MARINE SHELL AS MEDIUM IN AMERINDIAN ARUBA

by

MARLENE S. LINVILLE

VOLUME I

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

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William J. Parry

Date — Chair of Examining Committee

Louise D. Lennihan

Date — Executive Officer

Gregory A. Johnson

Thomas H. McGovern

Mary Jane Berman

Supervisory Committee

THE CITY UNIVERSITY OF NEW YORK

ABSTRACT

MARINE SHELL AS MEDIUM IN AMERINDIAN ARUBA

by

Marlene S. Linville

Advisor: Professor William J. Parry

Archaeologists in the Caribbean have long recognized the utility of shell-based analysis in environmental and dietary reconstructions. Increasingly, however, researchers are expanding the role of shell artifacts in their investigations of prehistoric societies. This research examines the ornamental and/or symbolic (O/S) use of marine shell in Amerindian Aruba. Of particular interest is the potential of museum collections to assist archaeological interpretations of the past. An investigation of marine shell artifacts in the collections of the Archaeological Museum of Aruba (AMA) provides insights into the archaeology of Aruba's Amerindian cultures, and suggests pathways toward an increased understanding of past utilization of Aruba's marine shell resources and the cultural value of these among the island's Amerindian inhabitants. Drawing on ethnohistoric, archaeological, and other anthropological sources, this study considers the socio-cultural and/or political implications of observed spatial and temporal variation in the ornamental, ceremonial and/or symbolic use of marine shell resources.

In loving memory of my first teacher,

my mother,

Ruth P. Jessee Linville (1935 - 1978)

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CHAPTER ONE

INTRODUCTION TO THE STUDY

1.1 Introduction

Among the most noticeable features of Aruba's leeward coast are the ubiquitous seashells regularly deposited by the sea all along the island's sandy shores, relics of the living creatures that, for thousands of years, have been an important natural resource for the island's inhabitants. Archaeological remains found throughout the island suggest that the molluscan producers of these shells contributed significantly to prehistoric subsistence on the island, likely in greater proportion than they now do to the modern Aruban diet. The archaeological record also indicates that prehistoric Aruban peoples appreciated these marine resources beyond their role in subsistence. The marine shell artifacts in the collections of the Archaeological Museum of Aruba (AMA) form an important part of this record.

When modified to produce useful implements, ornaments, or even a variety of objects of unknown function, it is clear that marine shells served early Amerindian Arubans as a convenient and durable raw material. When recovered in a ritual context (either modified or unmodified), they suggest a symbolic value, the interpretation of which challenges the limits of archaeological inference. Somewhere in between these two

extremes are a number of objects that suggest that prehistoric Arubans simply appreciated seashells, something they apparently share in common with many modern visitors to the island's shores, and, indeed, with countless people throughout the world, from time immemorial.

This study examines the nature of marine shell use for "non-tool" ornamental, and/or symbolic (O/S)[1] purposes among prehistoric peoples of Aruba, and reports the findings of the study of marine shell artifacts in the collection of the Archaeological Museum of Aruba (AMA).[2] However, in order to consider broadly human behavior represented in the use of marine shells in Aruba, beyond the production of tools, this study focuses not simply on marine shell artifacts, but, more specifically, on marine shell as a medium. It recognizes not only the utility of shell in the production of artifacts of cultural

[1] This usage is adapted/modified after Wessen (1982) and Claassen (1998:229), who use the form "decorative/symbolic/ceremonial (DSC)" to classify exotic (therefore, high status) shell species at Ozette. As Claassen explains, "Wessen reasoned that the shells of primary and secondary food species at Ozette should be less frequent around high status households and that shells of those species classed as decorative/symbolic/ceremonial (DSC) should be more prevalent yet unevenly distributed in high status houses" (Claassen 1998:229). Because it has been widely used to describe "non-tool" shell artifacts, the term "ornamental" (a synonym for "decorative") is used in the interest of producing comparable data. Other common "non-tool" functional categories (e.g. "ritual" and "ceremonial") are here subsumed under the term "symbolic." The O/S category is not meant to be exhaustive, and thus, does not encompass the full range of potential uses of marine shells and shell artifacts. It simply provides a convenient rubric for evaluating objects not generally (or not exclusively) interpreted as tools.

[2] The study of the AMA collection of shell tools was the focus of a study by my "Shell Industry of Aruba" project colleagues Ramón Dacal Moure and Fransisco Croes (2004); I was invited to contribute to the project a study of shell "symbolic pieces" (Dacal, Personal Communication, July 2000).

value, objects which may be both functional and symbolically expressive, but also the ornamental and/or symbolic potential of whole (or practically whole) shells.[3]

1.2 Background to the Study

Since the founding of the Archaeological Museum of Aruba, archaeological research in Aruba has increasingly become a multidisciplinary exercise, and researchers from diverse nations and backgrounds have been welcomed to the island in a concerted effort to achieve synergistic gains in the study of Aruba's limited (and continuously threatened) soil archive. The most recent excavation of the Tanki Flip site (1994-5) (one of three primary habitation sites of the island's Ceramic Period) provided an important model for archaeological research in the Caribbean as a whole by harnessing the knowledge of a wide variety of specialists from Europe, the US, Cuba, and Aruba. Although it was organized as a salvage project, the research at the Tanki Flip site was part of an emergent, but concerted, effort on the part of the AMA to contextualize and present Aruba's past (Ruiz & Dacal 2004). This commitment to the presentation and interpretation of archaeological knowledge has been summarized by Ruiz & Dacal:

> The . . . AMA was established in 1981 with the primary goal of presenting the island's archaeological heritage to the Aruban public. Over time, the goals and duties of the AMA have evolved. Today, archaeological research and documentation, education, and heritage preservation are all fundamental aspects of the museum's mission (2004:xv).

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[3] Although it may seem to, the taxonomic division between shell tools and "non-tools" is not meant to suggest that shell tool production and/or use do not reveal cultural symbolism and/or expression. The division is, instead, a convenient rubric with which to focus on non-tool shell behaviors, those artifacts more closely associated with what Binford (1971) describes as sociotechnic and ideotechnic than those produced for environmental adaptation ("technomic" in Binford's classification (1971) (in Keegan 1981:39-40).

One outcome of the research at the Tanki Flip site was the realization that marine shell artifacts had received relatively little archaeological attention in Aruba. As a result, plans were initiated for a study of this class of artifacts in the museum's collections.

In July, 2000, following my participation in a survey of several shell matrix sites in Aruba, I was invited to participate as part of the international, multidisciplinary team assembled by the museum's director, Evelino Fingal, to focus attention on the island's prehistoric shell industry. This team included the late Cuban archaeologist Ramón Dacal Moure, Professor at the University of Havana, who has been widely recognized as the foremost authority on prehistoric shell industries throughout the Caribbean area (David Watters, personal communication, 2000), and whose research design guided the "Shell Industry of Aruba" project. AMA geologist specialist Arminda C. Ruiz also contributed significantly to the development and continuity of the project from its inception.

The formal study of the AMA shell collections began in February, 2001, six years after the initiation of the project. This phase was directed by Raymundo A. C. F. Dijkhoff, who had subsequently joined the AMA staff as head of the museum's scientific department. Other project contributors during this phase included AMA archaeology technicians Fransisco Croes and Hiram Angela and marine biologist Byron G. Boekhoudt. Subsequent to the formal study, two other archaeologists joined the research team, Harold J. Kelly of the AMA and Ricardo Sampedro Hernández of Havana University. The project, which was funded by the *Fundacion Union Di Organisacionnan Cultural Arubano* (UNOCA) and by the Aruban government, culminated with the publication (in September,

2004) of the findings in the 10th publication of the AMA: *The Archaeology of Aruba: The Marine Shell Heritage* (Dijkhoff & Linville, eds. 2004). In keeping with the project commitment to public education, I accepted the invitation extended in the Fall of 2004 by the AMA staff and by UNOCA to present aspects of the research to high school students in Aruba.

1.3 Research Questions and Goals

The goals of the "Shell Industry of Aruba" project included 1) to study of the biological aspects and distribution of shells; 2) to describe and classify the shell artifacts of the collection of the Aruba Archaeological Museum; 3) to identify the distribution of the artifacts over the archaeological sites to determine local sequences in the cultural use of marine shell; and 4) to compare data from the Western Caribbean region and the Caribbean area as a whole (Figure 1.1) (Ramón Dacal, personal communication, 2000; AMA Archives).[4] The team also sought to present the findings of the study to the Aruban public in a timely fashion.

In addition to addressing the overarching goals of the "Shell Industry of Aruba" project, the research presented here also examines the potential of the AMA's marine shell collections to provide further insights into the people who made them, to answer a number of questions regarding cultural variation, social differentiation, and political organization in Amerindian Aruba.

[4] The region in question is variously described as the Western Caribbean, the Southern Caribbean and Venezuela's northwestern coast and off-shore islands.

1.3.1 Cultural Variation

Does the simple ubiquity of specific marine shells in Aruba guide their selection in ritual contexts or for the production of desired objects among Amerindian inhabitants of the island? Is a particular marine shell (e.g. *Strombus gigas*) simply a strong material with natural cleavage properties that make it an expedient medium? Or, does the selection of a particular shell, or one form and/or technique over an alternate one reveal significant cultural differences among peoples making these choices? Do the collections of ornamental and/or symbolic shell artifacts in the collection of the Archaeological Museum of Aruba reveal spatial and/or temporal variation in the production and use of "non-tool" O/S shell artifacts (presumably for ornamental and/or symbolic purposes) among Aruba's Amerindian peoples? Efforts to answer these questions aim first to place archaeological evidence of shell-related behavior within Aruba's cultural chronology.

Archaeological evidence suggests that Aruba may have been inhabited as early as circa 2000/2500 B.C. by peoples of the Meso-Indian Period (Versteeg 1991; Versteeg & Ruiz 1995). The earliest radiocarbon dates obtained thus far are associated with burial sites of later Preceramic hunting/gathering/fishing populations of the first century B.C. By ca. 900/1000 A.D. both radiocarbon dates and ceramic evidence indicate the emergence of a settled, agrarian way of life in Aruba.

Archaeological and/or linguistic evidence suggests that these Aruban farmers were not isolated, but were linked not only to mainland groups, but also to other islanders whose common ancestors migrated northward from a Llanos/Middle to Upper Orinoco secondary hearth, and probably ultimately from the Central Amazonian area (Oliver 1989).[5] These closely associated groups are indicated archaeologically by a distinctive pottery known as Dabajuroid (after the type site "Dabajuro," in a town by the same name near Coro in Western Venezuela) (Oliver 1989).

Dabajuroid pottery also links these early Aruban farmers to island inhabitants of the 15th and 16th centuries. Ethnohistoric evidence indicates that these inhabitants were ethnically identified as Caquetíos,[6] and that during the early contact period, they were closely associated with socially complex mainland groups, as well as with peoples

[5] Based on linguistic analyses Oliver suggests that "the area with the highest potential as the hearth for all the northernmost Maipuran languages is probably circumscribed to the Central Amazon (Stage 1) with a secondary hearth in the Upper-Middle Orinoco (beginning of Stage 2) . . . By late stage 2, the "pre-Caquetío" had already reached the Upper Llanos, becoming the dominant Arawakan-speaking group there . . . , and, eventually, by Stage 3 had reached the Barquisimeto Plateau and the Coast of Falcón" (1989:178).

[6] The term *Caquetío /kaketío/* "is a cognate to the Lokono term kakitho meaning 'person, people' (Oliver 1989:186). As Spencer explains, the term was used in the 16th century "to refer to a number of independent but ethnically related chiefly polities in several river drainages over a large area extending from the sub-Andean valley of Barquisimeto well into the llanos (humid savanna grasslands) of the Orinoco Basin (Morey 1975; Oliver 1989)" (1999:108).

occupying the Caribbean islands of the north coast of Venezuela, including Curaçao and Bonaire.[7] Analyses of ceramic evidence in Aruba reveals that pottery production did not proceed unchanged throughout the 5-6 centuries of Dabajuran occupations of the island. This is expected, since cultures are not only subject to external influences, but also undergo internal evolutionary processes. Therefore, it seems reasonable to suggest that the production of "non-tool" O/S shell artifacts should also reveal cultural changes over time.

1.3.2 Sociopolitical Organization

Claassen suggests that "the use of artifacts and shell matrix sites to explore social organization is the research arena least well developed by archaeologists who work with shell" (1998:235). Available evidence suggests that shell remains provide an important opportunity to investigate social organization in Aruba. Ethnohistoric evidence indicates that the use of shell for the production of culturally valued objects was widespread in Precolumbian America. Among Amerindians peoples of South America, including those who occupied nearby islands to the north, beads made of shell were particularly valued (Sahlins 1977; Oliver 1989;Gassón 2000). What, if anything, do shell artifacts and other shell related behaviors suggest about the social organization(s) of the Aruba's inhabitants throughout more than two millennia of prehistoric inhabitation? Do they indicate

[7] According to Oliver, the Late Urumaco phase (A.D. 1350-1500) of the Urumaco style (A.D. 1200-1450) and the historic Los Médanos-B phase (A.D. 1450-1560+) of the Los Médanos style (A.D. 1400-1550) provide "a direct link between the prehistoric ceramic materials of the Dabajuran Dabajuroid subseries and the ethnohistoric Coastal Caquetío" (1997:395).

socio-cultural differentiation on either the intra-site or inter-site level? Do they reveal evidence of religious symbolism?

Shell artifacts associated with Amerindian Arubans of the Ceramic Period may also provide clues to Aruba's role within the Protohistoric Caquetío polity of Coastal Falcón (Figure 1.2), which extended throughout the modern State of Falcón, Venezuela, the islands of Aruba, Curaçao, and Bonaire, and also included frontier settlements in the La Guajira Peninsula, from Cabo de La Vela to the Punta Espada coastal zone, and lowland alluvial plains in the Juruara region of eastern Maracaibo, Venezuela (Oliver 1989:306). Much of what is known of ethnohistoric Caquetíos was recorded by early European explorers referring specifically to mainland groups.[8] Oliver describes those of coastal Falcón and the off-shore islands as "the largest and the most complex of all Caquetío polities" (1989:254):

> The Coastal Caquetío Polity [was] characterized by a hierarchical, centralized leadership, with a paramount chief that embodied both shamanistic as well as worldly power, but whose power still had to operate through a council of second-order chiefs. . . . First and second order *diaos* had the prerogative of polygamy, including marriage alliances with foreign ethnic groups. The settlements were not nucleated or tightly clustered over a limited space, and the territory seems to have been further sub-divided into smaller sociopolitical units, possibly controlled directly by second-order chiefs. The village itself also had a lesser principal "chief," who probably was the head of a lineage group. The villages did not have defensive constructions. Domestic dwellings were capable of housing an extended family of 40 to 50 individuals (*maloca*), and several of these dwellings constituted (in the eyes of the chroniclers) a *poblado* (village) (Oliver 1989:305-306).

[8] Oliver (1989) details accounts recorded in the first half of the 16th century by de Castellanos, Martín, and Ojeda [Vespucci] (Bartone & Versteeg 1997:125).

The polity included outpost or frontier settlements, "in locations such as Upper Guajira, which . . . [Oliver suggests was] used for trading exotic goods back to Coastal Falcón (Oliver 1989:306). Unlike other mainland Caquetío groups of the South American mainland, the Coastal Caquetíos were distinguished by "their lack of an effective military organization" (Oliver 1989:306). Oliver suggests that when faced with "confrontational situations," their norm was "to *alzarse* (flee, run away)" (ibid.).

During the early 16th century, leadership of the complex Caquetío polity of coastal Falcón was inherited by Manaure, the son of the *diao*. Manaure headed the territory of Caçicure, with his seat of power situated at Pueblo Viejo (Oliver 1989:277). Early contact documents specifically indicate that shell beads were an important component of his elite regalia. They served as cultural symbols that reinforced the privileged status of the chief, communicating his social and economic standing, and reinforcing his political power.

According to Oliver, Esteban Martín (1534) "stated unambiguously that all the coast of Falcón from Barlovento to Coquibacoa was controlled by Caquetío" (1989:257). But what was Aruba's role within this social system? Haviser (1987) favors a limited social interaction sphere for the pre- and proto-historic peoples of Aruba, Bonaire and Curaçao, over a more politically integrated one, and suggests that the Amerindian inhabitants of Curaçao may have remained at a Formative Age stage of development (characterized by independent agricultural villages) even while their contemporary counterparts on the mainland participated in a more complex hierarchical socio-political

system (1987:141).[9] Oliver suggests that the extent of Manaure's power and his position as paramount chief (*diao*) is evidenced by the fact that during his negotiations with Juan de Ampíes (or Ampúes) Manaure sent caciques as envoys to Aruba, Curaçao, and Hispaniola (Oliver 1989:277).

It is clear that ethnohistoric Caquetíos were not a single homogenous group. According to Oliver, "available data on house types, intra-village organization, and general features of settlement pattern, and territorial integration among the different Caquetío held regions in the coast and interior present far more differences that similarities . . . [He suggests that] the differences noted are likely the result of adaptive radiation and evolutionary divergence" (1997:395). Yet, some researchers have suggested that the disjunctions between various Caquetío groups of the Coastal Caquetío polity may reflect internal ethnic distinctions.

Social scientists in general increasingly view ethnicity as a political-historical phenomenon of groups in contact, rather than as a pristine or innate condition. This tendency echoes a parallel shift in the conception of ethnicity in the past. As have their counterparts in other disciplines of social science, archaeologists, too, have expanded their view of ethnicity from one largely focused around biological ancestry to include groups united by non-biological, cultural, or social ties. Although the recognition that, particularly within industrialized societies, ethnic distinctions are often arbitrarily created

[9] Haviser cites Rouse's finding of this situation among the Taínos and their neighbors, generally referred to as Sub-Taínos, the latter of which may not have been hierarchically organized (1987:141).

(and just as easily abandoned once their usefulness has been exhausted) constrains efforts to identify ethnicity, ethnic diversity continues to be one explanation for variation in archaeological deposits among otherwise closely related groups. Such evidence may also indicate other forms of group differentiation, including social inequality, and political hierarchy. Emberling (1999) suggests that shifts in the meaning of material culture from markers of elite status to symbols of ethnic identity "may be a general feature of development from chiefdoms to states" (1999:277).

For Dabajuroid peoples, Oliver suggests that "markers that are emblematic of group differentiation" (1997:417) should be sought in what Kroeber has defined as "secondary culture" (1957:36). In the case of ceramic analysis, Oliver suggests that such differentiation may be isolated in analyses of fine ware pottery, as opposed to everyday pots that are largely homogenous across groups. Several authors have suggested that the pottery of Aruba is more consistent with that of coastal Falcón, while that of both Curaçao and Bonaire shows a wider sphere of influence (farther east within Venezuela) (Du Ry 1961:100; De Josselin de Jong 1920; Nomland 1935, Haviser 1987:51). Analyses of elaborated shell artifacts have the potential to reveal such differentiation; both inter- and intra-group differentiation can potentially be revealed by discrete distributions of specific artifact forms. If, as Oliver suggests (1997), the prehistoric Arubans maintained a continuous relationship with the mainland during the Ceramic age, this contact should be reflected in the cultural use of shell, particularly in distributions of "secondary culture" expressed in "highly modified" ornamental and/or symbolic shell artifacts.

1.3.3 The Study of Museum Collections

Can the study of artifacts in museum collections, with their varied (and sometimes dubious) collection histories, provide meaningful insights into the archaeology of a region? Pursuing an answer to this question has been a main goal of this investigation. As is expected of studies of museum collections, the research presented here is constrained by sampling problems. Not only have random sampling strategies typically not been used in excavations on Aruba, much of the material culture remains that are available for study in Aruba has been surface collected by avocational archaeologists. (Oliver favors the term "*aficionados*" [1989:2]). Thus, much of the collection lacks precise contextual data.[10] Of course, the problem of unprovenienced materials is not unique to Aruba. Particularly when one considers that the human interest in the past predates the discipline of anthropology/archaeology (in some areas by thousands of years), it is only reasonable to expect that unprovenienced or *under*provenienced materials should be the norm for museum collections throughout the world, many of which receive substantial portions of their holdings through donations from individuals who have obtained the materials through various channels.

[10] One early avocational investigator, Mario "Mai" Odor, did keep meticulous notes regarding provenience and these notes have been archived in the Aruba Archaeological Museum. These are important resource for studies of a variety of prehistoric artifacts in Aruba. However, one challenge currently presented by these records is the frequent lack of correspondence between the archaeological sites recorded by museum professionals and the provenience names recorded in these notes.

Despite the limits of inferences that may be drawn using museum collections, researchers are increasingly focusing on these materials, for a variety of reasons. One obvious reason is that museums and other repositories are replete with archaeological material. Thus, those with a passion for the past would naturally be drawn to these resources. Some may recognize that much of this material has scarcely (or *never*) been studied, and suspect that this oversight may have led researchers to squander potentially valuable data sources that can contribute *something* to the study of past human behavior.

The costs of excavation probably also factor into the trend toward the study of "old collections." The expenses are not only operational; they also include an important opportunity cost. Few would dispute that technological innovations continue to improve the archaeological recovery process. Although the improvements that will be made in the future are not presently knowable, it seems reasonable to expect (based on past experience) that technological improvements in the collection of excavation data will be forthcoming. Because the archaeological record of prehistoric peoples preserved in the ground remains finite, any decision to reduce these reserves through the inherently destructive process of excavation must be weighed against the opportunity cost of foregoing such improvements. Extracting new knowledge from old collections may help to tip the balance in favor of preserving the soil record for the future, when technological innovations may increase their productivity.

1.4 The Role of Archaeology

Archaeology is crucial to an understanding of Aruba's prehistoric O/S objects made of shell, many of which may be described as "beads." Ceci has identified the changing nature of shell bead studies:

> The study of shell beads in anthropology has evolved during the past century from simple listings of curiosities and culture traits to greater research of these objects as sensitive markers for social, political, economic, and ideational processes among prehistoric, historic and living societies (1989a:1)

A recent study of shell beads from the Orinoco Basin (Gassón 2000) reveals this kind of holistic approach to shell beads, focusing on their use in the early historic period as a medium of exchange as much among Amerindian peoples as with European colonists. In an insightful analysis of the role of shell beads in the ethnohistorically identified System of Orinoco Regional Interdependence, and the "possible prestige-good systems indicated by the archaeological record" (2000:601) of that region, Gassón suggests that archaeologists have placed undue emphasis on the physical properties of these artifacts, arguing that "the attributes of the shell beads were more the result of the perceptions of different social actors through time than inherent characteristics of these objects" (2000:601). He suggests that shell bead researchers abandon the "positivist perspective, centered on classifying and describing the beads themselves" (2000:583) in favor of a shift toward the study of their meaning "as dynamic objects manipulated by people with different ethnic and sociopolitical backgrounds" (2000:601) and their importance to the social and economic interactions among the peoples that inhabited the Orinoco Basin through time (ibid.).

Although I share Gassón's view that the study of shell beads (and other O/S objects made of shell) should be broadened to include attempts to contextualize these objects within their sociopolitical contexts (including their role in political economy as important elements of exchange networks), I would argue that this very position rests on a typological exercise (however cursory), the results of which suggest few diagnostic attributes. The same conclusion must not be assumed for Aruba, but should instead follow equally exhaustive efforts to identify variation in archaeological shell beads.

The comparatively voluminous quantity of ethnohistoric resources available for Venezuela, which has more than any area of the Caribbean, facilitates the kind of document-centered approach Gassón advocates. The same may not be said for Aruba, for which few ethnohistorical or ethnographic records exist (Boerstra 1971:3). In fact, knowledge of the early contact period of the island is itself quite dependent on archaeological data. While ethnohistoric records support the view that O/S shell objects were valued by Caquetíos, archaeological research is the primary means of identifying the nature of these cultural expressions and how they may have varied on the island and/or changed over time. Even addressing questions about Historic Age occupations is reliant on archaeology. For example, answering the question of indigenous survival and the cultural use of shell artifacts beyond Spanish contact may never be possible using extant historic documents. However, a better understanding of these issues may be forthcoming through archaeological research. A classification of O/S shell objects is a fundamental first step toward understanding the cultural (including social-political) use of marine shell on both a local and regional level.

1.4.1 The Archaeology of Belief Systems, Symbolism, and Ideology

According to the noted anthropologist Leslie White, "all human behavior is symbolic behavior" (1949:11). This suggests that all objects modified by human agency may be considered evidence of symbolic behavior and refutes any dichotomous distinctions drawn between "symbolic" shell artifacts and "utilitarian" or "functional" ones. Indeed, as Kingery suggests, "artifacts are tools as well as signals, signs, and symbols" (1996:1). In the context of this study, "symbolic" behavior is defined more narrowly as human behavior that expresses an intangible concept, cultural value or selection, and/or belief not associated with the production or use of shell tools. This division, which results primarily from the categories defined for the "Shell Industry of Aruba" project, is not meant to suggest that tool-related behavior and symbolic behavior are unrelated. Instead, this division is made as a convenient heuristic device that helps to isolate evidence of *non*-tool-related behaviors (including artifacts) for closer study.[11]

Of course, symbolic behavior does not necessarily result in the production of a tangible object. For example, some prehistoric shells on the island express "symbolic" or "ritual" behaviors by virtue of their depositional contexts. Identifying such behaviors requires careful attention during excavations of archaeological sites, since the shells themselves may be completely intact, with no evidence of human modification.

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[11] Andrefsky (1998:59) advocates using classification as a heuristic device to, as Turney explains, "allow . . . comparison between datasets and [to generate] . . . questions about the dataset" (2001:48).

Whether symbolic shell-related behavior is expressed as an artifact or in an archaeological context, the interpretation of its meaning presents a formidable challenge to archaeology. Ashmore & Sharer define symbols as ". . . shorthand ways of conveying messages about often complex subjects" (1996:189) and assert that the relationship between them and their meaning is arbitrary (ibid.).[12] As these authors suggest, "even when an interpretation seems obvious, there may be no way of testing this conclusion" (ibid.). Without indigenous informants, codices (indigenous texts), direct historical accounts or analogous ethnographic data, the search for meaning in symbolic forms, "the stock in trade of the first generation of anthropologists" (Metcalf 1997:459), can be viewed as unscientific (Feder 1996 [1997]). This, perhaps, explains the materialist tendency to embrace the "ladder of inference" (Hawkes 1954), which situates the meaning of symbolic behaviors beyond the scope of archaeology, a discipline which is, by its very nature, grounded in empirical analysis of material remains:

> Without written texts, archaeologists can investigate economy readily, and political and social systems to a lesser extent, but for the most part, prehistoric symbols and ideas must remain a closed book. (Hawkes 1954; quoted from Robb 1998:330).

Yet, in recent years many have questioned the stability of the inferential "ladder' that has supported archaeological interpretation. Some question the very base of this ladder. This

[12] According to Ashmore & Sharer, it is precisely their "arbitrariness and complexity that makes symbols both rewarding to study and difficult to interpret, especially in the archaeological record" (1996:189).

critique is summarized by Bender's assertion that "the line between empirical finding and interpretation is artificial" (1995), that archeological data are both theory laden and subjectively interpreted by archaeologists (ibid.). Archaeologists generally recognize that the analogies and inferences they make, which structure their reconstructions of the past, are based on their own individual experiences and "knowledge of history" (Wenke 1999:7). For many this recognition has served to broaden the scope of archaeological inquiry.

In fact, the post-processual shift in archaeology (which takes many forms) has effectively paved the way for a more inclusive consideration of past human behavior. Not only do archaeologists increasingly recognize that symbols are unavoidable in archaeological analysis, for many they are fundamental components. Some operating within the synthetic cognitive-processual paradigm, for example, have focused on how symbolic forms function within society; within this paradigm, the "role of symbols within the process of change" has been a one important theme (Flannery & Marcus 1983; Renfrew & Bahn 1996:471.

Despite the difficulties inherent in the interpretation of these cultural expressions, archaeologists increasingly acknowledge the importance of symbolic behaviors in their analyses of the prehistoric cultures they study. Issues of symbolism, beliefs, and ideology are emerging as primary research foci. One North American University currently offers as a primary graduate research concentration "Ideation and Material Culture Studies," which

is explained as follows:

> Ideation and its expression in material culture are active areas of faculty research and teaching in the Anthropology Department and School of Art. This realm of study includes the reconstruction of past world view and belief systems, the "politically interested" use of beliefs, ideational factors in sociocultural change, cognitive landscapes and culturally constructed environments, material style, material symbols of social organization and exchange, craft organization and production, and ethnoaesthetics. Some media for which these topics have been addressed by ASU faculty and students include iconography, rock art, architecture, various crafts (e.g. ceramics, textiles), and burials.[13]

As the foregoing paragraph suggests, there is a great deal of variation in archaeological approaches to material symbols, whether they are viewed primarily as a means of conveying information (Wobst 1977 – the "Symbols as Tokens" approach (Robb1998:332), of constituting and structuring society (the "Symbols as Girders" approach [Robb 1998:334]), or as culturally emergent objects without inherent meaning, which become meaningful only at the moment they intersect with people (Bernbeck 1999:94; Thomas 1996:97). An approach that views symbols as building blocks with which to construct an archaeological interpretation, the "Symbols as Tesserae" approach (Robb 1998:337), has been effectively demonstrated by Pasztory (1993). Using the analogy of the Teotihuacan ceramic censur, Pasztory emphasizes that Teotihuacán censer components may be assembled, disassembled or reassembled to transform the same constituent parts into new forms (1993:45). Similarly, symbols and other archaeological data may be variously employed to build an interpretation of the past (ibid.). Multiple, often conflicting interpretations may consequently emerge from a common data set.

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[13] http://www.asu.edu/clas/anthropology/graphic/grad/archy.htm.

De Boer suggests that "today . . . archaeologists-as-shamans are flying everywhere" (1996:1). This raises an important point. Archaeologists are not diviners (at least not any known to me). Those who investigate cognitive issues must (and generally do) recognize the elusive nature of symbolic behavior and continue to acknowledge the inherent limitations of cognitive approaches. The history of archaeological interpretation is replete with evidence to reinforce the idea that a consideration of symbols in archaeology need not (viz *must* not) include *definitive* statements on the meaning of uncontextualized symbolic forms. (I offer as a cautionary example the premature interpretation of Maya iconography as evidence of an idyllic society ruled by passive priests.) Yet, archaeologists and prehistorians (including art historians) in the late 20th/early 21st centuries investigate a wide variety of issues related to prehistoric symbolic behaviors (including material remains) without necessarily colliding with epistemological issues regarding the circumscription of meaning(s).

Robb suggests that "there is . . . no specific methodology unique to the archaeology of symbols (1998:341). According to Robb, "the key starting point for investigation is realizing what are the right questions to ask"(ibid.). He lists several points of inquiry that could potentially inform the studies of material symbols. Several of these have been considered within the context of the "Shell Industry of Aruba" project:

> (a) iconic or representational meaning of symbols . . .(d) . . . variations of form, technique, and decoration; . . . (e) perceptual aspects of symbolic artifacts (visual, auditory, tactile features); (f) cross-artifact styles and semantic associations; (g) social connotations and associations of artifacts, representations, and styles; (h) technical analysis of techniques of manufacture and use wear; (i) economic aspects of artifact manufacture and circulation; (j) knowledge and execution of artifact manufacture as cultural process; (k) artifact life histories from manufacture through deposition; (l) context of usage and interpretation; . . . [and] (n) ambiguity, multiplicity of interpretations, misunderstanding, and irony (Robb 1998:341).

Clearly, the items listed above are not all equally accessible to the archaeology of O/S shell remains in Aruba. Yet, each of Robb's items listed above has influenced (to a greater or lesser degree) the study presented here. Even those more consistent with a "mental reality approach" ("Symbols as Girders": Robb 1998:334), or with "Symbols as Tesserae" (e.g. a, g, and n of Robb's list above – perhaps best approached using ethnographic correlates), have not been entirely ignored.

Given the many challenges to the interpretation of symbolic behavior, archaeologists who work in areas for which sufficient ethnographic data are lacking (such as Aruba) are particularly reliant on the archaeological context of marine shell use in their efforts to understand past human behavior symbolized by these artifacts, particularly those for which formal attributes suggest no clearly discernable social value.[14] A carefully excavated O/S artifact can provide cultural data above and beyond whatever information

[14] Because contextual data are crucial to our understanding of human/marine shell relationships, its necessity is, predictably, a recurring theme in this discussion.

may be inferred based on its attributes of form, style (including iconography and material selection), or technology. Context provides the cornerstone of studies of symbolic objects ─ not simply for inferences of symbolic behavior, but also for both diachronic and synchronic variation in these behaviors.

1.4.2 Ethnohistoric Documents and Ethnographic Analogy

Archaeological data provide ample evidence that marine shells functioned as an important medium of expression for prehistoric peoples of the Southern Caribbean. However, the interpretation of these shell related behaviors is complicated by the fact that early explorers of the region left little information directly applicable to many cultures they encountered. As Sauer states, "[T]he men who discovered the Caribbean mainland had little interest in the natives and how they lived other than what profit could be had from them," suggesting that as a consequence "there are few parts of the New World of which we know so little at the time of first European contacts" (1966:115).

In the Greater Antilles, Bahamas and portions of the Eastern Caribbean, the interpretation of ornamental, iconographic, ritual and/or symbolic behavior is aided by the work of Fray Ramón Pané, a Franciscan friar commissioned by Columbus to study the belief system of the indigenous people living on Hispaniola at the dawn of history in the Americas, those now known to us as the Taínos. His work has facilitated a partial interpretation of Taíno iconographic expressions on artifacts produced from a variety of media that were either collected by early Spanish explorers, secreted away in caves during the early contact period, or discovered through archaeological excavations (Arrom 1974).

In a recent study of primarily museum collections, McGinnis (1997) incorporated this work in her own study of symbolic or "ideographic" expression among the Taíno. By ordering and quantifying stylistic traits, she was able to identify iconographic forms on Taíno artifacts that are consistent with forms present in artifacts of mainland South American peoples. While recognizing that the precise meaning of these iconographic forms would not necessarily be consistent throughout the vast stretches of both time and space that connect the Taíno to mainland populations, this study does suggest the potential for some degree of continuity among peoples of the Arawakan diaspora.[15]

Groups speaking languages of the Arawakan family were widely distributed in the late 15th century throughout the Amazon Basin, the Guianas, the Orinoco Valley, the eastern half of the Caribbean area, and all along the Northwestern coast of Venezuela, including in the off-shore islands of Aruba, Curaçao and Bonaire (the ABC islands), and Isla Margarita. This language family emerged from the Andean-Equatorial superstock. In 1965, Noble diagrammed the development of Proto-Equatorial language subgroups. Using basic vocabulary, Noble could find few cognates between the Taíno and their neighbors further south (Rouse 1992:39). Consequently, the Stammbaum (family tree) model he developed indicates an early separation between the Taíno and Proto-Maipuran groups (including Caquetío ancestors). According to Rouse, subsequent linguistic research has demonstrated that the "Taíno, Island-Carib, and Arawak languages diverged from the main line of Arawakan development at the same late date and that all three belong in the

[15] Yet, when one considers the limits of ethnography, it is not difficult to accept that Pané's account, too, provides but a singular view of Taíno beliefs.

Maipuran subfamily" (Rouse 1986, 1992:40; Oliver 1989:105). Thus, although primary sources for the Southern Caribbean region are few, and available historical accounts of the region are both later and less specialized than that of Pané, a consideration of iconography or stylistic elements may suggest general ancestral relationships between prehistoric Aruban peoples and their Arawakan contemporaries in the region.[16]

Ethnographic constraints throughout the region clearly limit some areas of inquiry about symbolic behavior. Ethnographic analogy, which uses data from analogous extant cultures to infer past human behavior within extinct prehistoric cultures, can often aid researchers in their interpretation of the archaeological record.[17] By observing the way contemporary peoples incorporate an object into their own cultures, archaeologists may infer a similar function for the object among the prehistoric peoples who actually used the artifact in question. Ethnographic analogy can be a powerful tool and its use is particularly prevalent in prehistoric research in the Americas, where culturally related groups frequently survive in close proximity to their ancestral homelands. Unfortunately, analogous groups are non-existent in Aruba.

Bartone & Versteeg (1997) have incorporated ethnographic analogy to inform their interpretation of social structure among the prehistoric Ceramic Age peoples of Aruba who occupied the portion of the Tanki Flip site they investigated during the 1994-1995

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[16] I must stress the word "general" here. I am aware that some find problematic the use of Pane's documents for symbolic inferences *anywhere* beyond the island of Hispaniola (L. Antonio Curet, personal communication, 2002).

[17] The validity of this type of analysis rests on the assumption that historically recorded human behavior reflects prehistoric human behavior.

excavations of that site. Although the Caquetío disappeared as a distinct group in the 19th century, ancestors of the Guajiro (Wayúu) and related peoples of the Guajira Peninsula and coastal areas of northern Columbia and Venezuela were known to be a neighboring group of the Caquetío from A.D. 1500 to the 19th century, and, according to these researchers, could potentially provide a *relational analogy* (Versteeg and Rostain 1997; Hodder 1995:116) for the social structure of the Ceramic Age peoples whose Dabajuroid pottery links them to a common ancestral hearth. In addition, as Versteeg & Ruiz suggest, "there is evidence for regular contacts between Aruba and the Guajiro" (1995:60).

According to Oliver, the Guajiro are the most successful survivors of the region (Oliver 1989:176). They number ca. 250,000 (Ardila 1996:30) and continue to occupy the Guajira Peninsula, the landscape their ancestors first inhabited ca. 500 B.C. (Oliver 1989:176), as well as portions of the Maracaibo basin. Ethnohistoric evidence clearly indicates that the Caquetío were present in the Guajira Peninsula (Oliver 1989). One might expect that the geographic proximity of Caquetío and Guajiro groups may have mutually influenced cultural developments, resulting in some parallels in material expression. However, Oliver suggests that within the "Western Sphere, the Caquetío were clearly a minority imbedded, though not necessarily mixed, within a larger ethnic mosaic" (Oliver 1989:199).

The language of the Guajiro (also called Guajiro) is of Proto-Maipuran origin, and likely splintered off more than two millennia ago ─ more than one thousand years before the distantly related Caquetío, who spoke another Arawakan language (also called Caquetío), migrated into Coastal Falcón. Oliver's Stammbaum model of selected

Maipuran languages (based on cognates of the words for "fish" and "dog") (Figure 1.3) suggests that more linguistic distance separates Caquetío from Guajiro than from Taíno (the Arawakan language of the Taíno peoples).

Boomert cautions that cultures may not be equated with language groups (2003:146). Yet, while linguistic distance does not necessarily translate to more or less similarity/difference between groups in terms of cultural values or beliefs, greater social distance (time depth) would presumably provide more opportunity for divergence. It is possible that Taíno groups may provide a better "relational analogy" for interpreting some Caquetío remains than might the Guajiro, particularly aspects of culture that apparently express Pan-American traditions perhaps less apt to change (e.g. religion). Of course, this does not get us any closer to an ethnographic correlate, since the Taíno, like the Caquetío, are culturally extinct.[18] However, it does, perhaps, open a door (however slightly) for interpretations of shell artifact forms based on aspects of Taíno beliefs recorded by Pané.

Recent archaeological research on the peninsula suggests that the large span of time that separates the Guajiro and Caquetío migrations is not the only factor that constrains efforts to incorporate aspects of Guajiro culture in ethnographically analogous interpretations of Caquetío prehistory.[19] Perhaps a more formidable obstacle is the

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[18] I do not mean to deny the existence of the many who ethnically identify themselves as Taíno or Caquetío. Indeed, recent efforts to resurrect cultural practices driven to extinction through acculturation and other historical processes has led to the development of a substantial "Neo-Taino" (Rouse 1992) population.

[19] For inferences on shell use, Ardila (1996) relies not on extant groups on the peninsula, but on the ethnohistoric evidence synthesized by Oliver (1989) for the Caquetíos of coastal Falcón (the origin of the neighboring Caquetíos found living on the Guajira peninsula in the early 16th century).

transformation of Guajiro society as a result of a fundamental change in Guajiro subsistence strategies in the early post-contact period. The economic shift among the Guajiro populations away from a reliance on marine resources toward pastoralism may well have resulted in a similar shift in the relative cultural value they place on marine resources. In fact, the title of a recent publication on archaeological research on the peninsula, *Los tiempos de las conchas* [The time of shells] (Ardila 1996), indicates a fundamental disjunction between lifeways of prehistoric inhabitants and those living in the area today.[20] Yet, while Perrin suggests that "Guajiro society has, it is true, suffered a great deal of acculturation" (1987:153), he also reveals that Guajiro myths place little emphasis on pastoral activities, suggesting that this particular aspect of Guajiro society remained somewhat resistant to historical processes (1987:134). According to Wilbert, "their material culture, socioeconomic system, and entire value orientation were restructured into new configurations, all of which had cattle as a focal point" (1972:163). Versteeg & Ruiz have also noted that the Guajiro "calculate everything in cattle-value" (1995:60). Yet, they suggest that the Guajiro "keep their Indian culture (e.g. secondary urn burial)" (ibid.). Given these circumstances, the *potential* for ethnographic analogy using data from this culture group is something that certainly merits further research.

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[20] Ardila emphasizes the connections between Paraguaná inhabitants and other prehistoric peoples, suggesting that much of the relations established between Central America, the Caribbean Islands, the coasts of Venezuela and the areas around Sierra Nevada of Santa Marta were accomplished by sea (1996:210). Yet, he suggests that archaeological research in the La Guajiro peninsula provides little additional evidence (beyond mortuary practices) to link the contemporary Guarjiro peoples to the model of their prehistoric past. This does little to favor the use of Guarjiro culture in analyses of Aruban peoples of the Ceramic Period based on ethnographic analogy with extant Guajiro groups.

It is a common belief among social scientists that conquerors generally make very poor ethnographers. Yet, despite their inadequacies, ethnohistoric documents may offer some insights into the persistence of Amerindian cultural traditions in the region. For early conquest period, the *relaciones geograficas*, produced by 16th century Spanish officials and settlers in regions claimed for Spain, provide invaluable information on Amerindian cultures during the conquest period (Parry & Keith 1984:27). One report, "The Indians of Caracas, from a geographical account of the province," which was produced in 1578, describes the initiation of apprentice *piaches* (shamans). This process involves sequestering young initiates (ca. 14-15 years of age) for a period of twenty to thirty days in *camaretas* (small chambers) built within their own houses specifically for this purpose. During this time, initiates fast, abstaining from all food and water, with the exception of a glass of *masato* (maize beer), as they receive instruction in the magico-religious practices of *piaches*, their only visitors during this time. Following their period of "liminality" (Gennep 1960; Turner 1969, 1974; Lindholm 1997:288), initiates re-emerge in their new roles as *piaches*. As valued members of the community, they are then celebrated in great feasts (*ytaneras*) involving large amounts of *masato* prepared days before specifically for the occasion. The record of this Amerindian cultural tradition underscores the enduring nature of belief systems. Shamanic beliefs and influence persisted in the region well after the breakdown of other indigenous institutions, such as political structure (Arellano 1964:121-126; Parry & Keith 1984:27).

While both the extent of Caquetío influence in the region and the common linguistic heritage of diverse groups provides some basis for the consideration of

ethnographic analogies in interpretations of archaeological data of Aruba's Ceramic Period, other factors constrain the feasibility of such analogies in interpretations of symbolic behavior. Thus, inferences made using ethnographic or ethnohistoric resources must always be tested against local archaeological data.

1.4.3 Social Complexity in the Intermediate Area

Aruba's role in the Caquetío Polity of Coastal Falcón is an important area of archaeological inquiry on the island (Oliver 1989; Versteeg & Ruiz 1995; Dijkhoff 1997; Versteeg & Rostain 1997). As Figure 1.4 suggests, Aruba lies within the boundaries of the *Intermediate Area.* Willey defines this area as a spatial unit that includes "the Ecuadorian Andes and Pacific coast, the Colombian Caribbean coast, the Andes of western Venezuela and the adjoining Venezuela coast, and all of the Lower Central America up to a line that extends from the Gulf of Nicoya to the north-central Caribbean coast of Honduras" (1971:254). Yet, he recognizes the internal diversity of the natural environment within this geographic region bounded by tropical latitudes:

> The climate and vegetation of its high Andean valleys are moderated by this latitude; the lowland valleys and coastal flats are hot and humid. As in Peru, there is a close juxtaposition of high, temperate basins to tropical lowlands. Unlike Peru, and in this regard more like Mesoamerica, the transition between these uplands and lowlands is gradual, with a great variety of "niches" for human habitation in this gradient (1971:254).

While the Intermediate area definition is based on geography, it has, nevertheless, also been conceptualized within archaeology as an area of cultural development bounded by the relatively advanced civilizations of Mesoamerica and the South American Andes

(Willey 1971:254; Rouse & Cruxent 1963). Yet, researchers increasingly recognize the extensive cultural diversity of the region and view this diversity as more than just varying degrees of exposure to the "high" cultures of Precolumbian Mexico and Peru. It is clear that prehistoric peoples of the Intermediate area were dynamic agents in their own cultural developments, not simply passive receptors of influences from bordering state level societies (Oliver 1989).

Research in the Intermediate area indicates that social complexity may be expressed in multiple ways and that these may not necessarily include monumental architecture or social inequality easily identified in the archaeological record. Expressions of social complexity within the Intermediate area are highly diverse, and this diversity may explain why complex societies within the area remain comparatively poorly understood. A 1992 volume devoted to the archaeology of the Intermediate Area included little information on Venezuela and no mention of the ethnohistorically documented, socially complex peoples of the Caquetío Polity of Coastal Falcón, Venezuela's off-shore islands and the islands of Aruba, Curaçao and Bonaire (the ABC islands), and portions of the Guajira Peninsula of Colombia. The topic is much too extensive for a single volume.

The relative complexity of the Coastal Caquetío and their inferred relationship to other complex groups in the Intermediate area has precipitated their classification within the Intermediate area framework. Recent archaeological research in Venezuela undermines the geographic integrity of the classificatory boundary that separates some Intermediate Area groups from their Caribbean and Amazonian neighbors (Oliver 1989). Using archaeological, ethnohistoric, and linguistic evidence, Oliver has effectively

demonstrated that the Dabajuroid emerged in the region ca. 700/800 A.D. as the material expression of its producers who migrated into the region from the Venezuelan llanos and established themselves in Aruba soon thereafter (Oliver 1989). While the Intermediate Area framework may assist studies of Dabajuroid expansion and social complexity,[21] the geographically defined aerial boundaries must be hurdled in efforts to understand both the emergence and cultural development of the ethnohistoric Caquetío peoples. Available evidence suggests that the socially complex Caquetíos of coastal Falcón and their insular neighbors (including those in Aruba) were closely associated with other groups of the Arawakan language family (including those less socially complex),[22] rooted in the Middle Orinoco River system (Figure 1.5), and, ultimately to Amazonia. Social complexity among Dabajuroid peoples may be seen as the ultimate effect of Arawakan expansion to the northwest, just as this complexity among Chicoid peoples (the Taíno) may be seen as the sociopolitical consequence of Arawakan expansion along the eastern Caribbean corridor.

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[21] As Oliver emphasizes, Osgood & Howard's "Theory of the H" (1943) as an explanation of cultural developments within the region is also not supported by archaeological evidence. The outmoded theory is summarized by Osgood, as follows: "Venezuela is a region of great importance archaeologically, since it lies like the connecting bar of an H, between the main migration routes along the west coast of the Americas and the paths of later movements along the eastern parts of South America and throughout the Antilles (Osgood & Howard 1943:5; and in Oliver 1989:15). According to Oliver, the use of the word "later" to describe movements along the eastern parts of South America probably reflects "the, perhaps unconscious, biases of that time period toward the Andean areas" (Oliver 1989:15), since Osgood and Howard "acknowledged that their Orinoco phase is probably earlier than the Northwestern Phase" (ibid.).

[22] Oliver has studied "vocabulary items extracted from various XVIth century sources [which] show that Caquetío is without a doubt an Arawakan, almost certainly Maipuran language" (1989:158).

1.5 Summary and Organization of the Dissertation

Symbolic shell objects and other shell-related behaviors record aspects of cultural values. This work examines the use of marine shell as a medium for cultural expression among the diverse Amerindian population of Aruba. Following an overview of the anthropology of shell use and the consequent utility of shells and shell artifacts in social analyses (Chapter 2), the discussion centers on Aruba. Chapter 3 focuses on the physical setting of the island that fostered prehistoric Amerindian life and introduces the discussion of archaeological efforts to understand cultural developments on the island (Chapter 4). Chapter 5 synthesizes archaeological interpretations of Aruba's Amerindian cultural chronology.

The classification of marine shell artifacts in the AMA collection, supported by archaeological data, ethnohistoric documents, ethnographic accounts, and linguistic analyses, is a primary step toward investigating spatial and temporal variation in the cultural use of marine shell in Aruba. This is the focus of Chapter 6, which highlights the diverse ways that prehistoric Aruba peoples transformed marine shells from natural objects into human expressions. Distinctive types can be identified through analyses of form, technology, iconography, and style, which may be useful in comparative analyses on the intra-site, inter-site, and regional levels of Amerindian marine shell artifact production and use (Chapter 7).

The mission of Aruba's archaeological museum is very much in line with the aims and goals of modern archaeology. The recovery and presentation of artifacts is, perhaps,

foremost among them. Haviser envisions a wider role for artifacts:

> Artifacts can no longer be seen as exclusively objects unto themselves, but must be presented through museums as symbols of the complex contexts of our heritage, and thereby associated with aspects of the value-significance within our pluralistic society (1999:629).

Yet, before these artifacts may be fully appreciated (or fully functional) in their new roles, they must be understood as part of the cultural contexts of their production. With a view toward this goal, Chapter 8 discusses steps that may be taken to advance current knowledge of marine shell use among Amerindian Arubans, focusing on data acquisition, artifact conservation, and site preservation.

Careful attention to archaeological context can provide a bridge between formal analyses of material remains and past human behavior. Although the precise meanings of particular symbolic behaviors or forms may remain beyond the grasp of archaeological inference, contextual analyses of marine shell-related cultural expressions can potentially isolate patterns that signal social distinctions within groups and/ or reveal the relative degree of social interaction between them. This information may not only support efforts to understand the emergence of complexity on the island and in the region as a whole; on a more fundamental level, it can, perhaps, contribute finer distinctions to the cultural chronology of the island than can be achieved using pottery styles alone.

CHAPTER TWO

MOLLUSKS, SHELLS, AND CULTURE

2.1 Introduction

Mollusks have clearly adopted a winning strategy. From their beginnings millions of years ago, they have evolved and adapted to inhabit a wide range of habitats on land, in fresh water and throughout the world's oceans. Mollusks are important resources for humans. The protein and other nutrients of their fleshy bodies combined with their extensive distributions have made them an important subsistence resource for populations throughout the world for thousands of years. Yet, mollusks serve people in many more ways. Researchers have discovered that some mollusks have medicinal properties. Juice from abalone, for example, slows the growth of bacteria, and some cone shell species fight pain.

Some mollusks are useful to humans in the production of valued goods. Species of murex, for example, produce a purple dye (which varies from red to violet) that was not only highly prized in antiquity, but is still in used today in Mexico and South America. Some species of pelecypods produce a "golden fleece," a byssus used by the mollusk to attach itself to objects, and by humans to produce a special cloth. Humans exploit specific species of mollusks for the pearls they produce as they seek to neutralize intrusive irritants.

This fact was particularly detrimental to indigenous Caribbean peoples, whose pearl diving abilities led to their exploitation by Spanish conquistadors on the island of Cubagua. Yet, perhaps no molluscan product has been more valued by humans across time and space than their shells, and among these perhaps none so much as those produced by mollusks who inhabit the seas.

2.2 The Appeal of Marine Shells

Popular as collector's items and the subject of innumerable books, marine shells have been variously described as "gifts," "treasures," or "jewels" from the sea.[23] What is it about the hard exterior shells of these simple invertebrates that make them so fascinating? Perhaps it is their seemingly infinite variety. The vast majority of the approximately 100,000 known species in the Phylum Mollusca (the second largest in the animal kingdom) secrete calcium carbonate ($CaCO_3$) to produce a distinctive calcareous shell.[24] Perhaps we are drawn to their flawless geometric forms. One popular book devoted to them proclaimed them "nature's art" (Conklin1985:). Indeed, their aesthetic appeal is evident in their ubiquity in design for everything from fabric to architecture. In industrial societies, advertisements feature them in a symbolic way, to beacon tourists to island shores replete with these "treasures" that so frequently make their way back with the visitor, to destinations around the world, to be transformed into decorative items and/or

[23] Stix, Stix and Abbott 1984; Sutty 1986; and Gabbi 1999, respectively.

[24] A few thousand exceptional species, such as the octopuses of the Cephalopoda class, do not form a calcareous shell (Abbott and Morris 1995:xxviii).

souvenirs that perhaps evoke pleasant memories of beautiful, relaxing beaches, or the serenity of the sea. In their transformational journey from the seashore to desk tops, shelves, or curio cabinets, these marine shells become artifacts, cultural symbols the precise meanings of which are perhaps as individual as the persons who collect them.

2.3 Shells in Anthropology

Shells have been of interest to anthropologists/archaeologists for their utility in investigations on a variety of topics. They may be analyzed as proxy data for their invertebrate producers. When they occur as heaps, in middens, or shell matrix sites, they offer researchers important information about past subsistence practices. Shells can also frequently assist paleoenvironmental reconstructions. As aspects of shell growth and development are closely correlated with molluscan habitat, shells provide important paleoclimatic data, which can frequently be timed using shell growth increments, the natural chronological markers created by the molluscan mantle, which regularly deposits shell material to accommodate the animal's growth.[25]

Shells and objects made from them have also long been recognized in anthropology as important components of material culture. Even shell midden deposits have been exploited for a wide variety of uses, including for agriculture (as fertilizer, in garden topsoil and in poultry feed), in construction (for foundations, fill, roads, cisterns, sea walls, and as a component of building materials), and for commercial purposes (i.e. for the lime or tourist industries) (Ceci 1984, passim).

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[25] Temporal resolution as fine as daily tide intervals have been obtained in some cases.

Shells have also been investigated as indicators of cultural values. Malinowski's study of the Trobriand Islanders (1922) demonstrated that shells that were incorporated into the *kula* trade embodied important aspects of systems of prestige, mythology, and myth (Ruhm 1997). In a variety of cultures, seashells figure prominently in creation myths, as a form of currency, and in artistic expression (including performance). Two decades ago, researchers from the American Museum of Natural History published *Spirals from the Sea*, a volume focusing on the many ways that human beings use shells and the meaning of their use in a variety of cultures. Safer explains the transformational power of shells:

> [Through] . . . imaginative leaps, human beings can transform shells . . . into ritual objects, symbols, metaphors. The shell becomes a hiding place, the sun, a womb. In our contemporary experience, we mainly find this kind of metaphorical thinking in poetry. From European literature come images of the shell as a natural fortress, a grave, an image of resurrection, a toothed vagina – a small sample of the range of analogies that the human mind can imagine (Safer and Gill 1982:9).

In their study of non-industrialized societies, the authors of this volume find that ethnographic accounts the world over document the use of shells not only for ornamentation, but also in ritual, and as symbols of wealth, status or power (Safer and Gill 1982). Increasingly, archaeologists are also recognizing the utility of shell remains in investigations of social organization and/or political institutions (Claassen 1998:228).

Archaeological data suggest that human/shell relationships among prehistoric peoples parallel those documented ethnographically. Even in areas hundreds of miles from any sea, the presence of marine shells, and artifacts manufactured from them, attest to their cultural importance. Whether whole or modified to produce culturally valued objects,

marine shells have been extensively used, traded, and appreciated throughout the world for many thousands of years. Marine shell use has been documented for the Upper Paleolithic period, and recent finds in the Eastern Mediterranean suggest that human beings in this region were manufacturing ornaments from shells as far back as the Middle Paleolithic period, perhaps 40,000 years ago (Clark 1999). More recently, archaeologists have recovered 41 shell beads (made from *Nassarius kraussuanus* shells) in Blombos Cave on the East Coast of South Africa, a find that may push the first evidence of the ornamental use of marine shells back even further, to 75,000 years ago (Henshilwood et al. 2004:404; *El Pais,* April 16, 2004).[26] From this earliest evidence, the archaeological record tracks the migration of our species throughout the planet. Along this route, we find abundant evidence of marine shell valence beyond its utility for the production of tools.

For the Americas, the evidence is no less compelling. A slightly modified *Strombus gigas* shell recovered at Grand River Reserve in Ontario, Canada (Novella 1995:43) , more than a thousand miles from tropical waters, is just one of many similar finds that suggest the value of marine shells among prehistoric Americans. The precise function of the shell in its prehistoric context is unknown. Missing only its apex, it may have been used as a musical instrument.[27] It may also reveal that prehistoric peoples, like their modern counterparts, appreciated marine shells for their intrinsic beauty. Although aesthetic appreciation is difficult to establish using archaeological methods, archaeological

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[26] According to Claassen, "Shell, the material, has offered humans tools and symbols for hundreds of thousands of years" (1998:218).

[27] The sound of a trumpet may be produced by plugging the shell aperture while blowing through the hole created at the apical end of the shell (Novella 1995:11).

remains from various culture areas are suggestive. In prehistoric Cuba, for example, shell morphology was apparently so admired that it was mimicked as a design motif for ceramics. A bowl illustrated by Dacal Moure and Rivero de la Calle (1986:139; 1996:108) seems to have been inspired by shell morphology, perhaps that of *Strombus gigas*. Comparable uses of shell iconography are known for a number of cultures throughout the Americas.

Whatever its precise function, the Grand River Reserve Strombus shell was likely prized as a luxury item among the prehistoric Native American peoples who probably acquired it through trade networks. Abundant data reveal that marine shells were important trade items throughout the Americas. In many areas, archaeological evidence suggests that prehistoric peoples used these luxury items as ornamental objects, as was the case among the Hohokam of Southern Arizona (Jernigan 1978; Mitchell and Foster 2000). Among some cultures shells also served as essential elements in ritual and symbolic systems, as has been established for prehistoric peoples in interior regions of Colombia and Venezuela (Ardila 1996; see notes).

For many, marine shells served as a raw material useful in the production of valued cultural objects. All along the coasts and adjacent interior regions of prehistoric North America, marine shell predominates as the raw material for the production of beads and ornaments (Sutton and Arkush 1996).[28] The Mississippian site of Cahokia, which is located in southwestern Illinois, several hundred miles from the sea, has yielded several

[28] Fresh water species have also been used for ornament production and in ritual (see, for example, Agbelusi & Ejidike 1992).

thousand marine shell beads; twenty thousand of these were excavated from a single elite burial context. An equally large number were recovered from an earlier Hopewell burial in Ohio (ibid.). These examples demonstrate the multifunctionality of shell beads within each culture, and suggest some degree of diachronic continuity in shell bead valence on a regional level.[29]

In fact, throughout the hemisphere, prehistoric peoples chose marine shell for the production of beads over all other available resources (Orchard 1975:19). Early historic accounts suggest that many of these were used as money (Gifford 1947). Wampum beads are perhaps the best-known examples of shell beads that functioned as a medium of exchange (Ceci 1989b). The symbolic importance to Iroquois peoples of these white and purple beads, manufactured from the whelk gastropod (*Busycon canaliculatum*, or *Busycon carica*) and quahog bivalve (*Mercenaria mercenaria*) shells, respectively, precipitated their secondary use as a medium of exchange in the context of the Fur Trade during the Protohistoric period (Snyder 1999:362).[30]

The iconography of artistic production from Mesoamerica, whether modeled in clay, painted on murals, or carved in stone, attests to a powerful role for marine shells within prehistoric cultures of the region (Novella 1995). Shells are abundant in the iconography of Teotihuacan., part of the "the rich imagery of flora and fauna in

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[29] Large shell objects are also abundant in both Hopewell and Mississippian sites, among which Spiro Mound, in Oklahoma, is particularly noteworthy (William J. Parry, personal communication, 2005).

[30] It should be emphasized here that the importance of Wampum among these Native Americans extends far beyond their use as a medium of exchange.

Teotihuacan . . . [that situates] every act, every ritual, in the guise of natural or cosmic processes" (Pasztory 1993:61). The iconography of this site reveals a close association between feline imagery and conch shells (Pasztory 1993:60).

Surviving codices also provide important contextual data on human/marine shell relationships within complex cultures. Such evidence, together with historical accounts of the Protohistoric Period and archaeological data, helps researchers make inferences about the symbolic meaning of these shells in prehistory. The data suggest that in many prehistoric Mesoamerican cultures seashell imagery is associated with aspects of fertility and human fecundity (e.g. water, rain, agriculture, pregnancy, and birth). In the symbolic pantheon of these cultures, morphological attributes of particular shells were associated with specific deities. This precipitated their use in ritual ceremonies and in burial contexts (Novella 1995:3).

Prehistoric peoples in this region also incorporated *Spondylus* spp. shells in significant ritual and symbolic contexts and valued their use as the raw material for the manufacture of ornaments that were important components of elite regalia (Velázquez Castro 1999). Such was the demand for these particular shells that they were, perhaps, among the most prized trade commodities during the Classic period (Novella 1995). The archaeological record of the Andean region also reveals striking relationships between prehistoric peoples and marine shell resources. The recent selection of the *Spondylus* sp. shell as a symbol of unity between Ecuador and Peru (Sandweiss 1999) is itself symbolic of the vital trade relationship that existed between the prehistoric peoples of these lands. Although the Gulf of Guayaquil is the southernmost source for the spectacular Pacific

Spondylus spp. shells so revered in prehistoric Andean cultures, the archaeological record reveals that Andean peoples much farther south and at high elevations were able to gain access to this precious resource through trade. Spondylus shells achieved a special status (Paulsen 1974; Mester 1989)*;* this is evident not only in the iconography of ceramic and stone artifacts created by prehistoric South American peoples, but also in the ritual cache and mortuary contexts in which Spondylus shells are recovered archaeologically in the region (Mester 1888). As in Mesoamerica, the incorporation of ornaments manufactured with Spondylus shell in the production of elite adornment within this region further attests to the revered status of this marine shell resource (Cordy-Collins 2001:36).

However profound and widespread the interest in Spondylus shells among prehistoric Mesoamerican and Andean peoples, the cultural value of marine shell resources in these and other areas extends far beyond a single family of mollusks. Other marine shells, particularly gastropods, figure prominently in the archaeological record, either as complete (or slightly modified) shells (Shimada et al. 2000), as iconographic representations, or as the raw material for the production of cultural artifacts of ornamental, ritual and/or symbolic value. Throughout the Americas, a wide variety of artifacts survive to attest to the cultural value of marine shell within societies ranging from the complex agricultural Mesoamerican and Andean societies, to the many hunting, fishing and gathering groups evident in the archaeological record.

As might be expected in an area so rich in marine shell resources, the Caribbean region yields substantial evidence that prehistoric inhabitants, including those residing in coastal regions of the mainland (the Circum-Caribbean), not only exploited marine

molluscan resources for food and tools, but also valued marine shell as a medium for cultural expression.[31] This evidence is particularly abundant in the archaeological record of Aruba. In addition to the ancient shell mounds that reveal the utility of mollusks in prehistoric subsistence, the island's history records numerous discoveries with associated marine shell objects that indicate the aesthetic, symbolic or utilitarian value of marine shells not only in their natural, unmodified state, but also as a medium for the production of a wide range of artifacts in prehistoric Aruban societies.

2.4 Shell Artifact Research[32]

The many shell artifacts that survive as material evidence of prehistoric cultural processes have long commanded the attention of archaeologists, and their ubiquity across time and space has inspired a long tradition of shell artifact research. The research presented here benefits from several important studies of shell artifacts that consider the value of marine shells beyond their utility in the manufacture of tools. Distinguished among these is the 1883 publication, *Art in Shell of the Ancient Americans*, by William H. Holmes. In this, the first comprehensive work dedicated to shell artifacts in the Americas, now a classic study of shell artifacts studies in the Americas, Holmes suggests that Native American interest in shells, of both marine and fresh water molluscan species, was

[31] The Taíno of the Greater Antilles were particularly skilled at producing elaborate shell artifacts, which, according to Veloz Maggiolo, were "richly decorated and appear to have had ritual functions" (1997:41).

[32] According to Bobrowsky, "certain Indian groups in Venezuela . . . recognize aphrodisiac properties in land snails such as Cerion (Gould 1971), a property which may account for present-day popularity of snails among archaeologists" (1984:83).

primarily aesthetic, for enjoyment in their unworked, or only slightly modified form, and as "highly valued raw material intended for use in the manufacture of articles of utility and taste, in the tempering of potter's clay, or in effecting exchanges with neighboring tribes" (1883:189). Yet, Holmes discounts assertions by other authors that Native American peoples valued shells for either their rarity or symbolic import.

An early study by Orchard (1927, reprinted in 1975) of Native American beads, *Beads and Beadwork of the American Indians*, which devotes considerable attention to the production of marine shell ornaments among indigenous peoples throughout the hemisphere, is particularly useful in understanding the techniques of manufacture and geographic distributions of this particular artifact class.

Several more recent publications feature marine shell artifacts from specific regions. Lourdes Suarez Diez has published numerous detailed volumes on marine shell artifacts from prehistoric cultures in Mesoamerica. These offer important insights into the manufacture and use of marine shell artifacts that include ornamental, ritual, and symbolic forms. A recent BAR publication by Robert Novella focuses on a specific region of West Mexico and also provides cross-regional data useful in the interpretation of marine shell artifacts for which the specific function is unknown (Novella 1995).

Jernigan's study of shell artifacts among the Hohokam provides invaluable insights into importance of shell material within societies of the Southwest. Jernigan observed that the Hohokam exhibited a preference for a dozen or so species as the medium for the production of shell beads and pendants (1978:39).

Because shell material has been a favored material for the production of artifacts throughout the Circum-Caribbean, the study of shell artifacts in Aruba benefits from the published work of others who have examined the cultural use of marine shell in this region. Works by several researchers of shell materials provide useful comparative data; these include studies by de Josselin de Jong (1947), Dacal (1978), Sickler Robinson (1978, 1979), Sutty (1978; 1986; 1990), Keegan (1981, 1984), Lundberg (1985), Haviser (1990), Van der Steen (1992), Carlson (1993, 1995), Watters (1994), Ortega (2001), and Turney (2001). Others provide important shell data in the context of more general works on the archaeology of the region, including Cruxent & Rouse (1958/1959), Haviser (1987; 1991), Kidder (1944), Curet (1992, 1996), Murphy (1999), Oliver (1989), and Versteeg & Schinkel (1992).

Several general works on the archaeology of Aruba (de Josselin de Jong 1923; Du Ry 1960; Boerstra 1982; Versteeg 1991; Versteeg & Ruiz 1995) and site reports for the island (Boerstra 1971, 1974, 1991; Dahn 1970; Dijkhoff 1997; Heidecker & Siegel 1969; Versteeg & Rostain 1997) contain important data on shell remains. Those specifically focused on the cultural use of marine shell in Aruba are most helpful. The first researcher of Aruban archaeology to focus on shell artifacts was de Josselin de Jong, who published his findings beginning in the early 20th century. Several others have since contributed to this foundation. These include: Van Heekeren (1960, 1963), Dacal (1997, 2001), Reinink (1997), Rostain & Dacal (1997), Serrand (1997), Serrand, Dacal & Reinink (1997a, 1997b), Dacal & Croes (2001, 2004), Dacal, Sampedro & Kelly (2004), and Linville (2001, 2004). Most of this research has been completed within the context of two major

research projects of the Archaeological Museum of Aruba. The first was a salvage excavation of a portion of the Tanki Flip site, where work began in 1994, and the second was the "Shell Industry of Aruba" project, which grew out of the Tanki Flip project and which was specifically developed by Evelino Fingal, Arminda C. Ruiz, and Ramón Dacal Moure to study the marine shell artifacts in the AMA collections.

2.5 Evaluating Shell Artifacts

As with analyses of other artifact classes, the study of shell artifacts may indicate cultural processes of production and/or use. Variation in these may signal cultural distinctions between culture groups, while similarities may indicate social ties. Clearly, some of the variation in the production of shell objects may be explained by the variation in the marine shell itself, which constrains artifact form. However, the goals of the artisan and cultural norms must also be contributing factors. Multivariate analyses of shell artifacts that consider formal, functional, technological, and artistic (including iconographic and stylistic) characteristics of shell artifacts assist efforts to contextualize prehistoric shell artifacts, to better understand both spatial and temporal variation in the production and use of these cultural manifestations.

2.5.1 Form and Function

Typologies in archaeology often attempt to focus on either artifact form or function. Researchers increasingly recognize that these two categories are interlinked. For many functional typologies, artifact function(s) is/are inferred on the basis of form(s),

while typologies that group artifacts on the basis of form, frequently use terminology that suggests a particular function. The relevant issues have been synthesized by the Bordes/Semenov debate over the classification of Mousterian stone tools. While Bordes was concerned primarily with artifact manufacture, Semenov's approach focused on use.

Bordes is recognized for his experiments in stone tool manufacture, beginning in the 1940s. As Bordes suggests, "an implement can be defined in two different ways, by use and by form, and these two aspects are often related" (1969:1). The idea that the form of the tool reveals its "intended use" is the guiding principle behind his conception of type, which he defines as "the notion of realized intentions foreseen by the human intellect" (1969:1). Although Bordes distinguishes between morphological (form) and functional (use) typologies, he seems to suggest that morphological types are often inherently differentiated as to intended function, also that "different morphologies can fill the same function, so morphology reflects a cultural choice that is not entirely determined by environment (even if environment determines functional needs)" (William J. Parry, personal communication, May, 1998).

According to Semenov, "if a method does not allow one to define objects studied (to reveal their nature) and confines itself to description not infrequently to a subjective one, the method is not adequate for classification and generalization" (1970:4). Beginning in the 1930's, Semenov pioneered the modern technique of functional analysis of stone tools, achieved through observing microscopic traces left on stone tools during their manufacture and use. Semenov has termed this method "tracelogy." According to

Semenov, it is only through functional analysis that specific tool functions can be identified.

Although shell implements are in some ways constrained by the formal attributes of shell, the manufacture of shell tools is not unlike the production of implements made of stone (Murphy 1999). Both use reductive processes. Within shell studies, those who focus primarily on shell tools have generally used functional terminology (e.g. "gouge"). In some areas, these determinations may be supported by ethnographic analogy. In other areas/time periods, they are inferred based on artifact morphology. In the Caribbean, archaeologists who study shell tools frequently use similar classification methods, often inferring function on the basis of artifact form (Dacal 1978; Keegan 1981; Lundberg 1985; Serrand 1997). Some recognize, however, that some shell forms found in archaeological sites may result from the natural breakage pattern of the shell medium (Dacal 1997; Rostain & Dacal; Serrand, Dacal & Reinink 1997a; Dacal & Croes 2004). As these researchers suggest, these "recurrent forms" may be either tools, artifacts that represent a reduction stage in the production of tools, or natural objects occurring as a byproduct of subsistence or other site activities, and that determining which requires the identification (often using microscopic analysis) of reduction processes or artifact use wear (Dacal 1997; Rostain & Dacal; Serrand, Dacal & Reinink 1997; Dacal & Croes 2004; Dacal et al. 2004).

Classifications of Caribbean O/S shell artifacts are in many ways similar to those produced for shell tools. Shell artifact researchers are frequently charged with studying all shell artifact categories (Sickler Robinson 1978; Serrand 1997). Thus, most classifications

of O/S or "non-tool" shell artifacts are categorize "intuitive types," functional types inferred by artifact form.[33] (See Chapter 6 for further discussion.)

Despite his invaluable contribution to morphological typology, Bordes failed to acknowledge what is today conventional wisdom in archaeology – that types reflect choices about which attributes to cluster in attempting to classify raw archaeological data. Stone tools, for example, can be placed into morphological categories, or they can be separated into functional ones using attributes, such as the angle of the working edge, or striations left by work. Types might also result by clustering a combination of these attributes. The crucial point is that there is no single correct classification of types. Instead, typologies are arbitrary constructs used by researchers, the particular attributes isolated for study being dependent on the specific research questions being addressed. The goal of classifications based on morphological types should be to create exhaustive descriptions of artifacts so that they may be better compared with materials from other sites – not to separate them into immutable categories so that they will be unavailable for comparisons based on other (i.e.. non-morphological) attributes.

[33] See Parry (1987) for further discussion of intuitive types.

2.5.2 Shell Artifact Production Technology

Claassen suggests that despite the "tremendous variety of shell artifacts . . . evident in the archaeological record . . . only a few ways of producing . . . shell objects are known" (1998:196). Variation in shell reduction processes is evident in the archaeological record. Technological evaluation of shells artifacts may help to identify cultural variation. Some shell artifacts are produced by simply perforating a whole shell; others require a series of steps to transform the whole shell to one or more shaped objects. The shell selected for this transformation process will determine the initial steps performed in the modification process, while cultural choices may determine the nature and/or sequence of actions performed once the basic shape of the object has been determined.

In addition, technological analyses (particularly of shell beads) may reveal regularities in shell artifact production that indicate craft specialization. In some regions, the precise *chaîne opératoire* (technological sequence) employed in the production of shell beads may be reconstructed using prehistoric bead-making "kits" (Jernigan 1978:202). Carlson's research at Grand Turk (1993) is, to my knowledge, the only study to focus on the production of shell beads that is based on the careful identification and excavation of a shell workshop site in the Caribbean. A complete understanding of the precise production sequence is not yet possible for Aruba, where, despite the discovery of a few potential sites of bead manufacture (Versteeg & Ruiz 1995; Reinink 1997), archaeological excavations have not yet focused on the recovery of shell workshops. Yet, studies of shell artifacts from the Tanki Flip site in Aruba (Serrand 1997; Dacal et al. 2004) have identified bead reduction stages based on inferences about disparate morphological types recovered

from geographically dispersed features; these not only suggest that artifact production may have occurred in multiple areas of the site, but they may also provide some basis for inter-site analysis based on technological variation. This analysis may be further expanded with additional evidence provided by earlier excavation campaigns conducted at other areas of the site.

2.5.3 Artifact Style, Iconography, and Artistic Canons

For most people, the word "style" seems simple enough. According to Merriam-Webster's Dictionary (2005), the "style" of something may be defined as "a particular manner or technique by which something is done, created, or performed . . ."[34] In archaeology, style has been defined as "a term borrowed from art history and used . . . to refer to groups of distinctive decorative motifs" (Darvill 2002:412). Gamble explains the utility of style within archaeology as follows:

> Archaeologists have generally assumed that the more similar artefacts and cultures are, the more interaction took place between individuals and groups. This was refined by Wobst with his much tighter definition of style as information exchange. Wiessner then provided . . . a definition of style as "a means of non-verbal communication to negotiate identity" (1990:108). Her underpinning idea is that psychologically we derive our identities through comparison. She puts this into an evolutionary context by pointing out that those who create a positive self-image in this manner are also putting themselves at a selective advantage. This comes about because the style adopted encourages others to engage in desirable social activity (2001:197-8).

[34] http://www.m-w.com/cgi-bin/dictionary?book=Dictionary&va=style&x=18&y=13.

According to Conkey and Hastorf (1990:2), a consideration of style is "*unavoidable* in all archaeological interpretation":

> Style is involved in all archaeological analysis, whether it is covertly or overtly discussed. It is style that creates and defines artifact types, culture types and even types of evolutionary trajectories. Style is at work and can be studied at the level of the individual, a group, or a society. Style is rooted in both time and space. . .

Yet, as Conkey and Hastorf assert, "style is not separate from the social contexts that give the cultural remains in question their social values" (1990:1). Thus, the concept of style is a problematic one in archaeology, which these authors suggest should be expected:

> It is no wonder that style had been referred to as elusive, controversial, and the proverbial "black box." It is no wonder that many debates in the archaeological literature are over the use of style in analysis, in interpretation, and in legitimation of specific archaeological viewpoints (Conkey and Hastorf 1990:1).

Gamble, too, is mistrustful of the concept of "style," which he suggests "may not be the great ally we once thought it was to get at social life or identity from archaeological data" (2001:198). He suggests that the problem may lie in the archaeological tendency to view objects as commodities, rather than as evidence of social relationships:

> When objects are commodities, as in our own society, relationships, as Miller [1995] states, are created through collective ownership, distribution and consumption. Importantly, objects are regarded as having symbolic and material significance, just as they have been seen by archaeologists to have passive and active styles. The alternative is where social relations rather than commodities shape the significance of objects and hence how we deal with one another. Here, as Marilyn Strathern points out (1988:172), social relations can only be turned into other social relations. So, when objects are exchanged they become other social relationships. The material and the symbolic are therefore fused rather than analytically separate. Moreover, the objects have identities. When a transaction involving feathers, shells or salt takes place you also give a bit of yourself (2001:207).

The approach Gamble advocates is consistent with his challenge for archaeology to move beyond cultural historical descriptions toward more difficult explanations of "why" and

"how" (2001:181). This approach places a great burden on the excavation process, since it is highly dependent on the recovery of the archaeological context of objects under investigation, for without this data, how might we understand that whole shells recovered at archaeological sites are actually evidence of social relationships, and not simply byproducts of subsistence or locally abundant raw materials awaiting reduction processes that would transform them into culturally valued objects? Gamble's archaeological explanation goal is laudable. However, the "social relationships" approach is less than entirely amenable to collections of objects with diverse collection histories. To be feasible, its implementation should begin at an earlier stage in the process of evaluating archaeological data – at the point of acquisition, ideally during excavations that carefully record the context of social processes.

According to Wenke, "in all societies, styles fix social meaning and are powerful ways in which these groups define and construct their culture" (1999:68) Despite the challenges to the use of style, stylistic analysis remains the cornerstone of much archaeological interpretation. This is particularly true for studies of ceramics, which Wenke asserts "are almost always analyzed on the basis of their style" (ibid.). Although the tendency to track stylistic "traits" has been somewhat problematic in the Intermediate Area, elements of style endured as a primary means of reconstructing the prehistory of the region. From this foundation, researchers are also able to evaluate historical processes (see Oliver 1989, 1997), such as the development (or not) of complex social relationships. Thus, analyses of style have not been confined to chronology building.

Stylistic analyses of shell objects may facilitate a comparative analysis of geographically dispersed shell artifact assemblages. Unlike similar analyses of ceramic remains, analyses of shell objects potentially have the advantage of identifying cultural variation across the Preceramic/Ceramic divide, which may help identify cultural variation among Preceramic peoples. Even when the function of an artifact type remains obscure or the precise provenience of the object is unknown, stylistic considerations may reveal cultural patterns in shell artifact production.

Several researchers have noted that artistic "canons" can be identified across several media used by prehistoric peoples in the Greater Antilles (Roe 1993; Dacal and Rivero de la Calle 1996; Petitjean Roget 1997; Domínguez 2001:128). Roe (1993) refers to this as "cross-media isomorphism" (in Curet 1996:120). Many have suggested that this imagery was produced within communities with complex socio-political organization (Dacal and Rivero de la Calle 1996; Rouse 1992). If one considers Oliver's assertion that the Caquetío should be viewed as being at par with contemporary polities in the northern Caribbean, similar approaches to the use of resources may be anticipated. While it is, perhaps, reasonable to suggest that Aruba would have operated on the periphery of this complex arena, one might still expect to find stylistic elements of their participation in this wider socio-political sphere. This has been generally established in analyses of ceramic forms (Oliver 1989;1997; Dijkhoff 1997; Versteeg & Rostain 1997).

2.6 Shell Symbols in the Circum-Caribbean

Symbolic objects made of marine shell have been found in prehistoric contexts throughout the Caribbean region. In his discussion of Bonairian shell artifacts of the Ceramic Period, Haviser suggests that icons represented on these artifacts may provide a cultural link to Amazonian origins (1991:41). Wilson underscores both the strength and endurance of such cultural ties:

> Apparent parallels in myth and ideology connect prehispanic and traditional modern groups across broad geographical areas and through several thousand years of cultural) development in South America (1992:38, and in McGinnis 1997:75).

Several artifacts in the collection sample may convey such cultural ties for Aruban peoples of the Ceramic Period. Thus, aspects of Amazonian myth and symbolism, as well as mainland ideology, inform an interpretation of these, often enigmatic, forms.

2.6.1 Shell O/S Objects as Economic and Cultural Capital

There is ample evidence that a wide variety of shell artifacts were culturally valued items throughout the Caribbean and lowland South America. In the Eastern Caribbean, elaborate shell artifacts are associated with Saladoid peoples, the earliest farmers to migrate into the islands. On the island of Antigua, Murphy has found that the "shell industry was complex in the varieties of shells used as raw material, in decoration, technological ability, and high quality of finish" (1999:290).

The vast quantities of shell artifacts recovered in the Southern Caribbean also indicate that shell objects were also clearly important cultural objects among these groups. Both Saladoid and Dabajuroid peoples maintained close ties to South America, for which

abundant evidence indicates a widespread cultural attraction to shells and artifacts made from them.

Ethnohistoric documents together with archaeological data suggest that the multi-functional, multivalent North American wampum beads of the protohistoric period perhaps have counterparts in South America. For indigenous peoples of the Venezuelan llanos, strings of fresh water shell beads[35] known as "quiripa" (Morey 1975:111; Gassón 2000:581), functioned not only as decoration, but also as a form of currency used in trade relations (Gassón 2000). Inland Caquetío societies were among these llanos groups for which shell beads functioned as unifying markers in a regional exchange/value system, and symbols of both status and wealth. According to Spencer (1998), in addition to house size and the "number of wives a man had" [1998:109], bead necklaces were important markers of social differentiation within these Caquetío societies.

Marine shell beads likely played a similar role among the more socially complex ethnohistoric Caquetíos who inhabited Aruba, Curaçao, Bonaire and the coastal areas of Falcón, Venezuela, and the La Guajira Peninsula (Oliver 1989). These Caquetíos used a bead necklace exchange system to conduct trade throughout the region. According to Oliver, within this system necklace beads were "the most ubiquitous items which had a 'fixed,' artificially determined value" (Oliver 1989:285). The value of bead necklaces was

[35] Gassón suggests that the use of marine shell in the lowlands to produce "Quirípa" shell beads began in the 17th century (2000:584). He also asserts that "Despite some isolated claims, quiripa beads or strings have never been firmly identified in either museums or archaeological contexts [in the Orinoco Basin]; we have only objects that resemble the shell currency [Ernst 1989c [1890]:823; Morey 1975:258; Salas 1971:57] (2000:585).

determined both by the length of the necklace and the size of its beads, the smaller, the more valuable. Three types of necklace beads have been identified: the "boroyda," the "mamas," and the "querequetero" or "quitero" (Oliver 1989:285). While these could be made of either shell or stone, Oliver reports that beads made of shell are most frequently found in Caquetío archaeological sites and are "among the most minute of all beads" recovered (Oliver 1989:285). Given the prevailing inverse relationship between necklace bead size and value in the Caquetío exchange system, necklaces made of these tiny shell beads, which could be "as small as a pinhead," (Naveros and Vazquez de Acuna [1538], and in Gabaldón 1962 [2]:295; Oliver 1989:285), were the most important of all (Oliver 1989:285).

Although beads are, perhaps, the most visible material evidence of O/S marine shell use among prehistoric Caribbean (and Circum-Caribbean) peoples, both archaeological and ethnohistoric records reveal a larger role for these resources. Some shell artifacts suggest that prehistoric Caribbean peoples valued the acoustic properties of marine shells. One cultural practice among Taíno groups, documented in the Greater Antilles, was the use of small shells as musical implements in ritual dance. Small modified gastropod shells (typically Olive shells) were first perforated and then strung together and worn around the knees during ritual performances. Iconographic imagery incised into many of these shells suggest that they had been transformed into mythic beings. While the Taíno examples are the most complex, in both technical elaboration and iconography, examples of similar shell artifacts (generally referred to as "tinklers") are widely distributed throughout the Caribbean. Conch shell trumpets have also been recovered in

the Caribbean (though none is presently known for Aruba). Shells may also have served Caribbean peoples in the production of other musical instruments made of biodegradable materials that would not have survived taphonomic processes (e.g. as inserts for rattles made of wood or gourds).

2.6.2 Shells and Shamans in the Circum-Caribbean

Although prehistoric social structures were clearly less complex than modern Aruban society, Amerindian Arubans still had to contend with the basic needs of human life: they had to make a living, find or build shelter, and maintain order. They also had to ensure their own well-being and cultural continuity, and among many groups with animistic belief systems, shamans are central figures in these social imperatives. Shamans function as healers and are the keepers of sacred knowledge. Authorities in the areas of cosmology and myth, they are typically both feared and revered for their esoteric knowledge and power, which they use to mediate between the natural and supernatural realms, particularly in their role as healers.

Both ethnohistoric and ethnographic sources document pervasive animistic beliefs among indigenous lowland South American and Caribbean groups. Arawakan speaking groups are among those for whom the "magico-religious" domain includes natural creatures transformed into supernatural beings (Schmidt 1917, reviewed in De Josselin de Jong 1918). According to Eliade & Couliano, "peculiar to South American shamanism were the use of hallucinogens such as *Banisteriopsis caapi* or *yagé* or intoxicating substances such as tobacco, and the presence of collective ceremonies of initiation"

(2000:217). These authors also stress that within South American shamanism, "spirits were often ornithomorphic . . .[and] the shaman's transformation into a jaguar was common" (ibid.).

The iconography of some shell objects suggest an ideational basis for their manufacture, and ethnohistoric documents reveal that marine shells and objects made from them were important elements of Amerindian ritual practices. Shell objects have been identified as talismans among lowland Amerindian peoples of South America (Coomans Eustatia & Coomans 1987). These objects, either produced or commissioned by shamans, are kept as protection for the bearer.

Although Price suggests that shamanism has since the 1980s "reappeared in archaeological interpretations with some regularity, mostly in the context of post-processual concern for ancient symbolism and the meaning-content of material culture" (2001:7), identifying shamanic practices in the archaeological record remains a formidable challenge. As Hultkrantz suggests, "shamantic practices need not leave any archaeological remains" (1996:28; Jordan 2001:102).

Despite these constraints, Jordan suggests that by contextualizing shamanic practices "within a wider suite of practices then a number of themes can be opened out into a 'thicker' description of the material dimensions to a shamanistic world-view" (ibid.). Jordon cites the following:

- The routine and ritual treatment of specific animal body parts . . . reproduces broader cosmological concepts linked to wider processes of landscape enculturation, forming what Bourdieu (1977) would term the embodied community *habitus*.

- This wider enculturation includes the maintenance of sacred sites and

> constitutes the singling out of natural places in the landscape for special veneration and subsequent transformation through the creation and deposition of material culture . . ..
>
> - Finally, the conceptual treatment of material culture is linked to ideas that objects, as a result of their physical form (occurring naturally or as a result of human action), may come to be perceived as being animate, that is, charged with life forces, and consequently demanding special attention. In addition, these animate artefacts may have a particular symbolic value in the relationships of communication and exchange, which link human:spirit domains (2001:102-103).

An understanding of shamanic practices may suggest interpretations of some shell artifacts. The acoustic properties of shells may have precipitated their use as important elements of shamantic performance during ecstatic trance and/or otherwise as part of healing rituals. Whole shells or parts of them may also have been used as part of shamanic ritual attire and/or as inserts in rattles, which Eliade & Couliano suggest "were used to conjure up spirits more frequently than drums" (2000:217) among South American shamans. Iconographic elements of shell artifacts may also reflect shamantic world views. Yet, the ability to substantiate interpretations of shell forms based on shamantic practices remains highly contingent on contextual analyses of carefully excavated archaeological deposits.

2.7 O/S Shell Artifacts in Complex Caribbean Societies

As the foregoing discussion indicates, shell has been an important material for the production of culturally valued objects. Despite the fact that many Caribbean societies produced and traded elaborate shell artifacts, these were not necessarily products of complex societies. In the Eastern Caribbean shell artifact production was "a specialized

industry that involved the use of highly skilled artisans" (Murphy 1999:290) among the early Saladoid of Antigua. Most scholars agree that Saladoid society was not complex, although some kind of centralized leadership may have characterized Saladoid groups (Murphy 1999:303). The production of highly skilled crafts in the Caribbean may be interpreted as evidence of group participation in extensive trade networks not necessarily controlled by powerful chiefs. As Murphy suggests that "the status associated with . . . prestigious items of adornment, such as beads, carved zoomorphic shell artifacts, and particularly the greenstone pendants and amulets, has been underestimated by Caribbean archaeologists. It is unlikely that these exotic semi-precious stones and worked artifacts were easily available to everyone within the Saladoid society" (1999:303). Recent research in South American calls into question the long standing view of some lowland groups as egalitarian (e.g. those of the Quíbor Valley; Gassón 2000: 587). Thus, it may well be the case that some degree of social stratification characterized early farmers who migrated into the Caribbean islands, both along the Eastern corridor and along the mainland's southern coast.

Although few extant documents record aspects of protohistoric Caribbean societies, the importance of marine shell artifacts has been ethnohistorically documented for complex societies in the wider Circum-Caribbean region. Included among them are the Taíno, who were concentrated in the Greater Antilles and the Bahamanian archipelago, and the groups that constituted the Caquetío Polity of Coastal Falcón, the off-shore islands of Venezuela, and portions of the Guajira Peninsula of Colombia.[36]

[36] Taíno peoples also inhabited the Bahamas and portions of the Virgin Islands.

2.7.1 Ideology and Elite Adornment

In many societies objects made of shell adorn the elite (Safer & Gill 1982). Among the Taíno, shell masks, known as *guaiza*, were social markers, emblematic of political status. Columbus recorded their use among Taíno chiefs as insignia of their social rank.

Descriptions of Manaure, the Paramount Chief of the Caquetíos of Coastal Falcón relate that shell beads were among those articles considered elite adornment that clearly marked his privileged status among the protohistoric Caquetíos. These records further indicate that Manaure's import was not only secular in nature; he was also recognized for his shamanic powers.

According to Helms, in nonindustrial societies, "things and beings of the material world constitute tangible representatives and embodiments of cosmological qualities, including political legitimation" (1999:56). These, she suggests, "also distinguish between the spatial and temporal domains of the cosmos":

> Beings associated with the spatial realm include animals, other people (including affines), and the dead. Beings associated with the temporal realm include kin-group ancestors. All provide access to legitimizing cosmological origins, but beings associated with the spatial realm provide greater legitimizing authenticity than those associated with the temporal realm. Relationships with these outside beings and legitimation they provide are particularly significant for centralized political authority (Helms 1999:56).

Although specific historical references to shell O/S artifacts are rare, the archaeological record of Aruba has yielded O/S shell artifacts that are apparently iconic representations of culturally revered animals, most likely those linked to the cosmological order. Technical attributes of some of these shell artifacts suggest that they functioned as pendants.

Technical attributes of a very few suggest a level of craftsmanship likely unavailable to most members of society; these objects were mostly likely status symbols that adorned elite members of Caquetío society. The iconography of these objects may indicate an intricate association between shamanic and political powers within the Caquetío social order.

2.7.2 Marine Shell Artifacts as Labor Extraction

According to Murphy (who cites Brumfiel and Earle 1987), "the manipulation of long-distance trade, valuables and the workers who produce them has long been recognized as a key factor in the attainment of political power" (1999:305). The Caquetío of the early contact period were known to control trade routes that covered vast areas of the north coast of South America. As we have seen, shell beads were an important medium of exchange within this trade network. Thus, these shell transformations occupied a special position within Caquetío societies.

Safer and Gill assert that "where shells are valuable, they have also been scarce, at least in the form in which they are valued" (1982:70). The production of small shell beads provides an effective means of transforming an abundant resource into a scarce one. When one considers that the production of small beads requires a certain level of technical competence (above that required to produce larger beads) and a significant investment in both time and labor, the greater relative value of these artifacts seems only logical. By placing a premium on this type of anthropogenic transformation of a widely available resource (marine shell), the Caquetíos were able to create artificially the scarcity required

of an effective medium of exchange. As several researchers have found, the large investment in labor required to produce small beads tend to make their "exchange value . . . greater than their use value" (Grierson 1978:21; Ceci 1989a:1; Hammet and Sizemore 1989:126; Gassón 2000:583).

There has been considerable debate over whether or not shell beads used in the context of Amerindian trade were equivalent to money. According to Safer and Gill, "The most common definition of money includes four criteria: It must be a medium of exchange, a measure of value, an instrument by which value can be condensed and accumulated, and a standard of deferred payment. It must also be homogeneous, divisible, portable, durable, and all these criteria must exist simultaneously . . ." (Safer and Gill 1982:59). Although strings of shell beads would presumably satisfy these criteria, some researchers maintain that shell beads were probably not generalized as money before the European introduction of a market economy (Gassón 2000:585), but, instead, probably functioned more as a primitive currency or medium of exchange, which Yerkes defines as "a certain barter item that becomes more popular than others and acquires a greater acceptability in exchange" (Yerkes 1989:113, and in Gassón 2000:583).

Gassón suggests a link between social complexity and shell beads, as well as other shell artifact markers of social differentiation:

> Shell beads have been rather rare in the lowlands, being reported mainly in Andean and sub-Andean ceremonial and high-status contexts. Those associations point to the potential importance of social complexity and inequality to explain the origins and distribution of such valuables. For instance, shell objects such as "bat-wing" pendants and beads mainly from caves and funerary contexts of the Venezuelan Andes have been known since the nineteenth century . . . In the Escuque region the Cuica had a sanctuary devoted to a female deity called Icaque. Among the

> offerings kept in this temple were many strings of cay, that is, shell disks, that 'they had for money' (Castellanos 1962:255; Salas 1997:1)" (Gassón 2000:586).

Whether a "medium of exchange" or "shell money," it is clear that shell beads were culturally valued objects useful in trade relations. The control of trade routes, which may be considered a kind of labor extraction, would have been the prerogative of the chief of the Caquetío polity of Coastal Falcón.

2.8 Summary

Mollusks are important resources for societies worldwide, as they have been for millennia. Among their many contributions to humans are the calcareous shells they produce, which not only stimulate human admiration, but have also long supported many human cultures as important raw material sources. Shells have been used for a wide variety of purposes and they continue to inspire new research. The specific structure of *Strombus gigas*, for example, is the focus of materials research aimed at producing "ceramic plywood" that may ultimately have applications in outer space (Kamat et al. 2000).[37]

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[37] Boekhoudt & Linville (2004) summarize this research as follows: "For the past few years, the specific microstructure of the *Strombus gigas* shell has been the focus of intense research Case Western Reserve University, in Cleveland Ohio. Researchers there have been studying the shell of this particular gastropod in order to understand how it is able to resist fracture one hundred to one thousand times better than aragonite, the specific calcium carbonate mineral that comprises approximately ninety-nine percent of its content by volume (Gorman 2000:6). Using powerful microscopes, they have discovered that the chemical and mechanical properties of the shell combine to give it its extraordinary toughness. The protein matrix that surrounds the aragonite permits the shell to dissipate energy using small stress fractures in the outer or inner of its three shell layers, while the mechanical structure of the shell's middle layer inhibits shattering by orienting adjacent aragonite structures perpendicular to one another to effectively bridge crack surfaces (Kamat et al. 2000)" (2004:21).

Shells and objects made from them frequently endure in the archaeological record as evidence of past human behavior. The study of these remains support other archaeological efforts to understand prehistoric cultures. This knowledge may also inform modern humans about the potential of mollusks and the shells they produce to contribute to our modern world.

CHAPTER THREE

ARUBA: THE PHYSICAL SETTING

3.1 Introduction

Aruba is a relatively small Caribbean island, with an area roughly 190 km^2 (Versteeg & Ruiz 1995).[38] The island reaches its maximum length (31 km) from Cudarebe to Punta Basora (Dijkhoff 1997; Ruiz 2004) and it is just 10 km wide at its maximum width (Ruiz 2004). Aruba's modern capital is Oranjestad, the island nation's largest city, which is south-centrally located on the island's leeward coast.

Aruba is situated in the Southern Caribbean Region, off the north coast of mainland Venezuela (see Figure 3.1), in an area defined as "the east-west linear spread of small islands and atolls along the Aruba-to-Margarita island chain" (Haviser 1987:1, 1991: 6). It is the western most island of this group, and is the "A" in the group of three Dutch islands known as the "ABC Islands," the others being Bonaire (the "B") and Curaçao (the

[38] The World Factbook (2001) provides an estimate of 193 km^2; The Bureau of Western Hemisphere Affairs (2003), 180 km^2 (112 square miles).

"C"). Aruba is situated between 12º 25' and 12º 38' North Latitude and 69º 52' and 70º 03' West Longitude, just thirty kilometers north of the Paraguaná Peninsula of mainland Venezuela (Dijkhoff 1997).[39]

In 2003, the population was estimated at 94,154[40] ─ more than one thousand times prehistoric population levels. In addition to its growing population, the island also attracts approximately one million visitors annually from all over the world.

3.2 Landscape and Island Formation

Aruba's landscape is geomorphically diverse. The geologic events that precipitated the formation of Aruba are succinctly described by Ruiz as follows:

> Aruba formed during the Cretaceous period, ninety-five million years ago, as part of a volcanic arc in the Pacific Ocean. This arc was located on the leading edge of the Caribbean plate, which moved east and became encrusted onto the South-American plate. The island arc, geologically referred to as the "Aruba-La Blanquilla chain," also includes the islands of Bonaire and Curaçao. This chain is situated at the boundary of the Caribbean and the South-American plates (2004:11).

Unlike its sister islands, which are separated from the mainland by the deep (over 1000 m) Bonaire Trench (Haviser 1991), Aruba is located on the South American continental shelf (Figure 3.2), of which it is an outcropping (Heidecker & Siegel 1969; Dijkhoff 1997); the maximum depth between the island and Paraguaná Peninsula of Venezuela is just 200 m

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[39] Estimates vary. Van Heekeren reports the distance as 27 kilometers (1960:103).

[40] Bureau of Western Hemisphere Affairs (2003). http://www.state.gov/r/pa/ei/bgn/22491.htm.

(Ruiz 2004).[41] Faunal evidence suggests that a land bridge to the mainland may have been exposed by Ice Age sea level changes (Ruiz 2004). This can be clearly seen in a regional map published by Dacal Moure and Rivero de la Calle (1996, Figure 3), which indicates temporal changes in dry land since the beginning of the Holocene.[42]

The complex geologic processes that have impacted the island are evident in the island's terrain, which is of three main landscape types: hilly, undulating, and relatively flat (Figure 3.3). The hilly landscape, concentrated in the center of the island, includes the oldest part of the island known as the Aruba Lava Formation. As Figure 3.4 reveals, this formation is bordered (to the northwest and southwest) by the Batholith, an intrusive composite rock unit of quartzdiorite, gabbro and hooibergite that forms a relatively flat to slightly undulating landscape (Versteeg & Ruiz 1995:38). The island's third major landscape type, the lower and younger Limestone Landscape, surrounds and was deposited onto the denuded and much older geologic units (Westermann 1932; Versteeg & Ruiz 1995; Ruiz 1997; Ruiz 2004).

[41] Once more profound, the basin was slowly filled with sediments, resulting in the current relatively shallow depth (Ruiz 2004).

[42] Two endemic species reflect the island's mainland connection; burrowing owls (*Speotyto (Athene) cunicularia*) and rattlesnakes (*Crotalus durissus*) occur on Aruba, but are absent from other South Caribbean insular faunas (Voous 1983:14; Dijkhoff 1997:4).

3.2.1 The Aruba Lava Formation

The Aruba Lava Formation (ALF) is a rock unit comprised mainly of volcanic and metamorphic rocks (Versteeg & Ruiz 2004), found primarily in the hills and undulating landscape. Volcanic rocks of the ALF include basalt, dolerite, pillow lava,[43] and tuff (Ruiz 2004). The hills are formed of resistant volcanic rock, which can be seen in Arikok National Park, an area that also includes Jamanota, which at its maximum height (189 m) is Aruba's highest elevation point (Versteeg & Ruiz 1995). The hills Arikok (188 m) and Seroe Cabai (169 m) are also in this area (Ruiz 1997).

Less resistant metamorphic rock, such as schist and conglomerates, found in the valleys of the ALF, have been weathered by the action of rainwater to form shallow guts (gullies) known on the island as *rooien* (Ruiz 2004). Although the landscape associated with the ALF is unsuitable for agriculture, the rocks it provides were an important resource for prehistoric inhabitants. Two important prehistoric stone extraction sites are located in this area: Coashiati is located east of Aruba's highest peak, *Jamanota*, and Dos Playa is located near Fontein on the north coast. In addition, one small Preceramic site has been identified on an outcrop of the ALF (Versteeg & Ruiz 1995:37).

The physical characteristics of many of the diverse rocks found in the ALF factored into their selection for a variety of uses (Versteeg & Ruiz 1995:37). According to

[43] Pillow lava, which is formed by underwater volcanic activity, can be seen at Dos Playa (Ruiz 2004).

Versteeg & Ruiz, the hardness and homogenous structure of diabase of the ALF made it the "best raw material" available to Aruba's prehistoric inhabitants for the production of axes, chisels, knives, and polishers (1995:37). Interestingly, however, diabase was not the source for most of the tools recovered during the 1994-1995 excavations at the Tanki Flip site. Instead, the most frequently occurring stone tool was made of quartz.[44]

3.2.2 The Batholith

The ALF is bordered to the west and south by the Batholith, the second main geologic unit of Aruba. Tonalite (quartzdiorite) is the primary component of the Batholith (Ruiz 1997), a "solidified body of magma which intruded the Aruba Lava Formation approximately 85 million years ago and was subsequently exposed on the surface as the Aruba Lava Formation eroded and weathered off" (Ruiz 2004:1).

The landscape associated with the batholith is a relatively flat to undulating landscape that covers that greater part of the island (Ruiz 2004). Near Santa Cruz, the diorite landscape is dominated by huge exfoliated boulders of tonalite, resulting from spheroidal weathering (Ruiz 1997:9; 2004:1). Areas with few boulders, but significant quartzdiorite debris include Alto Vista, Nord, and Tanki Flip in the eastern side of the island, and Sabaneta to the south (Versteeg & Ruiz 1995:39).

[44] Also, while rhyolite has been identified as the source for mainland production of stone beads, this specific rock has not yet been identified for lithic beads found on Aruba.

The batholith also includes gabbro, which can be seen in the small hills of the north coast (Versteeg & Ruiz 1995:39) and hooibergite, a dark-colored plutonic rock found only at the site of the Hooiberg, an imposing cone-shaped hill (166 m) located west of Santa Cruz (Ruiz 1997, 2004).[45]

All soils suitable for agriculture in Aruba are associated with weathering of tonalite (quartzdiorite). Therefore, it is logical that most Ceramic period sites (those associated with agricultural production) are located in the quartzdiorite landscape.[46]

3.2.3 The Limestone Landscape

The ALF and batholith geologic formations are surrounded by limestone deposited in more recent times. Limestone terraces, formed by tectonic uplift and sea level changes no earlier than the Pleistocene (ca 1.6 million years ago) (Ruiz 2004) are clearly visible along the windward coast.[47] (Tertiary limestone also occurs in a few places in the island's interior.)

Limestone is also the primary component of the Aruban coastline, which is virtually covered by calcareous (coral) material (Ruiz 2004:14). The coastline is rough and rocky on the windward north coast and to the southeast. Here, the wind and sea

[45] The Hooiberg is also known among residents and visitors as the "haystack."

[46] In addition, ca 71% of pictograph sites are associated with this landscape type.

[47] According to Ruiz, "the lower and middle terraces are clearly visible along the south and east coasts" (2004:14).

combine to batter the coast. These forces have contributed to the formation of Aruba's "natural bridge," the most striking of several such formations on the island. By contrast, tranquil beaches composed of coral sands characterize the southwesterly leeward coast.

The limestone areas typically have little vegetation and soil (Versteeg & Ruiz 1995:41). However, important exceptions do exist, as Versteeg & Ruiz explain:

> The limestone areas inland are an exception because these areas are usually bordered by a QD [quartzdiorite] landscape. The combination of limestone and quartzdiorite also results in permanent freshwater sources like the one at Fontein and the one east of Malmok. Rainwater is 'caught' by limestone and released at the border of the limestone and quartzdiorite (1995:41).

Caves "formed by the dissolution of limestone by groundwater" [and exposed by] changes in sea level and upwards movement of the earth (Versteeg & Ruiz 1995:41) are a prominent feature of this landscape type. Canashito is located inland, in a relatively older area of the limestone landscape associated with both caves and prehistoric inhabitants (Ruiz 2004).

3.3 Climate

Aruba offers an inviting mix of sunshine, mild weather, and natural resources. Its climate is subtropical (tropical steppe) with temperatures averaging 82ºF/27.8ºC annually (Ruiz 1997).[48] With its low precipitation and bountiful coastal resources, one can easily understand why people have been attracted to this small island for thousands of years. Yet, both prehistoric and modern Arubans have effected change in Aruba's natural

[48] Temperatures range from 17º C to 35.8º C (Dijkhoff 1997:8).

environment; this is manifest in vegetation, soil, and water conditions that differ from those enjoyed by the island's earliest inhabitants (Ruiz 1997).

3.3.1 Precipitation and Hydrology

Aruba receives an average of just 437 mm rainfall annually (Ruiz 1997:8), less than either Curaçao or Bonaire (Versteeg & Ruiz 1995:75). It falls mostly from November to January (Ruiz 2004). On average, the island receives precipitation greater than 1 mm per 24 hours just 52 days per year (Versteeg & Ruiz 1995:52). However, during approximately 1/10 of those days, rain measures more than 10 mm/24 hour period (Versteeg & Ruiz 1995:53).

Although Aruba has no rivers, its complex hydrological system would have produced favorable conditions for prehistoric inhabitants. The batholith landscape that forms most of the island contains a considerable amount of debris associated with weathering (Versteeg & Ruiz 1995:39). This debris is typically cut by rainwater, forming a system of guts or gullies (known in Aruba as *rooien*) (Figure 3.5). The *rooien* "transport water and debris material to the sea during heavy rains (Ruiz 2004:11).[49] In prehistoric times, the *rooien* provided hydrological and soil conditions favorable for agriculture and settlement (Versteeg & Ruiz 1995; Ruiz 1997, 2004). Archaeological evidence reveals

[49] Aruba has just one inland bay (unlike Curaçao, which has many) (Versteeg & Ruiz 1995:75).

that Arubans of the Ceramic period modified the natural *rooien* system by digging ditches and channels to manage the scarce water resources (Ruiz 1997).

The impermeable quartzdiorite that underlies the weathered debris also facilitated the formation of shallow reservoirs (Versteeg & Ruiz 1995:39). In modern times the impermeability of the quartzdiorite base was exploited with the construction of manmade reservoirs (known locally as "tankis") used to trap water provided by the major *rooien*. Although useful in some areas, the tankis inhibited or prevented water flow to others (Ruiz 1997). This, coupled with erosion caused by deforestation during Aruba's Historic period, has significantly altered the landscape (Ruiz 1997:12), desiccating large areas that would have been forested in prehistoric times.[50]

3.3.2 Winds and Currents

Wind is a fact of daily life in Aruba. Tradewinds approach from the northeast and blow 90% of the time, with an average velocity that ranges from 13 to 20 knots (Dijkhoff 1997:9). Yet, Aruba lies outside the hurricane belt, so the island is rarely visited by severe storms (Figure 3.6). Hurricane Lenny is a notable exception that left its mark on the island in November, 1999. This storm altered the coastline by shifting significant quantities of sand (Byron Boekhoudt, personal communication, 2001).

[50] As late as the 19th century, historic documents indicate that extensive xerophytic forests still occurred in Aruba (Versteeg & Ruiz 1995:57).

Wind not only impacts conditions on land, but also influences ocean currents, which are particularly strong on the island's north and east (windward) coasts. More tranquil on the leeward coast, Aruba's currents help to aerate the seagrass meadows that support diverse marine fauna.

3.4 Flora and Fauna

3.4.1 Vegetation

Aruba is today a semi-desert island; an aerial view of the island reveals scant vegetation. Species that thrive in Aruba's xerophytic environment include cacti, scrubs, and trees of medium height (Ruiz 1997, 2004), which are dispersed throughout the landscape. Perhaps none is more closely associated with the island in modern times than *Caesalpinia coriaria*, commonly known as the "divi divi" tree, which yields to the power of the tradewinds as it grows (Figure 3.7). However, brasilwood or dyewood (*Haematoxylon brasiletto*) was perhaps the most important plant during the early Historic Period.

Haviser suggests that plants presently in use by Amerindians of the Guajira Peninsula likely also contributed to prehistoric subsistence on Bonaire (Haviser 1991; Gallagher 1976). Given its closer relative proximity, this inference may also extend to prehistoric Aruba. These plants include maguey, fique (*Furcraea macrophylla*), prickly pear (*Opuntia* sp.) and organ cactus (*Carnegiea gigantea*), a plant used also in Falcón for "water purification, house-roof-fence construction and as a food source" (Haviser 1991:16). As in Northwestern Venezuela and other coastal islands, agave may have been

used in prehistoric Aruba for food and/or fermentation, and likely also served as a raw material for the production of baskets, hammocks, and nets (Haviser 1991:16).

In addition to these terrestrial resources, marine plants, such as mangroves (especially *Rhizophora mangle*) and seagrasses (particularly eel grass and turtle grass) provide important natural habitats for marine fauna exploited by island inhabitants (Boekhoudt & Linville 2004). As Figure 3.8 reveals, seagrasses occur in areas (known as marine meadows) primarily along the island's leeward coast. However, marine shell remains are distributed throughout the island.

Since ca 1000 A.D., Arubans have also cultivated plants on the island.[51] Undoubtedly, these earlier island inhabitants enjoyed much better soil conditions than those that exist today. According to Versteeg & Ruiz, "only one extensive description of Aruba's soil (geomorphology) exists: it is the report of Grotmij (De Bilt) and Sogreah (Grenoble) of 1968" (1995:44). This report included a soil potentiality map (Figure 3.9) of Aruba, and revealed that just 11% of the island had soil type II, defined as soil suitable for "rain dependent agriculture under special conditions" (in Versteeg & Ruiz 1995:46). As Figure 3.9 reveals, these areas are concentrated inland in the northwestern region of the island and near the leeward coast to the southwest (Versteeg & Ruiz 1995:46). A recent survey of the island (Versteeg & Ruiz 1995) reveals that few sites presently have an "A Horizon," a topsoil unit that includes humus and other decay materials (Versteeg & Ruiz

[51] Archaeological evidence suggests that bitter manioc was the primary staple.

1995:43). These sites are included in the ca 18,000 hectares (89%) of the island now suitable only for "watershed or recreational purposes or wildlife" (Versteeg & Ruiz 1995, Figure 27).

Current conditions vary from those of the past (Ruiz 1997). Versteeg and Ruiz (1995) report that "several historical records like those describing commercial exploitation of wood gives us reason to believe that Aruba was a forest-clad island 500 years ago" (1995:1). By studying and comparing aerial photographs taken of the Tanki Flip site in 1946, 1957, and 1987, respectively, Ruiz (1997) was able to identify several changes in the natural setting of this site in recent times. Archaeological investigations have revealed manmade changes to the natural landscape that fostered prehistoric subsistence, including the construction of artificial *rooien* and/or the disruption of their natural flow (Boerstra 1991; Ruiz 1997; Versteeg and Rostain 1997).

3.4.2 Faunal Resources

Today wild goats and horses may be seen roaming the landscape in Aruba, particularly in the hilly areas. Such relatively large terrestrial/old world species were not available to prehistoric inhabitants. Faunal evidence from the Tanki Flip site suggests that mammals comprised a small portion of the indigenous diet (Grouard 1997), and that early populations relied more heavily on marine resources, such as fish, mollusks and sea turtles (Grouard 1997; Rostain 1997; Boekhoudt & Linville 2004; Newsom & Wing 2004),

particularly those associated with shallow waters and/or coral reefs (Grouard 1997).[52] Endemic reptiles and birds were also important resources (Grouard 1997). "Exotic" mainland species not endemic to the island have also been recovered archaeologically; these may have served non-subsistence functions for early inhabitants (Grouard 1997).[53]

A wide variety of mollusks thrive in Aruba's coastal waters (Reinink 1997; Boekhoudt & Linville 2004).[54] At least 48 species have been recovered from sites associated with Preceramic peoples (Versteeg, Tacoma & Van de Velde 1990), and thirty-five species have been identified at the Ceramic period Tanki Flip habitation site (Reinink 1997).[55] A single species, *Strombus gigas* (the Queen Conch), dominates the archaeological record for all periods of human occupation of the island. This is the same species most prized among modern island inhabitants not only in Aruba, but throughout the Caribbean Region (Boekhoudt & Linville 2004).

The importance of molluscan resources to indigenous peoples of Aruba is clearly evident at the island's archaeological sites. Shell remains have been identified in the

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[52] At the portion of the Tanki Flip site excavated in 1994-1995, mammals accounted for just 3.7% of the faunal remains; 31.2% of these were of small rodents, such as the rice rat (*Oryxomy* sp.) (Grouard 1997:259-260).

[53] The remains of one such species, the agouti, were recovered from the Santa Cruz site. Newsom & Wing explain that "wherever humans and agoutis occur together, people, now as in the past, use and sometimes tame them" (2004:72-73).

[54] The Caribbean Sea comprises a single malacological zone.

[55] Twenty-six are Gastropod species, eight are Bivalves, and one belongs to the class Polyplacophora (Reinink 1997).

majority of these sites, many of which have been identified as "shell heaps" (Boekhoudt 2001), "shell concentrations" (Heidecker and Siegel 1969) or "shell matrix sites" (Linville 2001). Precisely how this subsistence resource would have been exploited in prehistory has not yet been a research focus on the island (Boekhoudt & Linville 2004). Reinink's research at Tanki Flip (1997) does suggest that both marine and terrestrial mollusks formed an important part of human subsistence at that site. Modern fishermen in Aruba remove the animal from the *Strombus gigas* shell by counting down from the shell apex to the third whorl, after which they pierce the shell with a screwdriver to extract the snail, leaving the shell behind (Boekhoudt 2001). It is possible that prehistoric Arubans used similar methods (using prehistoric tools). Future investigations that focus on the procurement of these resources should provide a better understanding of the human exploitation of these resources on the island in prehistoric times[56] (Boekhoudt & Linville 2004; Linville & Dijkhoff 2004).

At the site of Arashi, marine shells once formed three distinct piles (Byron Boekhoudt, personal communication, 2001). These are now dispersed over the area. There are still three distributions, but storms have scattered the large mounds over a wider area. The cultural association of these remains is not yet known, since Arashi has not yet been the focus of research.

[56] The investigation of prehistoric exploitation of molluscan resources was part of the initial research design for the "Shell Industry of Aruba" project. However, plans to excavate a shell ridge in Sabaneta were cancelled when the site was inexplicably bulldozed within days of the planned excavation of the site (Linville & Dijkhoff 2004).

3.5 Summary

The geography, geology, and climate of Aruba favored its selection by early inhabitants. Its proximity to the South American mainland would have facilitated its use by hunter gatherers, perhaps attracted by the abundant resources (especially mollusks and fishes) fostered by the island's coastal waters. Caves produced in the limestone terraces may have offered them shelter, while both rocks of the ALF and molluscan resources provided the raw materials needed for the production of subsistence tools. In addition to these resources, agricultural producers would have also enjoyed more favorable soil conditions than those present today.

CHAPTER FOUR

THE ARCHAEOLOGY OF ARUBA'S EARLY POPULATIONS

4.1 Introduction

Given its closer proximity to mainland South America, it is not surprising that the island of Aruba contains more archaeological sites than its neighbor Curaçao. Presently, 171 archaeological sites have been identified on Aruba (Harold J. Kelly, personal communication, August 13, 2004) (Appendix Ia, Ib).[57] Of the known sites, approximately 14% are associated with Preceramic peoples, 68% are associated with Ceramic period peoples, 4% are Historic period sites, and 4% are considered multicomponent, with evidence of activity during both the Ceramic and Historic periods. Another 10% (n = 17) are pictographic sites. These have not yet been assigned to a specific period of occupation on the island (Raymundo Dijkhoff, personal communication, July 2000). All are terrestrial sites.[58]

[57] A revision of the current site list is presently ongoing. Thirteen new sites have been added since the completion of the most recent available site list (Harold J. Kelly, personal communication 2004).

[58] Although sub-aquatic sites are known for the island, these have not yet been systematically identified; nor have they been the focus of archaeological research in Aruba.

Sixty-two of these sites have been added to the total since the last comprehensive survey of the sites in 1990, led by Aad H. Versteeg and Arminda C. Ruiz (Versteeg and Ruiz 1995). Some of these new additions are not really new. These are "lost" sites that have been rediscovered in the archaeological literature or in the AMA archives since the publication of the 1990 survey. Others are completely new discoveries.

Although the new additions make up a significant percentage of the total number of known sites, these have not yet been systematically surveyed (Harold J. Kelly, personal communication, July 28, 2004). Most of what is presently known about the archaeology of the island is based on investigations of sites included in the 1990 survey list published in 1995 by Versteeg and Ruiz (Figure 4.1, Appendix Ia). Research has focused primarily on five of these sites, at two Preceramic Period burial sites (Canashito and Malmok),[59] and at the three primary habitation sites of the Ceramic period (Santa Cruz (#81),[60] Tanki Flip (#101), and Sabaneta (#76).

4.2 Aruba and The Colonial Encounter

While interest in Aruba's past has increased substantially in the past few years, little is yet known of the historic Amerindian populations. For more than three hundred years following the Colonial Encounter, the island garnered little attention. History does

[59] Prior to the survey of 1990, several sites were undifferentiated. Presently, four separate sites are known for Malmok (one of these is further differentiated into two subsites) and five sites have been identified at Canashito.

[60] Boerstra (1971) refers to this site as "Ceru Noka."

not even record precisely when Aruba was first encountered. Most assume that it must have been during Alonso de Ojeda's first voyage in 1499, when the explorer (accompanied by Vespucci) first visited nearby Curaçao, an island Vespucci recorded as one of the "Islas de los Gigantes."[61] Oliver suggests that Aruba was not visited during Ojeda's first voyage, and explains the first expedition to Caquetío territory as follows:

> Certainly, by the time Ojeda reached the famous site of Puerto Plecado (today Chichiriviche), he was right on the eastern frontier of the Caquetío territory (Las Casas 1929[2]:41). There he had an encounter with Indians who wounded some of his men, including Juan de La Cosa (Ramos 1976:85-87; Navarrete 1829[3]:6). The site of Puerto Flechado has been duly noted by the famous cosmographer Juan de La Cosa, also known as "El Vizcaíno," who provided the first map of the New World (1500; Fig. 40:3). After this incident, Ojeda sailed further along the coast, floundering in a site named by them as Valfermoso (whose precise locality is still debated).
>
> From Valfermoso Ojeda sailed to Curaçao where Amerigo Vespucci (Americo Vespucio) narrated his encounter with the local Indians in his famous *Quator Naigationes* (1500-1509) as well as his *Lettera* (1500) (Navarette 1829) [3]:255-259; Arcaya 1977:84]. In the former account Vespucci stated that the Spanish found a village of 5 houses, while in the Lettera 12 houses are mentioned. In either case, these houses had to be able to accommodate 36 men, 5 women, plus all the Spanish that came with Ojeda (including Vespucci). Because of the high stature and built (sic) of the Indians ("as tall as Francisco de Albicio" [Navarrete 1829 [3]:255]. the Island became known as Ysla de Gigantes (Fig. 40:7). In this first voyage, the neighboring island of Aruba was not visited, although in later

[61] This categorization, which most assume also includes Aruba, has garnered some attention among archaeologists. The results of research focused on the physical structure of early inhabitants suggests not that Amerindian occupants of the island were gigantic, but, rather that Spanish conquistadors were relatively short in stature.

> expeditions it became known as Ysla de Brasil, or Brasilwood Island (Ramos 1981:58), and whose Indians were referred to as Arubanas in the mid XVIIIth century (Altoaguirre [1768] 1908:192) (Oliver 1989:256).[62]

Not only are there few sources of information about the early historic period of the region, those that do exist are "vague, prone to exaggeration, and sometimes controversial" (Van Heekeren 1963:21-22). Specific references to Aruba are scarce, perhaps because it was among those islands deemed "*islas inútiles*" ["useless islands"] (Hoyer 1945:5) by the Spanish conquistadors.[63]

Kidder (1944:9-20) relates the findings of a few early chroniclers who recorded aspects of the lives of Caquetíos living near the island at the time of conquest. Captain Gonzalo Fernández de Oviedo Y Valdes [1526-1577] (the official chronicler of Castile) provides information for the Caquetíos of the Falcón district of the mainland, the area "which shows the closest archaeological analogies with the island of Aruba" (Van

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[62] Hoyer's account takes a less definitive stance: On August 15 he discovered a cape which he called San Roman. On the twenty-fourth of the same month he found himself in a port and huge lake, to which he gave the name San Bartolomeo. This name was later changed to Maracaibo, honoring a rich Indian chief living near the lake. It is most probable that en route Ojeda touched Aruba: it is fairly certain that he is the island's discoverer (Hoyer 1945:4)

According to Sauer, from Curaçao, "they sailed ten leagues west to the island of brasilwood (Aruba), where, according to Vespucci, a large population lived in houses built with ingenuity out into the water, as in Venice. By this version the name Venezuela originated outside the gulf that is thus called. On Aruba, Vespucci saw houses full of cotton; while they were helping themselves, they also took house beams of brasilwood" (1966:112).

[63] In a 1528 letter to Carlos V, Juan de Ampúes quoted this 1513 characterization of the ABC islands by Admiral Diego Colon (see note below).

Heekeren 1963:22). Within this area, Nicolás Fédermann (born Nikolaus Federmann), recorded his observations of the Caquetíos of the Coro Area (Kidder 1944:9-20; VanHeekeren 1963:22). A deposition by Esteban Martín in 1534[64] concerning the 1531-1534 expedition of Ambrosio Alfinger (Ambrosius Dalfinger)[65] in search of *El Dorado* provides early information about the Caquetíos found living in Western Venezuela, including in the Guajira Peninsula area (Oliver 1989:199).

By 1515, the "the greater part of the population" (Van Heekeren 1960:103) of Aruba had been systematically and forcibly removed by the Spaniards to the island of Hispaniola, where they were enslaved.[66] It would be twelve years before some of their

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[64] Martín served as an interpreter for Ambrosius Alfinger. Oliver describes Martín's deposition as follows:

> . . . quite detailed and precise as to: a) where different ethnic groups were located, b) whether or not Martín, as an expert interpreter, could communicate with the Indians, and how many intermediaries were needed to establish communication, and c) as to its content of quite detailed descriptions of the material culture and environmental surroundings of the native groups encountered (Oliver 1989:200).

He also notes that this letter was the primary source for the narrative of Oviedo y Valdés (1944) (Oliver 1989:200).

[65] Alfinger's search ended abruptly when he was killed by a poisoned arrow during a battle with indigenous peoples he encountered on the way (Oliver 1989:200).

[66] In 1513, King Ferdinand of Spain declared the ABC islands *Islas Inútiles* (Hartog 1953:32; Dijkhoff 1997:82). Then the Spanish Viceroy Diego Colon commissioned Captain Diego Salazar to capture of "red slaves' from the ABC islands for forced labor in Hispañola. Juan de Ampués, who was named Royal Factor of Hispaniola in 1511, worked to halt the raids. A decree issued in 1515 prohibited any further capture of these Indians. Of the estimated 2000 Caquetíos captured from the ABC islands, Haviser suggests that most were from the island of Curaçao (1987:57).

members would be returned to the region.[67] Just how many were able to evade capture and endure on the island is not known. It is also not known if any of the Caquetíos that were returned by the Spanish to the Southern Caribbean region actually returned to Aruba, nor if the island was eventually repopulated primarily by in migrations of mainland peoples. It is thought that those who either evaded capture or subsequently migrated to the island made their living primarily by tending livestock that had been deposited on the island by the Spaniards.

The Spanish maintained post-conquest control of Aruba until the spring of 1636, when the Dutch, following their capture of Curaçao (1634) and Bonaire (1635), took possession (Hartog 1973:19, 37). At that time it "was found inhabited by 73 people who, 'being untrustworthy and suspected of being in league with the Spaniards,' were expelled to the mainland of South America (Van Heekeren 1960:103). By the end of 1636, the island was reportedly completely uninhabited (Hartog 1953:45-46; Dijkhoff 1997:86). Under the Dutch West India Company[68] (also Nederlandische West-Indische Compagnie or WIC), the Dutch (as had the Spanish before them) used the island for cattle breeding

[67] In 1527 Manaure, the paramount chief of the Caquetíos, signed a treaty with Juan Martínez de Ampués to secure the return of the Caquetíos from Hispaniola (Oliver 1989; Dijkhoff 1997: 105). (Note that Versteeg and Ruiz (1995:67) list this date as 1523).

[68] The expiration of the Twelve Years' Truce (1621) in the rebellion against Hapsburg rule, provided an opportunity for the Dutch to expand their activities beyond the hunt for salt pans to supply North Atlantic herring fisheries. On June 3rd of that year, the States General of the United Provinces of the Netherlands grant to the Dutch West India Company its first charter "for trade and colonization in Africa and the Americas (along the Atlantic coast from Newfoundland to the Strait of Magellan as well as on the Pacific coast)" (Lugar 1996:421).

(Watts 1987). Sheep and goat breed in Aruba would support the population in Curaçao, while horses would supply forces making incursions into the mainland (Hartog 1973:19).[69]

From the mid 17th to the mid 18th century (ca 1640 to 1750), regulations of the *West-Indische Compagnie* prohibited anyone not of "Indian" [70] extraction from living on Aruba, which "rendered Aruba a *de facto* Indian Reservation" (Versteeg & Ruiz 1995:1). During this time, a census of Aruba (June 28, 1715) recorded 393 Indians on the island, most of whom were women (162) and children (78 girls, 66 boys) (Alofs 2001:244). Four years after the establishment in 1750 of the first Catholic church on Aruba (at Alto Vista), "non-Indians" were permitted to settle on the island. In 1805, during the Napoleonic Wars, the English briefly took control of Aruba. However, the Dutch regained control in 1816. At that time, the island was inhabited by 4 "Dutch," 187 "born whites," 20 "white strangers," 564 "full-blooded Indians" and 584 "coloured free people," 37 "free Negroes" 133 coloured slaves (Indians), and 203 "black slaves" (Dijkhoff 1997:93, after Hartog 1953:125). Nooyen has suggested that those listed as "coloured" were also "Indians" (Nooyen 1965:33,35; in Dijkhoff 1997:94).[71] They continued to comprise "the

[69] For example, in 1642 Peter Stuyvesant obtained horses in Aruba for his raid on the Venezuelan coast (Hartog 1973:19).

[70] Until recently, the term "Indian" has been used to refer to indigenous inhabitants of Aruba. The most recent publication of the Archaeological Museum of Aruba marks a change in this convention. In keeping with the terminology frequently used on the mainland, the editors of this publication use the term "Amerindians" to refer to Aruba's indigenous inhabitants.

[71] According to Alofs, given the inadequacy of racial categories on the census forms used in Aruba, "often cited figures such as those of 1816, when it was said that 564 'real Indians' lived on Aruba [such as is cited by Hartog 1980:125] . . . are not reliable (2001:246).

majority of the population well into the 19th century" (Versteeg and Ruiz 1995:1). According to Alofs, after that the extant "Indian population integrated rapidly into" (2001:247) colonial society.

In 1824 Aruba proved to be much more "*util*" than the conquistadors had suspected when gold was finally discovered in Rooi Fluit,[72] on the island's North coast (reportedly by Willem Rasmijn , a 12-year old boy tending sheep) (Hartog 1973:37).[73] Alofs suggests that this led to "increased migration of white colonists to the island" (Alofs 2001:247), who brought with them slaves of African descent. (Census figures provided by Dijkhoff (1997:94) suggest that the population of black slaves in Aruba increased 12% by 1840.) Gold-mining (along with the cochineal[74] industry) contributed to the increased importance of Santa Cruz, which had been both an important settlement center for prehistoric inhabitants, as well as the oldest Spanish settlement on Aruba (Hartog 1973:42).

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[72] According to Hoyer, the precise location was called "Lagabai (Let Go)" (1945:8).

[73] One hundred years earlier Paulus Printz, a Swedish miner, had searched in vain (Hartog 1973:53; Alofs 2001). According to Hoyer, Printz was a Norwegian mineralogist commissioned by the West India Company whose "correspondence with the [company's] Board of Directors in Amsterdam indicated clearly his belief in the existence of precious minerals in the Aruban stones he had examined" and whose premature recall by the company delayed the discovery of Aruba's gold (1945:7).

[74] The cochineal is an insect that lives off the nopal cactus. When dried and ground, female cochineals produce the coloring agent carmine. Beginning in 1837, cochineal insects were bread on Aruba for this purpose, until cheaper chemical agents began to reduce demand ca. 1853 (Hartog 1973:42).

Aruba remains today part of the Kingdom of The Netherlands.[75] Its current population is comprised of people from at least 90 countries (Dijkhoff 2004). Individuals ethnically tied to the island's indigenous population are not among them. Although evidence of Aruba's early populations endures in the island's toponyms and archaeological heritage, the last "full-blooded Indian" died at Sabaneta in 1843 (Alofs 2001; Dijkhoff 2004).[76] Despite this, Amerindian ancestry continues to be recognized on the island. As Alofs explains, "the Amerindian legacy is of great importance to the Aruban population" (2001:241).

4.3 History of Research on Aruba's Amerindian Past

For many years the best sources of information about Aruba's past were publications of the historian Johan Hartog, who was also the chief librarian. These publications, the first of which appeared in 1950, synthesized archaeological information that had been gathered on the island since the late 19th century. According to Versteeg, these resources remain, for the most part, valid, despite the passage of time and the considerable amount of archaeological data that have been collected through subsequent excavations on the island (1997a:89).

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[75] Once part of the Netherlands Antilles, and subject to the political authority of the neighboring island, Curaçao, Aruba achieved in 1986 *status aparte*, a direct relationship with the Dutch government independent of Curaçao. Although this new arrangement was designed to culminate in ten year's time with Aruba's complete independence (on January 1, 1996), Aruba officially cancelled this proposed "independence day" in April of 1995 (Hoefte 1996/1997).

[76] The skeletal remains of this individual, Nycolaas Pyclas, were among those collected by Van Koolwijk and later described by Koeze (Koeze1904; Leemans 1904:13; Dijkhoff 2004).

4.3.1 Early Investigations

Archaeological research on Aruba began in 1880, almost four hundred years after the Colonial Encounter, with Father Antonius J. van Koolwijk, a Roman Catholic priest transferred from Curaçao to Aruba during that year (Van Heekeren 1960:104).[77] Father van Koolwijk was not a professional archaeologist (Du Ry 1960:81). However, he was the first to investigate Dabajuroid pottery (in Curaçao in 1878), more than fifty years before researchers began to establish the relationship between the ethnohistoric Caquetío of Coastal Falcón and local pottery styles that would subsequently be called "Dabajuroid" (Tamayo 1932; Nomland 1933. 1935; Oliver 1989). During the six years Father van Koolwijk spent in Aruba, he actively investigated surface finds and conducted a few small scale excavations (Versteeg and Ruiz 1995; Dijkhoff 1997).[78] He also documented Aruba's pictographs (1881; Coomans-Eustatia and Coomans 1987; Dijkhoff 2004).

In addition to his interest in Aruba's past, Van Kookwijk also recorded extant remnants of aboriginal culture. He described the Amerindian people living on the island in the late 19th century (according to Van Heekeren 1960:103) as "strongly-built, copper-coloured men and women, with wide shoulders, round faces, and wavy, pitch-black hair, erect posture and gait, and possessing innate pride and dignified manners" (Van Koolwijk 1882).

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[77] Father van Koolwijk's investigations of the archaeology of the region began as early as 1878, when he investigated Dabajuroid remains in Curaçao (Oliver 1989:2).

[78] He focused on the area around Santa Cruz, but his collections also included artifacts from other sites (e.g. Arikok, Fontein, Sabaneta, and Tanki Flip) (van Koolwijk 1882, 1885; Dijkhoff 2004).

According to Hartog, Van Koolwijk "collected an astounding number of items" (1961:2). This material would provide the basis for several subsequent studies. During the period from 1883 to 1887, Father van Koolwijk sent all of his collections to Leiden, The Netherlands, where they were identified by C. Leemans (Haviser 1987:7) and housed in the *Rijksmuseum van Oudheden* (National Museum of Antiquities) (Dijkhoff 2004). In 1903, the collection was transferred to the *Rijksmuseum voor Ethnographie* (known since 1935 as the *Rijksmuseum voor Volkenkunde*) in Leiden, The Netherlands (Dijkhoff 2004). One year later, according to Weeks and Ferbel (1994), the *Reichsmuseum für Völkerdunde*, Haarlem, The Netherlands, published a brief summary of the archaeology of the Netherlands Antilles (Kleinman 1904). To this publication G. A. Koeze (1904) contributed an analysis of human skeletal remains from Aruba and Curaçao (Dijkhoff 1997). Leemans also contributed a ten page overview of the archaeology of Aruba and Bonaire, based in part on his study of artifacts collected by Father van Koolwijk (Leemans 1904; Versteeg and Ruiz 1995), which was published posthumously (Schmeltz 1904; Haviser 1987:7).[79]

J. P. B. de Josselin de Jong, an ethnologist and linguist, also made significant contributions (1918, 1923) to the study of Aruba's indigenous peoples. Early works by de Josselin de Jong that included data for aboriginal Aruba focused on a variety of subjects, including demography (1918), archaeological research (1919-1920), and material culture

[79] Nearly a decade later, ten Kate published an encyclopedic entry about the archaeology of the Netherlands Antilles based in part on his analysis of Van Koolwijk's collection.

(1923). As the curator of the State Museum of Ethnography at Leiden, de Josselin de Jong recognized the importance of the Van Koolwijk collection (Haviser 1987:7). He carefully analyzed the material collected for the islands of Aruba, Curaçao, and Bonaire. His report, published in 1918 and revised in 1923, continues to be recognized as an important contribution to the archaeology of these islands. Oliver credits de Josselin de Jong with "the first serious attempt to establish a correspondence between the Caquetío of the Dutch Islands and the archaeological components he analyzed" (Oliver 1989:2). According to Du Ry, de Josselin de Jong "is entitled to be called an archaeologist on account of his careful and scientific methods" (1960:81). De Josselin de Jong also excavated at the Santa Cruz site. However, the results of this study were never published (Dijkhoff 1997:10).

These early investigators of Aruba's past also contributed to efforts to understand the archaeology in a regional context. In 1943, Cornelius Osgood surveyed the Peninsula of Paraguaná and conducted stratigraphic excavations, the first in Falcón focusing on the ceramic style that would subsequently be known as "Dabajuroid" (Oliver 1989:1; Osgood and Howard 1943).[80] His analysis considered not only his own work in the area, but also that of other researchers who had analyzed regional material. The first researcher to investigate the relationship between the ethnohistoric Caquetío and archaeological remains (pottery and petroglyphs) in Coastal Falcón was Francisco Tamayo (Oliver 1989; Tamayo 1932). G. A. Nomland later analyzed collections sent to Berkeley's Lowie Museum from sites near Coro and Coastal Falcón (Oliver 1989:1). Data collected by early researchers in

[80] Oliver finds problematic Osgood's suggestion of "a gradual shift from early 'fabric impressed' to a later emphasis on lineal painted designs," noting that these two variables (fabric impression and lineal painted designs) should be treated as independent (Oliver 1989:1, note 2).

Aruba and Curaçao contributed to Osgood's chronology, the "first attempt at classification for the Dabajuroid Tradition" (Oliver 1989:1).[81]

A. D. Ringma was a non-archaeologist whose study of Aruba's indigenous past would not go unrecognized. In July, 1949, he excavated five skeletons from Mount Canashito (Versteeg and Ruiz 1995:83).[82] Although his findings were not widely disseminated, following his death eight years later, the bone material he excavated, together with his notes, provided the basis for two subsequent studies that have shed light on Preceramic peoples of the island (Wagenaar Hummelinck 1959; Tacoma 1959; Versteeg and Ruiz 1995). More than one half century later, the material collected by Ringma would also provide a sample for radiocarbon dating.[83]

Among those who analyzed the Ringma collections was the zoologist P. Wagenaar Hummelinck. In 1959 he published a study of the physical anthropology of skeletal remains from Aruba and Curaçao, based in part on the skeletal materials collected by

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[81] In addition, to a chronological framework for the region, the publication of Osgood's survey [Osgood and Howard 1943] also introduced the "Theory of the H" (Oliver 1989:2).

[82] In an earlier publication, this date is given as November, 1950.

[83] In 1990, the team of archaeologists, A. H. Versteeg, J. Tacoma, and P. van de Velde, obtained a radiocarbon date from a dental element of one individual (C-1)excavated by Ringma. This date demonstrated that the individual buried at Mount Canashito was "several centuries older than the Malmok cemetery" (Versteeg and Ruiz 1995:7).

Ringma.[84] This followed his doctoral thesis (1940), which focused on the fauna of the ABC Islands and Venezuela, and a publication (in Dutch) that describes pictographs on Aruba and Curaçao (Haviser 1987:8).

4.3.2 Formal Archaeological Research

4.3.2.1 J. M. Cruxent

The first institutionally affiliated, professional archaeologist to excavate on Aruba was J. M. Cruxent, who had begun his investigations with a survey of Falcón in the 1940s (Oliver 1989:3). In 1953, Cruxent excavated for seven days at Santa Cruz, where he obtained "a very substantial body of data" (Aruba Esso News, June 19, 1953: Van Heekeren 1960:105). Two years later, as the director of the *Museo de Ciencias Naturales* in Caracas, Cruxent analyzed two collections from Dabajuro, Venezuela. The use of the term "Dabajuro" emerged from this particular study to describe this local pottery style, which could also be related to the local style Cruxent had previously recovered in Aruba. Throughout the 1950s, Cruxent continued to identify Dabajuroid sites throughout the 1950s, when he and his associates were concerned primarily with their investigations of Paleoindian sites.

[84] Hummelinck collected materials from other sources, including Dominican Fathers in Bonaire, Ringma (for Curaçao and Aruba), A. C. J. Burgers (Bonaire), and G. Bogaers (Aruba) (Du Ry 1960:81).

4.3.2.2 C. J. Du Ry, H. R. Van Heekeren and D. P. Glazema

The Dutch team of C. J. Du Ry and H. R. Van Heekeren were the first professional archaeologists to work in Aruba and also publish their findings. According to Oliver, Du Ry and Van Heekeren "presented the first attempt to correlate the styles of the islands with the Dabajuroid pottery of the Venezuelan mainland" (1989:2). Both curators of the Rijksmuseum voor Volkenkunde, Leiden, Du Ry and Van Heekeren conducted investigations during a four month period in 1960 on the islands of Curaçao, Bonaire and Aruba (Van Heekeren 1963), which they published during the period from 1960 to 1963

Du Ry's 1960 study of ceramic remains on Aruba deviates from the findings by Cruxent and Rouse, which proposes a single Dabajuro style for the island (Oliver 1989:3). Oliver suggests that Du Ry's "Sabaneta style" "clearly corresponds to the mainland's late Los Médanos complex . . . [that] his Santa Cruz and related 'styles' equate with the mainland's Early and Late Urumaco complex phases (Oliver 1989:Note 5).[85]

D. P. Glazema also made several significant contributions to the archaeology of Aruba. The director of the State Service for Archaeology, Glazema not only conducted archaeological research on the island, he also was instrumental in the formation in 1967 of the Institute of Archaeology and Anthropology of the Netherland Antilles (AAINA) (Dijkhoff 1997:11).

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[85] Oliver also relates ceramic remains identified by du Ry (1960) to the Río Guapo (zone cross-hatched incised decoration). Oliver "speculate[s] that this intrusive unit may have been the result of direct contacts between the island's resident Meso-Indian people and people of the Guapoid-Ronquinoid Tradition in the eastern coast of Venezuela, where in late Meso-Indian periods (i.e. Manicuare site: Punta Gorda complex) have been shown to have contacted Coastal Saladoids (i.e. Ronquinoid Tradition)"(Oliver 1989:3, Note 5).

The development of archaeological knowledge in the Netherlands Antilles did not go unnoticed on the mainland. In 1969, Irving Rouse and J. A. Cruxent published "Archeologie," an article that included an assessment of the status of archaeological research on a regional level. The article was just the latest of a series of considerable contributions to the archaeology of Venezuela, which included the islands off its northern coast (Cruxent and Rouse 1958/59, 1961; Rouse & Cruxent, 1969). Their focus on regional chronology contributed to the development of chronology for Aruba's Ceramic period.

4.3.2.3 The Aruba Research Center

From 1967 until 1971, college students and faculty members from New York, most of whom were affiliated with the City University of New York (CUNY), particularly with Hunter College, contributed to the archaeology of Aruba (Hartog 1973:70). Their efforts were coordinated from the Aruba Research Center (ARC), a consortium of researchers studying the island and surrounding areas (Dijkhoff 2004:40; Lester 1968:2), which was based in Aruba, in facilities of the Lago Oil Company (Francis Conant, personal communication, 2000). ARC investigators conducted research in archaeology and related fields, such as ecology, sociology, and history) (Conant 1971:2). An important partner was Annemarie de Waal Malefijt, an anthropologist from Holland (Egbert Boerstra, personal communication, 2004). As a professor in the department of Anthropology at

Hunter College, she guided the completion (1970-1972) of at least four Master's theses on topics related to Aruban anthropology.[86] Dijkhoff suggests the following:

> The cooperative activities of the ARC and Hunter College were unique for Aruba at the time. For the first time, a local institution worked together with an international institution during archaeological investigations, involving not only professional archaeologists, but also archaeology students and students of related sciences (2004:40-41).

Principal ARC investigators included Francis Conant (Department of Anthropology, Hunter College, CUNY); Michael Siegel (Department of Anthropology, The Graduate School and University Center (GSUC), CUNY); Lorraine Heidecker [GSUC] CUNY); Ellis Juliana (GSUC, CUNY); Sonia Ragir (Richmond College, Staten Island, New York); Johanna Dahn (affiliation unknown); and Lynne Benson (Department of Anthropology, Hunter College, CUNY). The efforts of these researchers were supported by CUNY students, as well as Aruban citizens (including local physicians) interested in Aruba's past.

During the four years that the center was operational in Aruba, ARC researchers investigated several of the island's important archaeological sites. Much of the data collected had for many years been "lost" and, thus, could not be adequately integrated into syntheses of archaeological knowledge of Aruba's past. While working in Aruba in the context of the "Shell Industry of Aruba" project, I was granted permission to search the archives of the Archaeological Museum of Aruba (AMA) in an attempt to recover some of

[86] These are on file at the Department of Anthropology, Hunter College, CUNY.

this "lost" data.[87] I was pleased to find several files of data related to the archaeological research conducted by ARC investigators. A summary of investigations prepared by Francis Conant (1971) was particularly informative. Not only did it indicate much more work than had previously been attributed to the ARC researchers, it also contained two radiocarbon dates that had never before been published. (Available radiocarbon dates are provided in Appendix II). This information is now a part of the history of archaeological research in Aruba; much of it is recorded in an overview by Dijkhoff (2004) of archaeological investigations in Aruba.

In 1967 Francis Conant led a research team that excavated a disturbed site at Canashito, then known as "Canashitu Cave 'A'" (Conant 1971).[88] The team collected skeletal remains of "ca 10/12 persons, both sexes, all ages" (Conant 1971). Conant reported finding turtle shell and "unusual breaks in human skeletal remains," but no other cultural remains (Conant 1971:1). Subsequently, Nooyen (1979) reported that the bones discovered by students from Hunter College had been covered with red dye (1979:21;

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[87] The AMA houses a substantial collection of artifacts recovered during ARC investigations. Most are labeled "Hunter College." Since ARC involvement on the island predates the formation of the museum by 10 years, I had hoped to discover documentation to explain just how these artifacts entered the collections.

[88] According to Dijkhoff (2004), Nooyen reports that students from Hunter College discovered the site in 1966. This site may be among those listed in the sites list of the Archaeological Museum of Aruba (#28 Canashito-4, first excavated in 1949 by Ringma). Alternatively, it may be new site. Radiocarbon dates obtained in 1990 for Canashito-4 differ markedly from those obtained by Conant. It is possible, however, that both sites are contained within a large cemetery site that was used repeatedly throughout many centuries of occupation of the island by Preceramic Age peoples.

Dijkhoff 2004). The team also obtained two radiocarbon dates; these are recorded as 1150 ± 90 years BP and 1120 ± 90 years BP, respectively (Conant 1971:1).

In 1968, researchers from the ARC excavated at two key sites. One of these is the Tanki Flip/Henriquez I site. A portion of the site had been excavated prior to the work of ARC researchers by a local teacher (Lester) and his young students. Their findings and surface materials remaining at the site prompted ARC researchers Heidecker and Siegel to investigate further. The following year, they published a preliminary report of this excavation (Heidecker & Siegel 1969),[89] which uncovered two distinct cultural layers for which radiocarbon dates were obtained.[90] Recently, AMA archaeological assistant Hiram Angela recovered two field notebooks that record aspects of this ARC excavation. These have helped clarify not only the approximate excavation site, but also the proveniences for several of the marine shell artifacts recovered that are now in the AMA collection (see Chapters 6 and 7).

Siegel was also the principal investigator in the investigation of the west bank salinas at Malmok (#46), a site discovered in the 1940s (Versteeg, Tacoma & Van de Velde 1990). He mapped the area[91] and excavated a single skeleton of a child. A subsequent

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[89] This is presently the only known publication by ARC researchers.

[90] A charcoal sample from Feature I, Layer 1 dates to 740 ± 105 BP (I-4025), calibrated to A.D.1201-1390 (1 sigma) and A.D. 1040-1410 (2 sigma). The sample from Feature II, Layer 2 dates to 765 ±105 BP, calibrated to A.D. 1170-1390 BP (1 sigma) and A.D. 1040-1410 (2 sigma) (Heidecker and Siegel 1969; Dijkhoff 2004).

[91] A copy of this map was sent to J. Merryweather, Public Work, which Conant suggests may have then been located in Curaçao (1971:1).

X-ray and examination of the teeth by local physicians suggested that the child died at ca. 4-10 years of age (Conant 1971:1).[92] The excavation yielded no cultural material.

Under the direction of Conant, ARC researchers also conducted extensive surveys of Frenchman's Pass, R. Franchi, and Spans Lagoen on the leeward coast, and the area from "Fontein coast to Boca Prins & Baranca Cashunti ledge" (Conant 1971:1) on the windward side of the island. During their surveys, the team collected surface materials (fragments of pottery and stone) and flora specimens.

In December 1969 Heidecker excavated an urn burial at Sabaneta.[93] Pictures that may be associated with this excavation have been recovered and are now in the archives at the AMA. However, nothing more is known about the individual buried in the urn nor of the other cultural material that may be associated with the urn (if any existed).

During the spring of 1970, Conant surveyed the windward coast from Boca Prins to Boca Mahos. Together with Juliana, he also surveyed the Ceru Grandi area of Bonaire. Specimens collected during this survey were curated at the ARC and in Curaçao (by Juliana).

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[92] The sex of the child could not be determined.

[93] Conant suggests that this may have been done at the request of the owner of the property where the urn was discovered or of the Aruban government (1971:1).

In the summer of 1970, Ragir excavated a cave site at Boca Grandi, where she encountered an incomplete skeleton, little pottery, and drilled fish (barracuda) teeth.[94] Ragir also excavated an urn burial and hearth at Sabaneta.[95] Associated materials included pottery, stone, bone, and shellfish. According to Conant, the burial probably contained "more than one individual, [of] different ages and sexes" (1971:2).[96]

During the same summer, Conant revisited Canashito, where he surveyed the flora and fauna of the site. He also excavated "Gap Cave," a disturbed site on the southeast face of the hill. There he reported finding human and goat/sheep bone intermixed from the surface to a depth of 20 cm. From the surface of the site, he recovered some plain pottery sherds.

Conant also surveyed the surface of the southeast slopes of the hill, where an ARC/Hunter College, CUNY student, Johanna Dahn (1970) excavated two 1 m^2 pits, each from the surface down to 40 cm (Dahn 1970:10). The excavation yielded primarily undecorated pottery, shell, and "some stone" (Conant 1971:2).

In the spring of 1971, Conant resurveyed the site he called "Canashitu Cave A." He also excavated Valentine Cave, a cave located directly below "Canashitu Cave A" (Conant 1971:2). There he recovered both goat and human skeletal fragments, but no cultural remains.

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[94] A preliminary report of these excavations is on file at the AMA.

[95] Ragir also did some survey work and text excavations in Bonaire (Conant 1971:2).

[96] This burial was likely an example a secondary urn burial, one of five major burial types used by prehistoric inhabitants in Aruba.

4.3.2.4 The Foundation for Cultural Cooperation and Egbert H. J. Boerstra

In 1971, the Advice Council for Cultural Cooperation between The Netherlands, Surinam and the Netherlands Antilles (STICUSA, Amsterdam) recommended that a resident archaeologist be stationed in the Aruba (Hartog 1973:70).[97] Thus, Aruba received its first full-time archaeologist from The Netherlands, Egbert H. J. Boerstra, and "the systematic study into Aruba's prehistoric past began" (Hartog 1973:70).

Boerstra focused his efforts on the island's main sites of the Preceramic Period (Malmok and Canashito[98]) and Ceramic period (Santa Cruz, Tanki Flip, and Sabaneta). In addition to site reports for Santa Cruz (1971, 1974) and Tanki Flip (1983), Boerstra also synthesized his findings in publications focusing on prehistoric burial practices (1973, 1976) and lifeways, in Aruba (1977; 1991) and in the ABC islands as a whole (1982).[99]

4.3.2.5 The Archaeological Museum of Aruba

On December 19, 1981, The Archaeological Museum Aruba was founded as the repository and exhibition space for the island's archaeological materials, much of which had been excavated by Boerstra at Canashito, Malmok, Sabaneta, Santa Cruz and Tanki Flip (Henriquez I) (Versteeg and Ruiz 1995:10; Ruiz & Dijkhoff 2001). A general

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[97] The organization, based in Amsterdam, is also known as The Foundation for Cultural Cooperation and by the acronym STICUSA (Versteeg & Ruiz 1995:10).

[98] According to Versteeg & Ruiz, Boerstra investigated Canashito-1 (#25) in 1984; they report that no observations of archaeological materials could be made during their 1990 survey and that "most of the site has been destroyed" (1995:83).

[99] Boerstra's work at the AMA ended in 1985 (Boerstra, personal communication November 11, 2004; Ruiz & Dijkhoff 2001).

synthesis of Boerstra's work done during the previous decade, *De Precolumbiaanse Bewoners van Aruba, Curaçao, en Bonaire*, was published in 1982. After training his replacement as head of the AMA, Boerstra ended his fifteen year study of Aruba's archaeological record in 1984 (Egbert Boerstra, personal communication, November 11, 2004).[100] A summary of Aruban archaeology up until that time, which was coauthored by Boerstra, E.N. Ayubi, and Aad H. Versteeg (Ayubi et al. 1985), was published the following year.

Evelino Fingal and Arminda C. Ruiz

Under the direction of Evelino Fingal, AMA researchers steadily intensified efforts to recover Aruba's archaeological past. Together with geologist Arminda C. Ruiz, who joined the AMA staff in 1990, Fingal updated the exhibition of Aruba's archaeology on display at the AMA (Versteeg & Ruiz 1995:10) in order to more effectively present the island's past cultures to the viewing public.

The AMA and Leiden University

In addition to public outreach on the local level, the AMA also sought to advance archaeological knowledge on the island through partnerships with other institutions both in

[100] Since November 2002, Boerstra has worked with the Directory of Parks Foundation and he participates as a member of NAPA, a committee organized to protect nature and parks in Aruba. He presently conducts tours of the *Parke Nacional Arikok*.

Aruba and elsewhere. According to Dijkhoff, in 1988 "budgetary constraints and the lack of archaeological expertise prompted E. Fingal . . . to request archaeological assistance" (2004:45). Perhaps none of their relationships with other institutions and/or other countries has been more influential than their cooperative agreement with Leiden University.

W. I. M. Kersten

W. I. M. Kersten of Leiden University was the first to respond to the call for help. He worked primarily at Tanki Flip, where he excavated human remains (Kersten et al. 1988; reported also in Dijkhoff 1997). He also collected material at Santa Cruz (Dijkhoff 2004; Kersten et al. 1988). His findings there have not yet been published (Dijkhoff 1997).

Aad H. Versteeg

In 1988, Aad H. Versteeg began working in Aruba (Ruiz & Dijkhoff 2001). One year later, a cooperative research agreement between the AMA and Leiden University led to a series of archaeological projects in Aruba, which were directed jointly by Fingal of the AMA and his counterpart Aad H. Versteeg, a research fellow of Leiden University. That year, Versteeg conducted a salvage excavation of the Preceramic Malmok cemetery (200

B.C.-1000 A.D.) (Ruiz & Dijkhoff 2001), where he was assisted by J. Tacoma, P. van de Velde, and AMA field investigators Fransisco Croes, Angel Wernet, and Ignacio Wernet. As part of this investigation, the team obtained a radiocarbon date from a dental element of one individual (C-1) excavated by Ringma. This date demonstrated that the individual buried at Mount Canashito was "several centuries older than the Malmok cemetery" (Versteeg and Ruiz 1995:7).

The following year, AMA geologist Ruiz participated in the AMA joint venture with Versteeg to survey the island's archaeological sites. The publication of this survey, *Reconstructing Brasilwood Island: The Archaeology and Landscape of Indian Aruba* (Versteeg & Ruiz 1995), is not only the most comprehensive synthesis of Aruba's archaeological sites, it is also the first comprehensive publication of the archaeology of Aruba by an Aruban researcher (Ruiz).

The survey identified 109 archaeological sites (Versteeg & Ruiz 1995).[101] Twenty-two were identified as Preceramic Period sites, 58 as Ceramic Period sites, 17 as pictograph sites, and 10 as Historic Period sites. In addition, 6 are multicomponent sites containing evidence of occupation during both the Ceramic and Historic Periods on Aruba (see below).

Beginning in 1991, a team of investigators led by Aad Versteeg excavated a portion of the Santa Cruz site, the largest site yet identified on the island. This led to a larger excavation the following year (Ruiz & Dijkhoff 2001). Among the investigators of this

[101] Hiram Angela was by then also a member of the AMA archaeological team.

site was AMA archaeologist Raymundo A. C. F. Dijkhoff, then a student at Leiden University. Although the site report has not yet been published, an available assessment of houses and settlement pattern of the site reveals the first excavation of the complete post molds of a Caquetío house (Versteeg 1997a; Ruiz & Dijkhoff 2001).

In 1994, another cooperative effort between the AMA and the Institute of Pre- and Protothistory of Leiden University (Versteeg & Rostain 1997) led to the excavation of a portion of the Tanki Flip site, then threatened by proposed construction.[102] The research project, which included excavation campaigns in 1994 and 1995, was both international and multidisciplinary. Researchers from other international institutions were invited to participate, including the Sorbonne and Havana University. In addition, the trend toward increasing specialization was also reflected in the research team (Ruiz & Dijkhoff 2001). The large scale investigation at Tanki Flip provided a comprehensive overview of the spatial organization of a Caquetío settlement, the first of its kind in the Caribbean (Ruiz & Dijkhoff 2001). The preliminary report of the excavations, *The Archaeology of Aruba: The Tanki Flip Site*, includes reports covering a range of topics, including the natural environment (Ruiz 1997), features and structures (Bartone & Versteeg 1997), unmodified shell remains (Reinink 1997), shell recurrent forms (Dacal 1997), highly modified shell artifacts (Serrand 1997), stone and coral artifacts (Rostain 1997), faunal remains (Grouard 1997), pottery (Versteeg 1997b), hearths and kilns (Versteeg 1997c), carbonized wood (Newsom 1997), burials (Versteeg et al. 1997), colonial remains (Bulgrin & Bartone

[102] Development plans for the site have since been halted.

1997), and spatial patterns and symbolism (Rostain & Versteeg 1997). The volume also included a republication of Perrin's ethnographic study of extant Guajiro (Wayúu) peoples of the Guajira Peninsula, "The Guajiro Culture of Death," an effort to provide a "relational analogy" for the belief system of Tanki Flip inhabitants (Versteeg & Rostain 1997).

One contribution to the volume that merits special consideration is Oliver's "Dabajuroid Archaeology, Settlements and House Structures: An Overview from Mainland Western Venezuela" (1997), which provides an invaluable synthetic overview of the region and relates these findings specifically to archaeological data collected in Aruba. This work both updates and extends his exhaustive contribution to the archaeology of the region, *The Archaeological, Linguistic and Ethnohistorical Evidence for the Expansion of Arawakan into Northwestern Venezuela and Northeastern Colombia*, Oliver's 1989 doctoral dissertation, which has emerged as an essential reference for researchers investigating neo-Indian populations in the region, including in Aruba.

In 1998 the museum expanded their public outreach efforts by instituting an educational program in partnership with the island's Teachers College (Instituto Pedagogico Arubano). In addition to presenting the archaeology of the island to approximately sixty percent of Aruban school children, the museum also provides opportunities to the island's future educators (Ruiz & Dijkhoff 2001).

Continuity and Change at the AMA: Raymundo A.C. F. Dijkhoff and Harold J. Kelly

In 1999 Raymundo A. C. F. Dijkhoff joined the AMA staff as the first Aruban academically trained in archaeology. During the past five years, Dijkhoff has led the museum's archaeological crew in several salvage excavations (including one in which I participated), renewed efforts to survey the island's growing list of archaeological sites, and has also directed the international, multidisciplinary "Shell Industry of Aruba" project, of which this study is one outcome.[103] Working closely with the museum's current acting director (Arminda C. Ruiz), Dijkhoff has made the conservation and management of the island's archaeological heritage a main priority (Ruiz & Dijkhoff 2001), while maintaining the AMA's strong focus on research partnerships with professionals from other disciplines and/or other countries. The productive association between the AMA and Leiden continues, and the "Shell Industry of Aruba" project effectively served to reconnect the City University of New York to archaeological pursuits on the island. Other recent joint projects include the study of the Amerindian Historic Period (in partnership with L. Alofs), and a survey of sites on the sea floor in partnership with STIMANA (Stiching Marien Archeologisch Onderzoek Nederlandse Antillen) (Ruiz & Dijkhoff 2001).

In 2003, Harold J. Kelly, Aruba's second academically trained archaeologist, joined the AMA staff. Presently, he is working with Dijkhoff and field technicians Angela

[103] The project, which began in 1995 under the direction of Evelino Fingal, grew out of the collaboration between the AMA and Tanki Flip researcher Ramón Dacal Moure of Havana University. In July, 2000, I was invited to participate in the project as both contributing researcher and coeditor of the project's publication, *The Archaeology of Aruba: The Marine Shell Heritage*.

and Croes, to systematically survey (or resurvey) and to map Aruba's 171 presently known sites. This research is expected to change considerably current understanding of early Amerindian cultures in Aruba.

4.3.3 Other Contributions

Important contributions to the archaeology of Aruba have also come from studies of the neighboring islands. Archaeological studies of Aruba's sister islands, Curaçao and Bonaire, two other islands occupied by Dabajuroid peoples, have long contributed comparable data to the study of Aruba's past. Relatively recent research in these islands by Haviser (1987, 1990, 1991) has been particularly influential (Dijkhoff 1997).

In addition to the many professional archaeologists working to document the archaeology of Aruba, many other individuals have contributed to the emerging picture of the island's indigenous past. Variously described as "hobbyists" (Dijkhoff 1997), amateurs, avocationals (Dijkhoff 2004), or pot-hunters (Boerstra 1991), many have made significant contributions to the development of archaeological knowledge. Among them is I. E. A. Tjon Sie Fat, who not only provided important investigations of Aruba's rock art sites, but also documented several salvage excavations in the 1960s (Dijkhoff 2004). One of these was at the home J. Bongers, an Aruban citizen who conducted (and also documented) the excavation (ibid.). The report produced by Bongers (1963) provides important data on O/S artifacts made of shell.

Mario "Mai" Odor, who for many years housed a collection of archaeological materials within his numismatic museum, was another important contributor to the study of Aruba's past. Odor (1990) carefully recorded the geographic location of his archaeological finds, and he was the first Aruban to present an overview of Aruba's prehistoric past to the public. In addition, as new professional archaeologists began to work on the island, Odor generously shared the information he had collected.

4.4 Summary

Aruba's archaeological heritage has garnered considerable attention for more than a century. Yet, for many years, investigations of the island's past by researchers trained in the discipline of archaeology were more the exception than the norm. Most investigations were conducted by local *aficionados.*

Over the past few decades, archaeological research on the island has developed into a professional discipline. Today it is headquartered and coordinated through the Archaeological Museum of Aruba. Although the AMA staff now includes professional Aruban archaeologists, the museum continues to pursue collaborative relationships with other researchers and institutions, both local and international. AMA research projects that are increasingly multidisciplinary are also the foci of a series of publications; these have helped to advance archaeological knowledge on the island.

CHAPTER FIVE

AMERINDIAN CULTURE ON THE "ISLAND OF SHELLS"

5.1 Introduction

Several authors have suggested that the name "Aruba" may translate to "island of shells" (Hoyer 1945; Dijkhoff 1997:126; Dijkhoff & Linville 2004).[104] Shell remains are among the most ubiquitous evidence of prehistoric occupations (Dijkhoff & Linville 2004). This may be attributable in part to both chemical and physical properties of marine shell, which "favor the recovery of these remains over other more biodegradable evidence of past human activity" (Dijkhoff & Linville 2004:3). The evidence that molluscan resources contributed significantly to Amerindian societies is evident throughout Aruba, particularly at the island's many shell matrix sites. While archaeological research in Aruba has not yet exploited the potential of marine shell remains as proxy data in investigations

[104] Hartog suggests that the actual meaning of the word "Aruba" will never be known (1973:14). Hoyer suggests, alternatively, that the name derives from early Spanish names for the island, "Orua" or "Oruba," perhaps a contraction of *oro hubo,* meaning "there was gold." Because the name predates the discovery of gold on the island, I favor Hoyer's suggestion that the name is derived from "Oruba [which was] derived from the Carib word *oraoubao*, meaning 'isle of snails' (ora – snail, oubao – isle)" (Hoyer 1945:5) (in Dijkhoff & Linville 2004). See also Dijkhoff (1997:12-127) for other possible definitions of the name "Aruba."

of human subsistence on the island[105] (Dijkhoff & Linville 2004), many researchers have focused on marine shell remains as evidence of Amerindian material culture.

Among the significant gains achieved in archaeological research in Aruba since the founding of the AMA is the consolidation under one roof of archaeological data, including excavated cultural material, private collections, and research archives. These resources, many of which record evidence of molluscan resource use (including marine shell remains), have been an important component of efforts to reconstruct island life throughout the island's many centuries of Precolumbian Amerindian occupation. AMA researchers have sought not only to collect archaeological information, but also to disseminate the growing understanding of Aruba's Amerindian populations both to the general public and to other researchers. One of several publications produced by Boerstra during his many years as Aruba's only resident archaeologist appeared just one year after the inauguration of the museum. Written in Dutch, *de precolumbiaanse bewoners van Aruba, Curaçao en Bonaire* (1982), provides data on several "non-tool" O/S marine shell artifacts from the ABC islands. Many of the shell artifacts featured were recovered from Aruba, which is recognized by many as the richest of the three sister islands in archaeological remains (Dijkhoff 1997, 2004; Egbert Boerstra, personal communication, 2004).

[105] This research focus has not been entirely ignored. Studies by Ragir/Conant (n.d. AMA archives) and Reinink (1997) have considered molluscan contributions to prehistoric diet at Boca Grandi and Tanki Flip, respectively.

More recent AMA investigations have recorded significant data on marine shell remains. The 1990 AMA survey of Aruba's archaeological sites (Versteeg & Ruiz 1995) provides the most comprehensive assessment to date of island-wide occupation. Data collected during this survey for a number of key sites discussed in this and subsequent chapters are summarized in Table 5.1.[106] In addition to this, in July, 2000 researchers of the AMA "Shell Industry of Aruba" project also surveyed several of the island's archaeological sites for variations in surface deposits of marine shell, which are evident (sometimes in prodigious quantities) at nearly every site (Dijkhoff & Linville 2004); this

[106] The site dimensions reported here seem inconsistent with the current model of Ceramic Period occupation of Aruba. I initially contacted the AMA to seek clarification on the Tanki Lender site. Harold J. Kelly, Fransisco Croes, and Hiram Angela resurveyed the site. Kelly explains their findings as follows: "The size now is E/W 750 N/S300 a total of 225000 sq meters. The problem of sizes between the Tanki Flip site and Tanki Lender lies in the manner in which the Tanki Flip site was measured. Versteeg only measured the habitation area of the Tanki Flip site thus the core area where previous excavations were done before him together with the area he excavated himself. He did not measure the whole surface area of material occurrence belonging to the Tanki Flip site which made the site look smaller than it really is. The site of Tanki Lender has an even bigger surface area than thought by Versteeg but from what was seen during the control survey it probably did not occupy a more important role than the Tanki Flip site. The material does occur over a big area but is generally spread and not concentrated and has a low density of material concentration (between 1 and 2 and the scale goes up to 5) on the surface except for the area where is thought where the habitation area might have been which has a higher density (density of 3). Furthermore, there is no occurrence of a big variety of elaborated tools, occurrence of decorated or fine ware ceramics and other factors which might have indicated a large scale exploitation and habitation of the site as is the case for the Tanki Flip site. The Tanki Lender site does have a large surface area but was not occupied and exploited as intensely as the Tanki Flip site and thus can still be categorized as a medium size site on accounts of the spread out and low material density characteristics of the site . . . all these problems will be resolved after the completion of the survey project" (Harold J. Kelly, personal communication, March 24, 2005).

investigation also yielded data that will be helpful in on-going AMA efforts to update the original 1990 survey list inventories (ibid.).[107]

Archaeological evidence indicates a heavy reliance on *Strombus gigas,* a gastropod commonly known as the Queen Conch and known locally as *"Calcó*" (Boekhoudt & Linville 2004); this preference has been identified throughout the Caribbean region from prehistoric to modern times. Shell remains of this species are by far the most abundant shell remains recovered from excavations of Ceramic Period sites (Heidecker & Siegel 1969; Versteeg 1997a; Reinink 1997; Dijkhoff & Linville 2004). In fact, as Dijkhoff & Linville suggest, "the volume of shell remains generally recovered during excavations in Aruba is so large that typically only fragments identified as artifacts or unusual specimens are curated for further study (Heidecker and Siegel 1969; Boerstra 1974; Versteeg, Tacoma & Van de Velde 1990)" (2004:3). This has constrained efforts to differentiate between shell remains of subsistence-related procurement and those that are the by-products of artifact manufacture (Reinink 1997; Dijkhoff & Linville 2004); it has also precluded the recovery of shell artifact production workshops.

[107] As Dijkhoff & Linville have noted, "the presence of small quantities of Strombus species shell associated with ceramic remains" (2004:188, note 2) at Sero Muskita reveals a ceramic component for this site, recorded by Versteeg & Ruiz (1995) as the provenience for a Preceramic diabase tool (associated with Archaic Meso-Indian mainland visitors).

5.2 Chronology of Amerindian Aruban Occupation

Although archaeological knowledge in Aruba has seen considerable development in recent years, many aspects of the chronology of Amerindian occupations are presently underdeveloped. Using the example of stone tools, Dijkhoff highlights the situation as follows:

> A big problem is that no detailed (typological) studies have been done of the stone tools and the raw material of the Aruban sites . . . [which explains] why questions like who (which culture) manufactured them and to which period they belong, remain unsolved (Dijkhoff 1997:25).

The same may be said for other artifact classes, including shell, bone, and even pottery, the analysis of which has long been an important component of chronology building in the region.[108] While detailed analyses of ceramics from many "Dabajuroid site components in Aruba" (Oliver 1997: 415-416) have not yet been completed, and some inferences must await pending analyses, there exists a growing body of archaeological data available for Aruba and adjacent areas of the mainland useful in efforts to reconstruct the chronology of the island's Amerindian past.

[108] One notable exception is Dijkhoff's analysis (1997) of Early Urumaco ceramic remains excavated by Boerstra at the Tanki Flip/Henriquez I site.

5.2.1 The Archaic/Meso-Indian Period

The earliest evidence of Amerindian occupation in Aruba has been dated to ca. 2500 B.C., an estimate based on comparisons between stone tools recovered in Aruba and those known for mainland South America. This date corresponds to the Meso-Indian Period of the mainland (Rouse & Cruxent 1969) and to the Archaic age, which is associated with ground stone/shell technology (Rouse 1992; Dijkhoff 1997). Stone tools are the only remains that have yet been attributed to this time period. Versteeg & Ruiz discuss two of these artifacts, one recovered from Sero Muskita (#89) and the other from Arikok,[109] and suggest that these provide the only evidence that the island was utilized prior to 4000 BP (1995:17). The inferred date for these artifacts is much earlier than *any accepted* dates obtained using radiometric analysis of samples collected from various sites in Aruba (Appendix II). Several authors suggest that these artifacts are the cultural remains of "incidental" visitors from the mainland (Versteeg 1991:6; Versteeg & Ruiz 1995:16-17; Dijkhoff 1997:25). Despite this, Versteeg & Ruiz (1995) group Sero Muskita (#89) together with later Preceramic Period sites.

The scant evidence available for this time period does little to identify the origins and/or migration routes of these first Arubans. The origins of the first Arubans may be traced to Archaic groups from Central America, who populated mainland South America

[109] It is unclear whether the Arikok stone tool was recovered at the Arikok site (site #5), now the Arikok National Park, which protects the site's 7 large rocks and 10 cavities with ca. 48 pictograph drawings, (Versteeg & Ruiz 1995:79) or if it was recovered in the geographic area known as "Arikok."

via Panama and Colombia (Dijkhoff 1997; Dijkhoff & Linville 2004). It is unclear whether they reached Aruba via Curaçao or traveled directly to Aruba from the mainland (ibid.). The first Arubans may be associated with either of two Archaic/Meso-Indian complexes from the mainland, the Manicuare culture of "the eastern coast of Venezuela, at the Peninsula of Araya and the adjacent islands of Cubagua and Margarita" (ca. 2500-1000 B.C.) (Dijkhoff 1997:24), and the El Heneal Culture (ca.4000-1000 B.C.) of central and western Venezuela (Rouse & Cruxent 1963:44-47; Dijkhoff 1997:24).[110]

5.2.2 The Preceramic Period

Preceramic sites on Aruba suggest that the early non-agricultural peoples of the island depended to some extent on molluscan resources for their subsistence. Their sites are littered with the remains of shells exploited for the animal they contained, and these archaeological resources have provided datable organic materials that have supported the development of a chronology for Preceramic island occupation (Versteeg et al. 1990). According to Versteeg & Ruiz, three characteristics are diagnostic for Preceramic sites: "lack of pottery, a high percentage of bivalves, and a limestone surface or limestone-association" (1995:20).[111]

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[110] Without detailed lithic analysis, the possibility that both of these mainland cultures left artifactual evidence of their presence in Aruba may not be ruled out.

[111] Versteeg & Ruiz also acknowledge, as Haviser suggests, that the prevalence of bivalves at Preceramic sites may reflect concentrated exploitation of mangroves, adding "if this is true, it suggests a much wider occurrence of mangrove in Aruba in Indian times as compared to the present situation" (1995:20).

Shell tools have been recovered from some Preceramic sites (Dacal & Croes 2004; Dahn 1970). However, few "non-tool" O/S shell artifacts have thus far been attributed to the Preceramic Period in Aruba, and their association remains speculative.[112]

Most of what we know about the Preceramic peoples of Aruba comes from excavations of burial sites concentrated at Canashito and at Malmok, the only Preceramic sites for which archaeological data are presently available.[113] (The report of the Preceramic cemetery at Malmok [Versteeg, Tacoma & Van de Velde 1990] is the first publication to provide contextual data on whole marine shell use among Preceramic peoples on the island.) The 1990 AMA survey revealed that the majority of Preceramic sites surveyed are associated with limestone deposits (Figure 5.1), those areas unsuitable for agriculture, but convenient for harvesting the resources of the sea. Of the few

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[112] Shell spoons manufactured from marine shell, regarded by some as a "tool," and by others as symbolic objects, perhaps produced for ritual purposes (Dacal 2000), have been recovered at "Canashito" (Dahn 1970:7; Dijkhoff 1997:26). However, precisely at which Canashito site is unclear. The dates associated with Canashito site vary from 100 B.C. to 100 A.D. (Versteeg 1991:11) to 500 B.C. to 500 A.D. (Boerstra 1982); a third radiocarbon dating on shell material suggests that part of Canashito was utilized circa 500 A.D. (Ayubi et al. 1985:394, recorded in Dijkhoff 1997:26). (See Appendix II.) These dates suggest that the site, and its associated artifacts, should be considered Preceramic. However, because ceramic remains have also been found at Canashito (Dahn 1970:8-9; Versteeg 1990:35; Dijkhoff 1997:26), and a shell spoon similar in form was excavated from the Ceramic Period Tanki Flip site (#101-C) it is assumed here that these shell artifacts belong to a later culture inhabiting the Canashito area. Clearly, additional archaeological data are needed to establish the cultural association of these artifacts.

[113] Members of the AMA scientific team are presently investigating a burial at Boca Grandi, tentatively identified as Preceramic. Two Boca Grandi sites have been identified since the 1990 AMA survey. At the time of this writing, it is not clear which of these is associated with this burial. Interestingly, Francis Conant and students of the ARC/CUNY investigated a shell midden at Boca Grandi. Perhaps because the data were never published, this site also does not appear in the 1990 site list. However, the preliminary report of the site is on file at the AMA.

exceptions, several are small sites that record shell (and sometimes stone) remains; included among these are Daimari-4 (#36), and Soledad (#95); although it is closely associated with the crystalline part of the island, Site #100 (Suplado) is comprised of sand on limestone, as is the previously-discussed Sero Muskita site (#89).

5.2.2.1 Canashito

As the discussion in Chapter 4 suggests, Canashito has been an area of intense interest since the 1940s. Some confusion arises from the fact that several sites have been identified in the literature by the name "Canashito," and these have only relatively recently been differentiated. Since 1995, Canashito has been recognized as a series of at least five sites (see Appendix Ia) which are associated with a wide temporal range of Amerindian occupation of Aruba.[114] The five sites identified by Versteeg & Ruiz (1995) include one site with colonial materials (Canashito-2, site #26), one pictograph site (Canashito-3, site #27), and three associated with Preceramic burials (Canashito-1, site #25; Canashito-4, site #28; and Canashito-5, site #29). Discussions of Canashito (historically known also as *Canashitu*) do not generally distinguish between the disparate sites. Several radiocarbon

[114] It is possible that six (or more) Canashito sites exist because it is unclear whether the Canashito areas investigated by Conant and students of the ARC/CUNY are among those surveyed in 1990. It is possible that one of the ARC Canashito investigation site is the same one investigated by Boerstra (for which no evidence could be found in 1990), since Boerstra and Conant met on several occasions, including in New York (E. Boerstra, personal communication, November 11, 2004). According to Conant (personal communication), none of the Canashito sites listed by Versteeg & Ruiz (1995) (Appendix Ia), describes the site he and his students excavated in 1967 (Canashito Cave-A).

dates have been obtained for the deposits (see Appendix II). Yet, it is not clear which should be associated with "Canashito" artifacts now in the AMA collection, since the precise provenience of the objects is unknown.

Unlike many Preceramic sites, the Canashito area is located roughly 2800-2900 m from the leeward coast (Versteeg & Ruiz 1995:83). This variation may be explained in part by the Preceramic use of Canashito as a burial site. As Figure 5.2 suggests, the elevation of the Canashito burial sites, many of which were located in or near caves or limestone cliffs of Sero Canashito (70 m), further distinguish them from most other Preceramic sites.

The burials of five individuals excavated by Ringma in 1949 (Versteeg & Ruiz 1995:83) or 1950 (Versteeg, Tacoma & Van de Velde1990:9) at Canashito-4 (Versteeg & Ruiz 1995:83) have been interpreted as a single family cluster (Versteeg 1991:9). Dates for these burials, which range from 100 B.C. to 100 A.D. (Versteeg 1991:11; Dijkhoff 1997:26), are associated with Preceramic inhabitants, as are the physical traits of the skeletons. (The skeleton excavated by I. Tjon Sie Fat at Canshito-5 (#29) on the Northwest side of Sero Canashito also has been identified as Preceramic based on physical traits, Versteeg & Ruiz 1995:83).

Some researchers have proposed that Preceramic peoples buried at Canashito may have practiced cranial deformation (Tacoma 1959; Dijkhoff 1997). Tacoma suggests the possibility that two skulls excavated at Canashito by Ringma may exhibit evidence of "paralello-fronto-occipital" deformation (1959:107-108; Dijkhoff 1997:26). According to

Dijkhoff, Tacoma subsequently confirmed cranial deformation for one of five skulls he investigated that had been excavated in the 1960s by Du Ry and Van Heekeren, and although the provenience of the 1960 skulls is not known, Canashito could not be ruled out (based on physical skull characteristics) as the source (ibid.).

Little is known about the Canashito-1 site (#25). Although it was investigated by Boerstra in 1984, no observations were possible by 1990. Much of "Canashito" (particularly the south side of Sero Canashito) has been destroyed by sand digging activity (Dijkhoff 1997:26), which was already underway by 1970 (Dahn 1970:2). This has further complicated efforts to associate "Canashito" artifacts with specific deposits.

Some have cited evidence recovered from "Canashito" (one sherd from a pottery disc) to suggest that Preceramic peoples of the island had established trade relationships with mainland Ceramic Age peoples (Dahn 1970:9); Dahn speculates that this ware may have initiated from north-eastern Venezuela (1970:9), while Toro-Labrador et al. (2003) favor the Paraguaná Peninsula as the origin of such trade (2003:12). Findings of Versteeg & Ruiz (1995) and Versteeg, Tacoma & Van de Velde (1990) suggest other possible interpretations of this evidence. Might this disc fragment have come from the area now identified as Canashito-2 (site #26)? If so, it should be associated with later inhabitants of the area (those of the Historic Period). The close proximity of the Canashito site to the Ceramic Period Santa Cruz also leaves open the possibility that ceramic remains on Canashito may result from activities of Amerindian Arubans of the Ceramic Period. In addition, four radiocarbon dates (although uncorrected for the marine reservoir effect)

likely also support this interpretation. According to Versteeg, Tacoma & Van de Velde, two of these, collected by Steven J. Gould (1971), "must be associated with the use of the Canashitu terrain by Indians with a Ceramic technology" (1990:66, note 17). Given that materials recovered from Canashito have generally been reported as though from a single component, at present no conclusions may be drawn relative to cultural attributions for O/S marine shell (or ceramic) artifacts recovered from an unspecified Canashito provenience.

5.2.2.2 Malmok

The Malmok site (#46) includes two subsites (Versteeg & Ruiz 1995:87), a cemetery site (#46-A) located on open terrain with a sandy matrix, and a shell midden (#46-B). Approximately 60-70 individuals were interred in the Malmok cemetery, perhaps comprising 15 family groups (Versteeg 1991:9). Versteeg states that the Malmok people "belong to the latest phase" (Versteeg 1991:11) of groups with a Preceramic hunter/fisher/gatherer lifestyle (ca. 500-800 AD).

The skeletal remains recovered from Malmok suggest that Amerindian inhabitants of Aruba's Preceramic Period were "relatively small, strong people" with "very strong muscles and heavy bones" (Versteeg 1991:11). They attained an average height of 1.57 m and 1.49 m, for men and women, respectively (Versteeg, Tacoma & Van de Velde 1990), and had "long, high and narrow skulls" (Versteeg 1991:11). The average age at death for adults was 35 years (Versteeg 1991:11), and most of the dead showed evidence of markedly worn teeth (Dijkhoff 1997:29).

Characteristics of the Malmok burials suggest a variety of mortuary rituals. Roughly 10% of the deceased are associated with the carapaces of sea turtles that either overlay or provide a platform for the individual interred. Many of the deceased were arranged with their hands grasping their heads. Some skulls excavated at Malmok retain traces of red pigment, evidence that was also recovered during ARC excavations at Canashito. Many of the graves contained whole marine shells, which have been interpreted as grave gifts (Versteeg, Tacoma & Van de Velde 1990:14-18). Versteeg concludes that no clear pattern may be identified, since each of the burial attributes identified is randomly distributed "over men, women and children, age-groups and members of family groups" (Versteeg 1991:11).

Analyses of stable isotopes in bone collagen recovered from individuals buried at Malmok revealed a heavy dependence on marine resources (73.3%) (Van Klinken 1990:Ch.8.5; reported in Versteeg,Tacoma & Van de Velde1990:32).[115] Data collected from the associated shell midden suggest that marine mollusks formed an important part of Preceramic subsistence. Radiocarbon analysis revealed that the two sub-sites were not contemporaneous. Four radiocarbon dates obtained for bone collagen samples from Malmok human remains range from AD 410 to AD 990 (Oliver 1997:395, note), while dates on the associated shell midden that supplied the gifts predate these burials by at least 200 years (Appendix II) (Versteeg, Tacoma & Van de Velde 1990:1-2).

[115] Because of this a marine reservoir effect correction (310 years) was also calculated for the bone collagen samples dated by AMS (Versteeg, Tacoma & Van de Velde 1990:32).

It is not uncommon for groups to attach symbolic significance to animals that sustain them (Reitz & Wing 1999; Russell 1999), and it is possible that the people who buried their dead at Malmok valued seashells as symbols of the animals they once contained and/or the sea that supported their well-being. It is also likely, as the researchers who excavated this site propose, that these shells were placed in the graves as valued relics of the ancestors (Versteeg et al. 1990:31). If so, these shells must be understood not only as byproducts of subsistence, but also as artifacts having completed their use cycle among early Arubans as symbolic transformations reflecting cultural behavior.

Versteeg, Tacoma & Van de Velde suggest that Malmok graves with large quantities of shells are "high status" burials (1990:51).[116] Although they could find no clear pattern for grave gift shell species selection, *Strombus gigas* occurred with greatest frequency of the forty-eight molluscan species incorporated into burials at this site (Versteeg, Tacoma & Van de Velde 1990:33).[117] Just six species found in the midden (all bivalves) were *not* also introduced into the Malmok burials (1990:33). Preceramic peoples who buried their dead at Malmok may have found these species less desirable.

The excavations at Malmok uncovered no evidence that the Preceramic peoples who used this cemetery modified marine shells to produce culturally valued objects. From this we may not conclude that none were produced during this period of island occupation.

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[116] The careful recording of species for these graves should facilitate the use of this data in future studies of Preceramic burial in Aruba.

[117] These species were identified by H. E. Coomans (Versteeg, Tacoma & Van de Velde 1990:33).

As Dacal and Croes (2004) reveal, the collection of the AMA does contain marine shell tools recovered from Preceramic sites. Because shell tools were not recovered from the Malmok cemetery, we can verify in this instance that people who interred their dead at Malmok did not incorporate this type of artifact as grave goods. We may not assume that they did not use marine shells to produce tools. The same may be said for modified "non-tool" O/S shell objects. Since no such cultural objects were apparently incorporated in burials at Malmok, none are presently associated with Preceramic peoples who buried their dead there. Perhaps the archaeological maxim, "absence of evidence is not evidence of absence," ought to apply here.

Did the Arubans who buried their dead at Malmok also create beads, pendants or symbolic images using shell? Right now, we can say that we lack any evidence that they did, but we cannot say that they did not. Although available data for Preceramic burial sites suggest that "non-tool" O/S marine shell artifacts did not function as grave goods among Preceramic peoples of the island, investigations of non-burial Preceramic sites are needed to determine any potential use in other areas of life among these earliest Arubans. For now, we simply lack sufficient data on Preceramic lifeways to begin to understand the range of marine shell use (including artifact production) within these early Aruban societies.[118]

[118] Added to this deficiency is the fact that many of the marine shell artifacts in the collection of the Archeological Museum of Aruba are without associated proveniences. A Preceramic origin for these may not be ruled out.

Available evidence suggests that the Preceramic way of life endured until relatively late in prehistory in Aruba (Versteeg, Tacoma & Van de Velde 1990:33). Several authors have positioned Preceramic peoples as having shared the island with later migrants, settled farmers who began to colonize the island beginning in the 10th century A.D. (Dijkhoff & Linville 2004), which is roughly contemporaneous with the last radiocarbon date provided for Malmok.[119]

The evidence for a symbiosis includes the persistence of shell tool types, particularly the shell gouge (Dijkhoff 1997; Dacal & Croes 2004),[120] the continued use of the Malmok cemetery beyond the establishment of Ceramic Age farmers in Aruba, and, perhaps even small quantities of undecorated pottery found at sites that are otherwise consistent with Preceramic occupation (Versteeg & Ruiz 1995:18). Some researchers have also cited the persistence of shovel-shaped incisors among some Ceramic Period human remains as evidence of biological admixture.[121]

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[119] Four bone collagen dates on human remains from Malmok range between AD 410 and AD 990 (Oliver 1997:395, note).

[120] Versteeg concurs that the shell gouge was an important tool for Preceramic peoples in Aruba, but has expressed some doubt about its diagnostic value, since it is found at Ceramic Period settlements in Aruba (Versteeg & Ruiz 1991:17; 1995:19 in Dijkhoff 1997:32).

[121] Preceramic and Ceramic Period peoples have been differentiated on the basis of skeletal morphology. As Dijkhoff & Linville explain, "Dabajuran peoples of the island had relatively low, wide and short skull-shapes, which stand in stark contrast to the high, narrow and long skulls of the Preceramic Amerindians" (2004:6). Average stature also differs; the "stature of the Caquetío at the time of European contact ranged from 1.55m to 1.70m, while the average stature of the Preceramic peoples was 1.57m and 1.49m, for males and females, respectively" (ibid.).

5.2.3 Aruba's Ceramic Period

Radiocarbon dating has also helped to establish the beginning of the Ceramic Age in Aruba (ca. 900/1000 A.D.). Archaeological evidence also reveals that Ceramic Period Amerindians were farmers who lived in villages, unlike their predecessors who were apparently relatively mobile, making their living by moving around the landscape, exploiting the natural resources they found throughout the island and in the sea. Figure 5.3 indicates the location of the Ceramic Period sites identified in the 1990 AMA survey of the island. As this map suggests, Aruba's earliest farmers settled in the crystalline portion of the island, the area with the best soil and hydrological conditions (Versteeg 1991; Versteeg & Ruiz 1995).

Although many researchers cite DeBoer's cautionary note regarding the identification of manioc cultivation in the archaeological record (1975), most continue to associate archaeologically recovered remains of ceramic griddles with the prehistoric cultivation of manioc (*Manihot esculenta*) (Boomert 2003). Boomert suggests that Dabajuroid "manioc griddles are rare" (2003:183), while grinding stones and mortars and *metates* imply that "maize formed part of the Dabajuroid diet in the Venezuelan littoral zone" (ibid.). Small stone artifacts interpreted as "grater chips" also serve as evidence for manioc cultivation among Dabajuroid peoples (Haviser 1991; Rostain 1997). These and other archaeological evidence recovered from Ceramic Period archaeological sites in

Aruba (e.g. Tanki Flip[122]) suggest that Dabajuroid farmers on the island adopted a mixed cultivation strategy, with both maize and manioc as staples (Clarke 1968, and in Dijkhoff 1997:39).[123] This was also documented ethnohistorically (Herdández de Alba 1948:469-474; Haviser 1991:55). Thus, large, flat circular ceramic griddles approximately 2 cm in thickness are interpreted as "plates of pottery used to prepare cakes of cassava [manioc] and maize" (Versteeg 1991:14). Other likely crops include cotton and tobacco. In addition, cultivation of agave could have facilitated the production of fiber useful for making nets, rope, baskets and hammocks (Dijkhoff 1997); its fermentation would produce the intoxicant *fique* to complement the production of *maçato* (maize beer) (Dijkhoff 1997).

We may assume that as in all agricultural societies, the Arubans of the Ceramic Period sought to maximize the land, to grow as much food as possible to meet the needs of their population. Anthropogenic transformation of the *rooi* system at the Tanki Flip site may indicate efforts to intensify agricultural production.[124] Ceremonial activities may

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[122] One hundred and twenty-six "grater teeth" were recovered from Tanki Flip (#101-C). One chert example illustrated in the referenced study (Rostain 1997, Figure 169) bears little resemblance to the grater chips investigated by Iria Barricklo (and in DeBoer 1975:430). Six other illustrated examples (also made of chert) are more morphologically similar (Rostain 1997, Figure 175).

[123] On the mainland, corn cob impressions on ceramics (*tuza*) provide archaeological evidence of maize agriculture (Oliver 1997:377).

[124] This transformation may also be seen as adaptation to local conditions. As Oliver explains, the semi arid, xerophytic conditions of Coastal Falcón and the nearby ABC islands require either that crops have short growing seasons or that they be irrigated through human intervention (Oliver 1989:252).

have precipitated the demand for agricultural products beyond levels required for basic subsistence. Maize beer was important and its use in feasting among the historic Caquetíos was documented by 16th century chroniclers (Oliver 1997:410). Oliver explains its socio-political significance as follows:

> The prestige and display of power of the *diaos* (chiefs) was, at least, partially dependant upon his ability to orchestrate inter-communal maçato feasts . . . this is not a trivial side observation since, the ability of a chief (or élite) to provide vast quantities of maçato meant that, at some level, he must be able to control and harness the production levels of maize beer beyond the needs of individual households or even local village needs (1997:410).

According to Oliver, "vast amounts of maçato were also consumed in funeral ceremonies of principal chiefs" (1997:410; idem 1989:288). Fermented maguey, which was also widely used as an intoxicating beverage throughout much of northern South America (Steward 1948; in Haviser 1991:46),[125] was likely also produced/consumed among the Dabajuroid peoples of Aruba.

Faunal remains recovered during excavations, such as animal bones and shells, also reveal that the Ceramic Period peoples supplemented their diet by hunting small terrestrial species (e.g. iguanas and birds) and by also harvesting the resources of the sea, including fish, sea turtles and their eggs, crabs, and shellfish. The vast quantities of molluscan shell remains recovered during excavations indicate that *Strombus gigas* (Calcó) was the most important of all of the many shellfish species available to early Arubans during the

[125] Haviser's citation lists "Steward 1963." However, no such listing is found in his bibliography. I assume this is simply a typographical error and he intends to cite the Steward's 1948 volume, which does discuss maguey fermentation and consumption.

Ceramic Period. The abundance of this species in Aruban waters may have helped Aruba's first agriculturalists make the transition from mainland to island subsistence.

5.2.3.1 Dabajuroid Ceramics

By definition sites identified as Ceramic Period sites have ceramic remains. With very little debate, virtually all of the pottery recovered at Ceramic Period sites in Aruba has been described as "Dabajuroid" ─ after the type site in Dabajuro, Venezuela.[126] The Dabajuroid series includes a variety of vessel forms, including "jars with perforated annular bases and bowls with hollow rims, tripod legs and fabric impressions on their lower parts or surfaces roughened with the fingers" (Boomert 2003:182). Other Dabajuroid ceramic artifacts include "anthropomorphic figurines, cylindrical stamps, and spindle whorls" (Boomert 2003:183). Clay discs have also been recovered.

Dabajuroid ceramics are characterized by two distinctive wares, a common, more crude "utilitarian" ware (functionally associated with cooking and storage) and a technologically superior "fine" ware (functionally associated with serving and storage). According to Oliver, "the fine ware serving/drinking vessel subset carries the lot of painted designs that give the Dabajuroid series its distinctive character" (1997:412). Oliver suggests that the form and decoration of the fine ware vessel subset is "most diagnostic of related groups and most differentiated (i.e. specific) among unrelated groups, both through

[126] Dabajuroid is one of three series defined by Cruxent & Rouse for Western Venezuela, the other two being Tierroid and Tocuyanoid (Cruxent & Rouse 1958-59, 1961; Rouse & Cruxent 1963; and in Dijkhoff 1997:46).

time and space" (Oliver 1997:417).

Dabajuroid designs are complex and include geometric motifs, such as frets, clavats, line and dot combinations, and linear designs bounded by triangles (Boomert 2003:182). Boomert suggests that the Dabajuroid series "originated in the neighborhood of Lake Maracaibo and the Venezuelan Andes, i.e. in the realm of the Intermediate culture area" (2003:182). Yet, he also acknowledges that modeled Dabajuroid elements, including "small zoomorphic (twin) adornos such as frogs, birds and reptiles" point to Valencia influence (2003:182).

Oliver's 1989 study, The Archaeological, Linguistic and Ethnohistorical Evidence for the Expansion of Arawakan into Northwestern Venezuela and Northeastern Colombia, collapses "stylistic units (various horizons, series, local traditions/sequences into two higher order cultural units. . . . designated as Macro-Tocuyanoid and Macro-Dabajuroid" (1989:312-313), and suggests that the two macro traditions (both polychrome ─ early and late, respectively) are recognizable primarily by plastic attributes of form, decoration and design composition (1989: note 229).[127] Oliver proposes that the Macro-Tocuyanoid

[127] According to Oliver, the archaeological and linguistic evidence for Venezuelan prehistory supports neither Osgood's *Theory of the H*, nor Willey's *Pre-Agricultural/Early Pottery Horizon Hypothesis* (Willey 1958; Oliver 1989:312); instead he concludes that "Venezuela's cultural landscape is far better represented as a dendritic model, which almost precisely matches the riverine network of the Llanos of the Orinoco; that not every seemingly advanced or sophisticated cultural feature or complex is the result of western impact. Likewise, [there exists] a large body of evidence gathered since 1958, when Willey proposed his . . . hypothesis, which suggests that although there are maritime oriented formative ceramic complexes, these are either specialized fishing sites pertaining to an orbit of predominantly agricultural tradition, or represent either a process of acculturation or of symbiosis of coastal (Meso-Indian) fishermen with agriculturally oriented peoples living inland (sharing in the same ceramic tradition)" (1989:312).

tradition may be ancestral to the Macro-Dabajuroid tradition, an early expansion from the Middle Orinoco of an ancient polychrome tradition (Oliver 1989:414; Wagner 1988; Haviser 1991:63, in Dijkhoff 1997:50). Allaire favors a western origin for Tocuyanoid, which he states may be "considered the eastern expansion of the 'First Painted Horizon' of Colombia" (1999:702).[128] Figure 5.4 provides Oliver's 1989 hierarchical classification of these traditions (1989:327). As this classification indicates, Dabajuran is one sub-tradition of the Dabajuroid tradition. (Oliver's use of the term "sub-tradition" is analogous to Rouse's use of the term "sub-series" [Rouse 1986:10; Oliver 1989:320; also in Dijkhoff 1997:46]).

Oliver counters the prevailing hypothesis of internal development influenced by "stylistic diffusion from Colombia" (1989:505); according to Oliver, this hypothesis ignored "the fact that the Dabajuro people could not have 'evolved in situ' nor migrated from Colombia. Speaking the Caquetío language, these peoples who produced the Dabajuro style, could only have come from the Llanos, and ultimately from a Proto-Arawakan hearth" (1989:505).[129] Figure 5.5, which illustrates Oliver's 1989 model of the expansion of the Macro-Dabajuroid Tradition, signifies a plausible explanation for

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[128] Nevertheless, Allaire embraces Oliver's "Macro-Dabajuroid phenomenon," suggesting that it "may have had far-reaching repercussions as far away as the eastern fringes of the Caribbean region, even to the Lesser Antilles and Barbados" (1999:716).

[129] To this he adds the following: "I have shown that the prehistory of Venezuela is intimately correlated with the riverine network of the Orinoco Basin (including the Llanos). It is this rather large lowland area, but in specific niches, where I find that the key to the understanding of the cultural history of the northern parts (Caribbean Coast) of South America" (1989:505).

inferences of influences from both the east and the west (Oliver 1989:484). Table 5.2 identifies sub-traditions, styles and dates for the Macro-Dabajuroid Tradition.

Relatively recent investigations by Arvelo (1995) in the Quíbor Valley have since led Oliver to modify his classification of Dabajuroid and Tierroid as two related sub-traditions "assumed to have diverged from a common historical source" (Oliver 1997:398). It now seems possible that the "Dabajuran Dabajuroid ceramic subseries may have developed from a Tierroid background, if not from Tierra de los Indios itself" (Oliver 197:400.).[130] Based on this shift, Oliver has revised this portion of his Macro-Dabajuroid migration, as follows:

> Tierra de Los Indios preceded the earliest known Dabajuroid style by about 450 years, allowing sufficient time to account for the noted stylistic divergence between them . . . the split of a 'proto-Dabajuroid' from Tierroid did not occur in the Quíbor Valley. The Tierroid styles within the Quíbor Valley appeared already fully developed (Arvelo, pers. comm. 1995), which seems to suggest that the process of divergence probably took place elsewhere before A.D. 400, perhaps in the area between the Turbio River, Upper Cojedes and Upper Yaracuy Rivers (see Arvelo & Wagner [1987] in Fernández & Gassón 1993) (1997:400).

Oliver's updated migration scenario (Figure 5.6) posits a split westward of the fully developed Tierroid branch, and a "Dabajuroid splinter branch spread northeast along the Yaracuy Valley 'gap' toward the Caribbean Coast, and subsequently veered westward along the coastal plains of Falcón State, a region occupied by Archaic fisher folks and inland hunter and gatherers" (1997:400).

Figure 5.7 provides the chronological sequence developed by Oliver for Coastal Falcón and the off-shore islands, the Maracaibo basin, and the Caribbean coast of

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[130] Tierroid derives from the site of Tierra de los Indios (Allaire 1999:715).

Colombia (Oliver 1997:367, figure 286). As Figure 5.7 indicates, ceramics recovered in Aruba are associated with the Dabajuran Dabajuroid sub-series. Oliver's chronology reveals two local styles for Aruba, Santa Cruz and Savaneta (Sabaneta), which was first identified as a distinctive style by Du Ry (1960). The question mark over "Savaneta" in this chronology indicates Oliver's doubt that this style can be differentiated from the late Los Médanos complex of the mainland (1989:3, note 5).[131] According to Oliver, Du Ry's "Santa Cruz" style "and related 'styles' equate with the mainland's Early and Late Urumaco complex phases.

Rouse & Cruxent describe the pottery of Aruba (and neighboring Dutch islands) as "complex" (1969:64). The irregularities in ceramic remains reported for Aruba have, perhaps, contributed to this assessment. A few researchers have noted the presence of zone-incised cross-hatched (ZIC) decoration on a few pottery sherds recovered in Aruba. Five such sherds were reportedly recovered at Santa Cruz by Du Ry (1960:88), who described them as sherds of trade ware pottery of the "Cedros-style" (Saladoid)

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[131] According to Oliver, "The high degree of correspondence . . . between Urumaco style and those from Aruba (i.e. "Santa Cruz style" and probably "Savaneta style") raises the question whether or not the latter should be regarded as separate styles (sensu Irving Rouse). Versteeg (pers. comm. 1996) proposed that the ceramic components of Santa Cruz and Savaneta (or Sabaneta [Versteeg & Ruiz, 1995:116-7]) sites should both be considered as members of a single style, Urumaco style, as it was defined by the author [Oliver] for the mainland. Informally, the author [Oliver] agrees with Versteeg's suggestion that it is more probable that Santa Cruz and Savaneta (or Sabaneta) are not different styles. Nevertheless, a detailed ceramic analysis from Dabajuroid site components in Aruba (e.g. Santa Cruz, Tanki Flip, Sabaneta sites) must still be carried out before making a final decision to forego "Santa Cruz" and "Savaneta" as different styles of the Dabajuran subseries (Oliver 1997, 415-416, passim). Pending this analysis, Oliver continues the " multiple nomenclature (Santa Cruz, Savaneta, Urumaco) . . . following prior usage by van Heekeren, Du Ry, Rouse, Cruxent, Haviser and others" (ibid.).

(1960:89), which is "spread along the north coast of Venezuela via Irapa and El Mayal, as far as Rio Guapo" (ibid.). One alternative explanation suggests that the ZIC sherds in question were never actually recovered in Aruba. Sterks (1982:11) posits that their attribution to Aruba may result from an "administrative error" (in Dijkhoff 1997:35). Because Du Ry and Van Heekeren visited Trinidad around the same time they were in Aruba, it is possible that artifacts recovered from the two distinct locations may have been mixed (ibid.). Yet, crosshatched-incised sherds have also been recovered in Western Venezuela, from a Cero Iguanas Meso-Indian shell heap near Tucacas. Oliver provides a plausible explanation for these anomalous finds:

> I speculate that this intrusive unit may have been the result of direct contacts between the island's resident Meso-Indian people and people of the Guapoid-Ronquinoid Tradition in the eastern coast of Venezuela, where in late Meso-Indian Periods (i.e. Manicuare site: Punta Gorda complex) have been shown to have contacted Coastal Saladoids (i.e. Ronquinoid Tradition (1989:3).

Ceramic remains are among the most ubiquitous archaeological evidence littering the Aruban landscape. It has been estimated that ceramic artifacts constitute ninety percent of all artifacts found at Ceramic Period sites (Dijkhoff, personal communication, 2000).[132] Ninety percent of these are the remains of undecorated 'utility-ware" consisting of vessels to store liquids, cooking vessels, and griddles (circular pottery plates) (Versteeg 1991:14). The large size of some vessels recovered in Aruba reveal the technical mastery of Dabajuroid potters (ibid.).

[132] Evidence recovered from Tanki Flip suggests that this is not an MNI estimate, but an estimate of volume, one that considers each sherd as a single artifact.

A second Dabajuroid pottery type, known as "fine ware," is recovered with less frequency in Aruba. Fine ware vessels are generally smaller, and are "well-finished, by painting, slipping or polishing" (Versteeg 1997:302). The primary decoration techniques of this ware (painting and modeling), provide insight into Dabajuroid culture and clues to regional contacts. These include "coffee-bean" shaped eyes, which may indicate Valencoid influences, and avemorphic motifs recovered from both Santa Cruz and Sabaneta, which may signal contact with Colombia's Rancheria valley (Portacelli Complex) (Dijkhoff 1997:36). Black-on-red decoration, found in Sabaneta,[133] may indicate the site's close association with Los Médanos Phase of the mainland (Dijkhoff 1997:36). Four ceramic figurines are known to have been recovered in Aruba (Raymundo Dijkhoff, personal communication, 2003). Such figurines are frequently associated with Valencia.

Some of the most intriguing discoveries in Aruba are associated with the ceramic urn burials. So numerous were these in historic times that the Santa Cruz and Sabaneta sites have been described as "urn fields" (Van Heekeren 1963:15-16). Urn burials include primary burials, which involves the interment of the dead in large urns, seated in an upright position, often covered with a second inverted urn. Some urn burials are secondary; these may include the remains of one or several individuals. Excavations of urn burials led

[133] Sabaneta pottery contains both grit and shell tempering.

Boerstra to form the following impression:

> I get a vague notion that the prehistoric people of Aruba thought about death as a form of rebirth. Materialization of this belief could even go so far that the deceased was buried, not only in the attitude of a fetus, but even in a set of urns that closely resemble a womb (1976:128).

Historic records indicate that Amerindian peoples in Aruba continued the tradition of urn burial into the Historic Period. This is also corroborated by De Josselin de Jong excavation in Sabaneta of a double urn burial (36 cm below the surface) which contained a piece of glass (Van Heekeren 1960:108-109).

Urn burials (both primary and secondary) are two of the five general burial types identified for Aruba. Other Ceramic Period burials occur without associated urns within or just outside of houses, or in middens. Some of these contain other grave goods; others apparently contained none. Cave burial is also possibly associated with Ceramic Period peoples in Aruba (Versteeg 1991:16). For each of these burial types, Dabajuroid Arubans buried most of their dead in a fetal (flexed) position. In roughly 50% of the cases, skeletons are incomplete, further expression of complex mortuary practices.

In addition to providing cultural historical data, ceramic evidence can also contribute to shell artifact research. Oliver has pointed out that "one anthropomorphic neck specimen from Tanki Flip . . ., exhibits a nose ring (clay appliqué) that is extremely rare in Falcón, yet abundant in the anthropomorphic funerary urn lids of the Ranchoid series in Maracaibo" (Oliver 1997:410). However, according to Oliver, "in coastal Falcón, actual shell nose-rings (*Melongena melongena*) in various stages of manufacture have

been identified at several Túcua and Urumaco style sites" (Oliver 1997:410). Although this artifact type is not among those sampled from the AMA collection investigated in the context of the "Shell Industry of Aruba" project, its illustration in ceramics helps to identify this shell form, which has been recovered at Dabajuroid sites. One may have been recovered in Sabaneta by Bongers and reproduced in his report (1963). A nose ring was among those shell artifacts in one of the private collections of Curaçao studied by Haviser (1990).

5.2.3.2 Shell Matrix Sites of Aruba's Ceramic Period

Boomert asserts that Dabajuroid sites are typically formed by shell refuse heaps (2003:183). This is certainly the case in Aruba. For more than four decades, three main habitation sites (Santa Cruz, Sabaneta, and Tanki Flip) have been the focus of archaeological investigations of Aruba's Ceramic Period.[134] These have been described as shallow, yet extensive deposits left by sedentary farmers (Van Heekeren 1960:19-20). (These sites will be discussed further below).

Two other sites, Tanki Lender-1 (#102) and Parkietenbos-W (#63), described by Versteeg & Ruiz as "medium size" (1995: 64) or "relatively large" (1995:98) are intermediate between the main sites and the many smaller sites with ceramic remains that have been identified in Aruba. Each is closely associated with another site by the same

[134] Van Heekeren describes a fourth: "Seroe Noka" (1963:19). In recent years, archaeologists have determined that Seroe Noka (Ceri Noka) is part of the larger Santa Cruz site (Versteeg & Ruiz 1995). The name Seri Noka is presently reserved for pictographs located nearby.

name. Tanki Lender-2 (#103) is the site of four pictograph drawings, while Parkietenbos-E (#62) is a small site separated by Parkietenbos-W by a *rooi*.[135] Despite their relative importance, little is known about the Ceramic Period sites at Parkietenbos-W and Tanki Lender-1. Neither of these intermediate sites has been the focus of intense investigation.

Other, smaller, Ceramic Period shell matrix sites also await comprehensive research. These include sites at Arashi.[136] The Arashi-3 site (#4) is particularly important, since it is associated with the last remaining significant shell ridge on the island (Dijkhoff & Linville 2004).[137] Data collected during the "Shell Industry of Aruba" survey suggest that sites at Arashi may yet be consolidated into a single site (Dijkhoff, personal communication, 2002). If so, this site would be elevated in importance. The site is

[135] During the July 2000 survey, the two Parkietenbos appeared to all present to comprise a single site.

[136] One of these, Arashi-1 (#2), originally assigned to Aruba's Preceramic Period (Versteeg & Ruiz 1995), will likely be reclassified, since pottery remains were identified during the "Shell Industry of Aruba" project survey in July, 2000. These must be studied further to determine if the site is multicomponent or simply belongs to either the Ceramic or Historic Periods.

[137] The careful excavation of this site could provide important data comparable to shell data obtained for other Caribbean islands. Excavations using the cross-ridge transect methodology employed by Watters (1997) at the Gravenor Bay site in Barbuda should systematically sample the site to determine 1) molluscan taxa composition, 2) shell forms and fragments present, and 3) artifacts in association. Radiocarbon dates obtained at this site could also help to clarify the prehistoric chronology of the island.

threatened by tourist activities, including shell scavenging excursions organized by activities coordinators at some hotels on the island.[138]

Two sites where significant quantities of O/S shell artifacts have been recovered are Botón and Budui. Archaeologists have used the local name generally applied to shell discs "botóns," to name the first of these sites (#21), where large quantities of these shell artifacts were recovered. The site is located approximately 3000 m from the coast. Although, it has been characterized as "a special activity site of *botón* manufacture or use" (Versteeg and Ruiz 1995:82), it has never been analyzed as a shell artifact workshop. Thus, while the processes used to produce the many shell discs recovered from the site may be inferred, the specific details about them (e.g. specific species used, technology, associated remains, etc.) remain unknown.

According to Versteeg and Ruiz, although the Budui site was plundered in 1982, when it was surveyed in the early 1990s, "hundreds of botóns" were found there in association with human bone (Versteeg and Ruiz 1995:82). Further investigation has identified the bones as the remains of three people of the Ceramic Period (Tacoma & Versteeg 1990:3, 5; Dijkhoff 1997:71). Although no dates are available for the Budui site, the cave context and associated shell remains of the graves have led to their interpretation

[138] I personally witnessed one of these excursions. In the context of the "Shell Industry of Aruba" project, I went to the site with Fransisco Croes and Ramón Dacal for the purposes of photographic and removing a ceramic pile that had been generated at the site by well-meaning but misguided visitors (who may have considered the behavior helpful in some way). We decided to remove the pile in an effort to discourage others from mimicking the behavior. We arrived at the site to find a tourist group that had been delivered to the site in a van clearly marked as the property of a major hotel. While hotel personnel sat waiting in the van, tourists were busy digging into the profile of the steep, stratified shell ridge in an effort to scavenge shell specimens.

as evidence of elite burial among Ceramic Period peoples (Versteeg 1992:4; Dijkhoff 1997).

Santa Cruz

Santa Cruz is the largest site identified for Aruba. Its precise size is currently in question. The information reported in 1995 (Table 5.1) holds that the site measures 45 hectares. Recent publications indicate that the area covers just over 10 hectares, measuring 275 m (East-West) by 400 m (North-South) (Versteeg 1997a:89; Dijkhoff 1997:34).[139] It is centrally located, 3.5 km from the leeward coast. Like many sites in Aruba, it has two subsites, a western portion (Santa Cruz) and an eastern portion (Ceru Noka) named for a "rock formation on the northern part of the site" (Dijkhoff 1997:34). The size of the site is not the only thing in question, the name of the site has also been an issue of debate. Boerstra referred to the site as "Ceru Noka." By 1988, the name had been adjusted to "Ceru Noka/Santa Cruz." As Dijkhoff explains, "both the eastern and the western parts of the site are the result of one village located on both sides of the two north-south running *roois* [*rooien*], and consequently the name of the entire site is Ceru Noka/Santa Cruz" (1997:34). Subsequent research has resulted in a new formulation. As Table 5.1 indicates, observations during the 1990 AMA island survey has resulted in a reformulation. Presently, the name "Santa Cruz" applies to the habitation site, while the name "Ser'i Noka" refers specifically to the associated pictograph site.

[139] Dijkhoff cites two sources for this information (Versteeg 1988:19; Versteeg & Ruiz 1995:25). See footnote 110 for further clarification on site dimensions.

Historically, Santa Cruz has been the site of greatest interest to researchers. Small scale excavations and other collection activities date back to 1881, when Father Van Koolwijk investigated the site (Versteeg 1997a:89). Since then, many others have conducted research on Ceramic Period peoples at Santa Cruz, including De Josselin de Jong (1923),[140] and Du Ry & Van Heekeren (1960). According to Versteeg, all of the early excavations investigated the "south bank of the southern *rooi*" (1997a:100) of the site. In 1963, Van Heekeren noted that "the classic sites where Van Koolwijk collected eighty years ago are still prolific in surface finds" (1963:16). Excavations by Boerstra (1971) and Versteeg (1991-1992) were by far the most extensive investigations of the site. Preliminary reports for each of these provide important data on marine shell remains.

"Ceru Noka" [Santa Cruz], 1971

Santa Cruz was the first site Boerstra excavated after beginning his investigations in Aruba (Boerstra, personal communication, November 12, 2004). In 1971 he excavated an area of in the center of the site. He began by excavating a 4 x 4 m square in "arbitrary 10 cm layers" (1974:14). He subsequently abandoned this method, determining that "the topsoil down to 40 cm was to be considered homogeneous" as he expanded the "test pit by 4- by 6- m to form a 4- by 10-m" excavation area (ibid.). According to Boerstra, "all topsoil of the extension was also sifted and the finds collected" (Boerstra 1974:14).

Boerstra estimated that approximately 5% of the ceramic remains recovered in 1971 were decorated either by painting alone or in combination with appliqué (1974:16),

[140] De Josselin de Jong's findings were never published (Versteeg & Ruiz 1995:7).

which were further differentiated from the more common undecorated ceramic remains by the fact that the latter were noticeably thicker, noting that "the thickness of the former seldom exceeds 6 mm, that of the latter seldom is less than 8 and often reaches 10 to 12 mm" (ibid.). He also recognized that the painted pot sherds were stronger and technologically more homogenous (more "equally fired") than unpainted ones. He also identified the use of quartz grit and sand (but neither shell nor limestone) as ceramic temper (Boerstra 1974, passim).

According to Boerstra, the "most conspicuous on the surface of the site Ceru Noka [Santa Cruz] site is the white glitter of shell parts, the majority being fragments of the great conch [*Strombus gigas*], and this occurrence persists in the whole layer of the topsoil" (1971:6). Among the shell artifacts he recovered were "small discs, varying in diameter from 5 to 40 mm" (Boerstra 1974:15). He interpreted small chert points (which he called "flint") as borers used in the production of shell artifacts, since "some of them fit into some of the holes of the shell discs" (ibid.). He also suggested the possibility that these artifacts, which he described as "1 to 2 cm long, not thicker than 5 mm, more or less triangular but often irregular in cross section, and sharp point at one end" may have functioned as "tips for arrows or for use in manioc shredders (1974:15).

Santa Cruz, 1991-1992

The 1991-1992 excavations at Santa Cruz were the result of a joint agreement between the AMA and the Institute of Pre- and Protohistory of Leiden University (Versteeg 1997a:90), one "specifically aimed at questions of site/settlement and at

functional units and organizational pattern" (Versteeg 1997a:90). The excavation team, led by principal investigator Aad Versteeg, included AMA personnel and staff and students associated with Leiden University (Raymundo Dijkhoff among them).

The team excavated 840 m^2 of the Santa Cruz site. Following the mechanical removal of the topsoil overburden, his team excavated 50% of all features uncovered (n = 900); the soil removed from these features was screened using 3 mm mesh. Approximately 69% of the features were interpreted as Precolumbian (n = 618) (Versteeg 1997a:90); these included the remains of human burials (n = 31), dump pits (n = 7), postholes (n = ca. 566), and features interpreted as hearth-locations (14 of which contained burnt stone) (ibid.).

Among the ceramic wares recovered from Santa Cruz is a thin, hard-baked grayish-colored ware (Dijkhoff 1997:36). Versteeg noted that fine ware is associated with burials at Santa Cruz (1997:302). An elaborate burial was excavated from inside an area interpreted as a house, perhaps a *maloca*.[141] It contained an adult male found to have been holding a "rare pedestalled bowl" (Versteeg 1997a:93). Versteeg interprets the high degree of variation in the burials recovered during this excavation as evidence of "complicated rites de passage in the systemic context" (1997a:94).

Versteeg reveals that, along with pottery, shell "fragments were present in large numbers" (Versteeg 1997a:90). According to Versteeg, "one observation on shell is striking: much *Strombus gigas* shell is found at the site, complete specimens, mostly small ones, and fragments" (1997a:100). He also suggests that "the many Strombus specimens

[141] The house floor, located above the excavation level, was not present (Versteeg 1997a:93); it was, apparently, removed during the mechanical removal of the top soil.

seem to have something to do with a special function of these shells at Santa Cruz (1997a:101).

Sabaneta

The Sabaneta site is located just 500 meters from the southeastern leeward coast, at the confluence of several small *rooien* (Dijkhoff 1997:35). Although the list of researchers that have investigated Sabaneta is quite extensive, the site has not been as well documented as have the Santa Cruz and Tanki Flip sites.[142] Thus, little is known of its Ceramic Period inhabitants.

Dijkhoff suggests that the material remains of this site "corresponds closely with that from Santa Cruz, but a thin, hard-baked grayish ware is lacking" (1997:36). Both grit and shell temper occur in the Dabajuroid ceramic remains recovered from the site (ibid.).

Some ceramic remains recovered at Sabaneta suggest regional relationships. A ceramic figurine recovered from the Sabaneta-8 site (Maristella) (#168) (Raymundo Dijkhoff, personal communication, 2004), points to some relationship to the Valencia area of the mainland. Black-on-red ware (also found at Santa Cruz) suggests a Los Médanos association, and avemorphic motifs point toward contact/influence from the Portacelli complex of Rancheria valley, Colombia (Dijkhoff 1997:36).

[142] The general failure to document investigations in Aruba has been noted by Dijkhoff, who asserts "on Aruba it seems to be a trend that the material is excavated, but not investigated, or only partly investigated" (1997:235).

The Tanki Flip Site

The Tanki Flip site (Figure 5.8), a large ceramic age site located three kilometers off the leeward coast of Aruba, just northwest of the capital city of Oranjestad, has been the focus of research during three distinct phases of archaeological research on the island: excavations of Tanki Flip (Henriquez I parcel) in 1968 by researchers of the Aruba Research Center and the City University of New York (101-A)[143]; excavations of Tanki Flip (Henriquez I parcel) in the 1970s by Boerstra (101-B), and excavations of Tanki Flip (north of the Henriquez I parcel) by the research team organized by AMA officials Fingal and Versteeg (101-C). The edited volume that reports the findings of the 1994-1995 Tanki Flip excavations (101-C) (Versteeg and Rostain 1997) provides important data on Amerindian activities at the site, including contributions by archaeologists who focus on prehistoric marine shell use (Dacal 1997; Reinink 1997; Serrand 1997; Serrand, Dacal and Reinink 1997).[144]

Tanki Flip (101-A): The ARC/CUNY Campaign

Hunter College excavations, the first of the three campaigns, began in July 25, 1968 during a field school offered by the Aruba Research Center of the City University of New

[143] The capital letters A, B, and C are attached to the Tanki Flip site number (101) in order to differentiate between these three campaigns.

[144] These reports are vital resources for any researcher who studies marine shell artifacts on Aruba.

York (Heidecker and Siegel 1969:13). A small excavation, it sampled just 24 m^2 of the site (in six 2 m^2 units, five located within a scatter of shell remains identifiable on the surface, and one located outside of this midden area).

According to the principal investigators of the site during this campaign, "all cultural material was kept for analysis but shell was discarded after a sample for each layer was taken" (Heidecker and Siegel 1968:13). They detected soil changes that ranged (from a reddish-brown containing little cultural material to a grey brown in the range of 15- 20 cm from the surface. More than 90% of the shell sampled from the excavations was *Strombus gigas*, a high proportion of which comprised immature specimens (Heidecker and Siegel 1969:13). Shell artifacts recovered from this excavation included 156 discs "less than 1 inch in diameter in various stages of manufacture"[145](ibid.). Layer I contained 71 discs and Layer II, 85. Two contained "Y" type perforations. Two rectangular plaques each with two perforations were also recovered. In each layer, roughly 14% of the discs were reported to have been drilled. They also recovered 700 chert flakes.

Tanki Flip (101-B):The Boerstra Campaign

Between March 1975 and January 1977, Boerstra investigated a large area (ca. 4400 m^2) of the Tanki Flip site, ca. 40 m in a S-N direction, and 110 m in an E-W direction (Versteeg & Rostain 1997:5). Although Boerstra's excavations at Tanki Flip have never been thoroughly published, several preliminary reports provide some insight into his

[145] Because 1/4 inch mesh screen was used to sift the excavated soil, this investigation might not have detected (had they been present) the very small beads found at other sites.

findings there. The excavation area, located within the limits of the Henriquez I parcel, represents approximately 15% of the Tanki Flip (Dijkhoff 1997:36). Boerstra excavated 100 % of all features uncovered (n = 5000), which he identified as either "post-holes, burial pits, pits containing ashes and charcoal, possible storage and refuse pits, and many that cannot be functionally identified as yet" (1983:173). An important contribution of these investigations was the identification of intra-site paleo-rooien, which he called "ditches" (Boerstra 1983; Versteeg & Rostain 1997:5). As Boerstra suggests, these indicated that "the Pre-Columbian inhabitants of the Tanki Flip site had the knowledge and the means to maintain a certain water management in and around their settlement" (1983:177).

Two important objects recovered by Boerstra at Tanki Flip were two jet objects. Versteeg suggests that these objects, which were recovered from graves at the site, "could have been prestige items of equal order" (1997a:101). Their mammiform shape may indicate cultural influence from and/or trade relationships with groups further west.

Nearly two decades after Boerstra's excavations, the pottery he recovered was the focus of an intensive investigation by Raymundo Dijkhoff, which resulted in his master's thesis (1997). Using the Macro-Dabajuroid model developed by Oliver (1997), and its associated chronological framework, Dijkhoff was able to associate this pottery with the

Early Urumaco phase (1100/1200-1350 A.D.), and he suggested that the site was "possibly in transition to the Late Urumaco phase" (1350 to 1450 A.D.) (1997:236).[146]

Tanki Flip (101-C):The AMA/Fingal/Versteeg Campaign

In 1994-5 Fingal and Versteeg headed an international team of specialists who undertook a collaborative salvage excavation and evaluation of a substantial portion of Tanki Flip (101-C). At the time, the site was deemed threatened by proposed residential construction activities. The excavation, the most comprehensive archaeological investigation conducted on the island of Aruba to date, exposed an area approximately $50m^2$, revealing several large structures, seven human burials and a large quantity of artifacts. The excavation focused on some 2500 features uncovered (Figure 5.9) through mechanical removal of topsoil.

According to Oliver, "there is strong evidence that Tanki Flip's inhabitants were culturally, socially, politically, and economically tied to the larger Dabajuroid settlements of the mainland" (1997:363). These two areas share many things in common: secondary

[146] Dijkhoff's analysis divided the pottery remains from 416 features into five major categories: "body sherds, rim sherds, bases, griddles, and appendages/other" (1997:235). He found that just 4.9% of the assemblage was painted, and included painting on plain ware, bi-chrome and polychrome painting (1997:235). The black-on-white painting mode occurred most frequently, accounting for 63.5 % of the painted sherds. Other decoration modes of what Dijkhoff describes as a "relatively ample repertoire" include "coiled rims, finger indentation, modeling, perforation, incision, and punctation" (1997:236).

burials in vessels with lids, pottery, a preference for geometric painted design, similar lithics, and subsistence patterns. The pottery recovered from Tanki Flip is "nearly identical" (Oliver 1997:395) to the Urumaco style of the mainland "in terms of vessel forms, decorative techniques and designs" (Oliver 1997:412). Only the paste and temper material differ. Oliver places the pottery of Tanki Flip (#101-C) within the cultural chronology of Coastal Falcón as follows:

> Santa Cruz style ceramics recovered at Tanki Flip demonstrate that they are all derivable from the Urumaco style of the Dabajuran subseries present in the gulf coast of Falcón and the Peninsula of Paraguaná. These stylistic similarities are not merely individual modes of decoration or vessel types. The entire ordinary and fine ware vessel set, and the range of associated decorative techniques and designs can be matched almost on a one-to-one basis (Oliver 1997:413).

It is clear from this evidence that the Tanki Flip inhabitants maintained close cultural ties with mainland Dabajuroid groups. Functional pottery types identified using pottery sherds recovered at Tanki Flip include vessels for liquid storage, griddles for cooking cakes, and vessels for various other cooking needs. Functional uses for complete pottery vessels were identified as ceremonial; burial urns and whole urns associated with caches were recovered during this excavation. In two caches complete pottery vessels are associated with sea turtle bones (Versteeg 1997b:302).

Versteeg noted the recovery of a small sample of fine ware (Oliver's "serving ware"), small sherds < 20-25 mm, but revealed that no specific function for fine ware could be identified using the 1994-5 Tanki Flip assemblage (Versteeg 1997b:301). He also asserts that "there is not a 1:1 relationship between fine ware and decorated ware"

(Versteeg 1997b:301):

> To judge this relationship on the basis of a collection that consists for its larger part of small sherds is hazardous. A pottery bowl or vessel may be decorated, but, in most cases, it is not completely decorated. This implies that undecorated fragments may originally have been part of a decorated bowl or vessel (Versteeg 1997:301, note 163).

Yet, Versteeg suggests that the Tanki Flip pottery reveals strong cultural norms:

> When the fine ware collection and the decorated collection is overviewed, a conclusion is that all these products were made according to strict rules. These are not direct utility rules, but rules on the shape and manifestation of details such as adornos. The colors of the paint, the faces in vessel walls, the adornos, and other shapes, all seem to be made according to specific *canons*. None of the individual sherds are 100% similar. None of the representations of what seemingly are humans or animals are naturalistic. They are stylized. They are considered *canonized products* used for activities in which these *canonized products* were necessary or desirable (1997b:302).

A primary goal of the 1994-1995 excavations at Tanki Flip was the identification of Ceramic Period settlement pattern (Bartone & Versteeg 1997:23). Figure 5.10 provides the preliminary assessment of the structures (n = 14) identified at the site, which is divided here into 41 units (Bartone & Versteeg 1997:106). (Modifications to this approximation were subsequently appended to the site report; these resulted in the identification of an

additional structure.)[147] A series of postmolds running east-west in the northern third of the excavated area (area II) were interpreted as a "fence structure" not functional throughout the entire occupation of the site (Bartone & Versteeg 1997:104). Bartone & Versteeg interpret this fence as either an attempt to divide the social and cultural worlds or as a defensive construction; they favor the latter interpretation (1997:37).

The shell remains recovered from the Tanki Flip (1994-1995) were the focus of specialist researchers who each produced detailed reports of shell remains (Dacal 1997; Reinink 1997; Serrand 1997). Reinink's report, which includes biological and distributional data for 35 species identified from the site features, focused on the use cycle of molluscan resources. He concluded that shell remains at the site "are either the remains of the shellfish used as a food, or they were raw material for ornaments and tools" (Reinink 1997:150). The relative abundance of shell remains in the southeastern portion of the excavation area (Reinink 1997:153) is consistent with site reconstruction showing two (presumably sequential) structures overlapping in that area and also with the close

[147] Archaeobotanical analysis of wood samples recovered from one feature (F. 1765), identified as postmold, suggests that one structure at Tanki Flip (Str. 10) may have been constructed using *Conocarpus erecta* (button-wood, *grijze mangle*, *mangle blancu*) and/or *Guaiacum* sp. (e.g. lignum-vitae, *pokhout*, *wayaca shimarón*) (Newsom 1997:352). Both of these types have also been identified on Bonaire (Wanapa site) (ibid.). Newsom also suggests that "Lignum-vitae appears also to have been an important wood to prehistoric inhabitants of the Santa Barbara site on Curaçao" (ibid.). *Capparis* sp. (*oliba*) has also been tentatively identified from three stone hearths excavated at the Tanki Flip site (F. 1867, F. 1874, and F. 2607 (Newsom 1997:348); this species, too, has been identified at the Wanapa site in Bonaire (Newsom 1997:350). Fragments of two other wood types were recovered from F. 1867 (ibid.); three fragments are identified as *Caesalpinia* sp. (e.g. *C. coriaria*, *guatapana* or *divi-divi*), and one unidentified species, which may be related to South American genera (Newsom 1997:349).

association with Structure-3, which is the oldest of all structures at Tanki Flip sampled for radiometric analysis (see Appendix II).[148] However, according to Serrand, the data indicate no particular pattern of use/discard (1997:191).

Reinink (1997) identifies several potential extraction areas located within roughly 5 km of the Tanki Flip site; these roughly coinciding with the 4-5 km exploitation range he proposes.[149] McGovern (1980) posits that maritime coastal populations should not be restricted to 10-km catchment areas. Although Tanki Flip is an inland settlement, their proximity to both the leeward and windward coasts, together with the maritime orientation suggested by faunal remains, supports the contention that Tanki Flip inhabitants were not restricted in their ability to exploit all of the island's marine molluscan sources for the purposes of shellfish/shell procurement. Yet, the current distribution of marine meadows suggests that the leeward coast was the most abundant procurement source of S*trombus gigas* available to Tanki Flip inhabitants.

Tools recovered from the 1994-5 excavations at Tanki Flip, both "recurrent" (Dacal 1997) and "highly modified" (Serrand 1997) forms, were made predominantly of shell, accounting for more than 70% of all tools recovered (1997:267), and they were likely used at Tanki Flip to perform a variety of functions (Rostain & Dacal 1997).

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[148] Reinink divided the excavation into a nine area grid. The area to the extreme southeast contained 38% of the total shell remains (by count and weight) (Reinink 1997:154).

[149] This exploitation range is estimated based on the 7-8 km distances that separate the three largest Ceramic Period settlements: Santa Cruz, Sabaneta, and Tanki Flip (Reinink 1997:245).

Ethnographic accounts of both modern and early contact peoples suggest that wooden tools were probably also used (Rostain & Dacal 1997:267). Of the 281 shell artifacts classified as "shell artifacts with a relatively high level of modification," Serrand distinguished twenty-one "highly modified" shell artifact types in two main categories, tools and ornaments (1997). Of these 207 were classified as "ornaments," and 180 of these, the bulk of the elaborate ("highly modified") artifact sample (180/281), were further defined as beads and bead "blanks." Table 5.3 summarizes the data presented for shell beads excavated at Tanki Flip in 1994-1995, including artifacts thought to represent technological stages in their production (Serrand 1997) (See Appendix IIIa, Tables 1-4 for additional data on shell forms).[150] Serrand attributed the low frequency of finished beads (six out of twenty, ca. 30%) to the difficulty associated with the shell perforation process (Serrand 1997).[151]

Rostain & Dacal suggest that the production of some shell artifacts may have entailed care not generally evident in Tanki Flip material culture:

> The coarse aspect of many artifacts, and the lack of care in the finish of most of the artifacts – at least those of stone, shell, coral, and bone – suggests that the Tanki Flip [#101-C] inhabitants did not pay much attention to aesthetic aspects of their products. With their technical knowledge and with the available raw material, they could have made more beautiful artifacts. But they stayed at a relatively low, but probably efficient, level of manufacture (Rostain & Dacal 1997:278).

[150] At Tanki Flip, Serrand (1997) distinguished three bead subtypes: disc (n=16, seven of which are broken halves); ring (n=3); and pearl (n=1) (See Appendix IIIa for additional data).

[151] Shell material rates 3 on the Mohs scale.

Rostain & Dacal assert that relative to this general treatment, Tanki Flip "shell beads and blanks seem to have a more perfect finish" (Rostain & Dacal 1997:278, note 150).[152] Serrand suggests not only that "shell-workers may have been specialized" (Serrand 1997:192), but further that " . . . the elaborate shell artefacts and their archaeological contexts suggest that shell was highly valued, for utilitarian purposes and aesthetic qualities" (1997:217).

The Tanki Flip data reveal several important behaviors regarding marine shell use. The first is that *Strombus gigas* was preferentially selected for both shell tool and shell ornament production. In fact, this particular species accounts for 98% by weight of all shell remains excavated for the site during the 1994-5 field season (Reinink1997:149), and 96% of shell ornaments excavated from Tanki Flip features.[153] This specialization is consistent with the exploitation pattern of this species throughout the Caribbean Antilles. As Van der Steen suggests, "most of the recovered shell artifacts, by far, have been made from *Strombus gigas* shells, all over the Caribbean" (1992:100). This "is a result of its

[152] Rostain & Dacal also note the attention given to some pottery: "in pottery there is a striking dichotomy between the normal, relatively coarse ware and fine ware . . . the latter is called 'serving ware' by Oliver . . . It has a perfect quality and finish, especially the painted pottery specimens. The conclusion is that, in some cases, attention was paid to materials to obtain a perfect finish" (1997:278, note 150).

[153] At Tanki Flip, the species *Strombus gigas* comprised the raw material for ca 92% of all of the specimens classified as "Artifacts with a relatively high level of modification" (Serrand 1997:189). *Oliva reticularis* represented 4.6% of the sample, while four other species together accounted for 2.9% (*Cassis tuberosa*, *Lyropecten* sp., *Melongena melongena*, and *Codakia orbicularis*).

general availability in the whole region, its size, and of the mechanic qualities of its material" (Van der Steen 1992:100). Dacal offers that the natural cleavage properties of this species result in regular fragmentation patterns (1978:30; Serrand 1997:190).[154] Serrand suggests that the inhabitants of Tanki Flip used these properties to preferentially select specific areas of the shell for further reduction (1997:190). According to Serrand, Tanki Flip producers of shell artifacts also exhibited what Keegan describes as "intimate knowledge" (1984:19) of shell ontogeny, and they apparently recognized the three distinct stages of the *Strombus gigas* growth sequence (1997:190). These include the juvenile ("roller") stage, the adult stage, and the mature stage, which is evident by the full development of a thick exterior lip, a process that requires five years. Shell artifact producers at Tanki Flip favored the body whorl and the exterior lip (thin variety) of the adult shell specimens.

It is clear that Tanki Flip inhabitants favored *Strombus gigas* for ornament manufacture. The only other species recovered at this portion of the site that had been used to produce an ornament was the gastropod *Oliva reticularis*. Like *Strombus gigas*, this species is also frequently encountered in archaeological contexts throughout the Antillean Caribbean. However, at Tanki Flip this species accounted for a small fraction of the total count of shell ornaments, and just over half of these were found outside the excavated features.

[154] This finding has been replicated by Curet (1982:60-93) (Serrand 1997:193).

Not only did the prehistoric Arubans at Tanki Flip select specific shell species for the production of shell tools and ornaments, they also incorporated *Strombus gigas* shell artifacts in burial contexts. The behavior suggests that shell had a high symbolic value (Serrand 1997) in a least a segment of Tanki Flip society. With the exception of two infant burials, this particular grave good was found in each of the burials excavated at Tanki Flip during the 1994-5 excavations (See Appendix IIIb). A preliminary study of the shell artifacts identified these grave goods as "bead blanks" based on their morphology.[155] As Serrand suggests, "the recurrent location of some Tanki Flip shell artefacts, like blanks, in the burials suggest that this material also had symbolic functions" (1997:217). Other associated artifacts provide additional clues to cultural values.

The data collected during excavations of this portion of the Tanki Flip site suggest that, in addition to burial urns and shell discs, stone beads and unmodified crystals likely also served symbolic functions among Dabajuroid peoples who buried their dead at Tanki Flip. According to Rostain, several unmodified crystal quartz objects (showing no sign of use wear) were found in Tanki Flip (Rostain 1997:226), and may have come from Sero Cristal, located 5 km from the site (ibid.).

The production of shell artifacts presupposes access to the raw material. Given the relatively low prehistoric population, one might expect that this material would be plentiful on an island so rich in molluscan resources. Despite this abundance, it is possible that the

[155] Whether or not these artifacts could be differentiated from similar artifacts not associated with human burials was one of the many questions pursued during this study. In addition, the diachronic and inter-site distribution of this artifact type was investigated for its potential to reveal distinct symbolic behaviors within Dabajuroid societies.

demand for specific shell taxa exceeded supply. Particularly when one considers that marine shell artifact producers typically target living or neo-mortem specimens, since the shell material they provide is imminently better suited for reduction – unlike that of "old" shell which has been transformed by natural, postmortem taphonomic processes that diminishes the flexibility of the shell matrix. The abundance of immature *Strombus gigas* shells recorded by Reinink (1997) during the 1994-5 excavations of the Tanki Flip site, may indicate some degree of overexploitation of this species. If so, this contrasts with Grouard's assertion that the inhabitants did not over-exploit any animal resources available to them, a finding based on the limited number of juvenile specimens recovered from the site (#101-C) (Grouard 1997:263).

The data available for Tanki Flip clearly indicate that shell artifacts were manufactured at the site. Yet despite a series of large scale excavations, sampling strategies constrain efforts to draw conclusions about the distribution of specialized shell activity areas within the site (Reinink 1997). They also inhibit analyses of both intrasite and intersite variation in the production of O/S shell forms. Yet, the comparison of discrete subassemblages suggests that shell artifact production and other subsistence activities may have occurred at distinct areas of the site. Data collected from selected features (Appendix IIIc. Tables 1-4) indicate a disjunction between the respective volumes of shell and other faunal remains. It is clear by comparing those features that are relatively abundant in whole shells and/or "highly modified" shell artifacts with those that are relatively rich in other faunal remains that few of the features contained relatively high concentrations of

both classes of archaeological remains. This may indicate intrasite specialty and/or that whole shells are not subsistence byproducts.

While the intrusive nature of features (especially post holes) limits the inferences that can be drawn using this data, the interpretation of one of these features as a kiln presents an interesting example of what may be a symbolic use of shell artifacts. Feature #9, which has been interpreted as a kiln,[156] contained four "highly modified artifacts" (HMA), but no other shell remains. As the table of shell artifact provenience (Appendix IIId, Table 1) indicates, these artifacts were all unperforated discs. Other faunal remains, primarily fish and unspecified vertebrates, weighed just 174 gm. Precisely how four discs were recovered from this feature is unclear. It is possible that the discs were offerings either before or after the use of the kiln. It is associated with a radiocarbon date of 910 +/- 30 B.P, a date associated with the Early Urumaco series.

5.2.4 Aruba's Historic Period

The year 1515 A.D. is an important one in the history of Aruba, for it marks the end of the Ceramic Period in Aruba; it is the year that "the greater part of the population" (Van Heekeren 1960:103) of the island was removed and enslaved on the island of Hispaniola. We know this specific date because it was recorded during the Historic Period, after

[156] This "kiln" may also be evidence of a mortuary feature (William J. Parry, personal communication, 2005), a possibility perhaps supported by the ethnohistoric Caquetío practice of elite cremation.

Europeans had crossed the Atlantic Ocean to discover the existence of the continents that would eventually be named after one of them, Amerigo Vespucci.

When the Spanish conquistadors first encountered the mainland Caquetíos, they found them living in "more than one hundred villages" (Narveros and Vázquez de Acuña [1538] in Gabaldón 1962 [2]:324. Translation by Oliver 1989:271), evenly distributed along the coast (Oliver 1989:271-2). Each village was inhabited by approximately 150-200 individuals; thus, the coastal Caquetío population totaled approximately fifteen to twenty thousand (ibid.). The population of Aruba at this time is unknown.

While scant, the historic record of early post-contact events in Aruba provides that any survival of the original Caquetío inhabitants of the island would have endured in a highly transformed cultural environment. Indeed, subsequent ethnohistoric documents support the contention that Amerindians inhabited the island beyond the recognized terminal date of the Ceramic Period (1515 A.D.).[157] They may have been the indigenous descendants of indigenous Caquetíos who somehow evaded capture or those who were

[157] The 1527 agreement between Ampíes and the Caquetío leader Manaure suggests further that Caquetíos were returned to Aruba subsequent to their removal to Hispañola. In 1511 Juan de Ampíes was appointed Spain's first royal factor on Hispaniola. A proponent of peaceful Conquest, he eventually became a defender of the ABC islands, and was instrumental in having them eventually declared as *indios guaitiaos* (friendly Indians) (Quintero 1996:90). According to Quintero, in 1520, Ampíes was given the assignment of repopulating the ABC islands with a group of Caquetío Indians. From there he subsequently established peaceful contacts with those of the South American mainland. In 1526, he used the occasion of a commercial expedition to Caquetío territory to return Indians (Caquetíos) that he had first purchased and subsequently freed in Hispaniola, a gesture which garnered goodwill among the Caquetío. With their cooperation, and the help of his son, Ampíes took steps to establish a permanent settlement on the mainland, efforts which culminated with the founding of Coro on 26 July 1527. One year later, Ampíes was forced to abandon this settlement, which was placed under the control of the House of Welser banking establishment, and "limit his authority and jurisdiction to the island territories" (Quintero 1996:90-91).

returned to the island subsequent to their removal, a result of the 1527 agreement between Ampíes and Manaure (Oliver 1989; Dijkhoff 1997). It is equally possible that non-Caquetío groups could have settled on the island after it was initially depopulated (Oliver 1989:256 cites Altoaguirre [1768] 1908:192). Given both archaeological and ethnohistoric evidence of close contact between the island Caquetíos with their mainland counterparts, it is not difficult to imagine some degree of continuity as mainland groups migrated to the island during the Historic Period. By the mid 18th century the island's occupants were known as *Arubanas.* Their precise relationship to the Aruba's contact Caquetíos is unclear. It is possible that the name is a marker of ethnic distinction. Alternatively, it may describe anyone living on the island.

Few historic sites could be identified during the 1990 AMA survey of the island (Figure 5.11). The location of these sites predominantly in the crystalline portion of the island suggests some degree of continuity with Ceramic Age peoples (Figure 5.12). It seems likely that Amerindian Arubans of the Historical Period continued horticultural activities, perhaps along side other activities associated with animal husbandry. Hunting and gathering of wild resources likely also continued.

Shell remains at Historic Period sites suggest that mollusks continued to contribute to subsistence during this period. Little is known of the use of marine shell among Aruban peoples of the Historic Period. Such use certainly may not be ruled out. One possible marine shell artifact recovered from an historic burial site in 2001 may have functioned as a grave good in the Protohistoric Period. (This site has not yet been mapped.) Although the form of the *Strombus gigas* fragment is unlike other objects in the collection, the object is

clearly modified on its edge. However, the precise circumstances that led it to be deposited in the historic burial in which it was recovered remains unclear. Perhaps it formed part of the prehistoric record and was both unearthed and then redeposited as part of the burial activity of the site. Because the form of the object does not suggest its function, and its modification may be a consequence of excavation activities at the site, this artifact clearly raises more questions than it answers. We simply lack the ethnographic studies of the historic peoples of Aruba that would inform us about the system of thought or the specific meaning of any artifacts they may have left behind, including this enigmatic artifact.[158]

Despite evidence on continuous contacts with the mainland during the Historic Period, restrictions imposed on trade for the Europeans permitted to settle on Aruba (Appendix IV) probably also applied to indigenous inhabitants. Thus, it seems unlikely that any potential enduring trade in O/S marine shell objects during the early Historic Period would have persisted beyond the mid 18th century.

[158] It is important to understand one of the main lessons of the "garbage project" (Rathje & Murphy 1992). It can be summarized in this simple statement: What people say they do does not always coincide with what they actually do. This human tendency reveals one shortcoming of ethnographic data, which depends on information provided by informants. Also, since ethnographers typically rely on just a few contemporary sources for their insights, their analyses lack the time depth and variation that may be provided by archaeological data, which offers a broader perspective on a population's activities.

5.3 Summary

Available evidence (including geographic proximity) suggests that the South American mainland was the source of Amerindian migrations to Aruba, from the earliest inhabitants of the Preceramic Period to the last influx of Amerindian peoples during the Historic Period. Archaeological research in Aruba generally reveals a close association between the island's early inhabitants and mainland populations. Perhaps because this research has focused on the Ceramic Period, excavation data indicate that Dabajuroid populations may have been particularly dependent on these contacts. Evidence of chert "grater chips" is particularly suggestive. Natural deposits have not been located in Aruba, but they do occur on the mainland Paraguaná peninsula (and on Curaçao and Bonaire) (Rostain 1997:223). Faunal remains also indicate trade with the mainland. For example, remains of exotic deer (*Odocoileus gymnotus* subsp.) have been recovered during excavations at Santa Cruz and Sabaneta (Hooijer 1960:154; Grouard 1997:262). Non-endemic, exotic species recovered from Tanki Flip include freshwater turtle (Testudinidae), cat (Felidae) and deer (Cervidae) (Grouard 1997:264). Ocelot bones recovered from a cache at Tanki Flip may indicate that symbolic needs may have stimulated some interchange (trade) between island and mainland groups.

Excavations in Aruba have demonstrated that marine mollusks and their shells were integral parts of island cultures. These natural resources supported the island's early human inhabitants in at least two important ways: they provided an abundant supply of protein; and, they supplied a durable calcareous shell, valued in its natural state and/or as a raw material in the production of other culturally valued objects. Beginning in Aruba's

Preceramic Period, marine shell was an important raw material used to produce a variety of tools. Both ethnohistoric and archaeological data reveal that the ancestors of Aruba's Caquetíos of the Ceramic Period also transformed seashells into "non-tool" O/S objects. The data collected at Ceramic Period sites may provide insight into cultural variation of shell-related behaviors on an inter-site level.[159] Presently, the data suggest that mollusks and their shells contributed to the economic, socio-political and religious lives of these early Arubans and their abundance in Aruban waters may have made them and/or objects made from them potentially valuable in trade relationships with groups on neighboring islands and the South American mainland.[160]

[159] Serrand reports large quantities of "bead preforms and blanks" for both Tanki Flip and the Aruba site of Botón. Does the distribution of this artifact type suggest inter-site specialization in production? An analysis of artifacts from these sites might also inform a consideration of secular versus ritual production.

[160] Van Heekeren suggests that "salt and shell beads were probably used for the earliest maritime staple trade between Aruba and the continent of South America (1960:110).

CHAPTER SIX

"NON-TOOL" O/S SHELL ARTIFACTS IN THE COLLECTION OF THE ARCHAEOLOGICAL MUSEUM OF ARUBA: CLASSIFICATION AND INTERPRETATION

6.1 Introduction

Since its founding in 1981, the Archaeological Museum of Aruba (AMA) has amassed a substantial collection of archaeological materials. Among these are some extraordinarily well-preserved artifacts made of marine shell. These artifacts were studied in the context of a larger study of the "Shell Industry of Aruba," a project developed by Ramón Dacal Moure of Havana University and Arminda C. Ruiz of the Archaeological Museum of Aruba. The explicit goals of this multinational, multidisciplinary project included: "to describe and classify the shell artifacts of the collection of the Aruba Archaeological Museum; to distribute the artifacts over the archaeological sites to determine local sequences in the cultural use of marine shell; and to compare Aruba shell data with data from the Western Caribbean region, the Caribbean area as a whole, and the mainland" (Ramón Dacal, personal communication, 2000).

Of particular interest is the potential of this artifact class to reveal spatial and/or temporal variation in the prehistoric use of marine shell in Aruba. Therefore, this study

relates the findings of the 1994-1995 excavations at Tanki Flip to ornamental, ritual and/or symbolic shell assemblages from other archaeological sites in Aruba, using as the basis for the analysis the marine shell archaeological specimens in the AMA collection.

The criteria used to divide the shell artifacts collection for analysis differs somewhat from those used for the Tanki Flip study (1997), which separated "recurrent forms" and "possible tools" (Dacal Moure 1997) from "shell artifacts with a relatively high level of modification" (Serrand 1997). This study does not include artifacts generally identified as "tools" or "possible tools" (Dacal & Croes 2004). Instead, "non-tool" O/S artifacts, the majority of which could also be described as "highly modified objects," are considered here.

6.2 Classification of Marine Shell Artifacts: Form and Function

The classification system employed by any researcher who studies a collection of artifacts is typically chosen on the basis of the particular artifacts themselves. If one were to examine a collection of beads, for example, it might be useful to divide the collection based on formal attributes, since the function of the objects is already determined.[161] The resulting formal typology would potentially isolate meaningful differences among the artifacts in the collection, which would, in turn, suggest disparate cultural behaviors. For example, the observed differences in such variables as size, shape, color, materials, perforation type, iconography, etc., might reveal significant differences among the beads,

[161] According to the noted bead researcher, Horace C. Beck, "to describe a bead fully it is necessary to state its form, perforation, colour, material, and decoration" (1981:1).

which may provide insight into the social context of each artifact's production. Differences in one or more of these variables may signal differences in cultural value, the time period in which the artifacts were produced, or the artistic canons of a particular culture. Differences in media may indicate a disruption in the supply of particular materials, new trade contacts, or aesthetic choices, and changes in perforation types might point to a change in drill technology or aesthetic choice. In any case, the formal variation would lead the researcher to question why such differences exist and to investigate further to determine the circumstances that could explain the observed variation.[162]

As with marine shell tools, the formal characteristics of many "non-tool" O/S prehistoric marine shell artifacts have historically led archaeologists to infer their function. For many areas, such interpretations are supported by ethnohistoric accounts. Yet, even in areas for which no ethnographic or ethnohistoric data are available, interpretations for some artifacts are often accepted. Again, beads provide a good example. When an artifact conforms to the formal definition of a bead, it is typically classified as such. Under this system, the determination of function follows the analysis of form.

But what if the artifact looks like a bead, has a central perforation like a bead, can be strung on a cord like a bead, but it is, in fact, not a bead? Perhaps a marine shell disc with a central perforation was not intended to serve an ornamental function. This ambiguity has led some researchers to refrain from functional terms in favor of purely formal ones. Instead of "bead," one might describe such an artifact as a "disc with a central perforation."

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[162] According to Schiffer, "because most artifact typologies and attribute definitions contain some degree of ambiguity, a certain level of individual variability will always be present in their application" (1996 [1987]:362).

In his classification of shell artifacts from Aruba, Curaçao, and Bonaire, De Josselin de Jong (1918) describes these artifacts as "perforated," "partially perforated" or "unperforated" discs. He uses functional terms for other marine shell artifacts, and, in a later publication on shell artifacts from St. Eustatius, he suggests that large marine shell discs with central perforations "are beads or spindle-whorls" (1947:48).

6.2.1 When is a bead not *just* a bead?

The answer to this question reveals that even when a function can be reasonably inferred, a functional typology might also be inadequate to the task of classifying ornamental, ritual, or symbolic marine shell artifacts. Although, perhaps, "form follows function" in the production of marine shell artifacts, the formal attributes of an object do not *necessarily* delimit its function(s). What if that "bead" really is a bead, but is also more than a bead? At the Mississippian site of Cahokia a single burial contained 20,000 marine shell beads manufactured with Caribbean shells from the Gulf of Mexico (Mink 1992). Careful excavation of this burial revealed that the beads had been woven into a blanket on which to place the body of a ruler, demonstrating that many "beads" from this site served both a decorative and symbolic function. Although most archaeologists acknowledge that a complete understanding of the full meaning of these grave gifts will perhaps never be forthcoming, their inclusion in a high status burial, suggests not only that a perforated disc might have a variety of functions, but also that they may be important in the cultural context in which they served.

Lois Sherr Dubin emphasizes the cultural import of beads:

> Beads have frequently been enlisted as symbolic repositories of sacred knowledge, have been deemed to have curative powers, served as a fee for passage to the afterlife, and used as prompters to insure the proper conduct of ritual and prayer. (1987:17)

Among the ethnohistoric Kogi of Colombia "beads are part of ritual offerings to insure the future of newly built houses" (Sherr Dubin 1987:17). Since ethnohistoric records that document shell use among the Coastal Caquetíos record that shell beads were used for personal adornment as well as in trade, it is clear that they were valued for more than one purpose.

Multi-valance may also apply to unperforated marine shell discs. While these have been identified in a functional typology as bead "blanks" that represent a reduction stage in the manufacture of beads, circumstances of the recovery of some suggest that their role in prehistoric Aruban society was more complex (Serrand 1997). Several were recovered from burials at the Tanki Flip site, suggesting that these artifacts are not only finished objects, but also that they may have served an alternate, or perhaps, additional symbolic role (Serrand 1997:211).

Hernandez Baño (1984:76-77) identified discs of both ceramic and shell as game pieces that served the Caquetío of Falcón in "*Jugar al Perro*," a game played into the Historic Period.[163] Parry suggests that "Native Americans often used disc-shaped (two-sided) dice. In Basketmaker II sites in Arizona, these take the form of "partially

[163] Lindsay et al. (1968) also describe the partially perforated bone discs recovered from a cache near Navajo Mountain, Utah as "gaming pieces."

perforated" discs often misidentified as "bead blanks" (William J. Parry, personal communication, 2005).[164] Parry further offers that objects identified as game pieces "may not be just recreational, but may serve important ritual functions. In many cultures, dice-like objects are used for divination and fortune-telling, as well as gambling (for example, the I-Ching) (ibid.). Although some shell discs may well represent stages in the production of shell beads ("bead blanks"), it is clear that some might also be finished artifacts that served another function. Because of the ambiguity associated with this particular form, shell discs may not be categorically identified as "bead blanks."

As these examples reveal, efforts to identify the range of functions for marine shell artifacts are frustrated by our lack of ethnohistoric data or analogous extant populations that could inform our understanding of the role these artifacts played in Amerindian Aruban society. Such cultural insight is particularly vital for objects that may have served a symbolic or other function not apparent by their physical shape. A better understanding of these artifact types may be gained with analyses of shell artifact manufacturing workshops. Unfortunately, to date none have been identified on the island.[165]

The most abundant type of marine shell artifact recovered at archaeological sites in Aruba may be defined in formal terms as a "small perforated disc." The same type of artifact may, alternatively, be described in functional terms as "an ornament having a

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[164] Among these groups, the partially perforated side = "heads," the unperforated side = "tails" (William J. Parry, personal communication, 2005).

[165] Reinink's investigation of shell remains at Tanki Flip suggests specialized areas for shell artifact production (1997:155). However, the constraints of the salvage excavation at Tanki Flip did not permit the recovery of evidence beyond that located in site features.

central hole for stringing." The common term "disc bead" is consistent with either of these descriptions. It is with this flexibility in mind that, despite the lesser propensity for bias inherent in a typology based purely on formal attributes (Sutton and Arkush 1996), this classification of the artifacts in the AMA collection incorporates functional terms. It relies primarily on the formal definitions of these terms, while recognizing that the functional definition likely also applies. This allows the classification system to retain common functional terms without necessarily ascribing a specific function to the artifacts they describe. This is useful because researchers of shell artifacts within the region have generally identified these artifacts in functional terms (Boerstra 1982; Haviser 1990; Serrand 1997). Hence, a purely formal classification system may not only discard reasonable inferences about artifact function, but also complicate comparisons between AMA data and other local or regional data sets. Yet, when no conventional functional term is available, nor any specific function known, the classification relies on formal attributes to distinguish between artifact types. Within functional categories, too, subtypes may be established based on differences in relative shell modification, molluscan class, genus or species, technological attributes and/or formal elements.

6.2.2 The Artifact Sample

In an effort to understand the cultural use of marine shell among early Aruban peoples, one thousand and twenty-eight objects from the AMA collections were

evaluated.[166] On close examination of the specimens selected for this study, a few (n = 20) were determined to be natural shell objects devoid of any modifications resulting from human agency. Others were modified objects made of non-shell materials (n = 6). When these were found to share morphological, technical or stylistic attributes with marine shell specimens, these artifacts, manufactured from ceramic, stone, or bone, were also examined, as were several unmodified bivalve fragments recovered from archaeological sites on the island.

As is generally the norm for studies of museum collections, the study sample is not a random sample of prehistoric production. This is true not only because random sampling strategies have not been employed for excavations on the island, but, perhaps more significantly, because archaeological activities in Aruba predate the establishment of the museum by more than a century (see Chapter 4; Dijkhoff 2004). Not only have a large portion of the "non-tool" O/S artifacts produced by early Arubans made their way to other collections, but factors such as collection histories, development, and/or activities of *aficionados* have also impacted the collection in a variety of ways. These factors limit the use of the sample artifacts for inferential statistical analyses of variation between groups

[166] Approximately ninety percent of the sample was drawn from the museum's larger collection by Ramón Dacal and Fransisco Croes in preparation for the "Shell Industry of Aruba" project. At that time nine hundred and fifty-six objects were examined. Nine hundred and twenty-three of these were systematically evaluated. (Objects made of non-shell materials and those lacking any evidence of human modification are not included in this analysis.) The initial formal study of the objects housed in the Archaeological Museum of Aruba took place in February and March of 2001. Eighty-two artifacts were added to the sample when new information made it possible to determine that Boerstra's excavations at the Tanki Flip Henriquez I site (#101) during the 1970s were under-represented in the original sample.

and across time,[167] limitations that also apply to three objects from the collection of Mai Odor examined in the context of this study.[168]

While not a random sample of the whole, the artifacts presented, nevertheless, provide some sense of the range of marine shell artifacts produced by early Arubans. Indeed, a comparison of the AMA study sample artifacts with those published in available reports on the archaeology of Aruba suggests that the sample reflects greater variation in the production of marine shell artifacts than has thus far been reported for the island during the Ceramic Period (Serrand 1997).

6.2.3 Artifact Evaluation

Each of the remaining marine shell artifacts in the sample (n = 1005) was evaluated further. One object, excavated from Santa Cruz, likely dates to the Historic Period. Shell degradation has left no clear evidence of work, thus it is not clear if this object is a culturally determined form, debitage from artifact manufacture, or simply a byproduct of subsistence. Approximately 81% of the remaining shell artifacts in the sample (n = 818)

[167] Although the decidedly non-random nature of the raw data makes inferential statistical analysis ill-suited to this project, descriptive statistics can help to identify central tendencies for the disparate artifact types, data that may reveal variation on the intra-site or inter-site level in Aruba, or on the regional level.

[168] Two of these artifacts are unlike any others in the sample. The third is remarkably similar to a perforated disc from Canashito.

were available for more intensive evaluation.[169] These objects (comprising the subsample) were measured;[170] most were also drawn and, when available, the provenience for each was recorded.[171] Each object was evaluated according to the research design of the project, which sought to determine for each artifact: 1) the identification of the genus or species of mollusk used; 2) the part of the shell used; 3) the techniques employed in the object's manufacture; and, 4) a consideration of function, where possible.

6.2.3.1 Site Distribution and Cultural Context

Table 6.1 provides the site distribution for the AMA "non-tool" O/S sample. Roughly 63% of the artifacts in the original AMA "non-tool" O/S sample (76% of the subsample) are of known provenience. Some of these have been recovered during archaeological research activities, including surveys, site testing and full-scale excavations. Data collected during these research activities help to place these artifacts in

[169] The remaining artifacts in the sample were examined, but were not readily accessible for careful evaluation. Just 8 of these artifacts have associated collection data. They are marked "J. D" to indicate that they are from the Dania collection, thus likely from Santa Cruz. Six of these are biconical beads (Type 2) and two are conical beads (Type 1). All are included on a string of beads on display at the museum. One other bead on the string contained cryptic collection data that could not be deciphered.

[170] Initially, artifacts were measured using a 150 mm *Mitutoyo* caliper, accurate to .02 mm with .01 mm resolution. Some of this resolution was later relinquished in favor of a plastic caliper that would be a bit more "artifact friendly." This was particularly important for those artifacts that had suffered degradation from "Byne's disease," a condition that is not truly a disease, but a chemical process, which results in the loss of shell material, leaving chalky white residue on the surface of the artifact.

[171] Unfortunately, provenience data for many of the objects has been lost.

their spatial and/or temporal context. Others have entered the collection through other means.

While the precise spatial proveniences of these artifacts are not known, most do retain collection data that provide general information of artifact collection locations. These generally lack archaeological associations that could potentially inform our understanding of artifact function, and/or cultural origin. Unfortunately, many other artifacts in the sample (just over 37%) and subsample (roughly 24%) lack site provenience data beyond the island of Aruba in general. These artifacts can provide insights into prehistoric culture on a general level, but they contribute little to help differentiate between diverse prehistoric island populations.

As the table reveals, the Santa Cruz site (#81) is best represented in both samples, with 24.2% of the sample and 28.6 % of the subsample artifacts attributed to this site. The Tanki Flip site (#101), the provenience for 21.4% of the sample and 26.3% of the subsample artifacts, follows closely behind. These sites appear even more dominant when only artifacts of known provenience are considered. As Table 6.2 reveals, the Santa Cruz and Tanki Flip sites account for 37.7% and 34.7% of the subsample artifacts of known provenience, respectively. The bias evident in the samples is not unexpected; it reflects both aspects of prehistoric settlement in Aruba, as well as the history of research and collection activities on the island. These two sites are among the largest prehistoric habitation sites identified on the island (Versteeg and Ruiz 1995); perhaps consequently, they have been investigated more thoroughly than other Ceramic Age sites, those that typically yield O/S marine shell artifacts.

The cultural context of each artifact is considered in an effort to incorporate, in the most comprehensive manner, the data available for each type of artifact represented in the sample. Given the paucity of ethnohistoric sources, our knowledge of Amerindian marine shell use in Aruba is highly dependent on archaeological data. As might be expected, the quality of our inferences improves with the quality of this data. While knowing the geographic location of artifacts is a good first step in understanding their cultural associations, their precise position in the archaeological record can provide insight into their cultural value. Controlled, stratigraphic excavation of these artifacts can reveal not only important details in the production and use of the artifacts, but also any changes in these over time. These temporal data, too, are critical to our understanding of disparate marine shell related behaviors among early Arubans.

Available excavation data suggest that most (if not all) of the artifacts in the AMA sample were produced during Aruba's Ceramic Period, which began with the arrival of the first agriculturalists on the island, roughly A.D. 900/1000, and ended with the arrival of Old World explorers.[172] However, what can be said of the use of marine shell during these five/six centuries of prehistoric occupation of the island? Does the observed variation in marine shell artifacts reflect inter-site differentiation explained either by temporal change, the contemporaneous co-existence of disparate Aruban populations, site specialization,

[172] Because excavations on the island have focused primarily on Ceramic Age sites, this is the only period for which modified non-tool artifacts have been recovered archaeologically. Shell spoons and a distinctive shell disc "bead" have been recovered at Canashito. However, little is known of the precise archaeological contexts of these finds.

differential access to trade goods or a combination of these? Does the distribution of ornamental and/or symbolic (potentially prestige) items signal the existence of craft specialization on the intra-site or inter-site level? Data obtained through controlled stratigraphic excavations on the island will, over time, help to develop our current understanding of the material culture of early Arubans that is recorded in archaeological shell remains, and perhaps also provide better answers to the many questions raised by the study of the AMA collection. For now, we may say that the data indicate variation in the way prehistoric Aruban peoples used marine shell as a medium for the production of cultural objects across both space and time.

6.2.3.2 Identifying "Non-tool" O/S Artifact Source Shell

Upon the initial evaluation of the artifacts, it was clear that many had been both shaped and polished, leaving few natural morphological landmarks that would facilitate the identification the source shell and/or part thereof used in its manufacture. This was particularly true for small artifacts. Many of the very small "bead" artifacts (including some in the 2-3mm diameter range) proved quite difficult to evaluate without microscopic analysis. For this I was fortunate to have the opportunity to use the equipment at the Analytical Microscopy and Imaging Center in Anthropology (AMICA) at Hunter College

of The City University of New York.[173] With the help of AMICA researchers Haviva Goldman and Timothy Bromage, this equipment facilitated the identification of a variety of artifact attributes (e.g. shell reduction details, residues, etc.) for many of the smallest artifacts. It also enhanced the evaluation of shell structure. While it was not always possible to determine the precise species or part of the shell that was reduced to produce each artifact, the AMICA equipment did help to narrow the possibilities. For example, aided by this equipment, it was possible to exclude the use of the shell columella in the production of the smallest bead in the collection.[174]

Several of the "non-tool" O/S artifacts were manufactured using colorful bivalve species, yet the identification of their source shells beyond the class *Bivalvia* seemed dubious. The list of species recovered from the Tanki Flip excavations of 1994-1995 suggested a single species that could potentially serve, the brilliantly colored bivalve recently reclassified as *Nodipecten nodosus*.[175] However, close comparisons between

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[173] Among the facilities available in the AMICA laboratory were a Leo Stereoscan 440 Scanning Electron Microscope, a research-grade Leica-Leitz DMRX/E universal microscope, a Leica M ZAPO Stereo Zoom Microscope with 5-400x magnification capability, an Edge R400 Real-time 3D microscope, which provides high resolution 3-D imaging using transmitted light, and an Edge H160 Real-time 3D microscope, which uses reflected light. These were all directly addressable by a Leica Quantimet Q550 high resolution image analysis system to enhance detail, to improve visual contrast, and to perform various gray/color level analyses and measurement protocols. A Syncroscopy Auto Montage image analysis workstation was also available for the rendering of fully in-focusing imaging in 3d, permitting virtual 3d image output (Haviva Goldman, personal communication).

[174] Some beads recovered in Lara, Venezuela, were produced using the shell columella (Vargas et al. 1993:249). However, the use of this part of the shell has not been confirmed for any of the beads in the AMA sample.

[175] *Nodipecten nodosus* is identified as *Lyropecten nodosus* in the published record of this excavation (Versteeg and Rostain 1997).

many of the artifacts and shell specimens of this taxon revealed inconsistencies that ruled out this bivalve as the donor shell.[176] Might they be made of Spondylus? Although the *Spondylus* spp. so revered in Andean and Mesoamerican cultures are Pacific species, the Caribbean is home to other species of the genus, among them *Spondylus americanus*, commonly known as the Atlantic Thorny Oyster.

If the artifacts were made of Spondylus, why had these shells not been recovered during excavations? Or had they? A search of the museum's archaeological collections quickly uncovered several bivalve fragments and two whole valves. The valves had been recovered during Boerstra's excavations of the Tanki Flip/Henriquez I Site and the work by Bongers at Sabaneta, respectively. The valve from Sabaneta with thorny protrusions (Appendix V, Plate 1)[177] was clearly identifiable to the genus level as a *Spondylus* sp. left valve. However, the valve from Tanki Flip, more orange than the mauve colored Sabaneta valve, has an entirely smooth surface, and post-depositional processes have made it impossible to determine if this surface was created in whole or part by human agency. Some of the shell fragments, recovered during Versteeg's excavations at Santa Cruz, were similar to the valve from Tanki Flip. Others, clearly from the *Nodipecten nodosus*, were similar in color alone to both the valve from Sabaneta and many of the artifacts.

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[176] According to Abbott and Morris, the interior of this species "has channels corresponding to the outside folds. Color reddish brown to bright orange; glossy interior generally some shade of pink or salmon . . . A handsome shell eagerly sought by collectors and seldom found on shore. Single valves can be picked up at Sanibel Island after a storm, but most of the fine specimens seen are brought in by shrimp fishermen" (1995:29).

[177] All plates for this chapter are provided in Appendix V.

The challenge of identifying the source shell for some of the artifacts prompted me to consult a specialist at the American Museum of Natural History in New York City. There, malacologist Paula Mikkelsen identified both the Tanki Flip and Sabaneta whole valves as *Spondylus ictericus* shells and verified that this species had been used in the production of many of the AMA artifacts she examined. (One of these, an unperforated disc, is pictured in Plate 2).[178] She also confirmed the suspicion that for many of the very small artifacts that are completely devoid of original shell morphology, identification of the shell used to genus or species remains dubious. Although recent research on *Strombus gigas* suggests that shell microstructure might be useful in the identification of the shell genus or species for some of the small artifacts in the sample, currently the most that may be determined for many of them is that they are made of calcium carbonate, the main component of shell material. Of course *Strombus gigas* may not be ruled out; however, if this species is the source shell, in many cases it contributes just one layer of the multi-layered microstructure that has inspired recent research efforts.[179] Because of this, the identification even to

[178] Color reproductions of the images presented in Appendix V (plates for artifacts discussed in this chapter) have been previously published by the author (Linville 2004). Researchers requiring more detailed visual information than can be presented using the format of this document are urged to consult that publication.

[179] Researchers at Case Western University are currently researching the potential of ceramic plywood modeled after the shell of *Strombus gigas*, which is, by virtue of its microstructure, much stronger than its constituent parts (Kamat et al. 2000).

molluscan class for some of the highly modified, small artifacts amounts to little more than an educated guess.[180]

Table 6.3 provides the distribution of the AMA "non-tool" O/S marine shell artifacts according to the genus of their source shell. Most of the genera listed represent just one identified species. (See Appendix VI for additional information on these species, including size, habitat, feeding [VIa and VIb] and common names [VIc].) It must be stressed that the highly reduced nature of many of the artifacts precludes a secure shell attribution given available technology. Therefore, this distribution should be considered an approximation. Yet, what it suggests is that during the Ceramic Age, early Arubans preferentially selected only a few of the thousands of the shell-bearing molluscan species at their disposal.

As this table reveals, most of the artifacts in the collection subsample were made from univalve species (93.5%); the overwhelming majority of these (86.1%) from the genus Strombus. Available evidence further indicates that among the prehistoric peoples of the Ceramic Period in Aruba, the species *Strombus gigas* truly does reign supreme as the medium of choice for the production of shell objects. Of those artifacts manufactured using shells of the genus Strombus (80.6%), the overwhelming majority may be further identified to the species *Strombus gigas.* This species also dominates the marine shell

[180] At the first meeting of the Caribbean Shell Archaeology formed during the 19th Congress of the International Association for Caribbean Archaeology in Aruba in July, 2001, participants began to discuss possible collaborate efforts that would advance current techniques incorporated in the identification of raw material source in the production of shell artifacts that leave no trace of the original shell morphology. These efforts are currently ongoing.

artifact assemblage for that portion of the Tanki Flip site excavated in 1994-1995 (not included in the AMA sample). It accounts for 98% by weight of all excavated shell remains at the site (Reinink 1997:149), and 96% of shell artifacts identified as "ornaments" excavated from Tanki Flip features. This specialization is consistent with exploitation patterns of this species throughout the Caribbean Antilles. Van der Steen states, "most of the recovered shell artifacts, by far, have been made from *Strombus gigas* shells, all over the Caribbean" (1992:100). This, she concludes, "is a result of its general availability in the whole region, its size, and of the mechanic qualities of its material" (1992:100).

Of the artifacts sampled from the AMA collection, 6.0% are modified *Oliva* sp. shells, which account for 7.3% of the study subsample. Most (if not all) of these can be reasonably attributed to the species *Oliva reticularis*.[181] Shells of this species accounted for a smaller fraction (4.6%) of the total count of artifacts "with a relatively high degree of modification" for that portion of Tanki Flip excavated in 1994-1995 (Serrand 1997).[182]

Gastropods of the genus Cassis were modified to produce 3.3% and 3.8% of the sample and subsample artifacts, respectively. Most of these can be attributed to the species *Cassis tuberosa,* a species forming a smaller portion of the Tanki Flip assemblage. One half of one percent of the sample artifacts, and 0.6% of the subsample artifacts were manufactured from the gastropod *Charonia variegata*. The remaining univalve species (*Conus* sp., *Cyphoma gibbosum*, *Cypraecassis tecticulus*, *Melongena melongena*, and

[181] Determining this with certainty requires an observation of the live animal.

[182] Just over half of the artifacts were recovered from cultural layers removed prior to feature excavations.

Tonna maculosa), account for less than one half of one percent (less than five artifacts). Of these only *Melongena melongena* was also represented (as a small portion) in the Tanki Flip subassemblage.

Bivalves have been identified as the source shell for just over 6% of the samples, and most of the five genera identified are represented by just one or two artifacts. The two identified to the genus Pinctada are made of mother-of-pearl, most likely from the interior shell layer of a *Pinctada imbricata* valve. However, the genus Spondylus represents approximately 72% (sample) and 77.4% (subsample) of this molluscan class. In terms of shell selection, perhaps the most surprising difference between these samples and the collection recovered within the vast area most recently excavated at Tanki Flip is the apparent absence of Spondylus artifacts in the latter. Not only were modified artifacts of this genus not recovered, unmodified shells were also not found in this area of the site. The AMA sample contains forty-four artifacts identified to this genus, one of which was excavated in 1968 at the portion of the Tanki Flip/Henriquez I site investigated by Lorraine Heidecker and Michael Siegel of the Aruba Research Center. Most of the artifacts identified to genus are likely from the species *Spondylus ictericus*. Most of the ten bivalve artifacts with an unspecified genus are likely also made of *Spondylus* spp. shells. Two are made of mother-of-pearl, most likely from the interior shell layer of a *Pinctada imbricata* valve. Just one artifact can potentially be attributed to the species *Nodipecten nodosus*, a

species that accounted for a few objects from the most recent excavations at the Tanki Flip site.[183]

6.3 Shell Artifact Production

Many "non-tool" O/S artifacts in various stages of reduction and/or unfinished forms verify that prehistoric Arubans did, indeed, produce marine shell artifacts on the island. Despite this, to date no marine shell remains in Aruba have yet been identified as evidence of a shell workshop. Both the abundance and the nature of the shell material present at many sites suggests that careful excavation of marine shell remains could provide this evidence, which would potentially yield better data on the precise technology employed in the production of shell artifacts. At the present time, we must rely primarily on the evidence provided by the artifacts themselves.

The production of marine shell artifacts in the AMA collection involves the basic reduction sequences described by Dacal Moure and Croes (2004), and in the published report on the 1994-1995 Tanki Flip excavations (Dacal Moure 1997; Rostain & Dacal 1997; Serrand 1997). These techniques are generally consistent with those described throughout the literature on prehistoric marine shell industries in the Caribbean region and

[183] Three other species and one genus together account for the remainder (2.9%) of the relatively "highly modified" assemblage at that site; these include the gastropods *Cassis tuberosa*, and *Melongena melongena*, and the bivalves *Codakia orbicularis and Lyropecten* sp.) (Serrand 1997:189).

beyond (Francis 1989; Carlson 1993; Vargas Arenas et al. 1993). AMA marine shell artifacts are made primarily from the shells of just two of the seven extant molluscan classes ─ pelecypods (bivalves) (Figure 6.1), or more frequently, gastropods (also called univalves). In Aruba, as throughout the region, *Strombus gigas* is by far the most frequently used gastropod for the production of shell artifacts (including both "tool" and "non-tool" O/S forms).

The manufacture of an artifact from shell may involve simply drilling a hole. In Aruba both bivalves and gastropods were modified in this way. Other artifacts require more steps. The manufacture of a shaped artifact from a whole *Strombus* sp. shell (Figure 6.2a, Figure 6.2b) begins with the reduction of the shell by direct percussion, generally referred to as "hammering." A lithic implement (stone) is an effective tool for this purpose. (In bead production replication studies on Grand Turk, Carlson [1993] found that another shell also worked well for this task.) The natural cleavage properties of *Strombus* sp. facilitates a predictable breakage pattern that separates the most frequently used parts (the lip and the body whorl) from the shell columella (Figure 6.3a-d). As Dacal (1997) has demonstrated, this may be accomplished by striking the suture created by the mollusk between the final body whorl and the previous ones (Figure 6.3a).

The "breaking off" step follows the reduction by hammering (Dacal 1997). The shell material is typically then further reduced by pecking to produce artifact preforms (Serrand 1997). For the production of some artifact preforms, the shell artisan may utilize a technique known as the "groove and snap." This technique employs a lithic tool to score the shell with grooves that facilitate its breakage by pressure that "snaps" the

groove-defined area away from the raw material source. Archaeological evidence for prehistoric Cuba reveals that scoring the shell facilitated the production of regular preforms in the shell industry on that island. Although no such evidence exists for Aruba, this technique may have been employed in the production of shaped pendant artifacts found at Sabaneta.

Abrasion is often employed to further shape the artifact. One way to accomplish this is by grinding the artifact against limestone or another coarse stone. Some of the artifacts in the AMA collection are highly polished. This may be achieved using a finer stone. An even finer polish may be obtained by rubbing the artifact with hide (Ramón Dacal, personal communication, 2000).

Shell artifact holes (and partial perforations) were most likely achieved using a small tool made of stone, which was probably attached to a wooden shaft. Orchard (1975) illustrates one way a lithic implement used for this purpose may have been hafted (Figure 6.4a). A bow drill might also have been used to produce a rotary action that would help produce the holes (Figure 6.4b). It is also possible that Amerindian Arubans used a pump drill (Figure 6.4c), although Claassen (1998) suggests that this drill type was "introduced to Native Americans by the Spanish" (1998:197). The characteristic cone-shaped holes produced by the drilling techniques can be seen in the drawing of an agate bead illustrated in Figure 6.4d. Many pendants made of Olive shells show evidence that the shell was prepared for perforation by grinding the shell's surface, perhaps against a coarse rock.

A few of the AMA "non-tool" O/S marine shell artifacts are further embellished by incising and/or carving techniques probably using stone tools. Incision was most often

employed by prehistoric Arubans to create linear designs, while carving was used to achieve complex three-dimensional sculptural forms. Partial perforations were also employed as a design motif. Although some artifacts have also, apparently, been colored by mineral pigments, it is not yet clear if this results from human agency or from post-depositional processes.[184]

6.3.1 Perforations

While researchers in the Southern Caribbean have generally sought to classify marine shell artifacts according to their function(s) (Boerstra 1982; Serrand 1997; Haviser 1990), perhaps variation in artifact perforations has presented the most formidable challenge to efforts to identify these functions for Aruban artifacts. Approximately 56% of the artifacts in the sample are perforated with one or more holes. These perforations are most likely produced by drilling the shell surface using a small lithic tool. Haviser reports finding such tools with micro-wear striations that indicate their use for this purpose on Curaçao and Bonaire (1990), and he believes that these tools would have been hafted.

It is currently not known precisely which drilling technique(s) may have been used to produce perforations on marine shell artifacts in Aruba. However, the uniformity of some of the perforations suggests that bow drilling may have been one method employed. In her replication studies of bead production techniques, Betsy Carlson (1995) reports that

[184] Still others exhibit residues, the precise nature of which remains to be determined.

the use of a bow drill in the drilling process exerts considerable pressure on the shell, resulting in numerous artifact fractures for those made of relatively fragile shell material (1995:100). While she states that conch (*Strombus* sp.) shell is considerably more difficult to break (ibid.), artifacts made of this shell material also fractured during the drilling process. One partially perforated disc made from a *Strombus* sp. shell that apparently fractured during the drilling stage of production was excavated by Boerstra at the Tanki Flip/Henriquez I site (Plate 3). It was associated with small chert flakes that may have been used in its production.

The variation in the technology and placement of perforations in marine shell artifacts has led to disparate approaches to the classification of these artifacts. For example, while most researchers identify shell discs with a central perforation as "beads," in Aruba the popular term "*botón*" has been used to describe this artifact type (Boerstra 1982: 45). Indeed, although Boerstra (1982) suggests that the single hole produced by these perforation types likely precluded the use of these artifacts as buttons (as the name implies), and that they must have been used as beads (1982:45), he nevertheless continues to refer to these "bead" artifacts as "*botón*" (1982:46). The general use of this term to describe a wide variety of disc-shaped artifacts has complicated efforts to identify differentiation in the form, function, and inter-site distribution of the "hundreds and hundreds" (Boerstra 1982:45) of small disc-shaped artifacts that have been found in Aruba, cultural remains that have garnered considerable attention on the island (Boerstra 1982).

The hole typology developed by Haviser for ornaments from Curaçao and Bonaire (1990) provides a useful starting point for the classification of perforated artifacts from

Aruba. The first four of the six types he identified are consistent with perforation types observed on artifacts in the AMA sample. Table 6.4 summarizes the relationship between AMA perforation types, Haviser's hole types, and bead perforation types included in Horace C. Beck's classic reference, *Classification and Nomenclature of Beads and Pendants* (1981), which describes a wide variety of bead perforation types from around the world, including all of the perforation types found on prehistoric marine shell artifacts of Aruba, Curaçao and Bonaire.

As this table reveals, AMA perforation types 1-4 are consistent with Haviser's hole types I-IV. However, because this typology, developed specifically as a "bead-hole typology," conflates attributes such as perforation type, shape, and placement, it may not be entirely adopted for this study of prehistoric Aruban shell artifacts. Haviser's Type V apparently identifies not a hole type, but the physical placement of a single hole that would effectively render the artifact a pendant.[185] If both the hole depicted and its location must be replicated in order for the artifact to qualify as a Type V, then it must be concluded that the Aruba collections contain no such type. However, if the placement of the hole (not the hole itself) is key, then the "type" defines a "pendant" (Beck1981; Serrand 1997), and several AMA artifacts would qualify as this type.

In addition, one of the *perforation* types identified for Aruban shell "beads" apparently does not occur in either the Curaçao or Bonaire collections (Haviser 1990). This type (AMA Type 5) pierces the shell without producing the expected cone shape

[185] This type conflates perforation type and perforation placement, essentially establishing a new hole type without regard to the actual hole.

typical of holes drilled into shell material using a lithic perforator.[186] Instead, the holes are straight-sided. This may indicate either a change in technology or, perhaps, a concerted effort to produce this hole type using rotary action to completely drill through the shell material. William J. Parry has advised me that it is not possible to produce this hole type using stone tools, but that it can be achieved using a tubular read drill and abrasives or by using metal (William J. Parry, personal communication, 2005).[187] This hole type combines the characteristics of Beck's Single Type IV and Single Type II. In a perforation typology, this hole type would follow Haviser's first four types, which distinguish variation in perforation types. However, while the AMA Type 5 perforation is somewhat similar in form to Haviser's Type V, its location disqualifies it as this type.

Finally, Haviser's hole type VI is not a perforation produced by drilling, but a shell modification type achieved either by percussion, sawing, and/or grinding of the shell apex/spire. (This type may also result from natural taphonomic processes, making it difficult to identify these shells as objects modified by human agency.) Serrand (1997)

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[186] It is not clear if this hole type, which applies only to disc shaped artifacts, results from drilling from one or both sides of the artifact. However, the lack of any evidence of misalignment suggests that it was probably drilled from just one side (William J. Parry, personal communication, 2005).

[187] The relatively small diameter of the straight-sided holes in the AMA subsample favors the technological change (to metal) explanation for this perforation type (William J. Parry, personal communication, 2005).

employs the term "orifice" to describe this hole type, to differentiate it from perforations intentionally produced by perforating the shell.[188] In Aruba, this hole type applies only to Olive shells modified to produce artifacts that have long been recognized in the Caribbean region (and elsewhere) as "beads."

Table 6.5 summarizes the use of perforation types in the context of this study as a means of differentiating between artifact functional types, and illustrates AMA marine shell artifacts examples of each type. The AMA perforation typology adopts only Haviser's first four "hole" types. The numbers are expressed in Arabic numbers instead of Roman numerals. This shift is necessary to avoid confusion between the AMA Type 5 and Haviser's Type V (which essentially defines a pendant). The number format also helps to avoid confusion associated with Boerstra's description of Type 4 perforations as "V-shaped" (1982:46). (This perforation type is more commonly referred to as "Y-shaped" (Haviser 1990; Serrand 1997:213; Dacal Moure 2004).

Shaped-shell discs centrally perforated with a single hole (Types 1, 2 and 5) are classified as "disc beads." Artifacts similar in form to those described as "ring" (Serrand 1997:210), "loop," or "annular" beads (Beck's Type VIa and VIb)[189] are classified as a bead subtype. Although it is not possible to identify the original perforations made to

[188] Since this hole does not result from a drilling technique, it is not included in the AMA perforation typology presented here.

[189] Beads with "holes more than ¼ and less than ½ diameter [of whole bead]" are identified by Beck as "VIa Medium Large"; those with "Hole more than ½ diameter" are identified by the subtype "VIb Extra Large" (Beck 1981: Plate IV).

produce these artifacts, in cross-section these perforations would appear biconical. Thus, these artifacts have been classified as a subtype of Type 2 disc "beads."

Artifacts with either Type 3 or Type 4 perforations are among those classified as "adornments." Some of these are also disc-shaped; many are not. The use of the term "adornment" is consistent with the classification used by Serrand (1997) for Tanki Flip artifacts representing identified stages in the production of artifacts with Type 4 perforations. As Serrand suggests, such artifacts may have been "applied or fixed (ligatured, pasted, sewn . . .) on a support (human body, clothes, objects . . .)" (1997:213). In addition, despite Boerstra's inference that Amerindian Arubans probably did not use artifacts with V-shaped perforations (Type 3) as buttons (as the popular name "*botón*" implies), this potential use may not be ruled out. In fact, ethnohistoric sources describe the female use among some Amerindian groups of garments that were secured with brightly colored fasteners. For example, Wilbert reports the use of colored beads of one or more colors as fasteners for pre-puberty breechcloths worn by Guajiro women under their *mantas* (tunic-like dresses) (Wilbert 1972:166). Type 3 marine shell adornments particularly those made of Strombus shells) may have served a similar function among Amerindian Arubans.[190]

In addition to their many other potential uses, "adornment" artifacts may equally have served as "bead" ornaments among Amerindian Aruban populations. Such artifacts would qualify as a "bead" subtype within the classification system developed in 1926 by

[190] Also, the use of the term "adornment" is *not* meant to exclude the use of these artifacts as "beads." Indeed, as Beck's bead perforation typology suggests (1981:Plate IV), these "adornment" artifacts may also be considered a bead subtype.

Beck.[191] The term "adornment" is here used primarily to distinguish these morphological and/or technically distinct artifacts from the more common single perforation disc "bead" types.

6.3.2 Reduction Sequence

Fixing the precise sequence employed in the production of some marine shell artifacts remains problematic. This is apparent not only in the AMA study collection, but also within the Tanki Flip sample from the 1994-1995 excavations at that site. Many incompletely drilled artifacts identified as "beads" suggest that hole-drilling precedes any reduction techniques aimed at providing the artifact with a smooth finish (e.g. abrasion or polishing). This is apparently also true for artifacts described as adornment "preforms" in the Tanki Flip report of "artifacts with a relatively high level of modification" (Serrand 1997:212). Some are highly polished artifacts without perforations, while others, including one with a Type 4 perforation, have extremely jagged edges. A number of explanations are possible for this. Perhaps the "adornment" category actually contains a heterogeneous assortment of artifacts and/or a polished "blank" is actually a finished object. It is also possible that the reduction sequence for adornments was not consistent among prehistoric inhabitants at Tanki Flip, or alternatively, changed over time. A better understanding of the production sequence(s) for this artifact type will await careful, stratigraphic excavations of shell matrix sites on the island.

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[191] Despite recent criticism of his effort, Beck's typology continues to be highly influential among bead researchers.

6.4 Shell Artifact Variation

The marine shell artifacts in the AMA "non-tool" O/S sample may be "lumped" into eight general categories (Table 6.6).[192] (Again, some of these categories suggest a function; others are based on regularities in formal attributes.) Disc-shaped forms occur with greatest frequency. "Beads" account for 41.8% of the sample and 32.8% of the study subsample; small, unperforated discs account for roughly 33.5% and 37.2% of the sample and subsample, respectively. These two are by far the most frequent general types. Smaller categories in the subsample include pendants (9.7%), adornments (7.8%), geometric forms (3.8%), receptacles (3.6%), medium and large disc forms (2.8%), and a miscellaneous category (that includes modified shell nodules/spines, bipoints, cylindrically shaped "pegs" and sculptural forms accounts) for 2.5% of the study subsample.

Purdy suggests that "numerous similar artifacts from different locales are needed to create types and to assure that one is not describing interesting but nevertheless eccentric pieces" (1996:130). While useful in understanding the formal and/or technical attributes shared by artifacts within each of the general types, these categories do not reveal the variety of shell forms in the museum's collection. For example, "lumping" together all artifacts that feature one or more perforations placed to facilitate their use as pendants

[192] One artifact included in the inventory, but not in any of the larger categories, is a possible grave gift. It was recovered from a recent salvage excavation at Santa Cruz. Because the site was disturbed, it was not possible to determine the precise provenience of the artifact at this site. It might simply be a byproduct of subsistence activities. Alternatively, it may represent debitage from shell artifact manufacture. The object itself, a fragment of a *Strombus* sp. shell body whorl, from the area just below the final suture, is too degraded to reveal technical modifications.

obscures disparate iconographic ("symbolic") representations evident on artifacts belonging to this larger class. This process also does not reveal the range of shell species selected by Amerindian Arubans in the production of shell artifacts. In light of these "lumping" shortcomings, a "splitter" approach is often favored here, in order to reveal the variation masked by general categories (Willey 1949; Purdy 1999), and to highlight unique, "eccentric" creations in the AMA collection.[193]

6.4.1 Shell-Shaped and Shaped-Shell: Automorphic and Xenomorphic Forms

This presentation of the AMA marine shell artifacts distinguishes between two approaches to the cultural use of marine shells. Artifacts that retain most of the original morphology of the natural shell from which they were made are considered first. These automorphic (shell-shaped) artifacts suggest that prehistoric Arubans valued the natural shell, either for aesthetic, ritual or other symbolic reason(s) or, perhaps, for a combination of these. For automorphic artifacts, shell modification may have been as simple as striking a single blow to the apex/spire of a gastropod in order to produce a suitable hole for stringing. More modified artifacts in this class have been perforated and/or reduced by pecking or abrasion.

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[193] However, it must be recognized that, taken to an extreme, the "splitter" approach can quickly get out of hand. For example, if we estimate that the relatively small "adornment" category contains artifacts with five basic shapes and four different perforation types, this one category alone would potentially account for twenty subtypes before the artifacts are further divided according to class of marine mollusk modified. Further division by more specific biological or formal attributes would further subdivide these subtypes. With so much variation apparent in the sample, great care must be exercised in choosing those variables that are potentially meaningful in terms of cultural variation, less the classification system impose more chaos than order on the artifact sample.

Automorphic shell artifacts are here divided first by functional types suggested by technical modification of the source shell, with subtypes indicated by variation in source shell selected. Those in the AMA sample likely functioned as ornaments among prehistoric peoples of the island. The shells of *Oliva reticularis* mollusks provided the overwhelming majority of the shells used to produce automorphic artifacts. These artifacts are generally classified as either beads or pendants. Shells of *Conus* sp. and *Tivela mactroides* valves were also modified to produce pendants. These artifacts correspond to Beck's group XXVII "Beads and Pendants made of or representing complete shells" (1981:30). A fourth species, the gastropod *Cyphoma gibbosum*, is represented in the collection by a single artifact, which likely served an ornamental function the precise nature of which is not indicated by the shell's modifications.

Automorphic artifacts are followed by shaped-shell, "xenomorphic"[194] forms. These comprise the greatest portion of the sample, as well as the largest portion of each general category. Shaped-shell objects indicate that prehistoric Arubans valued marine shells as raw material for the production of culturally valued forms. However, within this shaped-shell artifact class, several artifacts also retain (sometimes feature) specific morphological features of the natural shell, elements that hint at the value placed on these attributes by prehistoric Arubans.[195] These shell artifacts may indicate either an aesthetic

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[194] This term is the English equivalent of the term "xenomorfas" used by Velázquez Castro (1999) in her study of shell artifacts from the Templo Mayor at Tenochtitlan.

[195] This difference may well justify division into two distinct categories (semi-automorphic and xenomorphic, respectively). It should also be noted that shell selection criteria beyond shell may not have survived. Color and patterning are two examples

choice of the artisan or a specific (albeit unknown) symbolic meaning associated with the shell selected. In each case a "shaped-shell" artifact is achieved by significantly modifying the shape of the natural shell. Some shaped-shell artifacts conserve little or no indication of the source shell. Some are so finely polished that identifying the raw material from which they were made remains dubious.

Shaped-shell artifacts are also divided first by functional categories suggested by technical modification. Subtypes of shaped-shell artifacts may be determined either by variation in source shell or by variation in form.[196] Table 6.7 summarizes the resulting subgroups for both the sample and subsample. Many of the resulting artifact types within these subgroups are consistent with those recorded elsewhere for Aruba and for the Caribbean area in general; others are, apparently, unique.

As this table reveals, medium and large discs (whether perforated or not) are segregated from both the small unperforated disc and shaped-shell "bead" categories. This

[196] While this system differs from the classification of automorphic forms, it is favored here primarily because within this class of artifacts, formal attributes are known, while the specific source shells sometimes are not.

was necessary not only in order to maintain consistency with the data reported for the Tanki Flip excavations (1994-1995) (Serrand 1997), but also because a frequency distribution of all unperforated disc-shaped artifacts in the AMA sample, which range in diameter from 6.5 mm to 138.5 mm, is multimodal. Given the large sample size of artifacts in this general category, these artifacts can reasonably be split into distinct subgroups. The same may be said for perforated disc-shaped artifacts, which range in diameter from 2.4 mm to 113.4 mm.

6.4.2 Shell Artifact Forms

6.4.2.1 Beads

Artifacts in the sample identified as beads take two basic forms. Roughly 8.6% are shell-shaped "automorphic" forms; the rest (91.4%) are shaped-shell "xenomorphic" bead types that together form the largest single subgroup of the AMA study sample (38.2%).

Automorphic Beads

Oliva reticularis

In a study of Olive shell artifacts from the Virgin Islands, Sickler Robinson (1978) identified two types based on the shell's modification. The first type lacks all or most of the shell apex. While the loss of the apex is something that may occur naturally, Type I shells clearly reveal modification by human agency, deliberate reduction by pecking. Many are reduced down to the final suture of the shell body whorl. The end result is a shell with a jagged edged orifice at the apical end. This type is identified as a "bead" (Kidder

1944; Haviser 1990). (N.B. Olive shell artifacts consistent with Sickler Robinson's second type, those further modified to produce pendants, are discussed under the "Automorphic Pendant" heading.)

As is the case for many sites in the Caribbean, *Oliva* sp. beads have been excavated in Aruba (Plate 4).[197] Among Dabajuran populations, *Oliva* sp. beads may have been strung together in a continuous strand or alternated with other decorative elements. Those in the AMA collection sample (n = 36) range in size from 23.3 mm to 40.3 mm (mean = 31.9 mm). Most no longer retain the external patterning that might help identify the specific species of each artifact. However, the distribution of *Oliva reticularis* around the island, suggests that this is the donor species for the automorphic beads in the AMA collection sample.

Although Type I *Oliva* spp. shells are consistently identified as "beads" when they occur in archaeological assemblages, it must be acknowledged that these artifacts may also have served an entirely different function. In Mexico, *Oliva* spp. shells have been recovered archaeologically in prehistoric contexts that suggest they functioned as inserts for rattles made of wood (Safer and Gill 1982:153). Scratches on the surface of some of the AMA artifacts may have been produced in this way (particularly if they were included with other component materials). However, because wood or other biodegradable materials useful in the production of musical instruments do not generally survive in prehistoric sites in Aruba, evidence that prehistoric Aruban peoples may have used Olive shells in this way

[197] There are several of unknown provenience, which makes it quite difficult to determine their potential use among prehistoric peoples.

is lacking. The recovery of evidence to support this alternate use (should it exist) would require careful attention to the archaeological context of *Olive* spp. shells.

Xenomorphic Beads

Artifacts identified as "xenomorphic beads" (Plate 5) are disc shaped and have central perforations of one of three basic types: Type 1, conical; Type 2 biconical, or Type 5, straight-sided (no cone). De Josselin de Jong discovered long ago that it is often not possible to distinguish clearly between conical (AMA Type 1) and biconical type (AMA Type 2) perforations (1918). This is because, while some perforated shell artifacts clearly reveal two cones drilled from either side (Type 2), most of the perforations in artifacts with the "xenomorphic beads" in the sample are less well-defined. Generally, these artifacts exhibit one primary perforation, with the other side revealing a very shallow cone that might result from the reduction sequence, or might, alternatively, have been created through use-wear. Technically speaking, they are biconical. Whether or not their secondary cone reflects the technical intent of the artisan is a debatable question, certainly one that merits further investigation. Most xenomorphic beads retain the natural surfaces (both interior and exterior) of the respective source shell. However, one Type 2 bead from Tanki Flip has been smoothed by abrasion on both sides.

Although it is often difficult to distinguish between Type 1 and Type 2 perforations, some perforated disc artifacts leave little doubt. These typically have very profound Type 1 (conical) perforations. This type is consistent with the perforation type most prevalent among the artifacts recovered from the 1994-1995 excavations at that site

(Serrand 1997).[198] Approximately 39 of the sample beads have perforations that are clearly Type 1. Of those with a known provenience (74%), 66% are from the Tanki Flip site. Disc beads with clearly definable Type 2 perforations are the most ubiquitous type of bead in the AMA collection samples. A few beads in this category may be further distinguished by their variation in formal attributes and/or techniques of manufacture.

Approximately 60% of the beads studied fall within the size range identified by Serrand for the beads recovered from the 1994-1995 Tanki Flip excavations (0.9 cm -1.5 cm) (Serrand 1997).[199] These range in diameter from 8.5 mm to 15.4 mm (mean = 11.7 mm). Sixty-eight beads fall below this range; these "microbeads" measure from 2.4 mm to 8.4 mm in diameter (Plate 6). A few beads exceeded the range (≥1.5 cm) (n = 20). Of these, two (discussed below) were outside the range provided by Serrand for all bead subtypes, including shaped artifacts and preforms (0.9 cm-2.5 cm). However, these may also be distinguished from larger perforated discs classified as "medium discs," and thus are also included here.

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[198] The beads recovered from the 1994-1995 Tanki Flip excavations are not currently in the museum, and, thus, were unavailable for direct visual comparison.

[199] Not all of the beads examined could be comprehensively studied. For example, beads on display at the museum were examined. However, both the need to keep the display intact for visitors and the fact that the beads are strung together on a necklace, prohibited a comprehensive study of these beads. Still, none of the beads excluded from the discussion may be considered unusual either in terms of size or source shell (or part thereof) used in their manufacture. Most also lack specific site proveniences.

Annular Beads

The AMA sample contains a few artifacts that may be described as "annular," "loop," or "ring" (Serrand 1997:210) forms. Three bead artifacts are classified in this subgroup. They range in diameter from 7.9 mm to 15.2 mm (mean = 11.3) (Plate 7). Only the largest of these is of known provenience. It was excavated by Boerstra at the Tanki Flip site.

Variation in the range and arithmetic mean ("average") for diameter measurements for sample disc beads for each of the sites suggests that variation exists in the spatial distribution of these artifacts. As Table 6.8 indicates, the mean measurement for beads from the Santa Cruz size is significantly lower than those obtained for the other sites.[200] This discrepancy may be explained by the relative abundance of very small beads from Santa Cruz in the AMA sample.

The discrepancies between the site means prompts the question: Might prehistoric and protohistoric shell beads exhibit changes through time, as archaeologists have discovered is the case in the U.S. Far West? Although it has been suggested that Caribbean prehistoric beads are not particularly diagnostic due to their ubiquity in the region (Haviser 1991:90), a comparison of the museum collection with the Tanki Flip data suggests that perhaps spatial and/or temporal variation exists in the distribution of shell beads in Aruba. The disc beads recovered at Tanki Flip (1994-1995) all exhibit conical perforations and

[200] Note that the mean measurement for Sabaneta is unstable, since few beads in the AMA sample (n=4) are from this site. Also, the Arashi 2 and Canashito sites are excluded, since they are represented in the sample by just one and two beads, respectively.

range in size from 0.9 – 1.5 cm. (mean = 1.2 cm). However, the museum's collection contains several beads outside of that range. Many of these (n = 68) are highly polished, small Type 2 biconically perforated beads having a diameter less than 0.9 cm (≤8.4 mm). The 2.8 mm mesh used to screen at Tanki Flip during the 1994-1995 excavations at the site (Bartone and Versteeg 1997: 26)[201] would have assured the recovery of all but the tiniest of the AMA microbeads, and should have recovered any such beads had they been present in the extensive area excavated during that investigation. However, none were recovered (Serrand 1997).[202]

The term "microbead," a relative term, applies to small disc beads with maximum diameters less than the lower limit identified by Serrand for shell disc beads recovered during the 1994-1995 Tanki Flip excavations (0.9 cm).[203] Although each site in Table 6.8 is represented in the sample by at least one bead smaller than those described by Serrand for the 1994-1995 Tanki Flip excavations, most of the microbeads in the collection sample are from the Santa Cruz site.

The tiniest bead in the collection (2.4 mm in diameter and 1.0 mm thick) belongs to the microbead subgroup. It was found at Santa Cruz. This bead is among the smallest

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[201] During the Hunter College research at the Tanki Flip/Henriquez I portion of the site in 1968, excavated soil was sifted through a ¼ inch (6.3 mm) screen. If the microbeads were to be found during this field work, it would have been largely by chance discovery, as this mesh size would not have been sufficiently small to trap many of the smallest beads in the collection.

[202] If micro beads do actually exist at this site, the failure to recover them archaeologically may be explained by other excavation methods that do not favor their recovery (i.e. the removal to unscreened dirt piles of "disturbed" soil to a depth of 30 cm) (Bartone and Versteeg 1997:25).

[203] The smallest bead in the annular/loop subgroup may also be classified as a microbead.

known for the Caribbean region (Alegría 1981; Carlson 1993; Haviser 1990). In the context of her shell bead research, Carlson (1993) noted that she was unable to find evidence of shell beads smaller than 4 mm other than at the GT-2 site (Grand Turk) where 190 such beads were found, the smallest of which also measured 2.4 mm. Haviser reports that the disc beads from Bonaire and Curaçao he studied range from 2-90 mm (1990:87). It is not clear if this range applies specifically to marine shell beads, since his analysis also included beads made of stone, bone and un-tempered clay materials. In a later publication, Haviser reveals that the smallest artifact from Bonaire measures 4 mm in diameter (Haviser 1991:41), so the smallest disc bead he describes must be from Curaçao.[204]

Boerstra reports finding "small shell discs, varying in diameter from 5-40 mm, sometimes drilled through the centre" during his excavations at the Santa Cruz site (#81) (Boerstra 1971:7).[205] Of the drilled specimens, he discloses that "in the small discs the hole in section is conical, in the larger ones, where it can be up to 4 mm thick, the hole is biconical, like an hour glass" (ibid.). Although "small" is a relative term, one that may not be clearly defined in this instance, Boerstra's finding is apparently inconsistent with the AMA sample of perforated forms, since all of the tiny beads in the AMA collection have Type 2 biconical perforations. This may be explained by the sample bias. Alternatively, it is possible that none of the "micro" discs recovered by Boerstra at this site were perforated forms.

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[204] According to Haviser, Ceramic Age peoples on Bonaire manufactured "shell discs, beads and pendants, with and without perforations, of various dimensions ranging from 4 mm to 4 cm in diameter" (1991:41).

[205] This site, then known as *Ceru Noka*, has since been renamed.

"Heishi" Beads

A few microbeads in the collection (n = 26) are further distinguished within the microbead subgroup by a particular technique of manufacture known as the "heishi" or "heishe" technique (Francis 1989). Heishi beads (Plate 8) are produced by stringing beads together and subsequently grinding their perimeters by rolling them as a group across a lithic or other abrasive surface. (Sand and water may be used to ease the grinding process.) This technique facilitates the production of beads with uniform perimeters (Plate 9). However, its successful implementation requires both knowledge and skill, as the misapplication of the technique may result in enlarged and/or irregular bead holes.

Micro "heishi" beads in the AMA samples range in diameter from 2.9 mm to 7.9 mm (mean = 4.9 mm) and in thickness from 1.2 mm to 2.6 mm (mean = 2 mm). Few of the micro "heishi" beads of this type in the AMA sample and subsample retain collection data. Those of known provenience are all from the Santa Cruz site (n = 10).

"Budui" Beads

A few beads in the AMA sample have central perforations that are straight-sided. These are bored through the shell without producing any discernable cone. These beads are among those recovered from the Budui site (#24). Some beads from this site, many of which have Type 2 perforations, may be further distinguished from most other beads in the AMA sample. While most sample beads have been reduced from the body whorl of *Strombus* sp. shells, some beads recovered from the Budui site are made from the interior lip portion of the shell, as Plate 10 reveals. For other beads from this site, factors such as

bead thickness and shell surface permit a similar inference. Because of its thickness and toughness, the part of the shell used to produce these beads is more difficult to work. The artisan who produced these beads was a skilled artisan and/or had at his disposal tools more sophisticated than the lithic implements inferred as the tools used to produce most of the shell beads in the AMA sample.[206] The uniform perimeters of many Budui beads (Plate 11) suggests that the "heishi" technique may also have been employed in the production of these artifacts.

Because all "Budui beads" were recovered together, we may consider the possibility that they were also all produced at about the same point in time and/or are the product of a single culture. They might even have been produced by a single individual. While this possibility may not actually be verified, the artifacts themselves indicate a concerted effort to create a bead of a preconceived standard size. Archaeological analyses of the remains recovered from the Budui site suggests the possibility that these beads may have been produced in the early Colonial Period.[207] If so, these beads provide important evidence of indigenous survival.

Beads with straight-sided holes are apparently unknown for the islands of Curaçao and Bonaire. However, beads of this type are illustrated in the typology developed by

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[206] William J. Parry adds that given the small diameter of the holes, it is "very likely that metal tools [were] used" (personal communication, 2005).

[207] Based on the archaeological evidence for the site, and conversations with Mai Odor, Versteeg suggests that Budui may have provided a refuge for the Amerindian peoples from Ceru Crystal during the Early Historic period (Versteeg 1990; A. Ruiz, personal communication, 2003).

Vargas Arenas and associates for artifacts from the state of Lara, Venezuela (Vargas Arenas et al. 1993:273, Figure 65a).

Elaborated "Notched" Disc Beads

Two elaborated disc "beads" in the AMA sample, one from the AMA collection, and the other from the Odor collection, are quite similar in size, shape, technical detail, and source shell. The museum's example (Plate 12), which is currently on display, measures 2.5 cm in diameter and features five semi-perforations that radiate around the central, bi-conical perforation. In addition, its perimeter is incised with notches to create an edge with a scalloped effect. The Odor specimen (Plate 13) is slightly larger (2.6 cm in diameter) and has one additional semi-perforation. The latter artifact was published by Coomans-Eustatia and Coomans, who suggest that it may have functioned as a "talisman" and was attributed by them to the site of Canashito (1987:10).[208] On a very general level, these objects are reminiscent of the "radial sun" motif and appear to combine and modify elements described by Oliver for the Urumaco complex of the Dabajuran Sub-tradition (Oliver 1989:681, Figure C-6, C, E-G). (To continue the speculation, the motif could record cryptic maps or cosmograms).

Small notched beads are known for Venezuela (Vargas et al. 1993:268) and for the Caribbean. They have been recovered at the Golden Rock Site, St. Eustatius (Van der

[208] They also describe another unperforated example from Bonaire (1987:12, figure 14 from the Wanapa site, Bonaire). Another incised bead similar to those found in Aruba was recovered from the Eastern Venezuela site of Campoma (north of Cariaco) (Wagner 1977:20-21; Dijkhoff 1997:70).

Steen 1992: Figure 73), in Antigua (Turney 2001), and in the Dominican Republic (José Ortega 2001). These examples apparently lack the partial perforations that embellish those from Aruba. The partial perforations used to embellish the Aruban "beads" actually seem to disqualify these artifacts as "beads" in the conventional sense of the term. This function would effectively obscure the partial perforation motif. It is unlikely that a cord would have been inserted through the axis of perforation of these "beads" in a manner that would hold the decorated surfaces perpendicular to both the cord and the "bead" wearer. It seems far more likely that these "beads" were strung so that their interior (concave) sides were on display. One way this could be accomplished is by threading both ends of a length of cord uni-directionally through the central perforation; subsequently, the cord could be secured by either tying it in a knot on one or both ends (e.g. in the manner used for bolo ties), or by using other artifacts.[209]

6.4.2.2 Discs

Small, Unperforated

As discussed by Dacal Moure et al. (2004), the AMA collection of "non-tool" O/S artifacts includes a variety of forms consistent with those described by Serrand for the artifacts recovered during 1994-1995 excavations at Tanki Flip (Serrand 1997:211-212) as "unshaped artifacts," "preforms," and "blanks" which, when lumped together range in size from 9 mm to 2.5 mm. Although the upper limit for the size of "small unperforated discs"

[209] Perhaps a Type 4 adornment would serve.

in the AMA samples approximates the upper limit for this class of artifacts at Tanki Flip, the lower limit (0.9mm) is too high for the AMA study samples. Unperforated disc artifacts in the AMA samples that are smaller in diameter than the smallest discs recovered from Tanki Flip (1994-1995) are referred to here as "micro" discs.

Most of the small unperforated discs in the AMA subsample (96.7%) have been shaped from the body whorl of *Strombus* sp. shells (Plate 14). The remaining artifacts in the subgroup (3.3%) are shaped from shells of bivalve species, most frequently from *Spondylus ictericus*. It is possible that some of these discs are preforms or "blanks" for adornments. As discussed previously, the reduction sequence identified by Serrand for Tanki Flip adornments (1997:212, and Figure 162) suggests that these disc forms are not preforms for adornments with Type 4 perforations.

The subgroup is not homogeneous, but exhibits variation in size, shape and reduction technique (Plate 15). Artifacts of this type in the subsample range from 6.5 mm to 24.9 mm in diameter. Although most are also in the range of discs described by Serrand for Tanki Flip, a few are smaller in diameter. The subsample includes nineteen small disc artifacts with diameters below 9 mm, and twelve that measure less than 8 mm. The latter group of "micro" discs in the subsample includes nine artifacts from Santa Cruz, one from the Canashito site, and two of unknown provenience.[210]

The size of many of the unperforated discs suggests that they may indeed be "bead blanks," destined to become disc beads similar to those previously discussed. Certain

[210] The microdiscs from the Tanki Flip/Henriquez I and Sabaneta sites can each be rounded to 0.9 cm, the lower limit for the Tanki Flip 1994-1995 sample "bead" category.

characteristics of the collection may refute this assumption. One of these is the production sequence suggested by the artifacts in this study. Several artifacts appear to represent discrete stages in the artifact production process. From them it is not possible to determine a sequence. Some of the discs feature incomplete perforations (Plate 16). Most of these artifacts have unfinished edges. Yet, several of the highly polished discs have no perforation at all.

Both unperforated discs and partially perforated discs may be inlays for wooden sculptures or other biodegradable objects that have not been preserved in the archaeological record (Alegría 1981). Other potential uses for disc shaped objects preclude the use of the term "bead blank" for this marine shell artifact form.

Discs, Other

The AMA sample contains a few artifacts that exceed the upper limit of the size range of disc-shaped artifacts identified at Tanki Flip (Serrand 1997) as "beads," bead "preforms," or "blanks." These are here classified using the relative terms "medium" and "large." Subsample discs in this group range from 26.3 mm to 138.5 mm (mean = 61.3 mm).[211] The precise function of medium and large marine shell discs among prehistoric Arubans is unknown. It is possible that unperforated medium and large discs represent a stage in the production of perforated forms. However, as with small discs, it is equally possible that they represent finished artifacts. Eight large discs were recovered in the

[211] The subsample mean measurement increases only slightly (to 66 mm) when discs with diameters close to those recorded for small disc "bead" artifacts (n=2) are excluded.

1994-95 excavations at Tanki Flip. Although they were classified in the Strombus Tools subcategory "Large Discs," the archaeologist who studied these artifacts suggests that there may be a range of functions associated with this morphological type (Serrand 1997:198-199). She also notes that while the artifacts appear to exhibit characteristics of various stages of manufacture, from crudely shaped preforms (produced by pecking and course abrading) to a more elaborately finished disc with a central conical perforation, each "stage" may actually represent a finished artifact with a distinct function. De Josselin de Jong described similar items on St. Eustatius and suggested that perforated forms might serve either as beads or spindle-whorls (1947:40-41, 48).

A frequency distribution of measurements of maximum diameter for artifacts in this class is markedly bimodal. Thus, despite the low relative frequency of these artifacts in the sample, they are considered two discrete subgroups.

Medium Discs

One medium disc is made of the gastropod *Charonia variegata* (Plate 17). All of the others are made from the body whorl of *Strombus* spp. shells; most (if not all) from the species *Strombus gigas* (Plate 18). As a group the diameters of medium discs in the AMA subsample range from 26.3 mm to 49.3 mm (mean = 36.2 mm). In thickness, these range from 3.3 mm to 11.8 mm (mean = 7.2 mm).

Large Discs

Several large disc artifacts were analyzed from the museum's collection (Plate 19). These range in diameter from 58.4 mm to 1385 mm (mean = 86.4),[212] and in thickness from 3.7 mm to 10.8 mm (mean = 8.2 mm). Five are perforated by Type 2 (biconical) holes. Artifacts of this artifact type have been reported as surface finds by Van Heekeren for Aruba (1963:21; 1960: Plate XXIII) and for Curaçao (1960:Plate XXIII shows large discs from Aruba; 1963: plate 9 one perforated, one unperforated for the St. Jan site, Curaçao). Similar artifacts are known throughout the region.

6.4.2.3 Adornments

Automorphic Adornments

Cyphoma gibbosum

A unique object in the museum collection is a whole shell Flamingo tongue (*Cyphoma gibbosum*) with four Type 1 perforations (Plate 20) from the Santa Cruz site (#81). The artifact is 25.3 mm in length and 13.7 mm in width and is virtually identical to two others (each described as a "bead") from Curaçao (Van Heekeren 1960: Plate XXIV; Haviser 1990:90). Although this modified shell contains four perforations, precisely how

[212] The small sample size and wide range in diameter of the artifacts in this class makes this mean unstable. Excluding just one artifact can increase or decrease the mean diameter by several millimeters. For example, if we exclude one artifact (now on display at the AMA) simply because it lacks a measure of thickness, the mean diameter of these artifacts increases to 81.6 mm, despite the fact that the range remains the same.

they might have served is not known. They could, indeed, have been used to wear the shell as a bead or a pendant or, perhaps, the object served an entirely different (or additional) function. However, the preservation of the whole shell form suggests that the shell itself was valued by Ceramic Age peoples of these islands. It was likely also valued for its aesthetic qualities. Because the animal that produces this shell wears its mantle on its exterior, the shell would originally have had a glossy sheen.

Xenomorphic Adornments

The AMA "non-tool" O/S marine shell artifact sample contains a wide variety of shaped-shell adornments. Table 6.9 summarizes this variation according to molluscan class of the source shell, perforation type and approximate shape. Approximately 44% of the subsample artifacts in this category were manufactured using bivalve species; the remaining adornments (56%) were apparently produced using univalve species, most likely from the body whorl of *Strombus gigas* shells.

The colorful bivalves used in the production of adornment forms provide an opportunity to consider the cultural values that may have determined their selection. Perhaps the use of *Spondylus* sp. shells in the production of marine shell artifacts is associated with the symbolic use of these shells among mainland cultures. It is also possible that their selection is governed by the symbolic import of their color. *Spondylus* sp. mollusks produce shells with a variety of colors. Artifacts in the AMA collection sample produced from these shells range in color from pale yellow to deep red/burgundy.

According to Reichel-Dolmatoff, among the Amazonian Desana, the colors red and yellow are among the three most symbolically important colors,[213] and they are each further differentiated according to tone and intensity such that "light yellow, bright yellow, yellow-red, light red, and dark red are all distinguished" (1971:122). Reichel-Dolmatoff relates some ethnographically identified color conceptions:

> The color yellow is 'good' and represents fertility, protection, and the energy of the Sun . . . [it] represents the concept of fertility, not only in terms of sexuality but of cosmic energy of procreation and renovation. The color red . . . is representative of sex in the sense of uterine fecundity, and of the vitality of our world . . . A yellowish-red tone . . . [combines] the principles of cosmic fertility and terrestrial fecundity with the concepts of health and the 'good life' (1971:122).

Although the precise value that the Amerindian peoples of Aruba may have placed on specific colors is not known, the selection of colorful bivalve species for the production of adornment forms may indicate that these colored artifacts may have been imbued with meaning beyond whatever function(s) they may have fulfilled.

Unperforated Forms

Five unperforated forms (two rectangular and three trapezoidal in shape) may represent stages in the production of perforated forms (Plate 21). These might also be finished artifacts that may have been attached to other artifacts (e.g. wooden objects). Four are made from bivalve species (two from unidentified species, one from the mother-of-pearl of a *Pinctada imbricata* valve, and one from a *Spondylus ictericus* shell); the fifth is apparently made from the body whorl of a *Strombus gigas* shell. They range in

[213] The third is the color blue (Reichel-Dolmatoff 1971:122).

size from 15.8 mm to 22.5 mm in length (mean = 18.2 mm), 9.8 mm to 13.8 mm in width (mean = 11.3 mm), and 1.1 mm to 4.8 mm in thickness (mean = 3 mm). All have been recovered from the Santa Cruz site (#81).

Modified Beach Find

The natural shape of a unique *Spondylus* sp. object from Tanki Flip (Plate 22) suggests that it is a beach find. However, its two conical holes (1 x 2) may result either from animal predation of the shell (after the death of its occupant) or may, alternatively, have been produced through human agency to facilitate its use as a pendant or other ornament. This artifact is a good example of those that do not fit comfortably in any one category. The placement of the two holes on this artifact would qualify it as a pendant. Yet, the object is extremely lightweight, so it would not have dangled as normally would be expected of a pendant. The two holes could also have been used to incorporate the item into a construct, perhaps to weave it into a headband, belt, basket, or necklace, or to sew it onto a garment. On the other hand, particularly if the holes are not anthropogenic, but are of natural origins, the item may have been valued as an unusual "gift" from the sea. It may also have been kept as an amulet or talisman of island shamanistic practices.

1x2 Polygonal Adornment

Two artifacts, each with two Type 1 (conical) perforations, are most likely made of the mother-of-pearl of the bivalve species, *Pinctada imbricata.* The larger specimen measures 20.8 mm in length, 15 mm in width, and is 0.8 mm thick (Plate 23). This artifact

was excavated at the Tanki Flip/Henriquez I site (#101) in 1968 by the ARC excavation team headed by Heidecker and Siegel (1968), and is associated with cultural layer II at that site, which has been radiocarbon dated to 765 years BP.

1x2 Rectangular Adornments

Rectangular adornments of this type range in length from 11.7 mm to 17.5 mm (mean = 13 mm) in width from 7.2 mm to 8.0 mm (mean = 7.6 mm) and in thickness from 1.4 mm to 2.5 mm (mean = 1.9 mm) (Plate 24). Proveniences for three of the "1x2 rectangular adornments" are known; all of these are from the Santa Cruz site (#81). One of these was excavated by Versteeg, and two are from the Dania Collection of artifacts from that site.

2x2 Rectangular Adornments

Two xenomorphic shell artifacts in the AMA sample are small, roughly rectangular shaped adornments, each with two Type 2 perforations. The longest of the two specimens is also the most narrow. It measures 19 mm in length, 2.4 mm in width, and is 1.5 mm thick. The shorter example is 12.9 mm long, 7.2 mm wide, and 1.0 mm thick. The precise proveniences of these artifacts are unknown.

Type 3 Adornments

Approximately 32% of xenomorphic adornments in the AMA sample have Type 3 ("V-shaped" or "axial") perforations (n = 21). Some of these artifacts are rectangular in shape (n = 11); others are round, or "disc-shaped" (n = 10).

Type 3 Adornment, Rectangular

Rectangular adornments with Type 3 perforations in the AMA sample (n = 11) range in length from 8.3 mm to 18.8 mm (mean = 13 mm), in width from 4.5 mm to 8.9 mm (mean = 6.8 mm), and in thickness from 1.7 mm to 3.5 mm (mean = 2.6 mm). Some are on display at the AMA (Plate 25). Just two artifacts of this type are of known provenience. Both of these are from the Santa Cruz site (#81). One specimen on display at the museum, which appears to have been altered either by fire or smoke, has been perforated with two holes on its more convex side. This is unusual for adornments in the sample.

Type 3 Adornment, Round

Disc-shaped artifacts with Type 3 perforations look very much like buttons (Plate 26). Boerstra has suggested that these "*botóns*" may provide an important link between the prehistoric and post-contact peoples of Aruba (1982:45, see also, Figure 14). Artifacts of this type in the AMA sample (n = 10) have been made from *Strombus* sp. (n=4), *Spondylus* sp. (n = 5), and *Trachycardium* sp. (n = 1) shells. They range in diameter from 6.3 mm to 11.8 mm (mean = 9.5 mm), and in thickness from 1.9 mm to 4.1 mm (mean = 2.9 mm). Ninety percent of the round Type 3 adornments are of known provenience and

all are from the Santa Cruz site (#81). Most are from the Dania Collection. However, one was excavated from a feature at the site by Versteeg in 1992 (Plate 27).

Type 4 Adornments

Distinguishing between Type 3 and Type 4 adornments can sometimes be a bit tricky. Some artifacts appear to have Type 3 perforations that were not skillfully drilled, resulting in two perforations that breach the exterior surface of the shell, the part normally unperforated in Type 3 adornments. These may be incomplete adornments meant to be finished with a Type 4 perforation. Yet, other artifacts in the collection sample suggest that the three holes required to produce a Type 4 perforation are all drilled simultaneously. Perforations in roughly 42% of xenomorphic adornments in the AMA sample are identified as Type 4 ("Y-shaped") perforations. Type 4 adornments in both shell and stone have been reported for the La Cabrera Peninsula, Venezuela (Kidder 1944; Dijkhoff 1997).

Type 4 Adornment, Polygonal

One unique shell object with a Type 4 ("Y") perforation has a complex profile and a form that defies easy classification (Plate 28). It is polygonal in shape. However, it may be an abstract representation of an iconic form, perhaps a stylized representation of the frog motif. As is the norm for symbolic forms, precisely what is represented by this form is open for interpretation. Although the highly polished surface of this object obscures any original shell morphology, the object was likely made of the lip portion of either *Cassis* spp. or *Strombus* spp. It measures 10.6 mm in length, 8.1 mm in width, and is 3.6 mm

thick. While it has no counterpart in the AMA collection, this artifact, from the Santa Cruz site (#81), is remarkably similar in form to an example from Santa Marta, Magdalena, Colombia, published in Orchard (1975:35, Figure 15).

Type 4 Adornment, Rectangular

Seven Type 4 adornments are rectangular in shape. These range in length from 9.6 mm to 12.9 mm (mean = 11 mm), in width from 6 mm to 7.9 mm (mean = 6.9 mm), and in thickness from 2 mm to 2.8 mm (mean = 2.2 mm) (Plate 29). Just one artifact of this type is of known provenience (Plate 30), and this particular example, which was excavated in 1968 by Heidecker and Siegel at the Tanki Flip/Henriquez I site, and is associated with cultural level II at that site, may have an incompletely formed Type 4 perforation, or alternatively, may have a Type 3 perforation that has breached the exterior shell surface.

Type 4 Adornment, Round

Eighteen round ("disc-shaped") marine shell artifacts in the AMA sample are identified as Type 4 adornments; seventeen of these could be thoroughly studied.[214] These range in diameter from 6.6 mm to 40.2 mm (mean = 13.8), and in thickness from 2.2 mm to 5.5 mm (mean = 3.2). Generally, artifacts of this type have polished surfaces that do not preserve original shell morphology and smooth, rounded edges (Plate 31). Some, apparently incomplete, examples have jagged edges. With a single exception, all artifacts of this type have been made from *Strombus* sp. shells. An unidentified bivalve species was

[214] One on display in the museum was not available for study.

used to produce one artifact of this type, which is from the Santa Cruz site (#81).[215] Several Type 4 round adornment artifacts have been recovered archaeologically. Three were excavated from features, one by Heidecker and Siegel at the Tanki Flip/Henriquez I site (#101), one by Boerstra at the same site, and one by Versteeg at Santa Cruz (#81). Two were surface collected by AMA personnel, one by G.H. Angela and F. Croes at the Tanki Flip site, and one by A.C. Ruiz at Sabaneta (#76).

Type 4 Adornment, Oblong

One artifact in the "non-tool" O/S AMA collection is an unusual, oblong shaped object, with well-formed Type 4 perforations. It was excavated by Boerstra at the Tanki Flip/Henriquez I site (#101). Its rough perimeter, produced by both vertical and transversal pecking, suggests that it is incomplete. Perhaps this artifact represents a stage in the production of a round Type 4 adornment. It is consistent with artifacts described by Serrand for the Tanki Flip 1994-1995 excavations as small, quadrangular "Finished adornments" (1997:212-213 and Fig. 162), which also have rough perimeters. Together these artifacts suggest that at the Tanki Flip site, perforation precedes shaping for Type 4 round adornments.

[215] This object, on display at the AMA, is excluded in the study subsample.

Other Adornment, Polygon

The unfinished state of two small artifacts in the subsample make them difficult to place in a well-defined group. Both are made of bivalve shells, most likely of *Spondylus ictericus*, and each is of an unknown provenience. Roughly polygonal in shape, they each show shell degradation in the form of multiple, probably zoogenic, holes. Each has in addition a slightly off-center Type 1 perforation, which is not symmetrical in respect to any axis. However, while this placement may qualify these artifacts as pendants, the unfinished state and light weight of each disqualifies them as such.

6.4.2.4 Pendants

Automorphic Pendants

Oliva reticularis

In the AMA "non-tool" O/S marine shell artifact sample, the most common pendant types that preserve the natural form of the utilized shell are made from Olive shells (n = 24). Both regional data and the distribution of mollusks suggests that most (if not all of these) were made from the species Oliva reticularis. Each has a hole drilled into the modified body whorl of the shell, which has also been modified by the removal of its spire. This artifact type corresponds to Sickler Robinson's Type 2 "pendant" (1978) and is also included in the typology developed for Venezuela by Vargas Arenas et al. (1993:267, Plate 24A), who propose that a cord may have been used to saw away the apical/spire portion of the shell before grinding it on a stone to produce a smooth surface. *Oliva reticularis* pendants in the AMA sample range in length from 16 mm to 40.8 mm

(mean = 29.2 mm). This variation in size is likely attributable to the disparate ages of the mollusks that produced the shells, but it may also indicate variation in the cultural use of these objects.

In the Caribbean the term "tinkler" is generally used to designate this type of modified shell artifact. According to Kidder (1944:78), the name originates from his analysis of similar ("almost identical") specimens from Pecos, New Mexico. Tinklers are typically fashioned from the shells of the gastropods *Oliva reticularis*. However, Conus, Voluta, and Cypraea examples also occur in the region (ibid.). As the name suggests, artifacts of this type may be used to create a pleasant resonating sound, particularly when they are strung together. Tinklers are known ethnographically for the Taínos of the Greater Antilles and the Bahamian Archipelago, where they often feature geometric or anthropomorphic motifs carved into the shell (Harrington 1921; McGinnis 1997: Figure 30; Ortega 2001: Plate 14). Among groups in that area, they were worn by men in ritual performance.

Precisely how these artifacts may have functioned in prehistoric Aruban society is not presently known. Nor is it certain how they were worn. Two artifacts of this type were published by Boerstra (1982:44, Figure 14), who suggests that in Aruba these artifacts were strung together to be worn as a necklace (Plate 32). Several specimens from various sites of the island are so displayed at the AMA. Alternatively, strings of tinklers may have been worn around the knees, the wrists (Plate 33), or ankles (Plate 34).

Kidder (1944) identifies two primary perforation types for tinklers. The first is produced by sawing through the shell body whorl perpendicular to the aperture, a

technique that produces an elliptically shaped perforation. This type is common in the Greater Antilles (Ortega 2001) and has also been identified in Antigua (Turney 2001), as well as in Venezuela (Vargas et al. 1993). Kidder suggests (1944:78) that the second type, which is produced by directly drilling the body whorl, is more common for *Oliva* sp. specimens. All of the Oliva pendants in the AMA sample feature Kidder's second type of perforation production, and all have Type 1 perforations.

Artifacts in various stages of production suggest a particular reduction sequence for this artifact type, indicating that the process begins with the removal of the shell apex/spire. Although some *Oliva* sp. shells that have been reduced in this way may have been used as beads, the degree of reduction of some would have inhibited their use as beads, as one specimen from Santa Cruz reveals (Plate 35).

Plate 36, which features the next reduction stage for this artifact type, illustrates preparation of the body whorl in anticipation of the perforation stage. Sickler Robinson has suggested that the shape of this modification might be one of several important variables in differentiating between different culture groups.[216] Thus far, however, the AMA sample reveals no clear patterning in this particular shell modification. Most "tinkler" perforations have been achieved by drilling, unlike in other areas of the Caribbean, where perforations were produced using a sawing motion.

[216]Other variables cited include body modification, modification technique, hole placement, orientation of the major axis of the modified area, and spire modification. Note also that Sickler Robinson (1978:175) did not distinguish between an apex/spire that was broken off from one that was ground off (Van der Steen 1992:282).

"Tinkler" pendant artifacts exhibit variation in the precise placement of the perforation. Even artifacts from the same site may exhibit some variation. (One artifact from Tanki Flip has been perforated unusually close to the siphonal canal.) All of the perforated *Oliva* spp. pendant ("tinkler") artifacts in the AMA sample are perforated with Type 1 perforations at the base of the shell body whorl, unlike the "possible pendant" described by Serrand (1997), in which a hole has been ground (and/or pecked out) near the shell spire. Indeed, the lack of any true "tinkler" pendant in the shell artifact assemblage from the extensive area of Tanki Flip excavated in 1994-1995 does suggest that this particular artifact may be a temporal marker in Dabajuran society.

***Conus* sp.**

One unique object is a small pendant fashioned from a tiny univalve. The shell that inspired this artifact is a *Conus* sp., perhaps a juvenile *Conus regius* or, more likely, a *Conus mus*. It was modified only by a single Type 1 perforation, and measures just 14 mm in length (from adapical to abapical end) and 6.3 mm in width. This artifact, which would have featured the natural shell coloring, was recovered from the site of Sabaneta and was originally published by Boerstra (1982:44, Figure 14). This object may indicate that Conus shells had a symbolic (albeit unknown) value among Amerindian Arubans. It may also be evidence that Dabajuroid peoples appreciated the aesthetic qualities of this natural object. Larger whole shell pendants made of juvenile gastropods (*Conus granulatus* and *Charonia variegata*) from Curaçao were published by Coomans-Eustatia & Coomans 1987:11).

Tivela mactroides

The AMA collection sample contains two artifacts made from the bivalve *Tivela mactroides* (Born, 1778) (Plate 37). They have each been perforated near the shell umbo, facilitating their use as pendants. The perforations may be described as variants of Aruba Type 1. They do not conform to other Type 1 perforations observed on shell artifacts of the island. They appear to have been produced by pecking, instead of by rotary drilling action. Perhaps variation in the shell material required the application of this variant technique. It must be acknowledged that the present state of the holes may result from their alteration through use.

These automorphic pendants measure 41 mm and 45.9 mm in length (from dorsal to ventral margin), and 36.7 mm and 39.9 mm in width (from posterior to anterior margin), respectively. Although neither specimen was recovered through controlled excavations, it is likely that they are both from the Santa Cruz site (#81); the smaller example is from the Angela collection, and the larger one from the Dania collection.

Similar specimens are identified by Kidder from his excavations on the Peninsula of La Cabrera in northwestern Venezuela (1944:78, Plate XII); others are pictured in a report by Bennett for La Mata (1937:121, Figure 15, ed). According to Sutty, shell pendants of *Tivela mactroides* are "frequently found in Amerindian shell mounds" (1990:93).[217] Turney identifies the use of a *Tivela* sp. shell to manufacture one of four

[217] Sutty suggests that the species is "a favourite food shell for Venezuelans" (1990:93).

pendants he identifies as "umbo-perforated shell pendants" that were surfaced-collected at the Elliot's site, Antigua (2001:85).

Xenomorphic Pendants

Fifty-two artifacts in the AMA "non-tool" O/S sample are classified as xenomorphic (shaped-shell) pendants (or fragments thereof). Almost 70% of the xenomorphic pendants in the AMA "non-tool" O/S marine shell sample were recovered as a unit by Boerstra from a burial at the Sabaneta site (#76). To some observers, two objects in this group would qualify as "semi-automorphic" types.

Columella Pendant

One artifact, clearly recognizable as part of the columella of a *Strombus gigas* shell (Dacal & Croes 2004, Figure 5.23), might be classified as a tool in a strictly formal typology. However, because it lacks identifiable traces of use-wear, and features a Type 2 perforation and an additional partial perforation, this artifact, which likely comes from Tanki Flip, was added to the "non-tool" O/S sample (Ramón Dacal, personal communication, 2001). The perforations of this object may indicate that it was somehow meaningful to early Tanki Flip inhabitants. (Alternatively, they may simply represent attempts to facilitate its portability.) This artifact, from the collection of Mai Odor, measures 63.4 mm in length and 24.8 mm in width.

Staff Pendant

Another "semi-automorphic" pendant has been described by Boerstra as a "magic rod" (1982:48-49). This large artifact from the Santa Cruz site (#81) (Plate 38) measures 172 mm in length and 34.7 mm at its widest point. The structure of this artifact mimics the natural shell from which it was made, and Boerstra suggests that it may have functioned as a "witch's wand" (1982), an inference probably based on shamanistic practices ethnographically documented among extant mainland groups.

Large Disc Pendants

Two xenomorphic pendants are large, disc-shaped artifacts. One, from the Bongers collection of the Sabaneta site (#76), has been drilled to produce a Type 2 (biconical) perforation. It also has several partial perforations (n = 12) scattered roughly around the perimeter of the interior side of the shell (Plate 39). The placement of the perforation, in a natural bend of the shell body whorl, suggests that the particular shell modified to produce this artifact, may have been specifically targeted for this specific attribute. Without it, the object would be evenly disc-shaped. With this feature, it falls a bit short of being a symmetrical disc shape. This artifact measures 44.9 mm in length, and 56.4 mm in width, and weighs 18.1 g.

Polygon Pendants

Two polygon-shaped pendants in the collection sample vary in size, thickness, weight, and surface finish, but are otherwise remarkably similar in form (Plate 40). In each

case the artisan(s) who produced this type of pendant made a conscious decision to transform the natural morphology of a marine shell into a desired cultural form. The meaning of the form is unknown. On a very general level, is similar to the shape of ocelot teeth pendants recovered in Panamanian from mortuary contexts (cf. Cooke et al. 2000:162). Ocelot remains have been recovered at Tanki Flip from contexts identified as ritual. These must have been traded in from the mainland, since such large mammals are not indigenous to Aruba. It is possible that these shell forms may have been produced to mimic ocelot teeth. This is, of course, conjectural. What can be said is that the replication of this form suggests that the form itself is culturally significant.

The larger specimen is largest in every respect; it measures 64.8 mm in length, 21.4 mm in width, 13.3 mm in thickness, and weighs 35.3 g. The smaller example is 53.2 mm in length, 16.7 mm in width, 3.9 mm in thickness, and weighs just 6.8 g. Each of the pendants was apparently made from a *Strombus* sp. and each has been drilled with a single Type 2 biconical perforation. Both are from the Santa Cruz site (#81), the only known provenience for this artifact type.

Spondylus "Pendants"

Two small "pendant" artifacts in the AMA sample, shaped from shell material from Spondylus shells, are most likely from the species *Spondylus ictericus.* In each example, the placement of the hole suggests that the artifact was meant to dangle from its suspending support. While they may have been used as pendants, each may have served a different, unknown, function. The smallest of the two, excavated by Boerstra at the Tanki

Flip/Henriquez I site, is just 10.4 mm in length. It is more finely finished than the larger example (of unknown provenience), which is 14.2 mm in length. It is possible that the latter is not yet completely formed.

Elongated Shaped-Shell Pendants

These elongated pendants (n = 36), made from the body whorl of a *Strombus* sp. were recovered from a single burial at Sabaneta (Boerstra 1982:44, and Figure 14) and presumably were strung together as they are pictured here (Plate 41 and Plate 42)). While no evidence survives to confirm the precise reduction stages for their production, findings in prehistoric sites in Cuba suggest how these artifacts may have been manufactured by prehistoric Aruban peoples. Transitional artifacts from Cuba indicate one technique that may have been used to produced these forms; they may have been initially shaped by scoring the body whorls of the *Strombus gigas* specimens used as the shell medium with parallel incisions that would facilitate the "breaking off" of elongated shapes. With the exception of a broken example (not pictured), each of the pendants have smooth surfaces on all sides. These were likely obtained by further reduction by grinding and/or polishing. The elongated pendants range in length from 26.7 mm to 50.9 mm (mean = 37.5 mm), in width from 7.3 mm to 17.9 mm (mean = 11.2 mm), and in thickness from 2.4 mm to 6 mm (mean = 3.7 mm).

Incised Ovoid Type 3 Pendant

An oblong-shaped adornment from Santa Cruz (Plate 43) is unlike any other in the AMA collection. On its perforated side, the object has the appearance of a stylized face. However, this is probably just an artifact of the use-life history of the object. The portion that now looks like a mouth is likely a ruptured Type 3 perforation and the "eye" holes resulting from a second Type 3 perforation likely produced after the rupture of the first. This artifact is one of the few embellished with incised lines, which encircle the object horizontally. In addition to residue that may or may not result from human agency, the object has several shallow punctuation-like depressions. These may be intentionally produced by the artisan or might, alternatively, result from either shell-boring animals or post depositional processes.

Needle-shaped Type 2 "Loop" Pendant

One interesting unique object may have served as a pendant (Plate 44). It was excavated by the Hunter College team in 1968, when it was described simply as a "pin" (Heidecker and Siegel field notebook, August 19, 1968). It was located at the bottom of cultural layer II, the oldest layer described by the authors. Just prior to the discovery of this artifact, the excavators characterized the context as a "possible feature," associated with "large quantities of animal remains . . . shell and [pottery] sherds" (Heidecker and Siegel field notebook, August 17, 1968). The extremely fine polish and patina of this shell object suggest that it might have served a utilitarian role, perhaps in addition to an ornamental one. On the other hand, it might represent a concerted effort by a prehistoric Aruban

artisan to produce a finely crafted object. This artifact measures 25.6 mm in length, and 9.1 mm at its maximum width.

Anthropomorphic Pendant

Among the finest artifacts contained in the collection is a small anthropomorphic face pendant (Plate 45) from Sabaneta. As Plate 45b, the object has two perforations that are not centrally located. This Type 3 perforation type is frequently associated with circular or rectangular "button" (*botón*) artifacts. However, because the perforations are not centered vertically, when strung on a cord, this object could function as a pendant. No morphological characteristics of the marine shell medium for this object remain, but the thickness and coloration of the shell suggest that the object was carved from the thick lip of a mature *Strombus gigas* shell, or, perhaps, that of the species *Strombus costatus*.

Although carving in shell is an extractive process, this maskette is stylistically quite similar to Dabajuran Dabajuroid ceramic forms produced by modeling, an additive technique (see Boerstra 1982:57, Figure 21). The protruding "coffee-bean" eyes are congruent with the similarly shaped mouth; these elements recall plastic decoration found on ceramic artifacts recovered on the island (Bongers 1963:Plate VI, number 20; Versteeg 1997:284, Figure 214) and on the mainland (Oliver 1989:685). Three incised lines extending at angles from each eye are reminiscent of similar imagery painted on ceramic vessels found in the Macro-Dabajuroid interaction sphere (cf. Oliver 1989:677; Bongers 1963:TXI). The lines suggest face painting or tattooing. Alternatively, they may represent tears. When identified on artifacts from the Taíno area, these lines may be interpreted as

"the magical tears of Boinayel" (Son of the Gray Serpent), a culture hero responsible for the creation of rain (Arrom 1997:73). However, Kidder relates a finding of Oviedo y Valdes that may apply to these incisions:

> Speaking of the Indians of this general region [western shore of the Maracaibo Basin], Oviedo y Valdes says that as a reward for deeds of courage, paint was applied to various parts of the body. After three such deeds, paint could be applied from the corners of the eyes to the ears. This practice accounts, according to Jahn, for the Spaniards often calling the Indians Alcojolados, a term of north African origin signifying people with painted eyes (Kidder 1944:13-14).

Although this carved shell artifact is unique to the island, it is remarkably similar to a slightly smaller example in a collection from the town of Dabajuro in the state of Falcón, Venezuela, described by Cruxent as follows:

> . . . interesting bead or botón of shell, with triangular form and anthropomorphic representation. Length equals 13 mm . . . Eyes, nose, mouth and very fine incised wrinkles or facial tattoos. Perforated on the reverse, with two conical perforations that unite horizontally under a small bridge between them. For this special type of perforation, one could question whether it is a button, . . . [pendant] of a necklace, or a simple bead perforated in this manner . . . (1955:108-110, Figure D-146) (translation by the author).

The similarity between the Aruba and Venezuelan examples suggests that they may reflect local variations in the creation of a single iconic theme in Dabajuroid society. They may also signal social and/or political rank. It is also possible that they are portraits. However, an interpretation of this kind is generally not corroborated by available archaeological data. According to Olsen Bruhns, "portraiture is rare in native American art styles and in those situations in which it has been identified, such as among the Olmec, the Maya, and perhaps the Moche, true portraiture seems to have a close association with a personalization of the leadership, in whatever way that leadership validated its position"

(1992:351).

The two shell artifacts share much in common; they also differ somewhat. The Aruba example is slightly larger (16.6 mm in length, 15.5 mm wide, 8.3 mm thick, and weight 2.9 g), has three lines incised beneath each eye, and has a more complicated silhouette and profile than the Dabajuro specimen. The Aruban example seems to portray a being that is not simply anthropomorphic. The forehead of the image is indicated by a thick ridge, which is surmounted by two knobs that may represent a stylized hairdo or headdress. They may also represent ears. Several researchers have noted the importance of jaguar symbolism in many areas of South or Central America (Reichel-Dolmatoff 1968, 1971, 1975; Roe 1982; McGinnis 1997). According to Reichel-Dolmatoff, in Amazonian cosmology, the jaguar was created by the Sun as its "main representative on earth . . . a phallic Solar animal that takes the place of the Sun . . . representing its fertilizing energy" (1971:77-78). The jaguar is also "the magical protector of the maloca [communal house], not only fostering the fertility of its occupants but also defending it against all kinds of dangers that may come near it" (Reichel-Dolmatoff 1971:78). Perhaps the maskette symbolizes the belief in shamanic human-jaguar transformations widely distributed among indigenous peoples of the mainland.

Haviser suggests that a zoomorphic shell ornament he excavated in 1987 at the Wanapa site on Bonaire represents a jaguar (1990:89). Although no such shell form is known for Aruba, faunal remains from the Tanki Flip excavation (1994-1995) revealed the presence of ocelot bones, suggesting that feline symbolism may have remained important

in the belief system of Ceramic Age migrants to the off-shore islands, despite the absence of these species on these islands.

Zoomorphic Forms

Roe has suggested that Arawakan peoples who migrated from the mainland into areas less abundant in faunal resources may have employed "mythic substitution," a cultural practice that "replaced the missing Amazonian megafauna with smaller local fauna, or found new fauna, like the shark, the anolis or other small lizards, to stand for the absent natural symbols [and] . . . relatively minor lowland animal and bird symbols, like the frog, bat, or the owl, came to bear an augmented 'semantic load,' transforming locally into major symbols" (Roe 1995b:5-6; and in McGinnis 1997). This assertion is apparently supported by a few marine shell artifacts in the AMA collection.

"Frog" Pendant

One artifact on display at the AMA (Plate 46) is remarkably similar to shell artifacts from Bonaire, two pendants each with two holes, and one non-perforated form (Haviser 1991:43-44, Figure 21and Figure 22, respectively). This type is featured in the typology developed by Vargas Arenas et al. (1993:273, Figure 65.u) and is also similar in form to amulets of both stone and shell described by Kidder for the La Cabrera Peninsula, Venezuela (1944:137-138, Figures 60 and 62, respectively). Kidder (1944) identifies this image as a frog motif and cites Wassén's assertion that this motif can be traced throughout South America. According to Arrom, frogs are "universal symbols for rains" (1997:76).

Representations of them are among those most frequently occurring iconographic motifs in Saladoid art ((Petitjean Roget 1997).

Boomert suggests that frogs pendants have “strong female and underworld connotations in Amerindian cosmology" (Boomert 1987:47). The frog motif figures prominently throughout the Amazonian and the Caribbean regions, particularly the Eastern Caribbean, where it is first associated with the migrations of agriculturalists, known as the Saladoid, into the islands beginning around 500 B.C. (Boomert 1987:47). According to Boomert, frog amulets made of a variety of precious stones, particularly “green-stone” are linked to ceremonial exchange (Boomert 1987:47). Shell frog effigy forms are also found in early agricultural sites in the Caribbean (Murphy 1999; Turney 2001; Chanlatte-Baik and Narganes Stordes 1983), and in later periods are, apparently, more abundant than those made of green stone (McGinnis 1997). Indeed, the use of shell to manufacture pendants and/or amulets depicting the frog motif is widely distributed through time and space throughout the region (McGinnis 1997: Figures 37 and 38).

The AMA example, which has two Type 2 biconical perforations, measures 32.2 mm in length, and 27.1 mm in width, is 4.3 mm in thickness, and weighs 7.1 g. This object was among several artifacts purchased by the AMA from the collection of J. Dania. It reportedly was excavated by him from his land at Santa Cruz.[218]

[218] It was previously reported that the provenience for this artifact was unknown (Linville 2004). This information was updated during my conversation with J. Dania on November 12, 2004.

"Bat" Pendant

One unique pendant in the collection (Plate 47) is apparently carved from the nodule of a *Strombus gigas* shell. In Beck's typology, this artifact would qualify as a pendant and would be classified as type XXXIV, a type that includes beads and pendants representing reptiles, insects, and deities with heads of reptiles or insects. This pendant illustrates, yet again, the difficulties inherent in symbolic forms. As Boerstra explains, the precise subject of this artifact is not "clearly recognizable" (1982:47). However, knowledge of the relationships between prehistoric peoples of Aruba and neighboring groups of the South American mainland suggests that the image depicted may represent a bat (Dijkhoff 2002d).

Bats figure prominently in the cosmology of prehistoric peoples of South America (Reichel-Dolmatoff 1971) and the Caribbean (Arrom and García Arévalo 1988; García Arévalo 1997; Petitjean Roget 1997). They have been identified in mainland myth as "soul and/or message carriers" that access "sky worlds," as "shaman helpers and bearers of hallucinogenically-released shaman spirits in flight" (McGinnis 1997). According to Reichel-Dolmatoff, in Amazonian cosmology, bats are associated with blood, menstruation and dysentery and symbolize the vagina, and their hanging position is associated with the uterine embryo (1971:101). Bats may also provide protection for the maloca (the communal home for many South American groups) (Reichel-Dolmatoff

1971:100; McGinnis 1997).[219] While the importance of bats in prehistoric cultures across wide expanses of both time and space may be inferred for the earliest Ceramic Age peoples in the region, it has been ethnohistorically documented for the contact people of the Greater Antilles now known to us as the Taíno by Pané (Arrom 1975). The shared Arawakan ancestry of the Eastern and Southern prehistoric Caribbean peoples permits us to consider that bats may have had similar associations for the prehistoric peoples of Aruba.[220]

Broad-Winged" Pectorals

A large pendant made from the lip of a mature *Strombus gigas* shell (Plate 48) was discovered at the Arashi-1 (#2) site at the northwestern tip of the island. The shape of this artifact is similar to stone "broad-winged ornaments" described by Kidder for the Andean region, in western Trujillo, Venezuela (1944:136, Figure 59, particularly no. 6) and those made of shell from the Andean and Lara areas (1944:138, Figure 61). Kidder suggests that broad-winged ornaments made either of stone or shell "seem to appear only in the Santa

[219] The fact that this object is unique may indicate that it was acquired through the extensive Caquetío trading network. If so, it is possible that the prehistoric Aruban who once owned this object may have been culturally disconnected from the norms of the object's maker. Pre-Columbian iconography indicates that bats were also important symbols for the Tairona (Morphy 1989; Legast 1989), the likely ancestors of the ethnohistoric Kogi (Legast 1989). Legast's interpretation of iconic elements in Tairona gold and ceramic objects favors a role for bats among the Tairona that is more ominous than their position in Kogi cosmology. However, she acknowledges that "it is not yet possible to reach definitive conclusions as to the true symbolic significance of the bat in Tairona culture" (1989:285). Ambiguity also attends this "bat" shell artifact. Insufficient archaeological evidence exists to adequately interpret this object.

[220] It is also *possible* that the "bat" pendant actually represents a dog. The faunal remains of dogs are often found in human burial contexts in the Eastern Caribbean (Wing and Wing 1995:123).

Marta region" of Colombia (1944:160; see also Mason 1936:179, Plates 85-91). Yet, subsequent research affirms that the distribution of this form is more widespread in the Circum-Caribbean region (Chanlatte-Baik and Narganes Stordes 1983), stretching from the Greater Antilles to Costa Rica (McGinnis 1997:6, Figure 49). In form, this pendant, which likely functioned as a pectoral, is particularly reminiscent of the lithic example illustrated by Reichel-Dolmatoff and Reichel-Dolmatoff (1955, Plate III, Figure 5) from Site 240 in the Sierra Nevada de Santa Marta area, which was excavated by Mason. However, the Arashi pectoral features two biconical perforations instead of the single, transversal perforation produced in the lithic example. The Colombian lithic example is small, just 72 mm wide. Several similar forms of various sizes are known. One example, also made from the lip of the Strombus shell, is known for Margarita Island, Venezuela (De Booy 1916:24; and in McGinnis 1997: Figure 54). The Arashi pectoral may be a trade piece; alternatively, (particularly because of its distinctive suspension holes), it may be an indigenous creation inspired by prehistoric Colombian examples. Its provenience may indicate a "Preceramic" origin, or, more likely, incidental discard/loss by later visitors to the shore (Arashi-1) area.

Two other artifacts are fragments that probably once formed parts of broad-winged pectorals (Plate 49 and Plate 50), from Malmok-3 (#128) and Santa Cruz (#81), respectively. Each was manufactured from the body whorl or lip of a *Strombus* sp. shell. When originally discovered by R. A. C. F. Dijkhoff, the Malmok fragment, which features a central partial perforation, also had, like the Arashi pendant/pectoral, two complete perforations from which it might have been suspended. The placement of a partial

perforation in this artifact is similar to that of the shell pendant from central Venezuela published by Rouse and Cruxent (1969:Plate 46A).

If, in fact, the shell pendants discussed here represent mythic beings and are not purely decorative items casually representing (however loosely) animals associated with prehistoric Aruban peoples, it seems reasonable to associate their iconography with shamanic transformations of the kind documented ethnographically for indigenous peoples of the mainland and for the ethnohistoric Taíno in the Greater Antilles.

6.4.2.5 Receptacles

Twenty-nine artifacts in the AMA sample are identified as "receptacles" based on their technical and formal attributes. All of the artifacts in this category may be considered "semi-automorphic," since they all preserve significantly the source shell morphology. Four species are represented in the "receptacle" category: *Cassis* spp. (83%), *Melongena melongena* (7%), *Strombus gigas* (7%), and *Capraecassis testiculus* (3%). Each of these species provides a shell medium with morphological attributes that are both highly decorative and functionally expedient. The choice of a particular shell species to produce these artifacts may reflect aesthetic choices or indicate an unknown symbolic association within the culture from which each originates.

Receptacles forms are divided into two subgroups, vessels (n = 28) and spoons (n = 1), as follows:

Vessels

Twenty-five artifacts in the AMA sample are vessel-shaped forms. These include modified body whorls of *Cassis* sp. (n = 23), *Cypraecassis testiculus* (n = 1), and *Strombus gigas* (n = 1) shells. These vessels range in maximum length from 40.8 mm to 69.8 mm (mean = 65.9), in width from 39.3 mm to 85.6 mm (mean = 62.6). The thickness of these vessels (excluding natural shell protuberances) ranges from 1.6 mm to 4.1 mm (mean = 2.8 mm). The weight of these vessels ranges from 8.1 g to 63 g, with the mean being 28.9 g.

The dominance of *Cassis* spp. as the medium of choice for shell vessels suggests that this species may have been particularly valued in early Aruban society (Plate 51 and Plate 52). These artifacts may have been used ceremonially (Ramón Dacal, personal communication, 2001). Vessel-shaped artifacts of known provenience have been recovered from Sabaneta (n = 10), Santa Cruz (n = 8), and Tanki Flip (n = 3).[221]

The specific shape of one *Cassis* sp. artifact indicate that it probably did *not* function as a receptacle. This unique object (Plate 53), recovered by Bongers at Sabaneta, may have functioned as an ornament, perhaps as a bracelet or armband.

Two shell artifacts in this group, which are very similar in form, are made from the apex and spire of the gastropod *Melongena melongena* (Plate 54). Although the precise function of these artifacts is unknown, the morphological attributes of the *Melongena melongena* shells from which they were made, make them ideal for use as receptacles. These artifacts may have had an entirely different function. The morphology of this

[221] With the exception of the shell spoon (described below), these forms were not identified during the 1994-1995 excavations at Tanki Flip.

gastropod species may even have inspired the production of a purely decorative object. However, the site provenience of the larger specimen, which was excavated by Boerstra at the Tanki Flip/Henriquez I site, permits us to attribute this particular cultural form to the Ceramic Age peoples of that site. The precise provenience of the smaller example is unknown. The maximum lengths of these artifacts are 83.1 mm and 94.3 mm, and they measure 66.0 mm and 68.2 mm in width, respectively. Their respective weights are 150.1 g and 152 g (mean = 151.1g).

Spoons

One artifact in the AMA sample is very similar in form to one identified by Serrand for Tanki Flip (1994-1995) as a "Spoon with nodule" (Serrand 1997:200). This particular specimen, formed from the body whorl of *Strombus gigas*, lacks any well-developed shell nodule morphology. It may be that the culturally determined form is more significant than the particular part of the shell used for its manufacture, since the nodule areas of the Tanki Flip specimen are highly abraded. The AMA specimen, of unknown Aruban provenience, preserves the original shell surface on both its interior and exterior faces. It measures 83.6 mm in length and is 35.2 mm at its widest point. Consistent with the Tanki Flip example, it has been polished on all margins.

6.4.2.6 Geometric Forms

Oval Forms

Fifteen shaped-shell artifacts are oval shaped. They range in length from 33.7 mm

to 81.6 mm, with the average being 56.3 mm. The widths range from 20.0 mm to 64.5 mm, with the average being 41.6 mm. In thickness, they range from 2.3 mm to 5.0 mm (average = 3.4 mm). Two are made from the body whorl of *Tonna maculosa* shells (Plate 55). Several have been fashioned from *Cassis* spp. gastropods (Plate 56), from the distinctive sculpture of the interior body whorl that characterize specimens of this genus. Indeed, these artifacts seem to feature this particular part of *Cassis* spp. morphology; this distinguishes them from simple geometric forms, and indicates that marine shells of this genus were aesthetically appealing and/or symbolically important to early Arubans.

A disc shaped pendant from Cuba made from the shell of a *Cassis tuberosa* suggests that prehistoric Cuban peoples also appreciated the aesthetic value of this species (Alvarez Conde 1956:Plate XXXIX). However, none of the Aruban artifacts made from this shell have been perforated. This does not necessarily indicate that they were not ornamental, as these artifacts could have been secured to supports (i.e. necklaces, belts, or headbands) by some other means.

Rectangular Forms

Thirteen geometric-shaped artifacts are roughly rectangular in form. These range in length from 29.1 mm to 73.9 mm (average = 55.1 mm), in width from 10.3 mm to 52.9 mm (average = 28.0 mm). These artifacts, most of which are made from the body whorl of *Strombus gigas*, are relatively thick, ranging from 2.9 mm to 7.8 mm in thickness (average = 6.3 mm) (Plate 57). The formal attributes of these artifacts lend themselves to a wide variety of inferences regarding their function(s), yet no specific function may be

identified. They correspond generally to artifacts recovered during the 1994-1995 excavations at Tanki Flip that are classified by Serrand as "small abraded plates" (1997:204). However, unlike the forms described by Serrand, the rectangular forms in the AMA sample generally lack the smooth edges and use-wear that could identify them as tools. One exception is a smooth artifact that is approximately square in shape (Plate 58). Normally, an artifact of this general size and shape may be identified as a kind of gauge used to regulate the spacing in fishing nets. However, the highly symmetrical shape and finished form of this artifact suggests that it is not a simple tool.

Other Geometric Forms

Two geometric forms made from Strombus shells are neither oval nor rectangular. One, from the Canashito site, is intermediate between these two forms, and is unlike any other in the sample. It has been formed from the body whorl of a *Strombus gigas* shell and measures 67 mm in length, 60.6 mm in width, and it is 4.8 mm thick (weight = 29.1 g). The rough edges around the perimeter of this object may indicate that it is an unfinished form. It is also possible that its condition results from use. Although it lacks the modified nodules that characterize artifacts identified as "vessels," it might well have been used as a small plate. It may have also been a decorative and/or symbolic object within early Aruban society.

Another unique marine shell artifact was excavated by Versteeg at the Santa Cruz site. It is roughly triangular in shape and is made form a *Strombus gigas* shell body whorl. It is quite similar in form to a shell vessel from the same site. However, this object is much

smaller and also lacks the modified shell nodules that vessels retain. This unusual artifact measures 56 mm in length, 49 mm in width and is 3.2 mm thick (weight = 12.1 g). The notch in this artifact does not appear to be created intentionally by pecking. It may result from the artifact's function, which is unknown.

6.4.2.7 Miscellaneous

Nodule/Spine Artifacts

Nine artifacts in the AMA sample have been produced from large spines or nodules of *Strombus gigas* shells. The precise functions of these artifacts remain obscure. However, elsewhere in the Caribbean region, they are frequently interpreted as mythological symbols associated with agricultural fertility (Arrom 1975:41).[222] Four relatively rough nodule/spine artifacts are pictured in Plate 59. Although these are less elaborated than the remaining examples, they are each modified either by pecking, polish or use-wear. They may represent preforms of more highly elaborated nodule/spine artifacts or they may be finished forms. Two are of unknown provenience; the remaining two are from Santa Cruz (largest) and Sabaneta (smallest), respectively.

Five shell nodule/spine artifacts in the sample are highly polished. However, they are not homogeneous in form. The specimen pictured in Plate 60 was collected by Bongers at Sabaneta. This artifact measures 35 mm in length, and retains the distinctive morphology of the source shell. Yet, it is also embellished with three incised lines, spaced

[222] Arrom suggests that the great variety in form of artifacts of this type found throughout the Caribbean are an indication of their generalized use (Arrom 1975:41).

roughly 0.25 mm apart; these encircle the nodule extremity. This artifact is quite similar in form to a larger, more elaborate example from Montserrat (Arrom 1975:Figure 13).

Four other artifacts in this class are also highly modified. Three are roughly conical forms. Two of these are pictured in Plate 61. The specimen on the left, from the Santa Cruz/Angela collection, is 18.5 mm in height; the one on the right, from Boerstra's excavations at Tanki Flip, measures ca. 14.7 mm.[223] Although the morphology of these shaped-shell artifacts is similar, the Tanki Flip example is further embellished with a partial perforation at either end, suggesting that this artifact may represent an unfinished ornament.

One highly modified nodule/spine artifact from Tanki Lender (Plate 62) is quite distinctive in shape and is unlike any other artifact known for Aruba. It has been identified as a "plug" subtype based on its suitability as either an ear or lip plug.[224] This artifact, which measures 20 mm in height and 20.2 mm at its widest point, is highly polished on all sides.

Cylindrically-Shaped, "Peg" Artifacts

The AMA sample includes two highly modified shell artifacts that are morphologically similar to pegs (Plate 63). Unlike artifacts in the class identified as "geometric shapes," neither of these artifacts preserves any traces of the original shell from which it was manufactured. Both are highly polished. The smaller, more complete

[223] One other (degraded) example from Tanki Flip is not pictured.

[224] However, this potential use has not been verified ethnographically.

example, which was excavated by Boerstra at Tanki Flip/Henriquez I, measures 26.6 mm in length and 7.4 mm at its maximum diameter. The larger, fragmented example is 41.8 mm in length and 14.8 mm at its maximum diameter. Although the symbol written on this example ("O/B") indicates that its precise Aruban provenience is unknown, traces of additional markings suggest that this artifact, too, may be from the Tanki Flip/Henriquez I site. No artifacts similar to these were reported for the portion of the Tanki Flip site excavated during the 1994-1995 campaign.

Bipoints

Two artifacts currently on display in the museum are described as "bipoints." Morphologically, they are similar, but by no means identical, to thirteen artifacts recovered at Tanki Flip during the 1994-1995 excavations. At 58.1 mm and 63.4 mm, respectively, the two bipoint specimens in our sample are slightly longer than those described by Serrand as "points/chisels" (1997: 202-203, Fig. 148).[225] The latter were all made from the interior wall of *Strombus gigas*, which is likely also the source for these two artifacts.

Although grouped together, the bipoints in the AMA collection may well have served diverse functions. Either may have been used "to perforate and/or cut soft materials," as Serrand suggests for similar forms from Tanki Flip (1997:202). These artifacts could have been used as ornaments, despite the fact that they are unperforated. This seems particularly likely for the smaller bipoint, currently on display at the AMA. As

[225] Tanki Flip artifacts of this type range from 2.7-5.7 cm in length, 0.5-1.5 cm in width, and 0.4-0.9 cm in thickness.

Plate 64 reveals, this artifact is slightly faceted, with a polygonal to trapezoidal cross-section, yet it is a highly polished, symmetrical form, and may easily have been used as a type of body adornment when inserted through facial piercings. This artifact likely comes from Santa Cruz.[226]

Bone artifacts similar in form to shell bipoints have been recovered in Aruba. Kidder has also describes bone bipoints, which he calls "spikes" (Kidder 1944) from the La Cabrera Peninsula, Venezuela.

Sculptural Forms

The sample contains a few unperforated elaborate forms. Although a secure identification of the shell species used for their manufacture is not always possible, each was likely made from *Strombus* spp. shells, none of the artifacts in this group features a perforation that could facilitate its use as an ornament. Yet, each reveals a concerted effort to produce a specific form.

Curvilinear Polygon

A large artifact made from the lip of a *Strombus gigas* shell (Plate 65) served an undetermined function. It may have been useful as a plate. Serrand (1997:196-197) describes as "large plates" two artifacts recovered during the 1994-1995 excavations at Tanki Flip that were, like this object, produced from the exterior lip of an adult *Strombus*

[226] According to J. Dania (personal communication November 12, 2004), this artifact was recovered by him during his own excavation activities of his land in Santa Cruz and it was part of a lot of artifacts purchased from him by the AMA.

gigas of the "thin lipped" variety. Yet, the carefully shaped format of this artifact, from Sabaneta, differs from that of the more amorphous, elongated examples from Tanki Flip. In addition, the Sabaneta plate is more highly polished.

Another curvilinear polygon, from the Odor Collection (Plate 66), is unlike any other object in the AMA sample. It measures 69.3 mm in length, 56.5 mm in width, 8.9 mm at its thickest point, and weighs 60.1 g. This object, from Sabaneta, effectively illustrates the difficulty in identifying prehistoric cultural forms. Little consensus exists among researchers in the "Shell Industry of Aruba" team regarding the subject of this artifact. Is it meant to depict a frog, a bat, or an anthropomorphic figure? These are just a few of the possible interpretations for this artifact. It may well represent something entirely different, or may be an unfinished form. Without the precise provenience for this artifact, it is not now possible to attribute it to a specific phase of island occupation.

Rectilinear Polygons

Two polygon artifacts are quite similar in form. They are each rectilinear polygons, notched on either of their longest sides with roughly 60 degree angles; these may have secured a cord to hold each object suspended as a pendant. No traces of use-wear that could help identify this particular function are evident in these artifacts. One of these artifacts, now on display in the museum is attributed to the Sabaneta site (#76) (Boerstra 1982:44, Figure 14). It is 23.9 mm in length, and 9.5 mm wide, and 4.6 mm thick. Another example, from the Santa Cruz site (#81) (Plate 67), is more refined, with faceted edges on its face. It is also smaller than the Sabaneta example; it is 15.9 mm in length, 5.88 in width,

and is 3.9 mm thick. Each is highly polished, without any traces of the source shell. Although the function and meaning of these artifacts is unknown, their formal properties were apparently significant to early Aruban peoples. These objects may be local variations of anvil-shaped perforated artifacts described by Mason for the Nahuange site, Tairona Culture, Santa Marta (1936:Plate CXXX).

"Bone"

One unique object in the AMA collection is embellished with five partial perforations, and two incised lines that, which, together with is shaped form, give it the appearance of a decorated bone fragment (Plate 68). A small artifact, it measures just 18.0 mm in length, 7.6 mm at its maximum width, and is just 3.7 mm thick. Although fragmented, its small size and artistic detail reveal a certain mastery of shell artifact production. It lacks a complete perforation that may have facilitated its use as an ornament. However, this function may not be excluded, particularly since the object is fragmented and its fragmented end reveals what is left of what could have been a hole used for stringing.

The interpretation of the iconography of this shell artifact rests on the widespread Amerindian practice of ancestor worship, which is well-documented throughout South American and the Caribbean (Siegel 1997), and is generally supported by archaeological evidence. Bones are essential primordial elements of beings. For early Arubans they may have represented the essence of the ancestors. When one considers that the archaeological record of Aruba reveals ample evidence that prehistoric peoples of the island demonstrated

great care for the bones of the ancestors, it is not difficult to image that this artifact may represent a human effigy of sorts, if only one that may only be fully recognizable within the cultural context of its production or use. Some Arubans of the Ceramic Period practiced secondary burial, which means that the bones of the ancestors would be excavated and reburied, either in Ceramic urns or in pits. Some burials would contain only certain bones, so particular bones might have carried specific meanings. According to Reichel-Dolmatoff (1971:49, 98), "bone" is one designation for the sun, which is viewed among the Desana peoples of the Amazon as divine, the source of all human life. It must be stressed that the deficiency of ethnographic data for early Aruban peoples makes these interpretations tenuous. The lack of precise provenience and contextual data for this artifact further limits our understanding of this object to conjectural inferences.[227] Yet, we may still admire the aesthetic qualities of this icon of the past.[228]

"Maloca"

One artifact currently on display in the AMA collection may represent a prehistoric house type, the "Maloca" (Plate 69). A unique form in the collection sample, this artifact was manufactured from a shell spine/nodule, and it retains this basic shell form. It is distinguished from artifacts in the "Nodule/Spine" group by its distinctive form and detail.

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[227] This object is part of a museum purchase from the collection of J. Dania. Dania reports finding it within the topsoil of his property at Santa Cruz (Dania, personal communication November 12, 2004).

[228] In form, the artifact is strikingly similar to the central "back" portion (dorsal side) of a bone pipe in the collection of Manuel García Arévalo (pictured in Arrom 1975:181).

These embellishments seemingly transform the artifact into an iconic form. Two notches produced by abrasion, located opposite each other at the perimeter of the base of this cone-shaped object, appear to represent entrances to the "maloca," and the concentric incised lines that encircle the notched tip appear to mimic decorative elements of the house structure putatively represented. The diameter of the artifact's base measures 7.3 mm, and it is 8.5 mm in height. Although this object is reportedly from the Santa Cruz site, its precise provenience, which could further inform our knowledge of its form and potential function, has been lost.[229]

6.5 Summary

The collection of the marine shell artifacts housed in the Archaeological Museum Aruba is just a small sample of the many objects left behind by the ethnohistoric Caquetíos of Aruba and their ancestors before them belonging to the Dabajuroid subgroup of the Dabajuran ceramic series that, according to Oliver (1997:398), likely originated in the Northern Llanos of Venezuela. Over time, and through various means, the cultural material of these Arubans has been distributed to other collections ─ on the island and in other parts of the world.

[229] This object is listed as a "carco punt" (Strombus point) on an inventory of objects purchased by the AMA from J. Dania (AMA archives and personal communication, J. Dania, November 12, 2004).

Technical attributes of the artifacts suggest that many were likely used as ornaments. Some artifacts in the collection may have served a ritual and/or symbolic function, although, frequently, the precise nature of the function is unknown. For some of these, inferences may be made using regional archaeological and/or ethnographic data. The collection contains several artifacts for which no intuitive function is apparent.

Lacking evidence of the Preceramic production of modified marine shell artifacts not identified as tools, the non-tool artifacts in the sample from the museum have, with a single exception, been attributed to prehistoric peoples of the Ceramic Age. Yet, it is likely that marine shell artifacts of the early Historic Period are also represented in the collection, not only as fortuitous surface finds that have been donated to the museum over the years, but also as a result of salvage excavations. The technological attributes of one specific type of perforated disc or "bead" from the site of Budui, suggests that indigenous peoples incorporated old world technology into the production of native forms. To date no comprehensive archaeological investigations have focused specifically on indigenous survival. Until excavation data can establish finer resolution in the classification of Amerindian cultural remains, these objects, along with all "non-tool" O/S shell artifacts in the museum sample, are associated (in dichotomous terms) with ceramic producing, agricultural prehistoric Arubans, those of the Ceramic Age.

CHAPTER SEVEN

ARUBA'S MARINE SHELL ARTIFACTS IN LOCAL AND REGIONAL CONTEXTS

7.1 Introduction

The study of marine shell artifacts in the AMA collection clearly reveals that molluscan resources provided important media for the production of objects of cultural value. What inferences may be drawn from these artifacts? What are the sociocultural and/or political implications of the observed variation in these cultural forms and other shell related behaviors?

Low frequencies and the lack of provenience data for many shell objects limit their use as potential "secondary culture" (Kroeber (1957:36) "markers . . emblematic of group differentiation" (Oliver 1997:417). However, the available data suggest spatial (and possibly temporal) variation, which may also reflect group differentiation, both on the intra-site and inter-site levels.

7.2 Resource Procurement and Cultural Variation

Available data reflect both continuity and change in the procurement and use of molluscan resources in Aruba. Table 7.1 lists the species modified to

produce the marine shell artifacts examined for this study and also indicates the presence/absence of each among the remains recovered during excavations at the Preceramic Malmok and Ceramic Period Tanki Flip sites (1994-1995), respectively. This table reveals both spatial and temporal variation in the procurement of molluscan resources, since only four species were common to both.[230] These four species, the gastropods *Melongena melongena* and *Strombus gigas*, and *Tonna maculosa*, and the bivalve species *Codakia orbicularis*[231] were likely important resources for diverse Aruban inhabitants through time. The evidence from each of these excavations suggests that none was more so than *Strombus gigas*. The collection of marine shell artifacts in the AMA reflects continuity in the reliance on this species (although it must be emphasized that currently no extant data link "non-tool" O/S marine shell artifacts to the Preceramic Period).[232] For the Ceramic Period, *Strombus gigas* dominates as the source shell modified to produce shell artifacts.

Table 7.1 also indicates change. Most notably, *Spondylus* sp. shells are clearly absent from the species recovered from the two excavation assemblages.

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[230] Small molluscan shells at sites may be evidence of natural processes; they can be transported to the site by scavenging animals or by meteorological events (e.g. strong winds and storms); they can also occur as by products of the consumption of predating species, such as birds and fish (Bobrowsky 1984).

[231] This species has been identified for prehistoric Aruban tool artifacts, but has not been specifically identified as a source shell for non-tool artifacts.

[232] The problems of negative evidence (discussed below) may apply here.

For the Malmok burial site, which lacks evidence of marine shell artifact production, this absence may be explained by the habitat of this species. *Spondylus* sp. mollusks attach to rocks (and in modern times to other objects) submerged on the ocean floor. Thus, it is not a convenient subsistence resource. Since Spondylus artifacts (including at least one whole valve) were recovered from the Henriquez I portion of the site of the Tanki Flip site, it is evident that Ceramic Period peoples who inhabited the site did make use of Spondylus shells. The lack of any Spondylus material at the very large portion of the Tanki Flip site excavated in 1994-1995, may indicate intra-site variation, perhaps a cultural shift.

One obvious difference between Preceramic and Ceramic Period Aruban populations is the absence of reliable evidence of Preceramic production of "non-tool" O/S shell artifacts. Some authors have identified shell artifacts from Canashito as Preceramic. However, the fact that pottery remains have also been found at Canashito negates this evidence. Substantiating any claims of Preceramic O/S shell artifact production requires the recovery of "non-tool" O/S shell artifacts in identifiable Preceramic contexts.

7.2.1 Intra-site Variation

Little is yet known of Preceramic lifeways on Aruba, a fact that challenges efforts to identify group variation on the site level. Of the few Preceramic sites thus far identified on the island, the Malmok cemetery offers the only potential evidence of group variation in the symbolic use of marine shell.

For the Ceramic Period, the Tanki Flip site offers the greatest potential for identifying variation on the intra-site level, if only because this is the site for which most of the supporting documents are available. The analysis of the AMA sample suggests intra-site variation in the production and use of O/S marine shell artifacts at the Tanki Flip site.[233] This can be seen by comparing the subassemblages of "non-tool" O/S marine shell forms excavated during three distinct excavation campaigns at that site: the 1968 ARC (Hunter College) excavations conducted by Heidecker and Siegel; the excavations by Boerstra (1975-1977); and the 1994-1995 excavations conducted by Versteeg, which tested diverse areas of the site. No pendant "tinkler" forms were recovered during the 1994-5 excavations. One artifact described as a "bead/tinkler" (Serrand 1997:215) may represent a stage in the production of this artifact type. Without any sign of perforation or other evidence of shell modification to produce this form, this artifact could also be an automorphic shell artifact typically described as a "bead" (Sickler Robinson Oliva Type 1). Several adornment types recovered during the ARC (Hunter College) excavations are also not represented in the Tanki Flip (#101-C) 1994-1995 shell artifact subassemblage, including polygon forms (with two conical perforations) made from modified *Pinctada imbricata* shells, as well as adornments made of *Spondylus* sp. shells.

Given the many differences in shell material culture, it is possible that the Tanki Flip site is not one site, but a series of sites of which the surface remains are now interspersed. Bartone & Versteeg (1997:112) has suggested that the Tanki Flip settlement expanded toward the south over time (see below). Perhaps the production and use of

[233] See Appendix VII for subsample data for artifacts of known provenience.

"tinklers" and other marine shell forms were practices adopted by Tanki Flip inhabitants only subsequent to this expansion.

7.2.2 Inter-site Variation

A comparison of data available for Malmok and Canashito burials indicates inter-site variation in the symbolic use of marine shells. Whole shells are present as burial offerings at Malmok, but no such use is presently known to have been recorded for the Canashito burials. One important point that mitigates this inference concerns the timing of investigations. Researchers have not always recognized shells as social markers. So, any shells recovered may have been regarded simply as byproducts of subsistence. The researchers who excavated at Malmok (Versteeg, Tacoma & Van de Velde 1990) provided the first indication that Preceramic peoples used marine shells in symbolic ways. All other excavations of Preceramic sites predate this revelation.

Available evidence also indicates variation in the cultural use of shell during the Ceramic Period. Both archaeological and ethnohistoric sources suggest that Dabajuroid populations of Venezuela and the ABC islands used shell discs (both perforated and unperforated) in a variety of ways. Although the ambiguity of the term "botón" makes it difficult to compare the use of shell discs across sites in Aruba, some perforated shell disc "beads" in the AMA collection suggest that the funerary "botóns" of Tanki Flip were unlike the Budui varieties. Budui "botóns" are not only best described as "beads," since they have perforations, they exhibit variation in artifact manufacture (i.e. in the part of the

shell modified for their production, in their perforation types, and in their artifact finish).

Much of the archaeological evidence is associated with the Tanki Flip site. The AMA sample contains more "non-tool" O/S shell artifact forms than have apparently been recovered at Tanki Flip during any excavation campaign at the site, suggesting inter-site variation. For example, no disc-shaped adornments with Type 3 perforations have been recorded for that site.[234]

Versteeg estimates that the Tanki Flip site was abandoned ca. 1400 A.D. This is generally supported by Dijkhoff's analysis of Tanki Flip (#101B) pottery, which reveals traits diagnostic of both Early and Late Urumaco style. Dijkhoff's analysis does not rule out the presence of stylistic traits consistent with the later Los Médanos at this portion of the site (Henriquez I parcel), since "all possible Los Médanos style characteristics are also present in the Urumaco phases" (Dijkhoff 1997:229). However, he does suggest that the absence of traits diagnostic of Los Médanos, such as black-on-red fine ware pottery rim forms, indicates that the site was likely not influenced by developments associated with this phase (1997:230-232). The lack of stratigraphic evidence combined with too few radiocarbon dates for the southern portion of the site constrains efforts to place a terminal date on the Tanki Flip site. Yet, evidence collected in this study also suggests that Tanki Flip *may* not have been occupied during the Protohistoric Period, which is temporally associated with the Los Médanos phase. The apparent lack of "heishi" beads, which have

[234] One rectangular adornment (Plate 30) has an incomplete Type 4 perforation. It is possible that the hole was originally produced with a Type 3 perforation and the surface of the artifact has eroded through use wear.

been ethnohistorically documented as important trade items among the ethnohistoric Caquetíos *may* indicate that ethnohistoric Caquetíos of the Protohistoric Period did not inhabit the Tanki Flip site, and also that these beads were a relatively late development among Dabajuroid farmers living in Aruba.

Most of the automorphic types in the subsample are either from Sabaneta or Santa Cruz, with the latter accounting for a large portion of the total number of these forms in the subsample. The Olive shell "tinkler" type, associated at Tanki Flip only with the Henriquez I parcel (Boerstra Campaign), is abundant at Santa Cruz. The Cyphoma gibbosum adornment with four perforations is also from Santa Cruz. Sabaneta has also yielded a well-preserved Spondylus valve and an incised Strombus nodule; these may indicate that Amerindian Arubans inhabiting this site also valued shell morphological attributes.

O/S shell artifacts with iconographic elements in the AMA study sample are also predominantly from Sabaneta or from Santa Cruz. For example, the elaborate "maskette" with Type 3 perforations and the "bat" with two Type 2 perforations are both from Sabaneta, while the "bone" and "maloca" forms are both from Santa Cruz, as is the large staff pendant described by Boerstra (1982). Two polygon pendants found only at Santa Cruz may also have icongraphic significance. The same may be true for the elongated pendants, which were all recovered together in Sabaneta.

Given that most of the iconographic shell artifacts occur in Aruba as unique objects, the possibility that these artifacts may not have been manufactured on the island must be considered. They may be evidence of trade relations between Amerindian

Arubans and other groups and their concentration at Sabaneta and particularly at Santa Cruz, an indication of the relative economic power of these two sites. The importance of the Santa Cruz site is further supported by the diversity of O/S shell types from this site, and by the available evidence of the distribution of micro "heishi" beads, shell artifacts types that are noticeably absent from the records for both Sabaneta and Tanki Flip.

7.3 The Problem with Negative Evidence

While the study sample data suggest both intra-site and inter-site variation in the production of "non-tool" O/S forms, it is important to weigh this evidence against potentially mitigating factors. Schiffer explains:

> A great many important archaeological inferences have been established prematurely on the basis of small numbers of sites and inadequate coverage of the study areas. Such inferences are quite vulnerable to new discoveries and, consequently, are overturned and replaced at a prodigious rate (1996 [1987]:341).

Data acquisition strategies likely play an important role in the variation suggested by the AMA "non-tool" O/S marine shell artifact sample.

Of course, it is not surprising that pre-excavation and other surface collections in Aruba may fail to recover small shell artifacts. As Schiffer and Wells suggest, "all surface collection strategies are biased against the recovery of very small artifacts" (Schiffer and Wells 1982:371; quoted in Schiffer (1996 [1987]:355).[235] However, excavation methods

[235] Schiffer also cautions that "the sometimes extreme size-effects of surface collections require the archaeologist to exercise much care when making comparisons, especially between surface-collected and excavated samples" (1996 [1987]:355).

may also have inhibited the recovery of these small artifacts.

While it may always be argued that absence of evidence is not evidence of absence (Schiffer 1987:356), there *is* evidence to suggest that research strategies and other post-depositional processes may play a major role in the absence of shell data, including shell artifact forms, spatially and/or temporally identifiable contexts, and symbolic associations. For more than thirty years, large-scale excavations in Aruba have focused primarily on identifying house structures and activity areas using subsurface horizontal probes. Although feature-targeted horizontal probes can provide invaluable data on site structure and spatial distributions, they may fail to reveal temporal changes. This is particularly true on Aruba, where the large scale clearing of sites has typically eliminated many stratigraphic, depositional, and/or temporal changes that may be identified through vertical investigations. In some cases, vertical penetrations (i.e. test pits or shovel tests) preceded excavations. However, it is not clear if such probes have been used to obtain data that could potentially inform questions of relative dating and/or depositional histories, or if they have been used primarily to identify site limits in advance of excavation.

According to Schiffer, "no recovery technique operates without bias; any that appear to simply have not been studied sufficiently" (1996 [1987]:358). Yet, the marked bias toward the horizontal in Aruba limits the inferences that can be made about temporal variation in marine shell production and use. Sampling strategies that include an aggressive removal of top-soil have compounded the problem by further constraining analyses of cultural sequence. Principal investigators have generally employed heavy machinery to strip away substantial deposits thought to comprise disturbed layers in order

to reveal features, subsequently excavated or sectioned and excavated in part.[236] Failure to screen these deposits has not only further frustrated analyses of diachronic change, but have also undermined analyses of both intra-site and inter-site spatial variation. As Versteeg suggests, these deposits "may supply crucial information" (1997d:458).

7.3.1 The Tanki Flip Site

As discussed above, several shell artifact types included in the AMA collection are apparently not known for the Tanki Flip site. Among these are the many iconographic forms recovered on the island. "Micro" and/or "heishi" beads are apparently also not among O/S shell artifacts from this site. None of the archaeological reports of the principal investigators of any Tanki Flip excavation (Heidecker and Siegel 1969; Boerstra 1976; 1982; 1983; 1991; Versteeg & Rostain 1997) have reported finding small ("micro") and/or "heishi" beads. Were these beads part of the material culture of Tanki Flip inhabitants?[237]

[236] Boerstra describes the use of this equipment for both the Ceru Noka (Santa Cruz) and Tanki Flip excavations (1974 and 1976, respectively). For the 1971 Santa Cruz excavation, the clearing depth of removed top soil was estimated at 40 cm; for Tanki Flip (1975-9), it was estimated to be 30-40 cm (1974:14; 1976:125).

[237] One may not exclude the possibility given the presence of such beads in the collection for which provenience data are unknown. However, If such artifacts were recovered by Boerstra at Tanki Flip, the data for such finds have not been preserved in the archaeological records at the Archaeological Museum of Aruba. In addition, during my meeting with Boerstra on November 11, 2004, he did not recall finding either "micro" or "heishi" bead types at Tanki Flip. Such beads were also not recovered from the exceptionally large portion of Tanki Flip excavated during the 1994-1995 campaign (Serrand 1997).

Hester, Shafer & Feder explain the importance of screening archaeological deposits:

> Sifting excavated material through screens enables the archaeologist to recover many materials that might otherwise be overlooked (leading to considerable bias in the sample obtained from a site) (1997:93).

Because standard ¼-inch mesh can permit the loss of minute artifacts, fine-screening (using 1/8-inch [3 mm] or smaller mesh) is now commonplace in archaeological investigations (Hester, Shafer & Feder 1997:93; Deagan 1987:156). The relatively large ¼-inch mesh size used for soil screening in 1968 by the ARC investigators of the site would have essentially precluded the recovery of small shell beads, if they, indeed, existed at the site.[238] Fine-screening (with 1/8 inch mesh) was subsequently used by Boerstra during excavations of the Henriquez I parcel in the 1970s, and by Versteeg for the northern portion during the 1994/5 excavations at Tanki Flip (Bartone & Versteeg 1997:26). Yet, this technological improvement has not yet led to the recovery of small ("micro" and/or "heishi") beads at Tanki Flip. All things being equal, one might conclude that the inhabitants of this site did not produce/use such beads. This would signal inter-site variation.

The primary data recovered for the relatively small-scale ARC excavation reveal that more modern methods also have their drawbacks (AMA ARC excavation archives, August 1968), and "micro" shell beads may not be the only potential casualties. The ARC data indicate that had the excavation begun with the aggressive removal of un-sifted top

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[238] Parry offers that "many archaeologists did not screen at all in 1968, and those that did often used ½ inch mesh; even now most use ¼ inch" (William J. Parry, personal communication, 2005).

soil, few (if any) of the 158 shell objects recorded for the site would have been recovered. Only two of the six units excavated extended below 40 cm. One (E4S2), which reached 42 cm, contained no shell artifacts. The second (E4S26) contained one of two pit features from which radiocarbon samples were obtained. This pit was identified at just 15 cm from the surface (Heidecker & Siegel 1969:14). Although it extended down to 59 cm, the authors/investigators reportedly found that "the top of the pit contained a heavy concentration of shell, bone and pottery which grew lighter toward the bottom. One perforated shell disc or bead was found in the upper portion of the pit, but the bottom 25 cm was relatively free from artifacts except for a few sherds" (Heidecker & Siegel 1969:14).

The most recent excavation of the Tanki Flip site was a salvage excavation, since plans were then underway to develop the land in order to provide housing for Aruba's burgeoning population. Excavation techniques were aimed at attaining a level of efficiency that would permit a small group to maximize their understanding of the approximately 50 m^2 excavation area. That the knowledge gained from the investigation was considerable (see Chapter 5) there is no doubt. This excavation campaign, perhaps because it *was* a salvage project, also did *not* focus on a systematic recovery of artifacts (Versteeg & Rostain1997:1). Careful attention to artifact recovery applied principally to the matrix removed from site features. The bulk of the "soil archive," the approximately 750-1000 cubic meters of topsoil determined to contain "low quality" data removed by

machine and shovel scraping (Versteeg & Rostain 1997:1) was not screened at all (Versteeg 1997d: 458; Raymundo Dijkhoff & Fransisco Croes, personal communication, 2001). This limits the inferences that can be made concerning shell bead production and use at the northern portion of the site.

As Hester et al. point out, "some archaeologists feel that shovel stripping is abused when plow zones are stripped without screening the excavated deposits" (1997:85). An examination of shell disc "beads" recovered from two different excavation campaigns at Tanki Flip illustrates the problem. Table 7.2 illustrates little difference in the ratio of finished beads to unfinished forms recovered during the disparate campaigns (which sampled geographically distinct areas of the site). Although the relative volume of shell "bead" artifacts recovered during the 1968 excavations at Tanki Flip seems remarkable (Table 7.3), it is not possible to know if this indicates the unwitting recovery of a shell workshop, an intensification of production of shell beads over time, or if this evidence is an artifact of sampling methods, perhaps a consequence of pre-excavation removal of soils that remained unscreened (Table 7.4).

The report of the specialist who analyzed the "highly modified" marine shell objects recovered from this excavation reveals that a significant percentage of the artifacts she analyzed were recovered by picking through the unsifted top-soil piles (Serrand 1997:216). The failure to sift this excavated material introduces considerable bias into the recovered materials sample. It effectively nullifies analyses of cultural variation based on the presence or absence of marine shell types. Indeed, if, in fact, the technology employed

to create micro "heishi" beads is associated with later periods, any evidence, had it been present at the site, would most likely have been discarded at the outset of the investigation.

Sampling strategies also influence other inferences at Tanki Flip. As discussed previously, Versteeg & Rostain have suggested that the Tanki Flip site was enlarged over time, with the northern portion of the site being the oldest. Radiocarbon dates do support an early occupation of this area of the site (Bartone & Rostain 1997:110). However, little can be said of later occupations, since any deposits providing evidence of them would have been removed prior to excavation and remain unscreened. Perhaps the seemingly anomalous Historic Period radiocarbon date obtained by Versteeg during the 1994-1995 excavation campaign (from Feature 408) indicates continuous (if dispersed) occupation (or resettlement) of this site in the early Historic Period (see Appendix II).[239] The argument that historic age artifacts were not recovered in the northern part of the site can not be supported, since the sampling strategy specifically targeted the removal of historic age deposits containing "low quality" data.

[239] See Bartone & Versteeg (1997:111); note also that this is also supported by evidence offered by Versteeg & Rostain, who cite Van Koolwijk's identification of Tanki Flip as an "Indian camp-site" and the home of "Uncle Kaus or Kausie," an "Indian," whom the "old people" of 1880s Aruba had known (1997:4). This evidence, together with the necessity of excavation methods that did not aim to recover historic evidence, makes the seemingly anomalous date entirely plausible.

The disparity between the two excavation campaigns of the Henriquez I portion of the Tanki Flip site (1968 ARC excavation and Boerstra's 1975-1979 excavations)[240] complicates efforts to evaluate the variation in the radiocarbon dates associated with these respective campaigns (Appendix II). The charcoal sample date obtained by Boerstra from feature 197[241] yields the radiocarbon date of 825 ± 30 B.P., while the two dates obtained by Heidecker & Siegel are 740 ± 105 and 765 ± 105, for features I and II, respectively. Calibrated, these dates may be considered contemporaneous. They may also indicate that Boerstra's excavations tested cultural levels below the levels at which the ARC radiocarbon samples were taken.

Given the lack of stratigraphic control during Tanki Flip (#101-B) excavations, Boerstra's suggestion that shell artifacts recovered from Tanki Flip "have little chronological significance" may also be questioned (1983:175). As this brief review of the excavations at Tanki Flip reveals, little attempt has been made at Tanki Flip to recover chronological data for shell artifacts.[242] Even the recent large-scale salvage excavation of the site, which has contributed significant data to the study of this Ceramic Period site, was not designed to incorporate a systematic recovery of shell artifacts (Versteeg & Rostain

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[240] A third excavation of this portion of the site was conducted prior to these two, by a local school teacher and his students. However, since no artifacts recovered from this excavation are included in the study sample (nor available for study, their whereabouts being presently unknown), this excavation is not included here.

[241] Vertical provenience data for this sample was unavailable to the author.

[242] Only the relatively small-scale excavations of the 1960s, by Lester (1968) and by Heidecker & Siegel of the ARC (1968, 1969), focused on the three dimensional provenience of excavated artifacts.

1997:1). While more conservative, the site-sampling strategy employed by Versteeg may be viewed as a continuation of the strategy adopted by Boerstra in the 1970s during excavations of the Henriquez I parcel of the Tanki Flip site.[243]

7.3.2 The Santa Cruz Site

The problem of negative evidence seen at Tanki Flip is replicated at the Santa Cruz site. More than four decades ago, Van Heekeren characterized the archaeological situation in Aruba as "precarious," noting that "large scale sand quarrying has been taking place day after day for many years in the very heart of the famous prehistoric settlement containing urn fields at Seroe Noka [Santa Cruz]" (1963:16). In addition, unlike the situation at Tanki Flip, the area around the Santa Cruz site has long been densely populated. In addition to the demands of modern life in Aruba, other forces have worked against the preservation of the island's "soil-archive" (Versteeg 1991:6). Perhaps more than other sites, the Santa Cruz site has been heavily impacted by the activities of *aficionados*.[244] Van Heekeren's 1963 assessment of the Santa Cruz site not only reveals that the destruction of the

[243] Boerstra introduced Versteeg to the archaeology of Aruba in the late 1980s (Boerstra, personal communication, November 12, 2004).

[244] A substantial portion of the recovered artifacts has subsequently been donated to the Archaeological Museum of Aruba.

archaeological record at Santa Cruz has been underway for several decades, but also suggests the extent of the loss:

> It is not exaggeration to state that approximately every fortnight an urn containing a human skeleton or a skull is exhumed. Usually these are demolished, or at best fall whole into incompetent hands. Important finds have found their way unlabeled and uncatalogued into private collections in the islands, where they are kept as curios (1963:16).

A more recent assessment of the site by Versteeg suggests that "the site has lost much of its archaeological value, mainly through building activities and sand extraction" (1997a:89).

7.4 Regional Ties: The Social-Political Interaction Continuum

Just as diverse uses of shell and distributions of shell artifacts communicate distinctions between groups, similar uses can potentially reveal common social or ideological traditions, as several researchers have suggested should be expected for groups that share linguistic roots (Siegel 1992; Lathrap 1970; McGinnis 1997). The "non-tool" O/S shell artifacts of the AMA, which suggest both similarities and differences between early Aruban peoples, also indicate cultural relationships to other groups in the region.[245]

[245] These similarities may be akin to those discussed by Oliver for common ware pottery (1997). Oliver shares Lathrap's view (1970:110) that among Amazonian groups, vessel forms appear less resistant to change than do vessel decorations, and that the former provide "better indicators of historic relationships among groups that participate in similar subsistence-economic patterns." Oliver further asserts that "in Western Venezuela (and probably the Intermediate Area as a whole) cooking vessel forms tend to be far more resistant to change, and are excellent indices of shared subsistence patterns, than are vessels primarily destined for presentation-consumption and storage of food/liquid" (1997:413). Similarly, common shell types may indicate regional cultural ties.

Brumfiel suggests that "most archaeologists study particular sites and prehistoric periods in order to formulate general theories about the factors that produced culture change in the human past" (2002:419). This study, too, attempts to contribute additional evidence to efforts to understand why social complexity emerged within the geographic expanse of the Caçicure Caquetío Polity, while other Caquetío groups remained at a simpler developmental stage.

Ceramic evidence reveals that the prehistoric Ceramic Age Arubans maintained close ties with the mainland throughout prehistory (Oliver 1997:396). The two areas share many things in common: secondary burials in vessels with lids, preference for geometric painted design, similar lithics, and subsistence patterns. Haviser suggests that the nature of interaction between the Caquetíos of Aruba, Bonaire, Curaçao with those of the mainland was probably limited to a social interaction sphere, and not a larger socio-political action sphere (1987:141). Oliver asserts that "there is strong evidence that Tanki Flip's inhabitants were culturally, socially, politically, and economically tied to the larger Dabajuroid settlements of the mainland" (1997:363), that the Tanki Flip settlement is "embedded in a larger, more complex, and hierarchically organized macro-regional Dabajuroid settlement pattern" (1997:422).

Oliver suggests that the ethnohistoric Caquetíos of Aruba may have constituted either a second or third order sub-polity of the paramount chiefdom of Caçicure (Oliver 1997:422; 1989:275-277) of coastal Falcón. Among the Caquetíos of this polity, society was organized into three levels of hierarchy: local *cacique* (village headman), the *diao* or chief of several local *caciques*, and the mainland paramount chief (also called *diao*). Their

position within this 3-tier hierarchy (a complex society according to Johnson's criteria [1973:2; Hayden 1995:63]) is unclear. Oliver suggests that Caquetíos of Aruba may have been politically subordinated to the Guaranao, the Caquetío sub-polity that controlled the northern portion of Paraguaná that was subordinated to the paramount chiefdom of Caçicure (Oliver 1997:422; 1989:275-277). In the early conquest period, this chiefdom was controlled by Manaure (Oliver 1997:422; 1989:275-277).[246]

Johnson & Earle identify both intensification and stratification as two evolutionary processes (along with integration) that are key to the evolution of complex societies (1987:243). Of these they suggest that intensification is similar within Complex Chiefdoms and simpler Big Man societies (ibid.), and that the evolution of complex society is an adaptational solution to "particular problems brought about by population growth under particular environmental conditions" (Johnson & Earle 1987:244). Four main causal explanations for the evolution of centralized societies include: centralized storage as a form of "risk management" (Gall and Saxe 1977; Athens 1977); "warfare in naturally circumscribed regions" (Carneiro 1970); "technological complexity" (Steward 1955; Wittfogel 1957); and external trade (Sanders 1956; Service 1962) (ibid.). These prime movers "require central management" (Johnson & Earle 1987:244). Of particular

[246] The *diao* (supreme leader) of the Coastal Caquetío Polity at the end of the 15th century was Manaure's father, Caujarao (Beaujon 1982:49; Haviser 1991:165; Dijkhoff 1997:95).

importance, according to Johnson & Earle, is the issue of control:

> . . . intensification of the subsistence economy necessitates centralized management, but some forms of management do not necessarily lead to the formation of chiefdoms. It is the particular forms of intensification favoring central control that result in chiefdoms and provide the opportunities for political growth . . . Stratification involves the differential control of productive resources, and it is this control above all that distinguishes chiefdoms from simpler societies. Chiefdoms are based on generalized central leadership, as are Big Man societies; but a chief has sufficient institutional control over his society's political and economic organizations to be able to restrict leadership to an elite segment. Such control, based on restricted access to critical economic resources, may derive from any of four major conditions: Central storage . . . Large-scale technology . . . Warfare in naturally circumscribed regions (Carneiro 1970b; D. Webster 1975) . . .[or] External trade (1987:245).

It is likely that centralized storage played a role in the evolution of the Coastal Caquetío polity. However, this is difficult to substantiate given the little archaeological attention afforded the region (Oliver 1989; Arvelo 1995). Yet, there is evidence that ritual feasting and/or or legitimation ceremonies played a major in Caquetío society (Oliver 1997). This activity would presuppose the accumulation of an agricultural surplus. Structures identified at Tanki Flip may have been used for storage of surplus production at this site. Large ceramic vessels might indicate storage and/or feasting.

Demographic change is one factor that has been attributed to increased social complexity (Johnson 1972, 1973, 1982; Blanton 2002). The archaeological evidence in Coastal Falcón suggests that the migration of Dabajuroid peoples into the area coupled with the need to integrate extant population of Meso-Indian peoples may have been one factor contributing to the emergence of complexity in the region (Oliver 1989; 1997). Organizational stress resulting from rapid social change in this territory may also have contributed to the emergence of social complexity (Simon 1973; Johnson 1982:417). A similar situation may also have occurred in Aruba.

Hayden suggests that chiefdoms "occur in environments that lend themselves to even greater surplus production and intensification than Entrepreneur communities" (1995:63). While the semi-arid conditions in Aruba and Coastal Falcón seem ill-suited to the development of chiefdom economies, these conditions do support Steward's suggestion that the need for irrigation agriculture may contribute to the rise of social complexity (Blanton 2002:401). Spencer's study of the development of chiefdoms in Venezuela suggests that evidence of complex agricultural technologies is among other archaeological indicators of the emergence of chiefdom societies in the western llanos of Barinas ca. A.D. 550 (1999:127). Others include:

> The appearance of a clear settlement hierarchy focused on a large regional center; . . . population growth, evidenced by a substantial increase in occupied area; . . . the construction of pyramid mounds and other earthworks; . . . social status differentiation seen in residences and burial treatment; . . . and expanded relationships of exchange and warfare" (1999:127).

Evidence for large-scale agricultural technology in Aruba includes the anthropogenic transformation of the natural *rooien* system. Their construction and maintenance may have required centralized authority. Yet, irrigation agriculture in Aruba, as well as in the major flood plains in Northwest Venezuela can be seen as a continuation of ancestral practices among less complex groups (Oliver 1989). It is possible that Dabajuroid peoples who migrated into the area carried these intensification practices with them, and equally possible that social inequality was already well-established within these groups. However, Arvelo's research in the Quíbor Valley (1995) suggests that sociopolitical complexity (on the chiefdom level) could have developed *in situ*, after the Dabajuroid migration into Coastal Falcón. Oliver speculates that the "semi-arid climate and fragile ecology in the region, and . . . intensive dependence on maize, *auyama*, and bean agriculture" (1989:494) were factors that contributed to the development of a centralized hierarchical society in the region. The Dabajuroid expansion into Coastal Falcón and adjacent islands may have been an evasive response to "aspiring chieftains" (McGovern 1981:290) further south. Once these areas were occupied, however, the conditions highlighted by Oliver likely did contribute to increased social complexity.

One potential problem relating the adaptational model to the development of complexity in Coastal Falcón lies in the evidence that suggests that population levels were not particularly high in the area. Unlike in the Barquisimeto valley, Caquetío settlements in Coastal Falcón were not nucleated, but were dispersed over large areas of the lowland

landscape.[247] Oliver estimates that Coastal Caquetío villages were inhabited by 200 to 500 individuals during the early contact period (1989:494). The evidence of Dabajuroid occupation in Aruba suggests that sites were not all contemporaneous. Some may indicate a long term sequential use of arable land. Dabajuran inhabitants for the whole island probably numbered in the hundreds (not thousands) (Dijkhoff & Linville 2004). The evidence suggests that under normal circumstances, the region was nowhere approaching carrying capacities. It is possible, however, that the demands of feasting (and/or legitimation ceremonies) may have contributed both to a narrowing of the diet, an intensification process that Johnson & Earle (1987) suggest may be the norm for complex societies, as well as to the need for intensified production beyond the level needed to support the population.

There is little evidence to suggest that Dabajuroid peoples of the Caçicure Polity engaged in warfare, in contrast to inland Caquetío groups (Oliver 1989; Spencer 1999:127). The ethnohistoric Caquetíos of the coastal region were relatively passive peoples who avoided such conflict (Oliver 1989). However, ethnohistoric evidence indicates that trade was an important aspect of regional interaction. The record of Aruba has demonstrated significant ties to the mainland, including the use of a variety of resources unavailable locally (e.g. chert and exotic animal species). Items used in apparently symbolic contexts suggest that cultural symbolism was an important factor in

[247] This settlement pattern was likely a defensive response developed to protect some Caquetío communities from their more bellicose neighbors (Arvelo 1995:180).

maintaining these cultural ties. Hatcher explains the importance of symbols in integrated societies as follows:

> Symbols of the whole society become more important in integration. These symbols are often both religious and political, and may center on a king, chief or high priest. As the whole society is too large to act out the relationships among its parts, the visual and visible symbols of common loyalties are very important (1999:5).

Social stratification may be in part a consequence of social integration processes. Brumfiel's research among Aztec peoples suggests how few elites can manage to maintain control over the masses (2002:409):

> social inequality develops as an ambitious leader implements strategies for building a coalition of followers larger than the following of any other individual or institution in society. In this way, a single, privileged, minority can rule because it is the largest organized group in society. People excluded from rule may outnumber those in control, but because they are not organized, they cannot oppose those who are in control under ordinary circumstances (2002:416).

Within the Caquetío polity, social stratification was apparently institutionalized, with hereditary access to power. A the very top of the social pyramid was the paramount chief, who was also regarded as the supreme mediator between Caquetíos and the supernatural realm. Those allied to the paramount chief, through marriage, heredity or otherwise occupied privileged positions within complex Caquetío society.

7.4.1 Shell Beads as Medium of Exchange

Differential access to valued resources may have also contributed to social inequality. Within the Caquetío Polity, shell beads, which were already valued cultural

objects, probably emerged as a central means of negotiating transactions, and their technical evolution to ever smaller forms was likely a means of resource control. The production of "heishi" beads was most likely the work of skilled craftsmen, and elite members of society (above all the paramount chief) likely controlled access to their production.

Ethnohistoric documents reveal that the coastal Caquetíos were excellent traders who participated in long-distance trade. For the Caquetíos of the Protohistoric Period, alliances formed by Manaure, at once both social and political, would have also facilitated Caquetío trading relationships; not only did he have multiple Caquetío wives, he also married to "daughters of the Caribs" (Oliver, 1989:281, and in Bartone and Versteeg 1997:114). Frontier settlements played a role in the Caquetío trade network and shell beads were important objects traded (Bartone & Versteeg 1997:115).

Bartone and Versteeg, contextualize the importance of shell beads within Caquetío society as follows:

> Part of [Manaure's] power and reputation was based on his activities as a great shaman, mediating between supernatural and natural aspects of life. Groups of Indians carried him in hammocks as a token of his position, and it is evident that there was a ranked access to him. His adornments consisted of gold and shell beads. Such treatment and adornments distinguished the diao from other caciques (1997:114).

As these researchers suggest, shell beads were prestige items. These and other marine shell objects were valued not only for their cultural meaning and aesthetic beauty, but also for the economic and social power they represented. Oliver asserts that "perhaps through a uniquely charismatic leader such as Manaure, the [sociopolitical] system transformed

into a kind of Theocratic Chiefdom" (1989:494). This would have enhanced the cultural value of symbolic shell forms associated with his position.

In their discussion of the Tanki Flip site, Bartone and Versteeg suggest the following: "Probably one or several village headmen (*caciques*) were present in Aruba, and perhaps a higher level chief (*diao*)," but add that "if [the *diao*] was present on Aruba he would not have lived in Tanki Flip, but in the largest settlement Santa Cruz, centrally on the island" (1997:125). Boerstra also identifies Santa Cruz as the likely location of an important island chief. As mentioned previously, Boerstra referred to the Santa Cruz site as Ceru Noka. He suggests that "Noka" may have been "the name of the last big chief of the Indians during, or after, the arrival of the Spaniards" (Boerstra 1971:3). According to local legend, this chief is buried near the hill ("Ceru") (Boerstra 1971:3). If true, this legend describes mortuary practices unlike those described by Oliver (1989) for chiefs among the Caquetío polity of Coastal Falcón.

Available data for the marine shell artifacts in the collection of the AMA may point to the relative importance of the Santa Cruz site. Beads provide a good example. All micro "heishi" beads of known provenience in the AMA sample are from the Santa Cruz site. Does this distribution simply reflect the specific curation history of this museum collection? Is it a consequence of research designs that do not favor the recovery of small artifacts?[248] The absence in the AMA sample of any micro "heishi" bead associated with

[248] It might also be a consequence of excavations methods that do not recover evidence within "disturbed" soil, where evidence of small beads, which may be closely associated with the protohistoric period, are likely to be found.

sites other than Santa Cruz may indicate inter-site differentiation, and, further, support the contention that Santa Cruz was the seat of power in Aruba. The chronology of Ceramic Period occupation of the island remains unclear. Was the island hierarchically organized, with Santa Cruz at the top of the organizational pyramid? The findings of this study of marine shell artifacts suggest that this question is certainly one that merits further archaeological testing.

7.4.2 Marine Shell Imagery on the Periphery: Evidence from Aruba

In addition to their role in elite regalia within stratified Caquetío society, archaeological and ethnohistoric evidence suggest that symbolic marine shell objects likely also served the chief in other ways. The elite use of culturally valued symbols as a means of consolidating and/or maintaining power is an important theme in the study of social complexity (see Curet 1992, 1996 for a more detailed discussion). Vargas et al. (1993), for example, suggest that with the emergence of hierarchical society, emerges the necessity for a formal expression of the ideology that supports it. Curet suggests that among Caribbean chiefs this was accomplished through the transformation of personal prestige items into communal symbols acquired by elites to both acquire and legitimize power (1982:338) Curet posits that "emerging chiefdoms will present a decrease in the number and quality of symbolic representations that reflect personal status, while complex, 'mature' chiefdoms should show qualitatively and quantitatively increased differentiation of symbolic representation" (1996:124).

A general characteristic of the cacicazgos of Northeast Venezuela, Colombia, and Central America is the development of a sector of technology that serves to maintain the structure of the cacicazgo through the religious paraphernalia, made of gold in Colombia and Central America, and of shell and stone in Venezuela (Vargas et al. 1993). Within the stratified societies in these areas, the cacical use of ideological symbols of group unity as a means to legitimize power is thought to have been widespread. Particularly in the Venezuelan cacicazgos, a certain unified ideology linked to a cult of a bat god or a winged deity prevailed. This was expressed in elaborate objects in shell and stone, like the pectorals (Sanoja Obediente and Vargas Arenas 1987; Vargas et al. 1993).

Broad-wing pectorals in the AMA collection of "non-tool" O/S marine shell artifacts are among those that support other archaeological evidence that suggests that Aruban peoples shared the ideology of mainland peoples and were integrated into their hierarchy on a regional level. These and other symbolic marine shell objects likely supported chiefly efforts to control not only economic, but also political and social institutions within the Caquetío polity.

7.5 Summary

The excavations at Malmok clearly indicate that Preceramic peoples attached some symbolic meaning to marine shells. The presence of ornate shells on Sero Canashito (Dahn 1970) may indicate a symbolic significance that has been overlooked in past investigations, attributable to either Preceramic or Ceramic Period peoples. Shell artifacts identified as ornaments have been recovered from a variety of Preceramic contexts in the

Eastern Caribbean (Rivero de la Calle, personal communication, 1999; Lundberg 1989). It seems reasonable to expect that Preceramic Arubans also produced O/S shell objects.

The O/S shell artifacts in the AMA collection contribute important data to current understanding of the chronology of Amerindian peoples in Aruba, including the island's ethnohistorically recorded position within the Caquetío polity of Coastal Falcón. Although Caquetío cultural practices that afforded special post-mortem treatment of *caciques* and/or *diaos* greatly inhibit analyses of social inequality or complexity based on burial data, the apparent concentration of relatively high intensity and symbolically rich artifacts at the Santa Cruz site suggests, minimally, that this site was the nexus of economic power on the island during the Ceramic Period (Versteeg and Ruiz 1995; Bartone and Versteeg 1997; Dijkhoff 1997; Dijkhoff and Linville 2004). In this sense, the data available for the AMA collection of "non-tool" O/S marine shell artifacts generally support the hierarchical structure proposed for the island (Bartone & Versteeg 1997:124-125). Yet, as research in the Eastern Caribbean has demonstrated, the presence of elaborate sumptuary goods does not necessarily indicate social complexity (Murphy 1999). Judged from this standpoint, the O/S AMA marine shell artifacts alone provide insufficient evidence of the dominance of Venezuelan chiefs over Aruba and/or Santa Cruz over other Aruban settlements. They do support ceramic evidence that indicates a close association between Aruba and the mainland, as well as the relative importance of the Santa Cruz site.

Although the complete findings of the 1991-92 excavations at the Santa Cruz Dania site (840m^2 of the site) have not yet been published (Versteeg and Rostain 1997:1), the data collected during that investigation should provide important comparative information

about marine shell artifact types.[249] If the manufacture of small shell beads can be inferred as chiefly provisioning, then the archaeological assemblage at Santa Cruz should reveal a dense concentration of this artifact type. If cacical power was achieved and displayed through elaborated shell artifacts, the concentration of these artifacts at Santa Cruz would support the oral history indicating that "Ceru Noka" (Santa Cruz) was the home of a Caquetío chief (Boerstra 1971:3).

As the foregoing discussion emphasizes, more/better data are needed to adequately place these cultural manifestations in the proper temporal and spatial framework. It is not presently known, for example, whether the three main settlements of the Ceramic Period were all inhabited simultaneously or if they represent sequential or episodic island occupations. A comprehensive diachronic study of the ceramic remains at the three main Ceramic Period settlements (Santa Cruz, Sabaneta, Tanki Flip) would provide an invaluable framework for assessing the intersite and intrasite variation identified in this study.

[249] During the 19th IACA Congress, which was held in Aruba in the summer of 2001, Aad H. Versteeg suggested to Arminda C. Ruiz, who was then serving both as the Congress chair and the interim director of the AMA, that the author should be recruited to evaluate the shell material recovered at the Santa Cruz site during the 1992 excavations (Ruiz, personal communication with author, July 2001). Although some of these artifacts are included in the study sample (having been selected from the collection by Ramón Dacal and Fransisco Croes), Ruiz decided that any comprehensive study of the Santa Cruz shell remains should await the culmination of the "Shell Industry of Aruba" project, of which this study is a part.

CHAPTER EIGHT

CONCLUSIONS AND COMMENCEMENTS

8.1 Introduction

Arubans have long enjoyed the marine molluscan resources of their island. Undoubtedly an important subsistence resource for early Aruban cultures, the shell material provided by these natural resources was also valued. Automorphic shell forms suggest that shells were valued for their intrinsic properties. These and other shell artifacts reveal that molluscan shell was one of a variety of media used by prehistoric Aruban artisans to craft culture. Indeed, Aruba's marine shell artifacts form an important part of what must have been a much larger oeuvre of artistic production. Sustained by the physical and chemical properties of their media, they endure as testaments to the industry, imagination, and creativity of prehistoric peoples long vanished.

8.2 The Study of Aruba's Marine Shell Artifacts: On-going Challenges

From a purely functional perspective, many AMA shell artifacts suggest that prehistoric Arubans exploited marine shell as a durable resource for the production of objects useful in subsistence activities or for ornamentation. Analyses of the iconographic, stylistic, and technical attributes of these artifacts all assist the typological exercise, which

itself helps to contextualize shell artifact production, on both a local and regional level. Yet, many questions remain, and answers for many of them many not be forthcoming using extant data. It is yet to be determined, for example, whether or not Preceramic peoples produced "non-tool" O/S marine shell artifacts. At the other end of the cultural chronology of Amerindian occupation in Aruba is the question of indigenous survival beyond the slave raids of the early Historic Period. Archaeological investigations in Aruba have not yet focused on recovering the kind of contextual data needed to adequately address these issues.

Both problems and potentialities discussed by Deagan in the context of her study of Spanish colonial beads are applicable to this study of Amerindian shell artifacts of Aruba:

> It is frequently difficult . . . to determine the specific function of individual beads without detailed contextual information . . . time period, functional associations, economic activities, cultural exchange and interaction, levels of access to resources by different households or groups, religion, and ideology can all be illuminated through analyses of material assemblages. It is axiomatic that the artifacts themselves cannot address any of those issues, but rather can do so only in conjunction with their archaeological contexts and associations (1987:161).

8.2.1 Understanding Symbolic Forms

Significant gaps remain in our understanding of the function(s) and/or decidedly more obscure meaning(s) of many "non-tool" O/S shell forms, particularly for high intensity objects whose iconography suggests a ritual, ceremonial, or other symbolic role. At present the marine shell objects sampled from the AMA only hint at their symbolic import within the lives of early Aruban peoples. Without substantial local ethnographic correlates, a better understanding of symbolic forms is highly dependant on data obtained through excavation. Additionally, evidence of temporal and/or spatial variation in the

production of symbolic forms using marine shell must be tested against the archeological record, during excavations that seek to recover contextual (including stratigraphic) data for marine shell objects. Since such has not been the focus of excavations in Aruba, inferences about symbolic context are highly provisional. Thus, operationally convenient interpretations advanced for many of the artifacts are offered only tentatively and primarily as a means of demonstrating general cultural associations. Recognizing that the "significance of an artifact may involve a complex combination or juxtaposition of many . . . codes, contexts, and circumstances" (Robb 1998:341), this study has generally eschewed the practice of *code breaking*, the implementation of what Robb characterizes as the "*Rosetta Stone view* of symbols" (ibid.). Instead, it has sought to contextualize these objects within their respective post-depositional cycles, many of which are characterized by a significant loss of data. Efforts to understand these forms and their symbolic import within early Aruban society are particularly reliant on contextual data, which is, unfortunately, an increasingly precious and endangered resource in Aruba.

8.2.2 Post-depostional/Taphonomic Processes

It is not uncommon for an archaeologist to lament the lack of sufficient data to answer the many questions that accompany archaeological remains. This is particularly true of studies of museum collections, which typically include artifacts with acquisition histories that vary from the nonexistent to the archaeologically documented. Indeed, many of the AMA shell artifacts are completely without contextual data, having been recovered

without the benefit of scientific methods.[250] Yet, efforts to infer meaning for marine shell artifacts that have been recovered through professional archaeological research in Aruba are also constrained by a number of other post-depositional processes. In addition to natural taphonomic processes (N-transformations), such as bio-turbations, biodegrading of associated remains, and the mixing of site matrices by the movement of water, anthropogenic processes (C-transformations) have impacted the recovery of contextual data for prehistoric marine shell use in Aruba; these include, land development, sand excavation, pot-hunting and other actions by lay individuals, and even prior archaeological research.

Fowler & Fowler list several "processes and procedures [that] operate on collections in the museum setting, changing their value and representativeness" (1996:133), and they extend the definition of the word "taphonomy" to include "cataloguing procedures, records maintenance, storage, movement, exhibition history, conservation history, deaccessioning (including trading, condemnation, or outright loss), facilities, overall management [Ford 1977], breakage, theft, and insect damage" (ibid.). According to these authors, all "affect collection taphonomy, that is, whether a collection remains in a steady state, declines, or is enhanced"(1996:132-133). Some taphonomic processes operating on AMA shell artifacts have further constrained the collection as a representative sample of Amerindian shell artifact production and/or expression in the past.

[250] Objects from private collections are especially problematic.

8.2.2.1 Data Acquisition and Attrition

As discussed in Chapter 7, the destruction of the soil archive is a byproduct of excavation. Schiffer emphasizes the central role of researchers in the process:

> The behavior of the archaeologist is the greatest source of variability in the archaeological record. It is the archaeologist who determines what is found and what is not, what is saved and what is not, what is counted and what is not, and what is reported and what is not. Above all, it is the archaeologist who may or may not strive to identify – and ascertain the influence of – other formation processes (1996 [1987]:362-3).

Clearly, recovery strategies may either mitigate or exacerbate the loss of contextual data. Some may impose unnecessary opportunity costs.

Curet (1982) suggests that the early European view of shell collecting as woman's work may have contributed to lack of ethnohistoric records associated with shells in the Caribbean. The limited scientific attention afforded shell artifacts and shell matrix sites is evident in the archaeological literature. For many years, archaeological shell data have been offered somewhat anecdotally, often presented in summary fashion together with analyses of other non-ceramic artifacts. This is not surprising, since in the Southern Caribbean, as elsewhere, the focus on pottery, particularly in the years that pre-dated the development of radiometric dating techniques, was (and remains) an essential aspect of chronology building. Although rarely thoroughly described, shell artifacts are typically recovered in Ceramic Period sites throughout the region and are often included in site reports (Boerstra 1971, 1974, 1983; Heidecker & Siegel 1969; Cruxent 1955) and regional overviews (Boerstra 1982, 1991; Kidder 1944; Cruxent and Rouse 1958/59, 1961, 1969; Rouse & Cruxent 1963).

The many casual references to and/or incomplete analyses of shell objects included in site reports and other archaeological studies focusing on other topics (e.g. pottery) are revealing for what they eschew; on a regional level, the study of marine shell objects and their role within prehistoric societies has suffered from data loss.[251]

Comparing O/S shell artifacts in Aruba is also complicated by the overall lack of published data on their manufacture and use. Given Aruba's rich archaeological heritage and the many reports that have focused on prehistoric finds, it seems more than probable that much more information has been collected on these shell artifacts than is suggested by available documents. This assertion rests on the many references to shell objects that have been gathered in Aruba over the years, but are neither presently in the AMA collection, nor adequately described in the literature. This situation is not unusual in archaeology, but it is unfortunate, since data on the many hundreds (or even thousands) of shell artifacts that have been recovered in Aruba would make an important contribution to any effort to understand spatial and temporal variations in the manufacture and use of these objects.

[251] In Aruba, it is clear that much data loss occurred well before the advent of professional archaeology on the island (Dijkhoff 2004), and there is evidence to suggest that it has since continued to occur at the hands of amateurs and/or "pot-hunters" who persist in their exploitation of the archaeological record for personal gain (AMA archives). Yet, considering the historically low density of professional archaeological attention in Aruba, where the responsibility for the relatively dense archaeological record was for many years in the hands of a single professional archaeologist, the premature conclusion that shell artifacts in Aruba are non-diagnostic must have certainly also contributed to their professional neglect.

8.2.2.2 Curation and Storage

Schiffer found that even artifacts recovered archaeologically and stored in museums "are subject to gradual attrition processes" (Schiffer (1996 [1987]:360; see also Spears 1978). Museum curation and storage practices are among those factors described by Schiffer which contribute significantly to marine shell artifact data attrition.[252] Since the early days of "cabinets of curiosity," archaeological specimens have typically been stored in wooden or wood-derived containers (e.g. cardboard).[253] This is also true for museums, as much for large institutions, many of which have only recently modernized storage systems, as for small museums and other repositories.

Many of Aruba's archaeological shell artifacts have also been stored in wooden containers. This has accelerated the natural degeneration of shell material such that many of these artifacts now suffer the effects of "Byne's disease" (Byne 1899:172; Davis 1989:14). Byne's Disease is not truly a disease but a condition resulting from the cycling of carbon dioxide.[254] According to Claassen, "the shells most susceptible are those contaminated with sea salt which hold water molecules from the air in the storage facility"

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[252] The tragic destruction of Boerstra's home also led to the destruction of substantial amounts of archaeological data (E. Boerstra, personal communication, November 2004).

[253] These are typically *not* acid-free containers.

[254] According to Claassen, Byne's disease (a powder of calcium acetate. calcium formate or calcium chloride) "is formed in the presence of acetic acid and formic acids found particularly in oak drawers and cardboard" (Claassen 1998:90).

(1998:90). Extremes of air temperature and humidity within the museum have been contributing factors.

Byne's disease is quite apparent on shell artifacts excavated in the1970s and is particularly problematic because these objects are numerous and most have never been systematically studied. Even though these shell objects were first placed in polyethylene bags, the bags have since deteriorated, and perhaps as a result, many of these shell artifacts show signs of "Byne's disease," evident by their chalky white surfaces.[255] The condition obscures artifact details and may even prevent the identification to genus of the source material.[256] Once begun, the condition accelerates the demise of the shell by creating pits that further increase the surface area available for salt development.

The deterioration of the bags has not only resulted in the loss of a protective barrier between the shell artifacts and the wooden drawers in which they are stored; those that have shredded have permitted the mixing of artifacts and the concomitant loss of feature provenience data (which was recorded directly on the bags) for some of these artifacts. Thus, some marine shell artifacts recovered through professional excavations in Aruba during the 1970s have since been separated from their associated provenience data; these

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[255] Shell artifacts placed in polyethylene bags will also suffer from the cycling of carbon dioxide. However, unless they are stored wet, shell artifacts should suffer fewer negative effects from storage in polyethylene bags or polystyrene boxes than they would in receptacles made of a variety of woods (not only oak) or their derivative products.

[256] The poor condition of these artifacts is likely the reason why shell artifacts excavated by Boerstra at the Tanki Flip/Henriquez I were underrepresented in the O/S sample originally drawn by Ramón Dacal and Fransisco Croes to be studied in the context of the "Shell Industry of Aruba" project.

circumstances further limit the inferential potential of these artifacts regarding past human behavior in Aruba.[257]

8.3 Looking Forward

In recent years, the AMA has effectively demonstrated how "small, low budget museums" (Ruiz & Dijkhoff 2001:2) can insure effective stewardship of archaeological heritage. From its initial partnership in 1989 with the University of Leiden and Aad Versteeg, the AMA has served as a dynamic umbrella organization, directing several collaborative research projects involving a variety of specialists from around the world. Among the most exemplary of these is the multidisciplinary research at the Tanki Flip site in 1994-5, a project that not only contributed exponentially to the development of archaeological knowledge of Amerindian Arubans of the Ceramic Period, but also precipitated the subsequent "Shell Industry of Aruba" project, a diachronic study of a specific class of material culture. By recognizing the trend toward increasing specialization within archaeology, and harnessing the efforts of diverse specialists, AMA researchers have effectively both broadened the scope of Aruban archaeology and minimized the burden on scarce resources (e.g. funds, local researchers, etc.). This

[257] The extreme fragility of the provenience bags may be another reason that explains the initial under-representation in the study sample of O/S shell artifacts excavated by Boerstra at the Tanki Flip/Henriquez I site. My subsequent efforts to include a sample of these shell objects were constrained by the necessity of carefully placing exhausted provenience bags within newer ones. Although it was clear that some provenience bags had already disintegrated, which resulted in mixed proveniences, others were carefully placed intact within new bags, a temporary solution that, nevertheless, helped to preserve provenience for future analyses and to inhibit further shell degradation.

approach has also provided an opportunity for the specialists to focus as never before on specific issues of past cultural behavior. This includes, but is in no way limited to, questions of cultural approaches to marine shell resources. As Aruba's "soil archive" becomes increasingly sparse, it is worth exploring some of the issues that should impact future research of the Aruban past in general, and shell artifacts in particular.

8.3.1 Data Reclamation and Consolidation

Efforts are already underway in Aruba to identify and repatriate archaeological data (including artifacts) stored in repositories outside the country (Arminda Ruiz, personal communication, 2004). This is a major step in the right direction, since the shell artifacts presently housed in the AMA are limited primarily to those materials recovered since the mid 1960s. The artifacts and unpublished data recovered prior to that time are presently dispersed, not only in other institutions, but also in other countries. Among these resources are shell artifacts that were part of the "astounding number of items" (Hartog 1953:2) collected by Van Koolwijk now housed in the *Rijksmuseum voor Volkenkunde* in Leiden, The Netherlands. As Van Heekeren reveals, other important finds in Aruba have been removed from the island:

> The classic sites where Van Koolwijk collected eighty years ago are still prolific in surface finds. Apart from this, we obtained important collections from amateurs, both in Bonaire and in Aruba, containing entire painted vessels, bowls and pots, and human skeletal remains and skulls from the urn fields at Seroe Noka [Santa Cruz] and Savaneta [Sabaneta] in Aruba. These are now in process of being studied at the Institute of Anthropology in Utrecht (1963:15-16).

A substantial portion of extant marine shell objects are in private hands in Aruba (Ruiz & Dijkhoff 2001). The collection of the late Mai Odor is comprised of archaeological materials recovered throughout the island, including vast quantities of marine shell artifacts. Yet, presently, these data are largely inaccessible for inter-site analyses because although Odor was careful to record the location names for the objects he collected, these location names are often inconsistent with the official site list. AMA efforts to link these lists, which would contribute significantly to an understanding of marine shell use island-wide, are among the museum's priorities in the short term (Ruiz & Dijkhoff 2001:5).

Ideally, all collections, even those formed over the years by hobbyists (including recent ones), would also be consolidated at the AMA. The new building planned to house the AMA will significantly increase the space available to store archaeological materials and will be well-equipped to ensure their conservation.[258] The conservation and management of Aruba's archaeological heritage has already be set as the museum's "one main priority" (Ruiz & Dijkhoff 2001:5) for the coming years. The reclamation and consolidation of collections and other data now dispersed is expected to provide information needed to better place the AMA shell artifact sample studied here within a wider context of prehistoric shell artifact production in Aruba.

[258] Efforts should be undertaken as soon as possible to consolidate shell artifacts because the damage to shells by "old chlorides, formats and calcium acetates (salts) can continue" (Claassen 1998:90), despite improved storage conditions. Kent (1988), Davis (1989) and Claassen (1998) each provide useful guidelines for conserving shell artifacts.

8.3.2 Excavation Strategies and Contextual Data

As discussed in Chapter 7, excavation strategies have constrained efforts to infer prehistoric cultural processes, including the production and use of marine shell artifacts. Particularly considering the largely stratigraphically intrusive nature of archaeological features, it is clear that prevailing excavation methods in Aruba have generally not facilitated the recovery of data needed to place excavated marine shell artifacts into a diachronic framework, nor have they aimed at obtaining a rigorous sample of other cultural processes. Even the recent large-scale excavations of Tanki Flip have contributed to the problem of negative evidence, despite the considerable insights they added to our present understanding of Dabajuran settlement of that site.

Oliver suggests that what the research of the region needs is "many more Tanki Flips" (1997:428); Versteeg echoes this call for further research on a regional level:

> If in future years, large scale excavations of uninterrupted sites areas in Dabajuroid sites in Falcón would provide data on comparable mainland sites, the understanding of pre-Columbian settlement patterns and culture of this area will increase significantly (1997d:458).

Pena's research on the use of Wampum in New Netherland and colonial New York (1990) demonstrates that careful analysis of stratigraphic deposits can improve understanding of even material remains that are relatively well documented historically. One can now only imagine the gains that could be made toward understanding the comparatively poorly-documented shell beads of the Caquetío polity.

Barring a fortuitous discovery of presently unknown relevant ethnohistorical documents (i.e. those that record aspects of marine shell use among ethnohistoric Caquetíos), archaeological research offers the only feasible path toward increased understanding of the role of marine shell artifacts within prehistoric Aruban societies. In Aruba, as is the case throughout the Caribbean region, archaeological deposits are typically shallow. Thus, aggressive pre-excavation clearing of "disturbed" soil is problematic. Particularly when the top soil piles are not subsequently screened, widespread clearing contributes to the loss of substantial amounts of provenience data. On the local level, it must be recognized that on a small island, all archaeological data are "quality" data. If excavations proceed primarily as salvage projects, the potential of the archaeological record to inform questions of cultural variation in the approach to marine shell resources, including cultural expression using marine shell, will continue to diminish.

Knowledge of prehistoric Amerindian Aruban cultures is not the only potential opportunity cost of removing archaeologically burdensome "disturbed" layers; the aggressive removal of these deposits also effectively removes history, particularly when deposits are not screened for evidence. Given the scarcity of historical documents available for the early Historic Period in Aruba, this is particularly detrimental. Furthermore, wholesale stripping of the earth also denudes the landscape, effectively destroying any agricultural potential it may hold. Further exacerbating the erosion that has characterized the Aruban landscape since pre-historic times makes an already destructive science even more so.

Plans for further research at the Tanki Flip site are, apparently, already underway. According to Versteeg, "Tanki Flip II will be a step forward in the understanding of the activities and culture of the pre-Columbian inhabitants of Aruba" (1997d:458).[259] Although to date, research on Aruba has focused on identifying site settlement, it is likely that future excavations at Tanki Flip will attempt to recover more detailed information. According to Versteeg, "with the knowledge and experience obtained in 1994-7, it will not be difficult to recognize a *maloca* before it has been excavated completely" (Versteeg 1997d:458).

In his discussion of the research completed at Tanki Flip (1994-7), Versteeg emphasizes the value of excavating prehistoric sites in the Caribbean:

> The . . . research underlines that Caribbean archaeological sites are rich in information. If the finds and their context over uninterrupted relatively large areas are documented and studied, much more information than pottery classifications and chronology comes into reach. Complete fossilized settlements exist sub-soil with intriguing patterns that inform us on crucial parts of prehistoric Indian culture (1997d:458).

Unfortunately, the reality is that development in Aruba has left few sites intact. Presently, Tanki Flip offers, perhaps, the best opportunity to gain a comprehensive understanding of the relationship between molluscan resources and prehistoric society during the Ceramic

[259] Since writing this, I have learned that Tanki Flip is in a "semi-protected" status. It's future remains uncertain and any planned excavations are on hold. AMA officials have expressed a desire to create a cultural heritage park at the site and have, together with the Department of Public Works, the deputy head of the Department of Land Management, and the head the Management team of the Institute of Culture Aruba petitioned the Minister of Economic Affairs, Tourism, Social Affairs and Culture for the comprehensive protection of the Tanki Flip terrain, under the management of the AMA (Raymundo Dijkhoff, personal communication, February 25, 2005).

Period. More modest excavations that incorporate some kind of random sampling strategy would be more appropriate. These would aid attempts to draw inferences from the excavated data.

The AMA emphasis on multidisciplinary research bodes well for future investigations of O/S shell artifacts in Aruba. Now that the efforts of the 1994-5 Tanki Flip excavation team have led to the protection of this site, it is hoped that future archaeological investigations will be guided by professional diligence in the development of research designs that will recognize the site as the precious resource that it is by maximizing the trade-off between data acquisition and site destruction.

One issue that merits further investigation is the presence of whole shells at archaeological sites, something has already been considered for Aruba by Versteeg (1997a) and Reinink (1997).[260] Whole shells at archaeological sites may be interpreted as subsistence refuse or raw material for the production of shell artifacts (Reinink 1997), particularly for shell tools (Jones O'Day and Keegan 2001). Yet, other factors might explain why prehistoric peoples of Aruba intentionally transported *Strombus gigas* and the shells of other mollusks to their habitation sites, as far as five kilometers from the sea.

Excavations at the Santa Cruz site, conducted prior to the work at Tanki Flip, revealed a "striking" amount of shell material, including many complete shells (Versteeg 1997a). In a preliminary report of these excavations, Versteeg discovered (1997a: 101)

[260] In addition to the many shell artifacts excavated from the Tanki Flip site in 1994-1995, several whole shell specimens (n=128) were also recovered (Reinink 1997).

that *Strombus gigas* shells recovered at Santa Cruz may have had a special function beyond their use as raw material, and he cites one alternative use, suggested by Marlena and Andrzej Antczak, who interpreted a similar pattern of occurrence on Los Roques; these authors propose that whole *Strombus gigas* shells were used by prehistoric peoples to trap rain water. The abundance of non-tool artifacts in Aruba clearly reveals that marine shells were a favored medium for the production of objects that may have been purely decorative, or may have carried symbolic meaning. It must also be recognized that marine shells may have been valued in their unmodified forms. This has certainly been demonstrated in South America. Why should it not be considered for other areas, particularly those populated by South American groups? The excavations at Malmok (Versteeg et al. 1990), as well as the shell data collected by Dahn at Canashito (1970), support the contention that archaeologists should not narrowly interpret whole shells at archaeological sites as either raw material or subsistence byproducts, but should consider that these may have other cultural and/or symbolic significance. Only then will they seek to identify the specific contexts of these remains, and potentially reveal symbolic associations and/or identify variation that can signal temporal and/or spatial differences between groups.

Another potentially important area of inquiry involves the possibility that shell artifacts express color symbolism (Oliver 2000:204). In Aruba, O/S shell artifacts may express color concepts analogous to those identified for other groups in South America.

The use of colorful Spondylus shells to produce O/S artifacts in Aruba, first identified in this study, may be symbolically meaningful and may also have implications for the study of cultural exchange in the region.[261] Particularly considering the importance of this genus among mainland groups, and the recovery of whole Spondylus valves at both Tanki Flip (#101-B) and at Sabaneta, this is an area that merits further consideration.

The larger role of molluscan resources within the Caquetío economy has also not yet been adequately investigated. The data collected at Tanki Flip may indicate long-term over-exploitation of *Strombus gigas*. The predominance of immature specimens, particularly evident in the southern part of the site (Heidecker & Siegel 1969) suggests an over-reliance on this marine resource. Both subsistence and raw material procurement may have contributed to the depletion of this resource during the Ceramic Period.

The role of local and regional elites in the consumption of molluscan resources also merits further investigation. While ethnohistoric documents reveal elite consumption of marine shell artifacts, little is known of the contribution of other molluscan resources to the Caquetío political economy. The value placed on marine shell artifacts surely also impacted molluscan fisheries. While archaeological evidence clearly reveals that molluscan resources were both valued and intensively exploited by Caquetío peoples, the nature of this exploitation remains poorly understood. It is possible that specialized coastal

[261] Spondylus shells range in color from yellow to red, and also have white interiors. Each of these colors is symbolically significant among South American Amerindian groups (Reichel-Dolmatoff 1971; Mester 1988; Oliver 2000). Their value to early Arubans remains obscure.

sites (e.g. Arashi) supplied molluscan resources to more inland settlements through trade relationships. The demand for molluscan resources (including shell artifacts) may also have extended to other areas of the Caquetío polity less abundant in these resources.

The problem of understanding marine molluscan exploitation in Aruba and the larger Caquetío Polity of Coastal Falcón is not unlike that described by Perdikaris (1996) in her investigation of the potential for commercialization of fisheries in medieval North Norway. Perdikaris explains that the "commercialization of fish or any other natural product is the end result of a process that gives human value and significance to a selected portion of an ecosystem" (1996:22). She notes further that while commercialization can be viewed as the "conversion of what Cronon (1991) has termed as the 'first-nature' of pre-industrial local subsistence in the 'second-nature' of a commercial capital asset [which] involves linked changes in the production, marketing, transport, diet and food ways, and most particularly in the political organization of space and time," she also notes that on a more fundamental level, commercialization of marine resources can be conceptualized simply as the generation of a surplus (ibid.). Were mollusks, particularly *Strombus gigas*, important in Caquetío society primarily for their contribution to subsistence? The demand for either the mollusk or its shell could have contributed to the transformation of *Strombus gigas* resources into cultural capital to "be mobilized by local and distant elites to finance other projects and agendas" (Perdikaris 1996:22). The transformation of the raw material they provide into objects with added cultural value could have served similar ends.

Intensive investigations of both inland and coastal shell-matrix sites can potentially yield important data, including both temporal and spatial variation in the use of these resources on an island-wide basis. This data can support investigations of aboriginal response to changing social, economic and political conditions during the conquest and early historic periods in Aruba. It can also provide a useful starting point for regional comparisons using comparable data sets. The present lack of archaeological data at *Strombus gigas* procurement sites in Aruba and comparable data sets for neighboring islands and the mainland severely limits analyses of molluscan fisheries in Aruba and the region.

The investigation of inter-regional exploitation and/or consumption of molluscan resources clearly requires a regional approach (not unlike the approach that Perdikaris advocates for fisheries in the North Atlantic). The conceptual framework provided by Historical Ecology (Crumley 1994), which combines archaeological, ethnohistoric and environmental evidence, can be an effective tool in an examination of molluscan resource procurement and use during the Ceramic Period. The integration of diverse data sets can provide better insights into the role of molluscan resources in the emergence of complex Caquetío society, as well as the changes in these during the conquest and early Historic periods. What is presently needed in Aruba is "problem-oriented" (Wenke 1999:61) research that seeks to recover the kind of archaeological and environmental data that would contribute to this effort. Given the rapid development of Aruba's leeward coast, the protection of the few remaining coastal sites that could potentially yield the data necessary

to understanding the nature of prehistoric molluscan procurement (Arashi, Malmok and Sabaneta sites among them) is imperative.

8.3.3 Object Archives, Data Retention and Data Sharing

According to Fowler and Givens, "without proper written and visual documentation, artifacts and observations are *meaningless* for scientific and culture history purposes" (1992:44, and in Parezo 1996:150). In her study of archival practices at the Smithsonian Institution, Parezo has suggested that "researchers reusing materials must know a great deal about the history of specific research projects, as well as the intellectual history of the field with regard to how information was categorized when it was produced and deposited, before they can use artifacts to their fullest potential" (1996:166). Yet, as Parezo explains, in the past, "researchers historically considered the field notes produced on a project their own, whereas the artifacts belonged to the institution" (ibid.). The result is that artifact analyses and field notes, which Parezo states are "basic as primary and contextual data" (1996:150), may not be housed together with their associated artifacts (1996:165-166).

The same may be said for objects and archives at the AMA. Although the organizational structure of the museum does not yet provide for an archivist position, the staff has generally done an excellent job of gathering together archival materials related to Aruba's archaeological record. Copies of the field notes for major archaeological excavations are not among them. This situation makes it exceedingly difficult for researchers whose analyses depend on contextual data.

Recent events at the AMA illustrate the importance of these resources. During the "Shell Industry of Aruba" project, AMA archaeological assistant Hiram Angela rediscovered in the AMA archives the field notes prepared by principal investigators and students of the ARC/CUNY during their small scale excavation at the Tanki Flip/Henriquez I site (101-A). These notes had not previously been mentioned (nor apparently used) in archaeological interpretations of the site since the late 1960s. Without these notes, a substantial portion of the O/S shell artifacts analyzed in the context of the "Shell Industry of Aruba" project would have lost much of their analytical utility. Prior to the recovery of these records, the artifacts in question were attributed to a separate excavation campaign (101-B). These records not only helped to correct this error, they also provide stratigraphic data for each object and record associations that did not appear in the published preliminary report of the excavation (Heidecker & Siegel 1969). This is not uncommon, but is, on the contrary, to be expected. Field notes frequently provide contextual data, the importance of which may not be evident to the excavators who may or may not be particularly interested in shell-related behaviors. The acquisition and maintenance of field notes, photographs and other excavation records are critical not only to the understanding of shell-related behaviors, but also to the interpretation of other evidence of material culture. They not only provide invaluable contextual data for artifacts, but also constitute the only enduring evidence available for other researchers of activities at archaeological sites permanently destroyed through excavation (Lynott 2002: 257).

In addition to data reclamation and the effective management of its acquisition and storage, the study of marine shell artifacts in Aruba (as well as in the region) can benefit substantially by data sharing. For many years marine shell artifacts have made their way to repositories of archaeological materials throughout the region (and, in some cases, throughout the world).[262] There they remain, often stripped of any contextual data, awaiting their reintegration into local sequences and/or regional analyses. In recent years, museums (e.g. The American Museum of Natural History) have begun efforts to record their holdings in digital formats. Such efforts, which greatly increase the exposure of collections, large portions of which are rarely (if ever) displayed to the viewing public, also facilitate archaeological research.

One outcome of the "Shell Industry of Aruba" project is the complete digitalization of all primary research materials (including survey and publication photographs). These records, now part of the AMA's permanent archives, constitute one phase in on-going AMA efforts to compile a complete digital database of Aruba's archaeological heritage (Ruiz & Dijkhoff 2001:5). They will not only facilitate future shell artifact research in Aruba (as new data emerge), but because they can be shared via the Internet (or through "snail" mail using digital media), they can also support research efforts throughout the region by providing a more comprehensive and more accessible assessment of marine shell data than has previously been available.

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[262] For Aruba, this includes museums (e.g. Leiden University Museum) and untold numbers of private collections.

The development of the Internet has increased substantially the degree to which many scholars share data. Many embrace this medium as an outlet for the publication of their research (particularly when mainstream alternatives may be unavailable to them), or simply as a way to stimulate discussion of the relevant issues within their field.[263] Although access to the Internet remains uneven among archaeologists who study shell remains in the Caribbean, the situation continues to improve steadily, and it is likely that the Internet will emerge as a powerful research tool in the research of archaeological shell. During the 19th Congress of the International Association of Caribbean Archaeologists (IACA), held in Aruba in 2001, several Caribbean archaeologists who study shell remains pledged to begin collaborative efforts to share marine shell data over the Internet. Among the goals of this interest group, known simply as the *Caribbean Shell Archaeology* (CSA) group, is to work cooperatively toward overcoming the language barriers that have historically inhibited data sharing in the region.[264] This alone can greatly increase knowledge of cultural variation in the procurement and use of marine shell resources on a regional level.

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[263] Of course, others are reluctant to relinquish data (that may form the foundation of their life's work) to such a casual forum. In addition, as Conyers & Hoopes suggest, "there is a legitimate fear that an article that is not printed on paper will not be accepted as a 'real publication' by department chairs, deans, or promotion-and-tenure committees" (2003:20)

[264] The idea for the group emerged initially during discussions I had with my friend and colleague, Ramón Dacal and our mutual friend, Reynold C. Kerr.

Data sharing may also serve to broaden the scope of investigations of iconic shell forms to include artifacts manufactured from other materials. This avenue of inquiry has, for a variety of reasons, been relatively unexplored in the context of this study.[265] The lack of data on non-shell iconic O/S forms has been a major factor. The scholarly exchange of data on a variety of materials from Aruba, as well as neighboring islands, and the mainland would certainly contribute important pieces to what is presently a relatively unpopulated puzzle.

8.4 Summary

The archaeological record of Aruba may continue to yield important data to help reconstruct the vital role of marine molluscan resources among the island's early Amerindian cultures, despite Historic Period activities that have impacted the island's many shell matrix sites. Nevertheless, both past human agency and the limitations of archaeological research will insure that many of the gaps in our understanding of marine shell use among Aruba's Amerindian populations will likely remain. The inherent ambiguity of symbolic forms is also a contributing factor. We will likely never know, for example, the full range of uses for marine shell discs or why some of them were incorporated into prehistoric human burials at the Tanki Flip site. That should not dissuade efforts to gain further insight through research.

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[265] A variety of factors constrain this kind of approach. In addition to budgetary constraints, the lack of access to non-shell materials from Aruba is a major factor. Not only are artifacts from Aruba widely dispersed, those that are in the AMA collection are not easily accessible given the current constraints imposed by the museum's current space limitations.

Even when their functions or meanings remain obscure, the marine shell artifacts in the collection of the Archaeological Museum of Aruba may be appreciated for their physical properties, attributes that signal relationship(s) to artifact forms found in other Caribbean islands or on mainland South America. Some also suggest technological and/or stylistic change that may relate to Aruba's position within the socially complex Caquetío polity of mainland coastal Falcón (and north shore islands of Venezuela) and the ABC Islands of the Southern Caribbean. Formal, stylistic, and/or technical attributes of others (e.g. Budui beads or Type 3 "*botóns*") may be associated with the arrival of European technology and/or ideas.

Data sharing may yet contribute to other archaeological efforts to isolate the cultural context and/or regional distribution of a variety of Aruba's "non-tool" O/S shell artifacts. Of the methodologies advanced by Robb for future investigations of symbolic forms, "contextual analysis of artifact use" (Robb 1998:342) seems most appropriate to the study of shell artifacts in Aruba. This process must begin with archaeologically identifiable contexts of this use. Presently, a pervasive lack of such data for many of the marine shell artifacts in the AMA collection is an important limiting factor in attempts to draw conclusions regarding marine shell resources and prehistoric human behavior in Aruba.

While it must be acknowledged that even the most sophisticated archaeological investigation is limited in its ability to recover symbolic meaning, such investigations can provide important contextual data that will improve our understanding of the spatial and temporal distribution of ornamental, ritual, and/or symbolic forms, information that could

potentially distinguish between disparate groups of prehistoric Aruban peoples, or perhaps help to identify intra-group differences regarding status, wealth, and ritual and symbolic behavior. Will Aruba's "soil archive" reveal more symbols of wealth, status, or ritual in identifiable contexts or might excavations on the island recover other such symbols currently unknown? Can we further isolate inter-group or intra-group differentiation among Dabajuroid populations of Aruba? Controlled, stratified excavations are needed to identify temporal changes in shell artifact production. Ideally, these would include random sampling strategies aimed at enhancing the inferential feasibility of the data.

The potential to gain further insight into the relationship between marine shell resources and prehistoric Aruban behavior rests on public stewardship (including the actions of archaeologists) of the evidence of this relationship, long safeguarded by Aruban soil (Linville & Dijkhoff 2004). Emergent efforts to mitigate modern transformations of archaeological deposits on the island provide a basis for optimism.

TABLES

Table 5.1. Primary sites discussed in Chapter 5.

Table Key

Materials
* = present
\- = absent
ds = discs
w = worked

Freshwater
nr = near rooi
t = tanki

Soil Conditions
c = cave
d = diorite
dd = diorite debris
l = limestone
ls = limestone surface

qdd = quartz-diorite debris
rs = rooi sand
s = sand
s/l = sand on limestone
ss/l = saliña sand on limestone

Site #	Site	Site Size N-S/E-W	Surface m^2	*d.* from coast, m	pictograph	human bone	pottery	shell	coral	stone	Fresh water	Soil
2	Arashi-1	100/100	10,000	50	-		?	*	*	*w	nr	ls, s
3	Arashi-2	100/40	4,000	25	-		*	*	*	*	nr	ls, dd
4	Arashi-3	25/100	2,500	50	-		*	*w	*	*w	nr	s/l, rs
21	Botón	25/25	625	3000	-		*	*wds	*	*	nr	qd
24	Budui	25/25	625	500	-	*		*wds			nr	c, l
25	Canashito-1	20/25	500	2900	-	-	-	-	-	-	nr	s/l
26	Canashito-2	50/100	5,000	2800	-	-	*	*	*	*	nr	s/l
27	Canashito-3	-		2800	*	-	-	-	-	-		l
28	Canashito-4	35/50	1,750	2800	-	*		*			nr	c, s, l
29	Canashito-5	5/5	25	2800	-	*					nr	s/l
46	Malmok	200/50	10,000	250	-	*					1000m	ss/l
47	Malmok-2	1000/25	25,000	25	-		*	*	*	*	1200m	s/l
62	Parkietenbos-E	20/20	400	700	-		*	*		*	nr	qdd
63	Parkietenbos-W	35/160	5,600	850	-		*	*	*	*	nr	qdd
76	Sabaneta	600/400	240,000	500	-	*	*	*wds	*	*	nr	qdd
81	Santa Cruz	750/600	450,000	3750	-	*	*	*wds	*	*	nr	s/d
83	Ser'i Noka	-		3750	*							di
101	Tanki Flip	200/150	30,000	2500	-	*	*	*wds	*	*	nr, t	s/d
102	Tanki Lender-1	375/250	93,750[1]	2500	-		*	*	*	*	nr, t	s/d
103	Tanki Lender -2	-	-	2500	*							

[1] This figure suggests that Tanki Lender-1 is larger than Tanki Flip. Tanki Flip is widely recognized as one of the three largest Ceramic Period settlements; the size of the other two (Sabaneta and Santa Cruz) are also inconsistent with more recent reports. Efforts to rectify the discrepancies are currently underway (Arminda C. Ruiz, personal communication, February, 2005). See footnote #111 for further clarification on the status of these sites.

Macro-Dabajuroid Tradition			
Tradition	**Sub-Tradition**	**Styles**	**Dates (ca.)**
Dabajuroid	Dabajuran	Túcua	800-1100/1200 A.D.
		Urumaco	1100/1200-1400/1450 A.D.
		Los Médanos	1350-1600/1650 A.D.
	Bachaqueroan	Supidebo	1300-1450 A.D.
		Las Minas	1300-1500 A.D.
		Bachaquero	1300-1600 A.D.
	Campoman	Guaraguaro	1000-1500 A.D.
		Punta Arenas	1000-1500 A.D.
		Playa Guacuco	1000-1500 A.D.
		Campoma	1100-1300 A.D.
	Capachoan	Capacho	1000-1250/1300 A.D.
		La Mulera	1250/1300-1500 A.D.
Tierroid	Tierran	Tierra de los Indios	300-900 A.D.
			1000 A.D.- Post-Contact
		San Pablo	1000 A.D.- Post-Contact
	Mirindayan	Mirinday	1100-1500 A.D.
		Chipepe[1]	1000-1500 A.D.

Table 5.2. Classification of the Macro-Dabajuroid Tradition (after Oliver 1989; Dijkhoff 1997:53-54).

[1] This style is absent from Oliver's hierarchical classification, but is included in Dijkhoff's study of Dabajuroid ceramics from the Tanki Flip site (#101-B), Aruba (1997:54).

"Bead/blank" Artifacts of Tanki Flip					
Subtype	**#**	**Diameter (*d.*)**	**Average *d.***	**Thickness (*th.*)**	**Average *th.***
Disc	16	0.9-1.5 cm	1.2 cm	0.2-0.4 cm	0.3 cm
Ring	3	0.7-1 cm		0.1-0.3 cm	0.2 cm
Pearl	1	0.7 cm	--	0.3 cm	--
Unshaped	46	1.1-2.5 cm	--	0.2-0.5 cm	--
Preform (polygonal disc)	23	1-2 cm	--	0.2-0.5 cm	--
Shaped (small, flat disc)	91	0.9-2.0 (?) cm	1.2 cm	0.1-0.8 cm	--

Table 5.3. Bead/blank subtypes identified by Serrand for Tanki Flip, 1994-1995 (1997:209-212).

Table 6.1. Site distribution of the AMA non-tool marine shell artifact samples.

Site	Site #	Original Sample		Subsample	
		n	**%**	***n***	**%**
Aruba, Unspecified	*O/B*	376	37.4%	198	24.2%
Arashi 1	*2*	1	0.1%	1	0.1%
Arashi 2	*3*	1	0.1%	1	0.1%
Boton	*21*	25	2.5%	25	3.1%
Budui	*24*	55	5.5%	55	6.7%
Canashito	*26*	5	0.5%	5	0.6%
Malmok	*47*	1	0.1%	1	0.1%
Sabaneta	*76*	80	8.0%	80	9.8%
Santa Cruz	*81*	243	24.2%	234	28.6%
Tanki Flip	*101*	215	21.4%	215	26.3%
Tanki Lender	*102*	3	0.3%	3	0.4%
Total		1005	100.0%	818	100.0%

Table 6.2. Site distribution of artifacts of known provenience in the AMA non-tool marine shell artifact samples.

Site	Site-Specific Artifacts	
	Original Sample	Subsample
Arashi 1	0.2%	0.2%
Arashi 2	0.2%	0.2%
Boton	4.0%	4.0%
Budui	8.7%	8.9%
Canashito	0.8%	0.8%
Malmok	0.2%	0.2%
Sabaneta	12.7%	12.9%
Santa Cruz	38.6%	37.7%
Tanki Flip	34.2%	34.7%
Tanki Lender	0.5%	0.5%

Table 6.3. The distribution of the AMA"non-tool" O/S marine shell artifacts according to the genus of their source shell.

Genus	Original Sample			Subsample		
	n	% of Total	% of Molluscan Class	n	% of Total	% of Molluscan Class
Bivalve, genus unspecified	10	1.0%	16.4%	5	0.6%	9.4%
Pinctada	2	0.2%	3.3%	2	0.2%	3.8%
Nodipecten	2	0.2%	3.3%	2	0.2%	3.8%
Spondylus	44	4.4%	72.1%	41	5.0%	77.4%
Tivela	2	0.2%	3.3%	2	0.2%	3.8%
Trachycardium	1	0.1%	1.6%	1	0.1%	1.9%
Bivalve subtotal	**61**	6.1%	100%	**53**	**6.5%**	100%
Cassis	33	3.3%	3.5%	33	4.0%	4.3%
Charonia	5	0.5%	0.5%	5	0.6%	0.7%
Conus	1	0.1%	0.1%	1	0.1%	0.1%
Cyphoma	1	0.1%	0.1%	1	0.1%	0.1%
Cypraecassis	1	0.1%	0.1%	1	0.1%	0.1%
Melongena	3	0.3%	0.3%	3	0.4%	0.4%
Oliva	60	6.0%	6.4%	60	7.3%	7.8%
Strombus	838	83.4%	88.8%	659	80.6%	86.1%
Tonna	2	0.2%	0.2%	2	0.2%	0.3%
Univalve subtotal	**944**	93.9%*	100%	**765**	**93.5%**	100%
Total	1005	100%				

* A rounding error causes this figure to increase (slightly) to 94.0%.

Table 6.4. The relationship between AMA perforation types, Haviser's hole types (1990:87, Figure 2), and bead perforation types described in Beck's classic reference, *Classification and Nomenclature of Beads and Pendants* (Beck 1981: Plate IV).

AMA Perforation Type	**Haviser Hole Type**	***AMA Perforations according to Beck's Classification***				
		Perforation	**Type**	**Name**	**Subtype**	**Description**
1	I	Single	III	Single Cone	--	Bored from one end.
2	II	Single	I	Double Cone	--	Bored from both ends. No attempt at parallel hole.
3	III	Single	VIII	V Perforation	VIIIa. Bored from one surface.	Both holes bored from one surface.
4	IV	Multiple	X	In One Plane	Xd. Y	--
5	--	Single	IV	Plain	--	Approximately parallel, bored from one end.[i]

[i] Note that AMA Type 5 perforations produce holes with straight sides. However, these may or may not be drilled from a single side.

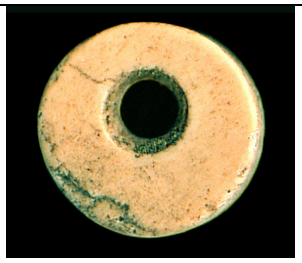
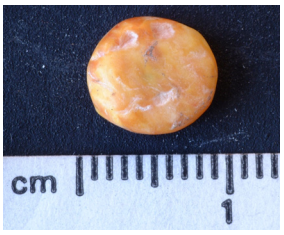
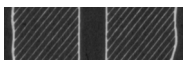
Type	Description	Cross-section Drawing	Aruba Example	
1	Conical			
2	Biconical			
3	V-Shaped			
4	Y-Shaped			
5	Straight Sided (No Cone)			n/a

Table 6.5. Summary of the five basic perforation types identified in the context of this study, with illustrations based on Beck's perforation (Beck 1981:Plate IV) and Haviser's (1990: Figure 2) hole typologies, and AMA marine shell artifacts examples of each type.

Table 6.6. The "non-tool" O/S marine shell artifacts in the collection of the Archaeological Museum of Aruba may be divided into eight general categories as shown here.

AMA Non-tool Marine Shell Artifacts				
	Original Sample		Study Subsample	
"Beads"	420	41.8%	268	32.8%
Discs, Small Unperforated	337	33.5%	303	37.0%
Discs, Other	22	2.2%	24*	2.9%
Pendants	79	7.9%	79	9.7%
Adornments	66	6.6%	64	7.8%
Geometric Forms, Other	31	3.1%	31	3.8%
Receptacles	29	2.9%	29	3.6%
Miscellaneous	21	2.1%	20	2.5%
Total†	1005	100%	818	100%

* Two artifacts, one from the "bead" and one from the "small disc" categories, were reclassified based on updated length/diameter measurements.

† Percent totals adjusted for rounding errors.

Table 6.7. Subgroups of major categories of AMA non-tool marine shell artifacts.

AMA Non-tool Marine Shell Artifacts						
	Original Sample		Study Subsample			
"Beads"					268	32.8%
Automorphic	36	3.6%	36	4.4%		
Xenomorphic	384	38.2%	232	28.4%		
Discs, Small Unperforated	337	33.5%	303	37.0%	303	37.0%
Discs, Other					24*	2.9%
Discs, Large Unperforated	7	0.7%	7	0.9%		
Discs, Large Perforated	4	0.4%	5	0.6%		
Discs, Medium Unperforated	9	0.9%	10	1.2%		
Discs, Medium Perforated	2	0.2%	2	0.2%		
Pendants					79	9.7%
Automorphic	26	2.6%	26	3.2%		
Automorphic, Blank	1	0.1%	1	0.1%		
Xenomorphic	50	5.0%	50	6.1%		
Xenomorphic, Fragment	2	0.2%	2	0.2%		
Adornments					64	7.8%
Automorphic	1	0.1%	1	0.1%		
Xenomorphic	60	6.0%	58	7.1%		
Shaped Blanks	5	0.5%	5	0.6%		
Geometric Forms, Other					31	3.8%
Oval	16	1.6%	16	2.0%		
Rectangular	13	1.3%	13	1.6%		
Other	2	0.2%	2	0.1%		
Receptacles					29	3.6%
Vessels	28	2.8%	28	3.4%		
Spoon	1	0.1%	1	0.1%		
Miscellaneous					20	2.5%
Nodule/Spine, Modified	10	1.0%	10	1.2%		
Peg-shaped Artifacts	2	0.2%	2	0.2%		
Bipoints	2	0.2%	2	0.2%		
Sculptural Forms	6	0.6%	6	0.7%		
Possible Grave Good	1	0.1%	0	-		
Total†	1005	100%	818	100%	818	100%

* Increase reflects a classificatory readjustment of two artifacts in the original sample based on updated measurements.

† Percent totals adjusted for rounding errors.

Table 6.8. Disc bead diameters (mm) according to site provenience.

Site	Site #	Study Sample	
		Range (mm)	Mean (mm)
Boton	*21*	8.1-15.5	12.0
Budui	*24*	8.3-14.0	11.0
Sabaneta	*76*	7.7-19.0	14.0
Santa Cruz	*81*	2.4-25.0	8.2
Tanki Flip	*101*	8.3-17.0	12.6

Table 6.9. AMA study sample shaped-shell adornments, divided according to molluscan class, perforation type and approximate shape.

Perforation Type - Shape	**Univalve**	**Bivalve**	**Total**
Unperforated - Rectangular	1	1	2
Unperforated -Trapezoidal		3	3
Type 1 x 2 - Natural		1	1
Type 1 x 2 - Polygonal		2	2
Type 1 x 2 - Rectangular	2	3	5
Type 2 x 2 - Rectangular		2	2
Type 3 - Rectangular	5	6	11
Type 3 - Round	3	7	10
Other - Polygonal		2	2
Type 4 - Polygonal	1		1
Type 4 - Rectangular	6	1	7
Type 4 - Round	17		17
Type 4 - Oblong	1		1
Total			**64**
Perforation Type	**Univalve**	**Bivalve**	**Total**
none	1	4	5
Type 1	2	6	8
Type 2	0	2	2
Type 3	8	13	21
Type 4	25	1	26
Other		2	2
Total			**64**
Shape	**Univalve**	**Bivalve**	**Total**
Natural		1	1
Oblong	1		1
Polygonal	1	4	5
Rectangular	14	13	27
Round	20	7	27
Trapezoidal		3	3
Total			**64**

Table 7.1. Species identified as source shells modified to produce AMA artifacts examined for this study, and the presence/absence of each at the Preceramic Malmok and Ceramic Period Tanki Flip sites, respectively.

AMA Artifact Species	Malmok	Tanki Flip, 1994-1995
Cassis flammea (Linnaeus, 1758)		√*
Cassis madagascariensis Lamarck, 1822		
Cassis tuberosa (Linnaeus, 1758)		√*
Cypraecassis testiculus (Linnaeus, 1758)		
Conus spp.	√	
Melongena melongena (Linnaeus, 1758)	√	√
Oliva reticularis Lamarck, 1810		√
Cyphoma gibbosum (Linnaeus, 1758)		
Charonia variegata (Lamarck, 1816)		
Strombus costatus Gmelin, 1791		
Strombus gallus Linnaeus, 1758		
Strombus gigas Linnaeus, 1758	√	√
Strombus pugilis Linnaeus, 1758		
Strombus raninus Gmelin, 1791		
Tonna maculosa (Dillwyn, 1817)	√	√
Vasum muricatum (Born, 1778)		√
Trachycardium spp.		√
Codakia orbicularis (Linnaeus, 1758)	√	√
Nodipecten nodosus (Linnaeus, 1758)		√†
Pinctada imbricata Röding, 1798		√‡
Spondylus ictericus Reeve 1856		
Tivela mactroides (Born, 1778)		

* These are each recorded by Reinink as "*Cassis spec.*" (1997:474).

† Although this species is not listed on Reinink's list of species recovered at the Tanki Flip site, 1994-1995 excavations (Reinink 1997:474), it is recorded (as *Lyropecten nodosus*) for this excavation as a source shell for "highly modified" shell artifacts (Serrand 1997).

‡ This species is listed as *Pinctada radiata* (Leach) in the list of shell species found at the Tanki Flip site, 1994-1995 excavations (Reinink 1997:474).

Table 7.2. “Bead” artifacts from Tanki Flip.

“Beads”	Tanki Flip/ Henriquez I 1968	Tanki Flip 1994-1995
Finished “beads”	22	20
“Bead Preforms and Blanks”	134	160
% Finished	.14	.11

Table 7.3. Shell artifact densities at Tanki Flip.

Tanki Flip Excavations		
Campaign	1968	1994-1995
Excavation Area	24 m^2	2275 m^2
Shell Artifact/ m^2	6.58	.12
Finished bead/ m^2	.92	.009

Table 7.4. Pre-excavation soil removal at Tanki Flip.

Tanki Flip Excavations			
Campaign	1968	1975-77	1994-95
Pre-excavation Soil removal	0 cm	30-40 cm	25-35 cm

FIGURES

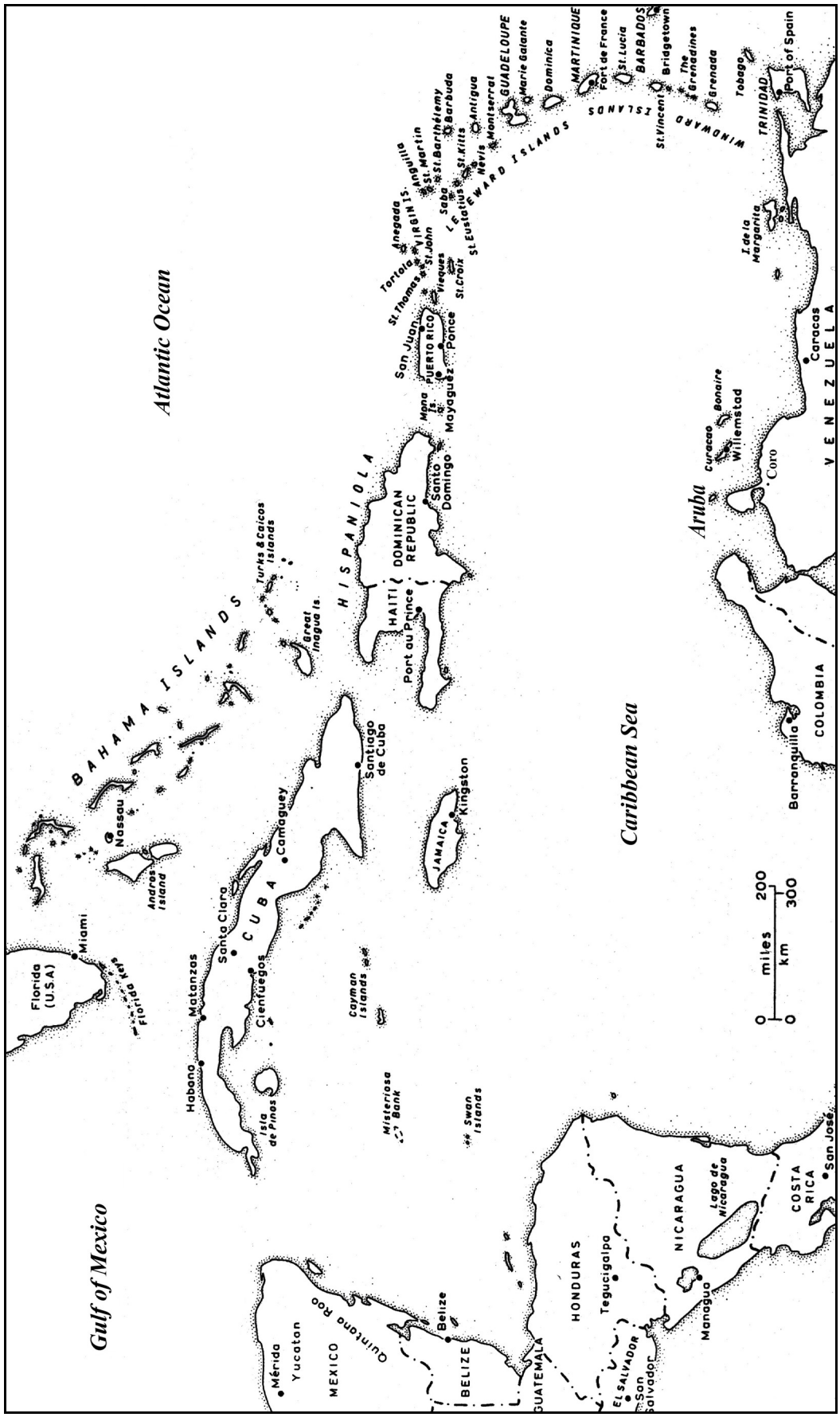


Figure1.1. The Caribbean Region (modified after Watts 1998:2).

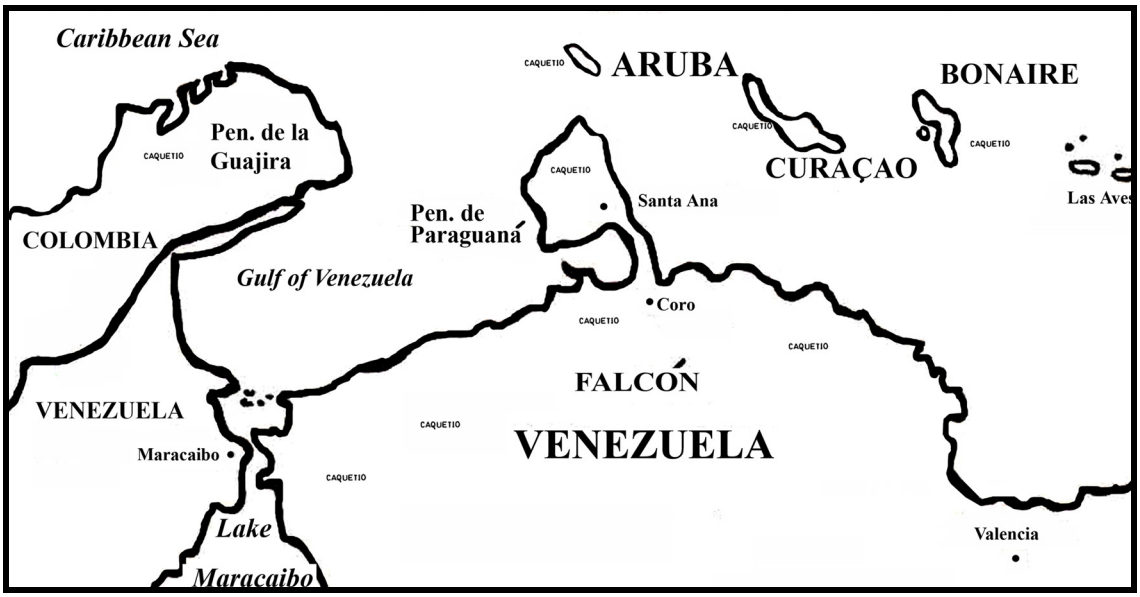


Figure 1.2.The Protohistoric Caquetío polity of Caçicure extended throughout Coastal Falcón, the ABC islands, and portions of the Guajira Peninsula.

Figure 1.3. Oliver's Stammbaum model of selected Maipuran Languages (modified after Oliver 1989, Figure 22).

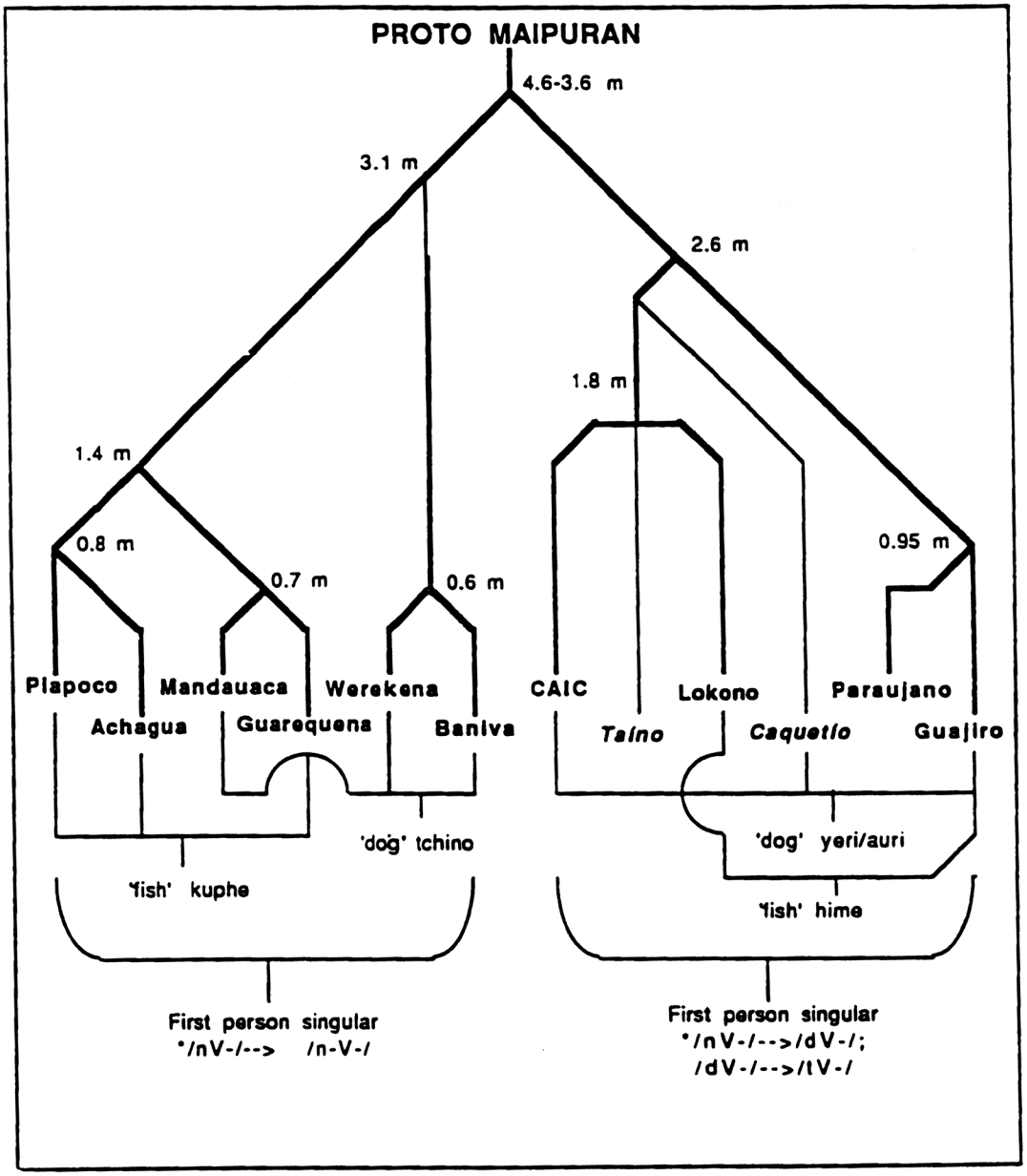


Figure 1.4. Map showing Aruba as part of the Intermediate Area of Cultural Development (modified after Rouse & Cruxent 1969, Figure 1).

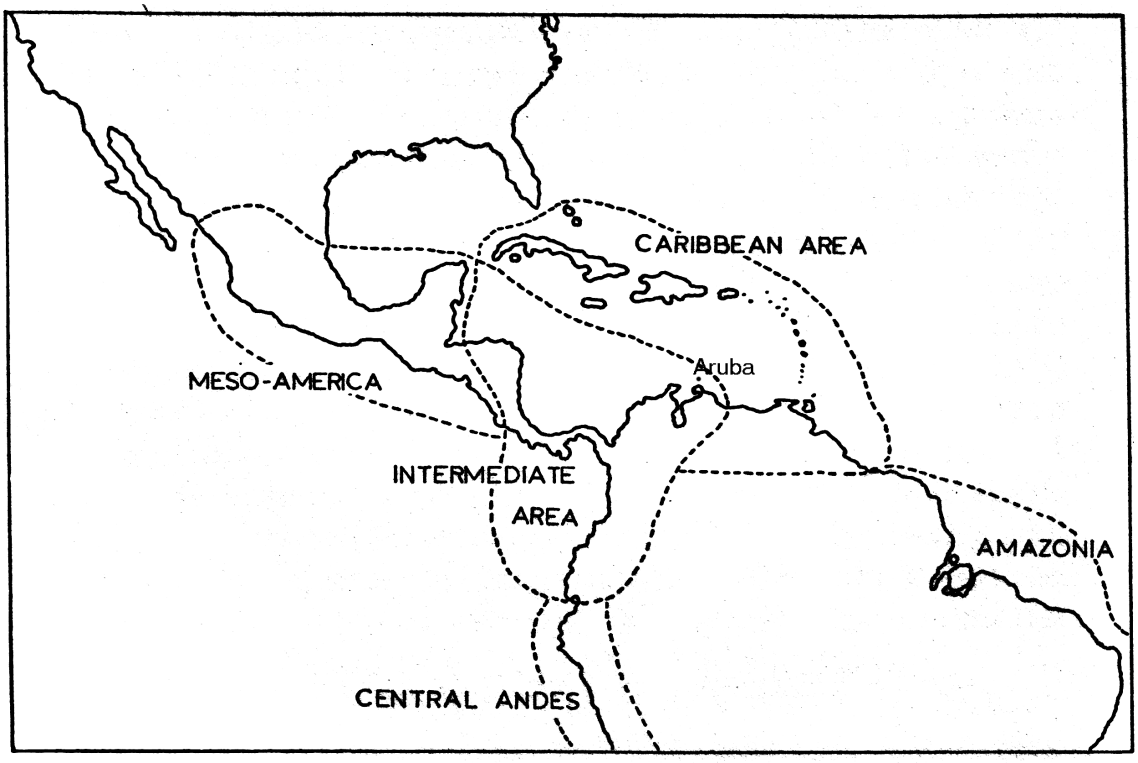
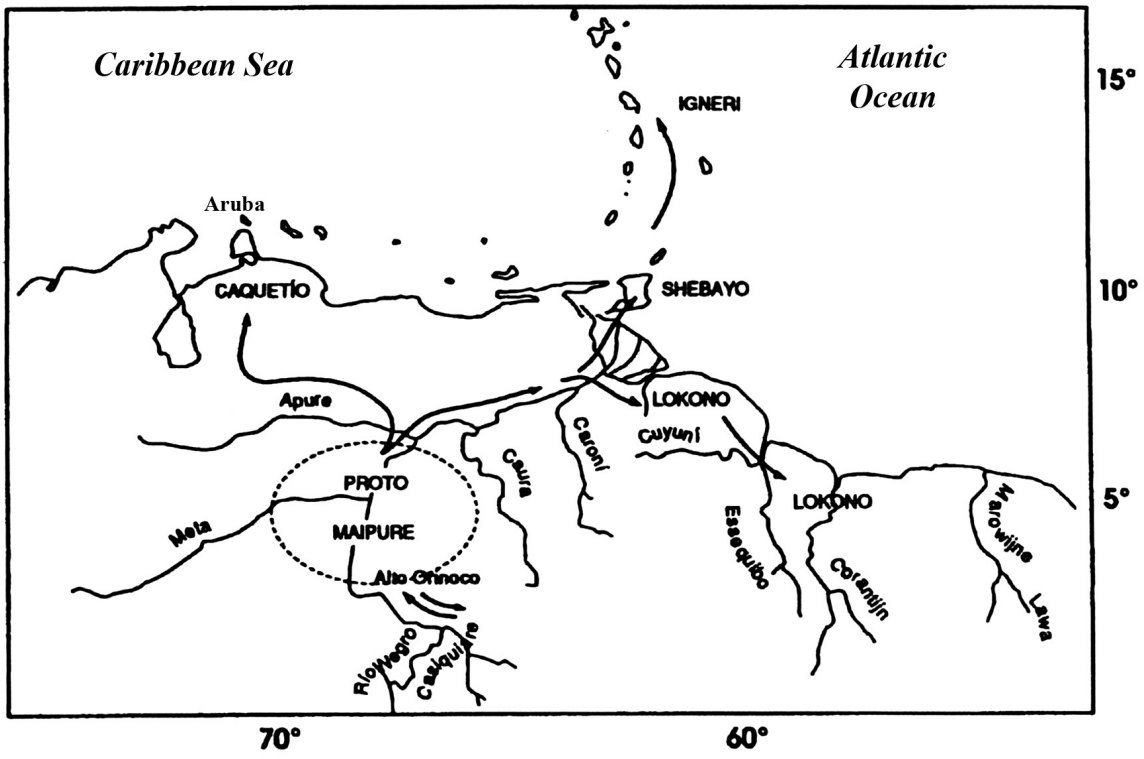


Figure 1.5. The migration of selected Arawakan groups (modified after Van Buurt & Joubert 1994:37; Dijkhoff 1997:122).



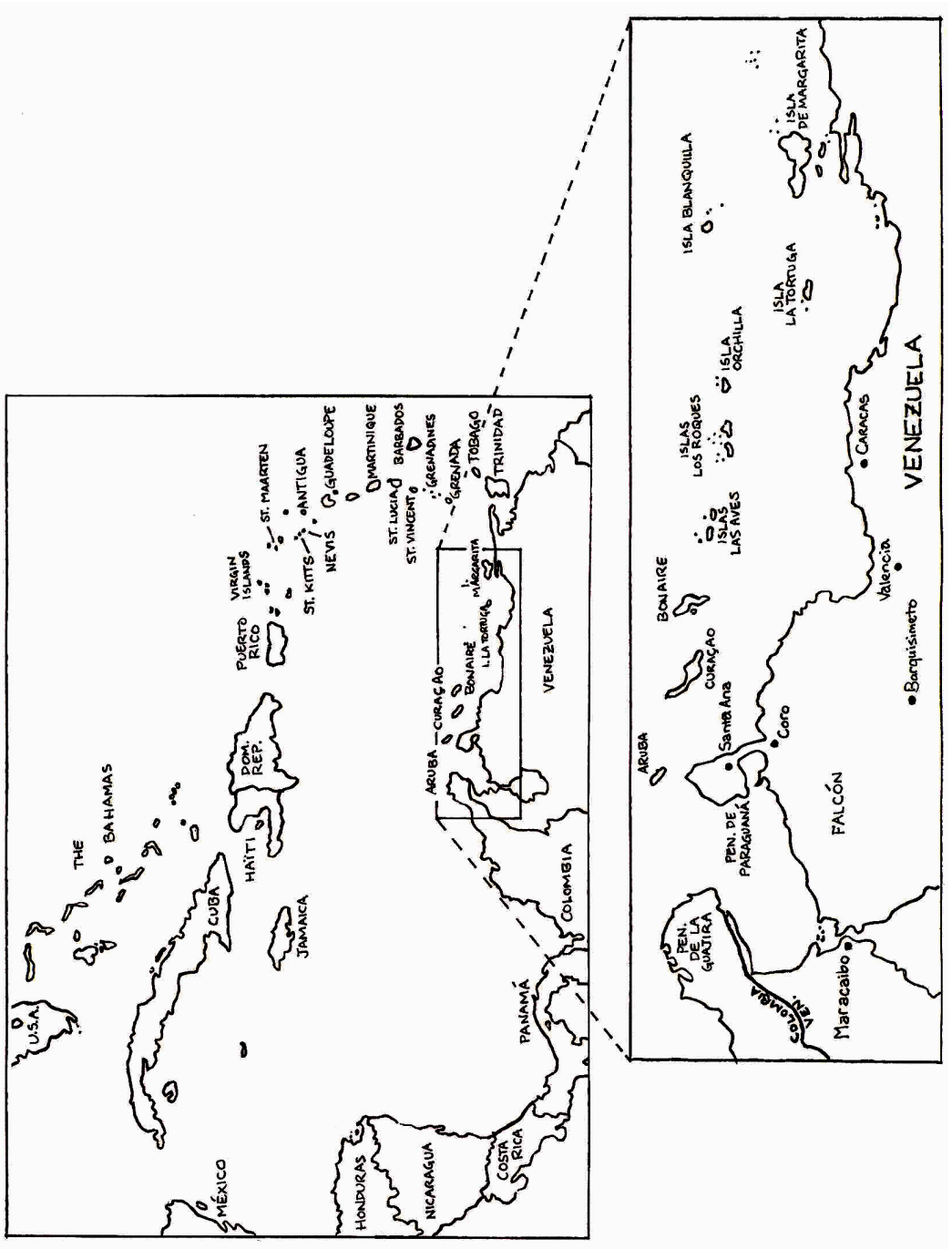


Figure 3.1. Aruba in geographic context (modified after Dijkhoff & Linville 2004, Figure 1.1).

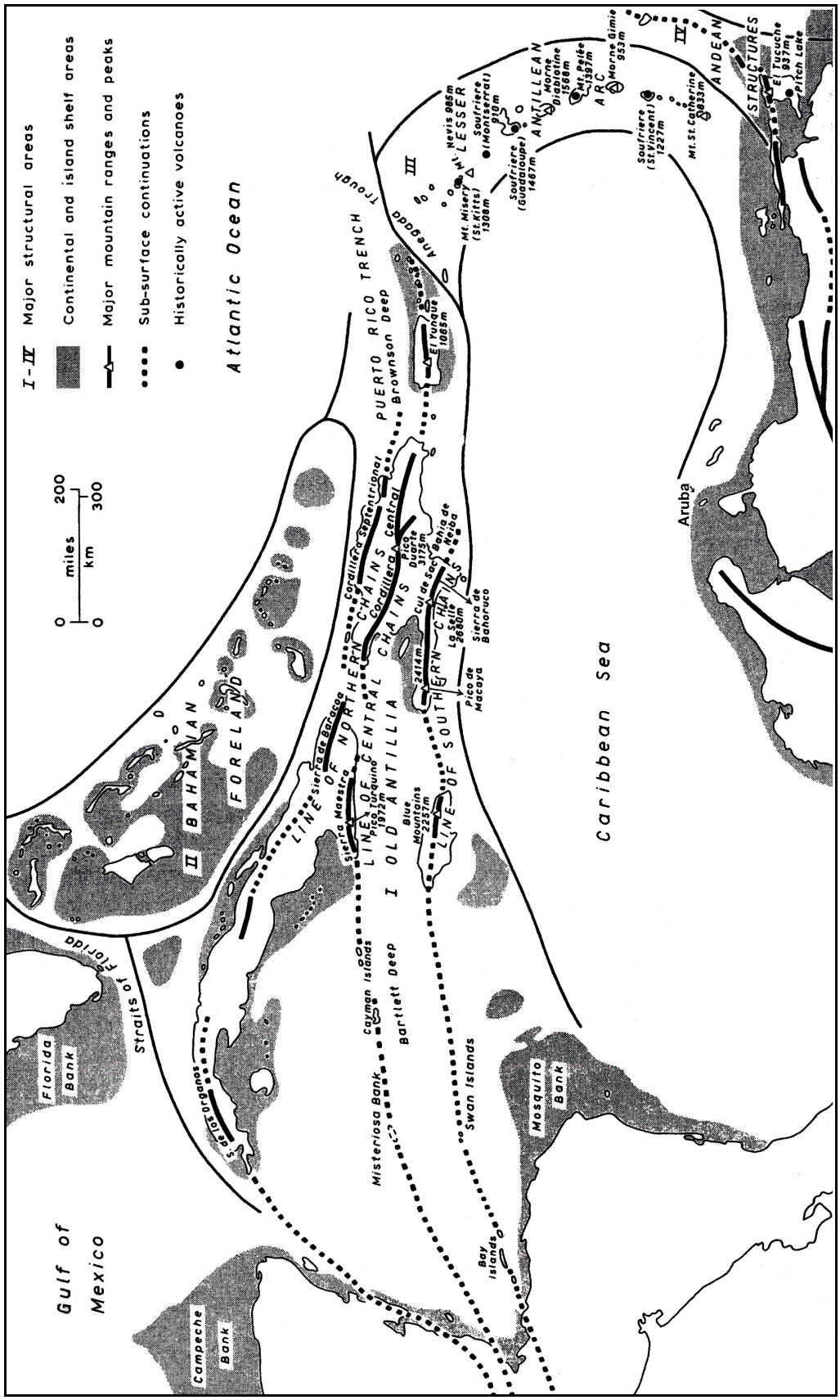


Figure 3.2. Major structural areas of the Caribbean region showing Aruba as part of the South American plate (modified after Watts 1998:8).

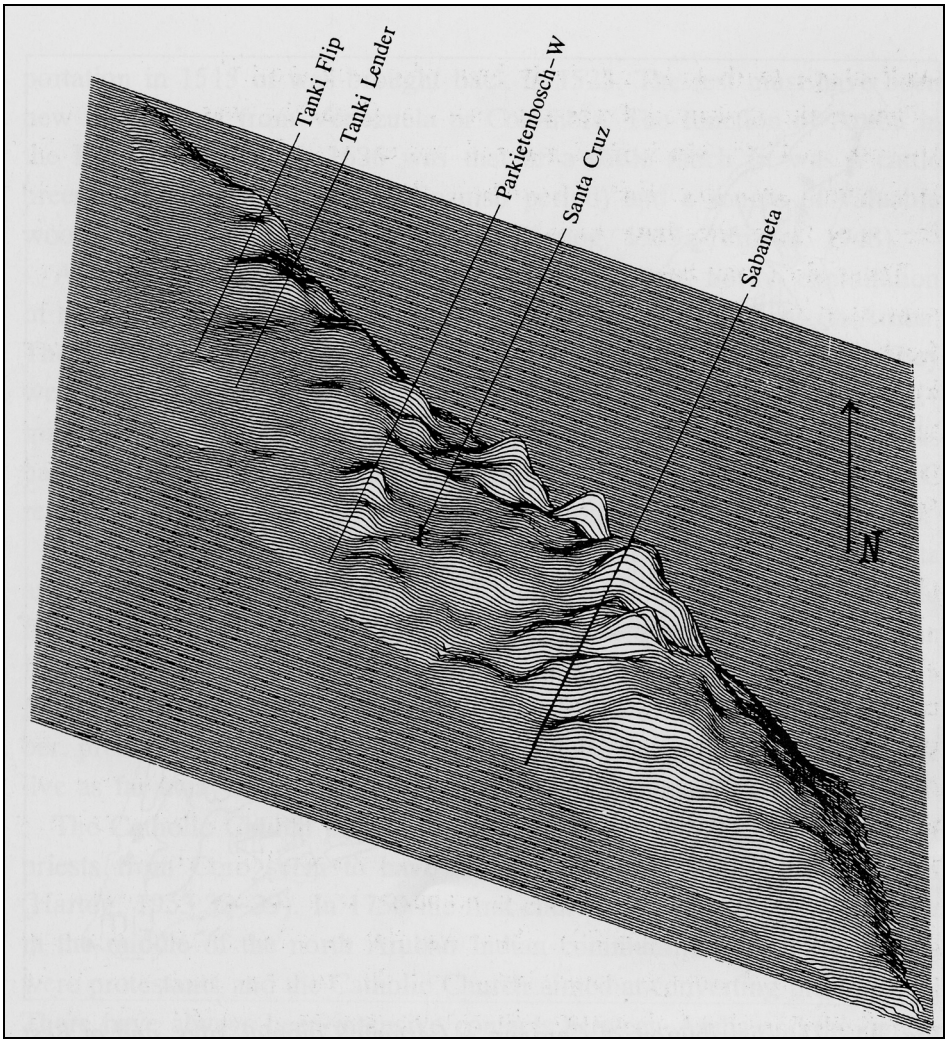


Figure 3.3. Relief Map of Aruba indicating major habitation sites of the Ceramic Period (modified after Versteeg & Ruiz 1995:65).

Figure 3.4. Westermann's 1932 Geologic Map of Aruba
(modified after Versteeg & Ruiz 1995:35).

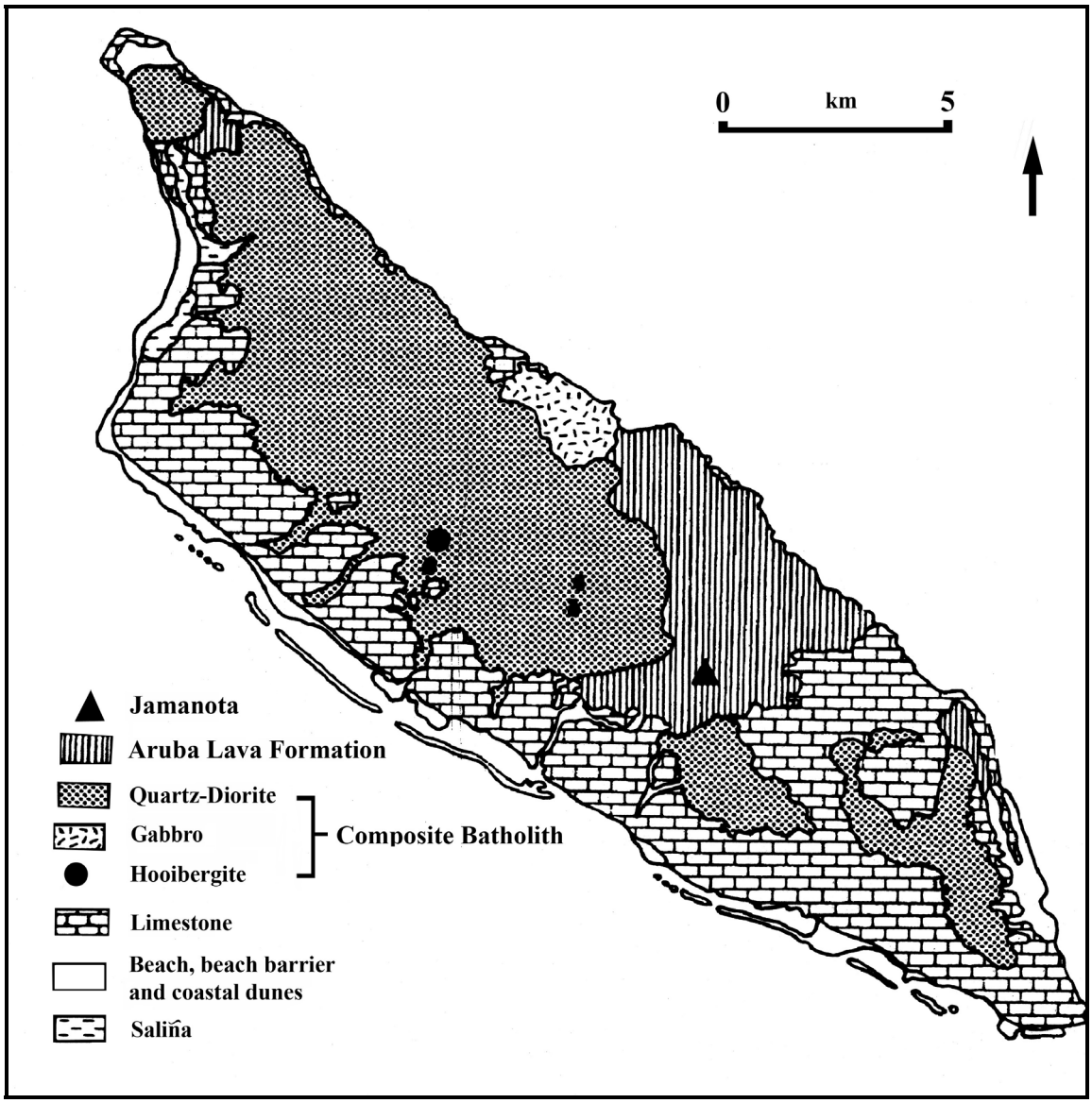
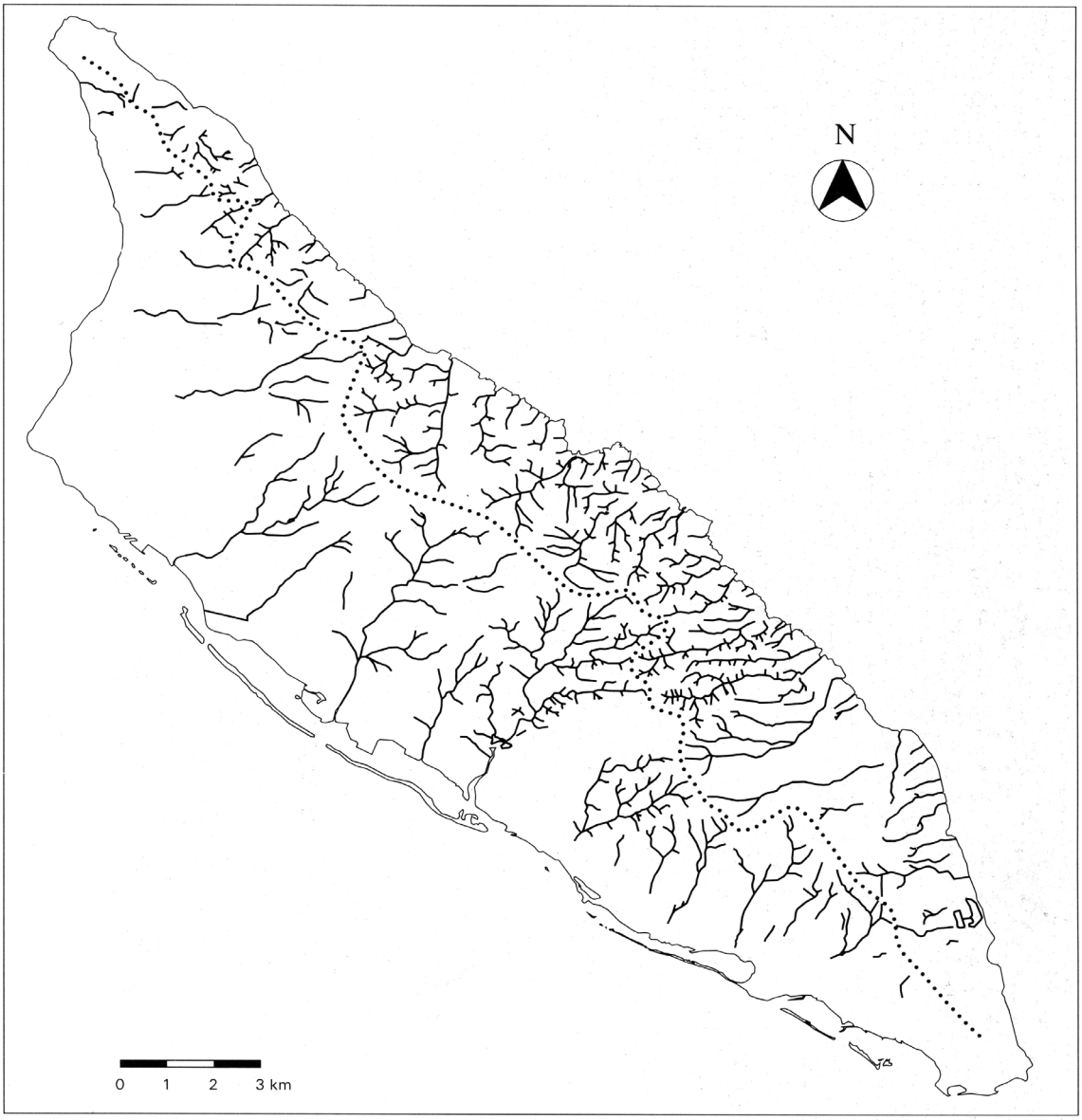


Figure 3.5. Map of Aruba's *rooi* (gut or gully) system (modified after Versteeg & Ruiz 1995, Figure 26).



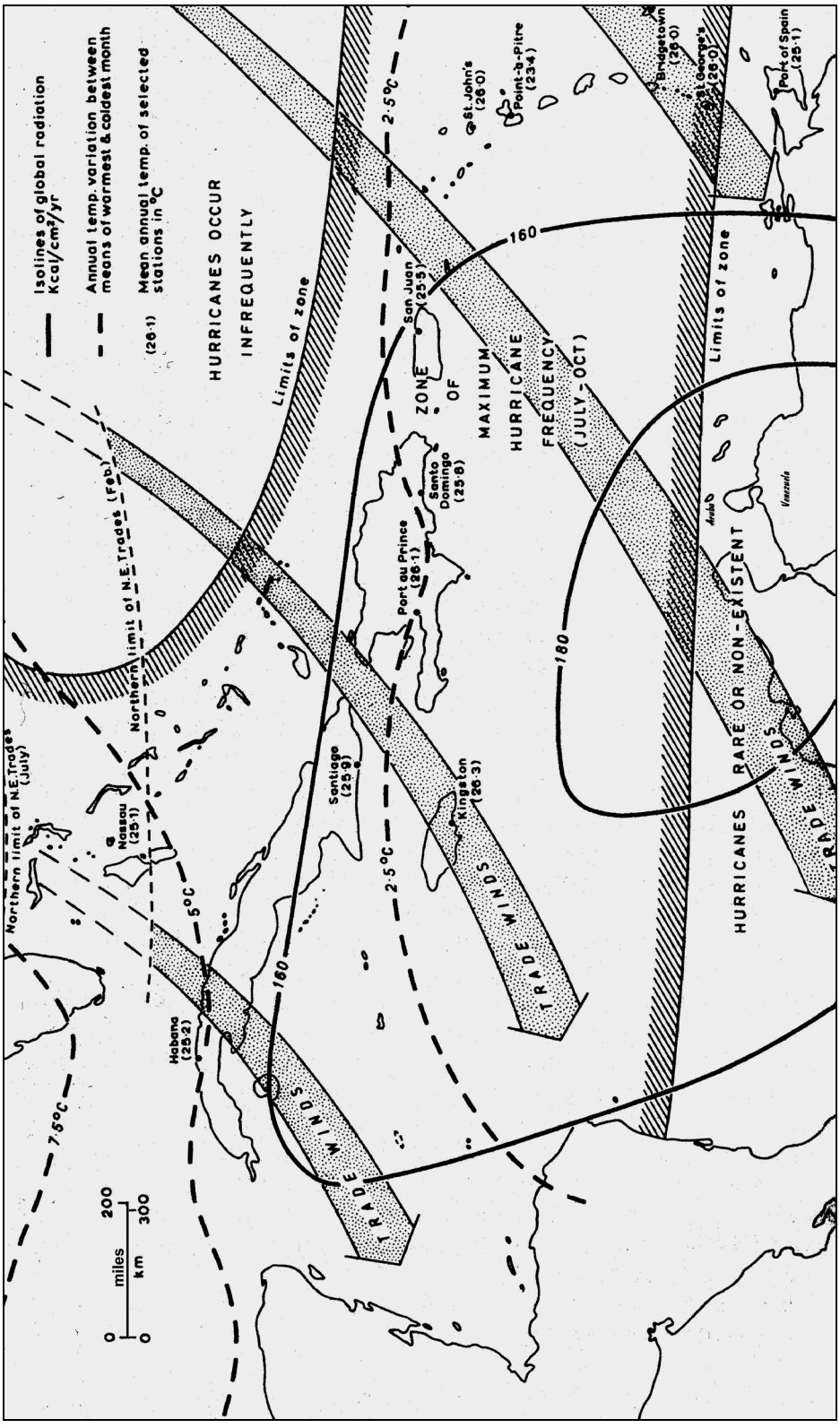


Figure 3.6. Aruba lies outside of the hurricane belt (map modified after Watts1998:16).

Figure 3.7. *Caesalpinia coriaria*, commonly known as the “divi divi” tree, yields to the power of the tradewinds as it grows (Photograph courtesy of Reynold C. Kerr).



Figure 3.8. Seagrass meadows distributed around the Aruban coast support the islands molluscan resources. (Map modified after Boekhoudt & Linville 2004, Figure 3.7).

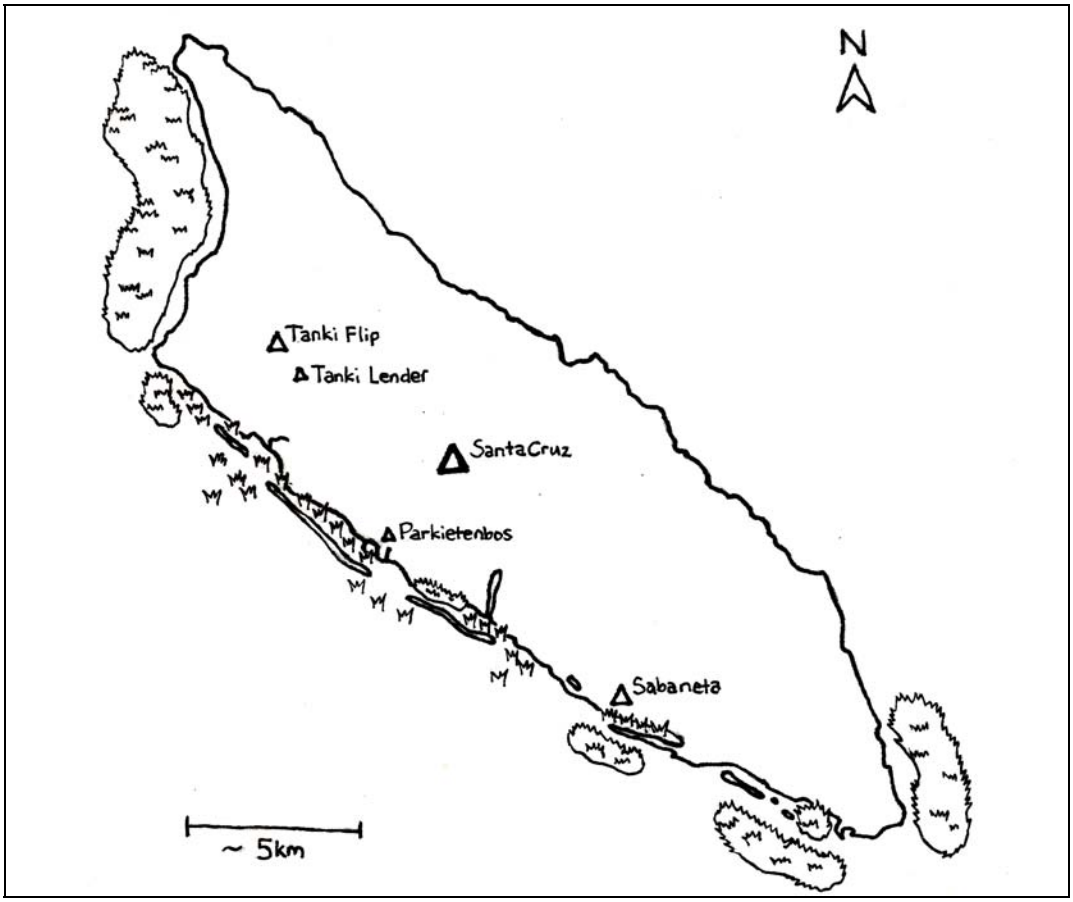


Figure 3.9. Soil potentiality map of Aruba (modified after Versteeg & Ruiz 1995:46).

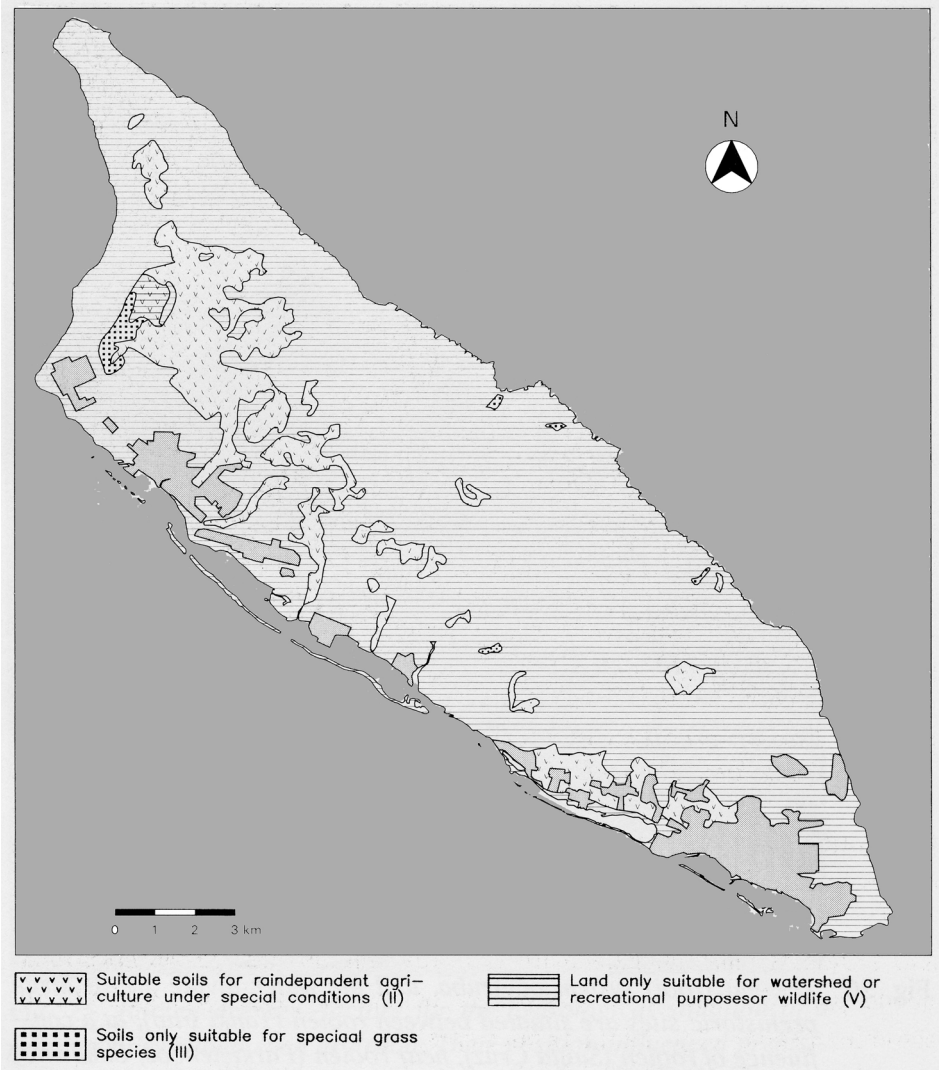


Figure 4.1. Aruba's Archaeological sites identified during the 1990 AMA survey (modified after Versteeg & Ruiz 1995:117).

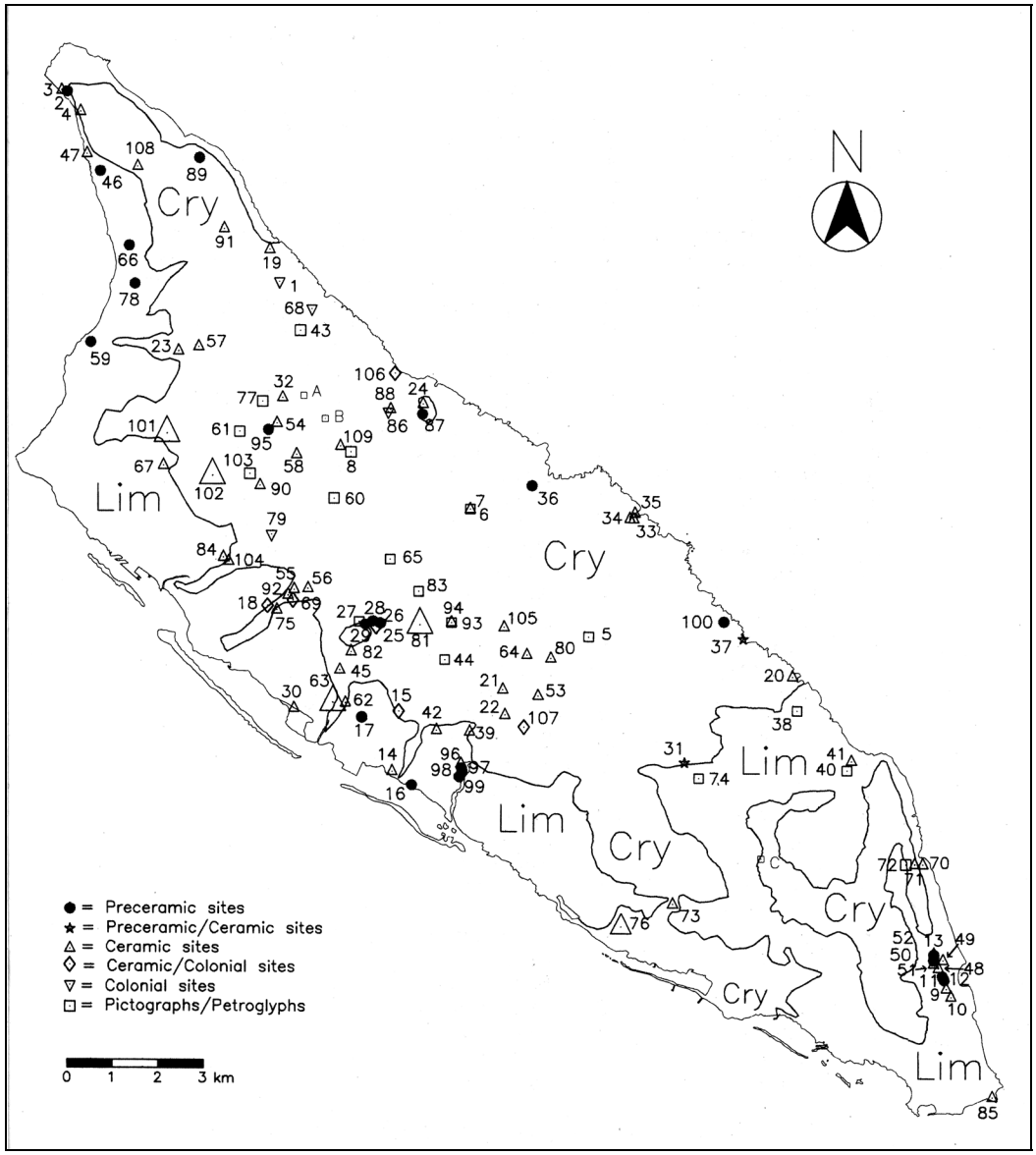


Figure 5.1. Most Preceramic sites identified during the 1990 AMA survey are closely associated with the limestone areas of the island (modified after Versteeg & Ruiz 1995:17).

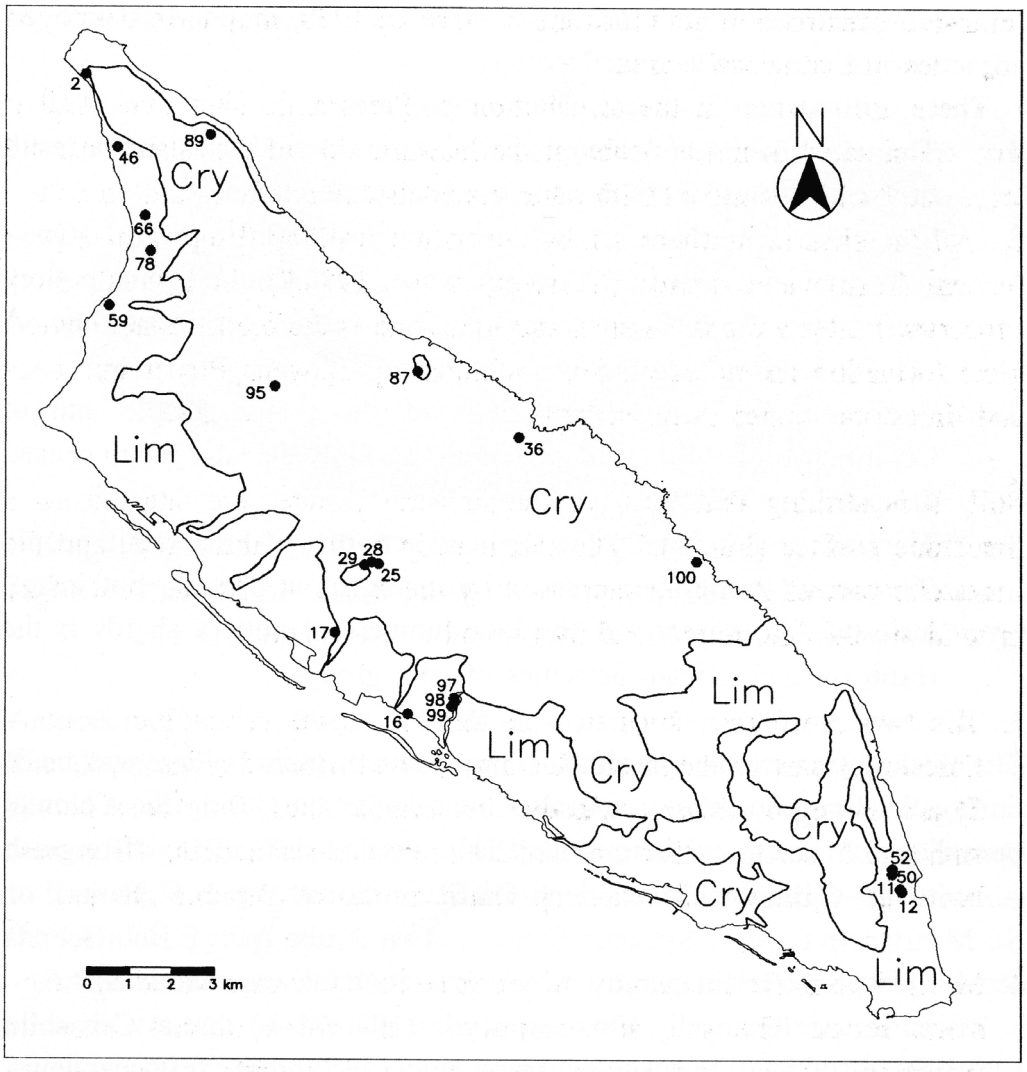


Figure 5.2. Preceramic sites elevation (modified after Versteeg & Ruiz 1995:15).

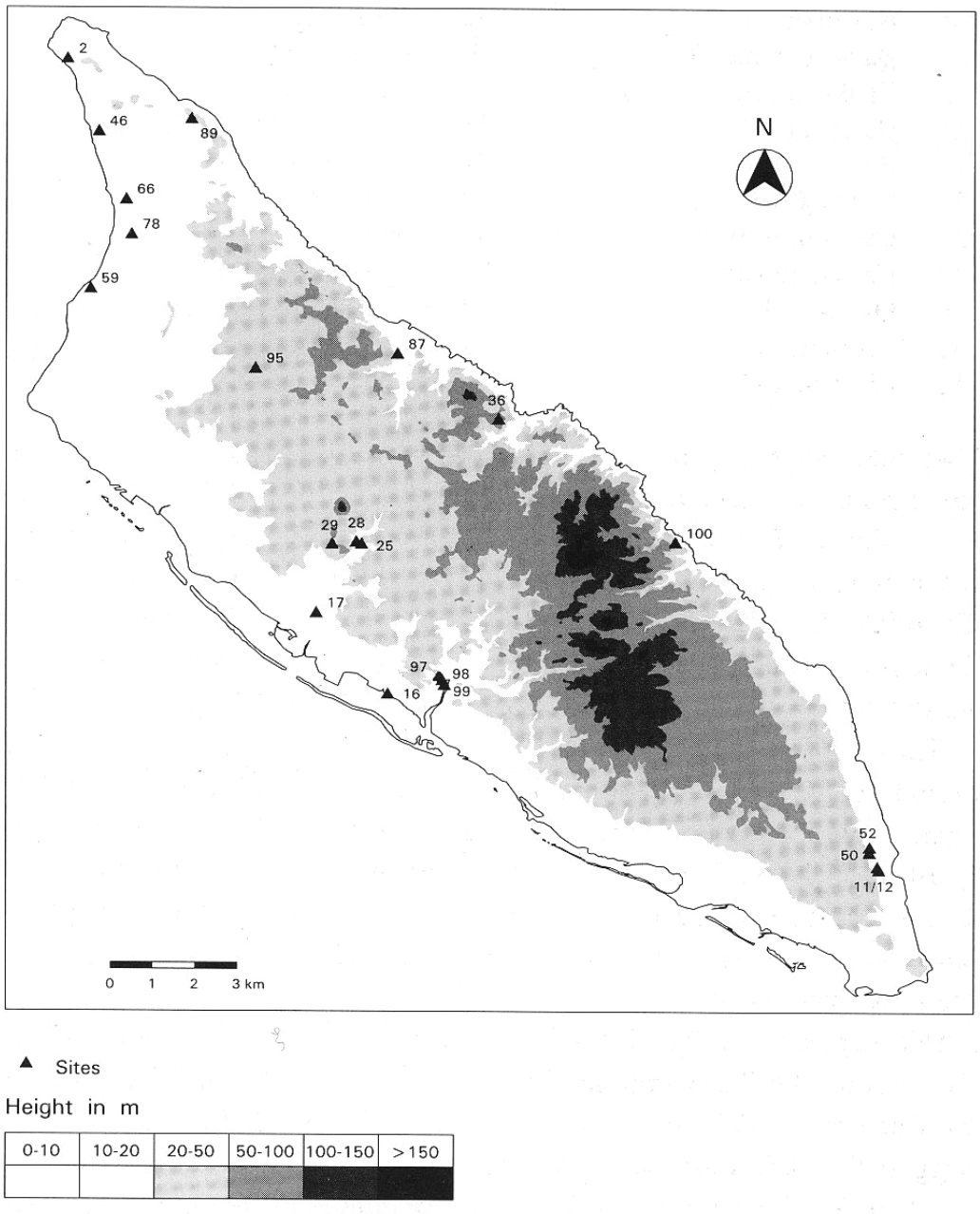
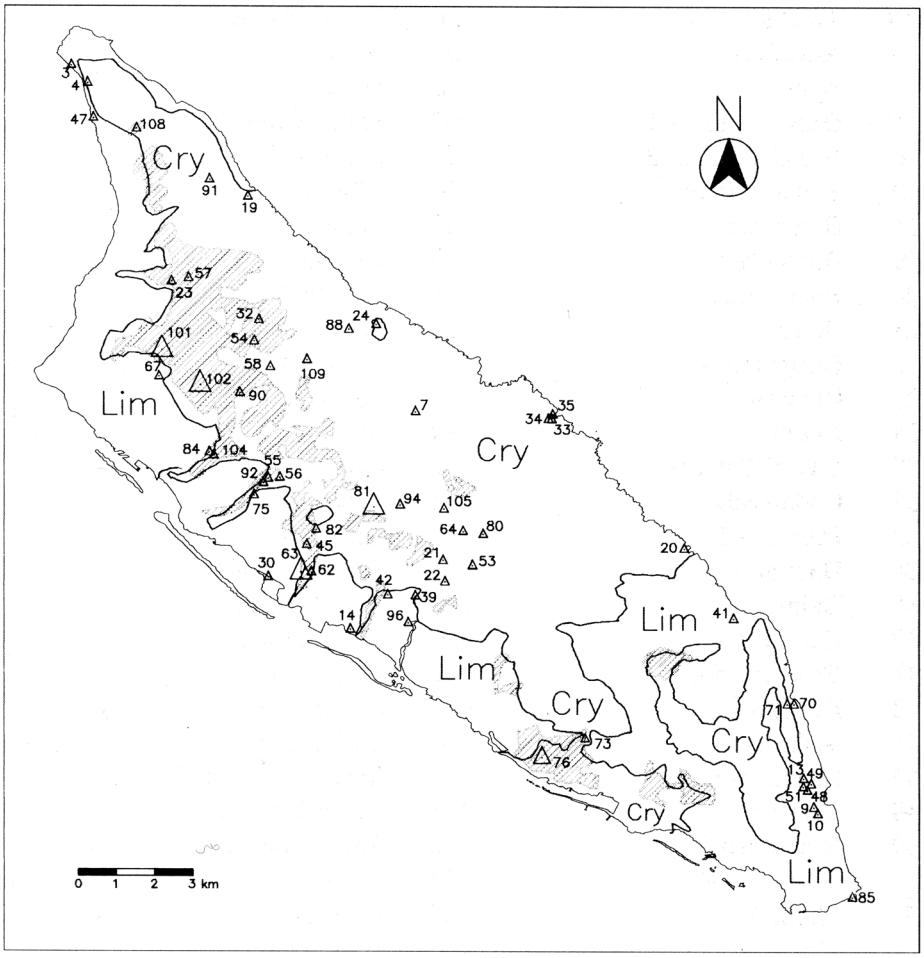


Figure 5.3. Aruba's Ceramic Period sites identified during the 1990 AMA survey (modified after Versteeg & Ruiz 1995:23).



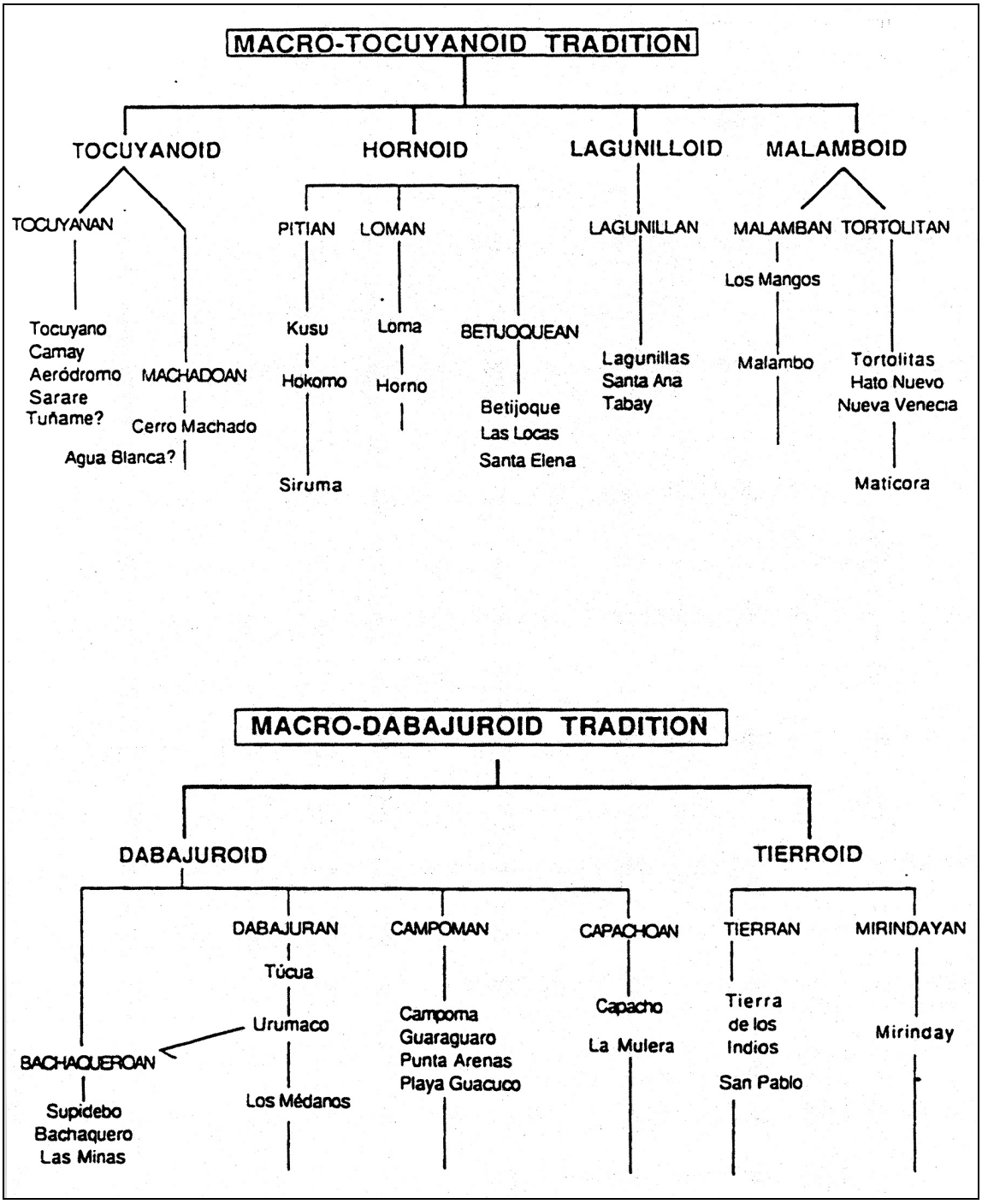
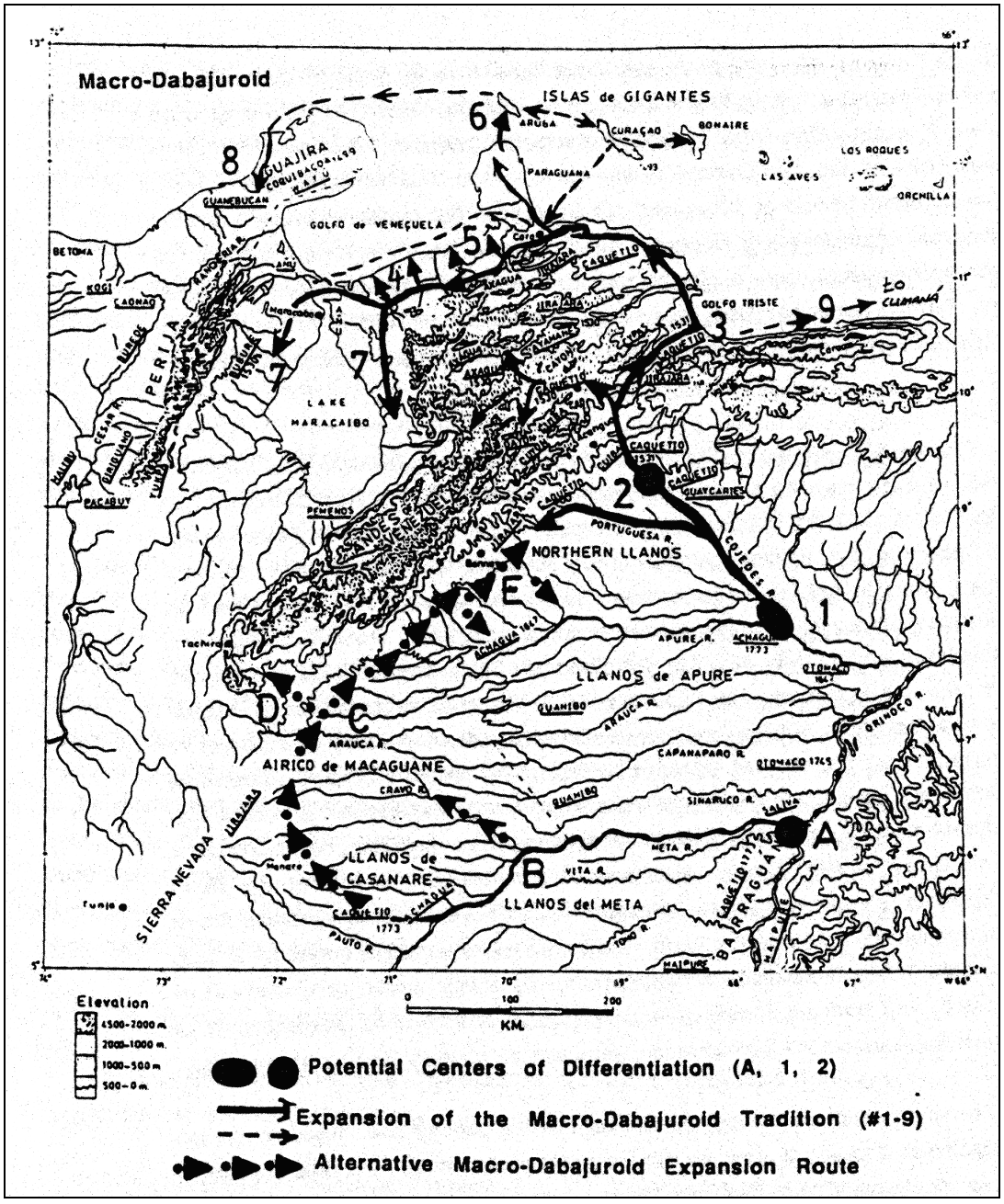


Figure 5.4. Oliver's Hierarchical Classification of Macro-Tocuyanoid and Macro-Dabajuroid Traditions (modified after Oliver 1989, Figure 44).

Figure 5.5. Oliver's model of Macro-Dabajuroid expansion (modified after 1989, Figure 96).



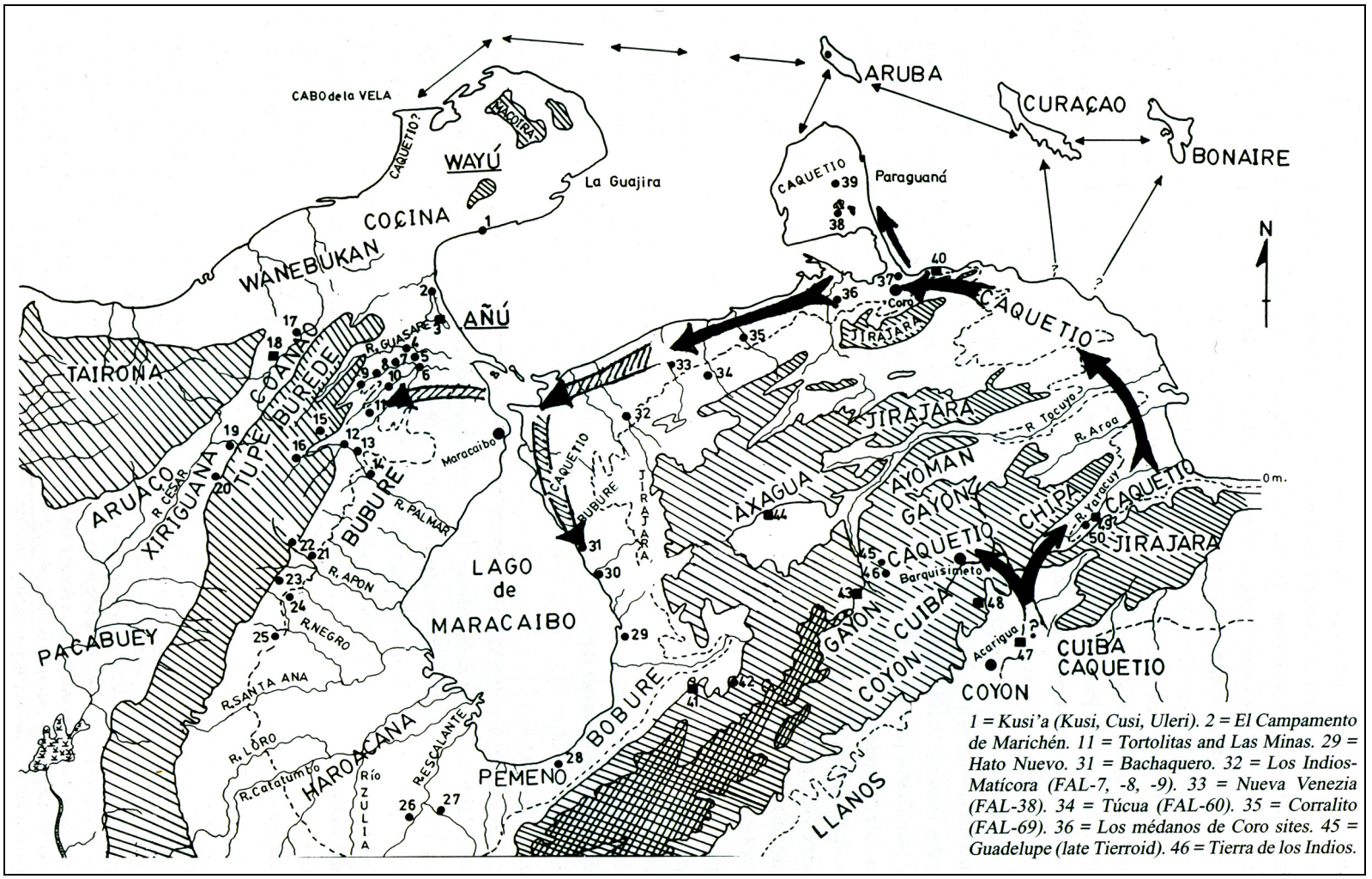


Figure 5.6. Oliver's updated model of Dabajuroid migration (modified after Oliver 1997, Figure 306).

Figure 5.7. Cultural Chronology of Aruba in relation to Coastal Falcón, Venezuela and the Off-shore Islands, the Maracaibo Basin, and Caribbean Coastal Colombia (modified after Oliver 1997:367).

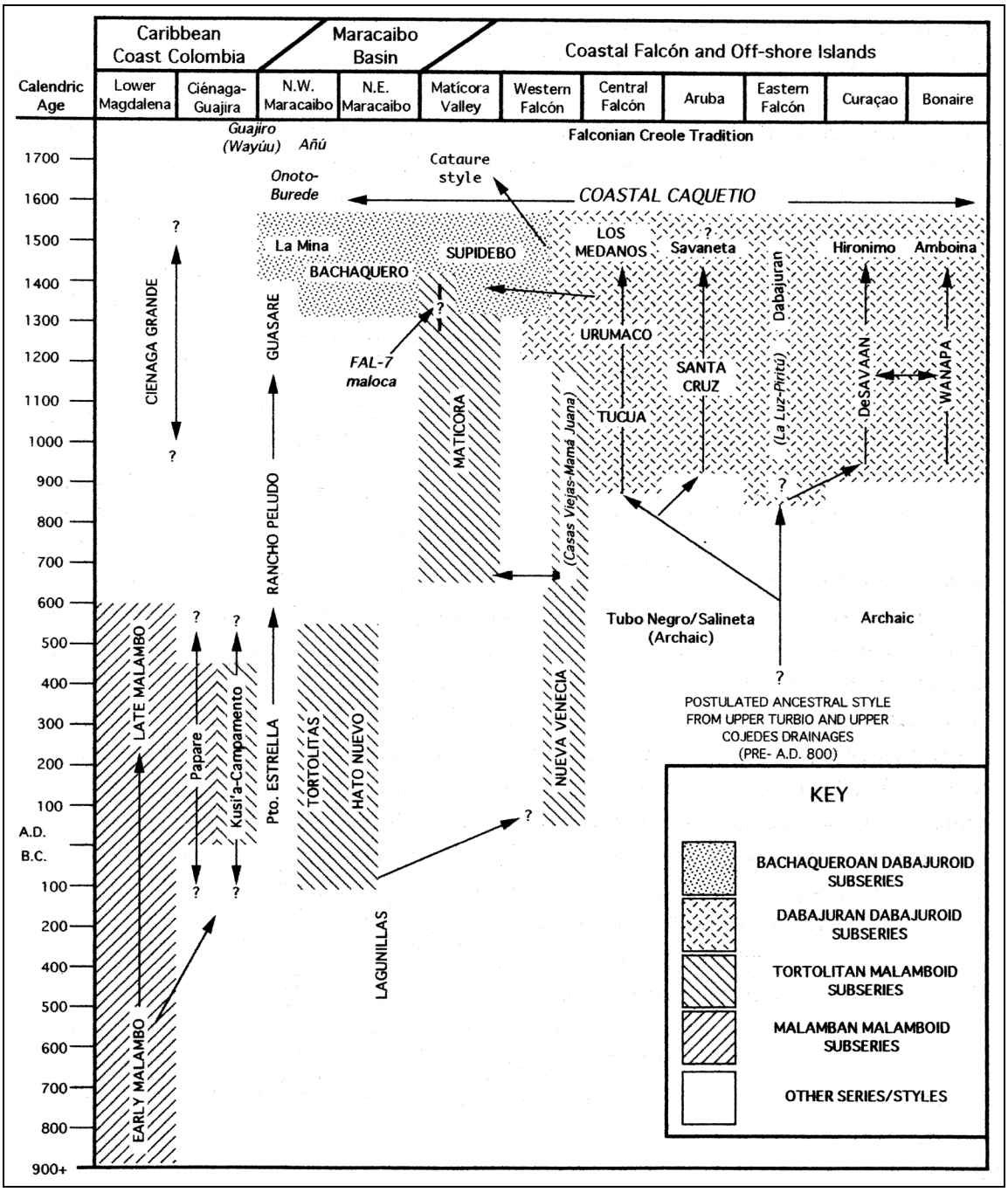
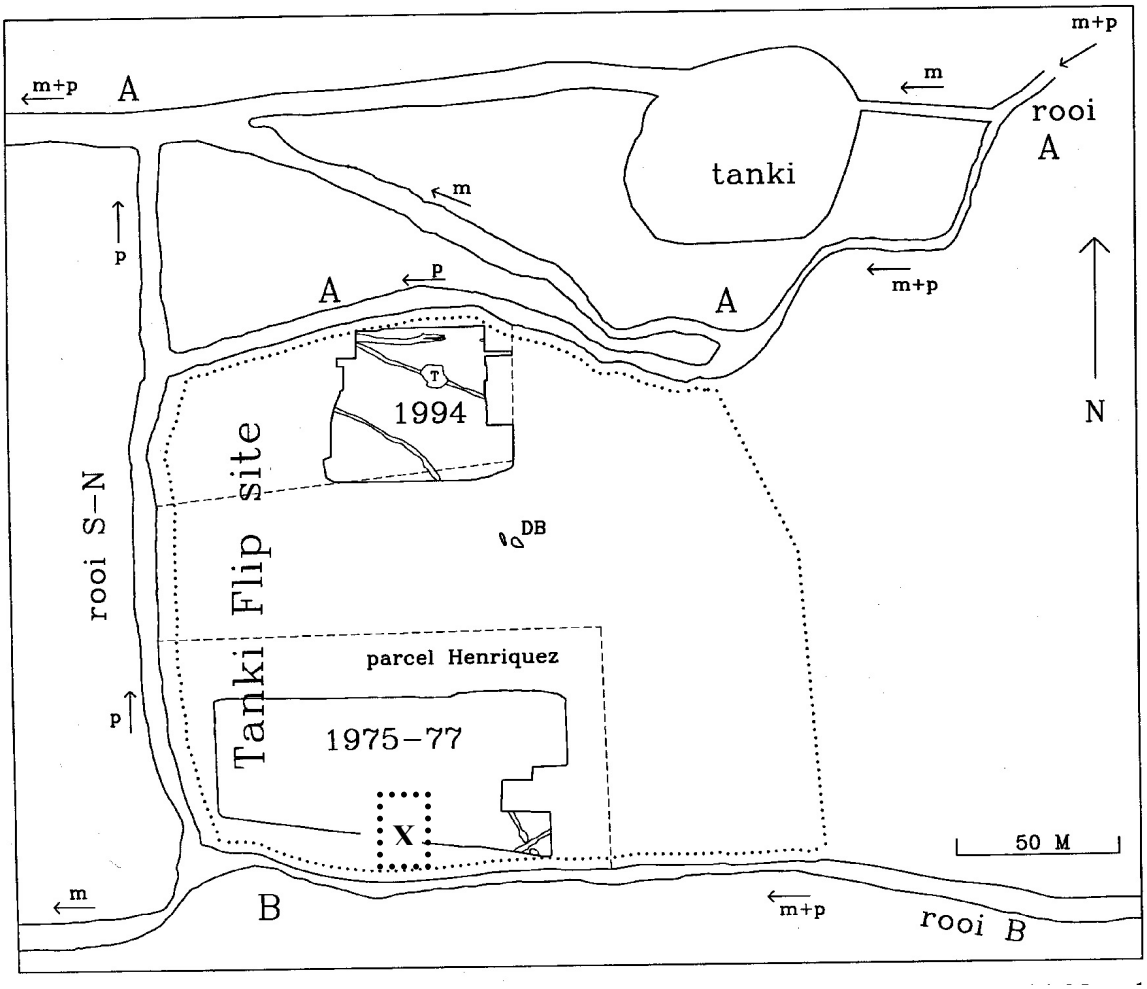


Figure 5.8. The Tanki Flip site, with three excavation campaigns indicated: the 1994-95 excavations, the 1975-77 excavations, and the much smaller 1968 excavation (6 test pits located within the reconstructed excavation area marked by an "X" (Modified after Versteeg & Rostain 1997:5).



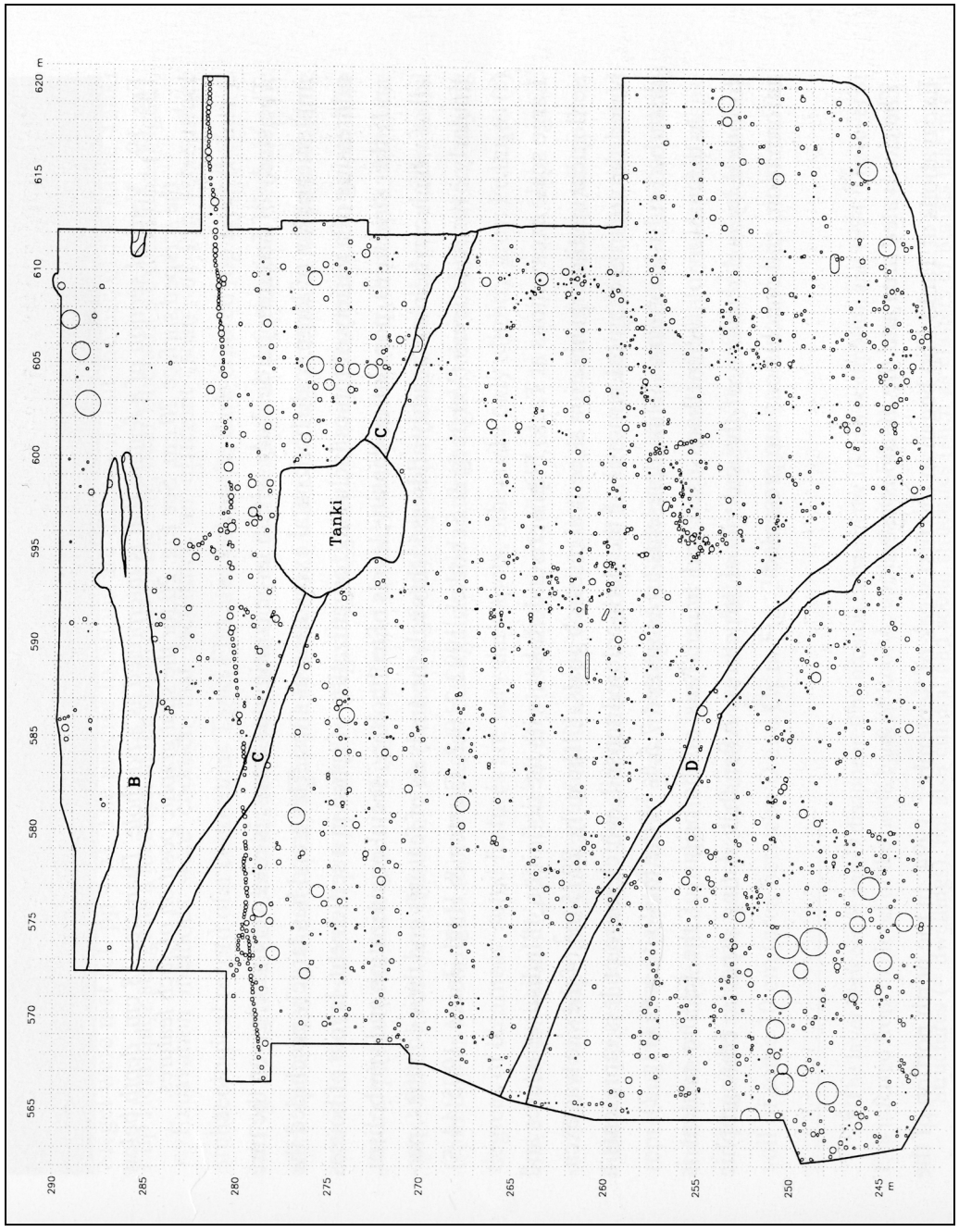


Figure 5.9. Features identified during 1994-1995 excavations at Tanki Flip (modified after Versteeg & Rostain 1997:23).

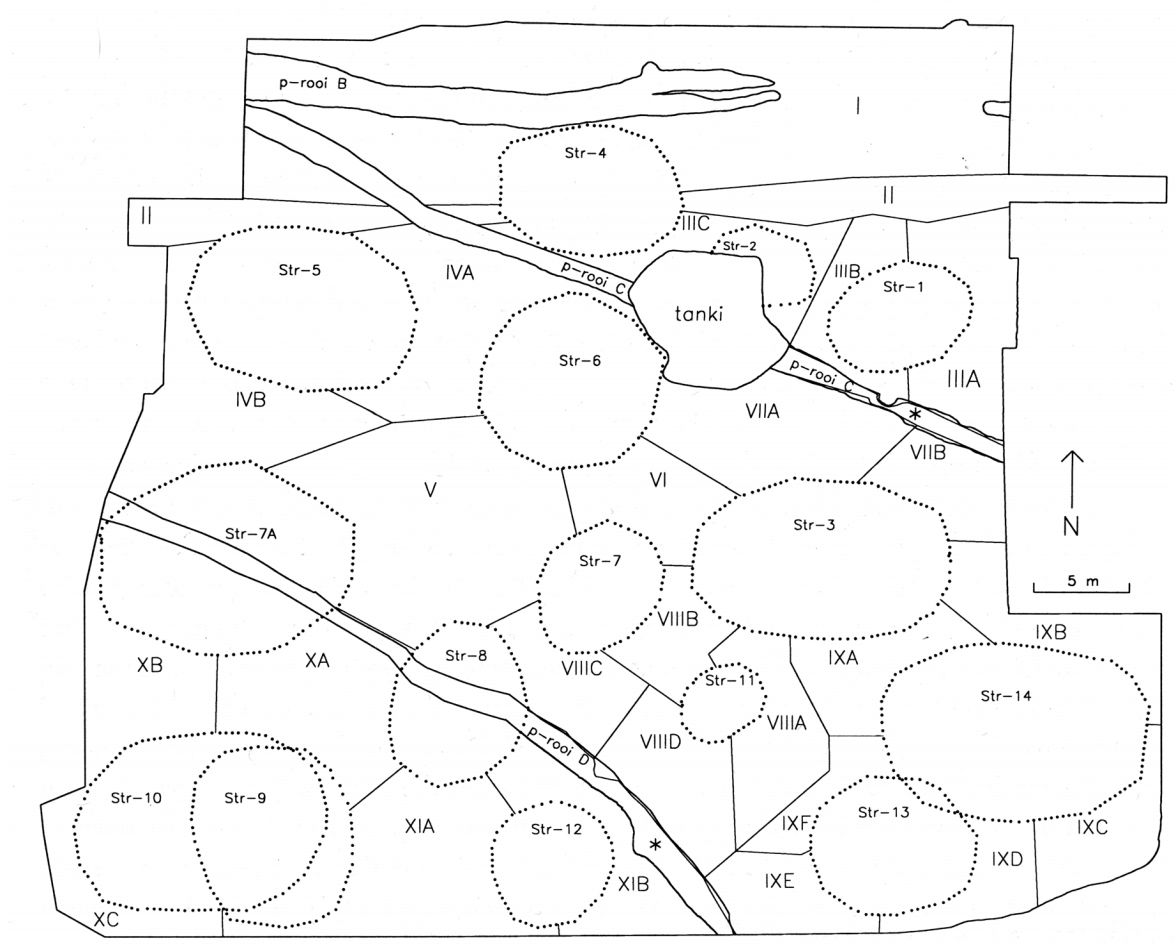


Figure 5.10. Preliminary assessment of the structures (n=14) identified at the Tanki Flip site, divided here into 41 units (modified after Bartone & Versteeg 997:106).

Figure 5.11. Historic Period sites identified during the 1990 AMA survey of the island (modified after Versteeg & Ruiz 1995:26. See Appendix 1a for site references).

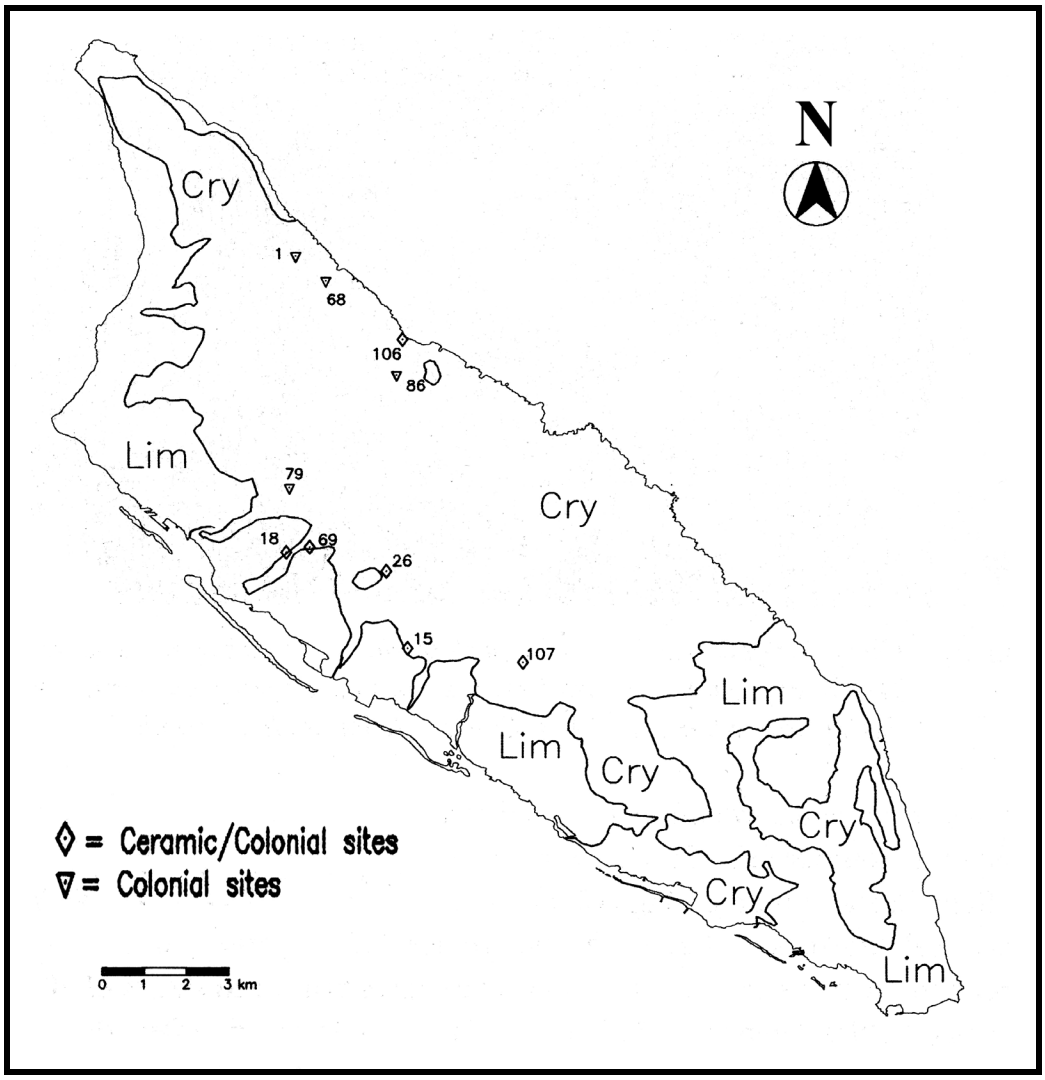


Figure 5.12. Ceramic/Colonial sites of the Historic Period, located predominantly in the crystalline portion of the island (modified after Versteeg & Ruiz 1995:66).

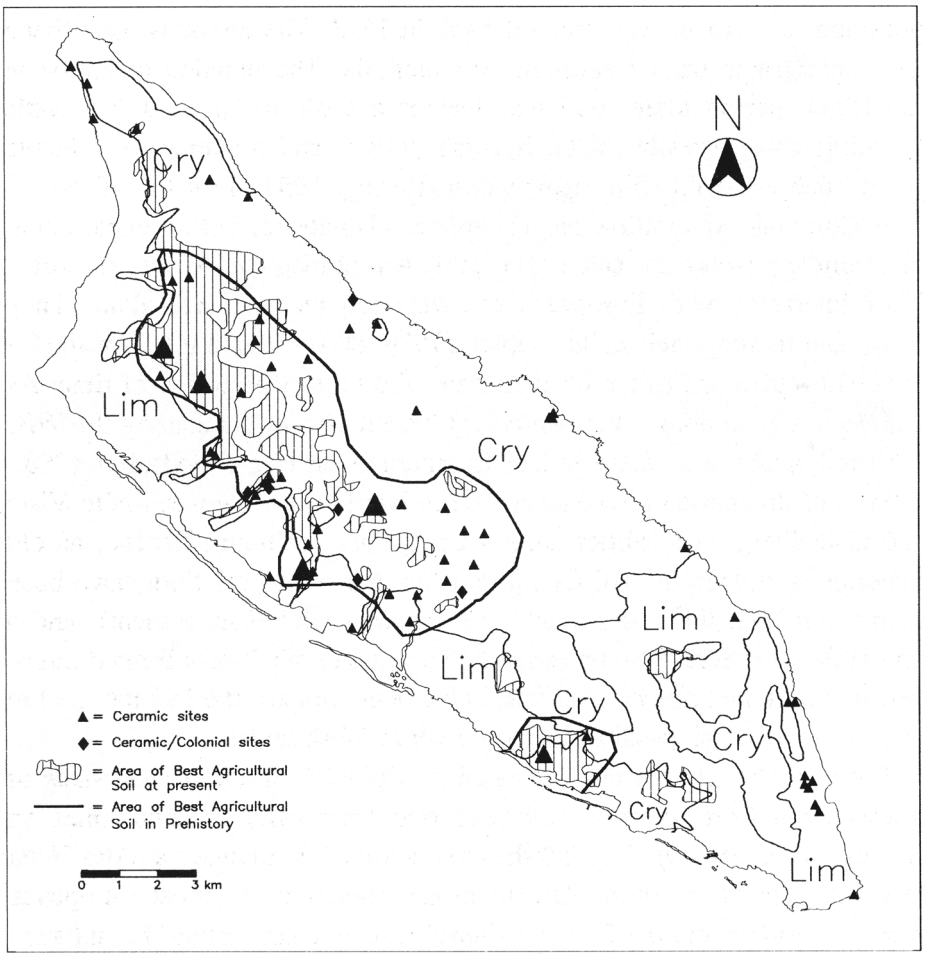
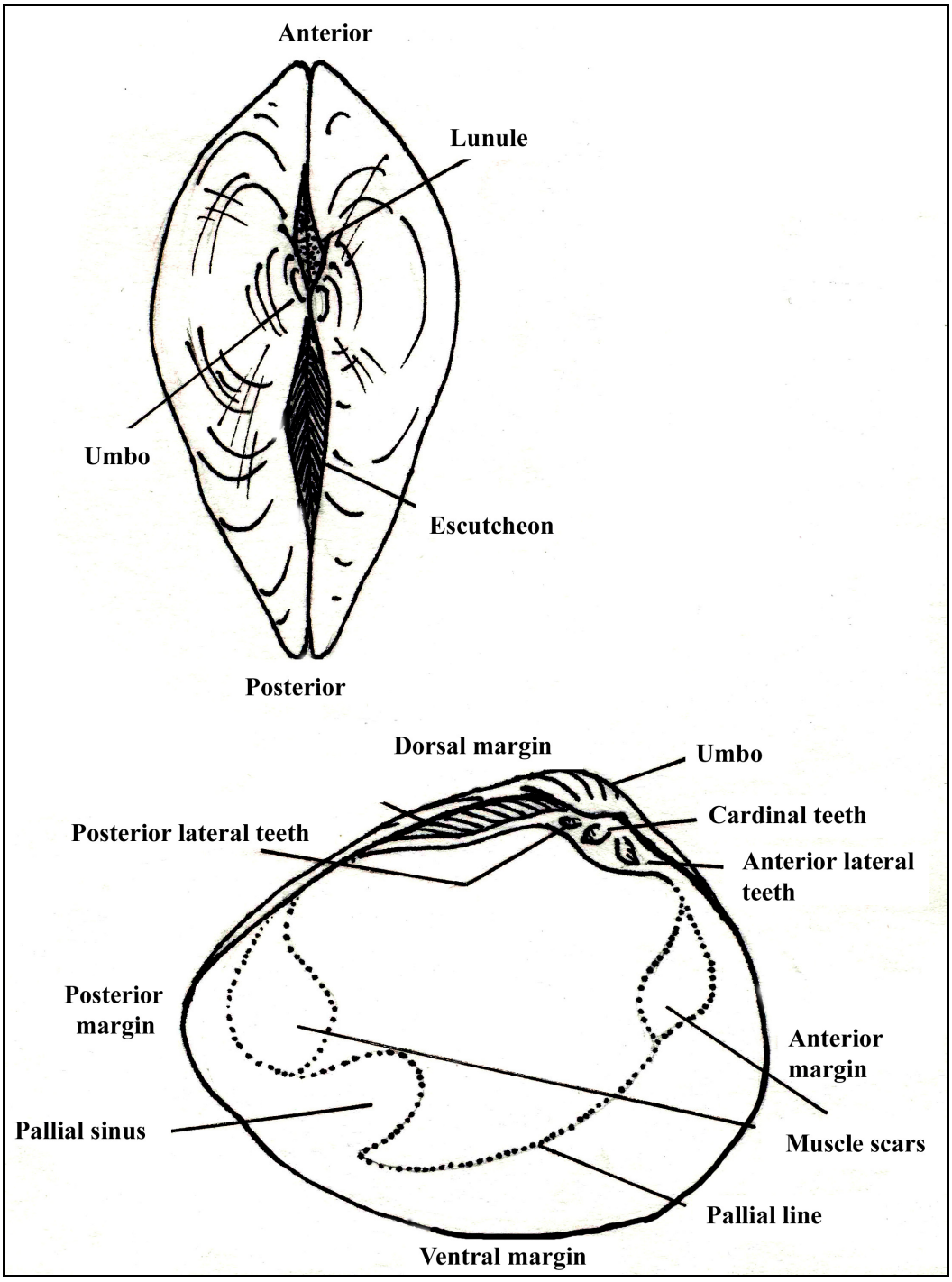


Figure 6.1. Parts of Bivalves (Modified after Boekhoudt & Linville 2004, Figure 3.4).



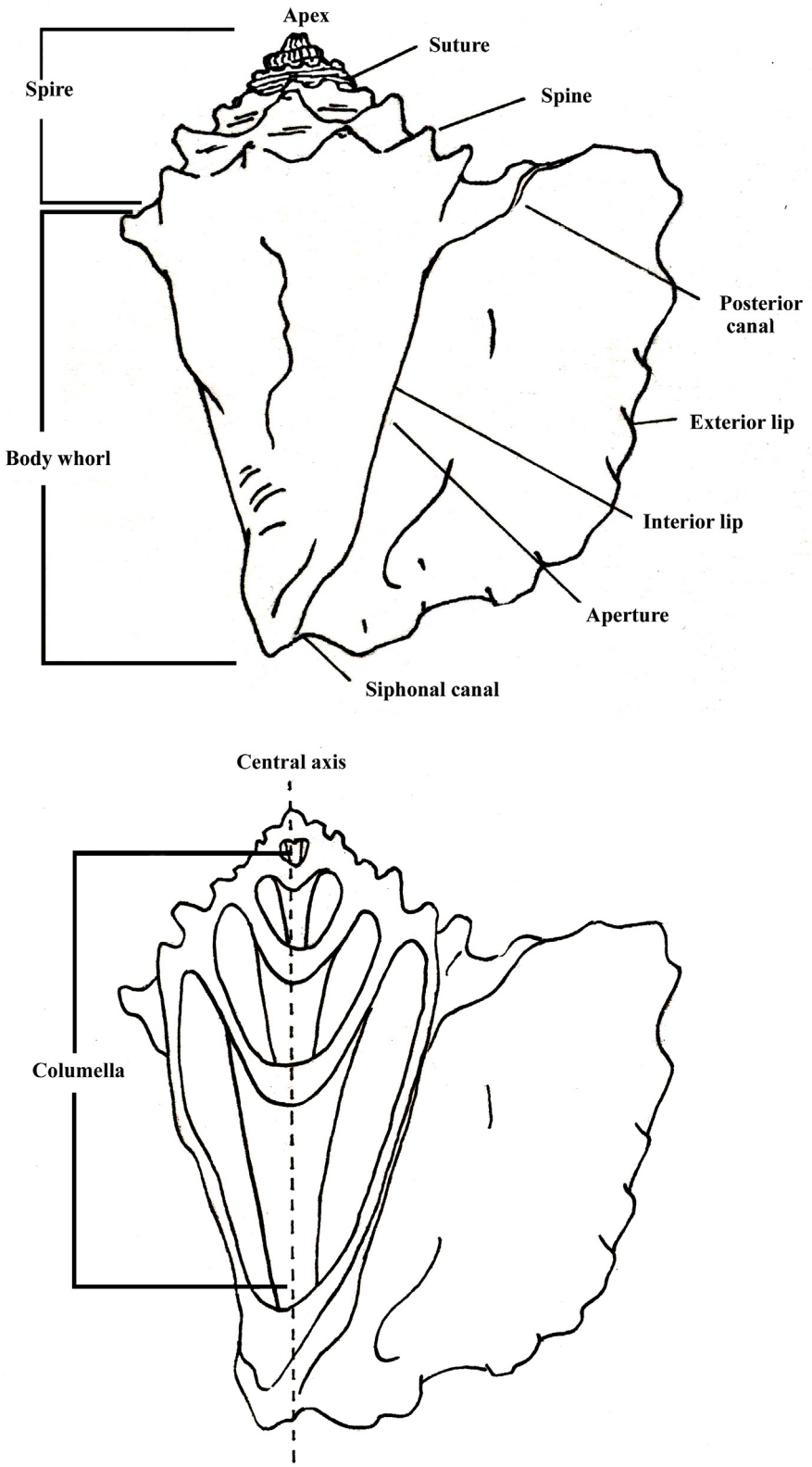


Figure 6.2. Parts of the adult *Strombus gigas* shell, whole (above) and cross- section (below) (Modified after Boekhoudt & Linville 2004, Figures 3.2 & 3.3).

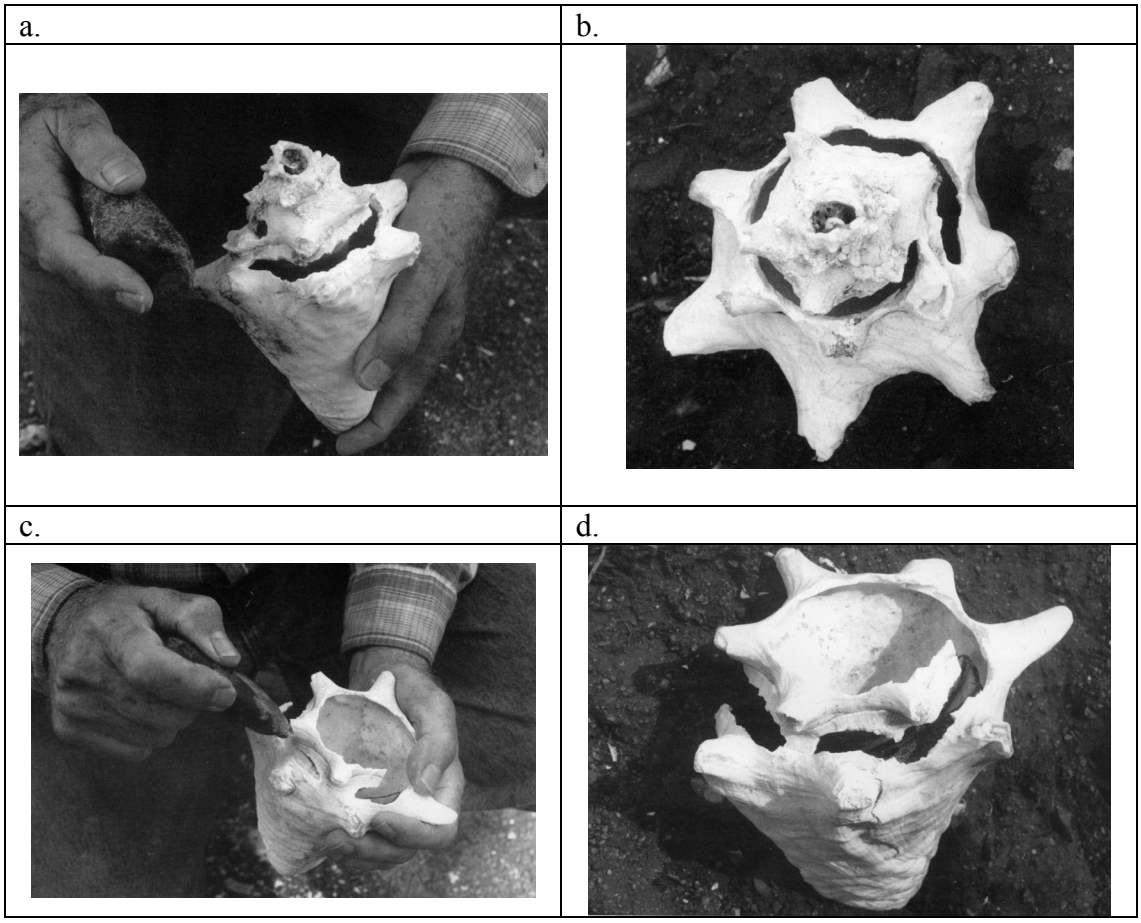
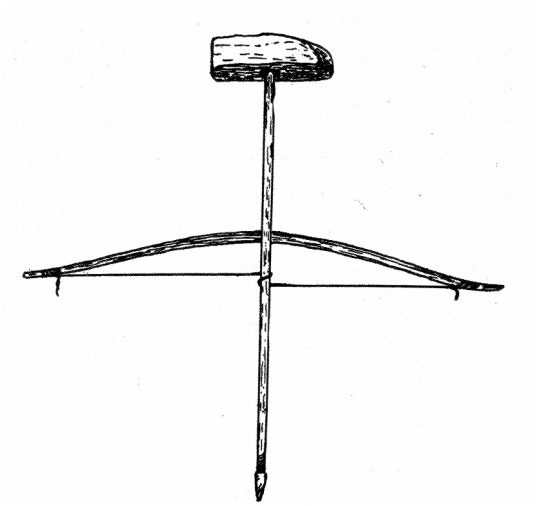


Figure 6.3 a-d. *Strombus gigas* shell reduction demonstrated by Ramón Dacal Moure (modified after Dacal 1997:180,182).

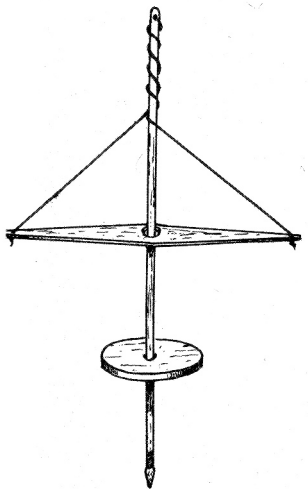
Figure 6.4. Drilling artifact holes (Modified after Orchard 1975, Figures 44-47).



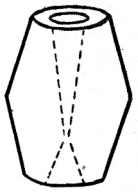
a. Bow drill.



b. Drill point.



c. Pump drill.



d. Drawing of agate bead from Panama.

APPENDICES

APPENDIX Ia

Aruba's Archaeological Sites as of 1990

Source:Versteeg & Ruiz, 1995

Site No./Name	Site No./Name	Site No./Name
1 Alto Vista	38 Fontein	75 Sabana Blanco
2 Arashi-1	39 Franse Pas	76 Sabaneta-1
3 Arashi-2	40 Guadirikiri-1	77 Saliña
4 Arashi-3	41 Guadirikiri-2	78 Saliña Cerca
5 Arikok	42 Kibaima	79 San Barbola
6 Ayo-1	43 Labega	80 San Fuego
7 Ayo-2	44 Macuarima	81 Santa Cruz-1
8 Babijn	45 Mahuma	82 Santa Martha
9 Banki Jerome-1	46 Malmok-1	83 Ser'i Noka
10 Banki Jerome-2	47 Malmok-2	84 Sero Blanco
11 Banki Jerome-3	48 Manzania-1	85 Sero Colorado
12 Banki Jerome-4	49 Manzania-2	86 Sero Cristal
13 Banki Jerome-5	50 Manzania-3	87 Sero Geel
14 Barcadera-1	51 Manzania-4	88 Sero Muerte
15 Barcadera-2	52 Manzania-5	89 Sero Muskita
16 Barcadera-3	53 Maria Mai	90 Sero Patrishi
17 Barcadera-4	54 Moco	91 Sero Pela
18 Barcelona	55 Morgenster-1	92 Simonslust
19 Boca Cura	56 Morgenster-2	93 Siribana-1
20 Boca Prins	57 Noord	94 Siribana-2
21 Boton	58 Nuñe	95 Soledad
22 Bringamosa-1	59 Palm Beach	96 Spaans Lagoen-1
23 Bucurui	60 Paradera	97 Spaans Lagoen-2
24 Budui	61 Paraguana	98 Spaans Lagoen-3
25 Canashito-1	62 Parkietenbos-E	99 Spaans Lagoen-4
26 Canashito-2	63 Parkietenbos-W	100 Suplado
27 Canashito-3	64 Picaron	101 Tanki Flip
28 Canashito-4	65 Piedra Plat	102 Tanki Lender-1
29 Canashito-5	66 Plantage Tromp	103 Tanki Lender-2
30 Cas di Paloma-1	67 Ponton	104 Tarabana
31 Coashiati	68 Pos di Noord-1	105 Urataca
32 Cudawecha	69 Primavera	106 Wariruri
33 Daimari-1	70 Rincon-1	107 Wela
34 Daimari-2	71 Rincon-2	108 Westpunt
35 Daimari-3	72 Rincon-3	109 Yanana
36 Daimari-4	73 Rooi Cochi-1	
37 Dos Playa	74 Rooi Thomas	

APPENDIX Ib

Aruba's Archaeological Sites identified since 1990

Source: Angela *et al*., 2004

Site No./Name	Site No./Name
110 Arashi-4	145 Santo Largo
111 Banki Jerome-6	146 Sero Tres Cabes-2
112 Banki Jerome-7	147 Shaba
113 Barcadera-5	148 Urirama
114 Boca Catalina	149 Weg Sero Blanco
115 Boca Grandi (Alto Vista)	150 Zwart Mangel
116 Boca Grandi (Sint Nicolaas)	151 Arashi- 5
117 Boca Keto	152 Boca Cura-2
118 Sero Tres Cabes	153 Boca Cura-3
119 Bringamosa-2	154 Pos di Noord-3
120 Burunbunu	155 Gabilan
121 Calabas/Bona Vista	156 Puente-1
122 California	157 Puente-2
123 Cas di Paloma-2	158 Sero Yuwana
124 Eagle Beach	159 Sero Geel-2
125 Isla	160 Sero Geel-3
126 Manzania-6	161 Rooi Santo
127 Manzania-7	162 Siribana -3
128 Malmok-3	163 Baranca Corá
129 Malmok-4	164 Palm Beach-2
130 Matadera	165 Hadicurari-1
131 Papilon	166 Hadicurari-2 (H.I.)
132 Pos di Noord-2	167 Eagle Arend
133 Rooi Cochi-2	168 Sabaneta-8 (Maristella)
134 Rooi Mahawa	169 Pied'I Mulina
135 Rooi Master	170 Butucu
136 Sabaneta-2	171 Sabaneta-10 (S233-G)
137 Sabaneta-3	
138 Sabaneta-4	
139 Sabaneta-5	
140 Sabaneta-6	
141 Sabaneta-7	
142 Santa Cruz-2	
143 Santa Cruz-3	
144 Santa Cruz-4	

APPENDIX II

Radiocarbon Dates

Canashito[‡]					
Label #	**P.I.**	**Sample #**	**Conventional Radiocarbon Age (Years BP)**	**Ages Corrected for Marine Reservoir Effect (Years BP)**	**Material**
Ua-1501	Ringma	Skeleton no. C1	2210 ± 95	1960 ± 95	Collagen
?	Gould	?	1685 ± 115	Not done. Expected to be yield date circa 1300 BP.	Shell
?	Gould	?	1345 ± 120	Not done	Shell
?	Gould	?	815 ± 105	Not done	Shell
?	Conant	?	1150 ± 90	?	(human bone) ?
?	Conant	?	1120 ± 90	?	(human bone) ?

Malmok[§]				
Label #	**Feature # (Skeleton or Pit #)**	**Conventional Radiocarbon Age (Years BP)**	**Ages Corrected for Marine Reservoir Effect (Years BP)**	**Material**
GrN-16836	41	2430 ± 150	2000 ± 150	Shell
GrN-16837	35	2210 ± 90	1780 ± 90	Shell
GrN-16834	19	2070 ± 80	1640 ± 80	Shell
Ua-1341	59B	1740 ± 110	1430 ± 110	Collagen
Ua-1342	11B	1520 ± 100	1210 ± 100	Collagen
Ua-1340	21B	1520 ± 110	1210 ± 110	Collagen
Ua-1514	41	1420 ± 150	1110 ± 1110	Collagen
GrN-16838	Pit 1, midden	2370 ± 140	1940 ± 140	Shell

[‡] Data sources: Versteeg et al. 1990; Dijkhoff 2004.

[§] All Malmok dates provided by Versteeg *et al.* 1990. Conventional radiocarbon dates on shell material (found in immediate asssociation with burials) provided by Isotope Physics Laboratory in Groningen. AMS dates on collagen from dental elements provided by Ypsala Tandem Accelerator Laboratory (Sweden). Specimens were excavated in 1972 and 1989, by Principal Investigators Boerstra and Versteeg, respectively (Versteeg *et al.* 1990:32).

APPENDIX II (cont.)

Radiocarbon Dates

Tanki Flip**							
Label No.††	**Feature No.**	**Years BP**	**Sigma**	**Cal. 1 s.**	**Cal. 2 s.**	**Provenience**	**Association**
GrN-16915	TFH-197	825	30	1216-1268	1174-1277	Burial	Southern part of site
I-4025	Feature I	740	105	1202-1390	1040-1410	-	Southern part of site
I-4026	Feature II	765	105	1170-1390	1040-1400	-	Southern part of site
GrA-2788	222	1080	50	892-1016	828-1036	Ash hearth	Structure-3
GrN-21665	1762	1030	40	978-1030	894-1158	Stone hearth	Structure-10
GrN-21666	1874	1030	30	994-1024	968-1150	Stone hearth	Structure - 10 (-9?)
GrA-2789	484	990	50	1004-1158	970-1172	Stonehearth	Structure-6
GrN-21656	9	910	30	1042-1172	1038-1210	Pottery “kiln”	Outside settlement
GrA-2785	608	860	50	1060-1254	1040-1278	Posthole	Structure - 11
GrN-21664	1702A	860	40	1066-1250	1044-1275	Burial (child)	Overlap Feature 1762
GrA-2778	1265	830	50	1174-1272	1050-1287	Stone-hearth	Str-5
GrA-2784	426	750	50	1242-1294	1210-1388	Posthole	Str-4
GrA-2790	408	340	50	1490-1636	1455-1652	Posthole/pit	Str-4
GrN-21657	49i	23470	750	Not calibrated.		Posthole	

** Data sources: Versteeg 1997:110 and Dijkhoff 2004:Appendix B.

†† Source material is charcoal in each case.

APPENDIX II (cont.)

Radiocarbon Dates[‡‡]

Sabaneta			
Label #	**Feature #**	**Years BP**	**Material**
GrN-7338	94	940 (± 25)	Charcoal
GrN-7339	154	1040 (± 45)	Charcoal
GrN-7340	278	1000 (± 30)	Charcoal

Santa Cruz (Ser'i Noka, Ceru Noka)				
Label #	**Feature #**	**Years BP**	**Corrected Age BP**	**Material**
GrN-7341	1	3300 (± 35)	?	Charcoal
GrN-7342	8	990 (± 30)	?	Charcoal
GrN-17460	131	910 (± 170)	580 ± 170[§§]	Human bone
GrN-17459	135	870 (± 80)	540 ± 80[***]	Human bone

[‡‡] Data sources for Sabaneta and Santa Cruz dates: Versteeg *et al*. 1990:65 and Dijkhoff 2004:Appendix B.

[§§] According to G.J. van Klinken, the marine reservoir effect correction factor for this sample is 330 years (Versteeg et al 1990:65; Dijkhoff 2004:Appendix B).

[***] The preceding note applies also to this sample.

APPENDIX IIIa

Tanki Flip Shell Ornaments, 1994-1995 Excavation (data source: Serrand, 1997)

Table IIIa1. Beads.

Bead Type	n	Diameter (*d.*) range	Avg. *d.*	Thickness (*th.*) range	Avg. *th.*	Perforation Type
Disc	16	0.9–1.5 cm	1.2 cm	0.2–0.4 cm	0.3 cm	Conical
Ring	3	0.7–1.0 cm	0.9 cm	0.1–0.3 cm	0.2 cm	Conical or Biconical
Pearl	1	0.7 cm	0.7 cm	0.3 cm	0.3 cm	Biconical

Table IIIa2. Shell disc "blanks."

"Blank" Type	n	Thickness (*th.*) range	Avg. *d.*	Thickness (*th.*) range
Unshaped	46	1.1–2.5 cm	?	0.2–0.5 cm
Preform	23	1–2 cm	?	0.2–0.5 cm
Shaped artifact	91	0.9–0.2 cm (*sic*)	1.2 cm	0.1-0.8 cm

Table IIIa3. Finished Adornments.

Type	n	Length	Thickness
I – Quadrangular	2	1.5 cm	0.14 cm
II Polygonal/round	1	0.6 cm	0.2.5 cm (*sic*)

Table IIIa4. Unfinished Adornments

Type	n	Diameter	Thickness
Unshaped	4	1.5 –2 cm	0.5–0.6 cm
Preform	2	1.7 cm (avg.?)	0.4 cm (avg.?)
Shaped	3	0.9–1.3 cm	0.3 cm

APPENDIX IIIb

Burials recovered at Tanki Flip (1994-1995) (data source: Versteeg, 1997).

Burial Feature #	Data	Association	Date	Intrasite location	Shell Remains
836	Infant, only skull bones, lower part of jaw	under small, inverted urn, posthole in burial		center of excavation Area	8 shell fragments
1701B	Child 4-6 yrs. + teeth of adults (17-25 & 40+ yrs.)	below two nested urns, large inverted over small, 1701	1030 +/-	southwest near stone hearth 1762, Str. 10	1 perforated + 2 unperfor-ated shell discs
1702	lower + jaw Post-cranial skeleton of child ca. 8 yrs.; 15 teeth: deciduous (primary) and adult (secondary); shovel-shaped incisors, lower & upper	below upright urn 1702A		southwest near stone hearth 1762, Str. 10	2 unperforated shell discs, one inside and one outside of urn, + 4 shell fragments inside urn
1702A	Child + skull without lower jaw (of child in 1702)	Below large inverted urn 1702, Stone Hearth	860 +/- 40 BP	southwest near stone hearth 1762, Str. 10	2 unperforated shell discs
1822A	Secondary burial, MNI=7:: 5 adults, 2 children, none complete	south of 1702A stone hearth 1820 is southwest of 1822		southwest near stone hearth 1762, Str. 10	1 unperforated shell disc on top of male skull
2556	Male, 33-45 yrs.	posthole in burial		Southeast Str. 13	2 unperforated shell discs
2559	“just born” Infant	Under inverted urn, outer wall of Str. 13, near burial 2556		Southeast Str. 13	None recorded

APPENDIX IIIc
Tanki Flip 1994-1995 Excvation Data[i]

Table IIIc1. Features relatively abundant in whole *Strombus gigas* shells and/or "highly-modified" shell artifacts.

Feature	Sub	St. gigas		Complete		Frag.	RF	HMA	RF, HMA Fr	Total	Total
		n	w	n	w	n	n	n	w	n	w
9		0	0	0	0	0	0	4	4	4	4
15		3	370	8	120	65	21	0	400	97	890
63		0	0	1	1	662	59	3	749	725	750
77		3	140	0	0	39	31	3	329	76	469
82		6	246	0	0	104	72	0	757	182	1003
90		9	540	1	26	151	65	3	839	229	1405
91		4	120	1	1	89	62	1?	682	157	803
94		3	180	1	1	76	37	0	563	117	744
304		4	100	2	18	143	109	2	1496	260	1614
331		5	250	1	13	723	57	5	920	791	1183
1701	B	0	0	0	0	6	0	3	12	9	12
1745		2	85	1	1	117	22	6	310	148	396
1877		0	0	0	0	6	0	4	31	10	31
2191		5	70	2	1	975	183	3	2552	1168	2623

Table IIIc2. Shells remains in features relatively abundant in other faunal remains.

Feature	Sub	St. gigas		Complete		Frag.	RF	HMA	RF, HMA Fr	Total	Total
		n	w	n	w	n	n	n	w	n	w
63		0	0	1	1	662	59	3	749	725	750
69	H	1	20	0	0	1	2	0	17	4	37
222		0	0	0	0	38	19	1	170	58	170
336		0	0	0	0	188	1	1	20	190	20
495	A	0	0	0	0	12	15	0	198	27	198
752		1	36	1	1	52	22	0	320	76	357
996		0	0	0	0	10	12	0	70	22	70
1728		0	0	0	0	11	7	0	70	18	70
1796		1	80	1	1	57	47	0	633	106	714
3068					?	?	?	?	?		?

Table IIIc3. Faunal remains in selected features with "highly-modified" artifacts.

Feature	Sub	Verteb.	Mammals	Aves	Reptiles	Batrach.	Fish	Invertb.	Total
9		48			1		125		174
15		-							-
77			3						3
82		2					6		8
90		1	1				1		3
91		-							-
94		151	8	7	29		123		323
304		8					52		60
331		41	1	2	4		75	4	127
1701	B						4		4
1745		13				49			62
1877									-
2191		10					29		39

Table IIIc4. Features relatively abundant in faunal remains.

Feature	Sub	Verteb.	Mammals	Aves	Reptiles	Batrach.	Fish	Invertb.	Total
63		879	12	18	18	4	1055	30	2016
69	H	129	67	13			101	0	310
222		150		8	24		171	1	354
336		271	2	6	18		352	2	651
495	A	234	10	2	6		73		325
752		210	5	4	15		154	2	390
996		253	4	14	34	2	264		571
1728		187	3	11	11	2	285		499
1796		249	15	3	9		337	6	619
3068		988	20	22	33		1276	6	2345

[i] Modified after Reinink (1997, Table 3) and Grouard (1997, Table 5).

APPENDIX IIId
Tanki Flip 1994-1995 Excavation Data*

Table IIId1. Distribution of "highly-modified" shell types.

Feature	Sub	Area	HMA	Tools	Orn. description	"Beads"	"Blanks"	Oliva
9			4				4	
15			0					
77			3	2		1		
82			0					
90			3	1			2	
91			1?		½ round shape		1	
94			0					
304			2	1				1 complete medium
331			5?†		2 "preforms"		2	1 complete large
1701	B		3			1	2	
1745			6‡			1	1	
2191			3	1		2		

Table IIId2. "Highly-modified" shell artifacts in faunal-rich features.

Feature	Sub	Area	HMA	Tools	Ornaments	"Beads"	"Blanks"	Oliva
63			3	0	1- Y oval rect.	½	1	
69			0	0	0	0	0	0
222			1	0	½ preform			
336			1	0	Rectangular §b/cperforation, fractured	0	0	0
495			0	0	0	0	0	0
752			0	0	0	0	0	0
996			0	0	0	0	0	0
1728			0	0	0	0	0	0
1796	A		0	0	0	0	0	0
3068			0	0	0	0	0	0

* Data from Reinink (1997, Table 3), and working documents of Dacal andSerrand (n.d., AMA archives).
† This figure may be a typo. Serrand's database suggests that 3 HMA were found in this feature (AMA archives).
‡ Available data for this feature is incomplete.
§ Serrand's database suggests that this object may represent a small frog (AMA archives).

APPENDIX IV

1754 Sworn Statement of Those Wishing to Live in Aruba

(Hoyer 1945:7-8)

I, _____ do solemnly swear:

1. That in coming to Aruba, I will conduct myself as a loyal citizen, obedient in everything the Commander orders, and together with the other working residents of the Honorable Company, will assist in cleaning wells; that in no manner will I set up a business or sell anything or buy from foreigners; and if I know that others have done this, I will immediately advise the Commander and also if I have knowledge of anyone with malicious intent against the island; that I can neither transfer nor sell the land that has been conceded me under restrictions but must turn it over to my descendants so that after my death it shall revert to the Honorable Company.

2. That I may not rear animals without the consent of the Company.

3. That if I do not comply with everything herein stated in all its ramifications, the Commander has the right to take the land away from me without formality and to dispatch me from the island.

APPENDIX V

Chapter 6 Plates*

* Photographs courtesy of Reynold C. Kerr. (See also Linville 2004, 8.1-8.69).



Plate 1. *Spondylus ictericus* valve from Sabaneta.



Plate 2. *Spondylus ictericus* unperforated disc
(Modified after Linville 2004, Figure 8.2).



Plate 3. Fractured bead and chert artifacts from the Tanki Flip/Henriquez I site.



Plate 4. *Oliva* sp. beads.



Plate 5. Xenomorphic beads.



Plate 6. Microbeads.



Plate 7. Beads described as “annular,” “loop,” or “ring.”



Plate 8. Heishi beads with uniform perimeters.



Plate 9. Heishi beads from Santa Cruz.

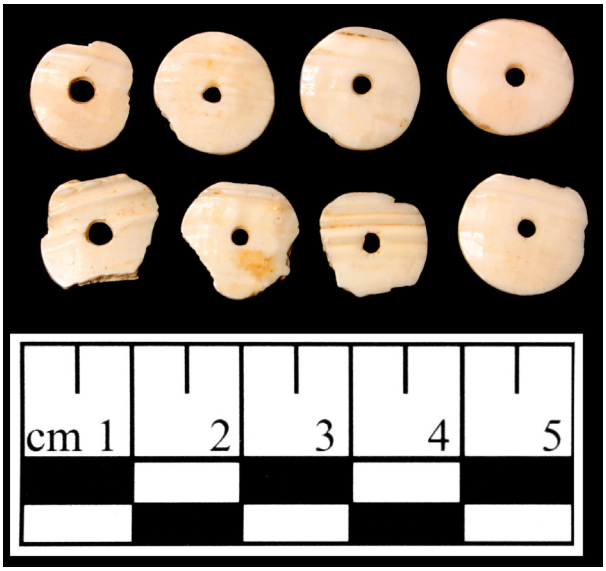
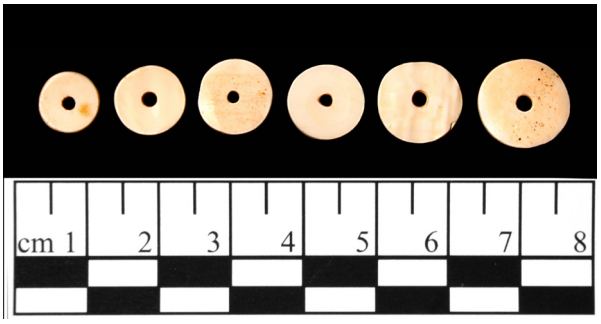


Plate 10. Beads from Budui made from the interior lip portion of Strombus shells.

Plate 11. Beads with uniform perimeters from Budui.



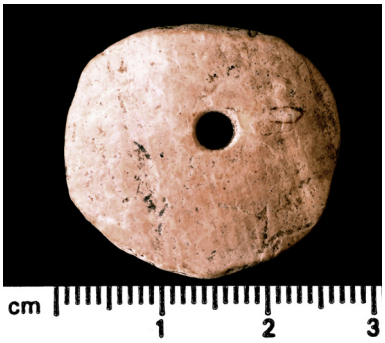


Plate 12. AMA notched disc "bead."



Plate 13. Notched disc "bead" from the Odor Collection.





Plate 14. Unperforated discs.



Plate 15. Shell discs exhibit variation in size, shape and reduction technique.



Plate 16. Discs with incomplete perforations.

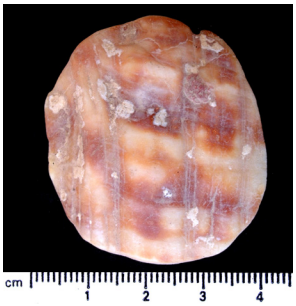


Plate 17. Medium disc made from the body whorl of a *Charonia variegata* shell.



Plate 18. *Strombus gigas* medium discs.



Plate 19. Large disc artifacts.



Plate 20. *Cyphoma gibbosum* automorphic adornment.



Plate 21. *Spondylus ictericus* unperforated xenomorphic adornment.



Plate 22. *Spondylus* sp. modified beach find.



Plate 23. Polygonal adornment with two Type 1 perforations.



Plate 24. Rectangular adornments with two Type 1 perforations.

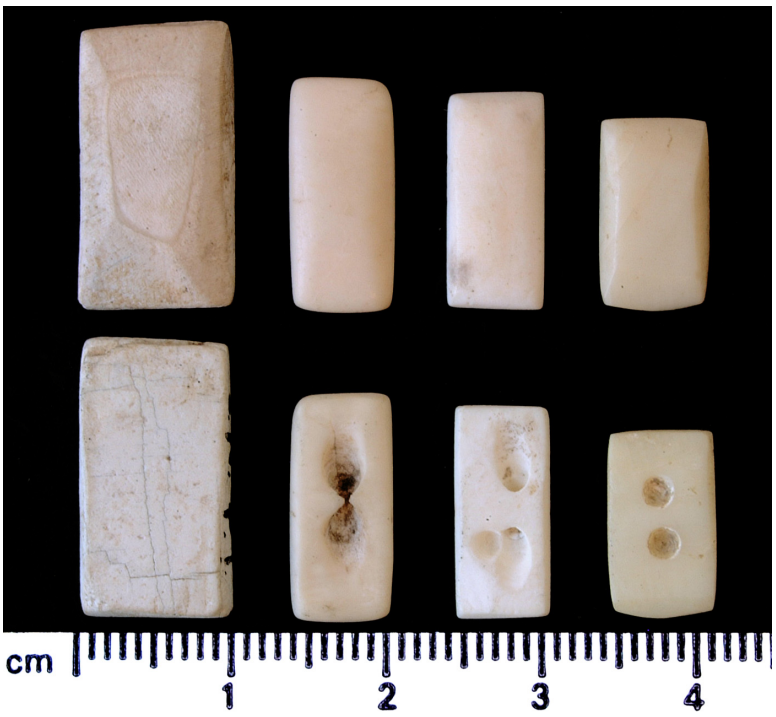


Plate 25. Rectangular adornments with Type 3 perforations.



Plate 26. Disc-shaped artifacts with Type 3 perforations.



Plate 27. Disc-shaped artifact with Type 3 perforations from Santa Cruz.

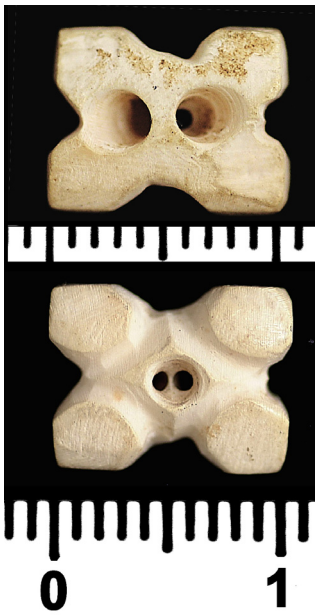


Plate 28. Unique adornment from Santa Cruz, with Type 4 perforations.

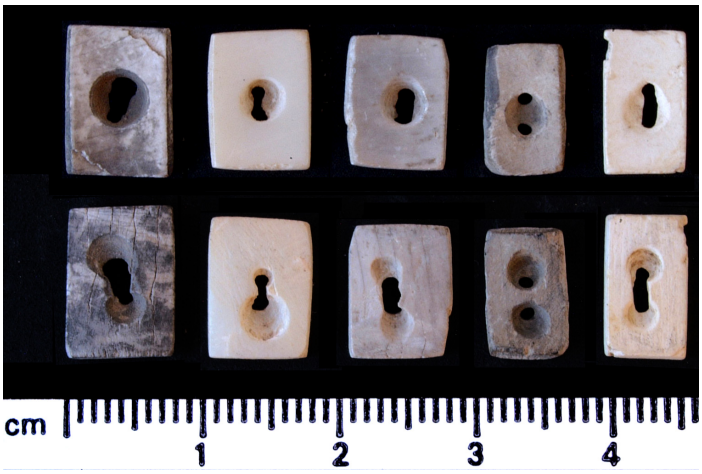


Plate 29. Rectangular adornments with Type 4 perforations.

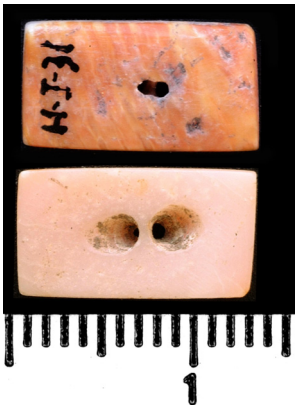


Plate 30. Rectangular adornment from the Tanki Flip/Henriquez I site with Type 4 (or Type 3) perforations.



Plate 31. Round adornments with Type 4 perforations.



Plate 32. *Oliva reticularis* pendants.

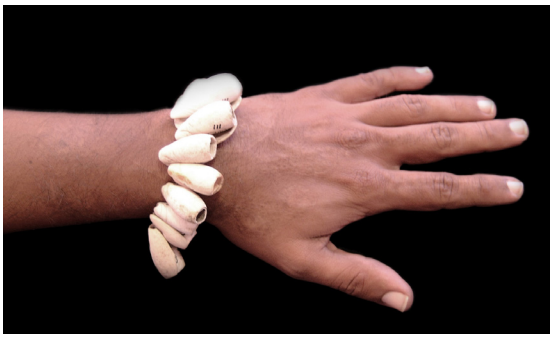


Plate 33. *Oliva reticularis* pendants worn around the wrist.



Plate 34. *Oliva reticularis* pendants worn around the ankles.



Plate 35. Unperforated "tinkler" preform.

Plate 36.
Conus sp. shell pendant (left) pictured with unperforated specimen recovered from Malmok beach.





Plate 37. *Tivela mactroides* automorphic pendants.

Plate 38. Staff pendant from the Santa Cruz site.





Plate 39. Large disc pendant from Sabaneta (the Bongers Collection).



Plate 40. Polygon-shaped pendants from Santa Cruz.



Plate 41. Elongated shell pendants from Sabaneta.



Plate 42. Elongated shell pendants as they may have been worn.



Plate 43. Oblong-shaped adornment from Santa Cruz.



Plate 44. Needle-shaped Type 2 “loop” pendant.



Plate 45. Anthropomorphic face pendant.



Plate 46.“Frog” pendant.



Plate 47. "Bat" pendant.

Plate 48. "Broad-winged" pectoral from Arashi.







Plate 49. "Broad-winged" pectoral fragment from Malmok.



Plate 50. "Broad-winged" pectoral fragment from Santa Cruz.

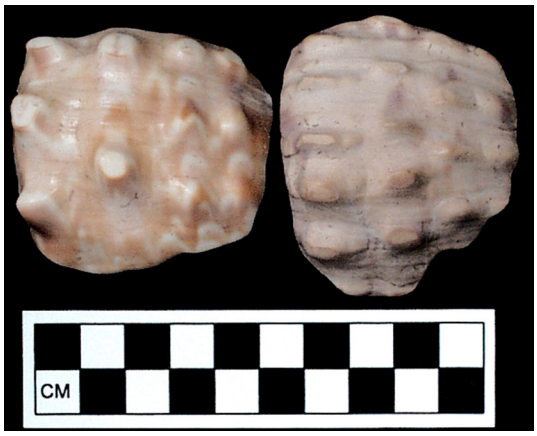


Plate 51. *Cassis* spp. shell vessels.



Plate 52. *Cassis* spp. shell vessels.



Plate 53. *Cassis* spp. shell artifact from Sabaneta.



Plate 54. *Melongena melongena* shell vesssels.

Plate 55. Oval forms made from the body whorl of *Tonna maculosa* shells.

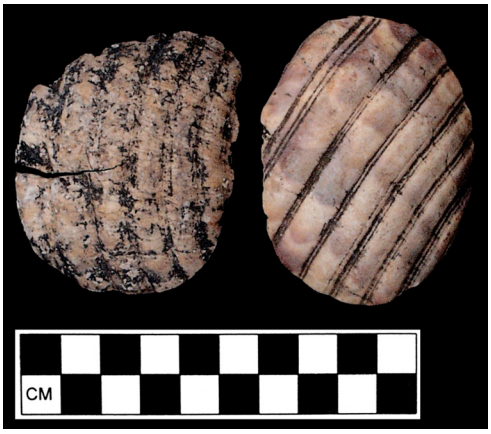


Plate 56. Oval forms from the interior lip portion of *Cassis* spp. shells.





Plate 57. Rectangular forms made from the body whorls of Strombus shells.





Plate 58. Unique square-shaped shell artifact.



Plate 59. Four relatively rough nodule/spine artifacts.



Plate 60. Incised nodule/spine artifact from Sabaneta (Bongers Collection).



Plate 61. Roughly conical nodule/spine artifacts.



Plate 62. Highly modified nodule/spine artifact from Tanki Lender.

Plate 63. Cylindrically-shaped, "peg" artifacts.



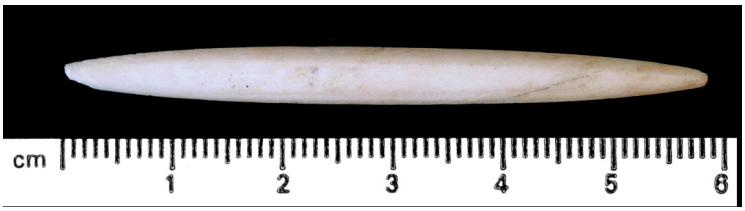


Plate 64. Highly modified bipoint shell artifact on display at the AMA.



Plate 65. Curvilinear polygon artifact made from the lip of a *Strombus gigas* shell.



Plate 66. Curvilinear polygon artifact from the Odor Collection.



Plate 67. Rectilinear polygon from the Santa Cruz site.



Plate 68. Unique bone-shaped object in the AMA collection.



Plate 69. Unique “maloca-shaped” object made from the spine of a Strombus shell.

APPENDIX VIa

Gastropod species modified by Amerindian Arubans of the Ceramic Period[i]

GASTROPODS				
Species	**Size (Adult)**	**Marine Habitat(s)**	**Feeding**	**Comments**
Cassis flammea	10–20 cm (4–8 in.)	Shallow water, on sandy bottom.	Carnivore.	Preys on sea urchins, sand dollars and star fish.
Cassis madagascariensis	10–30 cm (4–12 in.)	Deep water on sandy bottom.[ii]	Carnivore.	Preys on sea urchins, sand dollars and star fish.
Cassis tuberosa	18–30 cm (7–12 in.)	Shallow water, on seagrass, sand, or near coral.	Carnivore.	Preys on sea urchins, sand dollars and star fish.
Cypraecassis testiculus	4–10 cm (1.5–4 in.)	Moderately shallow (subtidal) water, sandy bottom.	Carnivore.	Burrows in sand **i**n calm waters (Sutty 1990).
Conus spp.	2.5–10 cm (1–4 in.)	Various: coral reefs, seagrass beds, mud, etc.	Carnivores. Shoot venomous teeth using harpoon-like radulae.	Most aggressive gastropods. Aperture narrow. Shells vary with habitat.
Melongena melongena	7.5–25 cm (3–10 in.)	Mangroves; intertidal mud.	Carnivore; smothers prey with slime.	Sexes separate; females lay strings of fan-shaped capsules (Sutty 1990).
Oliva reticularis	2.5–5 cm (1–2 in.)	Shallow water, sand burrowing.[iii]	Carnivore.	Aperture narrow. Fleshy foot. Mantle protects shiny shell.
Cyphoma gibbosum	2.5–4.5 cm (1–1.75 in.)	Coral reefs.	Parasitic. Feeds on sea fans & other sedentary animals.	Seriously depopulated (Sutty 1990).
Charonia variegata	26–45 cm (10–18 in.)	Shallow to deep water (adults); soft sand, mud.	Carnivore; secretes paralyzing acid.	Among the most aggressive of all mollusks (Sutty 1990).
Strombus costatus	10–23 cm (4–9 in.)	Shallow water.	Herbivore.	Thick lip, aperture glossy "milky" white.
Strombus gallus	10–20 cm (4–8 in.)	Moderately shallow water; sand offshore; eel grass beds.	Herbivore.	The least common of the Strombidae (Sutty 1990).
Strombus gigas	20-30 cm (8–12 in.)	Shallow water: marine meadows; sand inshore.	Herbivore.	Heavily fished. Biological pathology can result in shells to 36 cm (14 in.).
Strombus pugilis	7.5 –18 cm (3–7 in.)	Eel grass beds; sand; mud channel bottoms.	Herbivore.	Range of depths; migrates in summer (Sutty 1990).
Strombus raninus	10–13 cm (4–5 in.)	Shallow water, eel grass.	Herbivore.	Approx. 8 whorls, well-developed spire.
Tonna maculosa	7.5–18 cm (3–7 in.)	Under coral heads, to depths of 16 m.	Carnivore.	Animal is "midnight blue" (Sutty 1990).
Vasum muricatum[iv]	5–10 cm (2–4 in.)	Sandy bottoms; intertidal zone.	Carnivore.	Feeds on bivalves and worms.

APPENDIX VIb

Bivalve species modified by Amerindian Arubans of the Ceramic Period[v]

BIVALVES				
Species	**Size (Adult)**	**Marine Habitat**	**Feeding**	**Comments**
Trachycardium spp.	5–10 cm (2–4 in.)	Various: coral sands, eel grass, shallow reefs.	Filter feeds; short siphons.	Mobile, but generally burrows just below sand surface. *Trachycardium isocardia* found in colonies (Sutty 1990).
Codakia orbicularis[vi]	8 cm (3 in.)	Burrows in sand in moderately shallow waters.	Feeds on deposits.	Mobile. May be found in depths 2 – 60 m.
Nodipecten nodosus (formerly, *Lyropecten nodosus*)	8–18 cm (3–7 in.)	Offshore, below tide line: on mud, sand, rubble.	Filter feeds.	Mobile. Shells generally found as single valves cast ashore.
Pinctada imbricata (formerly, *Pinctada radiata*)	5–10 cm (2–4 in.)	Shallow water, below tide-line; attaches to rocks, reefs. Larger specimens in waters to 65 m.	Filter feeds.	Immobile, bysally attached. Edible, but not highly palatable (Sutty 1990).
Spondylus ictericus	5–8 cm (2–3 in.)	Attaches to rocks, reef cliffs, piers and debris on shallow sandy bottoms.	Filter feeds.	Immobile. Frequently found cemented to sunken ships. Shell color varies.
Tivela mactroides	2.5–5 cm (1–2 in.)	Inshore below tide line.	Filter feeds.	Mobile. Shells favored as pendants in prehistory.

[i] Modified after Boekhoudt & Linville 2004, Table 3.4.

[ii] In North America, it occupies shallow waters (Meinkoth 1997).

[iii] May be found at depths to 91 m (Meinkoth 1997).

[iv] *Vasum muricatum* was modified to produce shell tools (Dacal & Croes 2004). However, no non-tool artifacts made from the shell of this species have yet been identified on the island.

[v] Modified after Boekhoudt &Linville 2004, Table 3.5.

[vi] *Codakia orbicularis* was modified to produce shell tools (Dacal & Croes 2004). However, no non-tool artifacts made from the shell of this species have yet been identified on the island.

APPENDIX VIc

Molluscan species providing shell used and/or modified in the production of shell artifacts among prehistoric Aruban peoples.

Species	**Common Name**
Cassis flammea	Flame Helmet
Cassis madagascariensis	Emperor Helmet of Queen Helmet
Cassis tuberosa	King Helmet
Charonia variegate	Atlantic Triton
Conus spp.	Cones
Cyphoma gibbosum	Flamingo Tongue
Cypraecassis testiculus	Reticulated Cowrie-Helmet
Melongena melongena	Crown Conch
Oliva reticularis	Netted Olive
Strombus costatus	Milk Conch
Strombus gallus	Rooster-tail Conch
Strombus gigas	Queen Conch or Pink Conch
Strombus pugilis	West Indian Fighting Conch
Strombus raninus	Hawk-Wing Conch
Tonna maculosa	Atlantic Partridge Tun
Codakia orbicularis	Tiger Lucine
Nodipecten (Lyropecten) nodosus	Lion's Paw
Pinctada imbricata	Atlantic Pearl Oyster
Spondylus ictericus	Digitate Thorny Oyster
Tivela macroides	Trigonal Tivela
Tracycardium spp.	Cockle

APPENDIX VII

AMA O/S "Non-tool" Shell Artifact Data

Key to Appendix VII Data Tables*

A. Artifact Number — Artifact number based on AMA storage location.

B. Identification Number — Individual artifact number independent of AMA storage.

C. Museum Provenience — AMA storage location.

D. VR Site # — Site provenience recorded for artifact. Aruba site number according to the "Catalogue of the Archaeological sites of Aruba" published by Versteeg and Ruiz (1995).

2 = Arashi 1
3 = Arashi 2
21= Boton
24 = Budui
26 =Canastito
47 = Malmok
76 = Sabaneta
81= Santa Cruz
101= Tanki Flip
102= Tanki Lender

E. Field Provenience — Excavation provenience recorded (either on artifact or on artifact receptacle).
L/V = surface find

F. Excavation — Principal Investigator:

1. Boerstra
2. Heidecker & Siegel, ARC, Hunter College, CUNY
3. Versteeg

G. Artifact Label — Information recorded on artifact.

H. Collection Number — Artifact collection number (#1-11 provided by Ramón Dacal, February, 2001):

1. Boerstra
2. Hunter College (excavated)
3. Versteeg
4. Angela
5. Biemans
6. Bongers
7. Croes
8. Dania
9. Hunter College (other, where applicable)
10. Lester
11. Nooyen
12. Oduber
13. Hymering
14. Dacal & Croes
15. Dijkhoff
16. Linville
17. Haviser
18. H. Angela
19. Ruiz
20. H. Angela & F. Croes
21. AMA, unspecified

* n/a = not applicable or unavailable.

Data Tables Key, continued

I. Major (General) Type Category

1. Beads
2. Discs, Small Unperforated
3. Discs, Other
4. Pendants
5. Adornments
6. Geometric Forms (other than disc shaped)
7. Receptacles
8. Miscellaneous

J. Subgroup

0. Small Uperforated Disc
1. Automorphic Bead
2. Xenomorphic Bead
3. Large Unperforated Disc
4. Large Perforated Disc
5. Medium Unperforated Disc
6. Medium Perforated Disc
7. Automorphic Pendant
8. Automorhic Blank Pendant
9. Xenomorphic Pendant
10. Xenomorphic Pendant Fragment
11. Automorphic Adornment
12. Xenomorphic Adornment
13. Shaped Adornment Blank
14. Oval Geometric Form
15. Rectangular Geometric Form
16. Other Geometric Form
17. Vessel
18. Spoon
19. Modified Nodule/Spine
20. Peg-shaped Artifact
21. Bipoint
22. Sculptural Form

K. Hole 1/0

Perforation:

0. Absent
1. Present

L. Perforation Type

1. Conical
2. Bi-conical
3. V-shaped cross-section
4. Y-shaped cross-section
5. Straight sided

X x Y, where X = Perforation Type, Y = number of holes

? = incomplete
^ = Budui subtype
* = Only slightly biconical; profound conical whole

M. Shape

Approximate shape of artifact:

1. Automorphic, in whole or part
2. Round
3. Oval
4. Rectangular
5. Square
6. Polygonal
7. Trapezoidal
8. Other

(* = fragment, ~ approximation rough)

N. Variant

Formal/Technical variation:

1. Disc
2. Oliva
3. Loop
4. Budui
5. Nnotched
6. Micro
7. Heishi Technique
8. Notched
9. Elongated

Data Tables Key, continued

O. Notes Other observations:
-A/S = Apex/Spire removed
A/P = Abraded and/or Polished
B-O = Breaking Off
Ext. = Exterior
H= Hammering
Inc. = Incomplete
Int. = Interior (placement of primary perforation)
IW = Interior Whorl
Pa = Partial
Pf =Perforation
Peck = Pecking
Pol = Polished
Trans = Transversal Pecking Angle (Dacal, personal communication February, 2001)
Vert = Vertical Pecking Angle (Dacal, personal communication February, 2001)

P. L/ D (Max) Length or maximum diameter

Q. W/D (Min) Width or minimum diameter

R. Thk (Max) Maximum thickness

S. Thk (Min) Minimum thickness

T. Wt. (gm) Weight (when obtainable)

U. MC Molluscan Class:
1 = Gastropod
2 = Bivalve

V. Genus

0. Identified to class only
1. Cassis
2. Charonia
3. Conus
4. Cyphoma
5. Cypraecassis
6. Melongena
7. Oliva
8. Strombus
9. Tonna
10. Nodipecten
11. Pinctada
12. Spondylus
13. Tivela
14. Trachycardium

AMA SHELL ARTIFACT SUBSAMPLE DATA*

A	B	C	D	E	F	G	H
Art. #	**ID#**	**Prov #**	**VR Site #**	**Field Prov.**	**Excavation**	**Artifact Label**	**Coll. #**
169	928	169	3	L/V	n/a	n/a	16
73.15	434	73	21	n/a	n/a	n/a	11
73.1	420	73	21	n/a	n/a	n/a	11
73.2	421	73	21	n/a	n/a	n/a	11
73.3	422	73	21	n/a	n/a	n/a	11
73.4	423	73	21	n/a	n/a	n/a	11
73.5	424	73	21	n/a	n/a	n/a	11
73.6	425	73	21	n/a	n/a	n/a	11
73.7	426	73	21	n/a	n/a	n/a	11
73.8	427	73	21	n/a	n/a	n/a	11
73.9	428	73	21	n/a	n/a	n/a	11
73.10	429	73	21	n/a	n/a	n/a	11
73.11	430	73	21	n/a	n/a	n/a	11
73.12	431	73	21	n/a	n/a	n/a	11
73.13	432	73	21	n/a	n/a	n/a	11
73.14	433	73	21	n/a	n/a	n/a	11
73.16	435	73	21	n/a	n/a	n/a	11
73.17	436	73	21	n/a	n/a	n/a	11
73.18	437	73	21	n/a	n/a	n/a	11
73.19	438	73	21	n/a	n/a	n/a	11
73.20	439	73	21	n/a	n/a	n/a	11
73.21	440	73	21	n/a	n/a	n/a	11
73.22	441	73	21	n/a	n/a	n/a	11
73.23	442	73	21	n/a	n/a	n/a	11
73.24	443	73	21	n/a	n/a	n/a	11
73.25	444	73	21	n/a	n/a	n/a	11
152.1	753	152	24	n/a	3	Budui	3
152.2	754	152	24	n/a	3	Budui	3
152.3	755	152	24	n/a	3	Budui	3
152.4	756	152	24	n/a	3	Budui	3
152.5	757	152	24	n/a	3	Budui	3
152.6	758	152	24	n/a	3	Budui	3
152.7	759	152	24	n/a	3	Budui	3

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	I	J	K	L	M	N	O
ID#	**Major Cat.**	**Sub group**	**Hole 1/0**	**Perf. Type**	**Shape**	**Variant**	**Notes**
928	1	2	1	2*	2	1	deep cone
434	1	2	1	1	2	1	
420	1	2	1	2*	2	6	deep cone, int.
421	1	2	1	2	2	6	
422	1	2	1	2	2	1	
423	1	2	1	2	2	1	
424	1	2	1	2	2	1	
425	1	2	1	2	2	1	
426	1	2	1	2	2	1	
427	1	2	1	1	2	1	
428	1	2	1	1	2	1	
429	1	2	1	2	2	1	
430	1	2	1	1	2	1	
431	1	2	1	2	2	1	large hole, int.
432	1	2	1	2	2	1	
433	1	2	1	1	2	1	
435	1	2	1	2	2	1	
436	1	2	1	2	2	1	
437	1	2	1	2	2	1	
438	1	2	1	5	2	1	no cone
439	1	2	1	2	2	1	off center
440	1	2	1	2	2	1	fractured
441	1	2	1	2	2	1	large hole
442	1	2	1	2	2	1	large hole
443	1	2	1	2	2	1	small hole
444	1	2	1	2*	2	1	
753	1	2	1	2^	2	1	
754	1	2	1	2^	2	1	
755	1	2	1	2^	2	1	IW
756	1	2	1	2^	2	1	IW
757	1	2	1	1^,5	2	1	IW
758	1	2	1	2^	2	1	IW
759	1	2	1	2^	2	1	IW

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	P	Q	R	S	T	U	V
ID#	**L/D (Max)**	**W/D (Min)**	**Thk. (Max)**	**Thk. (Min)**	**Wt. (gm)**	**MC**	**Genus**
928	10.70	10.20	n/a	n/a	0.3	1	8
434	12.60	11.10	1.90	1.40	0.4	2	12
420	8.30	7.70	3.40	3.00	0.3	1	8
421	8.10	7.90	1.90	1.70	0.2	1	8
422	10.20	9.20	1.50	1.20	0.2	1	8
423	10.20	8.70	1.40	0.90	0.2	1	8
424	9.80	9.40	2.10	1.50	0.3	1	8
425	10.20	9.90	1.80	1.50	0.3	1	8
426	10.10	9.10	1.80	1.80	0.2	1	8
427	10.10	8.80	2.80	2.10	0.4	1	8
428	10.90	10.20	2.70	2.50	0.5	1	8
429	10.40	10.10	3.00	2.40	0.5	1	8
430	11.70	10.70	2.60	2.30	0.5	1	8
431	11.00	10.20	2.50	1.80	0.4	1	8
432	12.30	11.60	2.30	1.70	0.5	1	8
433	11.40	11.10	2.30	2.10	0.6	1	8
435	13.60	12.30	3.10	2.30	0.7	1	8
436	13.70	12.00	2.60	2.10	0.7	1	8
437	13.40	12.80	1.70	1.40	0.5	1	8
438	14.00	13.20	1.90	1.70	0.6	1	8
439	13.40	12.80	1.70	1.40	0.5	1	8
440	15.50	11.50	1.70	1.30	0.5	1	8
441	13.90	13.40	1.70	1.20	0.5	1	8
442	14.80	13.80	2.30	2.00	0.8	1	8
443	15.50	14.30	2.20	1.40	0.8	1	8
444	15.10	14.60	2.40	1.60	0.8	1	8
753	13.24	11.69	2.29	n/a	n/a	2	12
754	11.89	11.04	1.97	1.37	n/a	2	12
755	12.44	12.25	2.66	2.38	n/a	1	8
756	11.83	11.40	3.04	2.30	n/a	1	8
757	12.32	12.04	4.59	2.33	n/a	1	8
758	13.99	13.24	3.16	2.05	n/a	1	8
759	12.07	11.97	1.61	1.55	n/a	1	8

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

A	B	C	D	E	F	G	H
Art. #	**ID#**	**Prov #**	**VR Site #**	**Field Prov.**	**Excavation**	**Artifact Label**	**Coll. #**
152.8	760	152	24	n/a	3	Budui	3
152.9	761	152	24	n/a	3	Budui	3
152.10	762	152	24	n/a	3	Budui	3
152.11	763	152	24	n/a	3	Budui	3
152.12	764	152	24	n/a	3	Budui	3
152.13	765	152	24	n/a	3	Budui	3
152.14	766	152	24	n/a	3	Budui	3
152.15	767	152	24	n/a	3	Budui	3
152.16	768	152	24	n/a	3	Budui	3
152.17	769	152	24	n/a	3	Budui	3
152.18	770	152	24	n/a	3	Budui	3
152.19	771	152	24	n/a	3	Budui	3
152.20	772	152	24	n/a	3	Budui	3
152.21	773	152	24	n/a	3	Budui	3
152.22	774	152	24	n/a	3	Budui	3
152.23	775	152	24	n/a	3	Budui	3
152.24	776	152	24	n/a	3	Budui	3
152.25	777	152	24	n/a	3	Budui	3
152.26	778	152	24	n/a	3	Budui	3
152.27	779	152	24	n/a	3	Budui	3
152.28	780	152	24	n/a	3	Budui	3
152.29	781	152	24	n/a	3	Budui	3
152.30	782	152	24	n/a	3	Budui	3
152.31	783	152	24	n/a	3	Budui	3
152.32	784	152	24	n/a	3	Budui	3
152.33	785	152	24	n/a	3	Budui	3
152.34	786	152	24	n/a	3	Budui	3
152.35	787	152	24	n/a	3	Budui	3
152.36	788	152	24	n/a	3	Budui	3
152.37	789	152	24	n/a	3	Budui	3
152.38	790	152	24	n/a	3	Budui	3
152.39	791	152	24	n/a	3	Budui	3

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	I	J	K	L	M	N	O
ID#	**Major Cat.**	**Sub group**	**Hole 1/0**	**Perf. Type**	**Shape**	**Variant**	**Notes**
760	1	2	1	2^	2	1	IW
761	1	2	1	2^	2	1	IW
762	1	2	1	2^	2	1	IW
763	1	2	1	2^	2	1	IW
764	1	2	1	2^	2	1	IW
765	1	2	1	2^	2	1	IW
766	1	2	1	2^	2	1	IW
767	1	2	1	2^	2	1	IW
768	1	2	1	2^	2	1	IW
769	1	2	1	2^	2	1	IW
770	1	2	1	2^	2	1	IW
771	1	2	1	2^	2	1	IW
772	1	2	1	5	2?	1?	IW, hole (chipped), Frag.
773	1	2	1	2^	2	1	IW
774	1	2	1	2^	2	1	IW
775	1	2	1	2^	2	1	IW
776	1	2	1	2^	2	1	IW
777	1	2	1	2^	2	1	IW
778	1	2	1	2^	2	1	IW
779	1	2	1	2^	2	1	IW
780	1	2	1	2^	2	1	IW
781	1	2	1	2^	2	1	IW
782	1	2	1	2^	2	1	IW
783	1	2	1	2^	2	1	IW
784	1	2	1	2^1	2	1	odd conical hole, IW
785	1	2	1	2^	2	1	IW
786	1	2	1	2^	2	1	IW
787	1	2	1	2^	2	1	IW
788	1	2	1	2^	2	1	IW
789	1	2	1	2^	2	1	IW
790	1	2	1	2^	2	1	IW
791	1	2	1	2^	2	1	IW

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	P	Q	R	S	T	U	V
ID#	**L/D (Max)**	**W/D (Min)**	**Thk. (Max)**	**Thk. (Min)**	**Wt. (gm)**	**MC**	**Genus**
760	12.68	10.65	2.76	2.42	n/a	1	8
761	12.73	12.19	2.02	1.83	n/a	1	8
762	11.49	11.21	1.41	1.38	n/a	1	8
763	10.78	10.47	2.01	1.42	n/a	1	8
764	12.10	9.69	3.23	2.27	n/a	1	8
765	10.79	9.92	2.08	1.91	n/a	1	8
766	10.47	10.80	1.87	1.85	n/a	1	8
767	11.22	11.03	2.69	2.03	n/a	1	8
768	10.01	9.95	1.21	1.08	n/a	1	8
769	10.50	10.20	2.48	2.24	n/a	1	8
770	10.97	9.94	1.84	1.84	n/a	1	8
771	12.38	11.27	2.01	1.99	n/a	1	8
772	10.36	8.16	1.43	1.36	n/a	1	8
773	10.70	9.10	1.84	1.71	n/a	1	8
774	11.61	10.83	2.80	2.11	n/a	1	8
775	11.21	10.23	2.00	1.73	n/a	1	8
776	11.64	11.11	2.64	1.56	n/a	1	8
777	11.07	10.64	2.15	1.56	n/a	1	8
778	11.13	10.83	2.13	1.48	n/a	1	8
779	13.36	11.80	2.09	1.50	n/a	1	8
780	10.84	10.63	2.30	1.28	n/a	1	8
781	11.85	11.00	3.47	2.79	n/a	1	8
782	11.49	11.19	2.77	1.90	n/a	1	8
783	10.70	9.90	2.86	1.60	n/a	1	8
784	11.57	11.33	1.62	1.27	n/a	1	8
785	11.05	10.85	1.32	n/a	n/a	1	8
786	11.06	11.01	1.41	1.30	n/a	1	8
787	9.73	9.63	1.51	1.46	n/a	1	8
788	10.73	10.64	2.37	2.01	n/a	1	8
789	11.00	10.73	1.75	1.01	n/a	1	8
790	9.47	9.15	2.25	2.04	n/a	1	8
791	10.52	10.18	1.42	1.38	n/a	1	8

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

A	B	C	D	E	F	G	H
Art. #	**ID#**	**Prov #**	**VR Site #**	**Field Prov.**	**Excavation**	**Artifact Label**	**Coll. #**
152.40	792	152	24	n/a	3	Budui	3
152.41	793	152	24	n/a	3	Budui	3
152.42	794	152	24	n/a	3	Budui	3
152.43	795	152	24	n/a	3	Budui	3
152.44	796	152	24	n/a	3	Budui	3
152.45	797	152	24	n/a	3	Budui	3
152.46	798	152	24	n/a	3	Budui	3
152.47	799	152	24	n/a	3	Budui	3
152.48	800	152	24	n/a	3	Budui	3
152.49	801	152	24	n/a	3	Budui	3
152.50	802	152	24	n/a	3	Budui	3
152.51	803	152	24	n/a	3	Budui	3
152.52	804	152	24	n/a	3	Budui	3
152.53	805	152	24	n/a	3	Budui	3
74.1	445	74	24	n/a	3	31-7-91	3
74.2	446	74	24	n/a	3	31-7-91	3
218	1015	218	26	L/V	n/a	Survey-90	21
171	930	171	26	n/a	n/a	n/a	21
172	931	172	26	n/a	n/a	n/a	21
81	478	81	76	n/a	1	S.O.L.V.4.3.12	12
82.2	480	82	76	n/a	n/a	n/a	13
82.3	481	82	76	n/a	n/a	n/a	13
82.4	482	82	76	n/a	1	n/a	13
37	232	37	81	n/a	n/a	Col. A	4
38	233	38	81	n/a	n/a	Col. D	8
39	234	39	81	n/a	n/a	SN 115 A	4
40	235	40	81	n/a	n/a	No. 1 Col. A	4
41.1	236	41	81	n/a	n/a	Col. A 104	4
41.3	238	41	81	n/a	n/a	Col. A 104	4
42.9	248	42	81	n/a	n/a	Col. A	4
213.1	1005	213	81	n/a	n/a	S/N Dania	8

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	I	J	K	L	M	N	O
ID#	**Major Cat.**	**Sub group**	**Hole 1/0**	**Perf. Type**	**Shape**	**Variant**	**Notes**
792	1	2	1	2^5	2	1	IW, no cone
793	1	2	1	2^	2	1	IW
794	1	2	1	2^	2	1	inc hole, smoothed
795	1	2	1	2^	2	1	IW
796	1	2	1	2^	2	1	IW
797	1	2	1	2^	2	1	IW
798	1	2	1	2^	2	1	IW
799	1	2	1	2^	2	6	IW
800	1	2	1	2^	2	1	IW
801	1	2	1	2^	2	1	IW
802	1	2	1	2^	2	1	IW
803	1	2	1	2^	2	6	IW
804	1	2	1	2^	2	1	IW
805	1	2	1	2^	2	1	IW
445	1	2	1	5	2	1	IW
446	1	2	1	5	2	1	IW
1015	1	2	1	2*	2	1	
930	1	2	1	2	2	8	5 PaPf radiate around center
931	1	2	1	2	2	8	6 PaPf radiate around center
478	1	2	1	2*	2	1	deep cone
480	1	2	1	2?	2	1	INC
481	1	2	1	2	2	6	Micro
482	1	2	1	2	2	1	
232	1	1	1	n/a	1	2	-A/S
233	1	1	1	n/a	1	2	-A/S
234	1	1	1	n/a	1	2	-A/S
235	1	1	1	n/a	1	2	-A/S
236	1	1	1	n/a	1	2	-A/S
238	1	1	1	n/a	1	2	-A/S
248	1	1	1	n/a	1	2	-A/S
1005	1	1	1	n/a	1	2	-A/S

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n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	P	Q	R	S	T	U	V
ID#	**L/D (Max)**	**W/D (Min)**	**Thk. (Max)**	**Thk. (Min)**	**Wt. (gm)**	**MC**	**Genus**
792	10.35	9.73	1.41	1.34	n/a	1	8
793	10.26	10.09	2.61	2.46	n/a	1	8
794	9.84	9.05	4.15	2.14	n/a	1	8
795	10.83	10.19	2.26	1.23	n/a	1	8
796	10.71	10.17	1.89	1.57	n/a	1	8
797	8.86	8.32	2.54	2.41	n/a	1	8
798	9.65	9.48	2.40	2.05	n/a	1	8
799	8.33	8.15	1.93	1.71	n/a	1	8
800	9.02	8.97	2.33	2.18	n/a	1	8
801	8.98	8.49	1.46	1.11	n/a	1	8
802	10.93	10.47	1.55	1.27	n/a	1	8
803	8.41	8.29	2.63	1.89	n/a	1	8
804	8.62	8.46	1.19	1.13	n/a	1	8
805	12.20	11.96	1.69	1.62	n/a	1	8
445	11.48	11.34	1.59	n/a	0.3	1	8
446	10.54	n/a	2.23	n/a	0.4	1	8
1015	11.80	10.60	n/a	n/a	0.3	2	10
930	25.90	23.70	3.00	1.90	2.5	1	8
931	26.49	n/a	3.09	1.26	2.6	1	8
478	17.43	16.89	3.19	2.62	1.6	1	8
480	18.99	15.89	3.50	2.30	1.8	1	8
481	7.66	7.26	2.40	2.33	0.2	1	8
482	11.95	11.51	3.86	3.66	0.9	1	8
232	33.70	18.39	n/a	n/a	7.6	1	7
233	24.56	14.46	n/a	n/a	4.0	1	7
234	30.46	16.56	n/a	n/a	4.8	1	7
235	39.77	22.32	n/a	n/a	11.9	1	7
236	39.20	25.01	n/a	n/a	17.6	1	7
238	33.01	20.89	n/a	n/a	10.1	1	7
248	30.54	16.83	n/a	n/a	6.3	1	7
1005	29.70	16.30	n/a	n/a	0.5	1	7

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n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

A	B	C	D	E	F	G	H
Art. #	**ID#**	**Prov #**	**VR Site #**	**Field Prov.**	**Excavation**	**Artifact Label**	**Coll. #**
213.2	1006	213	81	n/a	n/a	S/N Dania	8
220	1017	220	81	n/a	n/a	n/a	8
157	887	157	81	F671 Pit 6	3	C/N F676 Put6 28/9/ ´92	8
11.1	15	11	81	L/V	n/a	Dania 155	8
11.2	16	11	81	L/V	n/a	Dania 155	8
11.3	17	11	81	L/V	n/a	Dania 155	8
11.4	18	11	81	L/V	n/a	Dania 155	8
11.5	19	11	81	L/V	n/a	Dania 155	8
17.1	45	17	81	n/a	n/a	Sta Cruz ClN. Hircan	n/a
17.2	46	17	81	n/a	n/a	Sta Cruz ClN. Hircan	n/a
17.3	47	17	81	n/a	n/a	Sta Cruz ClN. Hircan	n/a
18.1	48	18	81	L/V	n/a	n/a	8
32.1	221	32	81	n/a	n/a	n/a	8
33.2	224	33	81	n/a	n/a	81.3	3
72	419	72	81	L.V-P-1	n/a	n/a	8
83.2	484	83	81	n/a	n/a	losse vondslen maart. 73	4
122	544	122	81	n/a	3	SN. P4	3
127	549	127	81	n/a	n/a	Col. D 124	8
158	888	158	81	n/a	3	F 649 Put 6 24/9/ ´92	8
160.1	890	160	81	L/V	n/a	C/N Santa Cruz L.V. Dania	8
160.2	891	160	81	L/V	n/a	C/N Santa Cruz L.V. Dania	8

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n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	I	J	K	L	M	N	O
ID#	**Major Cat.**	**Sub group**	**Hole 1/0**	**Perf. Type**	**Shape**	**Variant**	**Notes**
1006	1	1	1	n/a	1	2	-A/S
1017	1	1	1	n/a	1	2	-A/S
887	1	2	1	2	2	6	Micro
15	1	2	1	2	2	6,7	Micro Heishi
16	1	2	1	2	2	6,7	Micro Heishi
17	1	2	1	2	2	6,7	Micro Heishi
18	1	2	1	2	2	6,7	Micro Heishi
19	1	2	1	2	2	6,7	Micro Heishi
45	1	2	1	2	2	6	Micro
46	1	2	1	2	2	6	Micro
47	1	2	1	2	2	6,7	Micro Heishi
48	1	2	1	2	2	6	Microinc
221	1	2	1	2	2	6	Micro
224	1	2	1	1	2	1	Conical, deep cone, fragment
419	1	2	1	2	2	6,7	Micro Heishi
484	1	2	1	2?	2	6	INC
544	1	2	1	2	2	1	Incised
549	1	2	1	2*	2	1	interior conical, exterior has inc. perforation
888	1	2	1	2	2	6	Micro, fractured
890	1	2	1	2	2	6	
891	1	2	1	1	2	1	Conical, deep cone

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n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	P	Q	R	S	T	U	V
ID#	**L/D (Max)**	**W/D (Min)**	**Thk. (Max)**	**Thk. (Min)**	**Wt. (gm)**	**MC**	**Genus**
1006	30.50	17.60	n/a	n/a	6.0	1	7
1017	31.80	15.50	15.30	n/a	3.6	1	7
887	5.37	5.37	n/a	n/a	0.0	2	12
15	7.40	7.10	2.50	2.34	0.2	1	8
16	5.97	5.97	3.16	3.09	0.2	1	8
17	5.58	5.44	1.90	1.83	0.1	1	8
18	5.42	5.42	2.55	2.29	0.1	1	8
19	4.64	4.64	1.96	1.70	0.1	1	8
45	7.48	7.15	1.86	1.60	0.2	1	8
46	7.17	6.90	1.96	1.77	0.1	1	8
47	5.66	5.59	3.12	2.99	0.2	1	8
48	8.27	6.99	2.52	2.47	0.2	1	8
221	2.40	2.40	1.14	1.00	0.0	1	8
224	19.75	*	5.22	3.92	1.9	1	8
419	7.06	6.98	2.55	2.52	0.2	1	8
484	7.54	7.21	2.04	1.88	0.2	1	8
544	21.03	21.00	10.75	8.52	8.3	1	8
549	24.98	23.68	n/a	n/a	3.0	1	8
888	4.38	4.38	n/a	n/a	0.0	1	8
890	6.04	n/a	n/a	n/a	n/a	1	8
891	15.42	14.70	4.06	3.90	1.4	1	8

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n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

A	B	C	D	E	F	G	H
Art. #	**ID#**	**Prov #**	**VR Site #**	**Field Prov.**	**Excavation**	**Artifact Label**	**Coll. #**
160.4	893	160	81	L/V	n/a	C/N Santa Cruz L.V. Dania	8
160.6	895	160	81	L/V	n/a	C/N Santa Cruz L.V. Dania	8
160.7	896	160	81	L/V	n/a	C/N Santa Cruz L.V. Dania	8
160.8	897	160	81	L/V	n/a	C/N Santa Cruz L.V. Dania	8
161.2	899	161	81	F167 P.3	3	n/a	8
161.3	900	161	81	F167 P.3	3	n/a	8
161.4	901	161	81	F167 P.3	3	n/a	8
161.5	902	161	81	F167 P.3	3	n/a	8
161.6	903	161	81	F167 P.3	3	n/a	8
162	904	162	81	F679	3	SCF .679	3
163.1	905	163	81	n/a	n/a	7/19/1992	8
163.2	906	163	81	Pit 4 F331c	3	Pit 4 F331C 7/19/92	8
163.3	907	163	81	Pit 4 F331c	3	Pit 4 F331C 7/19/92	8
163.6	910	163	81	Pit 4 F331c	3	Pit 4 F331C 7/19/92	8
165	913	165	81	Pit 2 F182	3	Put 2F182, I sikgeperf.schelp knoopje	8
166.2	915	166	81	F144	3	F144	8
216.2	1012	216	81	SC L/V	n/a	SC L/V	n/a
221.2	1019	221	81	L/V	n/a	C/N Dania	8
196.2	975	196	101	F408	1	n/a	1
195	973	195	101	F283	1	TF/H #283	1
198	978	198	101	F937	1	TF/H #937	1

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n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	I	J	K	L	M	N	O
ID#	**Major Cat.**	**Sub group**	**Hole 1/0**	**Perf. Type**	**Shape**	**Variant**	**Notes**
893	1	2	1	2?	2	1	INC
895	1	2	1	2	2	6	Micros, , off center
896	1	2	1	2	2	6,7	Micro Heishi
897	1	2	1	2	2	6,7	2 Micro Heishi
899	1	2	1	2	2	6	Micro
900	1	2	1	2	2	6	Micro-Small
901	1	2	1	2	2	6	Small
902	1	2	1	2	2	6	Small
903	1	2	1	5?	2	6	INC
904	1	2	1	2	2	6,7	Micro Heishi
905	1	2	1	2	2	6	Micro; fits on .84 wire
906	1	2	1	2	3	6	Micro
907	1	2	1	2	2	6	Micro
910	1	2	1	2*	2*	1	B/C-barely,deepCon
913	1	2	1	2	2	6	Micro
915	1	2	1	2	2	6,7	Micro Heishi <.1gm, fits on .84 wire
1012	1	2	1	2?	2	1	
1019	1	2	1	2	2	6	Micro
975	1	2	1	2		1	
973	1	1	1	n/a	1	2	-A/S
978	1	1	1	n/a	1	2	abraded, possible tinkler preform

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n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	P	Q	R	S	T	U	V
ID#	**L/D (Max)**	**W/D (Min)**	**Thk. (Max)**	**Thk. (Min)**	**Wt. (gm)**	**MC**	**Genus**
893	10.70	10.28	2.28	2.09	0.5	1	8
895	6.98	6.98	2.03	n/a	0.0	1	8
896	4.62	4.57	2.39	1.83	0.0	1	8
897	5.59	5.46	1.85	1.59	0.0	1	8
899	7.56	7.35	1.73	n/a	0.2	1	8
900	6.94	6.73	1.65	n/a	0.2	1	8
901	6.73	5.67	1.47	n/a	0.1	1	8
902	8.70	7.38	1.54	n/a	0.2	1	8
903	7.23	7.11	2.17	n/a	0.1	1	8
904	7.87	7.59	2.64	n/a	0.0	1	8
905	3.81	3.70	1.39	n/a	0.0	1	8
906	6.20	5.48	1.50	n/a	0.1	1	8
907	7.44	7.29	1.92	n/a	0.2	1	8
910	11.27	7.64	2.90	2.86	0.3	1	8
913	7.52	7.45	2.14	1.99	0.2	1	8
915	4.75	4.73	1.61	1.60	0.0	1	8
1012	13.20	12.80	n/a	n/a	0.8	1	8
1019	4.80	4.00	1.20	1.20	0.0	1	8
975	14.70	13.90	n/a	n/a	1.0	1	6
973	36.10	18.20	n/a	n/a	5.4	1	7
978	25.00	13.70	n/a	n/a	3.6	1	7

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AMA SHELL ARTIFACT SUBSAMPLE DATA*

A	B	C	D	E	F	G	H
Art. #	**ID#**	**Prov #**	**VR Site #**	**Field Prov.**	**Excavation**	**Artifact Label**	**Coll. #**
6	6	6	101	n/a	2	H-I-31; Ring No. 9	9
10.1	13	10	101	0-10 cm	2	H-I-25, bead no 15	9
10.2	14	10	101	L/V	2	H-I-3, outer wall, No 15	9
28.1	200	28	101	Center 17.5 cm	n/a	H-I-20	9
28.2	201	28	101	23,16, 18, 8.5	n/a	H-I-15	9
28.3	202	28	101	24-32, 44NE	n/a	H-I-29	9
28.4	203	28	101	16, 20, 12.5, 12.5 cm	n/a	H-I-16	9
28.5	204	28	101	31 cm	n/a	H-I-17	9
28.6	205	28	101	0-15 cm	n/a	H-I-28	9
28.7	206	28	101	5-15 cm	n/a	H-I-30	9
28.8	207	28	101	15-40 cm	n/a	H-I-31	9
71.1	414	71	101	5-15 cm	n/a	H-I-30	9
71.2	415	71	101	5-15 cm	n/a	H-I-30	9
71.3	416	71	101	5-15 cm	n/a	H-I-30	9
71.4	417	71	101	5-15 cm	n/a	H-I-30	9
71.5	418	71	101	0-13 cm	n/a	H-I-8	9
125	547	125	101	n/a	1	TF./H 854	1
170	929	170	101	L/V	n/a	n/a	17
176	935	176	101	822	1	TF/H#822	1
177	936	177	101	722	1	TF/H#722	1
178	937	178	101	1461	1	TF/H#1461	1
180	939	180	101	F979	1	TF/H#979	1
184.3	946	184	101	F964	1	n/a	1

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n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	I	J	K	L	M	N	O
ID#	**Major Cat.**	**Sub group**	**Hole 1/0**	**Perf. Type**	**Shape**	**Variant**	**Notes**
6	1	2	1	2	2	3	Annular, crack
13	1	2	1	2?	2	1	INC
14	1	2	1	2?	2	1	INC
200	1	2	1	1	2	1	Conical
201	1	2	1	1	2	1	Conical
202	1	2	1	1	2	1	Conical?
203	1	2	1	1	2	1	Conical?
204	1	2	1	2	2	1	B/C-barely,deep Cone
205	1	2	1	1	2	1	Conical?
206	1	2	1	1	2	1	Conical?, deep cone
207	1	2	1	1	2	1	Conical?
414	1	2	1	1	2	1	Conical, deep cone
415	1	2	1	1	2	1	Conical, deep cone
416	1	2	1	2	2	1	
417	1	2	1	1	2	1	Conical
418	1	2	1	2?	2	6?	Inc, smallest H-I, exterior preserved.
547	1	2	1	2	2	3	loop
929	1	2	1	1	2	1	Conical, deep cone
935	1	2	1	2*	2	1	B/C-barely,deepCon
936	1	2	1	1	2	1	Conical, deep cone
937	1	2	1	2	2	1	
939	1	2	1	2*	2*	1	Fragment
946	1	2	1	1	2	1	Conical, deep cone

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n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	P	Q	R	S	T	U	V
ID#	**L/D (Max)**	**W/D (Min)**	**Thk. (Max)**	**Thk. (Min)**	**Wt. (gm)**	**MC**	**Genus**
6	10.72	10.62	3.17	2.89	0.5	1	8
13	12.31	12.18	3.54	3.50	1.0	1	8
14	11.42	11.42	5.49	4.45	1.1	1	8
200	15.38	14.79	2.68	2.51	1.0	1	8
201	11.36	11.16	2.03	1.76	0.4	1	8
202	10.36	9.60	2.38	2.21	0.3	1	8
203	16.08	15.92	3.02	n/a	1.4	1	8
204	16.26	15.70	3.30	3.21	1.5	1	8
205	12.00	11.95	2.83	2.70	0.7	1	8
206	12.40	11.73	2.92	2.80	0.8	1	8
207	10.90	10.86	2.56	2.37	0.5	1	8
414	16.09	14.67	3.81	3.49	1.7	1	8
415	12.00	11.96	2.57	2.52	0.6	1	8
416	11.91	11.38	1.83	1.61	0.4	1	8
417	13.78	10.39	2.62	2.34	0.6	1	8
418	8.26	7.99	3.55	2.73	0.3	1	8
547	15.21	14.86	n/a	n/a	0.5	1	8
929	12.60	12.10	3.60	3.30	0.4	1	8
935	17.00	16.40	2.90	2.40	1.4	1	8
936	13.30	12.80	3.70	3.30	1.0	1	8
937	13.30	12.30	2.20	2.00	0.7	1	8
939	16.00	15.90	n/a	n/a	1.4	1	8
946	9.80	9.20	2.50	2.50	0.4	1	8

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AMA SHELL ARTIFACT SUBSAMPLE DATA*

A	B	C	D	E	F	G	H
Art. #	**ID#**	**Prov #**	**VR Site #**	**Field Prov.**	**Excavation**	**Artifact Label**	**Coll. #**
185.2	948	185	101	F985	1	TF/H #985	1
186.1	951	186	101	F1004	1	TF/H #186	1
186.2	952	186	101	F1004	1	TF/H #186	1
186.3	953	186	101	F1004	1	TF/H #186	1
186.4	954	186	101	F1004	1	TF/H #186	1
191	965	191	101	L/V	1	TF/H LV	1
192.1	966	192	101	F192	1	TF/H #192	1
196.3	976	196	101	F408	1	TF/H #408	1
199	979	199	101	F271	1	TF/H #271	1
202.1	983	202	101	F946	1	TF/H #946	1
202.2	984	202	101	F946	1	TF/H #946	1
202.3	985	202	101	F946	1	TF/H #946	1
207.2	996	207	101	F427	1	TF/H #427	1
227	1032	227	26	n/a	n/a	n/a	21
15.1	38	15	76	n/a	n/a	76.LV	21
15.6	43	15	76	n/a	1	S.O.L.V.	12
26.43	173	26	76	n/a	n/a	XXX	13
89.1	493	89	76	1 t/m3	n/a	76	13
89.2	494	89	76	1 t/m3	n/a	76	13
89.3	495	89	76	1 t/m3	n/a	76	13
15.5	42	15	81	n/a	n/a	SN P.1	n/a
18.2	49	18	81	L/V	n/a	n/a	8
27.22	197	27	81	n/a	n/a	No.132	8
84.1	485	84	81	L/V	n/a	C/N Dania /L.V. v 17st Oct. 96	8
84.2	486	84	81	n/a	n/a	C/N Dania /L.V. v 17st Oct. 96	8
212.2	1004	212	81	C/N LOV 1.3.5	n/a	C/N L.O.V.1.3.5	8
87	491	87	81	F-92	n/a	n/a	8

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	I	J	K	L	M	N	O
ID#	**Major Cat.**	**Sub group**	**Hole 1/0**	**Perf. Type**	**Shape**	**Variant**	**Notes**
948	1	2	1	1	2	1	Conical, deep cone
951	1	2	1	2*	2	1	deep cone
952	1	2	1	2*	2	1	deep cone
953	1	2	1	2*	2	1	deep cone
954	1	2	1	2*	2	1	deep cone
965	1	2	1	1?	2	1	Conical INC, assoc. with chert
966	1	2	1	1	2	1	Conical, deep cone
976	1	2	1	1	2	1	Conical, deep cone
979	1	2	1	1	2	1	Off-center Conical Int.perf. Int. whorl juvenile
983	1	2	1	2*	2	1	B/C-barely,deepCon
984	1	2	1	2*	2	1	B/C-barely,deepCon
985	1	2	1	1	2	1	Conical, deep cone
996	1	2	1	2*	2	1	B/C-barely,deepCon
1032	2	0	0	n/a	2	6	
38	2	0	0	n/a	2	1	
43	2	0	0	n/a	2	1	Pol, int.
173	2	0	0	n/a	2	1	PeckPol
493	2	0	0	n/a	2	1	
494	2	0	0	n/a	2	1	
495	2	0	0	n/a	2	1	
42	2	0	0	n/a	2	1	
49	2	0	0	n/a	2	6	10YR7/3
197	2	0	0	n/a	2	1	
485	2	0	0	n/a	2	1	
486	2	0	0	n/a	2	1	
1004	2	0	0	n/a	3	1	
491	2	0	0	n/a	2	1	

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	P	Q	R	S	T	U	V
ID#	**L/D (Max)**	**W/D (Min)**	**Thk. (Max)**	**Thk. (Min)**	**Wt. (gm)**	**MC**	**Genus**
948	11.40	10.90	3.20	2.90	0.6	1	8
951	13.80	13.20	2.30	1.90	0.6	1	8
952	14.50	14.30	3.40	3.40	1.1	1	8
953	15.40	14.10	n/a	n/a	1.4	1	8
954	15.20	15.10	2.50	2.40	1.0	1	8
965	22.80	22.10	4.50	3.50	3.6	1	8
966	13.40	13.20	3.60	2.70	1.0	1	8
976	13.90	13.30	3.50	2.00	0.7	1	8
979	12.10	11.80	2.20	1.80	0.6	1	8
983	15.00	14.90	3.20	3.00	1.3	1	8
984	16.20	15.60	3.10	2.20	1.3	1	8
985	16.10	n/a	n/a	n/a	0.6	1	8
996	9.60	9.20	2.60	2.50	0.3	1	8
1032	7.10	6.50	3.10	3.10	0.3	1	8
38	14.83	14.01	5.00	3.78	1.8	1	8
43	8.69	8.53	3.22	2.80	0.4	1	8
173	12.50	12.30	3.50	2.70	*	1	8
493	12.50	12.20	4.65	3.96	1.2	1	8
494	11.74	11.15	2.11	1.66	0.4	1	8
495	10.26	9.88	1.42	1.21	0.3	1	8
42	11.10	10.42	2.96	2.90	0.6	2	12
49	7.17	7.15	2.33	2.20	0.2	2	12
197	11.42	11.02	3.65	3.14	0.8	2	12
485	11.78	10.91	4.48	4.18	1.0	2	12
486	18.42	17.73	3.38	2.34	1.8	2	12
1004	12.70	12.60	3.40	2.20	0.7	2	12
491	11.73	11.51	3.59	3.52	0.9	1	8

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

A	B	C	D	E	F	G	H
Art. #	**ID#**	**Prov #**	**VR Site #**	**Field Prov.**	**Excavation**	**Artifact Label**	**Coll. #**
15.2	39	15	81	n/a	3	8L3	3
15.3	40	15	81	n/a	3	8L.3	3
15.4	41	15	81	n/a	3	81.3	3
27.2	177	27	81	n/a	n/a	No.132	8
27.3	178	27	81	n/a	n/a	No.132	8
27.4	179	27	81	n/a	n/a	No.132	8
27.5	180	27	81	n/a	n/a	No.132	8
27.6	181	27	81	n/a	n/a	No.132	8
27.7	182	27	81	n/a	n/a	No.132	8
27.8	183	27	81	n/a	n/a	No.132	8
27.9	184	27	81	n/a	n/a	No.132	8
27.10	185	27	81	n/a	n/a	No.132	8
27.11	186	27	81	n/a	n/a	No.132	8
27.12	187	27	81	n/a	n/a	No.132	8
27.13	188	27	81	n/a	n/a	No.132	8
27.14	189	27	81	n/a	n/a	No.132	8
27.15	190	27	81	n/a	n/a	No.132	8
27.16	191	27	81	n/a	n/a	No.132	8
27.17	192	27	81	n/a	n/a	No.132	8
27.18	193	27	81	n/a	n/a	No.132	8
27.19	194	27	81	n/a	n/a	No.132	8
27.20	195	27	81	n/a	n/a	No.132	8
27.21	196	27	81	n/a	n/a	No.132	8
27.23	198	27	81	n/a	n/a	No.132	8
27.24	199	27	81	n/a	n/a	No.132	8
65.1	312	65	81	n/a	n/a	n/a	4
65.2	313	65	81	n/a	n/a	n/a	4
65.3	314	65	81	n/a	n/a	n/a	4
65.4	315	65	81	n/a	n/a	n/a	4
65.5	316	65	81	n/a	n/a	n/a	4
65.6	317	65	81	n/a	n/a	n/a	4
65.7	318	65	81	n/a	n/a	n/a	4
65.8	319	65	81	n/a	n/a	n/a	4

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	I	J	K	L	M	N	O
ID#	**Major Cat.**	**Sub group**	**Hole 1/0**	**Perf. Type**	**Shape**	**Variant**	**Notes**
39	2	0	0	n/a	2	1	
40	2	0	0	n/a	2	1	
41	2	0	0	n/a	2	1	
177	2	0	0	n/a	2	1	
178	2	0	0	n/a	2	1	
179	2	0	0	n/a	2	1	
180	2	0	0	n/a	2	1	
181	2	0	0	n/a	2	1	
182	2	0	0	n/a	2	1	
183	2	0	0	n/a	2	1	
184	2	0	0	n/a	2	1	
185	2	0	0	n/a	2	1	
186	2	0	0	n/a	2	1	
187	2	0	0	n/a	2	1	
188	2	0	0	n/a	2	1	
189	2	0	0	n/a	5	1	
190	2	0	0	n/a	2	1	
191	2	0	0	n/a	2	1	
192	2	0	0	n/a	2	1	
193	2	0	0	n/a	2	1	
194	2	0	0	n/a	2	1	
195	2	0	0	n/a	2	1	
196	2	0	0	n/a	2	1	
198	2	0	0	n/a	2	6	
199	2	0	0	n/a	2	6	
312	2	0	0	n/a	2	1	
313	2	0	0	n/a	2	1	
314	2	0	0	n/a	2	1	
315	2	0	0	n/a	2	1	
316	2	0	0	n/a	2	1	
317	2	0	0	n/a	2	1	
318	2	0	0	n/a	2	1	
319	2	0	0	n/a	2	1	

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	P	Q	R	S	T	U	V
ID#	**L/D (Max)**	**W/D (Min)**	**Thk. (Max)**	**Thk. (Min)**	**Wt. (gm)**	**MC**	**Genus**
39	14.65	14.14	2.85	2.70	1.2	1	8
40	12.00	11.90	4.34	3.88	0.9	1	8
41	11.91	10.52	4.32	2.79	1.1	1	8
177	15.18	14.93	15.21	4.32	n/a	1	8
178	14.47	13.92	5.26	3.31	n/a	1	8
179	14.23	13.81	4.47	3.37	n/a	1	8
180	13.45	13.36	4.91	4.42	n/a	1	8
181	13.69	13.19	4.45	3.94	n/a	1	8
182	13.55	13.29	4.23	3.62	n/a	1	8
183	12.87	12.65	3.80	3.36	n/a	1	8
184	12.80	12.30	4.13	3.62	n/a	1	8
185	12.22	11.74	4.38	4.31	n/a	1	8
186	11.96	11.03	3.40	3.32	n/a	1	8
187	17.11	15.90	2.97	2.46	n/a	1	8
188	11.52	10.96	3.08	2.61	n/a	1	8
189	12.80	12.09	2.62	1.84	n/a	1	8
190	11.77	10.99	4.28	3.89	n/a	1	8
191	11.01	10.48	1.78	1.19	n/a	1	8
192	11.54	11.43	2.69	2.18	n/a	1	8
193	11.92	11.21	4.34	3.43	n/a	1	8
194	12.14	11.81	1.79	1.61	n/a	1	8
195	9.77	9.68	3.08	2.94	0.5	1	8
196	10.49	10.08	5.83	4.64	n/a	1	8
198	7.59	7.34	2.51	2.39	n/a	1	8
199	6.61	6.54	2.30	2.00	n/a	1	8
312	24.90	22.00	3.30	2.60	n/a	1	8
313	22.90	20.10	4.80	2.10	n/a	1	8
314	21.70	21.20	4.60	2.50	n/a	1	8
315	20.90	20.20	7.40	7.00	n/a	1	8
316	20.40	19.30	2.80	2.50	n/a	1	8
317	19.60	18.80	2.80	2.10	n/a	1	8
318	19.60	18.70	5.40	4.10	n/a	1	8
319	19.10	17.00	2.30	1.90	n/a	1	8

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

A	B	C	D	E	F	G	H
Art. #	**ID#**	**Prov #**	**VR Site #**	**Field Prov.**	**Excavation**	**Artifact Label**	**Coll. #**
65.9	320	65	81	n/a	n/a	n/a	4
65.10	321	65	81	n/a	n/a	n/a	4
65.11	322	65	81	n/a	n/a	n/a	4
65.12	323	65	81	n/a	n/a	n/a	4
65.13	324	65	81	n/a	n/a	n/a	4
65.14	325	65	81	n/a	n/a	n/a	4
65.15	326	65	81	n/a	n/a	n/a	4
65.16	327	65	81	n/a	n/a	n/a	4
65.17	328	65	81	n/a	n/a	n/a	4
65.18	329	65	81	n/a	n/a	n/a	4
65.19	330	65	81	n/a	n/a	n/a	4
65.20	331	65	81	n/a	n/a	n/a	4
65.21	332	65	81	n/a	n/a	n/a	4
65.22	333	65	81	n/a	n/a	n/a	4
65.23	334	65	81	n/a	n/a	n/a	4
65.24	335	65	81	n/a	n/a	n/a	4
65.25	336	65	81	n/a	n/a	n/a	4
65.26	337	65	81	n/a	n/a	n/a	4
65.27	338	65	81	n/a	n/a	n/a	4
65.28	339	65	81	n/a	n/a	n/a	4
65.29	340	65	81	n/a	n/a	n/a	4
65.30	341	65	81	n/a	n/a	n/a	4
65.31	342	65	81	n/a	n/a	n/a	4
65.32	343	65	81	n/a	n/a	n/a	4
65.33	344	65	81	n/a	n/a	n/a	4
65.34	345	65	81	n/a	n/a	n/a	4
65.35	346	65	81	n/a	n/a	n/a	4
65.36	347	65	81	n/a	n/a	n/a	4
65.37	348	65	81	n/a	n/a	n/a	4
65.38	349	65	81	n/a	n/a	n/a	4
65.39	350	65	81	n/a	n/a	n/a	4
65.40	351	65	81	n/a	n/a	n/a	4
65.41	352	65	81	n/a	n/a	n/a	4

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	I	J	K	L	M	N	O
ID#	**Major Cat.**	**Sub group**	**Hole 1/0**	**Perf. Type**	**Shape**	**Variant**	**Notes**
320	2	0	0	n/a	2	1	
321	2	0	0	n/a	2	1	
322	2	0	0	n/a	2	1	
323	2	0	0	n/a	2	1	
324	2	0	0	n/a	2	1	
325	2	0	0	n/a	2	1	
326	2	0	0	n/a	2	1	
327	2	0	0	n/a	2	1	
328	2	0	0	n/a	2	1	
329	2	0	0	n/a	2	1	
330	2	0	0	n/a	2	1	
331	2	0	0	n/a	2	1	
332	2	0	0	n/a	2	1	
333	2	0	0	n/a	2	1	
334	2	0	0	n/a	2	1	
335	2	0	0	n/a	2	1	
336	2	0	0	n/a	2	1	
337	2	0	0	n/a	2	1	
338	2	0	0	n/a	2	1	
339	2	0	0	n/a	2	1	
340	2	0	0	n/a	2	1	
341	2	0	0	n/a	2	1	
342	2	0	0	n/a	2	1	
343	2	0	0	n/a	2	1	
344	2	0	0	n/a	2	1	
345	2	0	0	n/a	2	1	
346	2	0	0	n/a	2	1	
347	2	0	0	n/a	2	1	
348	2	0	0	n/a	2	1	
349	2	0	0	n/a	2	1	
350	2	0	0	n/a	2	1	
351	2	0	0	n/a	2	1	
352	2	0	0	n/a	2	1	

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	P	Q	R	S	T	U	V
ID#	**L/D (Max)**	**W/D (Min)**	**Thk. (Max)**	**Thk. (Min)**	**Wt. (gm)**	**MC**	**Genus**
320	19.20	18.50	4.60	3.10	n/a	1	8
321	17.90	16.20	3.80	3.50	n/a	1	8
322	17.60	15.90	4.40	3.60	n/a	1	8
323	17.60	17.10	1.80	1.10	n/a	1	8
324	18.00	16.60	4.50	3.70	n/a	1	8
325	18.60	16.80	2.30	2.00	n/a	1	8
326	17.20	16.60	3.70	0.80	n/a	1	8
327	14.90	14.40	3.50	1.70	n/a	1	8
328	16.80	15.70	2.20	1.60	n/a	1	8
329	18.90	17.50	5.30	2.80	n/a	1	8
330	17.00	16.30	3.20	2.60	n/a	1	8
331	18.40	16.70	5.20	2.40	n/a	1	8
332	17.10	16.80	3.90	3.20	n/a	1	8
333	16.80	15.90	3.70	2.30	n/a	1	8
334	15.70	15.60	2.10	2.10	n/a	1	8
335	15.80	15.20	4.20	3.80	n/a	1	8
336	16.90	12.30	2.40	1.30	n/a	1	8
337	13.20	12.90	1.40	1.20	n/a	1	8
338	14.80	13.60	3.50	2.10	n/a	1	8
339	15.40	14.90	2.70	2.50	n/a	1	8
340	17.10	16.00	3.30	3.10	n/a	1	8
341	16.90	14.20	2.40	1.80	n/a	1	8
342	15.60	14.60	2.80	1.20	n/a	1	8
343	20.10	17.90	3.40	1.60	n/a	1	8
344	18.80	17.60	3.90	3.20	n/a	1	8
345	15.80	14.80	3.10	2.60	n/a	1	8
346	16.00	16.00	2.00	1.30	n/a	1	8
347	14.70	13.70	2.60	2.50	n/a	1	8
348	14.50	14.20	1.30	1.10	n/a	1	8
349	13.70	12.70	3.00	2.40	n/a	1	8
350	15.40	14.80	1.90	1.60	n/a	1	8
351	12.80	12.10	4.50	3.50	n/a	1	8
352	14.10	13.40	2.10	1.80	n/a	1	8

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

A	B	C	D	E	F	G	H
Art. #	**ID#**	**Prov #**	**VR Site #**	**Field Prov.**	**Excavation**	**Artifact Label**	**Coll. #**
65.42	353	65	81	n/a	n/a	n/a	4
65.43	354	65	81	n/a	n/a	n/a	4
65.44	355	65	81	n/a	n/a	n/a	4
65.45	356	65	81	n/a	n/a	n/a	4
65.46	357	65	81	n/a	n/a	n/a	4
65.47	358	65	81	n/a	n/a	n/a	4
65.48	359	65	81	n/a	n/a	n/a	4
65.49	360	65	81	n/a	n/a	n/a	4
65.50	361	65	81	n/a	n/a	n/a	4
65.51	362	65	81	n/a	n/a	n/a	4
65.52	363	65	81	n/a	n/a	n/a	4
65.53	364	65	81	n/a	n/a	n/a	4
65.54	365	65	81	n/a	n/a	n/a	4
65.55	366	65	81	n/a	n/a	n/a	4
65.56	367	65	81	n/a	n/a	n/a	4
65.57	368	65	81	n/a	n/a	n/a	4
65.58	369	65	81	n/a	n/a	n/a	4
65.59	370	65	81	n/a	n/a	n/a	4
65.60	371	65	81	n/a	n/a	n/a	4
65.61	372	65	81	n/a	n/a	n/a	4
75.1	447	75	81	L/V	n/a	L.V.-P-1 tot 4 1.2.6	8
75.2	448	75	81	L/V	n/a	L.V.-P-1 tot 4 1.2.6	8
75.3	449	75	81	L/V	n/a	L.V.-P-1 tot 4 1.2.6	8
75.4	450	75	81	L/V	n/a	L.V.-P-1 tot 4 1.2.6	8
75.5	451	75	81	L/V	n/a	L.V.-P-1 tot 4 1.2.6	8
78.1	460	78	81	L/V	n/a	L.V.-3-4	8
78.2	461	78	81	L/V	n/a	L.V.-3-4	8
78.3	462	78	81	L/V	n/a	L.V.-3-4	8

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	I	J	K	L	M	N	O
ID#	**Major Cat.**	**Sub group**	**Hole 1/0**	**Perf. Type**	**Shape**	**Variant**	**Notes**
353	2	0	0	n/a	2	1	
354	2	0	0	n/a	2	1	
355	2	0	0	n/a	2	1	
356	2	0	0	n/a	2	1	
357	2	0	0	n/a	2	1	
358	2	0	0	n/a	2	1	
359	2	0	0	n/a	2	1	
360	2	0	0	n/a	2	1	
361	2	0	0	n/a	2	1	
362	2	0	0	n/a	2	1	
363	2	0	0	n/a	2	1	
364	2	0	0	n/a	2	1	
365	2	0	0	n/a	2	1	
366	2	0	0	n/a	2	1	
367	2	0	0	n/a	2	1	
368	2	0	0	n/a	2	1	
369	2	0	0	n/a	2	1	
370	2	0	0	n/a	2	6	
371	2	0	0	n/a	2	6	
372	2	0	0	n/a	2	6	
447	2	0	0	n/a	2	1	
448	2	0	0	n/a	2	1	
449	2	0	0	n/a	2	1-6	
450	2	0	0	n/a	2	1	
451	2	0	0	n/a	2	6	
460	2	0	0	n/a	2	1	
461	2	0	0	n/a	2	1	
462	2	0	0	n/a	2	1	

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	P	Q	R	S	T	U	V
ID#	**L/D (Max)**	**W/D (Min)**	**Thk. (Max)**	**Thk. (Min)**	**Wt. (gm)**	**MC**	**Genus**
353	13.30	12.10	3.60	3.10	n/a	1	8
354	14.30	13.90	1.20	1.00	n/a	1	8
355	13.20	13.10	3.20	2.90	n/a	1	8
356	12.50	12.20	2.20	1.70	n/a	1	8
357	11.50	9.60	4.70	2.40	n/a	1	8
358	12.00	11.50	2.60	2.00	n/a	1	8
359	10.50	9.90	2.20	2.10	n/a	1	8
360	10.50	10.30	4.30	3.00	n/a	1	8
361	10.50	10.30	2.60	2.30	n/a	1	8
362	10.70	9.90	2.30	2.30	n/a	1	8
363	10.30	9.90	2.90	2.70	n/a	1	8
364	10.00	9.80	2.10	1.70	n/a	1	8
365	9.90	9.20	3.50	2.40	n/a	1	8
366	9.60	9.30	2.50	2.30	n/a	1	8
367	9.80	9.20	2.20	1.00	n/a	1	8
368	10.00	9.00	3.10	2.90	n/a	1	8
369	8.60	8.40	2.40	2.10	n/a	1	8
370	8.40	8.30	1.50	1.30	n/a	1	8
371	7.60	7.60	3.40	3.00	n/a	1	8
372	7.80	7.30	3.40	3.20	n/a	1	8
447	12.30	n/a	5.20	n/a	1.5	1	8
448	11.84	n/a	4.20	2.15	0.7	1	8
449	8.56	n/a	3.09	n/a	0.4	1	8
450	8.66	n/a	1.91	n/a	0.2	1	8
451	6.68	n/a	2.79	n/a	0.3	1	8
460	16.58	15.22	4.68	3.47	2.1	1	8
461	14.02	n/a	3.53	n/a	1.3	1	8
462	15.39	13.47	4.08	3.29	1.5	1	8

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

A	B	C	D	E	F	G	H
Art. #	**ID#**	**Prov #**	**VR Site #**	**Field Prov.**	**Excavation**	**Artifact Label**	**Coll. #**
83.1	483	83	81	n/a	n/a	losse vondslen maart. 73	4
85	488	85	81	F87 P-E	n/a	C/N F87 SCP-2 9/2/91	n/a
88	492	88	81	Pit-2-F-160	n/a	Put-2-F-160	8
160.3	892	160	81	L/V	n/a	*	8
163.4	908	163	81	Pit 4 F331c	3	Pit 4 F331C 7/19/92	8
163.5	909	163	81	Pit 4 F331c	3	Pit 4 F331C 7/19/92	8
166.1	914	166	81	F144	3	F144	8
216.1	1011	216	81	SC L/V	n/a	SC L/V	n/a
185.1	947	185	101	F985	1	TF/H #985	1
184.2	945	184	101	F964	1	n/a	1
185.3	949	185	101	F985	1	TF/H #985	1
185.4	950	185	101	F985	1	TF/H #985	1
187	955	187	101	F46	1	TF/H #46	1
188.1	956	188	101	F192	1	n/a	1
190.1	959	190	101	L/V	1	TF/H 19Nov98 L/V Angela Croes	n/a
190.2	960	190	101	L/V	1	TF/H 19Nov98 L/V Angela Croes	n/a
190.3	961	190	101	L/V	1	TF/H 19Nov98 L/V Angela Croes	n/a
190.4	962	190	101	L/V	1	TF/H 19Nov98 L/V Angela Croes	n/a

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	I	J	K	L	M	N	O
ID#	**Major Cat.**	**Sub group**	**Hole 1/0**	**Perf. Type**	**Shape**	**Variant**	**Notes**
483	2	0	0	n/a	2	1	
488	2	0	0	n/a	2	6	smooth ext. rough perimeter
492	2	0	0	n/a	2	1	
892	2	0	0	n/a	2	1	
908	2	0	0	n/a	2	6	Micro
909	2	0	0	n/a	2	1	Strombus sp.
914	2	0	0	n/a	2	6	rough border, striations, abrasions
1011	2	0	0	n/a	2	1	small
947	2	0	0	n/a	3	1	Spondylus, Found?
945	2	0	0	n/a	2	1	thick, blue
949	2	0	0	n/a	2	1	
950	2	0	0	n/a	2	1	
955	2	0	0	n/a	2	1	Body whorl
956	2	0	0	n/a	2	1	
959	2	0	0	n/a	2	1	
960	2	0	0	n/a	2	1	
961	2	0	0	n/a	2	1	
962	2	0	0	n/a	2	1	

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	P	Q	R	S	T	U	V
ID#	**L/D (Max)**	**W/D (Min)**	**Thk. (Max)**	**Thk. (Min)**	**Wt. (gm)**	**MC**	**Genus**
483	8.56	8.34	1.97	1.90	0.5	1	8
488	6.62	6.57	2.07	n/a	0.2	1	8
492	9.78	9.68	3.39	2.00	0.4	1	8
892	11.21	10.51	2.88	2.30	0.6	1	8
908	7.81	7.38	2.37	2.12	0.2	1	8
909	12.87	11.97	2.15	1.90	0.6	1	8
914	7.70	7.56	2.84	2.34	0.3	1	8
1011	9.40	9.10	2.80	2.60	0.4	1	8
947	19.10	14.10	n/a	n/a	1.6	2	12
945	16.70	15.70	n/a	n/a	3.3	1	8
949	12.40	12.00	2.00	1.80	0.6	1	8
950	10.20	10.00	3.90	2.70	0.6	1	8
955	16.30	16.00	5.70	4.60	2.3	1	8
956	19.40	17.80	2.10	1.30	1.1	1	8
959	18.00	16.60	4.80	3.60	2.3	1	8
960	16.40	15.90	5.00	2.90	1.9	1	8
961	11.00	10.70	4.40	4.00	0.9	1	8
962	10.70	10.50	1.80	1.70	0.4	1	8

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

A	B	C	D	E	F	G	H
Art. #	**ID#**	**Prov #**	**VR Site #**	**Field Prov.**	**Excavation**	**Artifact Label**	**Coll. #**
190.6	963	190	101	L/V	1	TF/H 19Nov98 L/V Angela Croes	n/a
192.2	967	192	101	F192	1	TF/H #192	1
192.3	968	192	101	F192	1	TF/H #192	1
193.2	970	193	101	F33	1	*	1
204.2	988	204	101	F419	1	TF/H #419	1
204.3	989	204	101	F419	1	TF/H #419	1
207.1	995	207	101	F427	1	n/a	1
210	1001	210	101	F12	1	n/a	1
22.2	54	22	101	0-13 cm	2	H-I-8	9
22.3	55	22	101	0-13 cm	2	H-I-8	9
22.4	56	22	101	0-13 cm	2	H-I-8	9
22.5	57	22	101	Surface	2	H-I-12	9
22.6	58	22	101	31cm	2	H-I-17	9
22.7	59	22	101	31cm	2	H-I-17	9
22.8	60	22	101	30, 21, 16, 19 cm	2	H-I-19	9
22.9	61	22	101	30, 21, 16, 19 cm	2	H-I-19	9
22.10	62	22	101	30, 21, 16, 19 cm	2	H-I-19	9
22.11	63	22	101	30, 21, 16, 19 cm	2	H-I-19	9
22.12	64	22	101	North Wall	2	H-I-21	9
22.13	65	22	101	'0-10 cm	2	H-I-25	9
22.14	66	22	101	'0-10 cm	2	H-I-25	9
22.15	67	22	101	'0-10 cm	2	H-I-25	9
22.16	68	22	101	'0-10 cm	2	H-I-25	9
22.17	69	22	101	0-15 cm	2	H-I-28	9
22.18	70	22	101	0-15 cm	2	H-I-28	9
22.19	71	22	101	0-15 cm	2	H-I-28	9

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	I	J	K	L	M	N	O
ID#	**Major Cat.**	**Sub group**	**Hole 1/0**	**Perf. Type**	**Shape**	**Variant**	**Notes**
963	2	0	0	n/a	2	1	
967	2	0	0	n/a	2	1	
968	2	0	0	n/a	2	1	
970	2	0	0	n/a	2	1	
988	2	0	0	n/a	2	1	
989	2	0	0	n/a	2	1	
995	2	0	0	n/a	2	1	
1001	2	0	0	n/a	2	1	
54	2	0	0	n/a	2	1	Trans
55	2	0	0	n/a	2	1	Trans
56	2	0	0	n/a	2	1	Trans
57	2	0	0	n/a	2	1	Trans
58	2	0	0	n/a	2	1	Trans
59	2	0	0	n/a	2	1	Trans
60	2	0	0	n/a	2	1	Trans
61	2	0	0	n/a	2	1	Trans
62	2	0	0	n/a	2	1	Trans
63	2	0	0	n/a	2	1	Trans
64	2	0	0	n/a	2	1	Trans
65	2	0	0	n/a	2	1	Trans
66	2	0	0	n/a	2	1	Trans
67	2	0	0	n/a	2	1	Trans
68	2	0	0	n/a	2	1	Trans
69	2	0	0	n/a	2	1	Trans
70	2	0	0	n/a	2	1	Trans
71	2	0	0	n/a	2	1	Trans

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	P	Q	R	S	T	U	V
ID#	**L/D (Max)**	**W/D (Min)**	**Thk. (Max)**	**Thk. (Min)**	**Wt. (gm)**	**MC**	**Genus**
963	9.90	9.50	2.30	1.90	0.4	1	8
967	15.70	13.70	5.40	4.60	2.0	1	8
968	21.00	18.70	4.40	4.30	3.2	1	8
970	12.40	11.90	3.30	2.80	0.9	1	8
988	20.30	18.80	3.90	2.80	2.6	1	8
989	17.10	16.40	3.80	3.10	1.9	1	8
995	19.70	18.60	3.40	3.30	1.8	1	8
1001	20.00	19.20	2.10	1.00	1.3	1	8
54	17.07	n/a	3.26	n/a	n/a	1	8
55	15.81	n/a	3.23	n/a	n/a	1	8
56	12.00	n/a	1.80	n/a	n/a	1	8
57	20.38	20.17	2.32	1.94	n/a	1	8
58	19.43	18.93	2.72	1.30	n/a	1	8
59	17.90	17.02	1.89	1.37	n/a	1	8
60	21.15	19.20	7.96	7.80	6.0	1	8
61	18.13	17.30	2.46	2.20	n/a	1	8
62	17.74	16.35	1.76	1.16	n/a	1	8
63	16.57	15.31	2.32	2.23	n/a	1	8
64	11.18	10.48	3.31	2.95	n/a	1	8
65	21.28	20.46	3.23	2.06	n/a	1	8
66	14.50	13.14	2.79	2.42	n/a	1	8
67	11.64	10.71	2.21	2.00	n/a	1	8
68	9.75	8.90	2.51	1.97	n/a	1	8
69	13.13	12.15	2.74	2.43	n/a	1	8
70	10.51	9.76	4.79	4.23	n/a	1	8
71	10.17	9.78	2.12	1.53	0.3	1	8

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

A	B	C	D	E	F	G	H
Art. #	**ID#**	**Prov #**	**VR Site #**	**Field Prov.**	**Excavation**	**Artifact Label**	**Coll. #**
22.20	72	22	101	5-15 cm	2	H-I-30	9
22.21	73	22	101	15-40 cm	2	H-I-31	9
22.22	74	22	101	15-40 cm	2	H-I-31	9
22.23	75	22	101	15-40 cm	2	H-I-31	9
22.24	76	22	101	15-40 cm	2	H-I-31	9
22.25	77	22	101	15-40 cm	2	H-I-31	9
22.26	78	22	101	15-40 cm	2	H-I-31	9
22.27	79	22	101	15-40 cm	2	H-I-31	9
22.28	80	22	101	15-40 cm	2	H-I-31	9
22.29	81	22	101	15-40 cm	2	H-I-31	9
22.30	82	22	101	15-40 cm	2	H-I-31	9
22.31	83	22	101	15-40 cm	2	H-I-31	9
22.32	84	22	101	15-40 cm	2	H-I-31	9
22.33	85	22	101	15-40 cm	2	H-I-31	9
22.34	86	22	101	15-40 cm	2	H-I-31	9
22.35	87	22	101	15-40 cm	2	H-I-31	9
22.36	88	22	101	15-40 cm	2	H-I-31	9
22.37	89	22	101	15-40 cm	2	H-I-31	9
22.38	90	22	101	15-40 cm	2	H-I-31	9
22.39	91	22	101	15-40 cm	2	H-I-31	9
22.40	92	22	101	15-40 cm	2	H-I-31	9
22.41	93	22	101	15-40 cm	2	H-I-31	9
23.1	94	23	101	13-30, 21,16,19 cm	2	H-I-11	9
23.2	95	23	101	13-30, 21,16,19 cm	2	H-I-11	9
23.3	96	23	101	16, 20, 12.5, 12.5 cm	2	H-I-16	9
23.4	97	23	101	Center 17.5 cm	2	H-I-20	9

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	I	J	K	L	M	N	O
ID#	**Major Cat.**	**Sub group**	**Hole 1/0**	**Perf. Type**	**Shape**	**Variant**	**Notes**
72	2	0	0	n/a	2	1	Trans
73	2	0	0	n/a	2	1	Trans
74	2	0	0	n/a	2	1	Trans
75	2	0	0	n/a	2	1	Trans
76	2	0	0	n/a	2	1	Trans
77	2	0	0	n/a	2	1	Trans
78	2	0	0	n/a	2	1	Trans
79	2	0	0	n/a	2	1	Trans
80	2	0	0	n/a	2	1	Trans
81	2	0	0	n/a	2	1	Trans
82	2	0	0	n/a	2	1	Trans
83	2	0	0	n/a	2	1	Trans
84	2	0	0	n/a	2	1	Trans
85	2	0	0	n/a	2	1	Trans
86	2	0	0	n/a	2	1	Trans
87	2	0	0	n/a	2	1	Trans
88	2	0	0	n/a	2	1	Trans
89	2	0	0	n/a	2	1	Trans
90	2	0	0	n/a	2	1	Trans
91	2	0	0	n/a	2	1	Trans
92	2	0	0	n/a	2	1	Trans
93	2	0	0	n/a	2	1	Trans
94	2	0	0	n/a	2	1	Vert
95	2	0	0	n/a	2	1	Vert
96	2	0	0	n/a	2	1	Vert
97	2	0	0	n/a	2	1	very thin, smooth, vert

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	P	Q	R	S	T	U	V
ID#	**L/D (Max)**	**W/D (Min)**	**Thk. (Max)**	**Thk. (Min)**	**Wt. (gm)**	**MC**	**Genus**
72	9.85	9.50	3.43	2.58	n/a	1	8
73	17.59	17.01	5.74	3.92	n/a	1	8
74	15.90	15.55	5.71	4.96	n/a	1	8
75	17.64	16.62	8.25	5.11	n/a	1	8
76	18.71	17.81	5.94	5.17	n/a	1	8
77	18.89	18.46	2.80	2.70	n/a	1	8
78	16.90	16.46	3.05	2.28	n/a	1	8
79	17.87	16.40	3.33	2.75	n/a	1	8
80	10.71	10.26	2.49	2.42	n/a	1	8
81	10.51	10.09	2.61	2.50	n/a	1	8
82	11.42	9.92	2.37	1.72	n/a	1	8
83	10.26	9.79	3.13	2.40	n/a	1	8
84	10.64	10.07	3.09	2.85	n/a	1	8
85	12.91	12.57	3.27	2.47	n/a	1	8
86	12.67	12.40	2.70	2.59	n/a	1	8
87	12.87	12.43	3.47	3.26	n/a	1	8
88	13.03	12.35	3.21	3.05	n/a	1	8
89	11.62	10.86	1.72	1.42	n/a	1	8
90	10.90	10.42	4.16	3.06	n/a	1	8
91	10.69	10.50	2.94	2.33	n/a	1	8
92	10.88	10.55	2.72	2.27	n/a	1	8
93	9.83	9.33	2.52	2.24	n/a	1	8
94	16.39	13.69	2.27	2.13	1.0	1	8
95	19.30	18.81	2.27	1.92	1.4	1	8
96	24.18	21.57	3.83	3.70	n/a	1	8
97	13.37	12.77	1.42	1.28	0.4	1	8

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

A	B	C	D	E	F	G	H
Art. #	**ID#**	**Prov #**	**VR Site #**	**Field Prov.**	**Excavation**	**Artifact Label**	**Coll. #**
23.5	98	23	101	0-10 cm	2	H-I-25	9
23.6	99	23	101	0-10 cm	2	H-I-25	9
23.7	100	23	101	0-15 cm	2	H-I-28	9
23.8	101	23	101	5-15 cm	2	H-I-30	9
23.9	102	23	101	5-15 cm	2	H-I-30	9
23.10	103	23	101	15-40 cm	2	H-I-31	9
23.11	104	23	101	15-40 cm	2	H-I-31	9
23.12	105	23	101	15-40 cm	2	H-I-31	9
23.13	106	23	101	15-40 cm	2	H-I-31	9
23.14	107	23	101	15-40 cm	2	H-I-31	9
23.15	108	23	101	15-40 cm	2	H-I-31	9
23.16	109	23	101	15-40 cm	2	H-I-31	9
23.17	110	23	101	15-40 cm	2	H-I-31	9
23.18	111	23	101	15-40 cm	2	H-I-31	9
23.19	112	23	101	15-40 cm	2	H-I-31	9
24.1	113	24	101	0-15 cm	2	H-I-5	9
24.2	114	24	101	30, 21, 16, 19	2	H-I-19	9
24.3	115	24	101	0-10 cm	2	H-I-25	9
24.5	116	24	101	5-15 cm	2	H-I-30	9
24.6	117	24	101	15-40 cm	2	H-I-31	9
24.7	118	24	101	15-40 cm	2	H-I-31	9
24.8	119	24	101	15-40 cm	2	H-I-31	9
25.1	120	25	101	0-13 cm	2	H-I-8	9
25.2	121	25	101	31 cm	2	H-I-17	9
25.3	122	25	101	Disturbed Soil	2	H-I-14	9
25.4	123	25	101	30, 21, 16, 19 cm	2	H-I-19	9
25.5	124	25	101	Center 17.5 cm	2	H-I-20	9
25.6	125	25	101	Center 17.5 cm	2	H-I-20	9

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	I	J	K	L	M	N	O
ID#	**Major Cat.**	**Sub group**	**Hole 1/0**	**Perf. Type**	**Shape**	**Variant**	**Notes**
98	2	0	0	n/a	2	1	Vert
99	2	0	0	n/a	2	1	Vert
100	2	0	0	n/a	2	1	Vert
101	2	0	0	n/a	2	1	Vert
102	2	0	0	n/a	2	1	Vert
103	2	0	0	n/a	2	1	Vert
104	2	0	0	n/a	2	1	Vert
105	2	0	0	n/a	2	1	Vert
106	2	0	0	n/a	2	1	Vert
107	2	0	0	n/a	2	1	Vert
108	2	0	0	n/a	2	1	Vert
109	2	0	0	n/a	2	1	Vert
110	2	0	0	n/a	2	1	Vert
111	2	0	0	n/a	2	1	Vert
112	2	0	0	n/a	2	1	Vert
113	2	0	0	n/a	2	1	Vert
114	2	0	0	n/a	2	1	Vert
115	2	0	0	n/a	2	1	Vert
116	2	0	0	n/a	2	1	Vert
117	2	0	0	n/a	2	1	Vert
118	2	0	0	n/a	2	1	Vert
119	2	0	0	n/a	2	1	Vert
120	2	0	0	n/a	2	1	Trans
121	2	0	0	n/a	2	1	Trans
122	2	0	0	n/a	2	1	Trans
123	2	0	0	n/a	2	1	Trans
124	2	0	0	n/a	2	1	Trans
125	2	0	0	n/a	2	1	Trans

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	P	Q	R	S	T	U	V
ID#	**L/D (Max)**	**W/D (Min)**	**Thk. (Max)**	**Thk. (Min)**	**Wt. (gm)**	**MC**	**Genus**
98	14.50	12.87	4.06	3.17	1.5	1	8
99	11.86	11.57	1.86	1.34	0.4	1	8
100	13.59	12.20	2.14	1.78	0.6	1	8
101	12.80	12.15	2.97	2.65	0.9	1	8
102	11.93	11.09	2.71	2.34	0.7	1	8
103	22.19	19.93	4.84	3.43	3.6	1	8
104	15.55	14.30	1.19	1.01	0.6	1	8
105	18.92	16.70	1.62	1.14	0.9	1	8
106	17.51	17.20	1.72	1.17	0.8	1	8
107	17.63	15.95	1.25	0.75	0.6	1	8
108	17.34	16.20	2.08	1.05	0.8	1	8
109	16.53	13.87	1.69	1.49	0.6	1	8
110	9.88	9.73	2.20	2.20	0.4	1	8
111	11.89	10.40	2.24	1.41	0.4	1	8
112	10.72	10.08	2.96	2.72	n/a	1	8
113	10.80	n/a	3.87	3.18	0.4	1	8
114	18.96	18.13	1.63	1.11	0.8	1	8
115	12.29	11.67	3.57	3.51	0.8	1	8
116	11.32	10.50	1.79	1.01	0.2	1	8
117	20.66	20.05	4.92	4.46	2.9	1	8
118	13.31	13.07	2.47	1.49	0.6	1	8
119	18.88	18.38	1.82	1.60	0.8	1	8
120	16.09	15.57	6.89	3.26	2.2	1	8
121	15.67	15.45	3.64	2.57	1.4	1	8
122	19.89	19.43	5.23	1.64	2.4	1	8
123	14.21	13.92	1.89	1.52	0.4	1	8
124	21.75	18.23	4.75	4.66	4.1	1	8
125	20.99	19.95	4.16	2.36	1.7	1	8

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

A	B	C	D	E	F	G	H
Art. #	**ID#**	**Prov #**	**VR Site #**	**Field Prov.**	**Excavation**	**Artifact Label**	**Coll. #**
25.7	126	25	101	5-15 cm	2	H-I-30	9
25.8	127	25	101	15-40 cm	2	H-I-31	9
25.9	128	25	101	15-40 cm	2	H-I-31	9
25.10	129	25	101	15-40 cm	2	H-I-31	9
25.11	130	25	101	15-40 cm	2	H-I-31	9
26.1	131	26	101	0-10 cm	2	H-I-7	9
26.2	132	26	101	0-10 cm	2	H-I-7	9
26.3	133	26	101	0-13 cm	2	H-I-8	9
26.4	134	26	101	13-30, 21, 16, 19 cm	2	H-I-11	9
26.5	135	26	101	16, 20, 12.5, 12.5 cm	2	H-I-16	9
26.6	136	26	101	16, 20, 12.5, 12.5 cm	2	H-I-16	9
26.7	137	26	101	31 cm	2	H-I-17	9
26.8	138	26	101	30, 21, 16, 19	2	H-I-19	9
26.9	139	26	101	30, 21, 16, 19 cm	2	H-I-19	9
26.10	140	26	101	30, 21, 16, 19 cm	2	H-I-19	9
26.11	141	26	101	30, 21, 16, 19 cm	2	H-I-19	9
26.12	142	26	101	North Wall	2	H-I-21	9
26.13	143	26	101	0-10 cm	2	H-I-25	9
26.14	144	26	101	0-10 cm	2	H-I-25	9
26.15	145	26	101	0-10 cm	2	H-I-25	9
26.16	146	26	101	0-10 cm	2	H-I-25	9
26.17	147	26	101	0-10 cm	2	H-I-25	9
26.18	148	26	101	0-10 cm	2	H-I-25	9

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	I	J	K	L	M	N	O
ID#	**Major Cat.**	**Sub group**	**Hole 1/0**	**Perf. Type**	**Shape**	**Variant**	**Notes**
126	2	0	0	n/a	2	1	Trans
127	2	0	0	n/a	2	1	Trans
128	2	0	0	n/a	2	1	Trans
129	2	0	0	n/a	2	1	Trans
130	2	0	0	n/a	2	1	Trans
131	2	0	0	n/a	2	1	PeckPol
132	2	0	0	n/a	2	1	PeckPol
133	2	0	0	n/a	2	1	PeckPol
134	2	0	0	n/a	2	1	PeckPol
135	2	0	0	n/a	2	1	PeckPol
136	2	0	0	n/a	2	1	PeckPol
137	2	0	0	n/a	2	1	PeckPol
138	2	0	0	n/a	2	1	PeckPol
139	2	0	0	n/a	2	1	PeckPol
140	2	0	0	n/a	2	1	PeckPol
141	2	0	0	n/a	2	1	PeckPol
142	2	0	0	n/a	2	1	PeckPol
143	2	0	0	n/a	2	1	PeckPol
144	2	0	0	n/a	2	1	PeckPol
145	2	0	0	n/a	2	1	PeckPol
146	2	0	0	n/a	2	1	PeckPol
147	2	0	0	n/a	2	1	PeckPol
148	2	0	0	n/a	2	1	PeckPol

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	P	Q	R	S	T	U	V
ID#	**L/D (Max)**	**W/D (Min)**	**Thk. (Max)**	**Thk. (Min)**	**Wt. (gm)**	**MC**	**Genus**
126	13.99	13.86	2.82	0.92	0.8	1	8
127	18.35	15.27	3.95	2.36	1.6	1	8
128	16.47	11.78	3.41	1.56	0.9	1	8
129	14.94	14.29	1.94	0.79	0.7	1	8
130	8.90	8.74	1.89	1.53	0.2	1	8
131	10.45	10.18	4.57	n/a	n/a	1	8
132	10.52	10.04	2.66	n/a	n/a	1	8
133	12.80	12.68	2.27	n/a	n/a	1	8
134	10.32	9.44	3.71	n/a	n/a	1	8
135	15.84	15.64	3.84	n/a	n/a	1	8
136	14.43	13.29	1.79	n/a	n/a	1	8
137	10.95	10.83	2.45	n/a	n/a	1	8
138	10.28	9.90	1.91	n/a	n/a	1	8
139	12.03	11.42	3.47	n/a	n/a	1	8
140	10.34	10.16	2.24	n/a	n/a	1	8
141	11.01	10.17	2.67	n/a	n/a	1	8
142	16.65	16.60	2.15	n/a	n/a	1	8
143	14.17	13.26	3.36	n/a	n/a	1	8
144	11.85	11.62	4.03	n/a	n/a	1	8
145	11.24	10.73	2.92	n/a	n/a	1	8
146	11.15	10.97	3.43	n/a	n/a	1	8
147	11.48	11.21	2.43	n/a	n/a	1	8
148	10.62	10.57	4.43	n/a	n/a	1	8

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

A	B	C	D	E	F	G	H
Art. #	**ID#**	**Prov #**	**VR Site #**	**Field Prov.**	**Excavation**	**Artifact Label**	**Coll. #**
26.19	149	26	101	0-10 cm	2	H-I-25	9
26.20	150	26	101	0-10 cm	2	H-I-25	9
26.21	151	26	101	0-10 cm	2	H-I-25	9
26.22	152	26	101	0-10 cm	2	H-I-25	9
26.23	153	26	101	0-15 cm	2	H-I-28	9
26.24	154	26	101	0-15 cm	2	H-I-28	9
26.25	155	26	101	0-15 cm	2	H-I-28	9
26.26	156	26	101	5-15 cm	2	H-I-30	9
26.27	157	26	101	5-15 cm	2	H-I-30	9
26.28	158	26	101	5-15 cm	2	H-I-30	9
26.29	159	26	101	5-15 cm	2	H-I-30	9
26.30	160	26	101	5-15 cm	2	H-I-30	9
26.31	161	26	101	5-15 cm	2	H-I-30	9
26.32	162	26	101	5-15 cm	2	H-I-30	9
26.33	163	26	101	15-40 cm	2	H-I-31	9
26.34	164	26	101	15-40 cm	2	H-I-31	9
26.35	165	26	101	15-40 cm	2	H-I-31	9
26.36	166	26	101	15-40 cm	2	H-I-31	9
26.37	167	26	101	15-40 cm	2	H-I-31	9
26.38	168	26	101	15-40 cm	2	H-I-31	9
26.39	169	26	101	15-40 cm	2	H-I-31	9
26.40	170	26	101	15-40 cm	2	H-I-33	9
26.41	171	26	101	15-40 cm	2	H-I-33	9
26.42	172	26	101	0-15 cm	2	H-I-28?	9
179	938	179	101	F396	1	TF/H#396	1
183.1	942	183	101	F1026	1	n/a	1
183.2	943	183	101	F1026	1	n/a	1
188.2	957	188	101	F192	1	n/a	1
189	958	189	101	F9	1	TF/H 9	1
193.1	969	193	101	F33	1	TF/H #33	1
194.2	972	194	101	F1024	1	TF/H #1024	1
200.1	980	200	101	F469	1	TF/H #469	1
200.2	981	200	101	F469	1	TF/H #469	1

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	I	J	K	L	M	N	O
ID#	**Major Cat.**	**Sub group**	**Hole 1/0**	**Perf. Type**	**Shape**	**Variant**	**Notes**
149	2	0	0	n/a	2	1	PeckPol
150	2	0	0	n/a	2	1	PeckPol
151	2	0	0	n/a	2	1	PeckPol
152	2	0	0	n/a	2	1	PeckPol
153	2	0	0	n/a	2	1	PeckPol
154	2	0	0	n/a	2	1	PeckPol
155	2	0	0	n/a	2	1	PeckPol
156	2	0	0	n/a	2	1	PeckPol
157	2	0	0	n/a	2	1	PeckPol
158	2	0	0	n/a	2	1	PeckPol
159	2	0	0	n/a	2	1	PeckPol
160	2	0	0	n/a	2	1	PeckPol
161	2	0	0	n/a	2	1	PeckPol
162	2	0	0	n/a	2	1	PeckPol
163	2	0	0	n/a	2	1	PeckPol
164	2	0	0	n/a	2	1	PeckPol
165	2	0	0	n/a	2	1	PeckPol
166	2	0	0	n/a	2	1	PeckPol
167	2	0	0	n/a	2	1	PeckPol
168	2	0	0	n/a	2	1	PeckPol
169	2	0	0	n/a	2	1	PeckPol
170	2	0	0	n/a	2	1	PeckPol
171	2	0	0	n/a	2	1	PeckPol
172	2	0	0	n/a	2	1	PeckPol
938	2	0	0	n/a	2	1	
942	2	0	0	n/a	2	1	Strombus sp.
943	2	0	0	n/a	2	1	Strombus sp.
957	2	0	0	n/a	2	1	
958	2	0	0	n/a	2	1	
969	2	0	0	n/a	2	1	
972	2	0	0	n/a	2	1	St.sp., int.layer
980	2	0	0	n/a	2	1	
981	2	0	0	n/a	2	1	

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	P	Q	R	S	T	U	V
ID#	**L/D (Max)**	**W/D (Min)**	**Thk. (Max)**	**Thk. (Min)**	**Wt. (gm)**	**MC**	**Genus**
149	10.62	9.65	2.08	n/a	n/a	1	8
150	9.74	9.58	2.75	n/a	n/a	1	8
151	9.36	9.14	4.73	n/a	n/a	1	8
152	11.00	10.90	2.40	2.30	n/a	1	8
153	10.60	10.10	2.70	2.30	n/a	1	8
154	12.20	10.70	3.10	2.90	n/a	1	8
155	12.20	11.50	2.50	2.30	n/a	1	8
156	12.40	11.80	4.40	4.20	n/a	1	8
157	12.00	11.30	2.10	2.00	n/a	1	8
158	12.20	11.80	2.90	1.40	n/a	1	8
159	11.20	10.30	1.90	1.70	n/a	1	8
160	10.20	10.00	2.40	2.00	n/a	1	8
161	10.30	9.40	2.40	2.30	n/a	1	8
162	9.50	9.20	1.70	1.40	n/a	1	8
163	10.60	10.20	2.60	2.40	0.0	1	8
164	10.40	10.00	1.60	1.40	n/a	1	8
165	13.60	12.30	2.80	2.70	n/a	1	8
166	13.70	13.30	3.90	3.70	n/a	1	8
167	14.50	14.10	3.40	2.80	n/a	1	8
168	17.10	15.90	2.60	1.40	n/a	1	8
169	18.40	17.60	4.50	3.20	n/a	1	8
170	11.50	11.20	2.40	2.20	n/a	1	8
171	15.70	14.90	2.90	1.50	n/a	1	8
172	15.20	14.10	2.50	2.50	n/a	1	8
938	12.70	12.60	4.00	3.50	1.2	1	8
942	9.50	9.30	3.40	3.00	0.5	1	8
943	9.70	9.50	3.40	3.20	0.5	1	8
957	15.30	14.50	4.20	2.40	1.5	1	8
958	12.40	11.80	2.30	1.60	0.5	1	8
969	12.70	11.50	5.80	5.20	1.3	1	8
972	11.50	10.90	2.80	1.60	0.5	1	8
980	9.60	9.30	2.90	2.50	0.5	1	8
981	14.20	13.90	3.50	3.00	1.3	1	8

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

A	B	C	D	E	F	G	H
Art. #	**ID#**	**Prov #**	**VR Site #**	**Field Prov.**	**Excavation**	**Artifact Label**	**Coll. #**
201	982	201	101	F170	1	TF/H #170	1
204.4	990	204	101	F419	1	TF/H #419	1
24.4	1033	24	101	0-15 cm	2	H-I-28	9
27.1	176	27	81	n/a	n/a	No.132	8
58.2	291	58	76	76.L/V	n/a	76.L/V	n/a
59.4	296	59	76	76. L/V	n/a	76. LV	n/a
130	552	130	76	L.1	n/a	L.1	6
108	530	108	81	81.3	3	81.3	3
59.7	299	59	81	SN/A 116	n/a	SN/A 116	4
60.1	301	60	81	81.9	3	81.9	n/a
60.2	302	60	81	81.3	3	81.3	n/a
119	541	119	81	S.N. 356	n/a	S.N. 356	3
120	542	120	81	Col. D	n/a	Col. D	8
136	558	136	81	Col. A 101	n/a	Col. A 101	4
138	560	138	81	Col. A 101	n/a	Col. A 101	4
59.5	297	59	101	F1131	1	TF/H 1131	1
204.1	987	204	101	F419	1	TF/H #419	1
59.8	300	59	102	n/a	n/a	102. L/V	n/a
46	266	46	2	n/a	n/a	n/a	4
90	496	90	47	n/a	n/a	n/a	n/a
118	540	118	76	n/a	n/a	L.1	6
34.2	226	34	76	n/a	n/a	76	n/a
34.3	227	34	76	n/a	n/a	76-9	n/a
35	230	35	76	n/a	n/a	n/a	13
143.3	677	143	76	n/a	n/a	L.1.	6
151.4	751	151	76	n/a	1	S.O.L.V. 4.3.15	12
156	886	156	76	n/a	1	S/O L.V. 4.3.18	12
59.1	293	59	76	n/a	1	S.O. 134	12

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	I	J	K	L	M	N	O
ID#	**Major Cat.**	**Sub group**	**Hole 1/0**	**Perf. Type**	**Shape**	**Variant**	**Notes**
982	2	0	0	n/a	2	1	St. sp., polish exterior, thick wall
990	2	0	0	n/a	2	1	Strombus sp.
1033	2	0	0	n/a	2	1	Vert
176	3	5	0	n/a	2	1	
291	3	4	1	2	2	1	Perforated
296	3	3	0	0	2	1	
552	3	6	1	2?	2	1	Perforation INC
530	3	5	0	0	2	1	
299	3	5	0	0	2	1	
301	3	3	0	0	2	1	Lg Strombus, lip
302	3	3	0	0	2	1	Lg Strombus
541	3	4	1	2	2	1	Perforated
542	3	6	1	2	2	1	Perforated
558	3	5	0	0	2	1	Smooth
560	3	5	0	0	2	1	Smooth
297	3	5	0	0	2	1	
987	3	4	1	2	2	1	Perforated, cones don't meet well
300	3	5	0	0	2	1	
266	4	9	1	2	8	n/a	St.gig Winged Bat?
496	4	9	1	2	1*	n/a	Partial perf, broken
540	4	g	1	1	1	n/a	Conus sp.
226	4	g	1	1	1	2	-A/S
227	4	g	1	1	1	2	-A/S, odd hole placement
230	4	g	1	1	1	2	-A/S
677	4	g	1	1	1	2	-A/S
751	4	g	1	1	1	2	-A/S
886	4	8	1	1	1	2	-A/S
293	3,4	4	1	2	2	1	Pendant, Conical

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	P	Q	R	S	T	U	V
ID#	**L/D (Max)**	**W/D (Min)**	**Thk. (Max)**	**Thk. (Min)**	**Wt. (gm)**	**MC**	**Genus**
982	20.00	19.10	7.00	6.40	4.6	1	8
990	11.50	11.10	2.80	2.70	0.7	1	8
1033	13.90	13.60	7.00	5.42	1.8	1	8
176	26.38	25.37	3.94	3.63	4.6	1	8
291	69.35	59.21	6.98	2.67	51.0	1	8
296	65.00	62.54	8.43	3.08	55.4	1	8
552	26.83	26.76	10.52	6.88	13.8	1	8
530	45.70	38.60	3.25	2.59	9.9	1	2
299	47.47	n/a	11.30	6.17	33.4	1	8
301	138.45	135.46	10.78	4.02	200.1	1	8
302	128.50	107.37	3.66	1.65	158.7	1	8
541	62.14	64.79	8.10	2.89	38.6	1	8
542	45.67	44.30	4.00	2.65	13.5	1	8
558	29.60	26.10	8.20	7.30	11.0	1	8
560	31.30	30.20	11.80	10.90	21.3	1	8
297	38.94	37.50	4.73	2.73	11.5	1	8
987	63.60	62.30	13.00	5.30	77.6	1	8
300	49.27	43.82	5.99	4.60	26.1	1	8
266	109.12	37.31	n/a	n/a	63.7	1	8
496	58.56	51.90	6.63	3.61	28.7	1	8
540	14.06	9.83	n/a	n/a	0.9	1	3
226	31.90	18.95	n/a	n/a	2.9	1	7
227	29.31	15.03	n/a	n/a	4.3	1	7
230	28.57	18.05	n/a	n/a	5.3	1	7
677	24.87	14.68	n/a	n/a	*	1	7
751	28.74	17.90	n/a	n/a	2.3	1	7
886	16.00	6.34	n/a	n/a	4.9	1	7
293	76.54	75.58	13.43	6.87	83.8	1	8

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

A	B	C	D	E	F	G	H
Art. #	**ID#**	**Prov #**	**VR Site #**	**Field Prov.**	**Excavation**	**Artifact Label**	**Coll. #**
226.2	1027	226	76	n/a	n/a	n/a	6
5	5	5	76	n/a	1	50/52	12
115	537	115	76	n/a	n/a	n/a	n/a
117	539	117	76	n/a	n/a	L.1.	n/a
142.1	639	142	76	n/a	1	50/52	12
142.2	640	142	76	n/a	1	50/52	12
142.3	641	142	76	n/a	1	50/52	12
142.4	642	142	76	n/a	1	50/52	12
142.5	643	142	76	n/a	1	50/52	12
142.6	644	142	76	n/a	1	50/52	12
142.7	645	142	76	n/a	1	50/52	12
142.8	646	142	76	n/a	1	50/52	12
142.9	647	142	76	n/a	1	50/52	12
142.10	648	142	76	n/a	1	50/52	12
142.11	649	142	76	n/a	1	50/52	12
142.12	650	142	76	n/a	1	50/52	12
142.13	651	142	76	n/a	1	50/52	12
142.14	652	142	76	n/a	1	50/52	12
142.15	653	142	76	n/a	1	50/52	12
142.16	654	142	76	n/a	1	50/52	12
142.17	655	142	76	n/a	1	50/52	12
142.18	656	142	76	n/a	1	50/52	12
142.19	657	142	76	n/a	1	50/52	12
142.20	658	142	76	n/a	1	50/52	12
142.21	659	142	76	n/a	1	50/52	12
142.22	660	142	76	n/a	1	50/52	12
142.23	661	142	76	n/a	1	50/52	12
142.24	662	142	76	n/a	1	50/52	12
142.25	663	142	76	n/a	1	50/52	12
142.26	664	142	76	n/a	1	50/52	12
142.27	665	142	76	n/a	1	50/52	12
142.28	666	142	76	n/a	1	50/52	12
142.29	667	142	76	n/a	1	50/52	12

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	I	J	K	L	M	N	O
ID#	**Major Cat.**	**Sub group**	**Hole 1/0**	**Perf. Type**	**Shape**	**Variant**	**Notes**
1027	4	9	1	2	2	1	very worn
5	4	9	1	2	3	9	PeckPol
537	4	9	1	3	8	n/a	"Maskette"
539	4	9	1	2 x 2	8	n/a	"Bat"
639	4	9	1	2	4	9	St. Boerstra 1982
640	4	9	1	2	4	9	
641	4	9	1	2	4	9	
642	4	9	1	2	4	9	
643	4	9	1	2	4	9	
644	4	9	1	2	4	9	
645	4	9	1	2	4	9	
646	4	9	1	2	4	9	
647	4	9	1	2	4	9	
648	4	9	1	2	4	9	
649	4	9	1	2	4	9	
650	4	9	1	2	4	9	
651	4	9	1	2	4	9	
652	4	9	1	2	4	9	
653	4	9	1	2	4	9	
654	4	9	1	2	4	9	
655	4	9	1	2	4	9	
656	4	9	1	2	4	9	
657	4	9	1	2	4	9	
658	4	9	1	2	4	9	
659	4	9	1	2	4	9	
660	4	9	1	2	4	9	
661	4	9	1	2	4	9	
662	4	9	1	2	4	9	
663	4	9	1	2	4	9	
664	4	9	1	2	4	9	
665	4	9	1	2	4	9	
666	4	9	1	2	4	9	
667	4	9	1	2	4	9	

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	P	Q	R	S	T	U	V
ID#	**L/D (Max)**	**W/D (Min)**	**Thk. (Max)**	**Thk. (Min)**	**Wt. (gm)**	**MC**	**Genus**
1027	56.40	44.90	n/a	n/a	18.1	1	8
5	44.78	11.13	3.88	1.97	3.3	1	8
537	16.56	15.45	8.27	n/a	2.9	1	8
539	17.63	20.23	12.82	n/a	4.2	1	8
639	50.86	11.67	4.30	n/a	n/a	1	8
640	34.13	11.65	3.15	n/a	n/a	1	8
641	33.21	10.96	3.67	n/a	n/a	1	8
642	35.07	10.51	2.98	n/a	n/a	1	8
643	39.80	13.40	3.31	n/a	n/a	1	8
644	34.71	11.95	2.46	n/a	n/a	1	8
645	49.72	11.31	2.91	n/a	n/a	1	8
646	40.17	11.70	4.45	n/a	n/a	1	8
647	32.20	11.93	2.93	n/a	n/a	1	8
648	40.28	9.55	4.89	n/a	n/a	1	8
649	42.78	17.88	3.59	n/a	n/a	1	8
650	29.84	9.66	3.68	n/a	n/a	1	8
651	38.97	12.36	4.37	n/a	n/a	1	8
652	39.74	7.44	6.00	n/a	n/a	1	8
653	28.88	10.56	3.38	n/a	n/a	1	8
654	43.79	11.62	3.25	n/a	n/a	1	8
655	36.27	10.38	3.59	n/a	n/a	1	8
656	34.37	7.32	3.03	n/a	n/a	1	8
657	40.85	14.13	2.40	n/a	n/a	1	8
658	26.66	10.03	2.67	n/a	n/a	1	8
659	40.46	11.54	3.22	n/a	n/a	1	8
660	39.58	8.35	3.40	n/a	n/a	1	8
661	41.97	10.78	4.34	n/a	n/a	1	8
662	35.01	13.35	2.96	n/a	n/a	1	8
663	36.92	8.48	4.69	n/a	n/a	1	8
664	30.83	10.03	4.78	n/a	n/a	1	8
665	33.60	11.76	3.82	n/a	n/a	1	8
666	31.62	10.80	3.77	n/a	n/a	1	8
667	35.00	13.06	4.31	n/a	n/a	1	8

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

A	B	C	D	E	F	G	H
Art. #	**ID#**	**Prov #**	**VR Site #**	**Field Prov.**	**Excavation**	**Artifact Label**	**Coll. #**
142.30	668	142	76	n/a	1	50/52	12
142.31	669	142	76	n/a	1	50/52	12
142.32	670	142	76	n/a	1	50/52	12
142.33	671	142	76	n/a	1	50/52	12
142.34	672	142	76	n/a	1	50/52	12
142.35	673	142	76	n/a	1	50/52	12
142.36	674	142	76	n/a	1	50/52	12
45.1	264	45	81	n/a	n/a	Col. Angela	4
34.4	228	34	81	n/a	n/a	81 R/F	*
36	231	36	81	n/a	n/a	N.2 81 R/F	14
143.1	675	143	81	n/a	n/a	Coll. D 112	8
143.2	676	143	81	n/a	n/a	Coll. D 112	8
143.5	679	143	81	n/a	n/a	Coll. A 106	4
143.6	680	143	81	n/a	n/a	Coll. D 111	8
143.7	681	143	81	n/a	n/a	Coll. D 111	8
143.8	682	143	81	n/a	n/a	Coll. D 111	8
143.9	683	143	81	n/a	n/a	Coll. D 112	8
143.11	685	143	81	n/a	n/a	Coll. D 112	8
45.2	265	45	81	n/a	n/a	Col. D 106	8
214	1007	214	81	SC L/V	n/a	SC L/V	n/a
111	533	111	81	n/a	n/a	n/a	n/a
132	554	132	81	n/a	n/a	n/a	8
224	1022	224	81	101	n/a	n/a	8
197	977	197	101	F474	1	TF/H #474	1
208.3	999	208	101	F305	1	n/a	1
174	933	174	101	n/a	n/a	Tp. 1a	*
2	2	2	101	15-40 cm	2	H-I-31	9
3	3	3	76	L/V	n/a	v. no. 9;nov. 15. 1996	*

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	I	J	K	L	M	N	O
ID#	**Major Cat.**	**Sub group**	**Hole 1/0**	**Perf. Type**	**Shape**	**Variant**	**Notes**
668	4	9	1	2	4	9	
669	4	9	1	2	4	9	
670	4	9	1	2	4	9	
671	4	9	1	2	4	9	
672	4	9	1	2	4	9	
673	4	9	1	2	4	9	
674	4	9	1	2	4	9	
264	4	9	1	2		n/a	Cassis Ext.lip?
228	4	7	1	1	1	2	-A/S
231	4	7	1	1	1	2	-A/S
675	4	7	1	1	1	2	-A/S
676	4	7	1	1	1	2	-A/S
679	4	7	1	1	1	2	-A/S
680	4	7	1	1	1	2	-A/S
681	4	7	1	1	1	2	-A/S
682	4	7	1	1	1	2	-A/S
683	4	7	1	1	1	2	-A/S
685	4	7	1	1	1	2	-A/S
265	4	9	1		6	n/a	
1007	4	9	0	0	8	n/a	H/B-O/A/P "Broad-wing"
533	4	9	1	2	8	n/a	Strombus Staff
554	4	9	1	3	3	n/a	"Head" Complex, repair? Incised
1022	4	7	1		1	n/a	Pecking
977	4	7	1	1	1	2	-A/S
999	4		1			n/a	
933	4	7	0	0	1	n/a	Columella Tool? 1 b/c perf, one PaPf?
2	4	7	1	2	8	n/a	"Key" very smooth patina
3	5	12	1	4	2	n/a	incomplete; uniform thickness

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	P	Q	R	S	T	U	V
ID#	**L/D (Max)**	**W/D (Min)**	**Thk. (Max)**	**Thk. (Min)**	**Wt. (gm)**	**MC**	**Genus**
668	29.62	10.41	3.33	n/a	n/a	1	8
669	39.71	11.18	4.00	n/a	n/a	1	8
670	39.97	12.20	2.95	n/a	n/a	1	8
671	32.09	8.28	4.18	n/a	n/a	1	8
672	47.88	11.33	5.33	n/a	n/a	1	8
673	36.46	11.31	4.18	n/a	n/a	1	8
674	47.99	15.28	3.19	n/a	n/a	1	8
264	64.78	21.44	13.28	8.83	35.3	1	1,8
228	27.00	16.21	n/a	n/a	2.6	1	7
231	34.71	20.39	n/a	n/a	9.6	1	7
675	31.65	17.72	n/a	n/a	n/a	1	7
676	26.12	14.68	n/a	n/a	n/a	1	7
679	30.54	17.40	n/a	n/a	n/a	1	7
680	30.86	17.83	n/a	n/a	n/a	1	7
681	33.48	20.54	n/a	n/a	n/a	1	7
682	40.75	22.33	n/a	n/a	n/a	1	7
683	33.26	20.24	n/a	n/a	n/a	1	7
685	24.90	17.46	n/a	n/a	n/a	1	7
265	53.16	16.70	3.90	3.28	6.8	1	8
1007	72.10	30.10	4.40	3.00	13.8	1	8
533	172.00	34.68	39.03	n/a	157.8	1	8
554	25.60	9.95	n/a	n/a	2.3	1	8
1022	45.90	39.90	n/a	n/a	7.6	2	13
977	25.40	14.80	n/a	n/a	3.0	1	7
999	10.40	7.90	2.40	1.30	0.2	2	12
933	63.36	24.81	n/a	n/a	16.0	1	8
2	25.59	9.07	2.66	2.05	0.6	1	8
3	10.83	10.07	3.26	3.26	0.6	1	8

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

A	B	C	D	E	F	G	H
Art. #	**ID#**	**Prov #**	**VR Site #**	**Field Prov.**	**Excavation**	**Artifact Label**	**Coll. #**
82.1	479	82	76	n/a	n/a	n/a	13
12.1	20	12	81	L/V	n/a	Dania 155	8
52	276	52	81	n/a	3	81.3	3
84.3	487	84	81	L/V	n/a	C/N Dania 17st Oct 96	8
113	535	113	81	n/a	n/a	Coll. D 117	8
160.5	894	160	81	L/V	n/a	n/a	8
212.1	1003	212	81		n/a	C/N L.O.V.1.3.5	8
29.3	210	29	81	n/a	n/a	no. 158	8
29.4	211	29	81	n/a	n/a	Dania 158; schelpen knoop (2st vierkant)	8
30.2	213	30	81	n/a	n/a	no. 119	8
30.4	215	30	81	n/a	n/a	no. 119	8
51	275	51	81	n/a	n/a	Col. Angela No. 119	n/a
161.1	898	161	81	F167 P.3	3	n/a	8
164	912	164	81	F699 Pit 6	3	Put 6F699 Kraaltje!9/10/92	8
1	1	1	81	L/V	n/a	Coll. Dania 159; 1st gepertor schelpknoop (met V-groeven)	8
12.2	21	12	81	L/V	n/a	n/a	8
14	37	14	81	n/a	n/a	C/NA 52	n/a
29.1	208	29	81	n/a	n/a	no. 158	8
29.2	209	29	81	n/a	n/a	no. 158	8
30.1	212	30	81	n/a	n/a	no. 119	8
30.5	216	30	81	n/a	n/a	no. 119	8
30.6	217	30	81	n/a	n/a	no. 119	8
30.7	218	30	81	n/a	n/a	no. 119	8
31.1	219	31	81	n/a	n/a	no. 126	8

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	I	J	K	L	M	N	O
ID#	**Major Cat.**	**Sub group**	**Hole 1/0**	**Perf. Type**	**Shape**	**Variant**	**Notes**
479	5	12	1	4	2	n/a	Y
20	5	12	1	4	2	n/a	Y
276	5	13	0	0	7	n/a	PeckPol
487	5	13	0	0	7	n/a	PeckPol
535	5	k	0	1 x 4	1	n/a	Perf
894	5	12	1	1 x 2	6	n/a	2 Conical
1003	5	13	0	0	4	n/a	Mother of Pearl/PeckPol
210	5	12	1	3	2	n/a	Perf
211	5	12	1	3	2	n/a	Micro
213	5	12	1	3	2	n/a	Perf
215	5	12	1	3	2	n/a	Perf
275	5	13	0	0	7	n/a	PeckPol
898	5	12	1	1 x 2	4	n/a	2 Conical
912	5	12	1	3	2	n/a	Perf
1	5		1	4	8	n/a	PeckPol
21	5		1	4	2	n/a	Y
37	5		1	4	2	n/a	Y
208	5		1	3	4	n/a	Perf
209	5		1	3	4	n/a	Perf
212	5		1	4	2	n/a	Y Incomplete
216	5		1	3	2	n/a	Perf
217	5		1	3	2	n/a	Perf
218	5		1	3	2	n/a	Perf
219	5		1	1 x 2	4	n/a	Perf

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	P	Q	R	S	T	U	V
ID#	**L/D (Max)**	**W/D (Min)**	**Thk. (Max)**	**Thk. (Min)**	**Wt. (gm)**	**MC**	**Genus**
479	8.20	7.98	3.53	n/a	0.3	1	8
20	10.47	10.25	2.62	2.25	0.5	2	0
276	22.52	10.07	3.02	2.88	1.6	2	0
487	18.62	13.78	2.35	1.17	1.3	2	0
535	25.27	13.65	10.95	n/a	2.2	1	4
894	15.08	10.23	1.18	0.70	0.3	2	11
1003	15.80	11.60	1.10	0.90	0.4	2	11
210	11.33	11.11	3.56	2.90	0.6	2	12
211	8.07	7.26	2.61	1.99	0.2	2	12
213	11.78	11.50	2.58	2.31	0.6	2	12
215	10.60	10.42	3.88	3.22	0.7	2	12
275	15.97	11.33	3.61	3.47	1.2	2	12
898	17.52	7.18	n/a	n/a	0.7	2	12
912	8.63	8.45	2.52	2.27	0.3	2	12
1	10.62	8.14	4.01	3.63	0.6	1	8
21	8.84	8.66	3.51	3.37	0.4	1	8
37	18.00	17.98	5.51	5.47	3.0	1	8
208	18.77	8.85	n/a	n/a	1.0	1	8
209	16.91	7.57	n/a	n/a	0.8	1	8
212	9.43	8.37	2.74	2.58	0.3	1	8
216	9.30	8.77	4.13	3.65	0.5	1	8
217	8.10	7.87	2.49	2.37	0.2	1	8
218	6.34	5.96	2.86	2.35	0.2	1	8
219	11.85	7.54	n/a	n/a	0.3	1	8

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

A	B	C	D	E	F	G	H
Art. #	**ID#**	**Prov #**	**VR Site #**	**Field Prov.**	**Excavation**	**Artifact Label**	**Coll. #**
31.2	220	31	81	n/a	n/a	no. 126	8
110	532	110	81	n/a	n/a	C.N/Angela/No 115	4
121	543	121	81	n/a	1	H	4
145.1	687	145	81	n/a	n/a	-	n/a
159	889	159	81	L/V	n/a	No. F. 25	8
163.7	911	163	81	Pit 4 F331c	3	Pit 4 F331C 7/19/1992	8
30.3	214	30	81	n/a	n/a	no. 119	8
8.1	8	8	101	15-40 cm	2	H-I-31	9
8.2	9	8	101	15-40 cm	2	H-I-31	9
19	50	19	101	n/a	n/a	Tagged Tanki Flip 1187	n/a
8.3	10	8	101	n/a	2	H-I-31	9
182	941	182	101	F971	1	n/a	1
190.6	964	190	101	FL/V	1	TF/H 19Nov98 L/V Angela Croes	20
196.1	974	196	101	F408	1	TF/H #408	1
21	52	21	?	n/a	n/a	*	n/a
104	526	104	26	n/a	n/a	Canashito C. Nooyen	11
226.4	1029	226	76	n/a	n/a	n/a	6
226.5	1030	226	76	n/a	n/a	n/a	6
226.6	1031	226	76	n/a	n/a	n/a	6
91.2	498	91	81	109 A	n/a	SN 109A	3
91.3	499	91	81	n/a	n/a	Col. D	8
107	529	107	81	n/a	n/a	S.N.P.1	3
53.1	277	53	81	n/a	n/a	Col. A 110	4
53.7	283	53	81	n/a	3	81.3	3
55.1	286	55	81	n/a	3	81.9	3
63.1	306	63	81	n/a	n/a	Col. D	8

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	I	J	K	L	M	N	O
ID#	**Major Cat.**	**Sub group**	**Hole 1/0**	**Perf. Type**	**Shape**	**Variant**	**Notes**
220	5		1	1 x 2	4	n/a	Perf
532	5		1	4	2	n/a	Perf
543	5		1	4	2	n/a	Y
687	5		0	0	4	n/a	PeckPol
889	5		1	4	2	n/a	Y
911	5		1	4	2	n/a	rough
214	5	2	1	3	2	n/a	Perf
8	5	12	1	1 x 2	4	n/a	Mother of pearl
9	5	12	1	4*	4	n/a	INC Y or breached Type 3
50	5	12	1	1 x 2	1*	n/a	Munsell 2.5 YR 6/8
10	5		1	4	2	n/a	Y
941	5		1	4	2	n/a	Perf
964	5		1	4	2	n/a	micro
974	5		1	4	3	n/a	Y
52	5		1	4	2	n/a	Y
526	6		0	0	3,4	n/a	PeckPol
1029	6	14	0	0	3	n/a	PeckPol
1030	6	14	0	0	3	n/a	PeckPol
1031	6	14	0	0	2	n/a	PeckPol
498	6	14	0	0	3	n/a	PeckPol
499	6	14	0	0	3	n/a	PeckPol
529	6	14	0	0	3	n/a	PeckPol
277	6		0	0	4	n/a	Pecking
283	6		0	0	4	n/a	Pecking
286	6		0	0	4	n/a	Pecking
306	6	14	0	0	3	n/a	PeckPol

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	P	Q	R	S	T	U	V
ID#	**L/D (Max)**	**W/D (Min)**	**Thk. (Max)**	**Thk. (Min)**	**Wt. (gm)**	**MC**	**Genus**
220	12.09	8.02	1.26	0.83	0.2	1	8
532	9.17	n/a	2.43	2.13	0.3	1	8
543	40.20	39.43	3.99	3.05	10.5	1	8
687	17.88	9.82	4.83	n/a	n/a	1	8
889	11.60	11.27	3.05	n/a	0.6	1	8
911	10.26	9.90	2.84	2.54	0.5	1	8
214	10.61	10.35	1.89	1.53	0.3	2	14. 12
8	20.83	14.96	0.92	0.80	0.3	2	11
9	12.78	6.99	2.01	1.41	0.4	2	12
50	22.51	9.86	1.92	1.39	0.5	1	12
10	11.80	11.74	3.64	3.36	0.8	1	8
941	11.90	11.80	2.90	2.80	0.7	1	8
964	6.60	6.40	2.20	2.10	0.1	1	8
974	13.60	8.00	n/a	n/a	0.4	1	8
52	24.20	22.50	2.87	2.62	3.0	1	8
526	66.96	60.56	4.84	2.92	29.1	1	8
1029	33.70	30.20	2.30	n/a	4.5	1	2
1030	35.50	35.40	2.60	1.70	4.9	1	2
1031	53.20	43.50	2.70	1.80	9.1	1	2
498	52.64	48.96	4.55	3.57	20.3	1	1
499	68.33	50.57	4.23	1.80	21.8	1	1
529	54.08	41.50	4.12	2.06	11.7	1	1
277	73.92	28.28	5.14	4.80	21.0	1	8
283	57.85	41.87	10.69	3.33	44.9	1	8
286	55.99	17.13	4.87	2.04	8.3	1	8
306	58.20	35.07	3.48	2.47	12.6	1	8

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

A	B	C	D	E	F	G	H
Art. #	**ID#**	**Prov #**	**VR Site #**	**Field Prov.**	**Excavation**	**Artifact Label**	**Coll. #**
63.2	307	63	81	n/a	n/a	Col. D	8
63.3	308	63	81	n/a	n/a	Col. D	8
63.4	309	63	81	n/a	n/a	Col. D	8
105	527	105	81	n/a	3	81.3	3
181	940	181	101	n/a	n/a	TF/H#393	?
103	525	103	101	n/a	n/a	T.F. 101.11	11
53.2	278	53	101	n/a	1	TF/H 1004	1
53.3	279	53	101	n/a	n/a	T.F. 101.11	11
53.4	280	53	101	n/a	1	TF/H 235	1
53.5	281	53	101	n/a	1	TF/H 966	1
102.1	523	102	101	n/a	1	TF/H 159	1
109	531	109	102	n/a	n/a	102. L/V 11	11?
95.2	506	95	76	n/a	1	S.O 182	12
96.1	507	96	76	n/a	1	S.O. 284 1	12
96.2	508	96	76	n/a	1	S.O. 234	12
97.2	510	97	76	n/a	1	S.O. 268	12
98.1	512	98	76	n/a	1	S.O. 273	12
98.2	513	98	76	n/a	1	S.O. 264 2	12
100.2	521	100	76	n/a	1	S.O. 234	12
101	522	101	76	n/a	1	S.O. 289	12
147	704	147	76	n/a	1	S.O.L.Y.4.3.1	12
226.1	1026	226	76	n/a	n/a	n/a	6
94	504	94	81	n/a	1	S.N.P.1	1
97.1	509	97	81	n/a	n/a	Col. A 111	4
97.3	511	97	81	n/a	3	81.9	3
99.1	515	99	81	n/a	n/a	SN 132 A	3
99.2	516	99	81	n/a	3	81.9	3
99.4	518	99	81	n/a	3	81.9	3
100.1	519	100	81	n/a	3	81.9	3
92.1	501	92	81	n/a	n/a	Coll Nooyen C. Alehandro	11
93	503	93	101	n/a	1	TF/H 156	1
204.5	991	204	101	F419	1	TF/H #419	1

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	I	J	K	L	M	N	O
ID#	**Major Cat.**	**Sub group**	**Hole 1/0**	**Perf. Type**	**Shape**	**Variant**	**Notes**
307	6	14	0	0	3	n/a	PeckPol
308	6	14	0	0	3	n/a	PeckPol
309	6	o	0	0	5	n/a	PeckPol
527	6	p	0	0	8	n/a	PeckPol
940	6	14	0	0	3	n/a	PeckPol
525	6	14	0	0	3	n/a	PeckPol
278	6		0	0	4	n/a	Pecking
279	6		0	0	4	n/a	Pecking
280	6		0	0	4	n/a	Pecking
281	6		0	0	4	n/a	Pecking
523	6	14	0	0	3	n/a	PeckPol
531	6	14*	0	0	~3	n/a	PeckPol
506	7	17	0	0	~1	n/a	H/B-O/A/P
507	7	17	0	0	~1	n/a	H/B-O/A/P
508	7	17	0	0	~1	n/a	H/B-O/A/P
510	7	17	0	0	~1	n/a	H/B-O/A/P
512	7	17	0	0	~1	n/a	H/B-O/A/P
513	7	17	0	0	~1	n/a	H/B-O/A/P
521	7	17	0	0	~1	n/a	H/B-O/A/P
522	7	17	0	0	~1	n/a	H/B-O/A/P
704	7	17	0	0	~1	n/a	H/B-O/A/P
1026	7	17	0	0	~1	n/a	H/B-O/A/P
504	7	17	0	0	~1	n/a	H/B-O/A/P
509	7	17	0	0	~1	n/a	H/B-O/A/P
511	7	17	0	0	~1	n/a	H/B-O/A/P
515	7	17	0	0	~1	n/a	H/B-O/A/P
516	7	17	0	0	~1	n/a	H/B-O/A/P
518	7	17	0	0	~1	n/a	H/B-O/A/P
519	7	17	0	0	~1	n/a	H/B-O/A/P
501	7	17	0	0	~1	n/a	H/B-O/A/P
503	7	17	0	0	~1	n/a	H/B-O/A/P
991	7	17	0	0	~1	n/a	H/B-O/A/P

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	P	Q	R	S	T	U	V
ID#	**L/D (Max)**	**W/D (Min)**	**Thk. (Max)**	**Thk. (Min)**	**Wt. (gm)**	**MC**	**Genus**
307	46.19	20.66	5.00	3.70	8.3	1	8
308	42.27	20.01	2.52	2.31	9.5	1	8
309	47.27	10.25	4.63	4.00	4.4	1	8
527	56.02	48.97	3.18	1.97	12.1	1	8
940	51.50	45.50	n/a	n/a	16.7	1	1
525	81.85	61.12	4.41	1.21	39.8	1	2
278	67.06	38.83	6.76	4.03	24.4	1	8
279	62.09	28.87	9.04	4.57	31.8	1	8
280	57.88	28.51	6.74	4.36	18.1	1	8
281	43.56	22.70	4.64	2.55	11.2	1	8
523	68.01	44.91	3.08	1.20	21.7	1	9
531	63.43	34.40	2.70	1.98	13.8	1	1
506	58.71	55.34	4.05	2.48	20.8	1	1
507	62.61	51.82	2.50	1.50	19.2	1	1
508	57.04	54.97	2.62	1.83	23.8	1	1
510	60.97	55.41	4.03	3.00	27.4	1	1
512	69.51	65.54	3.00	1.94	42.3	1	1
513	60.35	61.87	2.96	2.15	30.0	1	1
521	73.75	73.86	2.08	1.51	28.3	1	1
522	62.45	74.06	2.86	n/a	39.9	1	1
704	54.23	50.03	1.63	n/a	12.2	1	1
1026	80.50	40.10	n/a	n/a	27.7	1	1
504	90.55	84.71	3.09	2.52	44.9	1	1
509	73.17	67.69	3.09	2.48	34.2	1	1
511	62.81	56.62	2.24	1.96	17.2	1	1
515	50.64	71.76	2.07	1.44	26.1	1	1
516	52.70	51.35	2.15	1.50	15.9	1	1
518	40.82	50.13	2.52	1.68	13.1	1	1
519	52.85	65.68	1.85	1.39	15.0	1	1
501	110.64	85.62	3.25	2.39	63.0	1	1,8
503	77.60	75.08	3.34	3.05	56.0	1	1
991	84.60	67.00	2.90	2.00	34.7	1	1

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

A	B	C	D	E	F	G	H
Art. #	**ID#**	**Prov #**	**VR Site #**	**Field Prov.**	**Excavation**	**Artifact Label**	**Coll. #**
209	1000	209	101	F966	1	TF/H #966	1
61	304	61	76	n/a	1	S/O No. 43	12
173	932	173	76	n/a	n/a	Sabaneta FE-1a	n/a
49	270	49	76	n/a	n/a	L.1, Uli A permanente Aulfoerurstelling '95	6
50.4	274	50	76	n/a	n/a	76.2	n/a
112	534	112	81	n/a	n/a	n/a	8
114	536	114	81	n/a	n/a	n/a	8
116	538	116	76	n/a	n/a	L.1.	n/a
219	1016	219	81		n/a	C/N Dania	8
32.2	222	32	81	n/a	n/a	Col.Dania #114	8
48.2	269	48	81	n/a	n/a	Col. A 103	4
50.1	271	50	81	n/a	3	81.3	3
203	986	203	101	F946	1	TF/H #946	1
48.1	268	48	101	n/a	1	TF/H 164	1
64.2	311	64	101	n/a	1	TF/H 1182	1
134	556	134	101	n/a	1	TF./H 745	1
47	267	47	102	n/a	n/a	102	n/a

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	I	J	K	L	M	N	O
ID#	**Major Cat.**	**Sub group**	**Hole 1/0**	**Perf. Type**	**Shape**	**Variant**	**Notes**
1000	7	17	0	0	~1	n/a	H/B-O/A/P
304	8	22	0	0	6	n/a	
932	8	22	0	0	6	n/a	H/B-O/A/P
270	8	19	0	0	1, 8	n/a	Incised Nodule
274	8	19	0	0	1, 8	n/a	Nodule
534	8	22	1	n/a	8	n/a	"Bone" Frag. PaPf
536	8	22	0	n/a	8	n/a	"Maloca" notched
538	8	22	0	0	6	n/a	notched Rectilinear Polygon
1016	8	21	0	0	8	n/a	Bipoint
222	8	22	0	0	6	n/a	notched Rectilinear Polygon
269	8	19	0	0	8	n/a	Possible Ornament, Perf
271	8	19	0	0	1, 8	n/a	Nodule, PeckPol
986	8	19	0	0	1, 8	n/a	Nodule, PeckPol
268	8	19	0	0	8	n/a	Possible Ornament, Perf
311	8	20	0	0	8	n/a	“Peg”
556	8	19	0	0	1, 2	n/a	Disc/Nodule, Polish
267	8	19	0	0	8	n/a	Plug

*With provenience, sorted by general category
n/a = not applicable, unavailable

AMA SHELL ARTIFACT SUBSAMPLE DATA*

B	P	Q	R	S	T	U	V
ID#	**L/D (Max)**	**W/D (Min)**	**Thk. (Max)**	**Thk. (Min)**	**Wt. (gm)**	**MC**	**Genus**
1000	94.30	68.20	28.90	n/a	152.0	1	6
304	93.45	93.43	9.14	2.90	126.6	1	8
932	69.29	56.52	8.86	4.91	60.1	1	8
270	35.16	28.75	n/a	n/a	16.9	1	8
274	24.84	24.36	n/a	n/a	10.2	1	8
534	18.03	7.63	3.69	1.20	0.8	1	8
536	8.61	7.25	n/a	n/a	1.3	1	8
538	23.89	9.49	4.63	n/a	1.9	1	8
1016	63.40	8.90	5.40	2.40	5.6	1	8
222	15.92	5.88	3.86	2.75	0.8	1	8
269	18.51	23.01	n/a	n/a	8.8	1	8
271	33.20	25.44	n/a	n/a	16.3	1	8
986	25.70	23.80	17.00	n/a	9.4	1	8
268	14.69	13.17	n/a	n/a	4.4	1	8
311	26.64	7.42	n/a	n/a	2.6	1	8
556	21.30	19.40	13.40	11.40	8.9	1	8
267	20.02	20.16	n/a	n/a	7.4	1	8

*With provenience, sorted by general category
n/a = not applicable, unavailable

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