-	-	-	-	1	-	-	-	-	-	-
- percent of MNB								ins.						
MNI - number								1						
- percent of MNI								2.1						
Cygnus sp. - swan														
MNB - number	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- percent of MNB														
MNI - number														
- percent of MNI														
MAMMALIA														
Hyaena sp. - hyena														
MNB - number	-	-	-	-	-	-	-	-	1	-	-	-	-	-
- percent of MNB									0.2					
MNI - number									1					
- percent of MNI									1.3					
Felis (Panthera) spelaea - cave lion														
MNB - number	-	-	-	-	-	-	-	-	2	-	-	-	-	-
- percent of MNB									0.4					
MNI - number									1					
- percent of MNI									1.3					
Lynx lynx - lynx														
MNB - number	-	-	n.d.	-	-	-	2	-	-	-	-	-	-	-
- percent of MNB			n.d.				ins.							
MNI - number			2				2							
- percent of MNI			1.6				1.3							
Gulo gulo - wolverine														
MNB - number	-	1	-	7	5	-	5	159	1	-	-	-	-	-
- percent of MNB		0.1		0.2	ins.		0.09	13.5	0.2					
MNI - number		1		1	1		2	6	1					
- percent of MNI		2.6		0.9	0.2		1.3	12.8	1.3					
Mustela erminea - ermine														
MNB - number	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- percent of MNB														
MNI - number														
- percent of MNI														
Mustela eversmanni - pole cat														
MNB - number	-	-	-	-	6	-	-	-	-	-	-	-	-	-
- percent of MNB					ins.									
MNI - number					2									
- percent of MNI					0.5									
Mustela nivalis - weasel														
MNB - number	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- percent of MNB														
MNI - number														
- percent of MNI														
Putorius sp. - fitch														
MNB - number	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- percent of MNB														
MNI - number														
- percent of MNI														
Alopex lagopus - Arctic fox														
MNB - number	n.d.	42	n.d.	64	15,374	-	68	191	-	-	-	-	-	-
- percent of MNB	n.d.	3.2	17	2.3	53.6		1.2	15.7						
MNI - number	1	6	n.d.	7	278		12	2						
- percent of MNI	1.9	15.9	13.7	6.0	68.5		7.6	4.2						
Canis lupus - wolf														
MNB - number	n.d.	13	n.d.	53	1,045	-	44	276	2	-	-	-	-	-
- percent of MNB	n.d.	1.0	n.d.	1.8	3.6		0.7	19.8	0.4					
MNI - number	1	3	3	3	36		5	6	1					
- percent of MNI	1.9	7.9	2.4	2.6	8.9		3.2	12.8	1.3					
Vulpes corsac - corsac														
MNB - number	-	-	-	-	16	-	-	-	-	-	-	-	-	-
- percent of MNB					ins.									
MNI - number					4									
- percent of MNI					1.0									
Vulpes vulpes - red fox														
MNB - number	-	-	-	2	2	-	-	-	-	-	-	-	-	-
- percent of MNB				ins.	ins.									
MNI - number				1	2									
- percent of MNI				0.9	0.5									
Ursus arctos - brown bear														
MNB - number	n.d.	1	n.d.	13	96	-	5	6	4	-	-	-	-	-
- percent of MNB	n.d.	0.2	n.d.	0.4	0.3		0.07	0.4	0.9					
MNI - number	2	1	1	1	19		2	1	2					
- percent of MNI	3.9	2.6	0.8	0.9	2.5		1.3	2.1	2.5					
Mammuthus primigenius - woody mammoth														
MNB - number	n.d.	1,085	n.d.	2,766	>12,1871	255	**1,000	>616	**440	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
- percent of MNB	n.d.	83.0	n.d.	93.9	42.4	80.3	70.4	48.3	96.8	n.d.	n.d.	n.d.	n.d.	n.d.
MNI - number	45	11	13	91	69	11	93	n.d.	70	n.d.	n.d.	n.d.	n.d.	n.d.
- percent of MNI	86.6	29.1	10.4	78.3	14.9	68.8	58.6	n.d.	88.5	n.d.	n.d.	n.d.	n.d.	n.d.

SITES**																			
10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
-	-	-	-	-	3 Ins. 3 1.0	-	2 0.1 2 0.9	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	1 Ins. 1 0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		-	-	-	3 Ins. 2 0.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	5 0.3 3 1.4	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	61 3.9 8 2.5	28 0.4 5 1.0	-	-	-	-	-	-	-	-	-	8 3.2 1 4.3	-	-	-
-	-	-	-	-	-	-	4 0.3 2 0.9	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	18 0.9 5 0.2	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	2 0.1 1 0.5	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	146 3.2 11 1.5	1,842 12.4 112 22.7	169 11.7 49 10.3	-	-	-	93 18.0 8 4.7	-	-	37 6.5 1 5.9	n.d. n.d. 2 3.3	78 62.9 6 26.2	147 66.1 26 66.0	2 0.5 1 4.3-5.5	-
-	-	-	-	1 20.0 1 20.0	69 1.1 12 3.8	1,004 11.3 69 15.9	9 0.6 4 1.8	-	-	-	159 30.7 9 7.0	10 3.8 4 14.8	-	36 9.1 2 11.7	n.d. n.d. 1 4.2	5 4.0 1 4.3	32 9.3 3 3.0	-	n.d. n.d. 1 4.3
-	-	-	-	-	2 Ins. 2 0.6	-	-	-	-	-	-	-	-	-	-	-	1 0.2 1 1.0	-	-
-	-	-	-	-	2 Ins. 2 0.6	1 Ins. 1 0.1	3 0.2 1 0.5	-	-	-	-	-	-	-	-	-	1 0.2 1 1.0	-	n.d. n.d. 1 4.3
-	-	-	-	-	12 0.8 3 1.0	35 0.4 7 1.8	4 0.3 2 0.9	-	-	-	1 0.2 1 1.2	3 0.2 1 3.7	-	1 0.2 1 5.9	n.d. n.d. 1 3.3	1 0.8 1 4.3	13 2.6 1 1.0	-	-
none n.d. n.d. n.d.	none n.d. n.d. n.d.	none n.d. n.d. n.d.	none n.d. n.d. n.d.	44 88.0 1 20.0	3,677 58.4 149 47.3	3,779 46.3 116 23.6	373 26.5 15 6.7	n.d. n.d. 11 100	none n.d. n.d. n.d.	none n.d. n.d. n.d.	198 38.3 19 11.2	1,170 97.1 17 93.0	1,138 99.1 47 92.4	287 69.0 29 44.1	n.d. n.d. 15 62.5	>21 16.9 12 52.3	246 43.6 56 66.0	383 99.1 10-40 93.5-97.3	-

TABLE III-3 continued

	1	2	3	4	5	6	7	8	9	10	11	12
Equus caballus[b] - wild horse												
MNB - number	n.d.	6	n.d.	-	1	63	-	-	-	-	-	-
- percent of MNB	n.d.	0.5	n.d.		ins.	19.7						
MNI - number	1	2	7		1	5						
- percent of MNI	1.9	5.2	5.6		0.2	31.2						
Coelodonta antiquitatis - woolly rhinoceros												
MNB - number	n.d.	2	n.d.	2	-	-	-	2	4	-	-	-
- percent of MNB	n.d.	0.2	n.d.	ins.				0.1	0.9			
MNI - number	1	2	12	1				1	2			
- percent of MNI	1.9	5.2	9.6	0.9				2.1	2.5			
Ursus arctos - bear												
MNB - number	-	-	-	-	-	-	4	-	-	-	-	-
- percent of MNB							ins.					
MNI - number							1					
- percent of MNI							0.6					
Cervus elaphus - red deer												
MNB - number	-	-	-	-	1	-	-	-	-	-	-	-
- percent of MNB					ins.							
MNI - number					1							
- percent of MNI					0.2							
Cervus sp. - deer												
MNB - number	-	-	-	-	-	-	-	-	-	-	-	-
- percent of MNB												
MNI - number												
- percent of MNI												
Megaceros eurycerus - giant deer												
MNB - number	-	-	-	-	-	-	-	-	-	-	-	-
- percent of MNB												
MNI - number												
- percent of MNI												
Rangifer tarandus - reindeer												
MNB - number	-	21	n.d.	30	2	-	991	-	-	-	-	-
- percent of MNB		1.7	n.d.	1.0	ins.		17.5					
MNI - number		6	20	5	1		14					
- percent of MNI		15.9	16.2	4.2	0.2		8.8					
Bison priscus - steppe bison												
MNB - number	-	3	n.d.	2	-	-	5	15	-	-	-	-
- percent of MNB		0.3	n.d.	ins.			0.09	1.1				
MNI - number		2	4	1			2	1				
- percent of MNI		5.2	3.2	0.9			1.3	2.1				
Bos sp. - wild cattle												
MNB - number	n.d.	-	-	-	-	-	-	-	-	-	-	-
- percent of MNB	1											
MNI - number	n.d.											
- percent of MNI	1.9											
Ovibos moschatus - musk ox												
MNB - number	-	-	-	2	-	-	-	-	-	-	-	-
- percent of MNB				ins.								
MNI - number				1								
- percent of MNI				0.9								
Marmota bobac - steppe marmot												
MNB - number	-	2	n.d.	8	-	-	37	-	-	-	-	-
- percent of MNB		0.2	n.d.	0.1			0.6					
MNI - number		2	25	1			6					
- percent of MNI		5.2	20.3	0.9			3.8					
Castor fiber - beaver												
MNB - number	-	-	-	-	-	-	-	-	-	-	-	-
- percent of MNB												
MNI - number												
- percent of MNI												
Lepus tenaltiicus - hare												
MNB - number	-	-	n.d.	3	4	-	518	8	1	-	-	-
- percent of MNB			n.d.	0.1	ins.		9.1	0.6	0.2			
MNI - number			20	2	2		16	1	1			
- percent of MNI			16.2	1.7	0.5		10.1	2.1	1.3			
Total count of MNB	n.d.	1,188	n.d.	2,989	>28,754	319	5,678	1,393	465	n.d.	n.d.	n.d.
Total count of MNI	52	38	124	116	406	16	158	47[3]	79	n.d.	n.d.	n.d.
REFERENCES	3,4	3,5,20	5	5,6,7,8	3,4,24, 34,35	9	3,5,7,36	10,11,13 21	7,9	14	29,30	29,30

SITES**																		
11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
–	–	some n.d. n.d. n.d.	3 6.0 1 20.0	2 ins. 2 0.6	659 8.0 61 12.4	53 3.6 8 3.5	–	–	–	64 12.4 3 3.5	1 ins. 1 3.7	6 0.5 1 1.9	59 17.8 1 5.9	–	–	–	1 0.2 1 4.4–5.5	–
–	–	–	2 4.0 2 40.0	–	17 0.2 3 0.6	95 6.5 13 5.8	–	–	–	–	14 1.3 2 7.4	–	2 0.5 1 5.9	–	–	13 2.6 7 7.0	–	–
–	–	–	–	2 ins. 1 0.3	1 ins. 1 0.2	–	–	–	–	–	–	–	–	–	–	–	–	n.d. n.d. 1 4.3
–	–	–	–	–	–	–	–	–	–	1 0.2 1 1.2	–	–	–	–	–	–	–	n.d. n.d. 1 4.3
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1 0.2 1 1.0	–	–
–	–	–	–	–	1 ins. 1 0.2	–	–	–	–	–	–	–	–	–	–	1 0.2 1 1.0	–	–
	–	–	–	81 0.6 10 3.2	444 5.4 83 6.9	117 8.1 25 11.2	–	–	–	1 0.2 1 1.2	6 0.5 1 3.7	2 0.2 1 1.9	2 0.5 1 5.9	n.d. n.d. 3 12.5	10 8.2 1 4.3	15 2.9 n.d. n.d.	–	–
–	–	–	–	17 0.3 6 1.9	19 0.2 5 1.0	13 0.9 5 2.2	–	–	–	–	–	1 0.09 1 1.9	1 0.2 1 5.9	–	–	26 5.1 2 2.0	–	–
–	–	–	–	–	–	–	–	some n.d. n.d. n.d.	–	–	–	–	–	–	–	–	1 0.2 1 4.3–5.5	n.d. n.d. 1 4.3
–	–	–	–	–	118 1.4 17 2.5	–	–	some n.d. some n.d.	–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	5 0.1 4 0.8	140 9.7 31 13.9	–	–	–	–	–	1 0.09 1 1.9	–	–	–	3 0.6 1 1.0	–	n.d. n.d. 18 78.5
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3 0.6 1 1.0	–	–
–	–	–	–	2,633 34.9 79 25.2	37 0.5 11 2.2	86 5.9 26 11.6	–	–	–	–	–	–	2 0.7 1 5.9	n.d. n.d. 1 4.2	5 4.0 1 4.3	8 0.8 n.d. n.d.	–	–
n.d.	n.d.	n.d.	50	6,768	8,273	1,463	n.d.	n.d.	n.d.	517	1,205	1,148	816	n.d.	128	506	337	n.d.
n.d.	n.d.	n.d.	5	315	492	322	11	n.d.	n.d.	85	27	51	17	24	23	100	18–23	23
29,30	29,30	31	3,4	8,16,17	15	11,18	3,4	1,2	19,20	5,20	3,5	5,10, 37	3,21	3	22,23	4,24,25 26,34	3,4,27	3,28

TABLE III-3
continued

B. Economically unimportant taxa

AVES	SITES 1	2	3	4	5	7	8	15	16	17	21	22	24	25	26	27	29
Bubo bubo																	
MNB - number	n.d.	-	-	-	1	-	-	3	-	-	-	-	-	-	-	-	-
- percent of MNB[a]	n.d.				2.3			0.8									
MNI - number	1				1			3									
- percent of MNB[a]	20.0				7.7			3.0									
Nyctea scandiaca																	
MNB - number	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	2	-
- percent of MNB									0.3							4.5	
MNI - number									1							n.d.	
- percent of MNI									1.2							n.d.	
Alauda arvensis																	
MNB - number	-	-	-	-	-	-	1	-	-	9	-	-	-	-	-	-	-
- percent of MNB							0.4			ins.							
MNI - number							1			3							
- percent of MNI							n.d.			0.2							
Galerida cristata																	
MNB - number	-	-	-	-	-	-	1	-	-	4	-	-	-	-	-	-	-
- percent of MNB							0.4			ins.							
MNI - number							1			3							
- percent of MNI							n.d.			0.2							
Corvus corax																	
MNB - number	-	-	-	-	1	-	-	3	-	-	-	-	-	-	-	-	-
- percent of MNB					2.3			0.8									
MNI - number					1			1									
- percent of MNI					7.7			1.0									
Oenanthe oenanthe																	
MNB - number	-	-	-	-	-	-	-	3	1	-	-	-	-	-	-	-	-
- percent of MNB								0.8	0.3								
MNI - number								1	1								
- percent of MNI								1.0	1.2								
Eremiza cirrinella																	
MNB - number	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-
- percent of MNB							0.4			ins.							
MNI - number							1			1							
- percent of MNI							n.d.			ins.							
Aves ng.																	
MNB - number	-	-	-	1	-	1	-	22	2	315	-	-	1	n.d.	1	1	-
- percent of MNB				2.6		3.2		6.3	0.6	6.6			100	n.d.	100	2.2	
MNI - number				1		1		11	2	30			1	1	1	n.d.	
- percent of MNI				12.5		8.3		10.9	2.4	1.7			100	100	100	n.d.	

TABLE III-3B
continued

	SITES																
	1	2	3	4	5	7	8	15	16	17	21	22	24	25	26	27	29
Criotus crietus																	
MNB - number	-	-	n.d.	10	13	-	-	3	-	-	-	-	-	-	-	-	n.d.
- percent of MNB			n.d.	26.3	30.2			0.8									n.d.
MNI - number			9	3	3			2									1
- percent of MNI			1.2	37.5	23.1			2.0									10.0
Criotus sp.																	
MNB - number	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
- percent of MNB																6.8	
MNI - number																n.d.	
- percent of MNI																n.d.	
Dicrostonyx cf. gr. *guilelmi-hanseli*																	
MNB - number	-	-	-	-	-	-	13	-	-	-	-	-	-	-	-	-	-
- percent of MNB							5.9										
MNI - number							n.d.										
- percent of MNI							n.d.										
Dicrostonyx torquatus																	
MNB - number	-	4	n.d.	-	7	-	-	-	291	510	-	-	-	-	-	35	-
- percent of MNB		3.3	n.d.		16.3				88.5	10.8						79.6	
MNI - number		1	105		1				56	216						n.d.	
- percent of MNI		11.1	15.1		7.7				69.3	12.5						n.d.	
Ellobius talpinus																	
MNB - number	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
- percent of MNB									0.3								
MNI - number									1								
- percent of MNI									1.2								
Lagurus lagurus																	
MNB - number	-	-	n.d.	-	-	-	-	46	-	1,232	-	-	-	-	-	-	-
- percent of MNB			n.d.					13.4		25.8							
MNI - number			248					11		576							
- percent of MNI			35.5					10.9		33.3							
Lagurus lutcus																	
MNB - number	-	-	n.d.	-	-	2	-	-	-	28	-	-	-	-	-	-	-
- percent of MNB			n.d.			6.5				0.6							
MNI - number			6			2				10							
- percent of MNI			0.8			16.8				0.6							
Lemmus obensis																	
MNB - number	-	-	n.d.	-	17	-	49	-	-	16	-	3	-	-	-	-	-
- percent of MNB			n.d.		39.5		22.4			0.3		60.0					
MNI - number			7		5		n.d.			10		1					
- percent of MNI			1.0		38.4		n.d.			0.6		50.0					

TABLE III-3B
continued

	SITES																
	1	2	3	4	5	7	8	15	16	17	21	22	24	25	26	27	29
MAMMALIA																	
Dasypus novemcinctus																	
MNB - number	-	-	n.d.	-	-	-	-	-	-	43	-	-	-	-	-	-	-
- percent of MNB			n.d.							0.9							
MNI - number			3							6							
- percent of MNI			0.4							0.3							
Sorex cranesus																	
MNB - number	-	-	n.d.	-	-	-	-	-	-	12	-	-	-	-	-	-	-
- percent of MNB			n.d.							0.2							
MNI - number			3							6							
- percent of MNI			0.4							0.3							
Homo sapiens sapiens - See Table III-3D																	
RODENTIA																	
Citellus mexicanus																	
MNB - number	-	-	n.d.	-	-	15	-	4	1	90	-	-	-	-	-	3	-
- percent of MNB			n.d.			48.4		1.2	0.3	1.9						6.8	
MNI - number			15			1		3	1	19						n.d.	
- percent of MNI			2.1			8.3		3.0	1.2	1.1						n.d.	
Citellus rufescens																	
MNB - number	n.d.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- percent of MNB	n.d.																
MNI - number	4																
- percent of MNI	80.0																
Citellus variegatus																	
MNB - number	-	-	-	3	-	-	-	41	-	48	-	-	-	-	-	-	n.d.
- percent of MNB				7.9				11.8		1.0							n.d.
MNI - number				1				13		16							2
- percent of MNI				12.5				12.8		0.9							20.0
Citellus sp.																	
MNB - number	-	-	-	-	-	-	1	41	1	-	-	-	-	-	-	-	-
- percent of MNB							0.4	11.8	0.3								
MNI - number							n.d.	13	1								
- percent of MNI							n.d.	12.8	1.2								
Arvicola sp.																	
MNB - number	-	-	n.d.	-	-	8	-	-	1	27	8	-	-	-	-	-	-
- percent of MNB			n.d.			25.8			0.3	0.6	66.7						
MNI - number			3			4			1	17	2						
- percent of MNI			0.4			33.3			1.2	0.9	66.7						

TABLE III-3B
continued

	SITES**																
	1	2	3	4	5	7	8	15	16	17	21	22	24	25	26	27	29
Microtus arvalis																	
MNB - number	-	-	-	-	-	-	-	19	-	-	-	-	-	-	-	-	-
- percent of MNB								5.5									
MNI - number								8									
- percent of MNI								7.9									
Microtus (Stenocranius)[2] gregalis																	
MNB - number	-	100	n.d.	-	2	-	43	6	29	1,412	4	-	-	-	-	-	-
- percent of MNB		82.6	n.d.		4.7		19.5	1.7	8.8	29.6	33.3						
MNI - number		7	247		1		n.d.	3	16	620	1						
- percent of MNI		77.8	35.3		7.7		n.d.	3.0	19.9	35.8	33.3						
Microtus oeconomus																	
MNB - number										25							
- percent of MNB	-	-	-	-	-	-	-	-	-	0.5	-	-	-	-	-	-	-
MNI - number										11							
- percent of MNI										0.6							
Microtus sp.																	
MNB - number	-	-	-	-	2	-	111	71	-	-	-	-	-	-	-	-	-
- percent of MNB					4.7		50.6	20.6									
MNI - number					1		n.d.	11									
- percent of MNI					7.7		n.d.	10.8									
Silvimus silvaticus																	
MNB - number	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
- percent of MNB								0.3									
MNI - number								1									
- percent of MNI								1.0									
Allactaga iaculus																	
MNB - number	-	17	n.d.	20	-	-	-	-	1	629	-	2	-	-	-	-	-
- percent of MNB		14.1	n.d.	52.7					0.3	13.2		40.0					
MNI - number		1	18	1					1	28		1					
- percent of MNI		11.1	2.5	12.5					1.2	1.6		50.0					
Spalax microphthalmus																	
MNB - number	-	-	-	4	-	5	-	-	-	-	-	-	-	-	-	-	n.d.
- percent of MNB				10.5		16.1											n.d.
MNI - number				2		4											5
- percent of MNI				25.0		33.3											50.0
Spalax podolicus																	
MNB - number	-	-	-	-	-	-	-	20	-	-	-	-	-	-	-	-	-
- percent of MNB								5.8									
MNI - number								7									
- percent of MNI								6.9									
Ochotona pusilla																	
MNB - number	-	-	n.d.	-	-	-	-	56	-	329	-	-	-	-	-	-	-
- percent of MNB			n.d.					16.1		7.0							
MNI - number			37					7		118							
- percent of MNI			5.3					6.9		6.9							
Total count of MNB	n.d.	121	n.d.	38	43	31	220	see Table	329	see Table	12	5	1	n.d.	1	44	n.d.
Total count of MNI	5	9	695	8	13	12	n.d.	III-3C	81	III-3C	3	2	1	1	1	n.d.	9
REFERENCES	3	3,5	5	5,6,7	3,4,24,34	3,5,7	10,11,13	16,17	15	11,18	5,20	3,5	3	3	3,22	3,4,24,25	3,28

TABLE III-3
continued

C. ECONOMICALLY UNIMPORTANT FAUNA FOUND AT SINGULAR SITES

	MNB		MNI	
	number	percent	number	percent
15. MEZHIRICH				
AMPHIBIA				
Pelobates fuscus	4	1.1	4	3.0
AVES				
Vultur vel Gyps	1	0.3	1	1.0
Haliaetus albicilla	1	0.3	1	1.0
Strix uralensis	2	0.6	1	1.0
Total count of MNB	347			
Total count of MNI	101			
References:	11, 16, 17			

	MNB		MNI	
16. NOVGOROD - SEVERSKII				
AVES	number	percent	number	percent
Accipitres sp.	1	ins.	1	ins.
Circus sp.	1	ins.	1	ins.
Falco tinumculus	1	ins.	1	ins.
Crex crex	1	ins.	1	ins.
Porzana porzana	1	ins.	1	ins.
Rallus aquaticus	1	ins.	1	ins.
Charadrius morinellus	1	ins.	1	ins.
Limicola falcinellus	1	ins.	1	ins.
Tringa glareola	1	ins.	1	ins.
Tringa orythropus	1	ins.	1	ins.
Tringa tonatus	1	ins.	1	ins.
Vanellus vanellus	1	ins.	1	ins.
Chlidonias leucoptera	1	ins.	1	ins.
Sterna albifrons	2	ins.	2	0.1
Dryobates medius	1	ins.	1	ins.
Jynx torquilla	1	ins.	1	ins.
Calandrella cinerea	1	ins.	1	ins.
Delichon urbica	1	ins.	1	ins.
Hirundo rustica	7	0.1	5	0.3
Parus cristatus	1	ins.	1	ins.
Parus major	1	ins.	1	ins.
Anthus campestris	2	ins.	2	0.1
Motacilla alba	1	ins.	1	ins.
Lanius collurio	1	ins.	1	ins.
Sturnus vulgaris	1	ins.	1	ins.
Carduelis carduelis	1	ins.	1	ins.
Chloris chloris	1	ins.	1	ins.
Passer domesticus	1	ins.	1	ins.
Fringica coelebs	1	ins.	1	ins.
MAMMALIA				
Cricetulus migratorius	16	0.3	11	0.6
Microtus oeconomus	25	0.5	11	0.6
Total count of MNB	4,766			
Total count of MNI	1,729			
References:	5,11,18			

TABLE III-3
continued

D. HOMINID REMAINS

	Chulatovo I	Khotylevo II	Mezin	Novgorod - Severskii	Pushkari I	Yudinovo
Homo sapiens sapiens						
number of pieces found	6	2	1	4	1	1?
nature of remains	cranial fragments: frontal, parietal	fragments of deciduous tooth and mandible	fragment of lower right molar	one fragment of humerus, three fragments of cranium.	crown of deciduous molar	humerus fragment
age	adult	juvenile	n.d.	adult	juvenile	n.d.
References	20	13	15	18	20	26

Legend: MNB - minimal number of bones; MNI - minimal number of individuals; ∿ - about; ? - uncertain datum ; a. Polikarpovich 1968 reported finding 28 MNB and 14 MNI of Cyprinids, spectral analysis of remains conducted in 1978 at the Geology Institute AN SSSR in Moscow indicated that only one half of the remains were organic. Calculations in the table used values of 14 for MNB and 7 for MNI; b. Azzaroli 1982: personal communication, various Soviet researchers have identified this taxon as either Equus sp. or Equus latipes; 1) All MNB and MNI values in the table are minimal and vary in reliability - see discussion in chapter III; 2) Genus assigned by excavator or identifyer, current taxon category given in parenthesis; 3) MNI calculations at Khotylevo II do not include mammoths; * MNB and MNI percentage of economically important taxa and taxa not economically important calculated separately; ** Sites: 1. Berdyzh, 2. Chulatovo I, 3. Chulatovo II, 4. Dobranichevka, 5. Eliseevichi, 6. Fastov, 7. Gontsy, 8. Khotylevo II, 9. Kirillovskaya, 10. Klyusy, 11. Korshevo I, 12. Korshevo II, 13. Kositsa, 14. Kurovo, 15. Mezhirich, 16. Mezin, 17. Novgorod - Severskii, 18. Novo-Bobovichi, 19. Bugorok, 20. Pogon, 21. Pushkari I, 22. Pushkari II, 23. Radomyshl', 24. Suponevo, 25. Timonovka I, 26. Timonovka II, 27. Yudinovo, 28. Yurovichi, 29. Zhuravka; *** Taxa found at more than one site.

References: 1. Voevodskii 1952b; 2. Gvozdover 1947; 3. Gromov 1948; 4. Polikarpovich 1968; 5. Kornietz 1962; 6. Shovkoplyas et al. 1981; 7. Pidoplichko 1969; 8. My examination of collections at Zoology Institute AN Uk. SSR in Kiev; 9. Pidoplichko and Shovkoplyas 1961; 10. Velichko et al. 1981a; 11. Umanskaya 1972; 12. Archive of I.G. Pidoplicho and examination of collections at Zoology Institute AN Uk. SSR, and Institute of Geography AN SSSR, Moscow; 13. Velichko et al. 1977a; 14. Shovkoplyas 1967; 15. Shovkoplyas 1965a; 16. Pidoplichko 1976; 17. Kornietz et al. 1981; 18. Pidoplichko 1947b; 19. Voevodskii 1950; 20. Boriskovskii 1953; 21. Archival data and collections at Zoology Institute AN Uk. SSR in Kiev and Institute of Geography AN SSSR, Moscow; 22. Velichko et al. 1977d; 23. Examination of collections at State Historical Museum (GIM) and Institute of Geography AN SSSR in Moscow; 24. Vereschagin and Kuzmina 1977; 25. Archive of V.D Budko; 26. Budko 1969; 27. Budko 1967b; 28. Boriskovskii and Praslov 1964; 29. Tarasov 1976; 30. Tarasov 1977; 31. Tarasov 1981; 32. Pidoplicho 1947a; 33. Examination of collection at Zoology Institute in Leningrad; 34. Examination of collections and archival sources at the Arcnaeology Sector, Institute of History AN BSSR in Minsk; 35. Velichko et al. 1977c; 36. Archive and field notes of N.L. Kornietz; 37. Faunal collection at Zoology Institute AN Uk. SSSR in Kiev.

TABLE III-4

ECOLOGICAL PROVENIENCE OF FAUNA

Sites:	Tundra	Tundra-Forest		Forest					Forest-Steppe		Steppe		Wide Range						
	Arctic Fox	Musk-Ox	Beaver	Boar	Brown Bear	Giant Deer	Lynx	Wolverine	Bison	Wild Cattle	Corsac Fox	Horse	Fox	Hare	Hyena	Red Deer	Wolf	Mammoth	Wooly Rhinoceros
Berdyzh	+				+					+		+					+	+	+
Chulatovo I	+				+			+	+			+					+	+	+
Chulatovo II	+				+		+		+			+		+			+	+	+
Dobranichevka	+	+			+			+	+				+?	+			+	+	+
Eliseevichi	+				+			+				+	+?	+		+	+	+	
Fastov												+						+	
Gontsy	+			+	+		+	+	+					+			+	+	
Khotylevo II	+				+			+	+					+			+	+	
Kirillovskaya					+			+						+			+	+	+
Korshevo I																		+	
Korshevo II																		+	
Kositsa																		+	
Kurovo												+						+	
Mezhirich	+			+	+			+	+		+?	+	+	+			+	+	+
Mezin	+	+		+	+	+		+	+			+	+	+			+	+	+
Novgorod-Severskii	+				+		+		+			+	+	+			+	+	+
Novo-Bobovichi																		+	
Pushkari Group																			
Bugorok		+								+								+	
Pogon																		+	
Pushkari I	+				+							+				+	+	+	
Pushkari II	+				+							+		+			+	+	+
Radomyshl'									+			+						+	
Suponevo	+				+				+			+		+			+	+	+
Timonovka I	+				+									+			+	+	+
Timonovka II	+				+			+					+	+			+	+	
Yudinovo	+		+		+	+			+		+?			+			+	+	+
Yurovichi	+									+		+						+	
Zhuravka				+						+			+			+	+		

Legend: +? - Questionable classification, may be Arctic Fox
+ - Present

A. MNI

TABLE III-5
ECOLOGICAL PROVINCES OF MICROFAUNA

	SITES**											
TUNDRA	1	2	3	4	5	7	15	16	17	21	22	29
Dicrostonyx torquatus	-	1	105	-	1	-	-	56	216	-	-	-
Lemmus obensis	-	-	7	-	5	-	-	-	10	-	1	-
Microtus gregalis	-	7	247	-	1	-	-	16	620	1	-	-
total	-	8	362	-	7	-	-	72	846	1	1	-
percent	-	88.9	51.3	-	63.6	-	-	93.5	50.6	25.0	50.0	-
FOREST-TUNDRA												
Sorex araneus	-	-	3	-	-	-	-	-	6	-	-	-
Microtus arvalis	-	-	-	-	-	-	8	-	-	-	-	1
Microtus oeconomus	-	-	-	-	-	-	-	-	11	-	-	-
total	-	-	3	-	-	-	8	-	17	-	-	1
percent	-	-	0.4	-	-	-	10.5	-	1.0	-	-	11.1
FOREST												
Sorex araneus	-	-	3	-	-	-	-	-	6	-	-	-
total	-	-	3	-	-	-	-	-	6	-	-	-
percent	-	-	0.4	-	-	-	-	-	0.4	-	-	-
FOREST-STEPPE												
Desmana moschata	-	-	3	-	-	-	-	-	6	-	-	-
Silvimus silvaticus	-	-	-	-	-	-	1	-	-	-	-	-
total	-	-	3	-	-	-	1	-	6	-	-	-
percent	-	-	0.4	-	-	-	1.3	-	0.4	-	-	-
STEPPE												
Citellus major	-	-	15	-	-	1	3	1	19	-	-	-
Citellus rufensis	4	-	-	-	-	-	-	-	-	-	-	-
Citellus suslicus	-	-	-	1	-	-	13	-	16	-	-	2
Citellus sp.	-	-	-	-	-	-	-	1	-	-	-	-
Cricetulus migratorius	-	-	-	-	-	-	-	-	11	-	-	-
Cricetus cricetus	-	-	9	3	3	-	2	-	-	-	-	1
Ellobius talpinus	-	-	-	-	-	-	-	-	1	-	-	-
Lagurus lagurus	-	-	248	-	-	-	11	-	576	-	-	-
Lagurus luteus	-	-	6	-	-	2	7	-	10	-	-	-
Allactaga jaculus	-	1	18	1	-	-	13	1	28	1	1	-
Spelax microtus	-	-	-	2	-	4	-	-	-	-	-	-
Spelax podolicus	-	-	-	-	-	-	7	-	-	-	-	-
Ochotona pusilla	-	-	37	-	-	-	-	-	118	-	-	5
total	4	1	333	7	3	7	56	4	778	1	1	8
percent	100	11.1	47.1	100	37.3	64.0	73.7	5.2	46.6	25.0	50.0	88.9
WIDE RANGING												
Arvicola sp.	-	-	3	-	-	4	-	1	17	2	-	-
Microtus sp.	-	-	-	-	1	-	11	-	-	-	-	-
total	-	-	3	-	1	4	11	1	17	2	-	-
percent	-	-	0.4	-	9.1	36.0	14.5	1.3	1.0	50.0	-	-
Total sample size N=	4	9	707	7	11	11	76	77	1,670	4	2	9

TABLE III-5
continued

B.MNB

	SITES[88]										
	2	4	5	7	8	15	16	17	21	22	27
TUNDRA											
Dicrostonyx ex. gr. gulielmi-kanseli	-	-	-	-	13	-	-	-	-	-	
Dicrostonyx torquatus	4	-	7	-	-	-	291	513	-	-	35
Lemmus obensis	-	-	17	-	49	-	-	16	-	3	-
Microtus gregalis	100	-	2	-	43	6	29	1,412	4	-	-
total	104	-	36	-	105	6	320	1,938	4	3	35
percent	86.0	-	70.6	-	48.3	1.9	98.5	43.8	33.3	60.0	85.4
FOREST-TUNDRA											
Sorex araneus	-	-	-	-	-	-	-	12	-	-	-
Microtus arvalis	-	-	-	-	-	19	-	-	-	-	-
Microtus oeconomus	-	-	-	-	-	-	-	25	-	-	-
total	-	-	-	-	-	19	-	37	-	-	-
percent	-	-	-	-	-	6.2	-	0.8	-	-	-
FOREST											
Sorex araneus	-	-	-	-	-	-	-	12	-	-	-
total	-	-	-	-	-	-	-	12	-	-	-
percent	-	-	-	-	-	-	-	0.2	-	-	-
FOREST-STEPPE											
Desmana moschata	-	-	-	-	-	-	-	43	-	-	-
Silvimus silvaticus	-	-	-	-	-	1	-	-	-	-	-
total	-	-	-	-	-	1	-	43	-	-	-
percent	-	-	-	-	-	0.3	-	1.0	-	-	-
STEPPE											
Citellus major	-	-	-	15	-	8	1	90	-	-	3
Citellus suslicus	-	3	-	-	-	41	-	48	-	-	-
Citellus sp.	-	-	-	-	1	-	1	-	-	-	-
Mesocricetus raddei	-	-	-	-	-	-	-	16	-	-	-
Cricetus cricetus	-	-	13	-	-	3	-	-	-	-	-
Cricetus sp.	-	10	-	-	-	-	-	-	-	-	3
Ellobius talpinus	-	-	-	-	-	-	1	-	-	-	-
Lagurus lagurus	-	-	-	-	-	46	-	1,232	-	-	-
Lagurus luteus	-	-	-	2	-	-	-	28	-	-	-
Allactaga jaculus	17	20	-	-	-	8	1	629	-	2	-
Spalax microphthalmus	-	4	-	5	-	56	1	-	-	-	-
Spalax podolicus	-	-	-	-	-	20	-	-	-	-	-
Ochotona cuscitia	-	-	-	-	-	-	-	329	-	-	-
total	17	37	13	22	1	211	5	2,372	-	2	6
percent	14.0	100.0	25.5	73.4	0.5	68.6	1.5	53.6	-	40.0	14.6
WIDE RANGING											
Arvicola sp.	-	-	-	8	-	-	-	27	8	-	-
Microtus sp.	-	-	2	-	111	71	-	-	-	-	-
total	-	-	2	8	111	71	-	27	8	-	-
percent	-	-	3.9	26.6	51.2	23.0	-	0.6	66.7	-	-
Total sample size N=	121	37	51	30	217	308	325	4,429	12	5	41

TABLE III-5 continued

C. NUMBER OF SPECIES

		SITES**													
		1	2	3	4	5	7	8	15	16	17	21	22	27	29
Tundra	number	-	2	3	-	3	-	3	1	2	3	1	1	1	1
	percent	-	66.7	23.0	-	60.0	-	60.0	9.0	28.6	20.0	25.0	50.0	50.0	25.0
Forest - Tundra	number	-	-	1	-	-	-	-	1	-	2	-	-	-	-
	percent	-	-	7.7	-	-	-	-	9.0	-	13.3	-	-	-	-
Forest	number	-	-	1	-	-	-	-	-	-	1	-	-	-	-
	percent	-	-	7.7	-	-	-	-	-	-	6.7	-	-	-	-
Forest-Steppe	number	-	-	1	-	-	-	-	1	-	1	-	-	-	-
	percent	-	-	7.7	-	-	-	-	9.0	-	6.7	-	-	-	-
Steppe	number	1	1	6	4	1	3	1	7	4	7	1	1	1	3
	percent	100.0	33.3	42.6	100.0	20.0	75.0	20.0	64.0	57.1	46.6	25.0	50.0	50.0	75.0
Wide Ranging	number	-	-	1	-	1	1	1	1	1	1	2	-	-	-
	percent	-	-	7.7	-	20.0	25.0	20.0	9.0	14.3	6.7	50.0	-	-	-
Total number of taxa		1	3	13	4	5	4	5	11	7	15	4	2	2	4
Ecology on taxa		S	Ts	Stf	S	Ts	S	Ts	Stf	ST	Stf	Ts?	TS	TS	St

Legend: F = forest; S = steppe; T = tundra; capitals denote major ecology; lower case letters denote minor ecology
Reference on ecology of microfauna after Markova 1975,1981.

Sites: 1. Berdyzh; 2. Chulatovo I; 3. Chulatovo II; 4. Dobranichevka; 5. Eliseevichi; 7. Gontsy, 8. Khotylevo II; 15. Mezhirich; 16. Mezin; 17. Novgorod - Severskii; 21. Pushkari I; 22. Pushkari II; 27. Yudinovo; 29. Zhuravka

TABLE III-6 ECOLOGICAL PROVINCES OF AVIFAUNA

	Berdyzh		Dobranichevka		Eliseevichi		Khotylevo II		Mezhirich		Mezin		Novgorod - Severskii		Yudinovo	
	MNB	MNI	MNB	MNI	MNB	MNI	MNB	MNI	MNB	MNI	MNB	MNI	MNB	MNI	MNB	MNI
TUNDRA - All Terrestrial																
Lagopus lagopus*																
number	-	-	1	1	1	1	80	10	66	21	14	7	21	5	2	n.d.
percent			50.0	50.0	33.3	33.3	65.1	31.3	59.5	45.7	77.9	63.6	5.1	5.4	66.7	n.d.
Nyctea scandica																
number	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-
percent											5.5	9.1				
FOREST																
A. Terrestrial																
Limicola falcinellus																
number	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-
percent													0.2	1.0		
Tringa glareola																
number	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-
percent													0.2	1.0		
Tringa erythropus																
number	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-
percent													0.3	1.1		
Tringa totanus																
number	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-
percent													0.2	1.1		
Chlidonias leucoptera																
number	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-
percent													0.2	1.0		
Sterna albifrons																
number	-	-	-	-	-	-	-	-	-	-	-	-	2	2	-	-
percent													0.5	2.2		
Strix uralensis																
number	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-
percent									1.8	2.1						
Dryobates medius																
number	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-
percent													0.2	1.0		
Jynx torquilla																
number	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-
percent													0.2	1.0		
Alanda arvensis																
number	-	-	-	-	-	-	1	1	-	-	-	-	9	3	-	-
percent							0.8	3.1					2.6	3.3		
Galerida cristata																
number	-	-	-	-	-	-	1	1	-	-	-	-	4	3	-	-
percent							0.8	3.1					1.0	3.3		

TABLE III-6
continued

	Berdyzh		Dobranichevka		Eliseevichi		Khotylevo II		Nezhirich		Mezin		Novgorod - Severskii		Yudinovo	
	MNB	MNI	MNB	MNI	MNB	MNI	MNB	MNI	MNB	MNI	MNB	MNI	MNB	MNI	MNB	MNI
Calandrella cinerea																
number	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-
percent													0.2	1.0		
Delichon urbica																
number	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-
percent													0.2	1.0		
Hirundo rustica																
number	-	-	-	-	-	-	-	-	-	-	-	-	7	5	-	-
percent													1.7	5.4		
Parus cristatus																
number	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-
percent													0.2	1.0		
Sturnus vulgaris																
number	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-
percent													0.2	1.0		
Chloris chloris																
number	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-
percent													0.2	1.0		
Passer domesticus																
number	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-
percent													0.2	1.0		
Emberiza citrinella																
number	-	-	-	-	-	-	1	1	-	-	-	-	1	1		
percent							0.8	3.1					0.2	1.0		
B. Aquatic																
Larus argentatus*																
number	-	-	-	-	-	-	34	14	-	-	-	-	-	-	-	-
percent							27.7	43.7								
Larus ridibundus*																
number	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-
percent													0.2	1.0		
Gavia arctica*																
number	-	-	-	-	-	-	3	2	-	-	-	-	-	-	-	-
percent							2.4	6.3								
Porzana porzana																
number	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-
percent													0.2	1.0		
Rallus aquaticus																
number	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-
percent													0.2	1.0		
Charadrius morinellus																
number	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-
percent													0.2	1.0		
Motacilla alba																
number	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-
percent													0.2	1.0		

TABLE III-6 continued

	Berdyzh		Dobranichevka		Eliseevichi		Khotylevo II		Mezhirich		Mezin		Novgorod - Severskii		Yudinovo	
FOREST - FOREST-STEPPE	MNB	MNI	MNB	MNI	MNB	MNI	MNB	MNI	MNB	MNI	MNB	MNI	MNB	MNI	MNB	MNI
A. Terrestrial																
Lyrurus tetrix*																
number	-	-	-	-	-	-	-	-	5	1	-	-	1	1	-	-
percent									4.5	2.1			0.2	1.0		
Crex crex																
number	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-
percent													0.2	1.0		
Parus major																
number	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-
percent													0.2	1.0		
Oenanthe oenanthe																
number	-	-	-	-	-	-	-	-	3	1	1	1	-	-	-	-
percent									2.7	2.1	5.5	9.1				
Anthus campestris																
number	-	-	-	-	-	-	-	-	-	-	-	-	2	2	-	-
percent													0.5	2.2		
B. Aquatic																
Anas sp.*																
number	-	-	-	-	-	-	2	2	1	1	-	-	31	13	-	-
percent							1.6	6.3	0.9	2.1			7.4	13.8		
Anser sp.*																
number	-	-	-	-	-	-	-	-	3	3	-	-	2	2	-	-
percent									2.7	6.4			0.5	2.2		
Bucephala clangula*																
number	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-
percent							0.8	3.1								
Cygnus sp.*																
number	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-
percent									0.9	2.1						
Circus sp.																
number	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-
percent													0.2	1.0		
Vanellus vanellus																
number	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-
percent													0.2	1.0		
FOREST-STEPPE - All Terrestrial																
Haliaetus albicilla																
number	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-
percent									0.9	2.1						
Bubo bubo																
number	n.d.	1	-	-	1	1	-	-	3	3	-	-	-	-	-	-
percent	n.d.	100.0			33.3	33.3			2.7	6.4						

TABLE III-6
continued

	Berdyzh		Dobranichevka		Eliseevichi		Khotylevo II		Mezhirich		Mezin		Novgorod - Severskii		Yudinovo	
	MNB	MNI	MNB	MNI	MNB	MNI	MNB	MNI	MNB	MNI	MNB	MNI	MNB	MNI	MNB	MNI
Corvus corax																
number	-	-	-	-	1	1	-	-	3	1	-	-	-	-	-	-
percent					33.3	33.3			2.7	2.1						
Lanius collurio																
number	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-
percent													0.2	1.0		
Fringica coelebs																
number	-	-	-	-	-	-	-	-	-	-	-	-	2	2	-	-
percent													0.5	2.2		
WIDE RANGING																
Vultur vel Gyps																
number	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-
percent									0.9	2.1						
Accipitres sp.																
number		-	-	-	-	-	-	-	-	-	-	-	1	1	-	-
percent													0.2	1.0		
Falco tinumculus																
number	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-
percent													0.2	1.0		
Carduelis carduelis																
number	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-
percent													0.2	1.0		
Aves																
number	-	-	1	1	-	-	-	-	22	11	2	2	315	30	1	n.d.
percent			50.0	50.0					19.8	24.1	11.2	18.2	74.5	31.8	33.3	n.d.
Sample size N=	n.d.	1	2	2	3	3	123	32	111	46	18	11	423	95	3	n.d.

Legend: * - economically important taxa; n.d. - no data

References on ecology of avifauna: Landsborough-Thompson 1964; Umanskaya 1972

TABLE III-7 COMPOSITION OF AVIFAUNA

		Berdyzh		Dobranichevka		Eliseevichi		Khotylevo II		Mezhirich		Mezin		Novgorod - Severskii		Yudinovo	
		number	percent	number	percent	number	percent	number	percent	number	percent	number	percent	number	percent	number	percent
I. TOTAL	taxa	1		2		3		8		12		4		37		2	
	MNB	n.d.	n.d.	2	100.0	3	100.0	123	100.0	111	100.0	18	100.0	423	100.0	3	100.0
	MNI	1	100.0	2	100.0	3	100.0	32	100.0	46	100.0	11	100.0	95	100.0	n.d.	100.0
II. AQUATIC																	
A. Economically important																	
1. Forest:	taxa	-		-		-		1	12.5	-		-		1	2.7	-	
	MNB	-		-		-		34	27.7	-		-		1	0.2	-	
	MNI	-		-		-		14	43.7	-		-		1	1.0	-	
2. Forest-Forest-Steppe																	
	taxa	-		-		-		2	25.0	3	25.0	-		2	5.4	-	
	MNB	-		-		-		3	2.4	5	4.5	-		33	7.9	-	
	MNI	-		-		-		3	9.4	5	10.6	-		15	16.0	-	
3. Forest - Steppe																	
	taxa	-		-		-		-		-		-		-		-	
	MNB	-		-		-		-		-		-		-		-	
	MNI	-		-		-		-		-		-		-		-	
Total A	taxa	-		-		-		3	37.5	3	25.0	-		3	8.1	-	
	MNB	-		-		-		37	30.1	5	4.5	-		34	8.1	-	
	MNI	-				-		17	53.1	5	10.6	-		16	17.0	-	
B. Not important economically																	
1. Forest:	taxa	-		-		-		1	12.5	-		-		4	10.8	-	
	MNB	-		-		-		3	2.4	-		-		4	0.8	-	
	MNI	-		-		-		2	6.3	-		-		4	4.0	-	
2. Forest-Forest-Steppe																	
	taxa	-		-		-		-		-		-		2	5.4	-	
	MNB	-		-		-		-		-		-		2	0.4	-	
	MNI	-		-		-		-		-		-		2	2.0	-	
3. Forest-Steppe																	
	taxa	-		-		-		-		-		-		-		-	
	MNB	-		-		-		-		-		-		-		-	
	MNI	-		-		-		-		-		-		-		-	
Total B	taxa	-		-		-		1	12.5	-		-		6	16.2	-	
	MNB	-		-		-		3	2.4	-		-		6	1.2	-	
	MNI	-		-		-		2	6.3	-		-		6	6.0	-	
Total II A and B																	
	taxa	-		-		-		4	50.0	3	25.0	-		9	24.3	-	
	MNB	-		-		-		40	32.5	5	4.5	-		40	9.3	-	
	MNI	-		-		-		19	59.4	5	10.6	-		22	23.0	-	

TABLE III-7
continued

III. TERRESTRIAL		Berdyzh		Dobranichevka		Eliseevichi		Khotylevo II		Mezhirich		Mezin		Novgorod - Severskii		Yudinovo	
A. Economically important		number	percent	number	percent	number	percent	number	percent	number	percent	number	percent	number	percent	number	percent
1. Tundra:	taxa	-		1	50.0	1	33.3	1	12.5	1	8.3	1	25.0	1	2.7	1	50.0
	MNB	-		1	50.0	1	33.3	80	65.1	66	59.5	14	77.9	21	5.1	2	66.7
	MNI	-		1	50.0	1	33.3	10	31.3	21	45.7	7	63.6	5	5.4	n.d.	n.d.
2. Forest:	taxa	-		-		-		1	12.5	-		-		1	2.7	-	
	MNB	-		-		-		1	0.8	-		-		4	1.0	-	
	MNI	-		-		-		1	3.1	-		-		3	3.3	-	
3. Forest-Forest-Steppe																	
	taxa	-		-		-		-		1	8.3	-		1	2.7	-	
	MNB	-		-		-		-		5	4.5	-		1	0.2	-	
	MNI	-		-		-		-		1	2.1	-		1	1.0	-	
4. Forest-Steppe																	
	taxa	-		-		-		-		-		-		-		-	
	MNB	-		-		-		-		-		-		-		-	
	MNI	-		-		-		-		-		-		-		-	
Total A	taxa	-		1	50.0	1	33.3	2	25.0	2	16.7	1	25.0	3	8.1	1	50.0
	MNB	-		1	50.0	1	33.3	81	65.9	71	64.0	14	77.9	26	6.3	2	66.7
	MNI	-		1	50.0	1	33.3	11	34.4	22	47.8	7	63.6	9	9.7	n.d.	n.d.
B. Not important economically																	
1. Tundra:	taxa	-		-		-		-		1	25.0	-		-		-	
	MNB	-		-		-		-		1	5.5	-		-		-	
	MNI	-		-		-		-		1	9.1	-		-		-	
2. Forest:	taxa	-		-		-		2	25.0	1	8.3	-		16	43.3	-	
	MNB	-		-		-		2	1.6	2	1.8	-		32	7.7	-	
	MNI	-		-		-		2	6.2	1	2.1	-		24	25.1	-	
3. Forest- Forest-Steppe																	
	taxa	-		-		-		-		1	8.3	1	25.0	3	8.1	-	
	MNB	-		-		-		-		3	2.7	1	5.5	4	0.9	-	
	MNI	-		-		-		-		1	2.1	1	9.1	4	4.2	-	
4. Forest-Steppe																	
	taxa	1	100.0	-		2	66.7	-		3	25.0	-		2	5.4	-	
	MNB	n.d.	n.d.	-		2	66.7	-		7	6.3	-		3	1.2	-	
	MNI	1	100.0	-		2	66.7	-		5	10.6	-		3	2.2	-	

TABLE III-7
continued

		Berdyzh		Dobranichevka		Eliseevichi		Khotylevo II		Mezhirich		Mezin		Novgorod - Severskii		Yudinovo	
		number	percent	number	percent	number	percent	number	percent	number	percent	number	percent	number	percent	number	percent
5. Wide ranging																	
	taxa	-		1	50.0	-		-		2	16.7	1	25.0	4	10.8	1	50.0
	MNB	-		1	50.0	-		-		23	20.8	2	11.2	318	75.1	1	33.3
	MNI	-		1	50.0	-		-		12	26.2	2	18.2	33	34.8	n.d.	n.d.
Total B	taxa	1	100.0	2	100.0	2	66.7	2	25.0	7	58.3	3	75.0	25	67.6	1	50.0
	MNB	n.d.	n.d.	2	100.0	2	66.7	2	1.6	35	31.6	4	22.1	357	84.9	1	33.3
	MNI	1	100.0	2	100.0	2	66.7	2	6.2	19	41.0	4	36.4	64	66.3	n.d.	n.d.
Total III A and B																	
	taxa	1	100.0	2	100.0	3	100.0	4	50.0	9	75.0	4	100.0	28	75.7	2	100.0
	MNB	n.d.	n.d.	2	100.0	3	100.0	83	67.5	106	95.6	18	100.0	383	91.2	2	100.0
	MNI	1	100.0	2	100.0	3	100.0	13	40.6	41	88.8	11	100.0	73	76.0	n.d.	n.d.
Ecology based on all terrestrial avifauna:		FS	100.0	WR		FS	66.7	F	25.0	T	8.3	T	25.0	F	43.3	WR	50.0
										FFS	8.3	FFS	25.0	FFS	2.1		
										F	25.0	WR	25.0	FS	5.4		
										WR	16.4			WR	10.8		

Legend: F= Forest; FFS = Forest-Forest-Steppe; T = Tundra; WR = Wide Ranging taxa

References on ecology of avifauna: Landsborough- Thompson 1964; Umanskaya 1972

TABLE III-8
ECOLOGY BASED ON ECONOMICALLY UNIMPORTANT AVIFAUNA

		Berdyzh		Dobranichevka		Eliseevichi		Khotylevo II		Mezhirich		Mezin		Novgorod - Severskii		Yudinovo	
TOTAL NUMBER FOUND		number	percent	number	percent	number	percent	number	percent	number	percent	number	percent	number	percent	number	percent
all taxa		1		2		3		8		12		4		37		2	
economically unimportant																	
	taxa	1	50.0	1	50.0	2	66.7	3	37.5	6	50.0	3	75.0	32	86.5	1	50.0
	MNB	n.d.	n.d.	1	100.0	2	100.0	5	100.0	34	100.0	4	100.0	364	100.0	1	100.0
	MNI	1	100.0	1	100.0	2	100.0	4	100.0	18	100.0	4	100.0	71	100.0	n.d.	n.d.
TUNDRA	taxa	-		-		-		-		-		1	33.3	-		-	
	MNB	-		-		-		-		-		1	25.0	-		-	
	MNI	-		-		-		-		-		1	25.0	-		-	
FOREST	taxa	-		-		-		3	100.0	1	16.7	-		20	62.5	-	
	MNB	-		-		-		5	100.0	2	5.9	-		39	10.0	-	
	MNI	-		-		-		4	100.0	1	5.6	-		31	39.4	-	
FOREST - FOREST-STEPPE																	
	taxa	-		-		-		-		1	16.7	1	33.3	5	15.6	-	
	MNB	-		-		-		-		3	8.8	1	25.0	6	1.7	-	
	MNI	-		-		-		-		1	5.6	1	25.0	6	8.4	-	
FOREST-STEPPE	taxa	1	100.0	-		2	100.0	-		3	50.0	-		2	6.3	-	
	MNB	n.d.	n.d.	-		2	100.0	-		7	20.5	-		3	0.8	-	
	MNI	1	100.0	-		2	100.0	-		5	27.8	-		3	4.2	-	
WIDE RANGING	taxa	-		1	100.0	-		-		1	16.6	1	33.3	5	15.6	1	100.0
	MNB	-		1	100.0	-		-		22	64.8	2	50.0	319	87.5	1	100.0
	MNI	-		1	100.0	-		-		11	61.0	2	50.0	34	48.0	n.d.	n.d.
ECOLOGY BASED ON																	
	taxa	FS	100.0	WR	100.0	FS	100.0	F	100.0	F	16.7	T	25.0	F	62.5		
										FFS	16.7	FFS	25.0	FFS	15.6	WR	100.0
										FS	50.0	WR	50.0	FS	6.3		
										WR	16.6			WR	15.6		
	MNB	n.d.	n.d.	WR	100.0	FS	100.0	F	100.0	F	5.9	T	25.0	F	10.0	WR	100.0
										FFS	8.8	FFS	25.0	FFS	1.7		
										FS	20.5	WR	50.0	FS	6.8		
										WR	64.8			WR	87.5		
	MNI	FS	100.0	WR	100.0	FS	100.0	F	100.0	F	5.6	T	33.3	F	39.4	n.d.	n.d.
										FFS	5.6	FFS	33.3	FFS	8.4		
										FS	27.8	WR	33.3	FS	4.2		
										WR	61.0			WR	48.0		

Legend: F= Forest; FFS = Forest - Forest-Steppe; FS = Forest-Steppe; T = Tundra; WR = Wide Ranging

References on the ecology of avifauna: Landsborough- Thompson 1964; Umanskaya 1972

TABLE III-9
ECOLOGY BASED ON ECONOMICALLY IMPORTANT AVIFAUNA

		Berdyzh		Dobranichevka		Eliseevichi		Khotylevo II		Mezhirich		Mezin		Novgorod-Severskii		Yudinovo	
		number	percent	number	percent	number	percent	number	percent	number	percent	number	percent	number	percent	number	percent
TOTAL NUMBER FOUND																	
all taxa		1		2		3		8		12		4		37		3	
economically important																	
	taxa	-		1	50.0	1	33.3	5	62.5	5	41.7	1	25.0	6	16.2	1	50.0
	MNB	-		1	100.0	1	100.0	118	100.0	72	100.0	14	100.0	60	100.0	2	100.0
	MNI	-		1	100.0	1	100.0	28	100.0	27	100.0	7	100.0	25	100.0	n.d.	n.d.
TUNDRA	taxa	-		1	100.0	1	100.0	1	20.0	1	25.0	1	100.0	1	16.7	1	100.0
	MNB	-		1	100.0	1	100.0	80	67.9	66	91.5	14	100.0	21	35.0	2	100.0
	MNI	-		1	100.0	1	100.0	10	35.7	21	77.8	7	100.0	5	20.0	n.d.	n.d.
FOREST	taxa	-		-		-		2	40.0	-		-		2	33.3	-	
	MNB	-		-		-		35	29.6	-		-		5	8.3	-	
	MNI	-		-		-		15	53.6	-		-		4	16.0	-	
FOREST - FOREST-STEPPE																	
	taxa	-		-		-		2	40.0	3	75.0	-		3	50.0	-	
	MNB	-		-		-		3	2.5	6	8.5	-		35	56.7	-	
	MNI	-		-		-		3	10.7	6	22.2	-		16	64.0	-	
FOREST - STEPPE																	
	taxa	-		-		-		-		-		-		-		-	
	MNB	-		-		-		-		-		-		-		-	
	MNI	-		-		-		-		-		-		-		-	
WIDE RANGING	taxa	-		-		-		-		-		-		-		-	
	MNB	-		-		-		-		-		-		-		-	
	MNI	-		-		-		-		-		-		-		-	
ECOLOGY BASED ON																	
	taxa	-		T	100.0	T	100.0	T	20.0	T	25.0	T	100.0	T	16.7	T	100.0
								F	40.0	FFS	75.0			F	33.3		
								FFS	40.0					FFS	50.0		
	MNB	-		T	100.0	T	100.0	T	67.9	T	91.5	T	100.0	T	35.0	T	100.0
								F	29.6	FFS	8.5			F	8.3		
								FFS	2.5					FFS	56.7		
	MNI	-		T	100.0	T	100.0	T	35.7	T	77.8	T	100.0	T	20.0	n.d.	n.d.
								F	53.6	FFS	22.2			F	16.0		
								FFS	10.7					FFS	64.0		

Legend: F = Forest; FFS = Forest - Forest-Steppe; FS = Forest-Steppe; T = Tundra
References on ecology of avifauna: Landsborough-Thompson 1964; Umanskaya 1972

TABLE III-11
MOLLUSCS

A. UTILIZED	Chulatovo II number*found	Eliseevichi number*found	Mezhirich number found	Mezin number*found	Timonovka I number found	Yudinovo number*found
GASTROPODA						
Gibbula mega	-	-	-	-	-	1
Nerita sp.	-	-	-	-	3	-
Theodoxus (Nerita) pullasi**	-	-	-	-	-	3
Cyclope neritea	-	-	-	-	-	2
Cerithium rubiginosum	-	-	-	1	-	-
Cerithium vulgatum	-	-	-	31	1?	-
Vermicularia sp.-(a)	-	>101	-	-	-	-
Buccinum carbianum	-	-	-	91	-	-
Buccinum dublicatum	-	-	-	39	-	-
Buccinum opinabile	-	-	-	29	-	-
Buccinum subspinosum	-	-	-	1	-	-
Buccinum superabile	-	-	-	1	-	-
Buccinidae	-	-	-	45	-	-
Nassa (Nassarius) reticulata**	-	-	2	40	1?	141
BIVALVA						
Cardium edule	-	-	-	-	-	2
Cardium sp.	-	-	-	1	-	-
Ostrea sp.	>2	-	-	-	-	-
Didacna pullasi	-	-	-	-	-	1
Mollusca	-	4	1	-	6	-
CEPHALOPODA						
Belemnites sp.	-	-	-	10	-	-
References	1	2,3	6,11	4, 5	2,10	2,9

Legend: # - fossil shells used as personal decorations
* all numbers listed represent minimal values - Shovkoplyas 1965a reported over 800 shells found at Mezin of which only the listed have been identified and quantified;
** genus listed assigned by excavator or identifier, in parenthesis current terminology;
(a) may possibly also include Serpula.

B. UNUTILIZED	Gontsy	Eliseevichi	Mezhirich	Mezin	Novgorod-Severskii	Yudinovo
I. Aquatic						
GASTROPODA						
Valvata piscinalis - C	-	-	x	-	-	-
Valvata pulchella - T	-	-	x	-	-	-
Radix lagotis - C	-	-	x	-	-	-
Radix ovata -C	-	-	x	-	-	-
Galba truncatula - C	-	-	x	-	-	-
Physa fontinalis - C	-	-	x	-	-	-
Planorbis planorbis - C	-	-	x	-	-	-
Anisus contortus - C	-	-	x	-	-	-
Anisus spirorbis - C	-	-	x	-	-	-
Gyraulus grendleri - C	-	-	x	-	-	-
Segmentina nitida - T	-	-	x	-	-	-
Lithoglyphus natocoides-H	-	-	-	-	-	x
BIVALVA						
Anodonta sp.- WR	-	-	-	-	x	-
Unio sp. - H	3	-	-	-	-	-
Sphaerium solidum - H	-	-	-	-	x	-
Pisidium amnicum - H	-	-	x	-	-	-

TABLE III-11
continued

II. Terrestrial	Gontsy	Eliseevichi	Mezhirich	Mezin	Novgorod-Severskii	Yudinovo
GASTROPODA						
Carychium minimum - T	-	-	x	-	-	-
Succinea elegans - T	-	-	x	-	-	-
Succinea oblonga - C	-	-	x	xxx	-	-
Succinea putris - C-WR	-	-	x	-	-	-
Cochlicopa lubrica - WR	-	-	x	-	-	-
Vertigo antivertigo - T	-	-	x	-	-	-
Vertigo costata - n.d.	-	-	x	-	-	-
Columella edentula - WR	-	-	x	-	-	-
Pupilla muscorum - C	-	-	x	xxx	x	-
Vallonia costata - WR	-	-	-	x	-	-
Vallonia oblongata -WR	-	-	x	-	-	-
Valonnia pulchella - WR	-	-	x	-	-	-
Vallonia tenuilabris - C	-	-	x	xxx	-	-
Chondrula tridens - WR	-	-	x	-	-	-
Retinella hammonis - WR	-	-	x	-	-	-
Euconulus fulvus - T	-	-	x	-	-	-
Helicolomax pellucidus - C	-	-	-	x	-	-
Eulota fruticum - WR	-	-	x	-	-	-
Zenobiella (Monacha) rubiginosa - C	-	-	x	x	x	-
Mollusca	-	4	-	-	-	-
References	4	2,3	6,11	4,5	8	2,9

ECOLOGY ON UNUTILIZED TAXA* On number of taxa	Gontsy		Eliseevichi		Mezhirich		Mezin		Novgorod-Severskii		Yudinovo	
	#	%	#	%	#	%	#	%	#	%	#	%
Wide Ranging -WR	-		-		8	29.0	1	16.6	1	25.0	-	
Cold loving - C	-		-		12	43.0	4	66.8	2	50.0	-	
Temperate loving-T	-		-		6	21.0	1	16.6	-		-	
Warm loving- H	1	100	-		1	3.5	-		1	25.0	1	100
No data - n.d.	-		x	100	1	3.5	-		-		-	
Number found N=	1		1?		28		6		4		1	

Legend: ** Genus assigned by excavator or identifier given in parenthesis, current genus used in table; *** Ordering of taxa per Morton 1979; n.d. = no data; x = some; xxx = many
* References on the ecology of mollusca: Likhachev and Rammel'meier 1962; Zhadin 1965.

References: 1. Chepalyga 1983: personal communication; 2. Polikarpovich 1968; 3. Examination of Eliseevichi archival materials and collections at the Museum of History in Minsk, Archaeology Sector, Institute of History, AN BSSR in Minsk, and at the Museum of Anthropology and Ethnography in Leningrad; 4. Pidoplichko 1969; 5. Rudenko 1959; 6. Pidoplichko 1979; 7. Collections at Zoology Institute, AN UkSSSR, Kiev; 8. Pidoplichko 1947b; 9. Motuz 1969; 10. Examination of collection at the Museum of Anthropology and Ethnography in Leningrad; 11. Excavation field notebooks, Paleontology Department, Institute of Zoology AN UkSSR in Kiev.

TABLE III-12
DOBRANICHEVKA POLLEN TABLE
(after Pashkevich and Dubnyak 1978:Table I)

	sampled at depth - in meters												
	0.10	0.40	0.70	1.00	1.20	1.50	1.80	2.20	2.50	3.00	3.50	3.85	4.20
Total number of pollen and spores:	389	336	329	530	645	381	295	273	395	414	458	461	295
Composition - in percentages:													
AP	24.0	32.0	35.0	33.0	28.0	34.0	4.0	2.5	27.0	36.0	32.0	32.0	44.0
NAP	68.0	58.0	53.0	59.0	53.0	43.0	73.0	95.0	60.0	47.0	50.0	64.0	52.0
Spores	8.0	13.0	12.0	8.0	12.0	23.0	13.0	2.5	13.0	17.0	18.0	4.0	4.0
A. Arboreal :													
Abies	1.2	-	-	-	0.6	-	-	-	-	-	-	-	-
Picea	-	-	-	-	2.5	-	-	-	-	-	-	-	2.0
Pinus silvestris	76.3	50.0	44.0	84.0	83.6	72.8	6*	3*	64.0	87.0	63.0	83.8	57.0
Betula pubescens	14.5	18.0	26.0	2.0	3.9	7.4	-	-	15.0	4.5	12.0	6.0	22.0
Betula virrucosa	-	-	-	2.5	-	1.5	-	-	9.5	2.7	6.0	1.0	-
Betula humilis	-	-	-	0.7	0.5	3.8	-	-	-	-	-	-	-
Carpinus	-	-	-	-	-	-	-	-	-	-	-	-	3.0
Quercus	2.0	2.0	2.0	-	0.5	1.5	-	-	-	-	-	5.5	11.0
Ulmus	-	2.0	-	-	-	-	-	-	-	-	-	1.2	-
Tilia cordata	1.2	-	1.0	-	3.9	3.0	-	-	2.7	-	-	-	3.0
Alnus	4.8	28.0	27.0	8.7	4.5	10.0	-	-	10.0	5.5	19.0	2.5	2.0
Salix	12.0	7.0	17.0	1.8	5.5	4.7	6*	1*	5.7	2.5	2.5	2.3	2.2
Corylus	-	1.8	-	-	-	-	-	-	-	-	-	0.8	1.5
Rhamnus	-	-	-	-	-	-	-	-	-	-	-	-	1.5
B. Non Arboreal :													
Ephedra	-	-	-	-	-	-	-	-	-	-	0.3	-	-
Poaceae	5.3	0.9	8.2	12.0	10.8	15.6	-	2.5	11.0	6.8	7.9	16.0	11.3
Cyperaceae	12.0	4.2	9.5	13.1	8.2	8.6	5.4	-	14.0	8.4	14.0	3.1	1.2
Liliaceae	0.4	-	0.5	0.5	-	0.7	0.4	-	-	-	-	-	-
Urtica	-	-	-	-	-	3.6	-	-	-	1.7	1.2	-	1.2
Polygonaceae	-	-	-	1.5	2.5	1.4	-	-	6.5	3.3	0.4	2.3	3.2
Rumex	-	-	-	-	1.7	2.1	-	-	0.4	0.6	-	0.6	-
Polygonum bistorts	-	-	-	-	0.5	0.5	-	-	-	-	-	-	-
Chenopodiaceae	31.0	14.4	2.8	7.4	21.8	10.8	3.2	7.0	7.0	5.6	12.0	16.0	15.6
Caryophillaceae	-	-	13.0	0.5	0.5	1.4	1.4	-	0.4	-	0.4	0.6	-
Papaveraceae	-	-	-	0.5	-	-	0.8	-	-	-	-	-	-
Renunculaceae	0.8	-	1.0	-	1.8	3.6	0.4	9.0	3.0	5.3	-	0.9	-
Helianthemum sp.	-	-	-	-	0.5	1.2	4.6	-	-	-	-	-	-

TABLE III-12
continued

	sampled at depth - in meters												
	0.10	0.40	0.70	1.00	1.20	1.50	1.80	2.20	2.50	3.00	3.50	3.85	4.20
Brassicaceae	9.4	2.8	3.3	8.5	13.5	2.8	6.1	11.0	12.4	17.0	1.6	5.0	14.5
Rosaceae	0.8	12.0	10.7	12.4	5.4	16.6	9.3	19.5	0.8	2.8	6.0	7.3	13.4
Fabaceae	-	1.9	0.5	9.0	0.5	12.0	12.0	2.6	12.8	10.2	0.8	3.4	-
Geraniaceae	-	1.9	-	7.5	-	-	13.5	-	-	0.6	-	-	-
Linaceae	-	-	-	1.0	-	-	12.0	3.0	-	-	-	-	-
Apiaceae	1.6	11.0	3.3	1.5	12.3	0.7	0.8	3.0	0.8	2.3	0.8	0.9	1.2
Plumbaginaceae	-	-	-	-	-	2.8	6.5	-	-	1.2	-	-	0.6
Lamiaceae	-	3.8	5.6	1.5	6.2	1.4	-	13.3	16.2	8.6	4.2	5.4	
Convolvulaceae	1.6		5.6	10.5	2.8	-	10.4	15.3	0.6	1.3	1.6	0.3	4.5
Plantago	-	-	-	-	0.5	-	-	-	-	-	-	-	-
Rubiaceae	3.4	9.5	9.4	2.5	7.8	5.8	4.8	7.5	2.5	3.4	8.2	0.9	0.6
Scabiosa	-	-	-	5.0	-	2.4	16.5	-	-	1.1	-	-	-
Asteraceae	16.0	16.0	6.8	6.1	1.8	1.4	1.8	3.3	6.8	14.0	4.0	23.0	11.2
Artemisia	17.0	21.6	17.8	2.0	1.4	7.0	1.6	3.0	11.0	5.8	37.8	20.3	5.5
Aquatic Plants													
Sparganium	-	-	-	-	-	1.2	-	-	-	-	-	-	-
Potamogeton	0.8	-	1.0	-	-	0.6	-	-	-	-	-	-	-
Myriophyllum	-	-	1.0	-	-	-	-	-	-	-	-	-	-
Nymphaea	-	-	-	-	-	1.8	-	-	-	-	-	-	-
C. Spores :													
Pteridium aquilinum	-	-	-	-	1.7	1.0	-	-	-	-	-	-	-
Polypodiaceae	83.0	23.0	3.0	32.0	8.6	17.2	19.1	24.0	35.0	31.3	36.0	23.0	32.0
Botrychium boreale	-	-	-	-	-	5.0	16.0	-	-	-	2.5	-	-
Botrychium lunaris	-	-	-	-	58.0	4.0	-	-	13.0	2.7	2.5	27.0	13.0
Lycopodium clavatum	-	3.0	-	9.8	1.7	-	3.1	3.0	-	-	-	-	-
Diphasium complenatum	-	-	1.0	17.5	-	0.5	-	-	-	11.0	5.5	1.5	5.0
Lycopodiella inundata	-	3.0	-	2.4	-	1.0	-	-	2.0	-	-	-	-
Hepaticae	-	6.0	14.0	-	-	-	-	-	-	-	12.5	-	-
Bryales	17.0	65.0	17.0	19.5	28.3	69.6	59.2	73.0	50.0	55.0	43.0	49.5	50.0
Sphagnales	-	-	-	15.0	1.7	1.2	-	-	-	-	-	-	-
Selanginella selanginoides	-	-	1.0	4.8	-	0.5	2.6	-	-	-	-	-	-
Equistetum	-	-	-	2.4	-	-	-	-	-	-	-	-	-

Legend: * absolute values - not percentages

TABLE III-13 SPECIES USED AS FOOD

		SITES **												
		1	2	3	4	5	6	7	8	9	10	11	12	13
Number of food taxa		4	7	7	7	7	2	6	5	3	n.d.	n.d.	n.d.	n.d.
Percentage contribution:														
Fish	taxa	-	14.7	-	-	14.7	-	-	-	-	-	-	-	-
	MNB		4.6			0.1-0.2								
	MNI		7.4			9.8-17.7								
Birds	taxa	-	-	-	14.7	-	-	-	20.0	-	-	-	-	-
	MNB				ins.				15.7					
	MNI				1.0				n.d.					
Mammoths	taxa	25.0	14.6	14.6	14.6	14.6	50.0	16.7	20.0	33.4	100 ?	100 ?	100 ?	50.0
	MNB	n.d.	92.1	n.d.	98.7	99.8	80.3	72.1	80.9	98.9	n.d.	n.d.	n.d.	n.d.
	MNI	93.7	40.8	12.8	89.2	75.9-83.5	68.8	70.5	n.d.	95.9	n.d.	n.d.	n.d.	n.d.
Horses	taxa	25.0	14.7	14.7	-	14.7	50.0	-	-	-	-	n.d.	n.d.	50.0
	MNB	n.d.	0.5	n.d.		ins.	19.7					n.d.	n.d.	n.d.
	MNI	2.1	7.4	7.0		1.3-1.5	31.2					n.d.	n.d.	n.d.
Wooly Rhinoceri	taxa	25.0	14.7	14.7	14.7	-	-	-	20.0	33.3	-	-	-	-
	MNB	n.d.	0.2	n.d.	ins.				0.3	0.9				
	MNI	2.1	7.4	11.8	1.0				n.d.	2.7				
Boars	taxa	-	-	-	-	-	-	16.6	-	-	-	-	-	-
	MNB							ins.						
	MNI							0.8						
Red deer	taxa	-	-	-	-	14.7	-	-	-	-	-	-	-	-
	MNB					ins.								
	MNI					1.3-1.5								
Deer	taxa	-	-	-	-	-	-	-	-	-	-	-	-	-
	MNB													
	MNI													
Giant deer	taxa	-	-	-	-	-	-	-	-	-	-	-	-	-
	MNB													
	MNI													
Reindeer	taxa	-	14.7	14.7	14.7	14.7	-	16.7	-	-	-	-	-	-
	MNB		2.0	n.d.	1.2	ins.		17.9						
	MNI		22.2	19.8	4.9	1.3-1.5		10.6						
Steppe Bison	taxa	-	14.7	14.7	14.7	-	-	-	20.0	-	-	-	-	-
	MNB		0.3	n.d.	ins.				0.3					
	MNI		7.4	4.0	1.0				n.d.					

TABLE III-13
continued

		SITES **															
		14	15	16	17	18	19	20	21	22	23	24	25	26	27*	28	29
Number of food taxa		3	8	11	9	1	3	1	4	4	5	7	3	3	9	3	4
Percentage contribution:																	
Fish	taxa	-	12.5	-	11.1	-	-	-	-	-		14.7	-	-	-	-	-
	MNB		ins.		25.6							0.6					
	MNI		0.4		19.9							7.7					
Birds	taxa	-	12.5	9.0	11.1	-	-	-	-	-	-	-	-	-	-	-	-
	MNB		1.2	0.3	4.5												
	MNI		9.8	2.3	12.2												
Mammoths	taxa	33.4	12.5	9.0	11.2	100	33.3	100	25.0	25.0	20.0	14.6	33.4	33.4	11.2	33.4	-
	MNB	89.8	57.1	75.1	29.8	100	n.d.	100	75.0	98.3	99.2	82.0	n.d.	58.3	78.8	99.6	
	MNI	25.0	54.3	37.5	8.3	100	n.d.	100	93.2	81.1	92.0	53.8	78.9	85.5	81.1	88.2 - 91.0	
Horses	taxa	33.3	12.5	9.0	11.1	-	-	-	25.0	25.0	20.0	14.7	-	-	-	33.3	-
	MNB	6.1	ins.	12.5	4.2				24.2	ins.	0.6	15.0				0.2	
	MNI	25.0	0.4	19.7	4.4				4.0	4.8	2.0	7.7				4.5-5.9	
Wooly Rhinoceri	taxa	33.3	-	9.0	11.1	-	-	-	-	25.0	-	14.7	-	-	11.1	-	-
	MNB	4.1		0.3	7.6					1.2		0.6			4.2		
	MNI	50.0		1.0	7.1					9.2		7.7			10.0		
Boars	taxa	-	12.5	9.0	-	-	-	-	-	-	-	-	-	-	-	-	25.0
	MNB		ins.	ins.													n.d.
	MNI		0.4	0.3													4.7
Red deer	taxa	-	-	-	-	-	-	-	25.0	-	-	-	-	-	-	-	25.0
	MNB								0.4								n.d.
	MNI								1.4								4.7
Deer	taxa	-	-	-	-	-	-	-	-	-	-	-	-	-	11.1	-	-
	MNB														0.3		
	MNI														1.5		
Giant deer	taxa	-	-	9.0	-	-	-	-	-	-	-	-	-	-	11.1		
	MNB			ins.											0.3		
	MNI			0.3											1.5		
Reindeer	taxa	-	12.5	9.0	11.1	-	-	-	25.0	25.0	20.0	14.7	33.3	33.3	11.1	-	-
	MNB		0.6	8.4	9.4				0.4	0.5	0.2	0.6	n.d.	27.8	4.8		
	MNI		3.6	26.9	13.8				1.4	4.8	2.0	7.7	15.8	7.1	n.d.		
Steppe Bison	taxa	-	12.5	9.0	11.1	-	33.3	-	-	-	20.0	14.7	-	-	11.1	-	-
	MNB		0.3	0.4	1.0		n.d.				ins.	0.3			8.3		
	MNI		2.2	1.6	2.8		n.d.				2.0	7.7			2.9		

TABLE III-13
continued

		SITES **												
		1	2	3	4	5	6	7	8	9	10	11	12	13
Wild cattle	taxa	25.0	-	-	-	-	-	-	-	-	-	-	-	-
	MNB	n.d.												
	MNI	2.1												
Musk oxen	taxa	-	-		14.7	-	-	-	-	-	-	-	-	-
	MNB				ins.									
	MNI				1.0									
Steppe marmots	taxa	-	14.7	14.7	-	-	-	16.7	-	-	-	-	-	-
	MNB		0.2	n.d.				0.7						
	MNI		7.4	24.8				4.5						
Beavers	taxa	-	-	-	-	-	-	-	-	-	-	-	-	-
	MNB													
	MNI													
Hares	taxa	-	-	14.7	14.7	14.7	-	16.7	20.0	33.3	-	-	-	-
	MNB			n.d.	0.1	ins.		9.3	1.1	0.2				
	MNI			19.8	1.9	2.5-2.8		12.1	n.d.	1.4				

TABLE III-13
continued

		SITES **															
		14	15	16	17	18	19	20	21	22	23	24	25	26	27*	28	29
Wild cattle	taxa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	33.3	25.0
	MNB															0.2	n.d.
	MNI															4.5-5.9	4.7
Musk oxen	taxa	-	-	9.1	-	-	-	-	-	-	-	-	-	-	-	-	-
	MNB			2.2													
	MNI			5.5													
Steppe marmots	taxa	-	-	9.0	11.1	-	-	-	-	-	20.0	-	-	-	11.1	-	25.0
	MNB			0.1	11.2						ins.				1.0		n.d.
	MNI			1.3	17.1						2.0				1.5		85.9
Beavers	taxa	-	-	-	-	-	-	-	-	-	-	-	-	-	11.1	-	-
	MNB														1.0		
	MNI														1.5		
Hares	taxa	-	12.5	9.0	11.1	-	-	-	-	-	-	14.7	33.3	33.3	11.1	-	-
	MNB		40.8	0.7	6.7							0.9	n.d.	13.9	1.3		
	MNI		28.2	3.6	14.4							7 7	5.3	7.1	n.d.		

Legend: MNB = minimal number of bones; MNI = minimal number of individuals; ins. = insuffifient = 0.09%; ? = value uncertain;
* All MNI percentages at Yudinovo calculated without including reindeer or hares.

**Sites: 1. Berdyzh; 2. Chulatovo I; 3. Chulatovo II; 4. Dobranichevka; 5. Eliseevichi; 6. Fastov; 7. Gontsy; 8. Khotylevo II; 9. Kirillovskaya; 10. Klyusy; 11. Korshevo I; 12. Korshevo II; 13. Kositsa; 14. Kurovo; 15. Mezhirich; 16. Mezin; 17. Novgorod-Severskii; 18. Novo-Bobovichi; 19. Bugorok; 20. Pogon; 21. Pushkari I; 22. Pushkari II: 23. Radomyshl'; 24. Suponevo; 25. Timonovka I: 26. Timonovka II; 27. Yudinovo; 28. Yurovichi; 29. Zhuravka

TABLE III-14

LATE PLEISTOCENE SIBERIAN FAUNA
(after Kuzmina 1977:Table 1)

	MNI		Kilograms	Total	Percent of
	number	percent	per individual	kilograms	kilograms
Panthera spelaea	4	0.9	110 a	440	ins.
Gulo gulo	6	1.5	25 a	150	ins.
Alopex lagopus	4	0.9	5 a	20	ins.
Canis lupus	11	2.7	30 a	330	ins.
Thalacrctos maritimus	1	0.2	500 a	500	ins.
Ursus arctos	1	0.2	150 a	150	ins.
Mammuthus primigenius	94	23.1	3,000 c	282,000	66.5
Equus caballus	88	21.5	290 c	25,520	6.0
Coelodonta antiquitatis	24	5.9	2,800 c	67,200	15.9
Alces alces	9	2.2	370 a	3,330	0.8
Cervus elaphus	2	0.5	220 c	440	ins.
Rangifer tarandus	61	14.9	100 c	6,100	1.5
Bison priscus	68	16.6	500 c	34,000	8.2
Ovibos moschatus	26	6.4	180 c	4,320	1.1
Saiga tatarica	2	0.5	50 a	100	ins.
Lepus tenaiticus	8	2.0	6 c	48	ins.
Sample size N =	409				

Legend: a. Guthrie 1968; b. Pidoplichko 1969; c. Table III-16; MNI- minimal number of individuals.

TABLE III-15
FAUNA FROM LATE PLEISTOCENE BERELYOH
(after Vereschagin 1977:Table 2)

	MNI		Kilograms	Total	Percent of
	number	percent	per individual	kilograms	kilograms
Lagopus lagopus	1	0.6	3 b	3	ins.
Panthera spelaea	1	0.6	240 a	240	ins.
Gulo gulo	4	2.6	25 a	100	ins.
Mammuthus primigenius**	140	89.8	3,000 b	420,000	98.8
Equus caballus*	3	1.9	290 b	870	0.2
Coelodonta tichorhinus	1	0.6	2,200 b	2,200	0.5
Bison priscus	2	1.3	500	1,000	0.2
Rangifer tarandus	4	2.6	100	400	<0.1
Sample size N=	156				

Legend: * Vereschagin 1977 identified this species as Equus lanensis, following Azzaroli (1982: personal communication) I list all Late Pleistocene horses as Equus caballus; a. Table III-14; b. Table III-16; ins.= <0.09; MNI - minimal number of individuals.
** Vereschagin reports 140 mammoths at Berelyoh, Zherehova (1977) estimated 166 on teeth (see Table 22) - I have decided to use Vereschagin's values when dealing with ecological reconstructions and Zherehova's when discussing demographic composition of mammoth populations.

TABLE III-16

BIOMASS ESTIMATES FOR LATE PLEISTOCENE FAUNA

Taxa:	Live Weight in Kilograms	Usable Meat in Kilograms**	Kilo-Calories Per Kilograms	Kilo-Calories Per Individual	Amount Needed for Daily Intake of 2,500 Calories*
Mammoth	3,000 G	1,800.00	2,000 K	360,000,000	1.25
Wooly Rhinoceros	1,200 P	720.00	1,750 K	1,260,000	1.43
Steppe Bison	500 G	300.00	2,040 K	612,000	1.23
Cattle Sp.	300 G	180.00	2,040 K	367,200	1.23
Horse Sp.	290 G	174.00	1,150 K	200,100	2.20
Giant Deer	220 (1)	132.00	1,240 K	163,680	2.00
Red Deer	220 G	132.00	1,240 K	163,680	2.00
Musk Ox	180 G	108.00	1,300 K	140,400	1.92
Deer Sp.	160 (2)	96.00	1,240 K	119,040	2.00
Boar	135 j	81.00	4,000 W	324,000	0.62
Reindeer	100 G	60.00	1,000 K	60,000	2.50
Beaver	20 j	12.00	4,000 J	48,000	0.63
Hare Sp.	6 P	3.60	1,070 K	3,852	2.34
Steppe Marmot	1 S	0.60	3,000 W	1,800	0.83
Fish	1.25 j	1.00	1,300 W	1,300	1.92
Birds	1.25 j	1.00	2,500 W	2,500	1.00

Legends: *Average daily caloric intake in Jochim 1976 given as 2,000 calories
Average caloric intake in Wing and Brown 1978 given as 2,400 calories
(assumed 2,500 calories for northern latitude inhabitants).
**Estimated as 0.60% of live weight for mammals and 0.80% of live weight for fish and birds after Wing and Brown 1979
(1) Estimated as red deer
(2) Estimated as median between red deer and reindeer

References: G - Guthrie 1968
K - Klein 1968
j - Jochim 1976
P - Pidoplichko 1969

TABLE III-17
PERCENTAGES OF MAMMALS IN SIBERIAN AND ALASKAN LATE PLEISTOCENE ASSEMBLAGES

	Live weight in kilograms	Fairbanks Creek		Engineers Creek		Cripple Creek		Gold Hills		Summarized Alaska		Berelyoh		Siberia		Summarized Siberia	
		Ind.	Bio.	Ind.	Bio.	Ind.	Bio.	Ind.	Bio.	Ind.	Bio.	Ind.	Bio.	Ind.	Bio.	Ind.	Bio.
Felis sp.	110 b	0.8	0.2	0.2	0.1	0.5	0.1	-	-	0.4	0.1	-	-	-	-	-	-
Panthera spelaea	240 c	-	-	-	-	-	-	-	-	-	-	0.6	ins.	0.9	ins.	0.8	ins.
Smilodon sp.	100 b	-	-	-	-	ins.	ins.	-	-	ins.	ins.	-	-	-	-	-	-
Gulo gulo	25 c	-	-	-	-	-	-	-	-	-	-	2.6	ins.	1.5	ins.	2.0	ins.
Alopex lagopus	5 c	-	-	-	-	-	-	-	-	-	-	-	-	0.9	ins.	0.5	ins.
Canis latrans	15 b	-	-	-	-	0.1	ins.	-	-	ins.	ins.	-	-	-	-	-	-
Canis lupus	30 c	0.9	0.1	0.5	ins.	1.2	0.1	0.7	ins.	0.8	0.1	-	-	2.7	ins.	1.4	ins.
Thalarctos maritimus	500 c	-	-	-	-	-	-	-	-	-	-	-	-	0.2	ins.	0.1	ins.
Ursus arctos	150 c	ins.	ins.	ins.	ins.	0.2	0.1	0.2	0.1	0.1	ins.	-	-	0.2	ins.	0.1	ins.
Mammuthus primigenius	3,000 a	4.7	25.9	6.7	36.0	10.9	50.8	3.4	20.9	6.5	33.4	89.8	98.9	23.1	66.5	56.6	82.7
Mastodon americanus	2,500 b	ins.	ins.	-	-	-	-	-	-	ins.	ins.	-	-	-	-	-	-
Equus caballus*	290 a	17.3	9.2	36.8	19.1	41.0	18.5	35.4	21.1	32.7	17.0	1.9	0.2	21.5	6.0	11.7	3.1
Coelodonta antiquitatis **	2,800 a	-	-	-	-	-	-	-	-	-	-	0.6	0.5	5.9	15.9	3.3	8.2
Camelops sp.	180 b	ins.	ins.	ins.	ins.	0.1	0.1	0.3	0.2	0.1	0.1	-	-	-	-	-	-
Alces alces	370 b	4.7	3.3	0.3	0.2	0.7	0.4	0.3	0.2	1.5	1.0	-	-	2.2	0.8	1.1	0.4
Cervalces sp.	350 b	0.1	0.1	0.2	0.1	0.3	0.2	-	-	0.1	0.1	-	-	-	-	-	-
Cervus elaphus	220 a	0.3	0.1	0.7	0.3	0.7	0.2	0.4	0.2	0.5	0.2	-	-	0.5	ins.	0.2	ins.
Rangifer tarandus	100 a	4.7	0.9	2.9	0.5	6.6	1.0	3.0	0.1	4.3	0.6	2.6	<0.1	14.9	1.5	8.8	0.8
Bison priscus	500 a	64.6	59.4	44.9	40.2	35.9	27.9	54.9	56.4	50.1	45.9	1.3	0.2	16.6	8.2	9.0	4.2
Bos sp.	300 a	ins.	ins.	0.3	0.2	ins.	ins.	ins.	ins.	ins.	0.2	-	-	-	-	-	-
Ovibos moschatus	180 a	0.9	0.5	6.4	3.4	1.7	0.8	1.2	0.7	2.6	1.4	-	-	6.4	1.1	3.2	0.6
Ovis nivicola	80 b	0.1	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	-	-	-	-	-	-
Saiga tatarica	50	-	-	-	-	ins.	ins.	ins.	ins.	ins.	ins.	-	-	0.5	ins.	0.2	ins.
Symbos sp.	180 b	0.6	0.2	0.2	0.1	ins.	ins.	0.2	0.1	0.3	0.1	-	-	-	-	-	-
Lepus tenaiticus	6 a	-	-	-	-	-	-	-	-	-	-	-	-	2.0	ins.	1.0	ins.
Sample size N =		2,073		595		2,293		1,004		5,965		156		409		565	
Distance from floodplain in kilometers:		30		12		6		n.d.		-		on it		n.d.		-	
Reference:		Guthrie 1968										Vereschagin 1977		Kuzmina 1977			

Legend: a. Table III-16; b. Guthrie 1968; c. Table III-14; Ind.=individuals; Bio.= Biomass; ins.= present but in quantity less than 0.09; * Vereschagin 1977 identified horses at Berelyoh as Equus lenensis, I have listed all Late Pleistocene horses as Equus caballus (Azzaroli 1982:personal communication);** Vereschagin 1977 identified this taxon as Coelodonta tichorhinus.

TABLE III-18

CRANIAL MEASUREMENTS OF LATE PLEISTOCENE AND PRESENT DAY CANIDS
(from Pidoplichko 1969:p.103)

	A	B	C	D
	specimen number			
Measurements in millimeters:	5-490	9478	5-488	5580
Maximal length	226	237	257	283
Candylo-basal length	210	215	233	248
Zygomatic width	120±	123	148±	147
Width accross postorbital processes	57.5	67	61.5	64
Interorbital width - minimal	39	44	39	40
Width between orbits	48	47	55	53
Maximal width of rostrum at canines	45	48	51	51.5
Length of rostrum from alveolus of I^1 to orbit	110	121	127	143
Length of nasal bones	80	93	92	106
Maximal width of nasal bones	23	25	26	25.5
Maximal width at of brain case at parieto-temporal suture	44.5	45	48.5	52
Maximal width between outside bulla walls	70	71.5	78	80
Alveolar length of tooth row	121	117	132	136
Maximal length and width of P^4	25x15	22x12	25x13	28x12
Maximal length and width of M^1	16x22	15x19	17x22	17x22
Malimal palate width between P^4	63	62	75	71

Provenience of specimens: A. "Dog" from Mezin cultural layer; B. Present day Ukranian sheepdog from Dnepropetrovskaya Oblast'; Wolf from Mezin cultural layer; Present day wolf from the village of Semivolki in Kiev Oblast'.

TABLE III-19

ESTIMATED DENSITIES OF MAMMOTHS IN THE STUDY AREA

Conditions: 1. Live weight of mammoth = 3,000 kilograms
2. Mammoths represented 50% of ungulate biomass

Carrying Capacity of ungulates :	Budyko 1967 800 kg / km^2	Butzer 1971 3,000 kg / km^2	Martin 1973 9,000 kg / km^2	Bourliere 1963 (African grassland) 18,000 kg / km^2
Kilograms of mammoths per square kilometer	400	1,500	4,500	9,000
Square kilometers per mammoth	7.5	2.0	0.67	0.33
A. Total number of mammoth in area of 180,000 km^2	24,000	90,000	270,000	540,000
B. Total number of mammoths in area of 90,000 km^2	12,000	45,000	135,000	270,000
C. Total number of mammoths if species was migrating seasonally	6,000	22,500	67,500	135,000

TABLE III-19
continued

D. In Mixed Forest

Conditions: 1. Mammoth live weight = 3,000 kilograms
2. Mammoths represented 50% of ungulates
3. Carrying Capacity of mammoths = 250 kg./ km^2

	Area-km^2		
	180,000	90,000	If seasonally migrating
Total number of mammoths	15,000	7,500	3,750

E. Estimates on wolf and ungulate data

Conditions: 1. Wolf densities 1-3 individuals per 100 km^2*
2. Late Pleistocene ratio of wolves to ungulates = 1:35**
3. Mammoths represented 44.7% of ungulates (individuals)**

	wolves	ungulates	mammoths
In area of 180,000 km^2	1,800-5,400	63,000-189,000	28,161-84,483
In area of 90,000 km^2	900-2,700	31,500-94,500	14,081-42,242
Total number if mammoths were seasonal migrants and the area supported only 50% of regular mammoth density			7,041-21,121

Legend: * Kirikov 1979; ** Table III-17; kg. -kilograms; km -kilometers

TABLE III-20
ESTIMATES OF MAMMOTH PUPULATIONS

Conditions : 1. Mammoth recruitment rate = 4.7% per year*
2. Area = 90,000 kilometers square
3. If seasonally migrating, mammoth populations would have been 50% of regular estimates

	Carrying Capacity after		
	Budyko 1967 800 kg / km^2	Butzer 1971 3,000 kg / km^2	Butzer 1971 Mixed Forest-500 kg /km^2
A. Total number of mammoths in area	12,000	45,000	7,500
If mammoths migrated seasonally	6,000	22,500	3,750
B. Annual recruitment number			
1. In area of 90,000 km^2	564	2,115	352
2. If mammoths migrated seasonally	282	1,057	176
C. Mezhirich - MNI found = 149			
Found MNI as percentage of recruitment			
1. In area of 90,000 km^2	26.40	7.04	42.30
2. If mammoths migrated	52.80	14.10	84.60
D. Mezin - MNI found = 116			
Found MNI as percentage of recruitment			
1. In area of 90,000 km^2	20.60	5.50	33.00
2. If mammoths migrated seasonally	41.20	11.00	66.00
E. Dobranichevka - MNI found = 93			
Found MNI as percentage of recruitment			
1. In area of 90,000 km^2	16.50	4.40	26.4
2. If mammoths migrated seasonally	33.00	8.80	52.80

* After Laws et al. 1975 rate for elephants

TABLE III-21

SPATIAL AND TEMPORAL DISTRIBUTION OF KEY LATE VALDAI RESOURCES

SPECIES	A.SPACIAL DISTRIB.		B.SOCIAL BEHAVIOR		C.TEMPORAL DISTRIBUTION			D.PELT CONDITION	E.OPTIMAL TIME FOR HUNTING	
	(1)warm weather months	(2)cold weather months	(1)aggregation	(2)Dispersal	(1)Seasonal migration	(2)short term fluctuation	(3)supra-seasonal fluctuation		(1)time	(2)location
Mammuthus primiginius	Desna region flood-plain	mid-Dnepr region flood-plain	during migration?	local-north & south	north in warm weather south in cold weather	n.d.	n.d.	n.a.	south: October-May north: July & August	gallery forest
Equus sp.	local flood-plain	local flood-plain	late summer	fall, winter, spring	local	n.d.	n.d.	n.a.	late summer-August	flood-plains
Rangifer tarandus	?	gallery forest-flood-plain	n.d.	n.d.	n.d.	warm weather births	100-year population density oscillations	n.a.	October-April?	flood-plains
Marmota bobac	inter-fluves	inter-fluves hibernation	permanent	none	available warm months only	warm weather births	n.d.	n.a.	July & August	inter-fluves
Lepus sp.	local gallery forest	local gallery forest	late summer to 700 indiv.	fall, winter, spring	north in warm weather? south in cold weather?	warm weather multiple litters	9-10 year population oscillations	mid-October to mid-December	Late summer-August also December	gallery forest
Alopex lagopus	gallery forest?	gallery forest?	during migration	n.d.	migrate in winter into study area?	warm weather births	3-4 year population cycles; 10-20 year population cycles	December to February	December to February	gallery forest
Canis lupus	gallery forest	gallery forest	none	permanent	local	warm weather births	9-10 year population cycles	November-January	November to January	flood-plains-gallery forest

TABLE III-22

AGE AND SEX COMPOSITION OF BERELYOH MAMMOTHS

(After Zherehova 1977: p. 56)

AGE GROUPS:	0-2		2-5		5-10		10-20		>20		>30		
	MNI		MNI		MNI		MNI		MNI		MNI		
	#	%	#	%	#	%	#	%	#	%	#	%	N
A. MALES	2	3.0	4	6.1	13	19.7	18	27.3	16	24.2	13	19.7	66
B. FEMALES	2	2.0	6	6.0	24	24.0	18	18.0	28	28.0	22	22.0	100
C. ALL MAMMOTHS	4	2.4	10	6.1	37	22.1	36	21.7	44	26.4	35	21.0	166

Legend: # - MNI

% - percentage of individuals

TABLE III-23

DEMOGRAPHIC COMPOSITION OF MAMMOTHS FROM BERELYOH , UPPER PALEOLITHIC RUSSIAN PLAIN, AFRICAN HERDS, AND PALEO-INDIAN NEW WORLD SITES

age in years:	Juveniles (0-9)		Young (10-20)		Young Adult (20-30)		Mature >30		Total Sample
	#	%	#	%	#	%	#	%	
SITES:									
Berelyoh , Siberia a.	51	30.7	36	21.7	44	26.5	35	21.1	166
Old World Upper Paleolithic Sites: b.									
Dobranichevka, USSR	2	20.0	6	60.0	2	20.0	-	-	10
Mezhirich, USSR e	50	45.9	41	37.6	17	15.6	1	0.9	109
Mezin, USSR	9	20.5	12	27.3	14	31.7	9	20.9	44
Radomyshl', USSR	11	29.7	6	16.2	14	37.9	6	16.2	37
All Old World Sites	72	36.0	65	32.5	47	23.5	16	8.0	200
New World Paleo-Indian Sites: c.									
Blackwater Draw, USA	-	-	-	-	1	16.7	5	83.3	6
Dent, USA	4	30.7	4	30.7	4	30.7	1	7.9	13
Lehner Ranch, USA	3	21.5	8	57.1	3	21.4	-	-	14
Miami, USA	2	40.0	-	-	2	40.0	1	20.0	5
Murray Springs, USA	-	-	-	-	-	-	4	100.0	4
Pooled Dent, Lehner, and Murray Springs	9	28.1	12	37.5	9	28.1	2	6.3	32
All New World Sites	9	21.4	12	28.6	10	23.8	11	26.2	42
African Elephants: c.									
Samples 34- 47	5	41.6	2	16.7	4	33.4	1	8.3	12
52- 61	3	30.0	3	30.0	2	20.0	2	20.0	10
108-114	2	25.0	3	37.5	1	12.5	2	25.0	8
25- 33	3	30.0	3	30.0	4	40.0	-	-	10
130-135	1	16.6	3	50.0	2	33.4	-	-	6
88- 92	2	40.0	2	40.0	-	-	-	-	5
71- 82	6	42.8	2	14.3	4	28.6	2	14.3	14
207-217	2	16.7	4	33.3	4	33.3	2	16.7	12
218-226	2	22.2	4	44.5	1	11.1	2	22.2	9
227-235	4	44.5	1	11.1	3	33.3	1	11.1	9
236-245	1	9.1	4	36.4	5	45.4	1	9.1	11
298-310	3	23.1	4	30.7	5	38.5	1	7.7	13
311-322	5	41.6	4	33.4	3	25.0	-	-	12
333-336	-	-	2	50.0	1	25.0	1	25.0	4
Pooled African Data	39	28.9	41	30.4	39	28.9	16	11.8	135

Legend: - none; References: a. from Vereschagin 1977;
b. Kornietz 1962; c. Saunders 1980; d. Pidoplichko 1976

TABLE III-24

RESULTS OF KOLOMOGOROFF-SMIRNOV TWO SAMPLES TESTS ON ELEPHANT AND MAMMOTH DATA FROM THE SITES
DF=2

Sites and Samples:	N_1	N_2	D	X^2	p
I. Berelyoh vs Pooled African Elephants	166	135	0.09	2.23	0.30
II. Berelyoh vs Paleo-Indian Sites					
a. Berelyoh vs Blackwater Draw	166	6	0.62	8.86	0.01
b. Berelyoh vs Dent	166	13	0.13	0.84	0.70
c. Berelyoh vs Lehner	166	14	0.35	6.33	0.05
d. Berelyoh vs Miami	166	5	0.22	0.93	0.70
e. Berelyoh vs Murray Springs	166	4	0.79	9.70	0.01
f. Berelyoh vs Pooled Paleo-Indian Data	166	42	0.10	1.34	0.70
III. Berelyoh vs Old World Sites					
a. Berelyoh vs Dobranaichvka	166	10	0.38	5.47	0.10
b. Berelyoh vs Mezhirich	166	109	0.20	10.53	0.01
c. Berelyoh vs Mezin	166	44	0.10	1.39	0.50
d. Berelyoh vs Radomyshl'	166	37	0.12	1.80	0.50
e. Berelyoh vs Pooled Old World Data	166	200	0.13	6.08	0.05

TABLE IV-1
STYLISTIC CHRONOLOGIES

TIME			Boriskovskii 1953		Efimenko 1938			Shovkoplyas 1965a, 1967			Voevodskii 1952		
MESO-LITHIC	EARLY		II	Zhuravka									
			I	Chulatovo II, Kirillovskaya (ul), Gontsy (ul)									
UPPER PALEOLITHIC	LATE	MAGDALENIAN	VII	Bugorok, Gontsy (ll)	AZILLIAN		Yurovichi	MAGDALENIAN	L	Pastov	MAGDALENIAN	L	Bugorok, Chulatovo II, Gontsy, Kirillovskaya, Timonovka I
			VI	Chulatovo I, Suponevo, Timonovka I	MAGDALINEAN	L	Kirillovskaya (ul), Zhuravka		M	Bugorok, Chulatovo II, Dobranichevka, Gontsy		M	
						M	Gontsy, Timonovka I(?)		E	Chulatovo I, Eliseevichi, Kirillovskaya, Suponevo, Timonovka I, Yudinovo Mezin		E	Chulatovo I, Mezin, Suponevo
			V	Eliseevichi, Kirillovskaya (ll), Mezin, Pogon		E	Suponevo Eliseevichi Timonovka I Kirillovskaya Mezin	AURIGNACO-SOLUTREAN		Novgorod-Severskii, Pogon	SOLUTREAN	L	
	MIDDLE	AURIGNACO-SOLUTREAN	IV	Novgorod-Severskii, Pushkari I	SOLUTREAN	L				Berdyzh		M	
						M	Berdyzh			Yurovichi		E	Pogon, Pushkari I
			III			E				Klyusy / Pushkari			
	EARLY		II		AURIGNACIAN			AURIGNACIAN		Radomyshl'	AURIGNACIAN		

Legend:
ll - lower layer
ul - upper layer

TABLE IV-2
STYLISTIC DATING OF THE SITES

	Mousterian	Upper Paleolithic	Early Upper Paleolithic	Late Upper Paleolithic	Aurignacian	Solutrean	Gravettian	Magdalenian	Azilian
Berdyzh					15;17;28	7 8M		26E	
Chulatovo I								27E;20L;27L	
Chulatovo II								1L;20L;27L	
Dobranichevka				23L				9L	
Eliseevichi							4	8E;17;20	
Fastov								L2;19L;20L	
Gontsy	14							2M;19M;8M;20L	
Khotylevo II								1E;20E;27L	
Kirillovskaya	12								
Klyusy			21L						
Korshevo I				24					
Korshevo II				24					
Kositsa				25					
Kurovo		17							
Mezhirich					15	7L;8L		1E;9L;20E	
Mezin								9L;23L	
N.-Severskii						20L		20E;26E;16	
N.-Bobovichi		2							
Pushkari Group									
Bugorok								1L;19L;27L	
Pogon					22	27E;1L;20L		1E;20E	
Pushkari I			3		L1;27L 22	27E			
Pushkari II				27E					
Radomyshl'					13;21				
Suponevo					28	11;8L		20E;27E;17;7L	
Timonovka I					11L			20E;1;8;27L	
Timonovka II				10					
Yudinovo							5L	17L;20E	
Yurovichi				6	20		5L	20E;17	8
Zhuravka					18			9;8L	2

References

1. Boriskovskii 1953
2. Boriskovskii and Praslov 1964
3. Boriskovskii et al. 1981
4. Budko 1962
5. Budko 1966
6. Budko and Mitrofanov 1967
7. Efimenko 1938
8. Efimenko 1953
9. Gladkih 1973
10. Grehova 1970
11. Gorodtsov 1923
12. Hvoika 1901
13. Ivanova 1969
14. Kaminskii 1873
15. Mirchink 1934
16. Pidopchichko 1963
17. Polikarpovich 1963
18. Rudinskii 1929
19. Shovkoplyas 1956
20. Shovkoplyas 1965a
21. Shovkoplyas 1967
22. Shovkoplyas 1971
23. Shovkoplyas 1976
24. Tarasov 1977
25. Tarasov 1981
26. Voevodskii 1940
27. Voevodskii 1952b
28. Zamyatnin 1951

Legend: E - Early, M - Middle, L - Late } follows author where specified in text

TABLE IV-3

A. STYLISTIC CHRONOLOGY

Time	After Gladkih 1973; Personal Communication 1977
20,000 B.P.	Chulatovo I, II; Kirillovskaya; Mezin; Pogon; Suponevo; Yudinovo; Yorovichi Gontsy Mezhirich Dobranichevka Zhuravka
30,000 B.P.	Radomyshl' Pushkari I; Klyusy Novgorod-Severskii Eliseevichi

B. STYLISTIC CHRONOLOGY

Time	After Gvozdover in Lazvkov et al. 1981; Personal Communication 1978
Late UPPER PALEOLITHIC Early	Timonovka I, II; Yudinovo Zhuravka Gontsy; Mezhirich Mezin Pushkari I; Pogon; Klyusy Radomyshl'

Legend: [ ] --Sites enclosed more or less contemporary

TABLE IV-4

STRATIGRAPHIC DATING OF THE SITES

Sites	General Stratigraphy			Velichko's Scheme				Terraces		References
	Valdai	Early Valdai	Late Valdai	Bryansk Soil	Loess II	Gley Layer	Loess III	First	Second	
Berdyzh					6				23,8,10	1.Belyaeva, pers. comm. 1982
Chulatovo I	19								8	2.Boriskovskii 1953
Chulatovo II					19		22			3.Boriskovskii et al. 1981
Dobranichevka							17			4.Boriskovskii and Praslov 1964
Eliseevichi			~8	6,23		19,20			7,16	5.Budko 1967b
Fastov	UNDATED									6,Budko and Voznyachuk 1969a
Gontsy									8	7.Gladkih 1973
Khotylevo II				21						8.Gromov 1948*
Kirillovskaya									8,13	9.Ivanova 1969
Klyusy	UNDATED									10.Kaletchitz 1972
Korshevo I	UNDATED									11.Klein 1973
Korshevo II	UNDATED									12.Kornietz et al. 1981
Kositsa							18?			13.Pidoplichko 1969
Kurovo									8	14.Polikarpovich 1968
Mezin			15,19						15~	15.Shovkoplyas 1965a
Mezhirich									~12	16.Shovkoplyas 1967
N.-Severskii	UNDATED									17.Shovkoplyas 1981
N.-Bobovichi									14	18.Tarasov 1981
Pushkari Group										19.Velichko 1961
Bugorok							19			20.Velichko et al. 1977c
Pogon					19					21.Velichko et al. 1981a
Pushkari I					19		1?			22.Voevodskii 1952a
Pushkari II			8							23.Voznyachuk 1973
Radomyshl'	UNDATED									24.Voznyachuk and Budko 1969b
Suponevo							19		8,19	25.Voznyachuk et al. 1969a
Timonovka I				6			19,21L			
Timonovka II							21L		10,8,25	
Yudinovo							19L	19	10,14,25	
Yurovichi									10,8,14,5	
Zhuravka								2,3,7	8	

Legend: L - late
~ - equivalent to assigned terrace
* - present day equivalents
? - possible

TABLE IV-5
GEOCHRONOLOGIC DATING OF SOME SITES

Gromov 1948		Klein 1973		Velichko 1961	
				TIMONOVKA SOIL	
LATE	Gontsy, Yurovichi	LATE			Timonovka I,II,Yudinovo
				LOESS III	
	Bugorok, Chulatovo I,II, Eliseevichi, Mezin, Suponevo, Pushkari II		Berdyzh, Bugorok, Chulatovo I, Dobranichevka, Eliseevichi, Fastov (?),Gontsy (?),Kirillovskaya (?),Klyusy (?), Mezhirich(?), Mezin, Novgorod-Severskii(?),Novo-Bobovichi(?), Radomyshl'(?), Suponevo, Timonovka I,II,Yudinovo, Yurovichi, Zhuravka(?)		Bugorok, Suponevo ↑Mezin↓ ?
				GLEY LAYER	Eliseevichi
	Novgorod-Severskii, Pogon Pushkari I			LOESS II	
		WÜRM			Chulatovo II Pogon, Pushkari I
EARLY	Novo-Bobovichi (?)	MIDDLE	Chulatovo II, Pogon, Pushkari I	BRYANSK SOIL	
	Berdyzh (?)				Khotylevo II
	Undatable: Kurovo ? -uncertain dating		? -uncertain dating		Undatable: Chulatovo I ? -uncertain dating

TABLE IV-6
BIOLOGICAL DATA ON THE TIME OF OCCUPATION OF THE SITES

A NUMBER	B SITE	C AVIFAUNA	D MICROFAUNA	E MOLLUSCS	F POLLEN	G CLIMATIC OSCILLATION RANK	H GEOLOGICAL
1	Berdyzh	C	W	ND	C	C? - 3	4
2	Chulatovo I	ND	C	ND	ND	C - 4	ND
3	Chulatovo II	ND	W	ND	ND	W - 1	4
4	Dobranichevka	ND	W	ND	W	W - 1	2/4
5	Eliseevichi	ND	C	ND	C?	C? - 3	2
7	Gontsy	ND	W	W	ND	W - 1	ND
8	Khotylevo II	W	C	ND	C	C - 3	1
15	Mezhirich	W	W	C/W	W	W - 2	ND
16	Mezin	C	C	C	ND	C - 1	ND
17	Novgorod-Severskii	W	C	W	ND	W - 2	ND
21	Pushkari I	ND	C	ND	ND	C - 4	4
22	Pushkari II	ND	C	ND	ND	C - 4	4
26	Timonovka II	ND	ND	ND	W	W? - 1	4?
27	Yudinovo	ND	C	W	ND	C/W? 2/3	4
29	Zhuravka	ND	W	ND	ND	W 1	ND

Legend:
ND -- No Data Available
C -- Cold Predominance
W -- Warm Predominance
C/W -- No Predominance

TABLE IV-7

CLIMATIC RANKING OF THE SITES ON BIOLOGICAL DATA

NORTHERN SITES	WARM	SOUTHERN SITES
Chulatovo II; Timonovka	1	Dobranichevka; Gontsy; Zhuravka
Novgorod-Severskii Yudinovo (?)	2	Mezhirich
Berdyzh; Eliseevichi (?); Khotylevo II	3	
Chulatovo I; Mezin; Pushkari I, II	4	
	COLD	

TABLE IV-8

RADIOCARBON DATES FOR UPPER PALEOLITHIC SITES ON THE CENTRAL RUSSIAN PLAIN

Site #	Site Name	Date	Lab #	Material Dated	Provenience	Reference
1	Berdyzh	23,430 ± 180*b	LU 104	mammoth tooth	cultural layer	Kurenkova 1978
5	Eliseevichi	33,000 ± 400*a	GIN 80	wood? bone? loess-loam?	cultural layer	Klein 1973
		20,570 ± 430	LE 450	burnt wood	unclear	Kurenkova 1978
		17,340 ± 170	LU 360	mammoth tooth	cultural layer	"
		15,600 ± 1,350	QC 889	burnt bone (gas count)	cultural layer	This Report
		14,470 ± 100	LU 126	mammoth tooth	cultural layer	Kurenkova 1978
		12,970 ± 140	LU 102	mammoth tooth	cultural layer	"
7	Gontsy	13,400 ± 185	QC 898	burnt bone	cultural layer, storage pit	This Report
8	Khotylevo II	24,950 ± 400	IGAN 73	mammoth tooth	cultural layer	Velichko et al. 1981
		23,660 ± 270	LU 359	mammoth tooth	cultural layer	"
15	Mezhirich	17,855 ± 950	KI 1054	bone	cultural layer	Kornietz et al. 1981
		15,245 ± 1,080	QC 900	burnt bone (gas count)	cultural layer, dwelling 4	This Report
		14,320 ± 270	QC 897	burnt bone	cultural layer, dwelling 1	This Report
16	Mezin	21,600 ± 2,200*b	GIN 4	mammoth bone	n.d.	Ivanova et al. 1963
20	Pogon	18,690 ± 770	LU 361	mammoth tooth	cultural layer	Kurenkova 1978
21	Pushkari I	16,775 ± 605	QC 899	burnt bone	cultural layer	This Report
26	Timonovka II	15,110 ± 530	LU 358	mammoth tooth	cultural layer	Kurenkova 1978
27	Yudinovo	15,660 ± 180	LU 127	mammoth tooth	cultural layer	Kurenkova 1978
		13,830 ± 850	LU 103	burnt bone	cultural layer	"
		13,650 ± 200	LU 153	n.d.	cultural layer	"
28	Yurovichi	26,470 ± 420*b	LU 125	mammoth tooth	cultural layer	Kurenkova 1978

Laboratories: GIN -- Institute of Geology, Academy of Sciences, USSR
IGAN -- Institute of Geography, Academy of Sciences, USSR
KI -- Institute of Geochemistry and Mineral Physics, Academy of Sciences, USSR
LE -- Institute of Archaeology, Leningrad Division, Academy of Sciences, USSR
LU -- Leningrad University, USSR
QC -- Queens College, City University of New York, USA

*Problematic Dates: a provenience
b redeposition

TABLE IV-9
COMPARISON OF C 14 DATES FROM TWO MEDIA

TIME B.P.	MAMMOTH TEETH	BURNT BONE
10,000		
12,000	ELISEEVICHI — 12,970 ±140	GONTSY: 13,400 ±185
		YUDINOVO: 13,830 ±850
14,000	14,470 ±100	MEZHIRICH 14,320 ±270; 15,245 ±1080
	TIMONOVKA II: 15,110 ±530	
	YUDINOVO: 15,660 ±180	ELISEEVICHI: 15,600 ±1350
16,000	ELISEEVICHI — 17,340 ±170	PUSHKARI I: 16,775 ±605
18,000	POGON: 18,690 ±770	
20,000		
22,000	BERDYZH: 23,430 ±180	
24,000	KHOTYLEVO II 23,660 ±270; 24,960 ±270	
26,000	YUROVICHI: 26,470 ±420	

TABLE IV-10
SUGGESTED CHRONOLOGICAL ORDERING OF THE SITES

TIME B.P.	Late Valdai Climate (Dolukhanov and Pashkevich 1977)		Late Valdai Stratigraphy ammended after Velichko 1961		Periods	Colder Periods	No Information on Climate	Warmer Periods
A	B		C			D	E	F
	Dryas III	s	Contemporary Soil					
	Alleröd	i						
12,000	Dryas II	s	Loess III	- Gley Layer? Timonovka-Soil?				
	Bölling	i						
	Dryas I	s						
14,000	Raunis	i		- Gley Layer? Timonovka-Soil?	3	Chulatovo I,Eliseevichi, Klyusy(?),Mezhirich, Mezin, Pushkari I,II,Yudinovo(?)	Fastov, Kirillovskaya, Korshevo I,II,Kositsa, Kurovo, Novo-Bobovichi,Suponevo	Chulatovo II,Dobranichevka, Gontsy, Novgorod-Severskii, Timonovka I(?),II,Yudinovo(?), Zhuravka
	Lascaux	i		- Gley Layer II?		Possibly: Berdyzh(?) and Khotylevo II(?)	Possibly: Radomyshl'(?), Yurovichi(?)	
16,000								
	Laugerie	i	Gley Layer I					
18,000			Loess II		2	V A L D A I M A X I M U M		
20,000								
22,000					1			
	Tursac	i				Berdyzh (?),Khotylevo II(?)	Radomyshl' (?)	
24,000			Bryansk Soil					
26,000	Salpetriere	i					Yurovichi (?)	

Legend: i = interstadial; s = stadial; ? - uncertain

TABLE IV-11

NEAREST NEIGHBOR DISTANCES* OF EARLY UPPER PALEOLITHIC SITES OF THE CENTRAL RUSSIAN PLAIN

		BERDYZH	KHOTYLEVO II	RADOMYSHL'	YUROVICHI
A.	ALL				
	Berdyzh	0	230	250	140
	Khotylevo II	230	0	430	350
	Radomyshl'	250	430	0	120
	Yurovichichi	140	350	120	0
B.	WITH DWELLINGS				
	Berdyzh			250	
	Radomyshl'	250			
C.	WITHOUT DWELLINGS				
	Khotylevo II				350
	Yurovichi		350		

*Distances in Kilometers

TABLE V-1

GRINDING STONES AND SLABS OF SANDSTONE, QUARTZITE, AND FLINT AT STUDY SITES

Columns	1	2	3	4	5
Sites	Number Found	Used On	Ocher	Worked Bone	Storage Pits
1. Berdyzh				+	+
2. Chulatovo I				+	
3. Chulatovo II	22	nd	+	+	
4. Dobranichevka	>1	Ocher	+	+	+
5. Eliseevichi			+	+	+
6. Gontsy	Some	Bone	+	+	+
7. Khotylevo II			+	+	+
8. Kirillovskaya				+	
9. Kositsa	Some	nd	+		
10. Mezhirich	~8	Ocher	+	+	+
11. Mezin	~13	nd	+	+	+
12. N.-Severskii				+	
Pushkari Group					
13. Pogon			+		
14. Pushkari I	Some	nd	+	+	+
15. Pushkari II	1	Ocher	+		
16. Radomyshl'					+
17. Suponevo			+	+	+
18. Timonovka I	84	Ocher	+	+	+
19. Timonovka II	Some	Ocher	+	+	+
20. Yudinovo			+	+	+
21. Yurovicki	Some	nd	+	+	

Legend: nd - no data
+ - present
u - about

TABLE V-2

ϕ ASSOCIATIONS AND FISHER'S EXACT TESTS

	N	ϕ	p
1. Sites with storage pits and sites with dwellings	29	0.60	0.004
2. Grinding stones and worked bone	29	0.37	0.04
3. Grinding stones and ocher	29	0.66	0.0004
4. Grinding stones and storage pits	29	0.33	0.06
5. Sites with mammoth dwellings and low diversity index	19	0.41	0.05
6. Sites with mammoth dwellings and floodplain location	17	0.65	0.01
7. Sites with mammoth dwellings and multi-seasonal fauna	18	0.64	0.01
8. Sites with storage pits and multi-seasonal fauna	21	0.28	0.17
9. All time number of cold and warm weather occupied sites in the north versus south	21	0.18	0.27
10. Late sites: number of cold and warm weather occupations in north versus south	17	0.20	0.29
11. Early versus late sites - number of cold weather and warm weather occupied sites	20	0.13	0.43
12. Northern sites occupied in warm and cold weather months - early versus late	14	0.17	0.40

TABLE V-3

DISTRIBUTION OF GRINDING STONES IN THE STUDY AREA

	Study Area			North			South		
	Total Number of Sites	Number of Sites Where Found	Percent of Sites Where Found	Total Number of Sites	Number of Sites Where Found	Percent of Sites Where Found	Total Number of Sites	Number of Sites Where Found	Percent of Sites Where Found
A. All Time Sites	29	15	52%	22	8	36%	7	3	43%
B. Early Sites	4	1	25%	3	1	33%	1	0	0%
C. Late Sites	25	9	36%	19	6	32%	6	3	50%

TABLE VI-4

STORAGE PITS AT THE SITES

Sites	Interior						Exterior						Σ Mean Large Pit Volume-m^3
	Large			Small			Large			Small			
	# Found	Mean Volume	Σ Mean Volume	# Found	Mean Volume	Σ Mean Volume	# Found	Mean Volume	Σ Mean Volume	# Found	Mean Volume	Σ Mean Volume	
Berdyzh	1	$0.2m^3$	$0.2m^3$				3	$0.9m^3$	$2.7m^3$				2.7
Chulatovo II										few	$0.005m^3$	$0.01m^3$	
Dobranichevka							12	$2.5m^3$	$30.0m^3$				30.0
Eliseevichi	1?	nd	nd				>5	$\sim 2.0m^3$	$\sim 10.0m^3$				10.0
Gontsy				3	$0.03m^3$	$0.09m^3$	5.5*	$1.5m^3$	$\sim 8.3m^3$				8.3
Khotylevo II							some	nd	nd				
Kirillovskaya	nd			nd									
Mezhirich							2	$1.6m^3$	$3.2m^3$				3.2
Mezin							7.5*	$1.9m^3$	$13.1m^3$	>4	nd	nd	13.1
Pushkari I				~50	$0.007m^3$	$0.04m^3$				3	~0.007	$0.021m^3$	
Radomyshl'							1	$3.14m^3$	$3.14m^3$				3.14
Suponevo							1.5*	$0.8m^3$	$1.2m^3$				1.2
Timonovka I							2?	nd	nd				nd
Timonovka II							2	$0.9m^3$	$1.9m^3$	1	$0.007m^3$	$0.007m^3$	1.9
Yudinovo				~11	$0.003m^3$	$0.03m^3$	some?	nd	nd				

nd = no data * mean number found
~ = about

TABLE V-5

DIFFERENCE OF MEANS TESTS ON STORAGE PITS

	N	$\bar{X}_1$	$\bar{X}_2$	z	P
1. Large pits vs small pits - number	109	1.870	0.008	16.90	<0.0001
2. Large pits: north vs south - volume	9	5.72	11.16	0.92	0.36
3. Large pits: early vs. late - volume	9	2.90	8.79	1,87	0.06
4. Large pits, late: north vs south - volume	7	6.43	13.83	1.03	0.30

TABLE V-6

DENSITY OF FAUNA PER M^2 AT IN-SITU SITES

A. Taxa used as food

	Birds		Fish		Mammoths		Horses		Rhinoceri		Boars		Summed Cervids*		Reindeer	
	MNB	MNI	MNB	MNI	MNB	MNI	MNB	MNI	MNB	MNI	MNB	MNI	MNB	MNI	MNB	MNI
1. Berdyzh	-	-	-	-	n.d.	0.130	n.d.	0.003	n.d.	0.0028	-	-	-	-	-	-
3. Chulatovo II	-	-	-	-	n.d.	0.010	n.d.	0.007	n.d.	0.0120	-	-	-	-	n.d.	0.0020
4. Dobranichevka	0.0005	0.0005	-	-	1.380	0.050	-	-	0.0010	0.0005	-	-	-	-	0.0150	0.0025
5. Eliseevichi	-	-	0.025	0.017	19.560	0.100	0.002	0.002	-	-	-	-	0.0016	0.0016	0.0030	0.0016
6. Pastov	-	-	-	-	1.160	0.050	0.290	0.020	-	-	-	-			-	-
7. Gontsy	-	-	-	-	4.880	0.010	-	-	-	-	0.005	0.012	-	-	1.2090	0.0171
8. Khotylevo II	0.240	0.058	-	-	1.230	n.d.	-	-	0.0040	0.0020	-	-	-	-	-	-
9. Kirillovskaya	-	-	-	-	0.060	0.010	-	-	0.0005	0.0003	-	-	-	-	-	-
11. Korshevo I	-	-	-	-	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
12. Korshevo II	-	-	-	-	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
13. Kositsa	-	-	-	-	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
15. Mezhirich	0.149	0.053	0.002	0.002	7.240	0.290	0.004	0.004	-	-	0.004	0.002	-	-	0.0810	0.0197
16. Mezin	0.018	0.007	-	-	3.320	0.100	0.550	0.050	0.014	0.0025	0.001	0.001	0.0008	0.0008	0.3700	0.0692
Pushkari Group																
19. Bugorok	-	-	-	-	n.d.	n.d.	-	-	-	-	-	-	-	-	-	-
20. Pogon	-	-	-	-	n.d.	n.d.	-	-	-	-	-	-	-	-	-	-
21. Pushkari I	-	-	-	-	0.500	0.170	0.160	0.008	-	-	-	-	0.0025	0.0045	0.0020	0.0025
22. Pushkari II	-	-	-	-	20.170	0.290	0.020	0.020	0.2413	0.0344	-	-	-	-	0.1030	0.0172
23. Radomyshl'	-	-	-	-	1.900	0.080	0.010	0.002	-	-	-	-	-	-	0.0030	0.0017
24. Suponevo	-	-	0.010	0.005	1.440	0.040	0.270	0.005	0.0100	0.0050	-	-	-	-	0.0100	0.0050
25. Timonovka I	-	-	-	-	n.d.	0.080	-	-	-	-	-	-	-	-	n.d.	0.0025
26. Timonovka II	-	-	-	-	0.130	0.070	-	-	-	-	-	-	-	-	0.0610	0.0061
27. Yudinovo	-	-	-	-	0.490	0.110	-	-	0.0260	0.0140	-	-	0.0040	0.0040	0.0300	n.d.
29. Zhuravka	-	-	-	-	-	-	-	-	-	-	n.d.	0.003	n.d.	0.0030	-	-

TABLE V-6 A
continued

	All antlered taxa		Bison		Wild Cattle		Musk Oxen		Marmots		Beavers		Hares		All Food Taxa	
	MNB	MNI	MNB	MNI	MNB	MNI	MNB	MNI	MNB	MNI	MNB	MNI	MNB	MNI	MNB	MNI
1. Berdysh	-	-	-	-	n.d.	0.0028	-	-	-	-	-	-	-	-	n.d.	0.0085
3. Chulatovo II		0.0200	n.d.	0.0040	-	-	-	-	n.d.	0.0250	-	-	n.d.	0.0010	n.d.	0.0570
4. Dobranichevka	0.0150	0.0025	0.001	0.0005	-	-	0.0010	0.0005	0.002	0.0002	-	-	0.0015	0.0010	0.0070	0.0035
5. Eliseevichi	0.0046	0.0032	-	-	-	-	-	-	-	-	-	-	0.0064	0.0032	0.0296	0.0200
6. Fastov	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0900	0.0020
7. Gontsy	1.2090	0.0171	0.006	0.0024	-	-	-	-	0.045	0.0073	-	-	0.6268	0.0195	0.6828	0.0412
8. Khotylevo II	-	-	0.030	0.0020	-	-	-	-	-	-	-	-	0.0160	0.0020	0.2440	0.0600
9. Kirillovskaya	-	-	-	-	-	-	-	-	-	-	-	-	0.0001	0.0001	0.0006	0.0004
11. Korshevo I	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
12. Korshevo II	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
13. Kositsa	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
15. Mezhirich	0.0810	0.0197	0.033	0.0118	-	-	-	-	-	-	-	-	5.1831		5.3757	0.2284
16. Mezin	0.3778	0.0700	0.016	0.0012	-	-	0.0980	0.0140	0.004	0.0033	-	-	0.0308	0.0092	0.5016	0.0976
Pushkari Group																
19. Bugorok	-	-	-	-	some	some	some	some	-	-	-	-	-	-	n.d.	n.d.
20. Pogon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	n.d.	n.d.
21. Pushkari I	0.0045	0.0050	-	-	-	-	-	-	-	-	-	-	-	-	0.0045	0.0050
22. Pushkari II	0.1030	0.0172	-	-	-	-	-	-	-	-	-	-	0.0172	0.0172	0.3443	0.0510
23. Radomyshl'	0.0030	0.0017	0.002	0.0017	-	-	-	-	0.0020	0.0017	-	-	-	-	0.0140	0.0036
24. Suponevo	0.0100	0.0050	0.005	0.0050	-	-	-	-	-	-	-	-	0.0150	0.0050	0.0300	0.015
25. Timonovka I	n.d.	0.0025	-	-	-	-	-	-	-	-	-	-	n.d.	0.0008	n.d.	0.0025
26. Timonovka II	0.0610	0.0061	-	-	-	-	-	-	-	-	-	-	0.0307	0.0061	0.0610	0.0061
27. Yudinovo	0.0340	n.d.	0.052	0.0040	-	-	-	-	0.006	0.0020	0.006	0.002	0.0080	n.d.	0.0720	n.d.
29. Zhuravka	n.d.	0.0030	-	-	n.d.	0.0030	-	-	n.d.	0.054	-	-	-	-	n.d.	0.0600

TABLE V-6
continued

B. Fur bearers

	Rare Taxa**		Wolverine		Arctic Fox		Wolf		Bear		All Fur Taxa		Fur Taxa+Hares	
	MNB	MNI	MNB	MNI	MNB	MNI	MNB	MNI	MNB	MNI	MNB	MNI	MNB	MNI
1. Berdyzh	-	-	-	-	n.d.	0.003	n.d.	0.0029	n.d.	0.0057	n.d.	0.0116	n.d.	0.0116
3. Chulatovo II	n.d.	0.0230	-	-	n.d.	0.017	n.d.		n.d.	0.0010	n.d.	0.0230	n.d.	0.0430
4. Dobranichevka	-	-	0.0035	0.0005	0.033	0.007	0.026	0.0015	0.0065	0.0005	0.069	0.0065	0.070	0.0075
5. Eliseevichi	0.0096	0.0032	0.0080	0.0016	24.760	0.456	1.677	0.0578	0.1540	0.0160	26.609	0.5346	26.615	0.5378
6. Fastov	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7. Gontsy	0.0024	0.0024	0.0061	0.0024	0.080	0.015	0.054	0.0061	0.0061	0.0024	0.1490	0.0283	0.176	0.0478
8. Khotylevo II	-	-	0.3180	0.0120	0.380	0.004	0.552	0.012	0.0012	0.0020	1.2790	0.0300	1.295	0.0320
9. Kirillovskaya	00004	0.0003	0.0001	0.0001	-	-	0.001	0.0001	0.0005	0.0002	0.0020	0.0007	0.002	0.0008
11. Korshevo I	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
12. Korshevo II	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
13. Kositsa	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
15. Mezhirich	0.0059	0.0039	0.1200	0.0157	0.295	0.030	0.175	0.0236	0.0236	0.0059	0.6190	0.0791	5.802	0.2346
16. Mezin	-	-	0.0233	0.0042	1.540	0.094	0.837	0.0492	0.0292	0.0058	2.429	0.1532	2.460	0.1624
Pushkari Group														
19. Bugorok	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20. Pogon	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21. Pushkari I	-	-	-	-	0.233	0.010	0.398	0.015	0.0025	0.0025	0.6330	0.0275	0.633	0.0279
22. Pushkari II	-	-	-	-	-	-	0.172	0.0689	0.0517	0.0172	0.2240	0.0861	0.241	0.1033
23. Radomyshl'			-	-	-	-	-	-	-	-	-	-	-	-
24. Suponevo	-	-	-	-	0.135	0.005	0.190	0.0100	0.0050	0.0050	0.3300	0.0200	0.345	0.0250
25. Timonovka I	-	-	-	-	n.d.	0.002	n.d.	0.0008	n.d.	0.0017	n.d.	0.0046	n.d.	0.0054
26. Timonovka II	-	-	0.0245	0.0061	0.479	0.037	0.031	0.0061	0.0061	0.0061	0.5410	0.0553	0.572	0.0614
27. Yudinovo	-	-	-	-	0.298	0.054	0.064	0.006o	0.0260	0.0020	0.3880	0.0620	0.396	n.d.
29. Zhuravka	-	-	-	-	n.d.	0.003	n.d.	0.0030	-	-	n.d.	0.0060	n.d.	0.006

TABLE V-6
continued

C. Microfauna

	MNB	MNI
1. Berdyzh	n.d.	0.010
3. Chulatovo II	n.d.	0.700
4. Dobranichevka	0.019	0.004
5. Eliseevichi	0.069	0.020
6. Fastov	-	-
7. Gontsy	0.037	0.015
8. Khotylevo II	0.440	n.d.
9. Kirillovskaya	-	-
11. Korshevo I	n.d.	n.d.
12. Korshevo II	n.d.	n.d.
13. Kositsa	n.d.	n.d.
15. Mezhirich	0.683	0.199
16. Mezin	0.274	0.068
Pushkari Group		
19. Bugorok	n.d.	n.d.
20. Pogon	n.d.	n.d.
21. Pushkari I	0.030	0.008
22. Pushkari II	0.086	0.034
23. Radomyshl'	-	-
24. Suponevo	0.005	0.005
25. Timonovka I	n.d.	0.001
26. Timonovka II	0.006	0.006
27. Yudinovo	0.088	n.d.
29. Zhuravka	-	-

Legend: * Summed Cervids includes Cervus elaphus, Cervus sp. and Megaloceros; ** Included cave lion, hyena, lynx, and mustelids found at singular sites; n.d. - no data; - absent.

TABLE V-7
DENSITY OF TAXA IMPORTANT IN ECONOMY

A. Minimal Number of Individuals per m^2

	I. Study Area		II. Northern Sites					III. Southern Sites				
	# sites in sample	$\bar{x}$ MNI/m^2	# sites in sample	% of sites	$\bar{x}$ MNI/m^2	% of MNI	$\bar{x}$ of MNI	# sites in sample	% of sites	$\bar{x}$ MNI/m^2	% of MNI	$\bar{x}$ of MNI
Birds	20	0.119	2	15.0	0.065	55.0	0.032	2	29.0	0.054	45.0	0.027
Fish	20	0.024	2	15.0	0.022	92.0	0.011	1	14.0	0.002	8.0	0.002
Other fur bearers*	21	0.012	2	14.0	0.005	42.0	0.003	3	43.0	0.007	58.0	0.002
Wolverine	20	0.043	4	31.0	0.024	56.0	0.006	4	57.0	0.019	44.0	0.005
Arctic fox	20	0.734	10	77.0	0.682	93.0	0.068	4	57.0	0.052	7.0	0.013
Wolf	20	0.266	11	85.0	0.232	87.0	0.021	5	71.0	0.034	13.0	0.007
Bear	20	0.074	10	77.0	0.060	81.0	0.006	4	57.0	0.014	19.0	0.003
Mammoths	17	1.590	10	100.0	1.100	69.0	0.110	6	86.0	0.491	31.0	0.080
Horses	21	0.121	7	50.0	0.095	76.0	0.010	3	43.0	0.026	22.0	0.009
Rhinoceri	20	0.071	7	54.0	0.070	99.0	0.010	2	29.0	0.0008	1.0	0.0004
Boars	20	0.018	1	8.0	0.001	6.0	0.001	3	43.0	0.017	94.0	0.006
Red deer	20	0.007	2	15.0	0.004	57.0	0.002	1	14.0	0.003	43.0	0.003
Deer sp.	20	0.002	1	8.0	0.002	100.0	0.002	-	-	-	-	-
Giant deer	20	0.003	2	15.0	0.003	100.0	0.001	-	-	-	-	-
Antlered taxa without reindeer	20	0.012	4	31.0	0.009	75.0	0.002	1	14.0	0.003	25.0	0.003
Reindeer	19	0.164	8	67.0	0.124	75.0	0.015	4	57.0	0.040	25.0	0.009
Antlered taxa with reindeer	19	0.173	8	67.0	0.129	75.0	0.023	5	71.0	0.044	25.0	0.009
Bison	20	0.031	5	38.0	0.015	48.0	0.004	4	57.0	0.016	52.0	0.004
Wild Cattle	20	0.006	1	8.0	0.003	50.0	0.003	1	14.0	0.003	50.0	0.003
Musk oxen	21	0.015	1	8.0	0.014	97.0	0.014	1	14.0	0.005	3.0	0.005
Marmots	20	0.094	3	23.0	0.030	32.0	0.010	4	57.0	0.064	68.0	0.016
Beavers	20	0.002	1	8.0	0.002	100.0	0.002	-	-	-	-	-
Hares	19	0.240	8	67.0	0.064	27.0	0.008	4	57.0	0.176	73.0	0.044
All food taxa	19	0.680	10	83.0	0.323	47.5	0.032	7	100.0	0.357	52.5	0.051

TABLE V-7
continued

B. Minimal Number of Bones per m^2

	I. Study Area		II. Northern Sites					III. Southern Sites				
	# of sites in sample	$\bar{x}$ MNB/m^2	# sites in sample	% of sites	$\bar{x}$ MNB/m^2	% of MNB	% of MNB	# sites in sample	% of sites	$\bar{x}$ MNB/m^2	% of MNB	% of MNB
Birds	20	0.401	2	15.0	0.251	63.0	0.126	2	29.0	0.150	37.0	0.075
Fish	20	0.037	2	15.0	0.035	95.0	0.018	1	14.0	0.002	5.0	0.002
Other fur bearers*	20	0.018	1	8.0	0.009	52.0	0.009	3	43.0	0.009	48.0	0.003
Wolverine	20	0.504	4	31.0	0.374	74.0	0.093	4	57.0	0.130	26.0	0.032
Arctic fox	16	28.238	7	70.0	27.830	99.0	3.970	3	50.0	0.408	1.0	0.136
Wolf	16	4.177	8	80.0	3.921	94.0	0.490	3	50.0	0.256	6.0	0.064
Bear	17	0.313	8	80.0	0.276	88.0	0.034	4	57.0	0.037	12.0	0.009
Mammoths	15	63.460	8	100.0	46.840	74.0	5.860	6	86.0	16.620	26.0	2.770
Horses	18	1.306	5	45.0	1.002	77.0	0.200	3	43.0	0.304	23.0	0.101
Rhinoceri	18	0.302	5	45.0	0.300	99.0	0.059	2	29.0	0.0015	1.0	0.0008
Boars	19	0.010	1	8.0	0.001	10.0	0.001	2	33.0	0.009	90.0	0.004
Red deer	19	n.d.	2	15.0	0.005	n.d.	0.003	1	17.0	n.d.	n.d.	n.d.
Deer sp.	20	0.002	1	8.0	0.002	100.0	0.002	-	-	-	-	-
Giant deer	19	0.003	2	16.0	0.003	100.0	0.001	-	-	-	-	-
Antlered taxa without reindeer	20	n.d.	4	31.0	0.009	n.d.	0.002	1	14.0	n.d.	n.d.	n.d.
Reindeer	21	1.786	7	50.0	0.479	27.0	0.068	4	57.0	1.308	73.0	0.327
Antlered taxa with reindeer	18	1.903	7	64.0	0.595	31.0	0.085	5	71.0	1.308	68.0	0.327
Bison	19	0.145	4	33.0	0.103	69.0	0.026	4	57.0	0.042	31.0	0.011
Wild Cattle	19	n.d.	2	15.0	n.d.	n.d.	n.d.	1	17.0	n.d.	n.d.	n.d.
Musk oxen	21	0.099	2	14.0	0.098	99.0	0.098	1	14.0	0.001	1.0	0.001
Marmots	19	0.059	2	15.0	0.010	17.0	0.005	3	50.0	0.049	83.0	0.016
Beavers	19	0.006	1	8.0	0.006	100.0	0.006	-	-	-	-	-
Hares	18	5.935	7	64.0	0.124	2.0	0.018	3	50.0	5.811	98.0	1.937
All food taxa	16	7.654	8	80.0	1.283	17.0	0.160	6	100.0	6.371	83.0	1.062

Legend: n.d. = no data; - = none; * includes cave lion, hyena, lynx, and mustelids found at singular sites

TABLE V-8

PEARSON'S COEFFICIENTS OF CORRELATION BETWEEN DENSITY CONTROLLED MNB AND MNI VALUES

A. Sites considered without chronological considerations

	N	df	r	r^2	p.
1. Fish - all sites	3	1	+0.9877	0.98	0.10
2. Birds - all sites	4	2	+0.9655	0.93	0.05
3. Summed other fur bearers* - all sites	4	2	+0.7804	0.37	>0.10
- southern sites	3	1	+0.9684	0.94	>0.10
4. Wolverine - all sites	8	6	+0.7497	0.56	0.05
- northern sites	4	2	+0.9271	0.86	≤0.10>0.05
- southern sites	4	2	+0.9951	0.00	0.01
5. Arctic fox - all sites	10	8	+0.9870	0.97	0.001
- all northern sites	7	5	+0.9874	0.97	<0.001
- northern high density sites (5,16, 26,27)**	4	2	+0.9967	0.99	0.010
- northern low density sites (8,21, 24)**	3	1	-0.2680	0.07	>0.10
- all southern sites	3	1	+0.9648	0.93	>0.10
6. Wolf - all sites	12	10	+0.6307	0.40	0.05
- all northern sites	8	6	+0.5465	0.30	>0.10
- northern high density sites (5,8,16,21)**	4	2	+0.8805	0.78	>0.10
- northern low density sites (1,3,24,25, 26,27)**	4	2	+0.5404	0.29	>0.10
- all southern sites	4	2	+0.9966	0.99	0.01
- southern low density sites (4,7,9)**	3	1	+0.9648	0.93	>0.10
7. Bear - all sites	12	10	+0.7888	0.62	0.01
- all northern sites	8	6	+0.7709	0.59	0.05
- northern high density sites (5,16,22,27)**	4	2	+0.6629	0.44	>0.10
- northern low density sites (8,21,24,26)**	4	2	+0.9907	0.99	0.01
- all southern sites	4	2	+0.9495	0.90	≈0.05
- southern low density sites (4,7,9)**	3	1	+0.5564	0.31	>0.10
8. All fur bearers excluding hares - all sites	12	10	+0.9726	0.95	<0.0001
- all northern sites	8	6	+0.9787	0.96	<0.0001
- all southern sites	4	2	+0.9898	0.98	0.02
9. Mammoths - all sites	13	11	+0.5400	0.29	0.10
- all northern sites	7	5	+0.5700	0.32	>0.10
- all southern sites	6	4	+0.7500	0.56	0.07
10. Horses - all sites	8	6	+0.8079	0.65	0.02
- all northern sites	5	3	+0.7660	0.58	>0.10
- all southern sites	3	1	+0.9928	0.99	0.10
11. Wooly Rhinoceros - all sites	7	5	+0.9558	0.91	<0.001
- all northern sites	5	3	+0.9518	0.91	0.02
12. Boar - all sites	3	1	+0.7502	0.56	>0.10
13. Summed other cervids*** - all sites	4	2	+1.0000	1.00	<0.001
14. Reindeer - all sites	10	8	+0.3391	0.11	>0.10
- all northern sites	6	4	+0.9933	0.99	<0.001
- all southern sites	4	2	+0.5318	0.28	>0.10
15. All cervids including reindeer - all sites	10	8	+0.3359	0.11	>0.10
- all northern sites	6	4	+0.9915	0.98	<0.001
- all southern sites	4	2	+0.5318	0.28	>0.10
16. Steppe bison - all sites	8	6	+0.4310	0.19	>0.10
- all northern sites	4	2	-0.4020	0.16	>0.10
- all southern sites	4	2	+0.9975	0.99	0.10
17. Steppe marmots - all sites	5	3	+0.9385	0.88	0.02
- all southern sites	3	1	+0.9862	0.97	>0.10
18. Hares - all sites	10	8	+0.9946	0.99	<0.0001
- all northern sites	6	4	0.2545	0.06	>0.10
- northern high density sites (3,16,22, 26)**	3	1	-0.9609	0.92	>0.10
- northern low density sites (5,8,24,25)**	3	1	+0.0200	0.0004	>0.10
- all southern sites	4	2	+0.9999	0.99	<0.0001
- southern low density sites (4,7,9)**	3	1	+0.9992	0.99	0.05
19. All fur bearers including hares - all sites	11	9	+0.9576	0.92	<0.0001
- all northern sites	7	5	+0.9732	0.95	<0.0001
- all southern sites	4	2	+0.0863	0.97	0.02

TABLE V-8
continued

	N	df	r	r^2	p.
20. Arctic foxes and marmots - all sites -on MNI/m^2	6	4	-0.4655	0.22	>0.10
-on MNB/m^2	4	2	-0.3691	0.14	>0.10
- all northern sites-on MNI/m^2	3	1	-0.8274	0.68	>0.10
- all southern sites-on MNI/m^2	3	1	-0.4633	0.21	>0.10
21. Summed large sized taxa used as food, northern and southern ones calculated separately - all sites	13	11	+0.9403	0.88	<0.0001
22. Summed large sized taxa used as food without consideration of regional differences in utilization - all sites	13	11	+0.6387	0.41	0.02
23. Summed all taxa used as food - northern and southern taxa calculated separately - all sites	13	11	+0.9317	0.87	<0.0001
- all northern sites	7	5	+0.9600	0.92	<0.0001
- all southern sites	6	4	+0.9988	0.99	<0.0001
24. Summed microfauna - all sites	9	7	+0.9962	0.99	<0.001
- all northern sites	6	4	+0.9834	0.97	<0.001
- all southern sites	3	1	+0.9996	0.99	0.02

B. Sites occupied late - after 18,000 B.P.

	N	df	r	r^2	p.
1. Birds - all sites	3	1	+0.9991	0.99	0.05
2. Wolverine - northern sites	3	1	+0.9329	0.87	>0.10
3. Arctic fox - all sites	9	7	+0.9885	0.98	<0.0001
- northern sites	6	4	+0.9896	0.98	<0.0001
4. Wolf - all sites	11	9	+0.6576	0.43	0.05
- northern sites	7	5	+0.5769	0.33	>0.10
- northern high density sites (5,16,21)**	3	1	+0.8720	0.76	>0.10
- northern low density sites (3,24,25,26, 27)**	4	2	+0.5404	0.30	>0.10
5. Bear - northern sites	7	5	+0.8406	0.71	0.02
- northern low density sites (21,24,26)**	3	1	+1.0000	1.00	<0.0001
6. Summed all fur bearers - northern sites	6	4	+0.9772	0.95	<0.0001
- southern sites	4	2	+0.9898	0.98	0.02
7. Mammoth - southern sites	5	3	+0.7535	0.57	>0.10
8. Horse - all sites	7	5	+0.7886	0.62	0.05
9. Wooly hinoceros - northern sites	4	2	+0.9569	0.92	0.05
10. Reindeer - southern sites	3	1	+0.4188	0.18	>0.10
11. Steppe bison - all sites	6	4	+0.4669	0.22	>0.10
- northern sites	3	1	-0.8072	0.65	>0.10
- southern sites	3	1	+0.9999	0.99	0.01
12. Steppe marmot - all sites	4	2	+0.9336	0.87	=0.06
13. Hare - all sites	9	7	+0.9948	0.99	<0.0001
- northern sites	5	3	+0.2017	0.04	>0.10
14. Summed all taxa used as food - all sites	11	9	+0.9435	0.99	<0.0001
- all northern sites	5	3	+0.9774	0.95	0.01
- all southern sites	5	3	+0.9988	0.99	0.0001

Legend: * - summed other fur taxa includes cave lion, hyena, and mustelids found at singular sites; ** sites: 1. Berdyzh, 3. Chulatovo II, 4. Dobranichevka, 5. Eliseevichi, 7. Gontsy, 8. Khotylevo II, 9. Kirillovskaya, 16. Mezin, 21. Pushkari I, 22. Pushkari II, 24. Suponevo, 25. Timonovka I, 26. Timonovka II, 27. Yudinovo; *** - summed other cervids includes red deer, deer sp., and giant deer.

TABLE V-9
COMPARISON OF PEARSON'S COEFFICIENTS OF CORRELATION
(calculated on density controlled MNB and MNI values)

A. Without consideration of chronological differences

	N_1	N_2	z_1	z_2	Z	p.
1. Summed other fur bearers* - all sites vs southern sites	4	3	+1.045	+2.092	1.05	0.23
2. Wolverine - northern vs southern sites	4	4	+1.658	+2.647	0.70	0.31
- northern sites excluding Khotylevo II vs southern sites	3	4	+1.658	+2.647	0.99	0.24
3. Arctic fox - northern vs southern sites	7	3	+2.647	+1.946	2.80	0.008
- northern high vs low density sites	4	3	+2.647	-0.277	2.92	0.005
- high density northern vs southern sites	4	3	+2.647	+1.946	2.80	0.008
- low density northern vs southern sites	3	3	-0.277	+1.946	1.58	0.11
4. Wolf - northern vs southern sites	8	4	+0.618	+2.647	1.84	0.07
- northern high vs low density sites	4	4	+1.376	+0.604	0.55	0.34
- low density northern vs southern sites	4	3	+0.604	+1.946	0.95	0.21
5. Bear - northern vs southern sites	8	4	+1.020	+1.832	0.74	0.30
- northern low vs high density sites	4	4	+2.647	+0.739	1.35	0.16
- northern low density vs southern sites	4	4	+2.647	+1.832	0.58	0.34
- northern high density vs southern sites	4	4	+2.647	+0.739	0.78	0.29
- low density northern vs southern sites	4	3	+2.647	+0.633	2.01	0.05
- northern high density vs southern low density sites	4	3	+0.793	+0.633	0.16	0.39
6. Mammoth - northern vs southern sites	7	6	+0.973	+0.648	0.43	0.36
7. Horse - northern vs southern sites	5	3	+1.02	+2.647	2.29	0.029
8. Reindeer - northern vs southern sites	6	4	+2.647	+0.590	1.78	0.08
9. All cervids - northern vs southern sites	6	4	+2.647	+0.590	1.78	0.08
10. Reindeer vs other cervids** at northern sites	4	4	+2.647	+3.800	0.82	0.29
11. Steppe bison - northern vs southern sites	4	4	-0.424	+2.647	2.18	0.04
12. Steppe marmot - all vs southern sites	5	3	+1.738	+2.647	1.28	0.18
13. Hare - northern vs southern sites	6	4	+0.255	+2.647	2.08	0.05
14. Summed fur bearers - including hares, northern vs southern sites	7	4	+2.092	+2.647	0.48	0.35
- without vs with hares, all sites	12	11	+2.092	+1.946	0.30	0.38
- without vs with hares, northern sites	8	7	+2.298	+2.092	0.31	0.38
- without vs with hares, southern sites	4	4	+2.647	+2.647	0.00	0.00
15. Microfauna - northern vs southern sites	6	3	+2.298	+2.647	1.06	0.23
- vs mammoths, all sites	9	13	+2.647	+0.604	3.93	<0.0001
- vs mammoths, northern sites	6	7	+2.298	+0.648	2.17	0.04
- vs mammoths, southern sites	3	6	+2.647	+0.973	2.89	0.006
16. Summed food taxa - northern vs southern sites	8	6	+1.946	+2.647	0.96	0.25
17. Summed food taxa vs mammoths - all sites	13	13	+1.658	+0.604	2.34	0.03
- northern sites	8	7	+1.946	+0.648	1.94	0.06
- southern sites	6	6	+2.647	+0.973	2.07	0.05
18. Summed food taxa vs microfauna - northern sites	8	6	+1.946	+2.298	0.48	0.35
- southern sites	6	3	+2.647	+2.647	0.00	0.00

B. With chronological differences considered

	N_1	N_2	z_1	z_2	Z	p.
1. Bear - northern all vs late sites	8	7	+1.020	+1.221	0.30	0.38
2. Reindeer - southern all vs late sites	4	3	+0.590	+0.448	0.14	0.39
3. Steppe bison - northern all vs late sites	4	3	-0.424	-1.127	0.70	0.31
4. Hare - northern all vs late sites	6	5	+0.255	+0.203	0.06	0.39

Legend: * Other fur bearers include cave lion, hyena, and mustelids found at singular sites;
** Other cervids include red deer, deer sp., and giant deer.

TABLE V-10
DIFFERENCE OF MEANS TESTS ON DENSITY CONTROLLED MNI AND MNB VALUES

A. All sites without consideration of chronological differences

	N	$\bar{x}_1$	$\bar{x}_2$	z	p
1. Fish - northern vs southern sites on MNI	3	0.011	0.002	2.25	0.03
- northern vs southern sites on MNB	3	0.018	0.002	3.02	0.004
2. Birds - northern vs southern sites on MNI	4	0.032	0.027	0.19	0.39
- northern vs southern sites on MNB	4	0.126	0.075	0.51	0.35
3. Summed other fur bearers* - northern vs southern sites on MNI	5	0.003	0.002	0.44	0.36
- northern vs southern sites on MNB	4	0.009	0.003	5.15	<0.0001
4. Wolverine - northern vs southern sites on MNI	8	0.006	0.005	0.25	0.39
- northern vs southern sites on MNB	8	0.093	0.032	0.90	0.27
- southern high vs low density sites-MNI	4	0.016	0.001	24.50	<0.0001
- southern high vs low density sites-MNB	4	0.120	0.003	83.57	<0.0001
- northern high vs low density sites-MNI	4	0.012	0.004	8.00	<0.0001
- northern high vs low density sites-MNB	4	0.318	0.019	74.85	<0.0001
- northern high vs low density sites excluding Khotylevo II - MNI	3	0.005	0.002	4.86	<0.0001
- northern high vs low density sites ecsluding Khotylevo II - MNB	3	0.024	0.008	39.75	<0.0001
- high density northern vs southern sites on MNI	4	0.005	0.016	15.29	<0.0001
- high density northern vs southern sites on MNB	4	0.239	0.120	297.50	<0.0001
- low density northern vs southern sites on MNI	4	0.002	0.001	1.20	0.19
- low density northern vs southern sites on MNB	4	0.009	0.003	3.57	0.0006
- northern high density vs southern low density sites on MNI	5	0.005	0.001	4.44	<0.0001
- northern high density vs southern low density sites on MNB	5	0.024	0.003	21.00	<0.0001
5. Arctic fox - northern vs southern sites - MNI	14	0.068	0.013	0.18	0.39
- northern vs southern sites - MNB	10	3.975	0.136	1.19	0.20
- northern high vs low density sites-MNI	10	0.160	0.007	1.82	0.08
- northern high vs low density sites-MNB	7	6.770	0.249	1.25	0.18
- southern high vs low density sites-MNI	4	0.030	0.007	6.97	<0.0001
- southern high vs low density sites-MNB	3	0.295	0.057	14.0	<0.0001
- high density northern vs southern sites on MNI	5	0.160	0.030	1.57	0.12
- high density northern vs southern sites on MNB	5	6.770	0.295	1.24	0.18
- low density northern vs southern sites on MNI	9	0.007	0.007	0.00	1.00
- low density northern vs southern sites on MNB	4	0.184	0.057	1.95	0.06
- low density northern vs high density southern sites on MNI	7	0.007	0.030	11.50	<0.0001
- low density northern vs high density southern sites on MNB	3	0.184	0.295	3.20	0.002
6. Wolf - northern vs southern sites - MNI	16	0.021	0.007	2.00	0.05
- northern vs southern sites - MNB	11	0.490	0.001	2.30	0.03
- northern high vs low density sites - MNI	11	0.040	0.009	2.82	0.008
- northern high vs low density sites - MNB	8	0.727	0.095	2.68	0.01
- southern high vs low density sites - MNI	5	0.024	0.003	20.90	<0.0001
- southern high vs low density sites - MNB	4	0.175	0.027	7.40	<0.0001
- high density northern vs southern sites -MNI	6	0.040	0.024	5.13	<0.0001
- high density northern vs southern sites -MNB	6	0.727	0.175	2.38	0.02
- low density northern vs southern sites - MNI	10	0.009	0.003	1.91	0.006
- low density northern vs southern sites - MNB	6	0.095	0.027	1.62	0.11
- low density northern vs high density southern sites on MNI	7	0.009	0.024	4.56	<0.0001
- low density northern vs high density southern sites on MNB	4	0.095	0.027	1.70	0.09
7. Bear - northern vs southern sites - MNI	14	0.060	0.003	1.50	0.13
- northern vs southern sites - MNB	12	0.034	0.009	1.41	0.15
- northern high vs low density sites - MNI	11	0.010	0.003	2.33	0.03
- northern high vs low density sites - MNB	8	0.065	0.004	2.36	0.02
- southern high vs low density sites - MNI	4	0.006	0.001	6.83	<0.0001
- southern high vs low density sites - MNB	4	0.024	0.004	19.60	<0.0001
- high density northern vs southern sites-MNI	5	0.010	0.006	1.42	0.14
- high density northern vs southern sites-MNB	5	0.065	0.024	1.73	0.09
- low density northern vs southern sites -MNI	10	0.003	0.001	2.0	0.05
- low density northern vs southern sites -MNB	7	0.003	0.004	0.21	0.39

TABLE V-10A
continued

	N	$\bar{x}_1$	$\bar{x}_2$	z	p
8. Mammoth - northern vs southern sites-MNI	16	0.110	0.080	0.60	0.33
- northern vs southern sites-MNB	14	5.860	2.770	1.28	0.17
9. Horse - northern vs southern sites - MNI	10	0.010	0.009	0.13	0.40
- northern vs southern sites - MNB	8	0.200	0.100	0.84	0.28
10. Wooly rhinoceros - northern vs southern sites-MNI	9	0.010	0.0004	3.20	0.002
- northern vs southern sites-MNB	7	0.060	0.001	1.30	0.17
11. Boar - northern vs soutnern sites - MNI	4	0.001	0.006	1.89	0.007
- northern vs southern sites - MNB	3	0.001	0.004	11.30	<0.0001
12. Red deer - northern vs southern sites - MNI	3	0.002	0.003	3.33	0.002
- northern vs southern sites - MNB	2	-	-	-	-
13. Summed all cervids without reindeer - northern vs southern sites - MNI	5	0.002	0.003	1.67	0.09
14. Reindeer - northern vs southern sites - MNI	12	0.015	0.010	0.56	0.34
- northern vs southern sites - MNB	11	0.068	0.327	1.00	0.24
15. Summed all cervids including reindeer					
- northern vs southern sites - MNI	13	0.016	0.009	0.08	0.40
- northern vs southern sites - MNB	11	0.085	0.327	0.93	0.26
16. Steppe bison -northern vs southern sites - MNI	9	0.004	0.0004	0.043	0.40
-northern vs southern sites - MNB	8	0.026	0.011	1.36	0.16
17. Wild cattle - northern vs southern sites - MNI	2	0.003	0.003	-	-
18. Musk ox - northern vs southern sites - MNI	2	0.014	0.0005	-	-
- northern vs southern sites - MNB	2	0.098	0.001	-	-
19. Steppe marmot - northern vs southern sitea - MNI	7	0.010	0.016	0.48	0.35
- northern vs southern sites - MNB	5	0.005	0.016	0.92	0.26
20. Hare - northern vs southern sites - MNI	12	0.008	0.044	1.09	0.22
- northern vs southern sites - MNB	10	0.018	1.937	1.43	0.14
- northern high vs low density sites - MNI	8	0.013	0.003	3.55	0.006
- northern high vs low density sites - MNB	6	0.026	0.012	3.50	0.009
- southern high vs low density sites - MNI	4	0.087	0.0005	30.20	<0.0001
- southern high vs low density sites - MNB	4	5.183	0.209	29.08	<0.0001
- high density northern vs southern sites - MNI	5	0.013	0.155	47.50	<0.0001
- high density northern vs southern sites - MNB	4	0.026	5.183	1719.00	<0.0001
- low density northern vs southern sites - MNI	6	0.003	0.007	0.98	0.25
- low density northern vs southern sites - MNB	6	0.012	0.209	1.15	0.21
21. All fur bearers including hares					
- northern vs southern sites - MNI	15	0.101	0.059	0.68	0.32
- northern vs southern sites - MNB	12	4.070	1.510	0.78	0.39
- northern high vs low density sites - MNI	10	0.350	0.040	2.32	0.03
- northern high vs low density sites - MNB	8	14.540	0.580	1.63	0.11
- southern high vs low density sites - MNI	5	0.235	0.015	22.66	<0.0001
- southern high vs low density sites - MNB	4	5.802	0.083	142.97	<0.0001
- high density northern vs southern sites - MNI	3	0.350	0.235	0.86	0.28
- high density northern vs southern sites - MNB	3	14.540	5.800	1.02	0.24
- low density northern vs southern sites - MNI	12	0.039	0.015	1.72	0.09
- low density northern vs southern sites - MNB	9	0.580	0.080	3.37	0.001
22. Arctic foxes and wolves at high density northern vs southern sites - MNI	3	0.299	0.054	2.27	0.03
23. Summed taxa used as food (excluding mammoths)					
- northern vs southern sites - MNI	17	0.032	0.051	0.63	0.33
- northern vs southern sites - MNB	14	1.062	0.160	1.14	0.21
- northern high vs low density sites - MNI	9	0.070	0.010	5.08	<0.0001
- northern high vs low density sites - MNB	8	0.363	0.039	5.23	<0.0001
- southern high vs low density sites - MNI	8	0.228	0.021	23.00	<0.0001
- southern high vs low density sites - MNB	6	5.376	0.199	43.65	<0.0001
- high density northern vs southern sites - MNI	4	0.070	0.228	14.40	<0.0001
- high density northern vs southern sites - MNB	4	0.363	5.376	80.85	<0.0001
- low density northern vs southern sites - MNI	11	0.010	0.021	1.28	0.18
- low density northern vs southern sites - MNB	10	0.039	0.199	1.35	0.16
24. Summed microfauna - northern vs southern sites-MNI	12	0.091	0.030	0.20	0.39
- northern vs southern sites-MNB	11	0.125	0.246	0.50	0.35

TABLE V-10
continued

B. With chronological controls

	N	$\bar{x}_1$	$\bar{x}_2$	z	p
1. Birds - all early vs late sites - MNI	4	0.058	0.020	2.92	0.006
- all early vs late sites - MNB	4	0.240	0.054	4.77	<0.0001
- northern early vs late sites - MNI	2	0.058	0.007	-	-
- northern early vs late sites - MNB	2	0.240	0.012	-	-
- late northern vs southern sites - MNI	3	0.007	0.027	1.07	0.23
- late northern vs southern sites - MNB	3	0.012	0.075	1.19	0.20
2. Wolverine - northern early vs late sites - MNI	4	0.012	0.004	8.00	<0.0001
- northern early vs late sites - MNB	4	0.318	0.019	68.05	<0.0001
- northern high density early vs late sites - MNI	3	0.012	0.024	30.0	<0.0001
- northern high density early vs late sites - MNB	3	0.318	0.024	490.00	<0.0001
- late high density northern vs southern sites - MNI	3	0.024	0.120	160.00	<0.0001
- late high density northern vs southern sites - MNB	3	0.024	0.016	20.75	<0.0001
3. Arctic fox - northern low density early vs late sites - MNI	6	0.002	0.008	0.15	0.39
- northern low density early vs late sites - MNB	3	0.380	0.184	5.60	<0.0001
- late northern vs southern sites -MNI	12	0.078	0.013	1.28	0.18
- late northern vs southern sites -MNB	9	4.574	0.136	1.21	0.19
- late low density northern vs southern sites - MNI	7	0.085	0.007	0.36	0.37
- late low density northern vs southern sites - MNB	4	0.184	0.056	3.29	0.002
4. Wolf - northern high density early vs late sites on MNI	5	0.012	0.048	3.60	0.0006
- northern high density early vs late sites on MNB	5	0.552	0.771	0.76	0.30
- northern low density early vs late sites on MNI	5	0.003	0.006	1.94	0.06
- late high density northern vs southern sites on MNI	5	0.048	0.024	2.44	0.02
- late high density northern vs southern sites on MNB	5	0.771	0.175	2.07	0.05
- late low density northern vs southern sites on MNI	8	0.006	0.003	1.65	0.10
- late low density northern vs southern sites on MNB	6	0.095	0.027	1.62	0.11
- early northern high vs low density sites-MNI	2	0.012	0.003	-	-
5. Bear - northern low density early vs late sites-MNI	7	0.004	0.003	0.31	0.38
- northern low density early vs late sites-MNB	4	0.001	0.004	3.66	0.0004
- late low density northern vs southern sites on MNI	8	0.003	0.001	2.30	0.03
- late low density northern vs southern sites on MNB	6	0.005	0.004	0.50	0.35
6. Mammoth - southern early vs late sites - MNI	6	0.080	0.082	0.04	0.40
- southern early vs late sites - MNB	6	1.900	2.940	0.86	0.28
- northern early vs late sites - MNI	10	0.130	0.110	0.77	0.30
- northern early vs late sites - MNB	8	6.510	1.640	1.23	0.19
- early northern vs southern sites - MNI	2	0.130	0.080	-	-
- early northern vs southern sites - MNB	2	1.230	1.900	-	-
7. Horse - northern early vs late sites - MNI	7	0.003	0.015	1.71	0.09
- northern early vs late sites - MNB	no data available				
- southern early vs late sites - MNI	3	0.002	0.012	1.76	0.08
- southern early vs late sites - MNB	3	0.001	0.150	1.55	0.12
8. Wooly rhinoceros - northern early vs late sites-MNI	7	0.002	0.014	2.49	0.02
- northern early vs late sites-MNB	5	0.004	0.073	1.41	0.15
9. Reindeer - southern early vs late sites - MNI	4	0.002	0.013	2.59	0.01
- southern early vs late sites - MNB	4	0.003	0.435	1.36	0.16

TABLE V-10B
continued

	N	$\hat{x}_1$	$\hat{x}_2$	z	p
10. Steppe bison - northern early vs late sites-MNI	5	0.002	0.004	10.95	<0.0001
- northern early vs late sites-MNB	4	0.030	0.024	0.52	0.35
- southern early vs late sites-MNI	4	0.002	0.005	1.12	0.21
- southern early vs late sites-MNB	4	0.002	0.013	1.40	0.15
- late northern vs southern sites-MNI	7	0.004	0.005	0.21	0.39
- late northern vs southern sites - MNB	6	0.024	0.013	1.34	0.16
- early northern vs southern sites-MNI	2	0.002	0.002	-	-
- early northern vs southern sites-MNB	2	0.030	0.002	-	-
11. Steppe marmot - southern early vs late sites-MNI	4	0.021	0.002	1.35	0.16
- southern early vs late sites-MNB	3	0.024	0.002	1.43	0.14
- late northern vs southern sites-MNI	6	0.021	0.010	0.71	0.31
- late northern vs southern sites-MNB	4	0.005	0.0002	0.32	0.38
12. Hare- northern early vs late sites - MNI	8	0.002	0.006	2.0	0.05
- northern early vs late sites - MNB	7	0.016	0.018	0.51	0.35
- northern low density early vs late sites-MNI	4	0.002	0.003	1.0	0.25
- northern low density early vs late sites-MNB	4	0.016	0.010	3.0	0.004
- late low density northern vs southern sites on MNI	4	0.003	0.007	0.80	0.29
- late low density northern vs southern sites on MNB	4	0.010	0.209	1.17	0.20
13. All fur bearers including hares					
- northern early vs late sites - MNI	10	0.022	0.120	1.66	0.10
- northern early vs late sites - MNB	8	1.295	4.466	0.92	0.26
- northern low deansity early vs late sites-MNI	7	0.022	0.045	1.49	0.13
- northern low density early vs late sites-MNB	6	1.295	0.437	13.20	<0.0001
- late low density northern vs southern sites on MNI	9	0.045	0.016	1.60	0.11
- late low density northern vs southern sites on MNB	8	0.437	0.083	4.60	<0.0001
14. Summed all taxa used as food					
- early northern vs southern sites-MNI	3	0.034	0.004	1.69	0.09
- early northern vs southern sites- MNB	2	0.244	0.014	-	-
- late northern vs southern sites - MNI	14	0.032	0.050	0.53	0.35
- late northern vs southern sites - MNB	12	0.149	1.271	1.21	0.19
- northern early vs late sites - MNI	10	0.034	0.032	0.06	0.40
- northern early vs late sites - MNB	8	0.244	0.149	1.40	0.15
- southern early vs late sites - MNI	7	0.036	0.006	1.73	0.09
- southern early vs late sites - MNB	6	0.014	1.271	1.37	0.16
- late northern high vs low density sites- MNI	8	0.075	0.018	3.00	0.004
- late northern high vs low density sites- MNB	7	0.423	0.039	6.74	<0.0001
- northern high density early vs late sites-MNI	3	0.060	0.075	0.88	0.27
- northern high density early vs late sites-MNB	3	0.244	0.423	3.20	0.002
- northern low density early vs late sites- MNI	7	0.008	0.018	1.20	0.19
- southern low density early vs late sites -MNI	6	0.004	0.025	2.14	0.04
- southern low density early vs late sites -MNB	5	0.014	0.245	1.65	0.10

Legend: * Summed other fur bearers include cave lion, lynx, hyena, and mustelids found at singular sites.

TABLE V-11

THE STRUCTURE OF MAMMOTH REMAINS AT MEZHIRICH (1966-1974)
(after Pidoplichko 1976:41)

Skeletal Elements	Total Numbers Found	
	MNB	MNI
Crania	97	97
Mandibles	109	109
Teeth	44	-
Tusks	92	-
Vertibrae	201	-
Ribs	266	-
Scapulae	102	53
Humeri	67	39
Radiae	27	18
Ulnae	14	13
Pelvises	129	71
Femura	105	57
Tibiae	36	21
Fibulae	5	-
Patellae	2	-
Carpals and Tarsals	6	-
Metapodials	13	-
Phlanges	17	-
Sesamoid Bones	2	-
Large bone fragments longer than 15 cm	86	-
Other bone fragments from 10-15 cm in length	273	-
Total	1,693	110

TABLE V-12

MEAN WEIGHT OF MINERALIZED* MAMMOTH BONES

Parts	N (weighed)	Weight-Kg
Skull (large)	1	100.0
Mandible with teeth	3	18.20
Teeth	3	5.0
Tusks	2	200.0
Scapula	2	4.90
Humerus	1	7.85
Radius and ulna	4	5.00
Pelvis half	1	16.50
Femur	1	15.00
Tibia	1	6.60
Long bone Average	7	8.60
Vertibrae: atlas	3	1.0
axis	3	0.54
thoractic	3	1.27
lumbar	5	2.0
coccyx	1	2.70
Ribs	2	1.50
Tarsal and carpal		nd
Metatarsal	5	1.80
Metacarpals	5	1.850
Patella	1	0.200
Phlanges	5	0.50
Calcaneus	5	0.95
Astrogalus	5	0.51

*For fresh weight add ~10% per Kornietz (1979:personal communication)

TABLE V-13

CALORIES PER SQUARE METER AT IN-SITU SITES*

	1	2	3	4	5	6	7	8	9
	Rhinoceri	Horses	Musk Oxen	Wild Cattle	Steppe Bison	Reindeer	Red Deer	Deer sp.	Giant Deer
1. Berdyzh	3,528	600	-	1,028**	-	-	-	-	-
3. Chulatovo II	15,120	1,400	-	-	2,443**	1,200	-	-	-
4. Dobranichevka	630	-	70	-	3,060	150**	-	-	-
5. Eliseevichi	-	400	-	-	-	96	327	-	-
6. Fastov	-	4,002	-	-	-	-	-	-	-
7. Gontsy	-	-	-	-	1,469	1,026**	-	-	-
8. Khotylevo II	2,530	-	-	-	1,224**	-	-	-	-
9. Kirillovskaya	379	-	-	-	-	-	-	-	-
15. Mezhirich	-	800	-	-	7,222	1,182**	-	-	-
16. Mezin	3,150	10,005	2,022	-	2,570**	4,152	-	-	327
21. Pushkari I	-	1,601	-	-	-	150	327	-	-
22. Pushkari II	43,344	4,002	-	-	-	1,032	-	-	-
23. Radomyshl'	-	400	-	-	1,040	102	-	-	-
24. Suponevo	6,300	1,000	-	-	3,060**	300	-	-	-
25. Timonovka I	-	-	-	-	-	150	-	-	-
26. Timonovka II	-	-	-	-	-	366	-	-	-
27. Yudinovo	17,640	-	-	-	2,448**	n.d.	-	238	327
29. Zhuravka	-	-	-	1,102	-	-	497**	-	-

TABLE V-13
continued

	10	11	12	13	14	15	16	17
	Wild Boars	Hares	Steppe Marmots	Beavers	Fish	Birds	All Mammoths	Half Mammoths
1. Berdyzh	-	-	-	-	-	-	468,000	234,000
3. Chulatovo II	-	77**	45	-	-	-	36,000	18,000
4. Dobranichevka	-	4	1	-	-	12	180,000	90,000
5. Eliseevichi	-	12**	-	-	22	-	360,000	180,000
6. Fastov	-	-	-	-	-	-	180,000	90,000
7. Gontsy	3,888	75	13	-	-	-	360,000	180,000
8. Khotylevo II	-	8**	-	-	-	145	n.d.	n.d.
9. Kirillovskaya	-	<1	-	-	-	-	36,000	18,000
15. Mezhirich	648	599	-	-	3	133	1,044,000	522,000
16. Mezin	324	35**	6	-	-	17	360,000	180,000
21. Pushkari I	-	-	-	-	-	-	612,000	306,000
22. Pushkari II	-	66**	-	-	-	-	1,044,000	522,000
23. Radomyshl'	-	-	3	-	-	-	288,000	144,000
24. Suponevo	-	19**	-	-	6	-	144,000	72,000
25. Timonovka I	-	3**	-	-	-	-	28,800	14,400
26. Timonovka II	-	23**	-	-	-	-	252,000	126,000
27. Yudinovo	-	-	4	8	-	-	396,000	198,000
29. Zhuravka	972	-	97	-	-	-	-	-

TABLE V-13
continued

	18	19	20	21	22	23
	Summed calories (no mammoths, no N-S differences)	Summed calories (no mammoths, N-S differences considered)	Percentile difference between columns 18&19	Extent of percentile difference	Summed calories with half mammoths	Summed calories with all mammoths
1. Berdyzh	5,156	4,128	80	20	238,128	472,128
3. Chulatovo II	20,290	17,765	87	13	35,765	53,765
4. Dobranichevka	3,927	3,777	96	4	93,777	183,777
5. Eliseevichi	857	845	98	2	160,845	360,845
6. Fastov	4,002	4,002	0	0	94,002	184,002
7. Gontsy	6,471	5,445	84	16	185,445	365,445
8. Khotylevo II	3,897	2,665	68	32	n.d.	n.d.
9. Kirillovskaya	380	380	0	0	18,380	36,380
15. Mezhirich	10,581	9,405	89	11	531,405	1,053,405
16. Mezin	22,608	20,003	88	12	200,003	380,003
21. Pushkari I	2,078	2,078	0	0	308,078	614,078
22. Pushkari II	48,444	48,378	99	1	570,378	1,092,378
23. Radomyshl'	1,545	1,443	93	7	145,443	289,443
24. Suponevo	10,685	7,606	71	29	79,606	151,606
25. Timonovka I	153	150	98	2	14,550	28,950
26. Timonovka II	389	366	94	6	126,366	252,366
27. Yudinovo	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
29. Zhuravka	2,667	2,171	81	19	2,171	2,171

Legend: * Calories calculated per formula $\frac{MII}{m2}$ x calories per individual and rounded off to the nearest kilogram;
N - northern sites; S - southern sites; n.d. - no data; ** possibly not actively hunted.

TABLE V-14

PERCENTAGE OF CALORIES PER TAXON PER SQUARE METER AT IN-SITU SITES

A. Excluding all mammoths

	Rhinoceri	Horses	Musk Oxen	Cattle	Bison	Reindeer	Red Deer	Deer sp.	Giant Deer	Boars	Hares	Marmots	Beavers	Fish	Birds	# of Taxa
1. Berdyzh	68	12	-	20	-	-	-	-	-	-	-	-	-	-	-	3
3. Chulatovo II	84	8	-	-	-	7	-	-	-	-	ins.	ins.	-	-	-	4
4. Dobranichevka	17	-	2	-	81	-	-	-	-	-	ins.	ins.	-	-	ins.	5
5. Eliseevichi	-	47	-	-	-	11	39	-	-	-	-	-	-	3	-	4
6. Fastov	-	100	-	-	-	-	-	-	-	-	-	-	-	-	-	1
7. Gontsy	-	-	-	-	27	-	-	-	-	72	1	ins.	-	-	-	4
8. Khotylevo II	95	-	-	-	-	-	-	-	-	-	-	-	-	-	5	2
9. Kirillovskaya	99	-	-	-	-	-	-	-	-	-	ins.	-	-	-	-	2
15. Mezhiricn	-	9	-	-	77	-	-	-	-	7	6	-	-	ins.	ins.	6
16. Mezin	16	50	10	-	-	21	-	-	1	1	-	ins.	-	-	ins.	7
21. Pushkari I	-	77	-	-	-	7	16	-	-	-	-	-	-	-	-	3
22. Pushkari II	90	8	-	-	-	2	-	-	-	-	-	-	-	-	-	3
23. Radomyshl'	-	28	-	-	71	-	-	-	-	-	-	ins.	-	-	-	3
24. Suponevo	83	13	-	-	-	4	-	-	-	-	-	-	-	ins.	-	4
25. Timonovka I	-	-	-	-	-	100	-	-	-	-	-	-	-	-	-	1
26. Timonovka II	-	-	-	-	-	100	-	-	-	-	-	-	-	-	-	1
27. Yudinovo	n.d.	-	-	-	-	n.d.	-	n.d.	n.d.	-	-	n.d.	n.d.	-	-	5
29. Zhuravka	-	-	-	51	-	-	-	-	-	45	-	4	-	-	-	3

TABLE V-14
continued

B. Including half of the mammoths

	Mammoth	Rhinoceri	Horse	Musk Ox	Cattle	Bison	Reindeer	Red Deer	Deer sp.	Giant Deer	Boar	Hare	Marmot	Beaver	Fish	Birds	# of Taxa
1. Berdyzh	98	1	ins.	-	ins.	-	-	-	-	-	-	-	-	-	-	-	4
3. Chulatovo II	50	42	4	-	-	-	3	-	-	-	-	-	ins.	-	-	-	5
4. Dobranichevka	96	ins.	-	ins.	-	3	-	-	-	-	-	ins.	ins.	-	-	ins.	7
5. Eliseevichi	99	-	ins.	-	-	-	ins.	ins.	-	-	-	-	-	-	ins.	-	5
6. Fastov	96	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	2
7. Gontsy	97	-	-	-	-	ins.	-	-	-	-	2	ins.	ins.	-	-	-	5
8. Khotylevo II	n.d.	-	-	-	n.d.	-	-	-	-	-	-	-	-	-	-	n.d.	3
9. Kirillovskaya	97	2	-	-	-	-	-	-	-	-	-	ins.	-	-	-	-	3
15. Mezhirich	98	-	ins.	-	-	1	-	-	-	-	ins.	ins.	-	-	ins.	ins.	7
16. Mezin	90	1	5	1	-	-	2	-	-	ins.	ins.	-	ins.	-	-	ins.	8
21. Pushkari I	99	-	ins.	-	-	-	ins.	ins.	-	-	-	-	-	-	-	-	4
22. Pushkari II	91	9	ins.	-	-	-	ins.	-	-	-	-	-	-	-	-	-	4
23. Radomyshl'	99	-	ins.	-	-	ins.	-	-	-	-	-	-	ins.	-	-	-	4
24. Suponevo	90	8	1	-	-	-	ins.	-	-	-	-	-	-	-	ins.	-	5
25. Timonovka I	99	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	2
26. Timonovka II	99	-	-	-	-	-	ins.	-	-	-	-	-	-	-	-	-	2
27. Yudinovo	n.d.	n.d.	-	-	-	-	-	-	n.d.	n.d.	-	-	ins.	ins.	-	-	6
29. Zhuravka	-	-	-	-	51	-	-	-	-	-	45	-	4	-	-	-	3

TABLE V-14
continued

C. Including all of the mammoths

	Mammoths	Rhinoceri	Horse	Musk Ox	Cattle	Bison	Reindeer	Red Deer	Deer sp.	Giant Deer	Boar	Hare	Marmot	Beaver	Fish	Birds	# of Taxa
1. Berdyzh	99	ins.	ins.	-	ins.	-	-	-	-	-	-	-	-	-	-	-	4
3. Chulatovo II	66	28	3	-	-	-	2	-	-	-	-	-	ins.	-	-	-	5
4. Dobranichevka	97	ins.	-	ins.	-	2	-	-	-	-	-	ins.	ins.	-	-	ins.	7
5. Eliseevichi	99	-	ins.	-	-	-	ins.	ins.	-	-	-	-	-	-	ins.	-	5
6. Fastov	98	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	2
7. Gontsy	98	-	-	-	-	ins.	-	-	-	-	1	ins.	ins.	-	-	-	5
8. Khotylevo II	n.d.	-	-	-	n.d.	-	-	-	-	-	-	-	-	-	-	n.d.	3
9. Kirillovskaya	99	ins.	-	-	-	-	-	-	-	-	-	ins.	-	-	-	-	3
15. Mezhirich	99	-	ins.	-	-	ins.	-	-	-	-	ins.	ins.	-	-	ins.	ins.	7
16. Mezin	95	ins.	3	ins.	-	-	1	-	-	ins.	ins.	-	ins.	-	-	ins.	8
21. Pushkari I	99	-	ins.	-	-	-	ins.	ins.	-	-	-	-	-	-	-	-	4
22. Pushkari II	95	4	ins.	-	-	-	ins.	-	-	-	-	-	-	-	-	-	4
23. Radomyshl'	99	-	ins.	-	-	ins.	-	-	-	-	-	-	ins.	-	-	-	4
24. Suponevo	95	4	ins.	-	-	-	ins.	-	-	-	-	-	-	-	ins.	-	5
25. Timonovka I	99	-	-	-	-	-	ins.	-	-	-	-	-	-	-	-	-	2
26. Timonovka II	99	-	-	-	-	-	ins.	-	-	-	-	-	-	-	-	-	2
27. Yudinovo	n.d.	n.d.	-	-	-	-	-	-	n.d.	n.d.	-	-	n.d.	n.d.	-	-	6
29. Zhuravka	-	-	-	-	51	-	-	-	-	-	45	-	4	-	-	-	3

Legend: ins. = under 0.9 %; n.d. = no data

TABLE V-15

REGIONAL DISTRIBUTION OF CALORIES

A. Without Mammoths

	NORTH			SOUTH				
	# of sites	Σ calories/m^2	percent of calories	# of sites	Σ calories/m^2	percent of calories	total	% of total
Mammoths	-	-	-	-	-	-	-	-
Rhinoceri	7	91,602	73	2	1,009	4	92,611	61
Horses	7	21,409	17	3	5,202	20	26,611	18
Musk Oxen	1	2,022	2	1	70	ins.	2,092	1
Wild Cattle	1	1,028	1	1	1,102	4	2,130	1
Bison	in southern sites only			4	12,791	48	12,791	9
Reindeer	8	7,446	6	in northern sites only			7,446	5
Red deer	2	654	ins.	in northern sites only			654	ins.
Deer sp.	1	238	ins.	in northern sites only			238	ins.
Giant deer	2	654	ins.	in northern sites only			654	ins.
Boars	1	324	ins.	3	5,463	21	5,787	4
Hares	in southern sites only			4	679	2	679	ins.
Marmots	3	55	ins.	4	114	ins.	169	ins.
Beavers	1	8	ins.	-	-	-	8	ins.
Fish	2	28	ins.	1	3	ins.	31	ins.
Birds	2	162	ins.	2	145	ins.	307	ins.

TABLE V-15
continued

B. With Half of the Mammoths Included

	NORTH			SOUTH				
	# of sites	ξ calories/m^2	percent of calories	# of sites	ξ calories/m^2	percent of calories	total	% of total
Mammoths	10	1,850,000	93	6	1,044,000	98	2,894,000	95
Rhinoceri	7	91,602	5	2	1,009	ins.	92,611	3
Horses	7	21,409	1	3	5,202	ins.	26,611	1
Musk Oxen	1	2,022	ins.	1	70	ins.	2,092	ins.
Wild Cattle	1	1,028	ins.	1	1,102	ins.	2,130	ins.
Bison	in southern sites only			4	12,791	1	12,791	ins.
Reindeer	8	7,446	ins.	in northern sites only			7,446	ins.
Red deer	2	654	ins.	in northern sites only			654	ins.
Deer sp.	1	238	ins.	in northern sites only			238	ins.
Giant deer	2	654	ins.	in northern sites only			654	ins.
Boars	1	324	ins.	3	5,463	ins.	5,787	ins.
Hares	in southern sites only			4	679	ins.	679	ins.
Marmots	3	55	ins.	4	114	ins.	169	ins.
Beavers	1	8	ins.	-	-	-	8	ins.
Fish	2	28	ins.	1	3	ins.	31	ins.
Birds	2	162	ins.	2	145	ins.	307	ins.

TABLE V-15
continued

C. With All Mammoths Included

	NORTH			SOUTH				
	# of sites	Σ calories/m^2	percent of calories	# of sites	Σ calories/m^2	percent of calories	total	% of total
Mammoths	10	3,700,800	97	6	2,088,000	98	5,788,800	97
Rhinoceri	7	91,602	2	2	1,009	ins.	92,611	2
Horses	7	21,409	ins.	3	5,202	ins.	26,611	ins.
Musk Oxen	1	2,022	ins.	1	70	ins.	2,092	ins.
Wild Cattle	1	1,028	ins.	1	1,102	ins.	2,130	ins.
Bison	in southern sites only			4	12,791	1	12,791	ins.
Reindeer	8	7,446	ins.	in northern sites only			7,446	
Red deer	2	654	ins.	in northern sites only			654	ins.
Deer sp.	1	238	ins.	in northern sites only			238	ins.
Giant deer	2	654	ins.	in northern sites only			654	ins.
Boars	1	324	ins.	3	5,463	ins.	5,787	ins.
Hares	in southern sites only			4	679	ins.	679	ins.
Marmots	3	55	ins.	4	114	ins.	169	ins.
Beavers	1	8	ins.	-	-	-	8	ins.
Fish	2	28	ins.	1	3	ins.	31	ins.
Birds	2	162	ins.	2	145	ins.	307	ins.

Legend: ins. = less than 0.9 percent

TABLE V-16

DIFFERENCE OF MEANS TESTS ON THE DISTRIBUTION OF CALORIES PER SQUARE METER

		N	$\bar{x}_1$	$\bar{x}_2$	z	p.
A. Excluding all mammoths	1. All northern vs southern sites	23	9,663	2,657	1.02	0.24
	2. All early vs late sites	17	3,087	8,717	1.63	0.11
	3. Early sites with storage pits in the north vs the south	3	3,910	1,443	2.79	0.01
	4. Late northern high density sites with storage pits vs without storage pits	3	19,676	33,071	1.23	0.19
	5. Late high density sites with storage pits in the north vs in the south	2	19,676	9,405	-	-
	6. Late northern low density sites with storage pits vs those without storage pits	5	4,225	865	1.37	0.16
	7. Late southern low density sties with storage pits vs those without storage pits	5	4,611	2,184	2.33	0.03
	8. Late low density sites with storage pits in the north vs in the south	6	2,242	4,611	1.42	0.15
	9. Late low density sites without storage pits in the north vs in the south	4	2,078	2,184	0.12	0.40
	10. Late northern high density sites without storage pits vs southern high density sites with storage pits	3	33,071	9,405	2.18	0.04

		N	$\bar{x}_1$	$\bar{x}_2$	z	p
B. Including half of the mammoths	1. All northern vs southern sites	25	141,116	97,325	0.28	0.38
	2. All early vs late sites	16	192,299	174,317	0.31	0.38
	3. Early sites with storage pits and dwellings in the north vs in the south	2	239,156	145,443	-	-
	4. Early vs late sites with storage pits	10	192,299	176,459	0.15	0.39
	5. Early vs late sites with storage pits and dwellings	8	192,299	184,666	0.06	0.40
	6. Late northern high density sites with storage pits vs sites without storage pits	4	190,260	439,228	2.67	0.01
	7. Late southern high density sites with storage pits vs sites without storage pits	1	531,405	-	-	-
	8. Late northern low density sites with storage pits vs sites without storage pits	4	73,507	35,765	1.42	0.15
	9. Late southern low density sites with storage pits vs sites without storage pits	5	139,611	38,184	2.35	0.03
	10. Late high density sites with storage pits in the north vs in the south	3	190,260	531,405	51.09	<0.0001
	11. Late low density sites with storage pist in the north vs in the south	5	73,507	139,611	2.32	0.03
	12. Late low density sites without storage pits in the north vs in the south	4	35,765	38,184	0.09	0.40
	13. Late high density sites in the north without storage pits vs southern sites with storage pits	3	439,228	531,405	1.00	0.24

TABLE V-17

END SCRAPER PLUS BURIN AND LITHIC DENSITIES AT THE SITES

	A. NORTH					B. SOUTH			
	1	2	3	4		5	6	7	8
	ESB/m^2	Lithics/m^2	ESB expected	ESB residuals		ESB/m^2	Lithics/m^2	ESB expected	ESB residuals
Chulatovo II	0.46	13.4	-4.17	+4.63	Dobranichevka	0.006	0.17	-0.170	+0.176
Eliseevichi	0.74	128.4	+3.76	-3.02	Fastov	0.040	8.60	+0.270	-0.230
Kositsa	0.80	20.0	-3.71	+4.51	Gontsly	0.310	3.70	+0.015	+0.295
Mezin	2.80	94.4	+1.42	+1.38	Kirillovskaya	0.0004	0.50	-0.150	+0.154
Bugorok	13.90	308.60	+16.18	-8.58	Mezhirich	1.300	29.30	+1.350	-0.050
Pogon	0.40	400.00	+22.48	-22.08	Zhuravka	0.060	11.20	+0.410	-0.350
Pushkari I	1.03	10.60	-4.36	+5.39					
Pushkari II	0.02	1.50	-4.99	+5.01					
Timonovka I	4.90	85.00	+0.77	+4.13					
Timonovka II	3.12	85.50	+0.80	+2.32					

C. Pearson's Coefficients of Correlation

	N	df	r	r^2	p
Northern sites	10	8	0.4500	0.20	>0.10
Southern sites	6	4	0.8960	0.80	0.02

Legend: ESB = end scrapers plus burins

TABLE V-18

END SCRAPER AND BURIN RESIDUALS AND ARCTIC FOX MNI - PER m^2

A. DATA	NORTH		SOUTH		
	ESB	A.fox MNI		ESB	A.fox MNI
1. High Density Sites			1. High Densities Sites		
Eliseevichi	-3.02	0.456	Mezhirich	-0.05	0.03
Mezin	1.38	0.094			
Timonovka II	2.32	0.037			
2. Low Density Sites			2. Low Density Sites:		
Chulatovo II	4.63	0.017	Dobranichevka	0.176	0.004
Pushkari I	5.39	0.010	Gontsy	0.295	0.015
Timonovka I	4.13	0.002	Zhuravka	-0.350	0.003

B. PEARSON'S CORRELATION COEFFICIENTS	N	df	r	r^2	p	Slope	Intercept
1. North Hi Density Arctic Fox Sites	3	1	-0.9993	0.99	0.05	-0.080	0.213
2. North Low Density Arctic Fox Sites	3	1	+0.4291	0.18	>0.1	0.005	-0.014
3. South: Low density a. fox sites	3	1	+0.6983	0.49	>0.1	0.014	0.007

C. COMPARISON OF CORRELATION COEFFICIENTS	N_1	N_2	z_1	z_2	Z	p
1. North: Low A.fox vs Hi A.fox density	3	3	-2.467	0.460	3.107	0.003
2. Low density A.fox sites: N vs S	3	3	0.460	0.867	0.407	0.37

Legend: ESB - End scrapers and burins
A. fox - Arctic fox

TABLE V-19

EXPLOITATION OF FUR BEARERS THROUGH TIME

	NORTH				SOUTH			
	1	2	3	4	5	6	7	8
A. Early Sites	Number of sites found	% of sites	Proportion of MNI	Proportion of MNB	Number of sites found	% of sites	Proportion of MNI	Proportion of MNB
Arctic fox	2	67	100%	100%	-	0	0	0
Wolf	2	67	100%	100%	-	0	0	0
Wolverine	1	33	100%	100%	-	0	0	0
Bear	2	67	100%	100%	-	0	0	0
Hare	1	33	100%	100%	-	0	0	0
Summed all fur bearers	2	67	100%	100%	-	0	0	0

TABLE V-19
continued

B. Northern sites

	EARLY						LATE					
	1	2	3	4	5	6	7	8	9	10	11	12
	Number of sites found	% of sites	Percentage of MNI high density	Percentage of MNI low density	Percentage of MNB high density	Percentage of MNB low density	Number of sites found	% of sites	Percentage of MNI high density	Percentage of MNI low density	Percentage of MNB high density	Percentage of MNB low density
Arctic fox	2	67	0	50	0	67	8	73	100	50	100	33
Wolf	2	67	20	33	50	n.d.	9	82	80	67	50	n.d.
Wolverine	1	33	33	0	92	0	3	27	67	100	8	100
Bear	2	67	0	50	0	20	9	82	100	50	100	80
Hare	1	33	0	50	0	60	8	73	100	50	100	40
Summed all fur bearers	2	67	0	50	0	67	9	82	100	50	100	33

C. Late sites

	NORTH						SOUTH					
	1	2	3	4	5	6	7	8	9	10	11	12
	Number of sites found	% of sites	Percentage of MNI high density	Percentage of MNI low density	Percentage of MNB high density	Percentage of MNB low density	Number of sites found	% of sites	Percentage of MNI high density	Percentage of MNI low density	Percentage of MNB high density	Percentage of MNB low density
Arctic fox	8	73	50	50	50	75	3	43	50	50	50	25
Wolf	9	82	67	50	80	50	4	57	33	50	20	50
Wolverine	3	27	75	50	67	67	4	57	25	50	33	33
Bear	9	82	67	50	80	50	4	57	33	50	20	50
Hare	8	73	8	50	0.5	50	4	57	92	50	99.5	50
Summed all fur bearers	9	82	50	50	50	83	4	57	50	50	50	17

TABLE V-20

NUNAMIUT HUNTING RECORD 1950-1951
(after Binford and Chasko 1976:Table 22)

A. DATA

Species	Kcals Per Individual	COLD WEATHER: OCTOBER-MARCH # Individuals	% Individuals	Total Kcals	% of Kcals	WARM WEATHER: APRIL-SEPTEMBER # of Individuals	% of Individuals	Total Kcals	% of Kcals
Caribou	80,500a.	279	89.4	22,459,500	87.7	173	72.7	13,926,500	67.2
Sheep	86,487a.	30	9.7	2,594,610	10.1	42	17.6	3,632,454	17.4
Bear	272,400a.	2	0.6	544,800	2.1	10	4.2	2,724,000	13.1
Moose	407,000a.	0	-	-	-	1	0.4	407,000	1.9
Squirrel	1,000b.	0	-	-	-	4	1.7	4,000	0.1
Marmot	1,800c.	1	0.3	1,800	0.1	8	3.4	14,400	0.3
	Σ	312	100%	25,600,710	100%	Σ 238	100%	20,708,354	100%

B. DIVERSITY INDICES

	Cold Weather J	Cold Weather H		Warm Weather J	Warm Weather H
1. MNI	0.16	0.27	1. MNI	0.53	0.68
2. Calories	0.19	0.32	2. Calories	0.41	0.52

C. COMPARISON OF DIVERSITY INDICES

$N_1 = 4$ $H_1 = 0.32$ $t = 3.8023$
$N_2 = 6$ $H_2 = 0.52$ $v = \sim 200$
$P(2\ tail) = <0.001$

Note: References for live weights, edible weights, and calories per kilogram of taxa
a. Klein 1969 b. Assume weight = 1 Kg and 1,000 calories per Kg ;c. **Table III-16**

TABLE V-21

OJIBWA FOOD HARVEST RECORD
(after Jochim 1976:Table 10)

A. DATA:*		COLD WEATHER: OCTOBER-MARCH			WARM WEATHER: APRIL-SEPTEMBER		
Species	Kcals Per Individual	Kilos of Food Taken	Total Kcals	% of Calories	Kilos of Food	Total Kcals	% of Kcals
Moose	320,000a	132,448.97	4.2384×10^{10}	99.93	3447.30	1.031×10^{9}	96.85
Beaver	4,000a	4,277.38	17,109,480	0.04	3669.56	14,678,240	1.28
Fish	1,300a	3,964.40	5,153,720	0.01	10332.83	13,432,679	1.19
Small game	1,800a	5,320.64	9,577,152	0.02	4322.76	7,780,968	0.68
			Σ 4.2416×10^{10}	100%		Σ 1.1390×10^{9}	100%

B. DIVERSITY INDICES

	J	H
Cold Weather Months:	0.003	0.005
Warm Weather Months:	0.07	0.12

C. COMPARISON OF DIVERSITY INDICES

$N_1 = 4$ $H_1 = 0.005$ $t = 181.82$ P (2 tail) = 0.05

$N_2 = 4$ $H_2 = 0.12$ $v = \sim 1.0$

Legend: * In calculating values in this table I had to omit some entries in Jochim (1976) as they could not be quantified. I eliminated approximately the same amount of kilograms from both the cold and warm weather seasons: cold - 1918.70 Kg, warm - 2059.31 Kg.

a. - Caloric values per taxon from Jochim 1976:pp. 42-43.

TABLE V-22

DIVERSITY INDEX AT IN-SITU SITES

(calculated on percentages of calories per taxon per square meter)

	Without mammoths		With half mammoths		With all mammoths	
	H	J	H	J	H	J
1. Berdyzh	0.36	0.75	0.03	0.05	0.01	0.02
3. Chulatovo II	0.23	0.33	0.41	0.59	0.36	0.51
4. Dobranichevka	0.24	0.31	0.08	0.09	0.06	0.07
5. Eliseevichi	0.46	0.77	0.01	0.02	0.01	0.02
6. Fastov	0	0	0.07	0.02	0.04	0.13
7. Gontsy	0.25	0.42	0.05	0.08	0.03	0.05
8. Khotylevo II	0.09	0.29	n.d.	n.d.	n.d.	n.d.
9. Kirillovskaya	0.0004	0.001	0.046	0.09	0.007	0.01
15. Mezhirich	0.34	0.48	0.04	0.05	0.02	0.02
16. Mezin	0.56	0.62	0.23	0.24	0.10	0.10
21. Pushkari I	0.30	0.62	0.01	0.02	0.01	0.02
22. Pushkari II	0.16	0.34	0.13	0.21	0.08	0.13
23. Radomyshl'	0.26	0.54	0.01	0.02	0.01	0.02
24. Suponevo	0.24	0.40	0.15	0.22	0.08	0.11
25. Timonovka I	0	0	0.02	0.08	0.02	0.08
26. Timonovka II	0	0	0.03	0.01	0.03	0.01
29. Zhuravka	0.36	0.75	0.36	0.75	0.36	0.75

TABLE V-23

T-TEST ON DIFFERENCES IN DIVERSITY INDICES

	$S(N)_1$	$S(N)_2$	J_1	J_2	H_1	H_2	df	t	p (2 tail)
Northern vs Southern Sites									
1. All mammoths excluded	13	10	0.36	0.59	0.40	0.59	~200	2.92	0.005
2. Half mammoths included	14	11	0.11	0.05	0.12	0.05	200	1.32	0.20
3. All mammoths included	14	11	0.07	0.05	0.08	0.05	~200	0.57	0.50

TABLE V-24

CALORIES PER TAXON AT DISTURBED SITES

	Chulatovo I	Kurovo	Novgorod-Severskii	Novo-Bobovichi	Yurovichi
Mammoths - all	39,600,000	3,600,000	54,000,000	39,600,000	63,000,000
Mammoths - half	19,800,000	720,000	27,000,000	19,800,000	31,500,000
Rhinoceri	2,520,000	2,520,000	16,380,000	-	-
Horses	400,200	200,100	1,600,800	-	200,100
Wild Cattle	-	-	-	-	367,000
Reindeer	360,000	-	1,500,000	-	-
Marmots	3,600	-	55,800	-	-
Fish	2,600	-	57,200	-	-
Birds	-	-	140,000	-	-
Calories with					
- all mammoths	42,886,400	6,320,100	73,733,800	39,600,000	63,567,100
- half mammoths	23,086,400	3,440,100	46,733,800	19,800,000	32,067,100
- no mammoths	3,286,400	2,720,100	19,733,800	0	567,100

TABLE V-25

PERCENTAGE OF CALORIES AT DISTURBED SITES

A. Excluding mammoths

	Chulatovo I	Kurovo	Novgorod-Severskii	Novo-Bobovichi	Yurovichi
Rhinoceri	76	93	83	-	-
Horses	12	7	8	-	35
Wild Cattle	-	-	-	-	65
Reindeer	11	-	8	-	-
Marmots	ins.	-	ins.	-	-
Fish	ins.	-	ins.	-	-
Birds	-	-	ins.	-	-

B. Including half of the mammoths

	Chulatovo I	Kurovo	Novgorod-Severskii	Novo-Bobovichi	Yurovichi
Mammoths	85	21	58	100	98
Rhinoceri	11	73	35	-	-
Horses	2	6	3	-	ins.
Wild Cattle	-	-	-	-	1
Reindeer	1	-	3	-	-
Marmots	ins.	-	ins.	-	-
Fish	ins.	-	ins.	-	-
Birds	-	-	ins.	-	-

C. Including all of the mammoths

	Chulatovo I	Kurovo	Novgorod-Severskii	Novo-Bobovichi	Yurovichi
Mammoths	92	57	73	100	99
Rhinoceri	6	40	22	-	-
Horses	1	3	2	-	ins.
Wild Cattle	-	-	-	-	ins.
Reindeer	ins.	-	2	-	-
Marmots	ins.	-	ins.	-	-
Fish	ins.	-	ins.	-	-
Birds	-	-	ins.	-	-

Legend: ins. = less than 0.9 percent

TABLE V-26

DIVERSITY INDEX* AT DISTURBED SITES

	All Mammoths		Half Mammoths		No Mammoths	
	H	J	H	J	H	J
2. Chulatovo I	0.13	0.16	0.22	0.29	0.31	0.44
14. Kurovo	0.34	0.71	0.31	0.64	0.11	0.37
17. Novgorod-Severskii	0.32	0.38	0.40	0.48	0.25	0.30
18. Novo-Bobovichi	0	0	0	0	-	-
28. Yurovichi	0.007	0.01	0.03	0.06	0.28	0.93

* Calculated on MNI percentages of calories per taxon per site

TABLE V-27

PROPORTIONAL CONTRIBUTION OF FOOD TAXA TYPED PER OPTIMAL SEASON FOR HARVESTING*

	Optimal Season For Harvesting												Season of occupation
	Cold weather months					Warm weather months			No data on optimal season				
	Red deer	Deer sp.	Giant deer	Reindeer	Hare	Horse	Bison	Marmot	Boar	Wild Cattle	Musk Ox	Beaver	
1. Berdyzh	-	-	-	-	-	37	-	-	-	63	-	-	N.D. + W
2. Chulatovo I	-	-	-	70	-	-	-	30	-	-	-	-	C + W
3. Chulatovo II	-	-	-	46	-	52	-	2	-	-	-	-	W + C
4. Dobranichevka	-	-	-	-	-	-	97	ins.	-	-	2	-	W + N.D.
5. Eliseevichi	39	-	-	11	-	46	-	-	-	-	-	-	C + W
6. Fastov	-	-	-	-	-	100	-	-	-	-	-	-	W
7. Gontsy	-	-	-	-	1	-	27	ins.	71	-	-	-	N.D. + W
9. Kirillovskaya	-	-	-	-	100	-	-	-	-	-	-	-	C
15. Mezhirich	-	-	-	-	6	9	76	-	7	-	-	-	W + N.D. + C
16. Mezin	-	-	ins.	25	-	60	-	ins.	-	-	12	-	W + C + N.D.
17. Novgorod-Severskii	-	-	-	39	-	13	-	48	-	-	-	-	W + C
21. Pushkari I	16	-	-	7	-	77	-	-	-	-	-	-	W + C
22. Pushkari II	-	-	-	21	-	79	-	-	-	-	-	-	W + C
23. Radomyshl'	-	-	-	-	-	28	-	ins.	-	71	-	-	N.D. + W
24. Suponevo	-	-	-	23	-	76	-	-	-	-	-	-	W + C
25. Timonovka I	-	-	-	100	-	-	-	-	-	-	-	-	C
26. Timonovka II	-	-	-	100	-	-	-	-	-	-	-	-	C
27. Yudinovo	-	some	some	some	-	-	-	some	-	-	-	some	C + W
28. Yurovichi	-	-	-	-	-	50	-	-	-	50	-	-	W + N.D.
29. Zhuravka	-	-	-	-	-	-	-	4	45	51	-	-	N.D. + W

Legend: * Calculated without mammoths and wooly rhinoceri; ins = less than 0.9 percent; N.D. =no data on optimal season for harvesting; W = warm weather months; C = cold weather months

Note: In some cases where fish or birds contributed more than 1.0 % of calories, summed percentages for the site are below 100.

TABLE V-28

FISH USED AS FOOD - MNIs

Sites	1		2		3		4	5			6	7	8	9	10
	Cold: Late Winter -Early Spring		Spring		Late Spring -Early Summer		Summer	Warm Weather							
	Pike	Bubgot	Roach	Dace	Pike-Perch	Perch	Cat fish	Salmonids	Carps	Bream	Fish (Unidentified)	Typed Per Spawn Season	% Cold Spawners	% Warm Spawners	Fishing Season
Chulatovo I	-	-	-	-	-	-	-	-	-	-	1	0	0	0	nd
Eliseevichi	-	-	-	-	-	-	-	-	10.5	-		10.5	0	100	W?
Mezhirich	1											1	100%	0	C
N.-Severskii	2	1	1	1	1	1	1	1	1	1	25	11	27%	73%	W
Suponevo	-	-	-	-	-	-	-	-	-	-	1	0	0	0	nd

Legend and Note: W - warm weather
C - cold weather

*Spawning data from Berg (1964), Carlander (1969) and Wheeler (1969)

FIGURE V-29

AVIAN FOOD TAXA - MNIs

Sites	Terrestrial		Water Fowl						Unidentified Birds	Total # Identified	Number of O	Number of M	Ratio of M to O	% of O	% of M	Season
	O	M-nd	All M - Mid to End of March													
	Willow Ptarmigan	Black Grouse	Silver Gull	Black-headed Gull	Field Geese	Duck	Golden Eye	Swan								
Dobranichevka	1								1	1	1	0	0:1	100%	0	C
Eliseevichi	1								-	1	1	0	0:1	100%	0	C
Khotylevo II	10		2	14		2			-	28	10	18	1.8:1	36%	64%	W
Mezhirich	21	1			3	1	1	1	11	28	21	7	0.3:1	75%	25%	C
Mezin	3				1				2	4	3	1	0.3:1	75%	25%	C
N.-Severskii	5	1			2	13			24	21	5	16	3:1	24%	76%	W
Yudinovo	✓								✓	nd	-	nd	nd	nd	nd	nd
Columns	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Notes: ✓ - present
nd = no data
O - overwintering
M - migratory and date of present day return to study region (after Voitenko 1965)
C - cold weather W - warm weather

TABLE V-30

VOLUME AND DENSITY OF HEARTHS

Sites	Interior			Exterior			All Hearths	
	Number Found	% Volume m^3	Total Volume m^3	Number Found	% Volume m^3	Total Volume m^3	Total Hearth Volume m^3	m^2 Per Hearth
Berdyzh	3	1.8	5.4	-	-	-	5.4	116.7
Chulatovo I	-	-	-	7	0.06	0,4	0.4	142.9
Dobranichevka	2	0.1	0.2	7	0.1	0.7	0.9	222.2
Fastovo	-	-	-	2	nd	nd	nd	110.0
Gontsy	1	nd	nd	2	nd	nd	nd	273.3
Khotylevo II	-	-	-	some	nd	nd	nd	nd
Kirillovskaya	-	-	-	>20	nd	nd	nd	~392.0
Mezhirich	3	0.05	0.15	6	0.05	0.3	0.45	254.5
Mezin	6	0.004	0.024	9	0.2	1.8	1.824	80.0
Pushkari I	3	0.2	0.6	2	0.15	0.3	0.9	80.0
Radomyshl'	some	nd	nd	some	nd	nd	nd	nd
Suponevo	1-2	0,2	~0.4	1-2?	0.8	1.6?	~2.0	50.0
Timonovka I	nd	nd	nd	1	0.6	0.6	nd	nd
Timonovka II	-	-	-	2	nd	nd	nd	81.5
Yudinovo	2	0.04	0.08	5	nd	nd	nd	71.4
Zhuravka	-	-	-	3	nd	nd	nd	110.0

Legend: ~ - about
nd - no data
>: over

TABLE V-31

COMPARISON OF HEARTH VOLUME AND DENSITIES

	Interior Hearths				Exterior Hearths				All Hearths	
A. DATA	Total # Hearths	$\tilde{x}$ Vol. m^3	Total Vol. m^3	Density Per m^2	Total # Hearths	$\tilde{x}$ Vol. m^3	Total Vol. m^3	Density Per m^2	Total Vol. m^3	Total Density m^2
Dobranich vka	2	0.1	0.2	0.2	7	0.1	0.7	0.2	0.9	0.2
Mezhirich	3	0.05	0.15	0.2	6	0.05	0.3	0.03	0.45	0.11
Mezin	6	0.004	0.024	0.01	9	0.2	1.8	0.1	1.82	0.05
Pushkari I	3	0.2	0.6	0.1	2	0.2	0.3	0.1	0.9	0.10

B. DIFFERENCE OF MEANS TESTS	N	$\tilde{X}_1^*$	$\tilde{X}_2^*$	z	p.
a. total hearth volume/m^3	4	0.75	1.824	8.73	<0.0001
b. interior hearth volume/m^3	4	0.32	0.024	2.44	0.02
c. exterior hearth volume/m^3	4	0.43	1.80	12.54	<0.0001
d. interior hearth density/m^2	4	0.17	0.01	5.77	<0.0001
e. exterior hearth density/m^2	4	0.11	0.10	0.25	0.39
f. total hearth density/m^2	4	0.14	0.05	3.35	0.002

note:

$\tilde{X}_1^*$ - summed Dobranichevka, Mezhirich, Pushkari

$\tilde{X}_2^*$ - Mezin

TABLE VI-32

ESTIMATES ON THE SEASON OF OCCUPATION OF THE SITES

Site	Div. Ind.	Food sp.	Fur taxa	Pits	Dwell-ings	Fish	Birds	Height Above Floodplain	Season on Height	Season on Hearths	Summed Estimated Season
1.Berdyzh	Lo	W+n.d.	W	+	+	-	-	n.d.	n.d.	n.d.	C
2.Chulatovo I	Hi	C+W	W	-	omit	n.d.	-	0-5m	W?	n.d.	W
3.Chulatovo II	Hi	C+W	W	-	-	-	-	15-20m	W	n.d.	W
4.Dobranichevka	Lo	W+n.d.	W	+	+	-	C	n.d.	n.d.	C	C
5.Eliseevichi	Lo	C+W	C	+	+	W?	C	on	C	n.d.	C
6.Fastov	Lo	C+W	W	-	-	-	-	n.d.	n.d.	n.d.	W
7.Gontsy	Lo	W+n.d.	W	+	+	-	-	on	C	n.d.	C
8.Khotylevo II	Lo	n.d.	C	+	-	-	W	5-7m	W	n.d.	C-W
9.Kirillovskaya	Lo	C	W	-?	+	-	-	on	C	n.d.	C
10.Klyusy	n.d.	n.d.	n.d.	omit	omit	-	-	n.d.	n.d.	n.d.	n.d.
11.Korshevo I	n.d.	n.d.	n.d.	-	-	-	-	n.d.	n.d.	n.d.	n.d.
12.Korshevo II	n.d.	n.d.	n.d.	-	-	-	-	n.d.	n.d.	n.d.	n.d.
13.Kositsa	n.d.	n.d.	n.d.	-	-	-	-	n.d.	n.d.	n.d.	n.d.
14.Kurovo	Hi	W	W	-	-	-	-	n.d.	n.d.	n.d.	W?
15.Mezhirich	Lo	W+C+n.d.	C	+	+	C	C	1-2m	C	C	C
16.Mezin	Hi	W+C+n.d.	C	+	+	-	C	on?	C	W	C-W
17.N.-Severskii	Hi	W+C	W?	-	omit	W	W	n.d.	n.d.	n.d.	W
18.N.-Bobovichi	0	-	W	-	omit	-	-	10m?	W	n.d.	W?
Pushkari Group											
19.Bugorok	n.d.	n.d.	W	-	-	-	-	35-40m	W	n.d.	W
20.Pogon	n.d.	n.d.	W	-	-	-	-	15-20m	W	n.d.	W
21.Pushkari I	Lo	W+C	?	+?	+	-	-	15-20m	W	C	C?
22.Pushkari II	Hi	W+C	?	-	-	-	-	15-20m	W	n.d.	W
23.Radomyshl'	Lo	W+n.d.	W	+	+	-	-	4-5m	W?	n.d.	C-W?
24.Suponevo	Hi	W+C	W	+	+	n.d.	-	on	C	n.d.	C-W?
25.Timonovka I	Lo	C	W	+	-	-	-	18-23m	W	n.d.	C?
26.Timonovka II	Lo	C	?	+	-	-	-	15-20m	W	n.d.	C?
27.Yudinovo	Lo?	C+W+n.d.	?	+	+	-	-	on	C	n.d.	C
28.Yurovichi	Lo	W+n.d.	W	-	omit	-	-	n.d.	n.d.	n.d.	C?
29.Zhuravka	Hi	W+n.d.	W	-	-	-	-	on	C	n.d.	W
Column #	1	2	3	4	5	6	7	8	9	10	11

Diversity Index: Hi > 0.20; Lo < 0.20; W = warm season; C = cold season; Div. Ind. = Diversity Index

TABLE V-33

REGIONAL PATTERNS IN SEASONAL OCCUPATION OF THE SITES

	Total Number of Sites With Determined Season	Sites Occupied in Cold Season		Sites Occupied in Warm Season		Number of Sites With Ambiguous Season
		No.	%	No.	%	
A. ALL SITES-no chronological controls:						
1. North	15	7	47	8	53	2
2. South	6	4	67	2	33	0
3. Total	21	11	52	10	48	2
B. EARLY SITES						
1. North	2	2	100	0	0	1
2. South	0	0	0	0	0	1
3. Total	2	2	100	0	0	2
C. LATE SITES						
1. North	11	5	45	6	55	2
2. South	6	4	67	2	33	0
3. Total	17	9	53	8	47	2

TABLE VI-1

DENSITY OF ARTIFACTS AT THE SITES

	Lithics/m^2	Tools/m^2	End Scrapers & Burins/m^2	Nuclei/m^2	MNB*/m^2	Worked Bone/m^2
1. Berdyzh	4.3	n.d.	n.d.	n.d.	n.d.	n.d.
2. Chulatovo II	13.4	0.5	0.46	0.16	n.d.	0.0006
4. Dobranichevka	6.8	0.6	0.17	0.15	1.50	0.005
5. Eliseevichi	128.4	6.4	0.74	0.52	46.10	0.50
6. Fastov	8.6	0.8	0.04	0.42	1.45	-
7. Gontsy	3.7	0.4	0.31	0.02	6.90	0.02
8. Khotylevo II	41.4	10.0	n.d.	n.d.	2.80	0.60
9. Kirillovskaya	0.5	0.01	0.004	ins.	0.06	0.0009
13. Kositsa	20.0	2.0	0.80	0.24	0.02	-
15. Mezhirich	29.3	2.5	1.30	0.66	13.30	0.50
16. Mezin	94.4	3.7	2.80	0.48	6.9	0.20
Pushkari Group						
19. Bugorok	308.6	19.7	13.90	9.56	n.d.	-
20. Pogon	10.6	1.1	0.40	0.38	n.d.	-
21. Pushkari I	400.0	8.0	1.0o	8.0	1.30	0.01
22. Pushkari II	1.5	0.03	0.02	0.29	3.50	-
23. Radomyshl'	16.7	1.9	n.d.	n.d.	1.90	-
24. Suponevo	150.0	1.0	n.d.	n.d.	2.08	1.00
25. Timonovka I	85.0	0.1	4.90	2.55	n.d.	0.10
26. Timonovka II	85.5	0.01	3.12	1.32	0.80	0.01
27. Yudinovo	>25.0	n.d.	n.d.	n.d.	1.01	n.d.
29. Zhuravka	11.2	0.2	0.06	0.01	n.d.	-

Legend: * MNB /m^2 calculated only for economically important taxa; ins. = less than 0.0009

TABLE VI-2

DIFFERENCE OF MEANS TESTS ON THE DISTRIBUTION OF ASSEMBLAGES

	N	$\bar{x}_1$	$\bar{x}_2$	z	p
1. Density of lithics at the sites					
- northern vs southern sites	21	97.71	12.71	2.74	0.009
- northern sites with storage pits vs those without them	14	112.67	70.87	0.65	0.32
- southern sites with storage pits vs those without them	7	11.40	9.90	0.31	0.38
- sites with storage pits in the north vs in the south	14	112.67	11.40	2.71	0.009
- sites without storage pits in the north vs in the south	7	70.87	9.90	1.15	0.21
2. Density of tools at the sites - residualized against lithic densities					
A. Northern and southern sites residualized together					
- northern vs southern sites	18	+0.64	-0.99	1.31	0.17
- sites with storage pits vs those without them	18	-0.07	+0.12	0.12	0.40
- northern sites with storage pits vs those without them	10	+0.80	+0.72	0.03	0.40
- southern sites with storage pits vs those without them	7	-0.84	-1.32	1.47	0.14
- sites with storage pits in the north vs in the south	10	+0.80	-0.84	0.75	0.30
- sites without storage pits in the north vs in the south	7	+0.72	-1.37	1.33	0.16
- late northern vs southern sites	15	+1.17	-0.62	1.81	0.08
B. Northern and southern sites residualized separately					
- late northern vs southern sites	16	+0.006	0	0.05	0.40
- late northern sites with storage pits vs those without them	10	-0.66	+0.67	0.58	0.34
- late southern sites with storage pits vs those without them	6	+0.12	-0.24	1.24	0.18
- late sites with storage pits in the north vs in the south	9	-0.66	+0.12	0.48	0.36
- late sites without storage pits in the north vs in the south	7	+0.67	-0.24	0.55	0.34
- all northern sites with storage pits vs those without them	11	+0.06	-0.07	0.04	0.40
- all southern sites with storage pits vs those without them	7	+0.13	-0.32	1.45	0.14
- sites with storage pits in the north vs in the south	11	+0.06	0.13	0.04	0.40
- sites without storage pits in the north vs in the south	7	-0.07	-0.32	0.31	0.38
3. Densities of end scrapers plus burins - residualized against lithic densities					
- northern vs southern sites	16	-0.02	-0.002	0.02	0.40
- sites with storage pits vs those without them	16	+0.38	-0.23	0.40	0.37
- sites with high densities vs sites with low densities	16	+1.52	-1.55	2.65	0.01
- northern sites with high densities vs southern sites with high densities	8	+2.92	+0.13	1.75	0.09
- low density sites in the north vs in the south	8	-1.97	-0.26	2.04	0.05
4. Densities of nuclei - residualized against lithic densities					
- all (= late) northern vs southern sites	15	-0.005	-0.002	0.008	0.40
- northern sites with storage pits vs those without them	10	-0.83	0.82	2.66	0.01
- southern sites with storage pits vs those without them	5	+0.06	+0.005	0.34	0.38
- sites with storage pits in the north vs in the south	8	-0.83	+0.06	1.89	0.07
- sites without storage pits in the north vs in the south	7	+0.82	+0.005	1.91	0.06
- northern sites with high densities vs those with low ones	10	-1.26	+0.83	4.48	<0.0001
- southern sites with low density vs those with high ones	5	-0.14	+0.09	2.58	0.01
- sites with low densities in the north vs in the south	5	-1.26	-0.14	3.37	0.001
- sites with high densities in the north vs in the south	9	+0.83	+0.09	2.42	0.02
- sites with high densities vs those with low ones	15	+0.58	-0.89	3.76	<0.0004
5. Densities of residualized values of end scrapers plus burins and of residualized values of nuclei					
- northern vs southern sites	15	-0.001	-0.002	0.00	0
- sites with storage pits in the north vs those in the south	8	+4.45	-0.37	1.98	0.06
- sites without storage pits in the north vs in the south	8	-3.31	-0.56	0.31	0.38
- sites with high densities vs those with low densities	15	+5.21	-4.36	4.83	<0.0001
- sites with high densities with storage pits vs sites without storage pits	6	+5.48	+11.84	5.63	<0.0001
- sites with low densities with storage pits vs sites without storage pits	9	-1.32	-5.71	4.11	<0.0001
- sites with high densities with storage pits in the north vs in the south	5	+6.13	+2.89	1.84	0.07
- sites with high densities without storage pits in the north vs in the south	1	+11.84			
- sites with low densities with storage pits in the north vs in the south	3	-2.18	-0.90	9.08	<0.0001
- sites with low densities without storage pits in the north vs in the south	6	-4.47	-12.95	7.00	<0.0001

TABLE VI-2
continued

	N	$\bar{x}_1$	$\bar{x}_2$	z	p
6. End scrapers plus burins residualized against lithic densities and against density of nuclei					
- sites with high densities vs those with low ones	9	+5.48	-1.51	5.87	0.0001
7. End scraper plus burin densities (residualized against lithic densities) plus fur bearers at late sites					
- northern high density vs low density sites	10	+1.91	-8.55	2.21	0.03
- northern sites without pits with high densities vs sites with low densities	4	+2.57	-16.61	3.99	<0.0001
- sites with high densities vs those with low ones	6	+5.99	-1.69	0.32	0.38
- southern sites with low densities with dwellings vs sites without dwellings	5	+0.06	-1.67	1.70	0.09
8. Blade:Nuclei ratios - on arcsine transformed values					
- sites with high ratios vs those with low ratios	18	40.28	12.42	5.04	<0.0001
9. Worked bone - density at the sites					
- sites with high densities vs sites with low densities, on raw values	9	0.33	0.006	2.49	0.02
- sites with dwellings vs sites without dwellings	11	0.32	0.18	0.78	0.44
- sites with storage pits vs sites without storage pits	11	0.29	0.0006	3.11	0.002
- northern sites with storage pits vs southern ones	0	0.30	0.18	0.60	0.55
- all northern sites vs all southern sites	11	0.31	0.12	0.95	0.34
- sites with high densities vs sites with low densities	12	0.44	0.004	3.67	<0.0004
- late northern sites with dwellings vs late southern sites with dwellings	11	0.40	0.13	1.59	0.11
- late sites with storage pits vs late sites without storage pits	11	0.33	0.006	2.66	0.01
- late northern sites with storage pits vs late southern sites with storage pits	10	0.47	0.13	1.70	0.09
10. Art at the sites					
- northern vs southern sites - on numbers found	10	12.57	6.66	0.91	0.26
- late northern vs late southern sites - on numbers found	8	14.20	6.66	0.94	0.26
- sites with high numbers vs sites with low numbers - on numbers found	10	24.50	1.67	5.11	<0.0001
- late sites with high numbers vs late sites with low numbers - on numbers found	8	27.33	1.80	4.31	<0.0001
- late northern vs late southern sites - on residualized values	6	+1.26	-2.51	1.19	0.20
- late sites with high numbers vs late sites with low numbers - on residualized values	5	+5.10	-3.39	2.47	0.02
11. Jewelry at the sites (excluding shells) - numbers found					
- all (=late) northern vs southern sites	6	23.25	15.10	0.67	0.32
- all sites with high numbers vs all sites with low numbers	6	30.00	1.50	5.67	<0.0001
12. Shells at the sites - on coded and distance scaled values					
- northern vs southern sites	6	1,137.9	9.0	1.71	0.09
- sites with high numbers vs sites with low numbers	6	1,868.3	31.17	2.09	0.04
- sites with low numbers in the north vs in the south	3	42.25	9.0	2.80	0.008
13. Amber at the sites - on coded and distance scaled values					
- northern vs southern sites	5	2.40	2.87	1.12	0.21
14. Art plus jewelry - on raw numbers found					
- simple vs complex base camps	9	1.00	86.60	3.72	<0.0004

Note: plus or minus values only appear on residualized mean values (i.e. when raw numbers have been residualized), all other mean values in the table are positive.

TABLE VI-3

PEARSON'S COEFFICIENTS OF CORRELATION FOR ASSEMBLAGES AND FEATURES

	N	df	r	r^2	p
A. Assemblages					
1. Thickness of the cultural layer and lithic density per m^2 at					
- all sites	19	17	+0.0800	0.01	>0.1
- all early sites	3	1	-0.1438	0.02	>0.1
- all late sites	16	14	+0.3900	0.15	>0.1
- late northern sites	11	9	+0.1644	0.03	>0.1
- late southern sites	5	3	+0.6584	0.43	>0.1
- all northern sites	13	11	-0.069	0.005	>0.1
- all southern sites	6	4	+0.5223	0.27	>0.1
2. Density of lithics and density of lithic tools per m^2 at					
- all northern sites	11	9	+0.6800	0.46	0.02
- all southern sites	7	5	+0.9200	0.85	0.01
- late northern sites	10	8	+0.7507	0.56	0.05
- late southern sites	6	4	+0.9341	0.87	0.01
3. Density of end scrapers plus burins and density of lithics per m^2 at					
- late northern sites - north and south residialuzed together	10	8	+0.4500	0.20	>0.1
- late southern sites - north and south residualized together	6	4	+0.8966	0.80	0.02
4. Density of end scrapers plus burins residualized against lithic density and density of fur bearers per m^2 at					
- sites with high density of fur bearers	3	1	-0.9918	0.98	<0.5>0.1
- sites with low density of fur bearers	9	7	+0.4815	0.23	> 0.1
5. Density of lithics and density of nuclei per m^2 at					
- all (= late) northern sites	10	8	+0.9200	0.85	0.001
- all (= late) southern sites	5	3	+0.8000	0.64	0.1
6. Density of nuclei and density of all lithics per m^2 at					
- all (= late) northern sites	10	8	+0.9200	0.85	0.001
- all (= late) southern sites	5	3	+0.8000	0.64	0.1
7. Density of economically important MNBs and density of worked bone per m^2 at all of the sites	10	8	+0.080	0.008	>0.1
8. Density of jewelry (excluding shells) with density of end scrapers plus burins (not residualized) at all sites	5	3	+0.6700	0.45	>0.05
9. Density of jewelry (excluding shells) with density of end scrapers plus burins residualized against lithic density					
- at all sites (= late sites)	5	3	+0.6600	0.44	>0.05
- at sites with low density of jewelry	3	1	-0.8200	0.67	>0.05
10. Amount of shells (weighed per distance and volume)and amount of art					
- at all sites	11	9	+0.7300	0.53	0.01
11. Amount of shells and of jewelry at the sites - raw counts	8	6	+0.7213	0.52	0.05

TABLE VI-3
continued

	N	df	r	r^2	p
B. Features					
1. Hearths					
a. Total hearth volume (m^3) and the thickness of the cultural layer at					
- all sites	7	5	+0.8300	0.70	0.02
- all northern sites	5	3	+0.8400	0.71	>0.05
- all southern sites - cant do as N=2					
b. Density of hearths (m^2 per hearth) and the thickness of the cultural layer at					
- all sites,omitting Kirillovskaya	12	10	-0.3789	0.14	>0.1
- all northern sites	7	5	-0.3234	0.10	>0.1
- all southern sites,omitting Kirillovskaya	5	3	+0.2300	0.05	>0.1
- all late sites, omitting Kirillovskaya	11	0	-0.3784	0.14	>0.1
- all late northern sites	6	4	-0.6540	0.43	>0.1
- all late southern sites, omitting Kirillovskaya	5	3	+0.2300	0.05	>0.1
2. Dwellings					
a. Number of dwellings and the thickness of the cultural layer at					
- all sites	10	8	-0.0588	0.003	>0.1
- all northern sites	6	4	-0.0655	0.004	>0.1
- all southern sites	4	2	+0.9700	0.94	0.05
- all late sites	8	6	+0.0389	0.001	>0.1
- late northern sites	5	3	+0.1524	0.02	>0.1
- late southern sites	3	1	+0.9608	0.92	>0.1
b. Number of dwellings and the hearth volume (m^3) at					
- all sites	6	4	-0.5505	0.30	>0.1
- all northern sites	4	2	-0.2399	0.06	>0.1
- all late sites	5	3	-0.4579	0.21	>0.1
- late northern sites	3	1	+0.3620	0.13	>0.1
c. Number of dwellings and density of hearths (m^2 per hearth at					
- all sites,omitting Kirillovskaya	8	6	+0.2891	0.08	>0.1
- all southern sites (= late),omitting Kirillovskaya	3	1	-0.7807	0.61	>0.1
- all late sites, omitting Kirillovskaya	7	5	+0.2657	0.07	>0.1
- late northern sites	4	2	+0.4363	0.19	>0.1
d. Area of dwelling and kilograms of mammoth bone used in the construction of the dwelling	9	7	+0.7951	0.63	<0.1>0.05

TABLE VI-4

LITHIC AND TOOL DENSITY RESIDUALS

A. All Sites

	North				South		
	Lithics/m^2 x	Tools/m^2 y	Tool density residuals		Lithics/m^2 x	Tools/m^2 y	Tool density residuals
Berdyzh	4.3	n.d.	n.d.	Dobranichevka	6.8	0.6	+0.06
Chulatovo II	13.4	0.5	-2.52	Fastov	8.6	0.8	+0.10
Eliseevichi	128.4	6.4	-0.07	Gontsy	3.7	0.4	+0.13
Khotylevo II	41.4	10.0	+6.14	Kirillovskaya	0.5	0.01	+0.02
Kositsa	20.0	2.0	-1.21	Mezhirich	29.3	2.5	-0.05
Mezin	94.4	3.9	-1.55	Radomyshl'	16.7	1.9	+0.5
Bugorok	308.6	19.7	+7.83	Zhuravka	11.2	0.2	-0.74
Pogon	10.6	1.1	-1.84				
Pushkari I	400.0	8.0	-6.6				
Pushkari II	1.5	0.03	-2.63				
Suponevo	150.0	n.d.	n.d.				
Timonovka I	85.0	8.9	+3.73				
Timonovka II	85.5	3.9	-1.28				
Yudinovo	>25.0	n.d.	n.d.				

TABLE VI-4
continued

B. Late Sites

	North				South		
	Lithics/m^2 x	Tools/m^2 y	Tool density residuals		Lithics/m^2 x	Tools/m^2 y	Tool density residuals
Chulatovo II	13.4	0.5	-1.63	Dobranichevka	6.8	0.6	+0.11
Eliseevichi	128.4	6.4	+0.51	Fastov	8.6	0.8	+0.17
Kositsa	20.0	2.0	-0.30	Gontsy	3.7	0.4	+0.17
Mezin	94.4	3.9	-0.88	Kirillovskaya	0.5	0.01	+0.05
Bugorok	308.6	19.7	+7.91	Mezhirich	29.3	2.5	+0.15
Pogon	10.6	1.1	-0.93	Zhuravka	11.2	0.2	-0.65
Pushkari I	400.0	8.0	-6.78				
Pushkari II	1.5	0.03	-1.71				
Timonovka I	85.0	8.9	+4.43				
Timonovka II	85.5	3.9	-0.59				

TABLE VI-5

RESIDUALIZATION OF NUCLEI DENSITIES

	North				South		
	Lithics/m^2 x	Nuclei/m^2 y	Nuclei density residuals		Lithics/m^2 x	Nuclei/m^2 y	Nuclei density residuals
Chulatovo II	13.4	0.16	+0.22	Dobranichevka	6.8	0.15	+0.01
Eliseevichi	128.4	0.52	-2.16	Fastov	8.6	0.42	+0.24
Kositsa	20.0	0.24	+0.14	Gontsy	3.7	0.02	-0.05
Mezin	94.4	0.48	-1.39	Mezhirich	29.3	0.66	+0.02
Bugorok	308.6	9.56	+2.58	Zhuravka	11.2	0.0009	-0.23
Pogon	10.6	0.38	+0.51				
Pushkari I	400.0	8.0	-1.15				
Pushkari II	1.5	0.29	+0.64				
Timonovka I	85.0	2.55	+0.90				
Timonovka II	85.5	1.32	-0.34				

TABLE VI-6

NUCLEI AT THE SITES

	Nuclei: % of All Lithics	Arcsine Transformed Nuclei %
Berdyzh	n.d.	n.d.
Chulatovo I	0.4	3.63
Chulatovo II	0.16	2.29
Dobranichevka	0.15	2.22
Eliseevichi	0.52	4.10
Fastov	0.42	3.72
Gontsy	0.01	0.00
Khotylevo II	n.d.	-
Kirillovskaya	ins	-
Klyusy	n.d.	-
Kositsa	0.24	2.81
Korshevo I	n.d.	-
Korshevo II	n.d.	-
Kurovo	0.004	0
Mezhirich	0.66	4.66
Mezin	0.48	3.97
N.-Severskii	0.04	0
N.-Bobovichi	n.d.	-
Pushkari Group		
Bugorok	9.56	18.05
Pogon	0.38	3.53
Pushkari I	8.0	16.43
Pushkari II	0.29	3.09
Radomyshl'	n.d.	-
Suponevo	n.d.	-
Timonovka I	2.55	9.28
Timonovka II	1.32	6.55
Yudinovo	n.d.	-
Yurovichi	n.d.	-
Zhuravka	0.009	0

TABLE VI-7

BLADE : NUCLEI RATIOS

	# of blades, blade fragments and tools	# of nuclei	Blades:Nuclei	Arcsine transforms*
	1	2	3	4
Chulatovo I	92	15	6.1	14.30
Chulatovo II	2,020	160	12.6	20.79
Dobranichevka	4,551	305	14.9	22.71
Eliseevichi	12,393	321	38.6	38.41
Fastov	225	92	2.4	8.91
Gontsy	680	13	52.3	46.32
Kirillovskaya	268	5	53.5	47.01
Kositsa	1,190	>30	39.6	39.0
Kurovo	5	1	5.0	12.92
Mezhirich	6,316	337	18.7	25.62
Mezin	19,092	576	33.1	35.12
Novgorod-Severskii	31	9	3.4	10.63
Novo-Bobovichi	1	-	-	-
Bogorok	499	130	3.8	11.24
Pogon	145	24	6.0	14.18
Pushkari I	16,990	3,200	5.3	13.31
Pushkari II	13	17	0.8	5.13
Timonovka I	14,735	~3,000	4.9	12.79
Zhuravka	258	3	86.0	68.03

* Arcsine transforms after Zar 1974:Table D 27

TABLE VI-8

DENSITIES OF END SCRAPERS PLUS BURINS RESIDUALIZED AGAINST MNI DENSITIES OF ALL FUR BEARERS

	All fur bearers/m^2	ESB residuals*	New ESB residuals+
A. Sites with high densities of fur bearers			
Eliseevichi	0.5378	-3.02	+0.24
Mezhirich	0.2346	-0.05	-0.32
Mezin	0.1624	+1.38	+0.26
B. Sites with low densities of fur bearers			
Chulatovo II	0.0430	+4.63	+1.90
Dobranichevka	0.0075	+0.17	-1.36
Fastov	0.0000	-0.23	-1.51
Gontsy	0.0478	+0.29	-2.61
Kirillovskaya	0.0008	+0.15	-1.14
Kositsa	0.0000	+4.51	+3.23
Bugorok	0.0000	-8.58	-9.86
Pogon	0.0000	-22.08	-23.36
Pushkari I	0.0279	+5.39	+3.16
Pushkari II	0.1033	+5.01	+0.24
Timonovka I	0.0054	+4.13	+2.66
Timonovka II	0.0614	+2.32	-1.23
Zhuravka	0.0060	-0.35	-1.84

Legend: * ESB residuals - densities of end scrapers plus burins residualized against lithic densities;
+ end scraper and burin densities residualized from lithic density and density of all fur bearers.

TABLE VI-9

PROVENIENCE OF LITHICS AT THE SITES

	Types present					Summed data on lithics		
	Ocher	Flint	Sandstone	Mountain Crystal	Slate	Presence-Absence of exotics	Coded values*	Dimension scaled codes**
	1	2	3	4	5	6	7	8
1. Berdyzh	L	n.d.	-	-	-	-	0	n.d.
2. Chulatovo I	L	L	-	-	-	-	0	0
3. Chulatovo II	E	L	-	-	-	+	0	1
4. Dobranichevka	E	L	L	E	-	+	1	2
5. Eliseevichi	E	E	E	-	-	+	1	3
6. Fastov	L	L	-	-	-	-	0	0
7. Gontsy	E	L	-	E	-	+	1	2
8. Khotylevo II	E	n.d.	n.d.	-	-	+	0	n.d.
9. Kirillovskaya	L	L	-	-	-	-	0	0
10. Klyusy	L	n.d.	-	-	-	-	0	n.d.
11. Korshevo I	L	n.d.	n.d.	-	-	-	0	n.d.
13. Korshevo II	L	n.d.	n.d.	-	-	-	0	n.d.
14. Kositsa	E	n.d.	n.d.	-	-	+	0	n.d.
15. Mezhirich	E	L	L	E	L	+	1	2
16. Mezin	E	L	-	-	-	+	0	1
17. Novgorod-Severskii	E	L	-	-	-	+	0	1
18. Novo-Bobovichi	L	L	-	-	-	-	0	0
Pushkari Group								
19. Bugorok	L	L	-	-	-	-	0	0
20. Pogon	E	E	-	-	-	+	1	2
21. Pushkari I	E	L	-	-	L	+	0	1
22. Pushkari II	E	L	-	-	-	+	0	1
23. Radomyshl'	L	E	-	-	-	+	0	1
24. Suponevo	E	L	-	-	-	+	1	1
25. Timonovka I	E	L	n.d.	-	E	+	1	n.d.
26. Timonovka II	E	L	-	-	-	+	0	1
27. Yudinovo	E	E	-	-	-	+	1	2
28. Yurevichi	E	L	L?	-	-	+	0	1?
29. Zhuravka	L	E	-	-	-	+	0	1

Legend: - absent; + = present; E = present, non-local origin; L = present, local origin; n.d. = present, no data on source of origin;
* Coded values: 0 = exotic material present in less than 2 categories, 1 = exotic materials present in more than 2 categories;
** Dimension scaled codes: 1 - exotics present in 1 category, 2 - exotics present in 2 categories, 3 - exotics present in 3 categories.

TABLE VI-10

DISTRIBUTION OF AMBER

Sites	Number Found	Kilometers to Source	Distance Scaled Values	Code
	1	2	3	4
Chulatovo II	1	260	2.6	1
Dobranichevka	12	130	15.6	2
Gontsy	some*	200	10.0	1.5?
Mezhirich	>348	100	348.0	3
Mezin	>1	220	2.2?	1

Legend: ~ - about
* - assume some = 5

Coding: 1 = <10
2 = 10-100
3 = >100

TABLE VI-11

ART AND JEWELRY

Sites	Art		Jewelry	
	# Found	Coded Values	# Found	Coded Values
	1	2	3	4
Dobranichevka	2	1	-	-
Eliseevichi	1	1	>32	3
Gontsy	-	-	2	1
Khotylevo II	~16	2	-	-
Kirillovskaya	3	1	-	-
Mezhirich	15	2	28	3
Mezin	~40	3	44	3
Pushkari I	-	-	1	1
Suponevo	2	1	16	2
Timonovka I	27	3	0	-
Timonovka II	1	1	0	-
Yudinovo	some*	2	some*	2
Yurovichi	1	1	-	-

Notes: 2 - coding in column 2
1 = 0-10
2 = 11-25
3 = >26

4 - coding in column 4:
1 = <10
2 = 11-20
3 = >20

* For Yudinovo assume some = >10

~ about

TABLE VI-12

DISTRIBUTION OF FOSSIL MARINE SHELLS

Sites	Number Found	Kilometers to Source	Distance Scaled Values	Code
	1	2	3	4
Chulatovo II	4	550	22.0	1
Eliseevichi	105	600	630.0	2
Mezhirich	3	300	9.0	1
Mezin	~800	500	4,000.0	3
Timonovka I	>9	650	58.5	1.5?
Yudinovo	>150	650	975.0	2?

Legend: ~ - about

Coding: 1 = 1-50
2 = 51-1,000
3 = >1,000

TABLE VI-13

DECORATIVE OBJECTS

Sites	1	2	3	4	5	6	7
	Coded Values For						
	Amber	Art	Fossil Shells	Jewelry	Pres/ abs	Scale Coded	Dimensional Scale Coded
1.Berdyzh					-	0	0
2.Chulatovo I					-	0	0
3.Chulatovo II	1	-	1	-	+	1	2
4.Dobranichevka	2	1	-	-	+	1	2
5.Eliseevichi	-	1	2	3	+	1	3
6.Fastov	-	-	-	-	-	0	0
7.Gontsy	1.5?	-	-	1	+	1	3
8.Khotylevo II	-	2	-	-	+	0	1
9.Kirillovskaya	-	1	-	-	+	0	1
10.Klyusy					-	0	0
11.Korshevo I					-	0	0
12.Korshevo II					-	0	0
13.Kositsa					-	0	0
14.Kurovo					-	0	0
15.Mezhirich	3	2	1	3	+	1	4
16.Mezin	1	3	3	3	+	1	4
17.N.-Severskii					-	0	0
18.N.-Bobovichi					-	0	0
Pushkari Group							
19.Bugorok					-	0	0
20.Pogon					-	0	0
21.Pushkari I	-	-	-	1	+	0	1
22.Pushkari II					-	0	0
23.Radomyshl'					-	0	0
24.Suponevo	-	1	-	2	+	1	2
25.Timonovka I	-	3	1.5?	-	+	1	2
26.Timonovka II	-	1	-	-	+	0	1
27.Yudinovo	-	2	2?	2	+	1	3
28.Yurovichi	-	1	-	-	+	0	1
29.Zhuravka					-	0	0

Notes: 1) Col. 6 - scaled coding: 0 = none, present in 1 category
1 = present in >2 categories
2) Col. 7: coding by presence in number of categories
3) ? - guessed values

TABLE VI-14

TESTS OF ASSOCIATION

	N	ϕ	p*
1. Sites with storage pits and/or dwellings and sites with thick cultural layers	19	+0.11	0.34
2. Interior and exterior hearths	22	+0.40	0.05
3. Sites with hearths and sites with dwellings	22	+0.56	0.01
4. Hearths and large storage pits at the sites	22	+0.75	0.0007
5. End scrapers plus burins and nuclei at the sites	16	+0.63	0.02
6. High and low percentages of end scrapers plus burins and of nuclei (of all lithics)	10	+0.20	0.40
7. High and low Blade:Nuclei ratios and sites with storage pits	18	-0.55	0.02
8. Density of nuclei and percentage of nuclei of total number of tools	15	+0.04	0.90
9. Presence of art and of jewelry	29	+0.44	0.03
10. Presence of art and jewelry and dwellings at the sites - all sites	28	+0.63	0.01
11. Presence of art and jewelry and dwellings at the sites - late sites	24	+0.91	0.000008
12. Presence of art and jewelry and storage pits at the sites - all sites	28	+0.86	0.000005
13. Presence of art and jewelry and storage pits at the sites - late sites	25	+1.00	0.000002
14. Presence of art and of storage pits - all sites	28	+0.75	0.00007
15. Presence of art and of storage pits - late sites	25	+0.85	0.00002
16. Presence of marine shells and of storage pits at the sites - all sites	25	+0.39	0.003
17. Presence of marine shells and of art	11	+0.13	0.51
18. Presence of marine shells and of amber	25	+0.42	0.06
19. Presence of amber and of storage pits	25	+0.36	0.08
20. Presence of amber and of art	29	+0.21	0.21
21. Presence of amber and of jewelry	25	+0.37	0.10
22. Presence of ocher and of storage pits	22	+0.43	0.05
23. Presence of decorative items and of exotic lithics and ocher - on dimensionally scaled codes	29	+0.67	0.001

TABLE VI-14
continued

	N	ϕ	p*
24. Presence of decorative items and of exotic lithics and ocher - on presence/absence	29	+0.56	0.003
25. Presence of grinding stones and of worked bone	29	+0.37	0.04
26. Presence of grinding stones and of ocher	29	+0.66	0.0004
27. Presence of gridning stones and of storage pits at the sites - all sites	29	+0.33	0.06
28. Presence of grinding stones and of exotic lithics (without ocher)	24	+0.22	0.19

Notes: N refers to number of sites in the sample
* probability estimated by Fisher's Exact Test

TABLE VI-15

DIFFERENCE OF MEANS TESTS ON CULTURAL LAYER THICKNESS

	N	$\tilde{x}_1$	$\tilde{x}_2$	z	p.
All:					
1.Pit vs -Pit	19	0.11	0.17	1.50	0.13
2.N vs S	18	0.18	0.11	1.75	0.08
3.N - Pit vs -Pit	13	0.2	0.13	1.40	0.16
4.S - Pit vs -Pit	6	0.13	0.08	1.67	0.10
5.Pit: Hi vs Low	10	0.29	0.11	6.00	<0.0001
6.-Pit: Hi vs Low (all = Late as no Early)	6	0.15	0.05	3.13	0.003
7.Pit N vs S	13	0.23	0.13	0.18	0.86
8.-Pit N vs S	6	0.13	0.08	1.00	0.32
9.Pit Hi: N vs S	5	0.31	0.2	5.50	<0.0001
10.Pit Low: N vs S	8	0.104	0.10	0.24	0.39
11.-Pit Hi - N vs S	4	0.16	0.1	2.00	0.05
12.-Pit Low - N vs S	2	0.04	0.06	-	1.00
14.High, North: Pit vs -Pit	7	0.31	0.16	3.75	<0.0001
15.Low, North: Pit vs -Pit	6	0.104	0.04	30.00	<0.0001
16.Hi South: Pit vs -Pit	2	0.2	<0.1	-	-
17.Low South: Pit vs -Pit	4	0.1	0.006	5.53	<0.001
Late					
26.Pit vs -Pit	16	0.14	0.11	0.75	0.45
27.N vs S	15	0.15	0.09	2.00	0.05
28.Pit: Hi vs Low	10	0.25	0.1	3.75	<0.0001
29.Pit: Hi vs Low if Elim*SU	9	0.3	0.1	33.30	<0.0001
30.-Pit N vs S	6	0.13	0.08	1.67	0.10
31.-Pit Hi vs Low	6	0.15	0.05	3.13	0.003
31.Pits Hi N vs S	2	-	-	-	-
32.Pits Low N vs S	8	0.104	0.1	0.24	0.39
33.-Pit Hi N vs S	4	0.16	0.1	1.50	0.13
34.-Pit Low N vs S	2	0.04	0.06	can't do	
36.Pits N vs S	10	0.16	0.1	2.00	0.05

Pit = with storage pits

-Pit - without storage pits

*note: Elim*Su = eliminate Suponevo

TABLE VI-16

LABOR EXPENDITURES IN THE CONSTRUCTION OF DWELLINGS

Sites	1						2	3	4	5	6	7
	Dwelling Area in m^2											
	Reported # Dw.	#1	#2	#3	#4	#5	Small Dw. #	# Large Dw.	Mean # Dw. Per Site	Total Estim. Kg Bone	Days of Labor Per Site 10 Men	20 Men
Berdyzh	2	12.5	45?				omit - questionable reconstructions					
Dobranichevka	4	12.5	12.5	12.5	12.5		4	-	4	19,260	5.4	2.7
Eliseevichi	2?	~20. for each					-	2	2	31,442	8.8	4.4
Gontsy	2	~20m^2 for each?					-	2	2	31,442	8.8	4.4
Kirillovskaya	3-4	~20m^2 for each					-	4?	-	omit (reconstructed)		
Mezhirich	4	24	20	12?	20		1	3	4	51,978	14.5	7.3
Mezin	2-5	20	8	28	8	23	2	3	3.5	56,793	15.9	8.0
Pushkari I	1-3	[a]48m^2	[b]12.5				3	-	2	[c]14,445	4.0	2.0
Radomyshl'	5-6	12.5	12.5	10	12.5	10	6	-	5.5	28,890	8.1	4.0
Suponevo	1-3	23.76	27.5	nd					2	47,163	13.2	6.6
Yudinovo	3-4	20-44	24	20-28	20-30		-	4	3.5	62,884	17.6	8.8

Note: Assume: 1. small dwelling = 4,815 Kg bone
2. large dwelling = 15,721 Kg bone

Legend: a. If one dwelling, then its area = 48 m^2
b. If 3 dwellings, then each has area = 12.5 m^2
c. Pushkari I calculated as 3 small dwellings for maximal bone estimates

TABLE VI-17

DIFFERENCE OF MEANS TESTS ON FEATURES AT THE SITES

	N	$\bar{x}_1$	$\bar{x}_2$	z	p
I. Hearths					
A. Density at the sites - m^2 per hearth - all sites					
- northern vs southern sites	12	92.42	226.95	3.18	0.01
- sites with dwellings vs sites without them	12	183.30	111.10	1.86	0.06
- sites with dwellings vs sites without them in the north	6	87.03	112.20	1.07	0.28
- sites with dwellings vs sites without them in the south	6	283.50	110.00	3.45	0.001
- northern vs southern sites with dwellings	8	87.09	285.30	6.14	<0.0001
- northern vs southern sites without dwellings	4	112.20	110.00	0.10	0.40
- northern sites with storage pits vs sites without storage pits	8	124.51	142.90	0.14	0.40
B. Density at the sites - m^2 per hearth - late sites					
- sites with storage pits vs sites without them	12	167.21	120.97	1.72	0.19
- northern vs southern sites	12	84.30	227.00	3.14	0.002
- northern sites with storage pits vs sites without storage pits	6	72.78	142.90	13.13	<0.0001
- southern sites with storage pits vs sites without storage pits	6	285.50	110.00	5.45	<0.0001
- northern vs southern sites with storage pits	9	72.78	285.30	6.52	<0.0001
- northern vs southern sites without storage pits	6	70.73	110.00	6.22	<0.0001
C. Volume of hearths - m^3 - all sites					
- northern vs southern sites	7	2.10	0.68	1.75	0.09
- northern vs southern sites with dwellings	6	2.52	0.68	1.82	0.07
- sites with storage pits vs sites without them	7	1.91	0.40	2.25	0.03
- northern vs southern sites with storage pits	6	2.53	0.68	2.37	0.02
- northern sites with storage pits vs sites without them	5	2.53	0.40	2.45	0.01
D. Volume of hearths - m^3 - late sites					
- sites with storage pits vs sites without them	6	1.21	0.40	3.12	0.002
- northern vs southern sites	6	1.28	0.68	1.62	0.11
- northern sites with storage pits vs sites without them	4	1.57	0.40	4.18	<0.0001
- northern vs southern sites with storage pits	5	1.57	0.89	2.70	0.008
II. Dwellings					
- number of dwellings at northern vs southern sites	11	2.50	3.80	2.28	0.03
- number of dwellings at late northern vs late southern sites	9	2.60	3.38	1.47	0.14
- large vs small dwellings (on area per dwelling)	32	23.13	11.29	12.21	<0.0001
III. Facilities					
- Numbers of storage pits, dwellings, and surface bone accumulations per square meter at simple vs complex sites with storage pits and dwellings (base camps)	10	114.42	67.85	1.97	0.05
- Square meters per facilities and hearths at simple vs complex sites with storage pits and dwellings (base camps)	10	67.90	39.52	2.59	0.01
IV. Labor investment of 10 men at sites with dwellings in the construction of dwellings at simple vs complex base camps	9	6.58	14.0	4.49	<0.0001

TABLE VI-18

DISTRIBUTION OF SKELETAL ELEMENTS* AND THEIR WEIGHTS** PER DWELLING AT MEZHIRICH

Mammoth:	Dwelling #1		Dwelling #2		Dwelling #3		Dwelling #4	
	number found	kilograms	number found	kilograms	number found	kilograms	number found	kilograms
Crania	46	9,200.0	34	6,800.0	17	3,400.0	40	8,000.0
Mandibles	95	1,729.0	2	36.4	12	218.4	11	200.2
Teeth	10	50.0	13	65.0	21	110.0	-	
Tusks	40	8,000.0	41	8,400.0	11	2,200.0	35	7,000.0
Vertibrae	47	61.1	70	91.0	84	109.2	9	4.7
Ribs	9	13.5	192	288.0	65	97.5	1	1.5
Scapulae	31	341.0	42	642.0	29	319.0	13	143.0
Humerae	20	157.0	32	351.2	15	117.8	6	47.1
Radiae	8	8.0	15	60.0	10	40.0	-	
Ulnae	2	2.0	5	5.0	7	7.0	4	4.0
Pelvises	46	506.0	61	671.0	22	242.0	28	308.0
Femora	26	390.0	59	885.0	20	300.0	7	105.0
Tibiae	6	39.6	12	79.2	18	118.8	1	6.6
Fibulae	1	1.0	2	2.0	2	2.0	-	
Patellae	-		1	0.2	1	0.2	-	
Tarsals	2	3.6	3	5.4	1	1.8	-	
Metapodials	3	3.6	5	9.0	6	10.8	-	
Phalanges	3	1.5	9	4.5	5	2.5		
Sesamoids	-		2	ins.	-		-	
Long bone fragments	18	77.4	58	249.4	283	1,216.9	-	
Total number of bones	406		658		629		155***	
Total weight	20,584.3 kgs		18,643.3 kgs		8,518.9 kgs		15,827.1 kgs***	

Legend: * Data on skeletal elements in dwellings 1,2,3 from Pidoplichko 1976, on dwellings #4 from my field notes on excavations during the 1978,1979 field seasons; ** weights of various skeletal elements from Table V-12; *** incomplete counts as dwelling #4 is still under excavation.

TABLE VI-19

MAMMOTH BONE DWELLINGS

	# of Dwellings	Interior Area/m^2	Amount of Mam. Bone in Dw.	Reference
Dobranichevka Total found = 4	1	12.5	8,209	Shovkoplyas et al. 1981, Shovkoplyas 1972
	2	12.5	1,045	
	3	12.5	1,490	
	4	12.5	n.d.	
Gontsy Total found=2	2 area $\tilde{x}$ = 20.0	20.0	>11,789	Pidoplichko 1969
Mezhirich Total found = 4	1	24.0	20,583	Ko ni tz et al. 1981, Pidoplichko 1969
	2	20	18,643	
	3	12.0*	8,514	
	4	27.0	15,827	
Mezin Total found = 2 - 5	1	20	8,202	Shovkoplyas 1965a
	2	8	n.d.	
	3	28	>2,944	
	4	8	>362	
	5	28	1,669	

* Area for Mezhirich dwelling #3 given in Pidoplichko 1976. This estimate is questionable as he gives a diameter of ~2 m.

TABLE VI-20

ESTIMATES OF LABOR INVESTED IN THE ASSEMBLAGE AND CONSTRUCTION OF MAMMOTH BONE DWELLINGS

A. Labor to assemble the bones - in days

Given: 500 kilograms carried per man per day over distance of 750 meters (after Coles 1979:138-139)

	Dwelling #1		Dwelling #2		Dwelling #3		Dwelling #4		Dwelling #5	
	10 men	20 men	10 men	20 men	10 men	20 men	10 men	20 men	10 men	20 men
Dobranichevka	1.6	1.0	0.2	0.1	0.3	0.1	ins.	ins.	-	-
Gontsy	2.4	1.2	2.4	1.2	-	-	-	-	-	-
Mezhirich	4.0	2.0	3.7	1.8	1.7	0.8	3.1	1.5	-	-
Mezin	1.6	0.8	n.d.	n.d.	0.6	0.3	ins.	ins.	0.3	0.2

B. Labor to erect the dwellings - in days

Given: 250 kilograms per man per hour and a 5 hour work day (after Coles 1973)

	Dwelling #1		Dwelling #2		Dwelling #3		Dwelling #4		Dwelling #5	
	10 men	20 men	10 men	20 men	10 men	20 men	10 men	20 men	10 men	20 men
Dobranichevka	0.7	0.3	0.08	0.04	0.1	0.05	ins.	ins.	-	-
Gontsy	0.9	0.5	0.9	0.5	-	-	-	-	-	-
Mezhirich	1.6	0.8	1.5	0.7	0.7	0.3	1.2	0.6	-	-
Mezin	0.7	0.3	n.d.	n.d.	0.2	0.1	0.1	0.05	ins.	ins.

C. Total days of labor to construct dwellings: A + B

	Dwelling #1		Dwelling #2		Dwelling #3		Dwelling #4		Dwelling #5	
	10 men	20 men	10 men	20 men	10 men	20 men	10 men	20 men	10 men	20 men
Dobranichevka	2.3	1.1	0.3	0.1	0.4	0.15	ins.	ins.	-	-
Gontsy	3.3	1.7	3.3	1.7	-	-	-	-	-	-
Mezhirich	5.6	2.8	5.2	2.5	2.4	1.2	4.3	2.1		
Mezin	3.1	1.5	n.d.	n.d.	0.8	0.4	ins.	ins.	ins.	ins.

Legend: ins.= insignificant is less than 0.01 days of labor for 10 or 20 men

TABLE VI-21

FEATURES AND FACILITIES* AT THE SITES

	Summed facilities*	Number of hearths	m^2 per facilities*	m^2 per facilities and hearths
	1	2	3	4
1. Berduzh	6	3	58.3	38.9
3. Chulatovo II	3+	2?	333.3	100.0
4. Dobranichevka	16	9	125.0	80.0
5. Eliseevichi	>9	n.d.	<69.2	<69.2
6. Fastov	0	2	0.0	110.0
7. Gontsy	8-9	3?	96.5	71.3
8. Khotylevo II	some	some	n.d.	n.d.
15. Mezhirich	9	9	56.4	28.2
16. Mezin	22.8	15	52.6	31.7
21. Pushkari I	1-3	5	200.0	57.0
23. Radomyshl'	6.5	some	92.3	92.3
24. Suponevo	4	4?	50.0	25.0
25. Timonovka I	>2	some	<598.0	<598.0
26. Timonovka II	>2	1-3	<81.5	<40.8
27. Yudinovo	>4.5	7	<111.1	143.5
29. Zhuravka	0	1-3	0.0	110.0

Legend: * = summed total numbers of dwellings, storage pits, and surface bone accumulations/heaps.

Note: Fractional values in columns 1 and 2 reflect mean estimates in cases where exact number is uncertain.

TABLE VI-22

PROFILE OF SITES WITHOUT DWELLINGS AND/OR STORAGE PITS

A. Assemblages

	Density of lithic tools	Density of nuclei	Proportion of nuclei	Blade:Nuclei ratios	Density of ESB 1	Density of ESB 2	Grinding stones	Worked bone	Exotic lithics	Ocher	Amber	Art	Marine Shells	Jewelry
I. Lithic Workshops														
Bugorok	Hi	Hi	Hi	Lo	Hi	Lo	-	-	-	-	-	-	-	-
Klyusy	R	R	n.d.	n.d.	R	R	-	-	-	-	-	-	-	-
Korshevo I	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	-	-	-	-	-	-	-	-
Korshevo II	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	-	-	-	-	-	-	-	-
Pogon (a)	Lo	Hi	Lo	Lo	Lo	Lo	-	-	+	+	-	-	-	-
Pushkari II (b)	Lo	Hi	Lo	Lo	Lo	Lo	+	-	-	+	-	-	-	-
II. Hunting-Collecting Camps														
A. Hunting														
Fastov	Hi	Hi	Lo	Lo	Lo	na	-	-	-	-	-	-	-	-
Kurovo	R	R	Lo	Lo	R	R	-	-	n.d.	-	-	-	-	-
B. Collecting														
Novo-Bobovichi	R	R	R	n.d.	R	R	-	-	-	-	-	-	-	-
III. Base Camps														
Chulatovo I	R	R	LO	Lo	R	R	-	+	-	-	-	-	-	-
Chulatovo II	Hi	Hi	Lo	Lo	Lo	Hi	+	+	-	+	+	-	+	-
Kositsa	Hi	Hi	Lo	n.d.	Lo	Hi	+	-	-	+	-	-	-	-
Novgorod-Severskii	R	R	Lo	Lo	R	R	-	+	-	+	-	-	-	-
Pushkari II (b)	Lo	Hi	Lo	Lo	Lo	Lo	+	-	-	+	-	-	-	-
Zhuravka	Lo	Lo	Lo	Hi	Lo	na	-	-	-	-	-	-	-	-

TABLE VI-22
continued

	B.Faunal Remains						C.Site Profiles		D.Features				
	# of taxa exploited	# of taxa exploited as food	Sum of MNI & MNB food taxa	Density of fur bearers	Density of kcals 3	Density of kcals 4	Season of occupation	Thickness of cultural layer	Small pits	Bone charcoal	Hearths volume	Hearths density	Bone heaps
I. Lithic Workshops													
Bugorok	3	3	n.d.	-	n.d.	n.d.	W	Hi	-	-	-	-	-
Klyusy	1?	1?	n.d.	-	n.d.	n.d.	n.d.	R	-	-	-	-	-
Korshevo I	1?	1?	n.d.	-	n.d.	n.d.	n.d.	n.d.	-	-	-	-	-
Korshevo II	1?	1?	n.d.	-	n.d.	n.d.	n.d.	n.d.	-	-	-	-	-
Pogon (a)	1	1	n.d.	-	n.d.	n.d.	W	n.d.	-	+	-	-	-
Pushkari II (b)	7	4	Lo	Lo	Hi	Hi	C-W	Lo	-	+	-	-	-
II. Hunting-Collecting Camps													
A. Hunting													
Pastov	2	2	Lo	-	Lo	Lo	W	Hi?	-	+	n.d.	Hi	-
Kurovo	4	3	R	+R	n.d.	n.d.	W	R	-	-	-	-	-
B. Collecting													
Novo-Bobovichi	1	1	R	-	n.d.	n.d.	W?	R	-	-	-	-	-
III. Base Camps													
Chulatovo I	11	6	R	+R	n.d.	n.d.	W	R	-	+	-	-	-
Chulatovo II	11	4	Lo	LO	Hi	Lo	W	Lo	+	+	Lo	Lo	-
Kositsa	2	2	n.d.	n.d.	n.d.	n.d.	n.d.	Hi	-	-	-	-	-
Novgorod-Severskii	31	21	R	+R	n.d.	n.d.	W	R	-	+	-	-	-
Pushkari II (b)	7	4	Lo	Lo	Hi	Hi	C-W	Lo	-	+	-	-	-
Zhuravka	6	3	Lo	LO	Lo	Lo	W	LO	-	+	n.d.	Hi	-

Legend: + = present; - = absent; ? = uncertain; (a) = predominantly; (b) probably two different occupations; C = cold weather months; ESB = end scrapers plus burins: 1= densities residualized against lithic densities (bone and hide work), 2= densities residualized against lithic densities and densities of fur bearers (bone work); Hi = high densities; kcals = kilo calories at the site: 3= with mammoths excluded, 4= with half of the mammoths included; LO = low density; na = not apply; n.d. = no data; R = redeposited; W = warm weather months

TABLE VI-23

PROFILE OF SITES WITH DWELLINGS AND/OR STORAGE PITS

A. Assemblages

	Density of lithic tools	Density of nuclei	Proportion of nuclei	Blade:Nuclei ratios	Density of ESB 1	Density of ESB 2	Grinding stones	Worked bone	Exotic lithics	Ocher	Amber	Art	Marine Shells	Jewelry
I. Simple Base Camps														
Berdyzh	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	-	-	n.d.	-	-	-	-	-
Dobranichevka	Hi	Hi	Lo	Hi	Hi	Lo	+	Lo	+	+	+	+	-	-
Gontsy	Hi	Lo	Lo	Hi	Hi	Lo	+	Hi	+	+	+	-	-	+
Kirillovskaya ?	Hi	n.d.	n.d.	Hi	Hi	Lo	-	Lo	-	-	-	+	-	-
Pushkari I	Lo	Lo	Hi	Lo	Hi	Hi	+	Hi	-	+	-	-	-	+
Radomyshl'	Hi	n.d.	n.d.	n.d.	n.d.	Lo	-	-	+	-	-	-	-	-
Yurevichi ?	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	+	+	-	+	-	+?	-	-
II. Complex Base Camps														
Eliseevichi	Lo	Lo	Lo	Hi	Lo	Hi	-	Hi	+	+	-	+	+	+
Mezhirich	Lo	Hi	Lo	Hi	Lo	Hi	+	Hi	+	+	+	+	+	+
Mezin	Lo	Lo	Lo	Hi	Hi	Hi	+	Hi	-	+	+	+	+	+
Suponevo ?	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	-	Hi	-	+	-	+	-	+
Yudinovo ?	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	_	Hi[a]	+	+	-	+	+	+
III. Problematic Base Camps														
Khotylevo II	Hi	n.d.	n.d.	n.d.	n.d.	n.d.	-	Hi	n.d.	+	-	+	-	-
Timonovka I	Hi	Hi	Hi	Lo	Hi	Hi	+	Hi	+	+	-	+	+	-
Timonovka II	Lo	Lo	Hi	n.d.	Hi	Lo	+	Hi	-	+	-	+	-	-

TABLE VI-23
continued

	B.Faunal Remains						C.Site Profile		D.Features						
	# of taxa exploited	# of taxa exploited as food	Sum of MNI & MNB food taxa	Density of fur bearers	Density of kcals 3	Density of kcals 4	Season of occupation	Thickness of cultural layer	Dwellings	Storage pits	Small pits	Bone charcoal	Hearths volume	Hearths density	Bone heaps
I. Simple Base Camps															
Berdyzh	7	4	Lo	Lo	Lo	Lo	C	Hi	+	+	-	+	Hi	Lo	-
Dobranichevka	13	7	Lo	Lo	Lo	Lo	C	Lo	+	+	-	+	Lo	Lo	-
Gontsy	13	5	Lo	Lo	Lo	Lo	C	Lo	+	+	+	+	n.d.	Lo	?
Kirillovskaya ?	8	3	Lo	Lo	Lo	Lo	C	n.d.	+	-	-	+	n.d.	Lo	n.d.
Pushkari I	7	4	Lo	Lo	Lo	Hi	C?	Lo	+	-	+	+	Lo	Hi	-
Radomyshl'	4	4	Lo	-	Lo	Lo	C	Hi	+	+	-	+	n.d.	n.d.	-
Yurevichi ?	3	3	n.d.	n.d.	n.d.	n.d.	C?	R	+?	n.d.	n.d.	+	n.d.	n.d.	n.d.
II. Complex Base Camps															
Eliseevichi	14	6	Lo	Hi	Lo	Hi	C	Lo	+	+	-	+	n.d.	n.d.	+
Mezhirich	19	11	Hi	Hi	Hi	Hi	C	Lo	+	+	-	+	Lo	Lo	+
Mezin	16	8	Hi	Hi	Hi	Hi	C-W	Lo	+	+	+	+	Hi	Hi	+
Suponevo ?	10	5	Lo	Lo	Lo	Lo	C-W	Hi	+	+	-	+	Hi	Hi	+
Yudinovo ?	14	7	Lo	Lo	n.d.	n.d.	C	Lo	+	+	+	+	n.d.	Hi	+
III. Problematic Base Camps															
Khotylevo II	13	7	Hi	Lo	Lo	Lo	C-W	Hi	-	+	-	+	n.d.	n.d.	-
Timonovka I	6	2	Lo	Lo	Lo	Lo	C?	Lo	-	+	-	+	n.d.	n.d.	?
Timonovka II	7	2	Lo	Lo	Lo	Lo	C?	Lo	-	+	+	+	n.d.	Hi	+

Legend: + = present; - = absent; ? = uncertain; # = not quantified but on personal inspection of collections at the Institute of History, AN BSSR and at the Historical Museum in Minsk; C = cold weather months; ESB = end scrapers plus burins: 1 = densities residualized against lithic densities (bone and hide work), 2 = densities residualized against lithic densities and densities of fur bearers (bone work); Hi = high densities; kcals = kilo calories at the sites: 3 = with mammoths excluded, 4 = with half of the mammoths included; Lo = low density; n.d. = no data; R = redeposited; W = warm weather months.

TABLE VI-24

EXOTIC AND LOCAL DECORATIVE OBJECTS AND FUR BEARERS AT THE SITES

Sites	Σ Amber and Shells		Σ Art and Jewelry		Fur Bearers	
	Σ Code Values	Density Controlled Coded Values	Σ Code Values	Density Controlled Coded Values	Density of Fox and Hares/ m^2	Density All Fur Bearers/ m^2
Chulatovo II	2	0.0010	0	0.00000	0.037	0.0400
Dobranichevka	2	0.0005	1	0.00025	0.005	0.0080
Eliseevichi	2	0.0016	4	0.0032	0.459	0.540
Gontsy	1.5	0.0009	1	0.0006	0.034	0.050
Kirillovskaya	0	0.0000	1	0.00006	0.0001	0.0008
Mezhirich	4	0.0039	5	0.00492	0.00492	0.2300
Mezin	4	0.0017	6	0.0025	0.103	0.1600
Pushkari I	0	0.0000	1	0.00125	0.010	0.0300
Pushkari II	0	0.0000	0	0.0000	0.017	0.1000
Suponevo	0	0.0000	3	0.0075	0.01	0.0300
Timonovka I	1.5	0.0006	3	0.00127	0.003	0.0050
Timonovka II	0	0.0000	1	0.0033	0.043	0.0600
Yudinovo	2	0.0020	4	0.0040	n.d.	n.d.
Zhuravka	0	0.0000	0	0.000	0.003	0.0060
Columns	1	2	3	4	5	6

TABLE VI-25

CORRELATION COEFFICIENTS - KENDALL'S TAU

	N	τ	z	p
1. Σ Amber and shells and Σ fox and hares	13	+0.40	9.09	<0.0001
2. Σ Amber and shells and Σ art and jewelry	12	+0.24	1.09	0.22
3. Σ Amber and shells and all fur bearers	13	+0.40	9.09	<0.0001
4. Σ Art and jewelry and all fur bearers	13	+0.26	1.24	0.18
5. Σ Art and jewelry and Σ fox and hares	13	+0.34	1.62	0.11

Legend: Fox = Arctic fox

TABLE VI-26

POPULATION ESTIMATES FOR FULLY EXCAVATED SITES

	Size of site	Population per Yellen*	Population per Weissner**	On Pincevent data***
	1	2	3	4
Chulatovo II	2,000	342	185	50
Dobranichevka	5,500	487	509	138
Kirillovskaya	7,840	n.d.	724	196
Mezin	1,200	>408	111	30
Timonovka I	2,800	655	259	70
Timonovka II	500	146	46	13

Legend: *see Table VI-27 ; ** After Weissner 1974 assuming 10.8 square meters per person; *** On estimates of 40 square meters per person derived from Pincevent data in Leroi-Gourhan and Brezillon 1972.

TABLE VI-27

POPULATION ESTIMATES BASED ON APPROXIMATIONS OF "INNER CORES"*

	Approximate area-m^2	Population
Chulatovo II	400?a	342
Dobranichevka		
- complex #1	130 a	107
- complex #2	200 a	168
- complex #3	130 a	107
- complex #4	128 a	106
Total		487
Mezhirich		
- complex #1	120	99
- complex #2	130	107
- complex #3	112	92
Total		298
Mezin		
- complex #1	232 b	196
- complex #5	250 b	212
Total		408
Timonovka I		
- complex #1	247 c	209
- complex #2	194 c	163
- complex #3	40 c	29
- complex #4	298 c	254
Total		655
Timonovka II	163 c	136

References: a. Leonova 1977 ; b. Shovkoplyas 1965a;
c. Velichko et al 1977a.
Legend: * per Yellen 1977

TABLE VI-28
POPULATION ESTIMATES BASED ON HOUSE FLOOR SPACE

	Area excavated	m^2 of excavated dwelling space	Population at the site: Per Naroll's* $10m^2$ per person	Per Cook & Heiser's** $6.1m^2$ per person	At 1-$3m^2$ per person	Mean population
	1	2	3	4	5	6
Berdyzh	$350m^2$	$57m^2$	~6	~7	19-57	38
Dobranichevka	$2,000m^2$	$71m^2$	~7	~7	24-71	48
Eliseevichi	$623m^2$	$40m^2$	~4	~6	13-40	27
Gontsy	$820m^2$	$40m^2$	~4	~6	13-40	27
Kirillovskaya	$7,840m^2$	$70m^2$	7	~7	23-70	47
Mezhirich	$508m^2$	$75m^2$	~7	~7	25-75	50
Mezin ***	$1,200m^2$	$70m^2$	~7	~7	23-70	47
Pushkari I	$400m^2$	$48m^2$	~5	~6	16-48	32
Radomyshl'	$600m^2$	$66.5m^2$	~6	~7	22-66	44
Suponevo	$200m^2$	$62m^2$	~6	~7	21-62	42
Yudinovo ***	$500m^2$	$91.4m^2$	~9	~8	30-91	61

Note:*** When a range is present in the number of dwellings reported for the site (e.g. Mezin with 2-5 dwellings), a mean value was used for both the number of dwellings (at Mezin = 3.5) and for the size of the dwellings ($20m^2$ at Mezin) to derive estimates in column 2.
Legend: ~ = about
References: * Naroll 1962; ** Cook and Heiser 1968

TABLE VI-29

LENGTH OF STAY ESTIMATES AT SITES WITH DWELLINGS ON KCALS PER SQUARE METER

	A. Minimal Group Size: density=0.33*per m^2 of dwelling						B. Maximal Group Size: density=1.0*per m^2 of dwelling					
	1	2	3	4	5	6	7	8	9	10	11	12
	People per m^2	Kcals per individual/m^2	No mammoths		Half mammoths		People per m^2	Kcals per individual/m^2	No mammoths		Half mammoths	
			months	years	months	years			months	years	months	years
Berdyzh	0.05	120	1.4	0.12	66	5.5	0.16	384	0.4	0.03	21	1.7
Dobranichevka	0.01	24	5.2	0.43	130	10.8	0.04	96	1.3	0.10	33	2.7
Eliseevichi	0.02	48	0.6	0.05	126	10.5	0.06	144	0.2	0.02	50	4.2
Gontsy	0.02	48	3.8	0.32	129	10.7	0.05	120	1.5	0.13	52	4.3
Kirillovskaya	0.004	10	1.3	0.11	61	5.1	0.01	24	0.5	0.04	26	2.1
Mezhirich	0.05	120	2.6	0.22	148	12.0	0.15	360	0.9	0.08	49	4.1
Mezin	0.02	48	14.0	1.17	139	11.2	0.06	144	4.5	0.38	46	3.9
Pushkari I	0.04	96	<1.0	0.08	107	9.0	0.12	288	0.2	0.02	36	3.0
Radomyshl'	0.04	96	0.7	0.06	51	4.2	0.11	264	~0.2	0.02	18	1.5
Suponevo	0.10	240	~1.0	0.08	11	~1.0	0.31	744	0.3	0.03	4	0.3
Yudinovo	0.06	144	n.d.	n.d.	n.d.	n.d.	0.18	n.d.	n.d.	n.d.	n.d.	n.d.

Legend: * = density of individuals; n.d. = no data; ~ = about.

TABLE VI-30

DURATION OF OCCUPATION ON THE RATE OF LITHIC DEPOSITION*-IN MONTHS

			A.Minimal Population Size				B.Maximal Population Size			
	Lithic density per m^2	Corrected lithic density**-m^2	Group size	Number of tool makers	Length of stay -lithic densities	Length of stay - corrected ** lithic densities	Group size	Number of tool makers	Length of stay -lithic densities	Length of stay - corrected** lithic densities
	1	2	3	4	5	6	7	8	9	10
Berdyzh	4.3	0.54	19	4	0.5	0.08	57	11	0.2	0.03
Dobranichevka	6.8	6.8	24	5	0.8	0.8	71	14	0.3	0.3
Eliseevichi	128.4	16.05	13	3	24.0	3.1	40	8	9.0	1.1
Gontsy	3.7	3.7	13	3	0.7	0.7	40	8	0.3	0.3
Kirillovskaya	0.5	0.5	23	5	0.06	0.06	70	14	0.02	0.02
Mezhirich	29.3	29.3	25	5	3.3	3.3	75	15	1.1	1.1
Mezin	94.9	11.8	23	5	10.6	1.3	70	14	3.8	0.5
Pushkari I	400.0	50.0	16	3	75.5	9.4	48	10	22.5	2.8
Radomyshl'	16.7	16.7	22	4	2.3	2.3	66	13	0.7	0.7
Suponevo	150.0	18.8	21	4	21.1	2.6	62	12	7.0	0.9
Yudinovo	>25.0	>3.1	30	6	2.3	0.3	91	18	0.8	0.1

Assumptions: a family = 5 individuals and has 1 tool maker per family

Legend: * Rate of lithic deposition assumed to be 1.78 lithics per man per month per square meter, after Leroi-Gourhan and Brezillon 1972;
** Densities at northern sites divided by 8, see discussion in chapter VI.

TABLE VI-31

LENGTH OF STAY ESTIMATES
CALCULATER PER YELLEN 1977

	"Outer Area" - m^2	Length of Stay	
		days	months
Chulatovo II	600	62	2.1
Dobranichevka	1,412	143	4.8
Fastov	188	20	0.7
Timonovka I	2,021	214	7.1
Timonovka II	337	36	1.2

TABLE VI-32

GROUP SIZE AND DURATION OF OCCUPATION AT WARM WEATHER SITES

	Area-m^2	Flint/m^2	Kcals per complex 1#	Kcals per complex 2#	Group size per Yellen	Group size per Weissner	Stay per Yellen-days 1#	Stay per Yellen-days 2#	Stay per Weissner-days 1#	Stay per Weissner-days 2#	# of knappers 3#	# of knappers 4#	Stay - months on flints/m^2 3#	Stay - months on flints/m^2 4#	Stay - months on corrected** flints/m^2 3#	Stay - months on corrected** flints/m^2 4#
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Chulatovo II																
Complex I	41d	59.4a	728,365	1,466,365	30	∽9	10	20	34	68	6	2	5.6	16.7	0.7	2.1
Complex II	20d	62.9a	355,300	715,300	12	-	12	25	-	-	2	-	18.0	-	2.2	-
Complex III	72d	99.0a	1279,380	2,575,081	57	11	9	19	48	97	11	-	5.0	28.0	6.6	3.5
Fastov-2 work areas for a total of 220 m^2	15	8.6	60,030	1,410,030	7	-	3.5	84	-	-	1	-	4.3	-	4.3	-
	17	8.6	68,034	1,588,034	9	-	3	74	-	-	2	-	2.4	-	2.4	-
Zhuravka-3 work areas for a total of 330 m^2 -each	∽110	11.2	79.603	79,603	80	14	1	1	4	4	16	3	0.4	2.1	0.4	2.1
Chulatovo II - Total estimates (three complexes summed)					99	>20	31	59	82	165	19	2	28.6	73.3	9.5	5.6
Mean estimates					60								51		8	
Fastov - Total estimates (complexes summed)					16	-	6.5	158	-	-	3	-	6.7	-	6.7	-
- Mean estimates					16								7.0		7.0	
Zhuravka - Total estimates (data above x 3)					240	42										
- Mean estimates					141								1.3		1.3	

Legend: # 1 = kcals excluding all mammoths; #2 = kcals including half of the mammoths; #3=for population estimated using Yellen's formula; #4 = for populations using Weissner's formula; ** densities of lithics at northern sites divided by 8; d = part of the complex only; ∽ = about; # = number.

References: a = Leonova 1977; Yellen 1977; Weissner 1974

TABLE VI-33

GROUP SIZE AND DURATION OF OCCUPATION

ESTIMATES FOR TIMONOVKA I,II

	Timonovka I	Timonovka II
1. Total area - m^2	2,800	500
2. Kcals - no mammoths	420,000	183,000
3. Kcals - half mammoths	40,740,000	63,183,000
4. Duration of occupation - per Yellen 1977- days	214	36
5. Kcals per day - no mammoths	1,962.6	50,833.3
6. Kcals per day - half mammoths included	190,373.8	1,755,083.3
7. Number of people - no mammoths	1	21
8. Number of people - half mammoths	79	731
9. Lithic density/m^2	85.0	85.5
10. Corrected* lithic density/m^2	10.6	10.7
11. Length of stay - in months - lithic density (row 9)	9.5	9.6
12. Length of stay - in months - corrected* lithic density (row 10)	1.1	1.0
13. Mean length of stay - mean of rows 11 & 12 - in months	5.3	5.3

Legend: * Corrected lithic density = density at northern sites divided by 8.

Reference: Yellen 1977

TABLE VI-34

MEAN VALUES FOR GROUP SIZE AND DURATION OF OCCUPATION-IN MONTHS

A. Sites with dwellings and storage pits

	Mean group size	Mean length of stay-lithics	Mean length of stay-kcals no mammoths	Mean length of stay-kcals half mammoths	Mean length of stay-mean kcals	Length of stay on kcals plus lithics	
						Rows $\frac{2+3}{2}$	Rows $\frac{5+2}{2}$
	1	2	3	4	5	6	7
Berdyzh	38	0.05	0.9	44	22	0.5	11
Dobranichevka	48	0.55	3.3	82	43	2.0	22
Eliseevichi	27	2.10	0.4	88	44	1.0	23
Gontsy	27	0.50	2.7	91	47	1.6	24
Kirillovskaya	47	0.04	0.9	44	22	0.5	11
Mezhirich	50	2.20	1.8	99	50	2.0	26
Mezin	47	2.55	9.3	93	51	6.0	27
Pushkari I	32	6.10	0.6	72	36	3.0	21
Radomyshl'	44	1.50	0.5	35	18	1.0	10
Suponevo	42	1.75	0.6	7.3	4	1.0	3
Yudinovo	61	0.20	n.d.	n.d.	n.d.	n.d.	n.d.

B. Sites without dwellings and with storage pits

	Mean group size	Mean length of stay-lithics	Mean length of stay-kcals no mammoths	Mean length of stay-kcals half mammoths	Mean length of stay-mean kcals	Length of stay on kcals plus lithics	
						Rows $\frac{3+3}{2}$	Rows $\frac{1+5}{2}$
	1	2	3	4	5	6	7
Chulatovo II	60	8	2.00	4.00	3.00	5.0	6.0
Fastov	16	7	0.08	0.08	0.08	4.0	4.0
Timonovka I *	n.d.	5.3a to 7.0				6.0	6.0
Timonovka II *	n.d.	5.3a to 1.0				3.0	3.0
Zhuravka	42	1	0.20	5.00	2.60	0.6	1.8

Note: a. Estimated for duration of occupation at Timonovka I and II from Table VI-32

TABLE VI-35

DIFFERENCE OF MEANS TESTS ON POPULATION SIZE
AND DURATION OF OCCUPATION

	N	$\tilde{x}_1$	$\tilde{x}_2$	z	p
1.Population size at cold vs warm weather base camps	13	42.09	51.0	1.27	0.18
2.Duration of occup. cold vs warm weather base camps (no mammoths)	14	2.22	2.8	1.05	0.23
3.Duration of occup. cold vs warm weather base camps	14	15.58	3.9	3.97	<0.0004
4.Population size at simple vs complex cold weather base camps	11	39.33	45.4	1.03	0.23
5.Duration of occupation at simple vs complex cold weather base camps (no mammoths)	12	2.2	2.5	0.25	0.39
6.Duration of occupation at simple vs complex cold weather base camps (mean Kcal values)	12	13.50	19.97	1.17	0.20
7.Simple base camps cold weather vs warm weather - pop. size	8	39.33	51.0	1.64	0.10
8.Simple base camps cold weather vs warm weather - length of occup. - no mammoths	10	2.2	2.8	0.97	0.25
9.Simple base camps cold weather vs warm weather - length of occupation - mean K-cal values	10	13.5	3.9	3.21	0.002

TABLE VI-36
DISTRIBUTION OF INVENTORIES PER COMPLEX AT DOBRANICHEVKA AND MEZHIRICH

	Dobranichevka				Mezhirich		
	number 1	number 2	number 3	number 4	number 1	number 2	number 3
1. Area of complex-m^2	130	200	120	128	68	64	~68
2. Area of dwelling-m^2	12.5	12.5	12.5	12.5	24	20	12
3. Mammoth bone per m^2 of dwelling	656.7	83.6	119.2	n.d.	857.6	932.1	709.5
4. Type of dwelling	small	small	small	small	large	large	small
5. Kilograms of mammoth bone in dwelling	8,209	1,045	1,490	n.d.	20,583	18,643	8,514
6. Lithics/m^2*	25.0	7.0	12.0	25.0	66.5	116.8	32.8
7. Lithic tools/m^2*	4.2	0.5	1.1	2.1	8.2	10.3	3.8
8. End scrapers plus burins/m^2*	5.8	1.9	n.d.	n.d.	4.9	6.2	2.0
9. Nuclei/m^2*	0.7	0.2	0.4	0.9	1.1	1.8	0.6
10. Worked bone/m^2*	some	some	some	n.d.	0.8	1.5	0.7
11. Amber/m^2*	some	some	-	-	1.0	3.6	0.6
12. Art/m^2*	some	some	some	-?	0.06	0.03	0.04
13. Red and yellow ocher/m^2*	some	some	-?	-?	0.9	1.1	0.3
References	Leonova 1977; Shovkoplyas 1965a				Kornietz et al 1981; Pidoplichko 1976		

Legend: - = none; ? = uncertain; *=density of inventories calculated per square meter of complex; ~ = about.

TABLE VI-37
DIFFERENCE OF MEDIAN TESTS

	N	Median	p*
A. Dimensionally scaled and coded values for exotics and decorative objects - including art			
1. All northern vs southern sites	14	0.69	0.44
2. Early vs late sites	14	0.69	0.23
3. Late northern vs late southern sites	11	0.75	0.36
4. Northern early vs late sites	10	0.63	0.22
B. Dimensionally scaled and coded values for exotics and decorative objects - excluding art			
1. All (= late) northern vs southern sites	10	0.56	0.41
C. Exotic lithics and ocher			
1. All northern vs southern sites	16	1.00	0.29
2. All early vs late sites	10	1.00	0.29
D. Exotic lithics without ocher			
1. Late northern vs late southern sites	9	1.00	0.48

* probability estimated by Fisher's Exact Test

TABLE VI-38

CHRONOLOGICAL COMPARISONS - DIFFERENCE OF MEANS TESTS

	N	$\bar{x}_1$	$\bar{x}_2$	z	p
A. Assemblages					
1. Lithic density per square meter					
- all early vs late sites	20	16.35	76.15	2.03	0.04
- early vs late sites with storage pits	14	20.80	91.69	2.08	0.04
- early vs late northern sites with storage pits	9	22.85	138.33	2.59	0.01
- early vs late southern sites with storage pits	5	16.70	10.08	1.67	0.10
- early sites with storage pits in the north vs in the south	3	22.85	16.70	0.47	0.36
- late northern vs southern sites	16	106.40	9.64	2.53	0.01
- late sites with storage pits vs sites without storage pits	18	91.69	53.41	0.75	0.30
- late sites with storage pits in the north vs in the south	11	138.33	10.08	2.98	0.003
- late sites without storage pits in the north vs in the south	7	70.82	9.90	1.15	0.25
2. Density of lithic tools per square meter - residualized against the density of lithics					
- early vs late northern sites	11	+6.14	-0.61	5.77	<0.0001
- early vs late southern sites	7	+0.50	-0.08	4.83	<0.0001
- early vs late northern sites with storage pits	6	+6.14	-1.15	4.93	<0.0001
- early vs late southern sites with storage pits	5	+0.50	+0.04	11.50	<0.0001
3. Density of worked bone per square meter at sites with storage pits					
- early vs late sites	11	0.60	0.33	2.25	0.03
4. Density of art at the sites					
- northern early vs late sites	4	8.50	14.20	0.62	0.33
- early vs late sites with high densities	4	16.00	27.33	1.91	0.06
- early vs late sites with low densities	6	1.00	18.00	2.42	0.02
B. Site Profiles					
1. Thickness of the cultural layer					
- all early vs late sites	19	0.28	0.13	5.00	<0.0001
- early vs late sites with storage pits	13	0.28	0.14	3.50	<0.0001
- early vs late northern sites with storage pits	9	0.33	0.16	4.25	<0.0001
- early vs late southern sites with storage pits	4	0.20	0.10	5.00	<0.0001
- early vs late sites with thick cultural layers and storage pits	4	0.33	0.25	1.60	0.11
- early vs late sites with thin cultural layers and storage pits	9	0.20	0.10	16.67	0.0001
- early vs late northern sites with thick cultural layers and storage pits	4	0.33	0.25	1.60	0.11
- early vs late southern sites with thin cultural layers and storage pits	4	0.20	0.09	11.00	<0.0001
- early sites with storage pits in the north vs in the south	3	0.33	0.20	6.50	<0.0001
- early sites with storage pits with thick vs thin cultural layers	3	0.33	0.20	6.50	<0.0001

TABLE VI-38
continued

	N	$\bar{x}_1$	$\bar{x}_2$	z	p
C. Features					
1. Hearths					
- density of hearths (m^2 per hearth) at early vs late sites	13	116.70	143.86	0.05	0.39
- volume (m^3) of early vs late hearths	7	5.40	1.08	40.00	<0.0001
- density of hearths (m^2 per hearth) at early vs late sites with storage pits	12	116.70	159.75	1.36	0.17
- volume (m^3) of early vs late hearths	6	5.40	1.21	16.12	<0.0001
2. Dwellings - numbers at the sites					
- early vs late sites	11	3.75	2.94	1.01	0.24
D. Group Size and Duration of Occupation					
- mean group size at early vs late sites with storage pits	11	41.00	42.30	0.32	0.38
- duration of occupation on kcals without mammoths plus lithics at early vs late sites	12	0.75	2.61	3.00	0.004
- duration of occupation on kcals with half of the mammoths included plus lithics at early vs late sites	12	10.50	17.60	2.09	0.05

TABLE VII-1

PRESENCE OF SIGNIFICANT LOCAL STYLISTIC DIFFERENCES ON THE CENTRAL RUSSIAN PLAIN

Medium	A. Early Sites		B. Late Sites
	Excluding Khotylevo II	Including Khotylevo II	
1. Lithics	+	+	-
2. Art:			
a. figurative	-	+	-
b. engraved and painted	-	+	-
3. Jewelry	none found	none found	-
4. Site structure	-	+	-
5. Architectural details	-	-	+

Legend: + = significant local differences present
- = significant local differences absent

TABLE VII-2
BURIAL DATA FROM THE UPPER PALEOLITHIC RUSSIAN PLAIN

SITE	#	AGE	SEX	GRAVE CONSTRUCTION	GRAVE GOODS		C 14 DATE	REFERENCES
					TOOLS	ORNAMENTS		
Kostenki II (Zamyatninskaya)	1	Old	M	Bone Lined	--	--	11,000±200	a, b
Kostenki XIV (Markina Gora) Layer III	1	25	M	Pit	--	--	14,300±460	a, c
Kostenki XV (Gorodtsovskaya)	1	6-7	n.d.	Pit	70 flakes, knife needles, burnisher	~150 a. fox* pendents or beads	21,720±570	a, d
Kostenki XVIII (Hvoikovkaya)	1	9-10	n.d.	Bone Cover	--	--	Not Dated**	a, e
Sungir	3-6?	55-65	M	Pit	flint knife	>3000 bone beads, pendants a. fox* pendants	25,500±200 24,430±400	
		7-9	M	Pit	bone spears	>3000 bone beads, pins, bracelets, stone pendants 100 a. fox* pendants, figurine	22,500±600 21,800±1,000 20,540±120 16,200±400 14,600±600	f
		9-12	F	Pit	4 shaft straighteners	>3000 bone beads, pins, bracelets, stone pendants, a.* fox pendants shells		
		plus possibly, two more females						

Legend: * a. fox = Arctic fox; ** assignment to early period of occupation uncertain

References: a. Gerasimova 1982; b. Boriskovskii and Dmitrieva 1982; c. Rogachev and Sinitsyn 1982a; d. Rogachev and Sinitsyn 1982b; e. Rogachev and Belyaeva 1982; f. Bader 1978

TABLE VII-3
DIFFERENCE OF MEANS TESTS ON THE DISTRIBUTION OF BLADE:NUCLEI RATIOS*

	N	$\bar{x}_1$	$\bar{x}_2$	z	p
1. Northern vs Southern sites--all	18	18.99	36.43	1.71	0.09
2. Northern vs Southern high ratio sites	8	37.51	41.94	0.47	0.36
3. Northern vs Southern low ratio sites	10	12.81	8.91	2.69	0.01
4. Northern vs Southern low ratio sites without lithic workshops	6	14.29	8.91	2.77	0.008
5. Northern low ratio lithic workshops vs other sites	7	12.71	14.29	0.56	0.34
6. Northern vs Southern sites without lithic workshops	15	21.92	36.43	1.38	0.15
7. Northern lithic workshops vs Fastov	3	12.71	8.91	1.84	0.07
8. Northern vs Southern cold weather base camps	8	24.91	35.42	0.96	0.25
9. Northern vs Southern warm weather base camps	4	15.24	63.03	13.19	0.0001
10. Northern cold vs warm weather base camps	7	24.91	15.24	1.11	0.22
11. Southern cold vs warm weather base camps	5	35.42	63.03	0.96	0.25
12. Northern warm weather lithic workshops and base camps vs southern warm weather sites (Kurovo and Fastov omitted from the sample)	8	12.80	68.03	28.62	0.0001

Legend: * = Arcsine transformed values, see TABLE VI-7

TABLE VII-4

NUMBERS OF DWELLINGS AND OF INTERIOR HEARTHS

SITE #	SITE NAME	DWELLING NUMBER	AREA (m^2)	NUMBER OF HEARTHS
1	Berdyzh	1	12.5	2
		2	45.0(?)	1
4	Dobranichevka	1	12.5	0
		2	12.5	1
		3	12.5	1
		4	12.5	0
7	Gontsy	1	20.0	1
15	Mezhirich	1	24.0	1
		2	20.0	1
		3	12.0(?)	1
16	Mezin	1	20.0	3
		2	8.0	0
		3	28.0	2
		4	8.0	0
		5	28.0	1
22	Pushkari I[a]	1	12.5	1
		2	12.5	1
		3	12.5	1
24	Suponevo	1	23.76	1
		2	27.5	1[c]
27	Yudinovo[b]	1	32.0	2
		2	24.0	1

Legend: a = Pushkari I considered as 3 small dwellings

b = Yudinovo areas per dwelling taken as mean values

c = Suponevo hearths in dwelling #2 taken as a mean value

TABLE VII-5

PEARSON'S CORRELATION COEFFICIENTS ON DWELLING SIZES AND NUMBERS OF INTERIOR HEARTHS

	N	df	r	r^2	p
1. All sites - dwelling size and numbers of hearths	22	20	0.40	0.16	<0.1>0.05
2. Late sites - dwelling size and number of hearths	20	18	0.61	0.38	0.01
3. All sites excluding Berdyzh dwelling #2 - dwelling size and numbers of hearths	21	19	0.53	0.28	0.02

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