SMALL CHERT TOOLS AND DEBITAGE FROM CRAFT ACTIVITY AREAS AT THE MAYA SITE OF CARACOL, BELIZE

by

CYNTHIA POPE JONES, B.A.

THESIS

Presented to the Faculty of the Graduate School

of The University of Texas at Austin

In Partial Fulfillment

of the Requirements

for the Degree of

MASTER OF ARTS

UNIVERSITY OF TEXAS AT AUSTIN

May 1996

SMALL CHERT TOOLS AND DEBITAGE FROM CRAFT ACTIVITY AREAS AT THE MAYA SITE OF CARACOL, BELIZE

APPROVED BY

SUPERVISING COMMITTEE:

Thomas R. Hester

Fred Valdez, Jr.

Arlen F. Chase

Dedicated to the Memory of

P. Ernest Lowe, Jr.

Beloved Uncle and

Gifted Flint Knapper

ACKNOWLEDGMENTS

I would like to thank the members of my thesis committee, Thomas R. Hester, Fred Valdez, Jr. and Arlen F. Chase, for their encouragement, patience, and input during the time I worked on this project. A special thanks goes to my husband, John G. Jones, for proof reading an early rough draft of this thesis. Little did I know when we first met that my inquiry of his expertise in removing phytoliths from lithics would lead us on to so many adventures together.

I would like to thank the Caracol Project Directors, Arlen F. Chase and Diane Z. Chase and the Department of Archaeology in Belize for giving me the opportunity to work at Caracol. I would like to thank the members of the Department of Archaeology in Belize, especially John Morris, Allan Moore, David Griffith, and Harriot Topsey, who gave their time and support to the Caracol Project. I would like to thank Rusty Okoniewski and the University of Central Florida for their support of the Caracol Project and for providing me with a fellowship which helped me to get underway studying Maya lithic material.

A special thanks goes to fellow Caracol Project members, the Chases, Susan Jaeger Liepins, Clarissa Hunter-

Tate, Wendy Giddens, Greggs Cestaro, Denise Kuiper, and Maureen, that led excavations at the ten operations included in this study. Thanks for the hard work and dedication, and thanks for the memories and snake stories. A special thank you goes to Susan Jaeger Liepins, from Southern Methodist University, who provided me with drafts of her dissertation which contained a lot of provenience data. Wendy Giddens is also appreciated for taking the time to xerox lot cards providing me with other much needed provenience data.

I would especially like to thank my husband, John G. Jones, and my parents, Armon David Pope and Barbara Estelle Pope, for their loving support during my days in graduate school and for their patience during the time I spent writing this work.

I would like to acknowledge the library staff at the Smithsonian Tropical Research Institute, in Panama, especially Vielka Chang, Angel, Elizabeth, and Ricardo. They helped provide me with books, journal articles, and dissertations while I was writing and gathering the background information for the thesis. I would also like to thank C. Antonio Montaner, from the Smithsonian Tropical Research Institute, for taking photographs of the stone tools. Another thank you goes to John G. Jones for taking the scanning electron microscope photographs, courtesy of the Smithsonian Tropical Research Institute.

I would like to thank Harry J. Shafer and John Dockall from Texas A&M University for providing technical information on lithic manufacturing and analysis. I also thank Thomas R. Hester for teaching me the fundamentals of lithic analysis in his class at the University of Texas at Austin. Allen Bettis spent numerous hours teaching me the skills of flint knapping and helped me figure out how to make drills and trimmed flakes. Our replicated tools came in handy for use-wear experiments, and these skills will help me conduct more use-wear experiments in the future.

A final thanks goes to those who make life in the field absolutely wonderful. Mrs. Rita Wiltshire is thanked for her wonderful cooking at Caracol. All the bird watchers and ornithologists at both Caracol, Belize (Carolyn and Bruce Miller) and from S.T.R.I., in Panama (George Angehr, Karl Kaufman, Doug and Tara Robinson, and Giles Seutin) are thanked for giving me the skills to find and identify birds. There are more than Maya ruins in the forest and I hope Caracol remains a beautiful refuge for both flora and fauna.

ABSTRACT

SMALL CHERT TOOLS AND DEBITAGE FROM CRAFT ACTIVITY AREAS AT THE MAYA SITE OF CARACOL, BELIZE

by

Cynthia Pope Jones, M.A.

The University of Texas at Austin, 1996

Thomas R. Hester

Lithic material was analyzed from ten different architectural groups at the Maya site of Caracol, Belize. This material was sorted into established tool and debitage types based on morphology, function, manufacturing techniques, and a linear reduction sequence. The lithics were examined in terms of craft activity locales which occurred in the Late Classic to Terminal Classic Maya periods. The majority of the tools consisted of drills, which were closely associated with marine shell manufacturing debris indicating their use for shell working. However, the tools may have additionally been used for working other materials not easily visible in the archaeological record. The presence of small chert tools indicates that a specialized level of craft activity had occurred at specific loci at Caracol and was important to the economic and socio-political aspects of the Maya.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1: INTRODUCTION

Statement of Research Problem

In order to understand the social, political and economic complexity of a culture, the role of craft specialization must be taken into consideration. Craft activities are an important aspect of any culture and should be studied in an attempt to understand the way in which they operate within a society. For the Maya, craft activities became very important to the economic, political, and social relationships within heavily populated areas. The question of who controlled the resources, the knowledge of manufacturing techniques, and even the craftsmen themselves becomes very important. At the Classic Lowland Maya site of Caracol, Belize, long-term excavations have been conducted (A. Chase and D. Chase 1987, 1989, 1994a, 1994b; D. Chase 1994; Hunter-Tate 1994; Jaeger 1991; Liepins 1994) which have uncovered lithic debitage deposits. Chert artifacts in these deposits have provided evidence for the existence of specialized craft activity (C. Pope 1991 and 1994). This present study concentrates on one particular type of lithic craft activity, which involves the manufacture of very small chert tools at the site of Caracol, Belize.

Lithic material recovered in excavations at Caracol are examined in this study in an effort to determine where such craft activity areas occurred. Sizable quantities of chert artifacts were recovered from various test excavations, during the 1985 to 1991 and 1994 field seasons of the Caracol Project. They are analyzed here in an attempt to clarify functional matters.

At the Mosquito architectural plaza group (Structures M11 through M14), excavations in 1989 uncovered chert debitage in association with marine shell debris (Cobos 1994; Jaeger 1991; Liepins 1994; C. Pope 1991, 1994). This type of deposit was unusual. A preliminary analysis conducted on the artifacts revealed small chert tools that seemed to be used as drilling, cutting, and grinding implements for working marine shell into jewelry and ornamental objects (C. Pope 1991, 1994).

The same type of chert tools were found in excavations at the Midway plaza group (Structures M6 through M10), although only a few pieces of marine shell debris were found. The presence of just a few pieces of marine shell is still quite significant, since this could indicate that the small chert tools found at the Midway group served the same purpose as those at the Mosquito group. It is possible that marine shell debris at the Midway group was collected and dumped by the Maya in another location which was not excavated. Another possibility is that the Midway artifacts were not only used for working shell but also for working other material such as limestone, bone, jadeite, teeth, or wood. After deposition, wooden artifacts usually decay rapidly and do not appear in the archaeological record. Thus, in order to better understand the function of the small chert tools more lithic artifacts from a variety of archaeological deposits needed to be analyzed.

An in-depth analysis of the small chert tools and related debitage from the Mosquito and Midway plaza group excavations is included in this study. Additionally, lithic material recovered during excavations conducted from the 1985 to the 1991 field seasons were examined in order to include more artifacts that share similar characteristics and contexts with the lithic material from both the Mosquito and Midway plaza groups. A total of 62 plaza groups were examined by excavations at Caracol by the end of the 1991 field season. All of the lithic material from these 62 plaza groups has been examined for this study, but only nine groups were found to contain similar small chert tools in large enough quantities to be possibly representative of areas used for craft activities.

Excavations conducted in 1994 at the Earth architectural group (Op. C103) uncovered a small chert tool workshop area. Lithic material from this group was included in this study since it was found in a primary deposit. In order to understand the importance of such small chert tools to the ancient Maya, analysis of the lithics from these ten operations was needed to determine the function of these tools, the craft activity involved in manufacturing the tools, and their relationship to other craft activities.

Goals of This Research

The goals of this study included: 1) a comparison of lithic data from different architectural groups which exhibit the same kind of lithic debitage and tools; 2) an analysis of the lithic debitage to determine the technique used to manufacture the tools; 3) a functional and morphological analysis to determine the tool types for better comparison of the tools between sites; 4) a use-wear analysis to determine the use of the tools; 5) the determination of the relationship between the stone tools and the associated marine shell debris- specifically, whether these tools were used only to carve marine shell or if they were rather used to carve various other types of material (such as wood, limestone, jadeite, teeth, and bone); 6) the determination of the time period in which these craft activities occurred, and 7) the examination of socio-political and economic influences this craft activity may have had on the Maya of Caracol.

Lithic material recovered in Caracol excavations was examined in order to discover which architectural groups had similar chert material consisting of these small tools. A total of 62 operations involving excavations at various architectural features were examined for the presence of small chert tools. Nine excavation areas were chosen from Operations 1 through 62 because they contained fairly large quantities of small chert tools and the related manufacturing debitage. Another operation from the 1994 field season was chosen because it contained large quantities of small chert tools and debitage. Detailed descriptions of these excavations and the results of the chert analysis for each are presented in Chapter Five.

The analysis of the lithic debitage is included in this thesis in order to determine what manufacturing processes were involved in the making of these stone tools. Lithics from all ten excavation areas are compared to determine any uniformity in the manufacturing techniques. A comparative analysis is also used to determine the origin of the raw chert material; this addresses the question of where the Caracol lithic resources came from. Are the lithics from local resources or are they trade materials from other Maya sites?

The next step in this analysis is the categorization of the small chert tools into types, so that intrasite and intersite comparisons can be made. A morphological and functional analysis of the small chert tools was conducted to determine identifiable tool types. Classification types were based on similarities in shape with known forms from published sources and from the presumed function as determined by visible and microscopic use-wear patterns found on the tools. Comparisons have also been made between the Caracol lithics and lithic material from other Maya sites, as well as other prehistoric cultures of Mesoamerica and North America.

In order to answer the question of whether the tools were used only for carving marine shell or whether they were also used for working other materials, a use-wear study was conducted. The stone tool artifacts were examined by a low (2x to 10x) power hand lens and by high (50x to 500x) power magnification with a light microscope to determine variations in use-wear patterns indicating different uses.

Another method for determining the possible function of the small chert tools consisted of a comparative study of the lithic material from the ten different architectural plaza groups. This included an examination of the size and shape of the artifacts, quantities and percentages of each tool type recovered, the type of deposition, and the contextual associations with other artifacts recovered in the same excavations.

Temporal variation of the small chert tools was also considered. Architectural features which are excavated and found to contain chert material may also contain pottery or pottery sherds. Ages of occurrence for many pottery styles have been determined at Caracol (A. Chase 1994), as well as other Maya sites. Ages assigned to pottery associated with small chert tools can be applied to the age of occurrence of the lithic manufacture.

Social, political, and economical aspects of craft specialization are also considered. Among the Maya, carved shell objects played an important role as status symbols and as ceremonial objects (Sievert 1994). Shell objects and jewelry are often depicted on the clothing of rulers in Maya art (Schele and Miller 1986). Archaeological excavations have revealed shell ornaments (i.e., adornos) and jewelry which were buried with the dead or placed in special caches (Moholy-Nagy 1985). The makers of these small chert tools participated in a craft activity which produced the means to transform the shell into beautiful and meaningful status objects. To what extent the elite members of society may have controlled this craft activity and the craftsmen is not known, although it is clear that these carved shell objects enabled many members of Caracol's society to display their wealth and position.

The lithic material is the sole remaining physical evidence of one or more existing craft activities which had their place in the social order of the Maya. The relationship of the lithic material to marine shell artifacts and other materials may be taken to indicate the social, political, and economic importance of the lithic craft activity. Small chert tools provided the means to produce important economic commodities, which may have fallen under the control of the elite members of the society. What may have started as a household industry by part-time craftsmen may have evolved into a full-time specialist production. In order to determine if occupational specialization existed among the Maya of Caracol, analysis of artifacts from craft activity areas becomes crucial.

CHAPTER 2: BACKGROUND

Background of the Maya

The ancient Maya culture is perhaps best known for its large urban centers consisting of monumental architecture. Many other key developments of the Maya are well known and include the extensive use of agriculture, the emergence of complex societies, the use of calendrical systems and the development of a writing system (Sharer 1994). The Maya are also highly regarded for their artistic abilities, as represented by their beautiful ceramics, stuccoed and painted friezes, carved stelae, woven textiles, carved shell, and eccentric lithics.

Early peoples lived in Belize prior to the Maya. The earliest culture is the Paleoindian best known for their lithic tool assemblages which often included fluted projectile points (Hester et al. 1982). Little information has been gathered on Paleoindian age sites in Belize. MacNeish et al. (1980) hypothesized that a Paleoindian complex existed in the area from approximately 9000-7500 B.C. This "Early Hunter" period ended at the finish of the Pleistocene ice age around 7500 B.C. (M. Coe 1987).

An Archaic period continued to around 2000 B.C., as represented by simple horticulturalists, hunters, and incipient farmers (Coe 1987). In Mesoamerica, village type settlements may have first appeared during the Archaic period along coastal areas where food was abundant year round (Sharer 1994). Archaic lithic sites have been found in Belize and several of these have occurred along the Caribbean coastal area (MacNeish 1980, 1986). Inland, probable sedentary, communities had become established by at least 3000 B.C. at the Cob site (Pohl et al. 1994). Between 3000 and 2500 B.C., incipient agriculture was being practiced throughout northern Belize, with pollen evidence for manioc and maize occurring at both the Cob site and Cobweb swamp (Jones 1992, 1994a; Pohl et al. 1994). Additional archaeological evidence from Pulltrouser Swamp (Jones 1992) and Colha (Hester et al. 1993) confirms the presence of preceramic peoples (Jones 1991, 1994b; Hester et al. 1993). This transition from the Archaic to the Preclassic Maya is not yet well defined. Traditionally it has been based on the introduction of the Swasey Ceramic complex at the site of Cuello, Belize (Andrews and Hammond 1990). Recent recalibration of radiocarbon dates from Swasey locations place the first appearance of this pottery phase at 1100 to 1000 B.C., during the Middle Preclassic (Andrews and Hammond 1990).

At present, there is little evidence of an Archaic occupation from the Maya site of Caracol, Belize. To date, only one chert projectile point that could be considered stylistically Archaic in date has been found; however, it was located in a modern roadway and, thus, its provenience is questionable.

The Maya Preclassic era (ca. 1000 B.C. to A.D. 250) is defined by societies that reached a high level of complexity (Hammond 1994; Sharer 1994). Archaeological evidence indicates that sophisticated religious and economic institutions occurred, probably based around hereditary leaders, or chiefs. These chiefdoms formed the basic cultural pattern which extended throughout Preclassic Mesoamerica (Sharer 1994).

The Classic Period, A.D. 250 to 900, saw the evolution of a more complex political organization and the development of the state. Areas surrounding large city centers were politically controlled by authorities presumably from dynastic lineages (Schele and Miller 1986; Sharer 1994). During this time, the lowland Maya area flourished. The Classic Period has been sub-divided into the Early Classic (A.D. 250-550), Late Classic (A.D. 550-800), and Terminal Classic (A.D. 800-900).

Maya society was integrated through ideology. The Maya believed in a cosmological order; the supernatural guided all the daily activities of individual people, including economic transactions, political events, social relationships, family and village life, as well as the production of food and other resources (Schele and Miller 1986; Sharer 1994). Functioning as both political leaders and priests, the rulers and elite directed activities such as the giving of tribute, the building of temples and palaces, and the trade networks operating both within a site and between sites (Sharer 1994).

The final period of the Maya is the Postclassic, A.D. 900 to 1500, which saw the transformation of Maya society (Chase and Rice 1985). The Postclassic period ended with the Spanish conquest (Hammond 1982).

Geology and Environment of Caracol

The Classic Maya site of Caracol is located on the Vaca Plateau in the foothills of the Maya Mountains of west-central Belize (Figure 1). The area surrounding the site of Caracol is a semi-deciduous tropical rain forest. High humidity and abundant rainfall created an environment with a great diversity of plant and animals species. In this environment the Maya were able to find hardwoods, vines, and palms for building materials. Edible fruits and plants were also available, as well as various animals which were

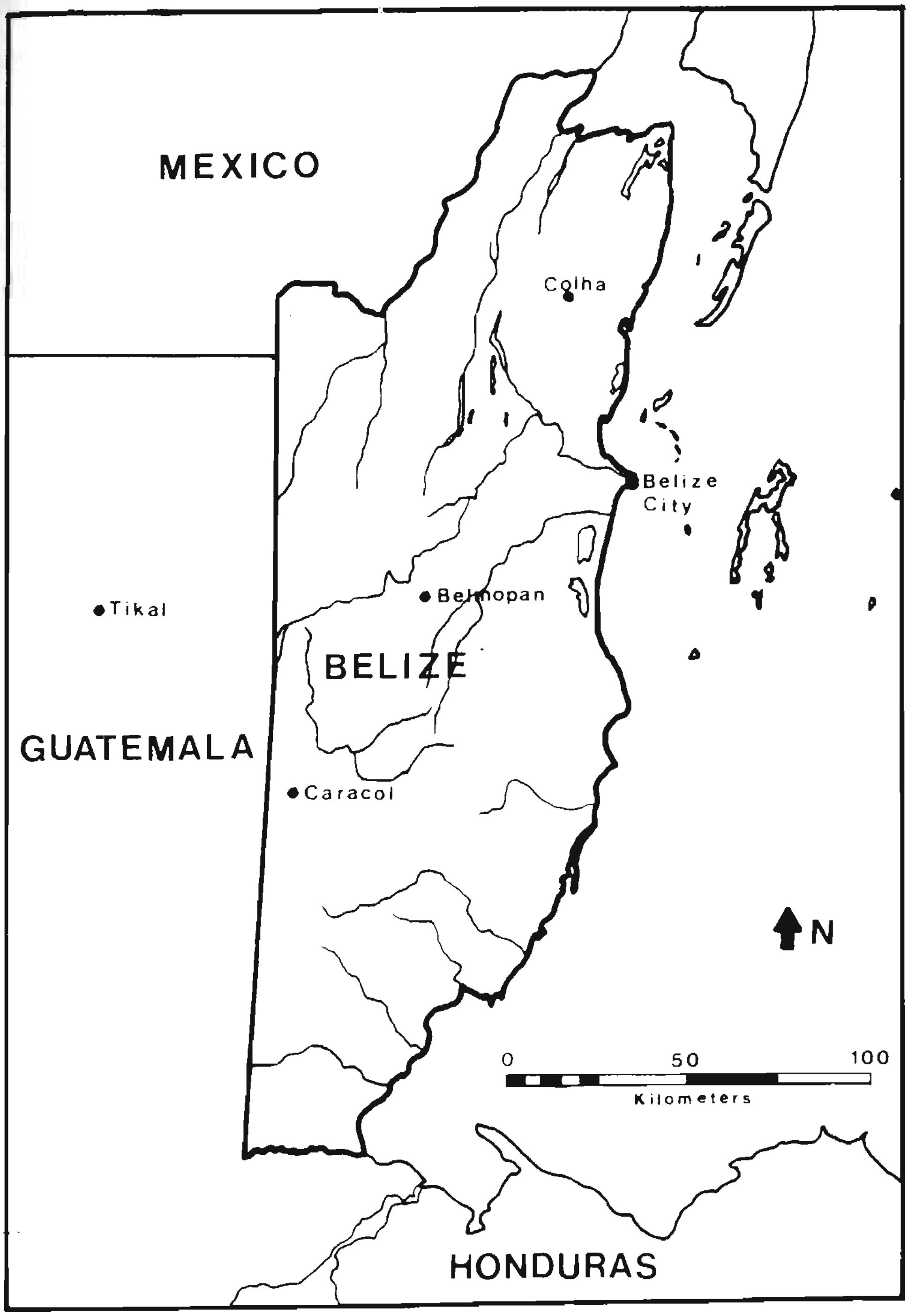


Figure 1. Location of Caracol, Belize

sought after not only for meat but also for hides and feathers.

The terrain of the area is composed of rugged, broken karst limestone of Mesozoic and Cenozoic Age formations (Bateson and Hall 1977; Weyl 1980). The local limestone provided a sturdy building material- soft enough to cut, but strong enough to withstand time. The Maya also developed a technique of using burned limestone to produce stucco and mortar to strengthen, enhance, and decorate their buildings. A visual study of the debitage from Caracol indicates that a local low grade chert material was employed for the majority of the small chert tools. Small chert nodules have been found in the limestone at Caracol and it is likely that chert outcrops could be found in the area.

At Caracol there is an abundance of agricultural terraces found throughout the site (A. Chase and D. Chase 1987; Healy et al. 1983; Jaeger 1991, 1994). It is assumed that the Maya cleared the local forests of its natural vegetation and began planting domesticated crops. Over the years, the Maya constructed terraces out of local rocks and boulders to cultivate crops, presumably of squash, beans, corn, and possibly other domesticated plants, although pollen and phytolith data are problematic at Caracol (Jones

1994). Some large stone tools were employed in these activities; however, these were not included in this study as they represent agricultural activities rather than craft activities.

Excavations at Caracol

The site of Caracol is believed to have been continuously occupied from at least the Late Preclassic (300 B.C. to A.D. 250) through the Classic Period (A.D. 250-900), and may even extend into the early part of the Postclassic era (ca. A.D. 1150) (A. Chase and D. Chase 1989). The site has not been mapped in its entirety and the extent of the peripheral areas of Caracol have yet to be determined. Surveys of the site core indicate that it encompasses some 177 square kilometers (A. Chase and D. Chase 1994a:5). Caracol consists of monumental architecture in the epicenter, with radial intrasite causeways extending outward into the peripheral areas (A. Chase and D. Chase 1994a: Figure 1.1). The pie-shaped wedge of land between the Pajaro-Ramonal Causeway and the Conchita Causeway (Figure 2) was sampled by excavations as part of a two-year project (sponsored by the H. F. Guggenheim Foundation) concerned with the effects of warfare on the Caracol population (A. Chase and D. Chase

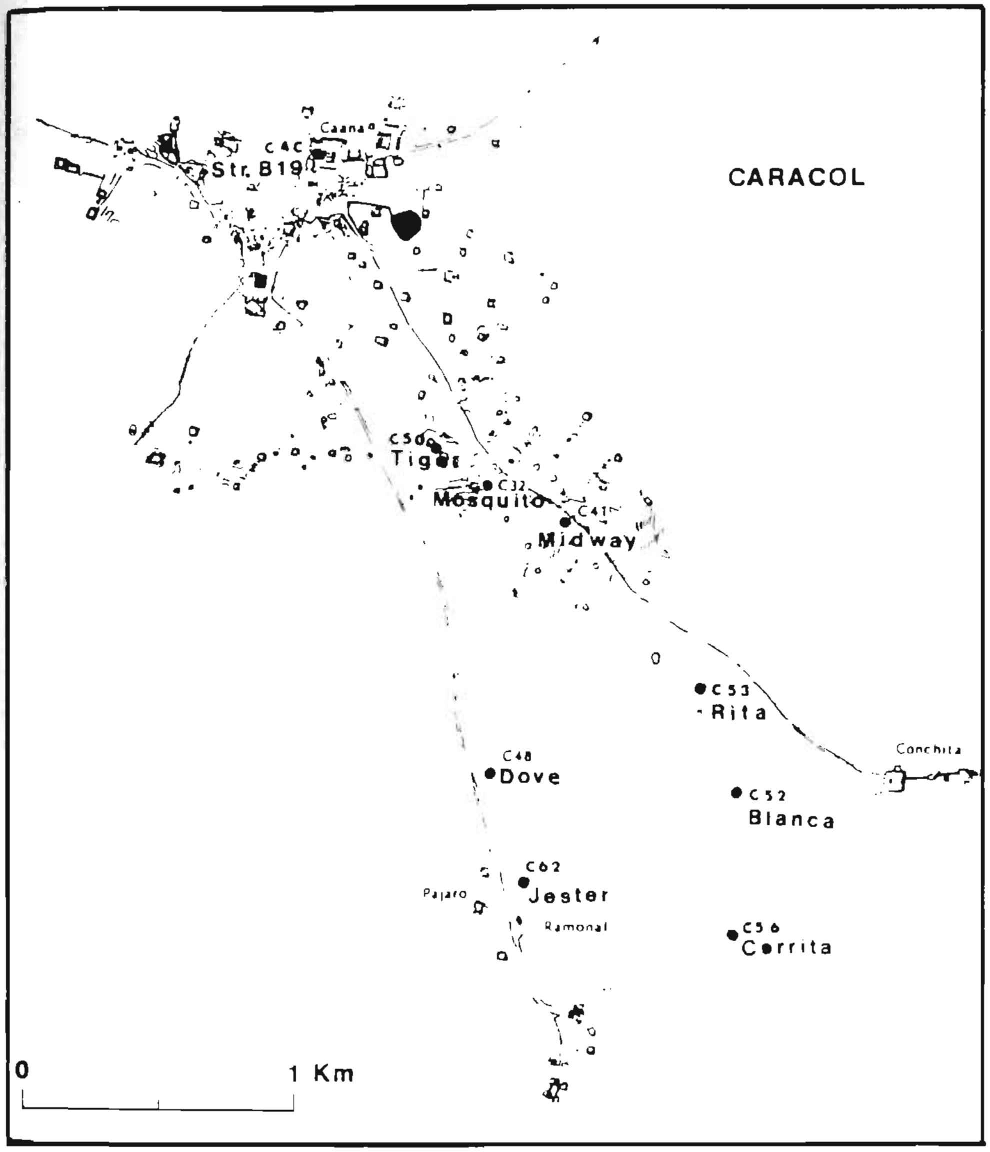


Figure 2. Location of excavation units containing small chert tools.

1989). This work was based on epigraphic data included on a ballcourt marker, Altar 21, which described Caracol's success in war with Tikal in 9.6.8.4.2 (A.D. 562). Archaeologically, it has been demonstrated that after this time there was a significant increase in the site's population as reflected by the large increase in the building of architectural structures (A. Chase and D. Chase 1989).

Throughout many sites in the Maya region, a "Middle Classic hiatus" had been noted for the Southern Maya Lowlands. There was a standstill in the amount of growth as demonstrated by a reduction in the building of structures and the lack of dated stelae. Whereas many sites dwindled or ceased to develop, Caracol seemed to have flourished (A. Chase 1991; A. Chase and D. Chase 1989). A slight decline and absence of monuments was first recorded for Copan by Morley (1920). The idea of a Middle Classic "hiatus" was discussed by Willey (1974, 1977), and a change in artifact styles and material culture was expressed by Proskouriakoff (1950). This is especially true for Tikal where burials were suddenly found to be impoverished and changes in material culture provided evidence for a new population at Tikal (Coggins 1975). This recorded "hiatus" period began at 9.5.0.0.0 (A.D. 534) and ended between

9.8.0.0.0 (A.D. 593) and 9.13.0.0.0 (A.D. 692); (A. Chase and D. Chase 1987:58-62).

Whereas many sites may have undergone a time of change, instability, and decline during the "hiatus", Caracol flourished and grew in size and population (A. Chase and D. Chase 1987). Caracol seemed to have ascended to power as the primary site of this region of the Southern Lowlands, and held this power for at least a century (A. Chase and D. Chase 1987).

It is interesting to note that the small chert tool industry appeared at Caracol around A.D. 600, after the war with Tikal. Perhaps the introduction of this craft activity was associated with the population boom that Caracol experienced as a new primary site.

Excavations at the Midway and Mosquito plazuela groups, located beside the Conchita Causeway, were conducted by Susan Jaeger as part of a settlement pattern survey (Jaeger 1991). Examination of the chert material from both of these architectural groups showed evidence of the small chert tools (C. Pope 1991, 1994). Lithic material from later excavations revealed that seven additional groups also contained this type of material out of a total of 62 plaza groups investigated through the middle of the 1991 field season. Eight of these architectural groups were located in the Conchita Causeway and Pajaro-Ramonal Causeway test area. An architectural group that possessed similar artifacts was located in the site epicenter in the B Plaza, and was associated with Structure B19, situated on top of the Caana complex (Figure 2) (A. Chase and D. Chase 1987 and 1989; C. Pope 1994). An axial trench cut through Structure B19 exposed a cache of these small chert tools. In 1994 the Earth group was found to contain a lithic workshop area. This group was included because it had a primary deposit of tools and debitage in situ and in the location where it was manufactured.

All architectural groups tested through excavation do not have small chert tool making. This small sample could be a function of limited excavation and analysis. However, it appears that this type of deposit exists in clusters and are not evenly distributed throughout the site of Caracol. Thus, it would appear that the knowledge of tool making techniques and the raw materials may have been limited to a small percent of the population, and that the craftspersons could have been considered specialists in this type of activity.

The present evidence indicates that the craft activities represented by these small stone tools derive from the Classic Period. Six of the architectural groups studied have lithic material which can be dated by contextual ceramic associations, hieroglyphic texts, or radiocarbon estimates. Unfortunately, at this time there is little information available regarding the ceramics found at the remaining four architectural groups containing the small chert tools which were analyzed for this thesis; thus ceramic age correlations will have to be established in the future.

The majority of the debitage and tools may be dated to the Late and Terminal Classic Periods (A.D. 550-900). This information is based on dates from the Mosquito, Midway, B19, Dove and Rita architectural groups at Caracol.

The Maya of Caracol erected their last monument, Stela 10, in 10.1.10.0.0 (A.D. 859). Caracol's epicentral buildings were seemingly burnt just prior to A.D. 900; however, outlying core populations continued beyond this date (A. Chase personal communication).

Although much is known about the Maya through excavation and epigraphic information, very little is known about their everyday activities and their economic structure, of which craft specialization plays a part. Epigraphic study of glyphs on stelae, monumental architecture, and artifacts provides some information on the political structure (Martin and Grube 1995).

Demographic, settlement, and artifact analyses give clues to the economic status of the people who lived in Caracol's residential groups. Comparisons of artifacts in relation to their contexts helps us to understand if the craftspersons gained an economic or social advantage by making craft objects.

CHAPTER 3: CRAFT SPECIALIZATION

Defining Craft Specialization

Analysis of lithic material from archaeological sites has moved beyond solely interpreting the morphological types and functions of tools. Instead, the archaeologist looks at the behavioral processes involved in making tools, investigates how and why tools and debitage were deposited, and interprets what role stone tools may have played in the social, political, and economic events for a given culture. Artifacts from craft activity contexts are analyzed to determine the extent and degree of craft specialization. In terms of economic and sociopolitical organization the complexity of a culture can be reflected by the type or intensity of craft specialization. Craft specialization in the Maya region has been studied by archaeologists (Hester 1985; Michaels 1989; Moholy-Nagy 1990; Roemer 1984; Shafer 1982; Shafer and Hester 1986, 1991). Their work at Maya sites indicates that a great deal of variation exists in the craft activities occurring at different sites. It appears that craft specialization produces a wide range of artifact types each with a different function and produces many different types of deposits and associations between artifacts.

The lithic material analyzed for this study indicates that small chert tools were used for craft activities and that some form of craft specialization occurred at the Maya site of Caracol, Belize. In order to better interpret these tools as representatives of craft activities, some terms must be defined. A "craft" is defined as skill or ability in handwork or the arts (Anonymous 1985). "Craft activities" produce material goods (i.e., artifacts) which are found in archaeological excavations and which represent each particular culture. Social, political, and economic factors at work within a culture or society affect craft activities by influencing the supply of crafts and the demand for particular types of craft items needed and appreciated by the consumer. These factors influence the craftspersons, the persons or groups controlling the resources used in making craft items, the marketing system which controls the movement of finished products, and the consumer.

Archaeologists try to determine the degree of specialization of craft activities. Michaels (1989) presented a useful definition of craft specialization:

> "the relatively regular and standardized mass production of a nonfood item in quantities clearly higher than those necessary for household consumption by persons having restrictive access to specific technology, knowledge, skills, or raw

materials, and characterized by a vertical division of labor."

Roemer (1984) defines craft specialization as "the markedly efficient and standardized production of a given class of artifacts which is distributed to consumers."

The term "workshop" is used to define loci where craft activities occurred.

Although archaeological evidence for craft specialization occurs at many sites, the quantity of items produced varies. A "cottage industry" is a term often associated with craft specialization and is defined as a usually small-scale industry carried on at home by family members using their own equipment (Anonymous 1985). Prentice (1983), in his comparison of the Mississippian economic system to ethnographic data of the Bushong, Lele, and Knonso tribes of Africa, gives an example of a type of cottage industry. Prentice states that, for the African tribes, cottage industries were typically found among self-supporting agriculturalists whose main livelihood stemmed from agricultural activities and whose production of items for trade tended to be a part-time activity that only supplemented the income of each family. These two definitions of cottage industries indicate either a full-time or part-time devotion to craft activities preformed at home by family members and occurring on a small scale of production.

The term "mass production" is often associated with a complex system of craft production. Arnold (1987) describes mass production as a special kind of economic specialization with greater efficiency in production and distribution, increased output, and often having technological superiority. Arnold distinguishes mass production as being identifiable archaeologically as having a high volume of production with many participants.

"Craft production" may also be defined as a full-time activity in which the participants spend all or most of their time producing craft items in order to sell these items in exchange for goods, services, or money. Shafer and Hester (1991) define a "craft specialist" as an individual who repeatedly manufactures a craft product for exchange. Production of goods by craft specialists exceeds that needed for household use. The degree of specialization is determined by the amount of time devoted to the craft and by the quantity of production.

<u>Examples of Craft Specialization</u>

In locating craft activity workshops, the type of deposition must be taken into consideration. The events resulting in the deposition of lithic material are not always easy to interpret, as the recovery of lithics does not always occur in primary deposit areas but often occurs in a secondary location (Moholy-Nagy 1990). "Primary deposition" refers to the original place of deposit with in situ artifacts relating to a workshop area. A "secondary deposit" indicates a relocation of artifacts either by ancient people or geologic processes. The Maya had a tendency to collect lithic material and redeposit it within architectural features as construction fill material (Moholy-Nagy 1990). Moholy-Nagy points out that secondary deposition could be quite misleading when trying to determine where craft workshops actually existed.

Ethnographic studies provide useful analogies that help us to better understand the circumstances surrounding chert artifact deposition from craft activity areas. Refuse disposal was studied in the Maya highlands by the Coxoh Ethnoarchaeological Project which examined the practices in three traditional Maya villages (Hayden and Cannon 1983). Hayden and Cannon found that little, if any, refuse was left in primary context and that the residents attempted to remove refuse from immediate living areas by taking it to a secondary discard area. Different types of refuse were variably treated according to their relative value, their usefulness as recyclable material, and their potential to be a hindrance (and in the way of other activities) at the site. Larger items which could create a hindrance were usually stored for short time periods nearby, then later gathered up and dumped in specified locations. Convenience was an important factor in determining which natural or cultural dumping locations would be used for the disposal of refuse. Household sweepings were conducted daily. This removed things such as wood shavings from carving, food scraps from eating, and small inorganic items with little future value. Refuse swept from patio areas was usually dumped into a garden plot, into an off-patio location near the structures, thrown downhill, or put into a designated dumping place. Thus, lithic material found within the hard packed dirt of a plaza floor may be those pieces that accumulated over time that were missed by sweepings because they had been pressed down into the dirt floor, possibly by people walking over them.

Hayden and Cannon (1983) mention "clutter refuse" which consists of potentially recyclable material, such as ceramics and lithics, which could be later reworked into something useful. Such material was usually kept in a temporary disposal area near or within a house structure, often with the intent to dispose or rework the material later. They suggest that items with a recycling potential, that were placed into temporary dumping sites, are the most likely to be left undisturbed at the time of household abandonment. They also found that the refuse disposal within a residential household group is affected by the number, type, and intensity of activities that take place within that group.

Removal of material from the primary location of the craft activity, or workshop area, to a secondary location affects the amount of debitage which would accumulate over time. This could bias a lithic sample. Lithic material recovered from excavations of primary deposit locations may actually be the byproduct of a much larger quantity of chert material, some of which may have been discarded within nearby architecture or even at a dumping location off the mound or plaza platform.

An example of craft specialization has been identified for the Maya region. Large chert tool workshops with high production rates have been recorded from the Maya site of Colha, Belize. Colha dates from the Middle Preclassic (1000 to 300 B.C.) to the Early Postclassic time periods (A.D. 850 -1250)(Hester 1982; Michaels 1986, 1989; Potter 1980; Roemer 1984; Shafer 1982; Shafer and Hester 1983, 1986, 1991). Workshop areas included talus accumulations that slumped off platform mounds and entire mounds made solely of accumulated material (sometimes even situated on top of small platforms). Mounds at Colha included an impressive amount of chert; some were constructed of over 99% pure debitage with very little other material (Shafer and Hester 1986). Large volumes of lithic material indicated production for a large number of consumers. The widespread distribution of Colha chert indicates that such production was clearly not only for local household use. During the Late Preclassic period, chert tools from Colha provide an excellent example of craft specialization. This specialization is easily noted because the lithics of this period included only a few specialized types: large oval bifaces, tranchet bit implements and macroblade implements (Hester 1982; Shafer 1982). Analysis of the debitage and tools which failed during production indicates a standardization of technique, tool forms, and production efficiency. These three traits are the characterizations of craft specialization on a commercial scale (Shafer and Hester 1986).

Craft specialization often involves resources other than lithic material. Marine shell manufacturing debris found in association with chert tools indicates possible workshop areas where craft activities occurred. Shell artifacts have been recorded from many Maya sites, including Uaxactun (Kidder 1946), Piedras Negras (W. Coe 1959), Mayapan (Proskouriakoff 1962), Cerros (Garber 1981), Tikal (Moholy-Nagy 1963, 1985), Colha (Buttles 1992; Dreiss 1982, 1994; Potter 1991), and Dzibilchaltun (Taschek 1994). Marine shell shows up very early in the archaeological record in the Maya region with shell production occurring in the Middle Preclassic at Colha (Potter 1980) and Cuello (Hammond 1982). Worked Spondylus shell and carved jade was common during the Maya Late Preclassic period (Culbert 1977). During this time period, there was an increase in the circulation of marine shell in the Maya Lowlands (Garber 1989). The use of marine shell increased during the Classic Period, when the use of marine shell ornaments was widespread throughout the Maya region.

Shell ornament and jewelry manufacture was an important activity not only for the Maya, but in other parts of Mesoamerica as well. In a survey of the Ejutla Valley in Mexico's Southern Highlands, Feinman and his colleagues (1991) recorded the finding of marine shell debris and jewelry items from the Terminal Formative and Early Classic periods (Monte Alban II-IIIA). At Ejutla, the basic marine shell ornament types included disks, beads, pendants, bracelets, and small angular pieces called "placas". These forms are similar to pieces described from sites in the Maya area. The Ejutla de Crespo site in Oaxaca was noted for its high density of shell debris and the presence of worked pieces, including several disks and an unfinished bracelet. This site was identified as a workshop area and chert tools were found in association with drilled shell beads. Shell working loci were also found at the San Jose Mogote center, 100 km from the Pacific Coast. Thus, important trade networks existed to bring marine shell into the site where the craft activity occurred.

Feinman, Nicholas, and Fedick (1991) point out that the percentage of finished and largely completed items found at Ejutla comprised only 3 to 4% of the total shell material. The remaining 96% of the shell material consisted of debris, indicative of a manufacturing context. For comparison, at Tikal, Moholy-Nagy (1985) recorded 35 to 45% finished and largely completed shell artifact types. These mostly derived from burials, caches, and structural contexts. Thus, smaller percentages of finished pieces, especially when mixed with larger quantities of shell fragments, could indicate a workshop area.

Lithic tools, that are similar to those from Caracol and associated with marine shell, have been recorded from craft activity areas from other cultural regions in North America. Jeanne Arnold (1987) recorded the use of chert microblade-drills among the late prehistoric Chumash on the Channel Islands in California. Arnold explained that thick, ridged or crested microblades were removed from the core by percussion and were then used to create sturdy drills or perforators. The ridge extends lengthwise down the dorsal surface of the microblade, forming a triangular or trapezoidal cross-section. The microblade is then retouched along either the distal or proximal end to form the tip portion of the microdrill (Arnold 1987).

The microblade-drills, described by Arnold (1987), were used by the Chumash to drill shell beads which were used as a type of monetary exchange. This production developed into a craft specialist's activity. Craft specialization among the Chumash is indicated by a very high volume of production materials, a high degree of technological standardization, high success rates in production, control over critical resources, and the inclusion of the specialists' tools with burials (Arnold 1987). Of particular interest is her identification of workshop areas which were spatially separated from house floors and occupation and subsistence areas.

Other regions of North America also produced lithic materials, similar to those from Caracol, which were determined to be shell-working tools (Ensor 1991; M. Pope 1989; Yerkes 1987, 1989, 1991). Chert tools from the Mississippian region included microdrills used to drill holes in shell beads. Yerkes (1991) described the technique of preparing microblade cores using a bipolar flaking technique. Burin spall-like microblades were then removed from the core. The microblades were then retouched to form rod-shaped microdrills which were hafted. Microdrill workshops have been found at Cahokia, where the Kunneman site yielded evidence of full-time specialists making microdrills (Yerkes 1991). Yerkes determined that the shell bead manufacturing areas were separate from the microdrill workshops. He reached this conclusion because other craft activity areas that contained microdrills, shell beads, and shell refuse mixed together had an absence of chert debitage.

Wood, Bone, Jadeite and Other Carved Material

Examples of carved wood were found at Dzibilchaltun, Yucatan, Mexico (Taschek 1994:124-131), preserved from deposition in constantly wet environments at Cenote Xlacah and in a well. Taschek describes carved wooden artifacts in the shape of beads, finger rings, ear flares, spindle whorls, pins, etc., and also describes carved and drilled beads made from cohune palm nuts. Sievert (1992:56) recorded the recovery of wooden tools, handles, atlatl shaft fragments and an idol which were made with stone tools, and found preserved in the wet environment of the Cenote of Sacrifice at Chichen Itza. Alternate periods of wetting and drying at Caracol would have destroyed any fragile wooden artifacts of these, but it is possible that the Maya of this site did make such items. The existence of a wooden lintel in the site's A Plaza (A. Chase and D. Chase 1986) confirms there was some form of woodworking at Caracol.

Carved bone has also been found in excavations at Caracol (A. Chase and D. Chase 1989:10-13; Jaeger 1991). Carved bone found at other Maya sites includes types as awls, pins, ear flares, perforated disks, pendants, finger rings, needles, beads (W. Coe 1959; Garber 1989; Taschek 1994).

Jadeite, and other polished stone such as hematite, has been carved and polished into beads, jewelry, figures and mosaic pieces and has been found at numerous Maya sites (W. Coe 1959; Garber 1989; Taschek 1994). Caracol also has produced jade beads, jewelry, adornos and mosaic pieces.

Limestone spindle whorls and drilled pottery sherds are also found at Caracol. Initial cutting, drilling and carving of these various materials may be conducted with small chert tools.

Interpreting Craft Specialization

For the interpretation of craft workshops, there is some difficulty in establishing whether the craftspersons worked on their crafts on a full-time or part-time basis. Although it is difficult to determine how much time was spent on the activity, it is possible to determine if the specialization is one that resulted in the production of excess goods for trade and exchange. Comparisons of archaeological data within a site and between sites may enable us to determine how much time was spent on a craft activity. For instance, the site of Colha has a tremendous quantity of accumulated lithic artifacts and debitage, representing full-time craft specialists' activities (Michaels 1989; Roemer 1984; Shafer and Hester 1991). The tools were made in amounts much greater than what the local residents could use and were traded or distributed to many other sites. The amount of debitage and tools from an architectural group, workshop area, or mound of debris can be compared statistically to the passing of time periods for the Maya culture (Drollinger 1989; Roemer 1984).

Workshops may be linked to full-time or perhaps even part-time specialists with a high production rate of standardized tool types (Shafer and Hester 1986). Workshop deposits at Colha during the Late Preclassic and Late Classic Periods contained over 99% pure chert debitage and included microdebitage from producing standardized tool forms at such primary locations. That standardization of tool forms existed in the process of manufacturing is indicated by the presence of only four types of tools being produced for distribution to consumers (Shafer and Hester 1986). In the interest of defining craft specialization, the production rates for making chert tools should be determined. At Colha, there is evidence of mass production for wide distribution based on high production rates (Shafer 1991; Shafer and Hester 1991).

Craft specialization could occur on a smaller level with part-time craftsmen. McAnany (1986) suggests that in non-money economies, land is the fundamental unit of wealth. It would not be an economic advantage to give up subsistence production in favor of specialized commodity production. Craft specialists and peddlers often emerge due to land shortages and are forced into attempting to transform their craft skills and transporting capabilities (i.e., trade) into food (McAnany 1986). Additionally, McAnany suggests that seasonal periodicity in agricultural activities can leave slack time which could be used for craft activities. By viewing the family as a production unit, a division of labor may be established based on sex or age (McAnany 1986). Some of the family members may have been involved with agrarian activities, while others would have been occupied with specialized craft activities to boost their families income through barter or trade.

The subject of craft specialization involves many economic and political issues. In order to understand the importance of craft activities, it is important to note what or who has control over the economy. Among the Maya, the government, a group of rulers, or a social elite may have controlled the economy. Defining the extent of craft specialization helps provide information on who has access to the materials and knowledge of craft-making techniques as well as who controls the resources.

Craft specialization is affected by the political and social views of a culture. Stone tools were used to work marine shell, which became an important commodity. Marine shells and the jewelry and decorative objects made of shell became status symbols and objects of wealth in Maya society. The importance of shells as a rare and precious item to the Maya is illustrated by the epigraphy and iconography found at archaeological sites. Schele and Miller (1986) give many examples of the intricate artwork of the Maya. Ornate items were made out of marine shells and were worn in elaborate clothing, in headdresses, and as jewelry. The importance of marine shells in Maya ideology is also reflected in the images of God N, who is often depicted as emerging from a conch shell or who often appears in a full-body form wearing a section of a shell as a pectoral (Schele and Miller 1986).

The ceremonial and social use of marine shell was documented by Moholy-Nagy (1985) at the Maya site of Tikal, Guatemala. She noted that, due to the distance of Tikal from the coast, it was doubtful that the mollusks would have arrived at the site fresh enough for consumption. She therefore attributes the use of the shells by the Maya for social and ceremonial purposes. She stated that by the time of the Terminal Preclassic period, the use of shell ornamental objects was important as a status indicator (Moholy-Nagy 1985). An important aspect of her findings is that there was a distinction between lower and higher status shell items based on the elaborateness of burials, caches and architecture; for example a tomb burial was thought to be a high status area of deposition and was correlated to Spondylus.

Moholy-Nagy (1963, 1985) stated that the thorny oyster shell , Spondylus spp., was ground and polished on the exterior to bring out the orange, red, or purple color, and this type of shell was valued almost as much as jadeite. Moholy-Nagy also described the use of conch shells, which were cut and carved into elaborate ornaments, especially rosettes. Additionally, Oliva sp. shells were found with the spires removed and perforated for hanging as tinklers; whole shells were drilled and strung as necklaces. The Tikal findings relative to the type of marine shell used seem to compare favorably with the Caracol material (Cobos 1994).

Archaeological evidence at Tikal seems to support the idea that the ruling elite controlled the trade of the most highly prized marine shells. Moholy-Nagy (1963, 1985) determined that Spondylus shell ornaments found in Early to Late Classic tomb burials were "made to order" at coastal sites and transported to Tikal and that the control of these specific marine materials was indeed in the hands of the elite.

McAnany (1986) presented a model, based on her studies at the Maya site of Colha, in which petty traders moved a single line of goods over a short distance. She viewed the petty trader as usually being the producer of the merchandise, which frequently originates from a limited resource zone. McAnany suggested that commodities could have been transported to a central marketplace for acquisition by local consumers, but it is also possible that goods were moved through an economically important figure, such as the head of a lineage. Establishment of marketplaces could provide elites with the opportunity to tap into exchange transactions through a type of taxation (McAnany 1986).

Craft Specialization at Caracol

The chert artifacts analyzed for this thesis consisted of small tools and the related manufacturing debitage recovered from ten different locales at Caracol. Flakes, cores, and other debitage produced by knapping chert provides evidence of tool manufacturing, which indicates craft activities.

The presence of chert tools and related chert manufacturing debitage represents an activity area where the stone is reduced in size and shaped into tool forms. These tools are then used and their edges worn down during another activity involving the making of artistic or functional craft objects. The making of chert tools is, in itself, a craft; however, in the craft activity areas at Caracol, the craftspersons went beyond making stone tools; they used these tools to create objects such as marine shell beads, jewelry and adornos, and carved wood. It is also possible that the chert tools were used for carving jadeite jewelry, limestone, and bone. Possibly they were even used to drill holes in teeth for jadeite and pyrite inlays. The evidence is clear that a specific type of craft activity occurred at Caracol. However, defining the extent of this activity is not quite so easy.

At Caracol, plaza household groups, containing chert artifacts from craft activity areas, are surrounded by agricultural terraces. The presence of these terraces indicates that at least some of the residents of these household groups spent much of their time in agricultural practices. It is possible that only a portion of the household members participated in craft activities, while the others spent their time in agricultural or other activities. The presence of finished craft objects in house groups that do not show evidence of craft activity areas; however, indicates that members of these households could acquire craft objects through trade or barter. Therefore, craftspersons from plaza groups containing workshops at Caracol produced craft items in quantities greater than needed for their own household group.

A problem of defining craft specialization at Caracol is determining whether these individuals used this craft activity as a full-time occupation or as a part-time specialization (with the rest of their time spent in other procurement activities, such as food growing and processing). Agricultural terraces surround eight household plazas that have workshop areas containing deposits of small chert tools and related debitage, thus suggesting that subsistence activities were also conducted by the residents of these architectural groups. The lithic material found at Caracol is not present in the extremely high quantities found at a site like Colha. Rather, small chert tools found at Caracol represent a small production rate. They nevertheless indicate the occurrence of a specialized craft activity.

Some statistical data has been gathered relating to chert artifacts from craft activity areas at Caracol. Comparisons of the quantity of lithic material recovered from different architectural features during a given period of time may provide information concerning the amount of chert material that was produced by the Caracol craftspersons over time.

In discussing locations of craft activity areas at

Caracol, the subject of "primary deposits" vs. "secondary deposits" needs to be taken into consideration. Primary deposition locations contain chert material representing the entire lithic reduction sequence. Not only are whole tools found, but debitage resulting from the manufacture of the tools is also recovered.

The lithic material from Caracol analyzed for this thesis represents various types of deposition. Only one architectural group, Op. C103, clearly demonstrates a primary deposit where lithic material was found in situ at the location where it was manufactured. Some of the chert material was placed in secondary deposits, such as trash heaps stored in old tombs, fill material placed within the architectural coring or under a plaza floor. These examples represent secondary deposits in which the Maya selectively chose the material to be dumped, gathered it up, and then transported it to the deposition area. However, it is most unlikely that the material would have been transported very far away; rather, it would have been discarded in a nearby storage area, dump site, or construction feature. Another type of secondary deposit includes ritually or ceremonially-placed caches of objects in architectural constructions. While the cache is a feature in a primary location, the artifacts may be considered as having been placed in a secondary location away from their place of manufacture or use. These caches are interpreted as being important for building dedications and rituals, having specific meanings tied into the activities that occurred at that architectural group (D. Chase 1988; Schele and Miller 1986; Sharer 1994). Secondary deposits often leave an unclear picture as to the place of origin or the manufacturing loci of the chert tools.

At Caracol, trash deposits were found within the architecture at the Mosquito household group. This would seem to fit well with Hayden and Canon's (1983) ethnographic study which showed that artifacts which have the potential of being recycled, such as broken pottery, bone, shell and lithic material, would likely be deposited nearby, either permanently or temporarily. With this material close at hand, a craftsperson could decide to reshape a flake, resharpen a tool, carve a bead out of a cut marine shell fragment, or carve a pottery sherd into a spindle whorl. At Caracol many marine shells were imported intact from the Caribbean coast and worked into ornamental objects. Clear evidence of this occurred at the Mosquito architectural group (Operation C32) where an abundance of worked shell fragments and unfinished jewelry items indicates a manufacturing context (C. Pope 1989, 1994).

During excavations at the Mosquito group the presence of marine shell was noted as something out of the ordinary, possibly reflecting a shell "workshop." The unique characteristics of the lithic assemblage was noted in the lab as containing an abundance of flakes with retouched edges. Analysis of the lithic material revealed both small tools and the debitage from their manufacture. A repeated pattern of standardized tool forms was found which included drills, trimmed flakes, wedges, and bifaced flakes of a specialized nature. A preliminary visual analysis of the wear patterns of this material seemed to point to their use as shell working tools. Small chert tools deposited with worked marine shell suggests that the Maya of Caracol used the tools to work the shell into jewelry and ornamental objects. The chert tools were likely to have been produced mainly for shell working, but may have also served as utilitarian tools for the working of other materials which do not readily show up in the archaeological record (such as wood, bone, or teeth).

The close association of chert tools and worked marine shell (C. Pope 1989, 1991) indicates that these tools were used for shell working. A total of 1829 fragments of Strombus gigas including partially worked and failed jewelry items as well as other worked pieces, were found at the Mosquito architectural group (Operation C32).

Marine shells found at Caracol included 49 marine species and 5 genera from the Belizean littoral (Cobos 1994). Of the 3650 marine shell objects described by Cobos (1994), the majority of the artifacts recovered in excavations at Caracol are made from Strombus gigas, the Queen conch shell. This included rings, buttons, discs and pendants. Large quantities of shell artifacts were made from Spondylus americanus, the Atlantic thorny oyster, which was highly sought after for its orange to red color. These two species plus Olivella dealbata and Prunum apicinum outnumber the other marine species found at Caracol (Cobos 1994).

At Caracol, 442 shell objects of the Atlantic thorny oyster Spondylus americanus (Pelecypoda) were found in excavations, most notably in the shape of beads, disks, pendants, or anthropomorphic figures (Cobos 1994). Other marine shell jewelry included rosettes, earflares, rings, pendants, and other intricately carved items; 84 such items were made from Strombus gigas (Gastropoda) (Cobos 1994). Oliva reticularis (Gastropoda) shells were found at Caracol in the form of tinklers, described as tweezers by Cobos (1994); they had holes drilled in them for stringing.

Beads were drilled either uniconically from one side or biconically from both sides until the holes met in the middle. In addition to beads, many pendants have been found which were drilled so they could be strung and worn. Disks made from marine shell at Caracol were decorated with a series of shallow holes drilled on the surface, from .5 mm to 1.0 mm deep, forming a decorative pattern. In addition to using solid chert drills for drilling holes or perforating material, another method has been mentioned at other sites. The use of hollow tubular drills made from cane, was used to cut shell into disk shapes (Caso 1965; Coe 1965; Feinman et al. 1991; Saville 1900). Although this technique may very well have been employed at Caracol, there is no clear evidence for it.

The abundance of marine shell at Caracol indicates the presence of a trade route. The Maya have long been recognized as having had complex trade networks. Caracol is situated in the Maya Mountains of Belize, approximately 100 miles from the Caribbean coast. The shell debris found at Caracol indicates that whole shells were transported from the coast to Caracol, where they were then worked into jewelry. Marine shell debris from the Mosquito group consisted of deliberately cut pieces and jewelry fragments abandoned after being broken during the manufacturing process. Other excavations at Caracol recovered whole shells. Intrasite exchange of the shell artifacts is inferred by their presence throughout Caracol in many residential burials in groups which are not associated with workshop debitage.

Throughout the Maya region, large tomb burials, crypt and cist burials, and even simple burials often contain shell jewelry and ornaments (including earflares, rings, pendants, beads, and adornos with sun, star, or disc shapes; Buttles 1992; W. Coe 1959; Garber 1981). These ornamental objects were included as grave goods in many Caracol burials, even though they may have been high status items (A. Chase 1992; Miller and Schele 1986; Sharer 1994; Sidrys 1983). A wide range of shell jewelry and ornamental objects have been found in burials at Caracol; they have been included in elite burials in the site epicenter and in simpler burials throughout metropolitan Caracol (A. Chase and D. Chase 1987, 1989, 1994a; D. Chase 1994; Cobos 1994). These items represent a craft activity which may or may not have been controlled by a select group within Maya society. To determine if elite members of society controlled this commodity, analysis of artifacts from craft activity areas is necessary in order to attempt to gain an understanding of the type and complexity of the economic and sociocultural systems of the Maya.

CHAPTER 4: METHODS OF LITHIC ANALYSIS

Lithic Analysis Background

Past archaeological studies of the Maya have often overlooked the importance of smaller lithic artifacts in favor of concentrating only on larger tools. Larger tool types were described in terms of morphology, the general appearance or shape of the artifact. Morphological studies in the Maya region were conducted at the sites of Uaxuctun (Kidder 1947), Piedras Negras (W. Coe 1957) and Tikal (Moholy-Nagy et al. 1984). However, analysis of stones tools based on morphology did not always represent the true use of the tools (Hester 1986, Lewenstein 1987). For instance, projectile point typology used in Texas was applied to tools in Mesoamerica (Moholy-Nagy et al. 1984). Morphological studies often misclassified tools with different shapes from tool resharpening and erroneously placed them as a separate type.

Lithic studies in other regions included functional analysis determined by basing morphology on measurable attributes of debitage (Collins 1974). Collins' analysis of debitage from France and Texas included a linear reduction model, based on behavioral patterns, from the acquisition of raw material, followed by initial reduction of the raw material, primary trimming, secondary trimming and to tool maintenance after its use. Lithic reduction analysis has been conducted with many artifact collections in an effort to reconstruct the steps taken in manufacturing tools (Collins 1974, Wyckoff 1992).

Lewenstein's (1987) lithic analysis at Cerros, a Late Preclassic Maya site in northern Belize, involved the determination of tool function through experimentation with replicated stone tools. Lewenstein established a set of use-wear standards by which to compare the ancient stone tools. She determined that tool morphology cross-cuts tool function (Lewenstein 1987:Table 26).

Intense lithic studies began to be conducted at the Maya sites of Colha (Hester 1985; Michaels 1989; Potter 1980; Roemer 1984; Shafer 1982; Shafer and Hester 1983, 1986, 1991) and Cerros (Lewenstein 1987; Mitchum 1991) in northern Belize which considered the development of craft specialization, production and trade. Other recent studies of lithics from Mesoamerica have also included economic perspectives (Clark 1988), and social behavior (Sievert 1992). While most lithic tool assemblages from northern Belize little resembled the small chert tools from Caracol, some parallels exist (Johnson 1976; Potter 1983). A few small chert drills similar to ones found in the Caracol assemblage have been reported by Mitchum (1991) from the Cerros area. Mitchum reports that these few drills were not standardized in their shape and seemed to have been made on small blades or biface resharpening flakes.

At Tikal, Guatemala, emphasis was placed on larger lithic tools until 1966 when Robert Fry collected lithic material which was analyzed by Olga Puleston in her thesis (Puleston 1969). Her study concentrated on a deposit of small chert tools which she suggested were used in wood working activities at the site. Tools which were identified as wood working tools from Tikal visually appear to be similar to tools from Caracol which were found in association with marine shell debris. Puleston's analysis placed the small chert tools into morphological categories based on shape attributes which seemed to cross-cut the function of the tools from Caracol. For this reason Puleston's model was not followed for this study. Apart from the Tikal study there are few references available which indicate the presence of these types of tools in large quantities from the Maya region.

Since many small chert tools at Caracol were found in close association with shell manufacturing debris, examples of shell working tools were examined from other cultures. For example, craft specialization among the prehistoric

Chumash of the Channel Islands of California has been documented by Jeanne Arnold (1984). Her study concentrated on the chert microblade-drill industry used in the manufacturing of shell beads for trade. Likewise, the use of stone tools in the manufacturing of shell beads by the Mississippian culture has been researched by Yerkes (1987, 1989, 1991), M. Pope (1979), and Ensor (1991). In these cases, the lithics described for these areas are quite similar to the small chert tools found at Caracol. The contextual associations between the chert tools, related chert debitage, and shell manufacturing debris bares a great resemblance to material found at the Mosquito group at Caracol (C. Pope 1991, 1994). The close association of marine shell and chert tools suggested the tools were used for shell working activities. This does not rule out the possibility that the chert tools may have had broader functions, being used with other materials (wood, bone, jadeite, teeth, etc.); however, their function still remains as craft making tools, thus indicating craft activities of a specialized nature.

In order to determine what type of tool manufacturing technique was employed an analysis of the chert debitage was conducted. A linear reduction sequence was considered as the model for classifying the chert debitage. Chunks of raw material were found in the debitage collection indicating that fist sized or slightly larger chunks of raw material were reduced in size by removing the rough outer cortex. Three classes of flakes were used by Collins (1974) in a debitage study to categorize flakes according to the amount of cortex present on the artifact. Primary cortex flakes were those with cortex over virtually all of the flake exterior. Secondary cortex flakes had remnants of cortex on portions of the exterior. Non-cortex (tertiary) flakes had virtually all of the cortex removed and were from the interior of the chert nodule. Collins (1974) found that his debitage from Texas and France contained less than 10% primary cortex flakes and most strata contained less than 5% primary cortex flakes. Collins found that secondary cortex flakes ranged from 12.7 to 23.3%, and non-cortex flakes were the most numerous flakes ranging from 51.4 to 88.9% of the flakes in each strata.

Lithic Debitage Types

In the case of flake analysis, the removal of flakes is thought to reflect a behavior which follows the process of core preparation, followed by cortex removal, (Collins 1974) and that past patterned behavior reflects patterns visible in lithic artifacts. To understand past behaviors concerning craft production involving small chert tools, the debitage remaining from their manufacture needed to be analyzed.

In order to understand the manufacturing processes behind the production of small chert tools found at Caracol, the lithic debitage needed to be sorted and classified. For this study the lithic debitage was divided into different category types based on a manufacturing reduction sequence. These technological types are easily distinguished by visible attributes which represent different stages in a linear reduction model based on the removal of cortex from the raw material. This whole process of reducing a raw material to a finished tool form is represented by the lithic debitage found in ten excavations at Caracol associated with small chert tools. The lithic debitage was classified into the following categories: raw material, cores, core fragments, primary and secondary cortex removal flakes, tertiary flakes, blocky fragments, shatter, ridge flakes and burned debitage.

Examination of debitage indicated that a bipolar flaking technique was used in the chert manufacturing process. This technique allows easier handling of small chert nodules and tends to conserve raw material by extracting only small portions of chert while removing the rough exterior cortex (Hayden 1980). Placed on a hard anvil stone or held in the hand and supported by the leg, the chert nodule would be struck from above by a hard object or hammerstone. Bulb-of-force scars are seldom seen from this technique; instead, there are force wave scars occurring at the end with the least contact and crushing at the opposite end (Crabtree 1982). Use of the bipolar flaking technique allowed the Maya of Caracol to obtain the greatest amount of tools from the locally available small nodules of chert.

Raw material is available in the Caracol vicinity and consists of fist sized or slightly larger nodules of poor to good quality chert. The chert is covered or partially covered with a thick gray or white patina. A great deal of variation exists in both the quality and color of the chert material. The finest quality chert came from Suboperation C4C, the trench into Structure B19 while the poorest quality chert was found along with better quality chert at the Earth group, Op. C103. Descriptions of the colors and qualities of the chert are given in Table 2.

A core is the nodule of lithic material which is struck in order to produce flakes. A core usually consists

Table 1. Chert Descriptions

No.	Munsell Color	Munsell Description	Quality	Description
1	10YR 6/1 to 10YR 5/1	gray	very good	gray with white inclusions
2	2.5YR 6/2	pale red	good	vitreous, translucent
3	10YR 6/2 and 10YR 8/1	light brownish gray and white	good	mottled appearance
4	10R 6/2 to 10R 4/2, with bands of 10YR 7/2 to 5YR 7/2	pale red to weak red with bands of light gray to pinkish gray	very good	banded in various shades
5	10R 6/3	pale red	fair	coarse and opaque, color has tiny speckles
6	2.5Y 8/2 and 10YR 8/8	white and yellow	fair	cream with a yellow band
7	7.5YR 8/0 and 7.5YR 6/0	white and gray	good	mottled, fairly smooth
8	7.5R 4/0 and 7.5R 3/4	dark gray to dusky red	fair	spotted appearance
9	7.5YR 7/4	pink	good	caramel color, semi-smooth, opaque
10	10YR 8/3 to 8/4	very pale brown	good	creamy texture

of a striking platform at the proximal end opposite the tip or distal end. Flake scars appear on its surface where flakes were removed, while lateral ridges form between the flake scars (Geier 1973). The majority of the cores from this sample show the use of bipolar flaking techniques, containing a great deal of force-wave scars. Many of the cores are amorphous in shape and contain several platforms.

Primary cortex removal flakes refer to the first flakes removed from a nodule of raw material, where cortical material covers the entire dorsal surface of the flake. The curvature of the cortex on the Caracol flakes indicates the use of small nodules of chert as the starting raw material. A secondary cortex removal flake is formed by the further removal of cortex from the core. Cortex appears on these flakes but they also show flake scars from previous removals of primary cortex flakes. Further reduction of the material forms tertiary flakes which lack cortex and are the result of low intensity percussion or pressure flaking intended to further modify and shape the stone (Geier 1973).

Blocky fragments refer to chunks of chert which cannot be identified as cores because they lack a striking platform. They do show flake scars but no signs of retouch flaking so they are not tool fragments. These pieces are probably the result of manufacturing errors and broken cores.

Shatter is characterized by angular and irregularly shaped chunks of chert resulting from high impact or heavy percussion techniques. They also lack well defined bulbs of percussion (Geier 1973).

Ridge flakes are also found among the debitage. These are formed by making a ridge along an edge of the core which is then removed in a single blow. The dorsal surface contains the ridge while the ventral surface is smooth and occasionally has a bulb of percussion at the proximal end. These ridge flakes have a slight curvature along the lateral edges and do not appear to be utilized. Ridge flakes may have been intended for further reduction by removing small flakes along the lateral edges forming workable tools, categorized as trimmed flakes. They are usually either triangular or trapezoidal in cross-section.

A few pieces of burned debitage are found among the lithic material. These include flakes, shatter and broken tools. Such pieces are characterized by a milky look on their surface and by the presence of pot-lid fractures (concave scars formed on the surface while the stones were heated unevenly). There is no further reduction of burned debitage in this manufacturing sequence.

The presence of cores and cortical flakes indicates initial reduction of the chert raw material. Tertiary flakes indicate the final steps taken in processing tools. Evidence of both the initial and final reduction of the lithic material was found at both the Midway and Mosquito architectural groups. Utilized tool forms were also recovered in the excavations at both groups.

Use-wear Analysis:

Use-wear analysis has been conducted among lithic studies in attempts to determine functions of chert tools (Johnson 1976, Keeley 1980, Lewenstein 1987, Semenov 1983, and Shea 1991). Microscopic scarring of the stone tool surface can indicate the direction of tool movement and gives clues which suggest the type of material worked by the tool and the length of use. Striations are a type of visible use-wear which appear as linear depressions that form on the tool surface. The pressure between the tool and the worked material can force microscopic grit or particles to be dragged across the stone surface forming these striations (Kamminga 1979; Shea 1991). Another type of use-wear is a polish which refers to the light reflecting properties of worn areas on siliceous rocks where use-wear forms a deformation of the surface (Kamminga

1979; Keeley 1980; Shea 1991). Polishes vary in the amount of light which is reflected and varies according to the material worked (Shea 1991).

Lawrence Keeley (1980) analyzed the use-wear of paleolithic material by conducting a series of replicative experiments using stone tools in a variety of functions. He compared the use-wear created on replicas with ancient stone tools of the same stone materials. Both high and low power magnification was used to look for microwear traces and heavy wear patterns on the tools. For each experimental tool and archaeological specimen, the types of wear were noted, the placement of the wear on the tool, and the direction of linear microwear features. Edge angles were measured with a goniometer and compared as well as the measurements of all the tool dimension sizes.

For this thesis, in studying the feasibility of using chert tools to cut marine shell, replicas of the tools were made for experimental use. Replicas of the small chert tools from Caracol were made by Allen Bettis, from the University of Texas at Austin and by the author. A bipolar flaking technique was used to initially reduce the raw material. Flakes were removed from the core to set up a ridge. The ridge blade was removed from the core. Small flakes were removed from the lateral edges using a hard hammer technique with a small hammerstone. The ridge flake was struck from the ventral side while removing the flakes so the flake scars would be on the dorsal surface and aligned with a steep angle. The ridge flake was trimmed into a lozenge-shape to make a trimmed flake. Extra flakes were removed from the distal end to form a sharp tip for making drills.

Replicas of drills and trimmed flakes were used by the author to cut and drill a conch shell, Strombus gigas, which composes the majority of the marine shell debris found at the Mosquito architectural group (Operation C32). Using a drill held in the hand, a hole 2 mm wide and 2 mm in depth was drilled in only one hour, approximating the size of the holes used for pyrite and jade inlays set into shell jewelry. A deep line was incised into the shell using the sharp lateral edges of both the drills and trimmed flakes. Many of the shell jewelry items from Caracol have similar incised lines. Chert drills may also have been used to drill holes into teeth for pyrite and jadeite inlays, however experiments with a hand held drill proved to be difficult using a single loose tooth and the author only managed to scratch the surface. Future experiments should be conducted to further test the use of chert drills on teeth.

Small Chert Tool Types

A drill is an implement with a pointed end that is used for boring holes in hard materials, by a rotating abrasion (Figure 3. g,h,i,j,k,l). Examination of use-wear patterns under low (2x to 10x) and high power (50x to 500x) magnification indicate a rounding of the pointed tip caused by abrasion during rotation. Drills typically have a longitudinal axis extending from the proximal or base end to the distal or tip end. This axis is longer than the width of the tool. In preparing the drill, the lateral edges are often trimmed to create parallel lateral edges for better manageability. Drills are the predominant tool type is this examination of craft activity areas. Table 2 lists the quantities and weights of the drills found for each of the 10 plaza group investigations.

Another type of drill called a core drill is also found in the Mosquito group assemblage. These are quite unusual being made from expended cores which are small in size and further reduced at the distal end forming a large coarsely shaped drill bit. Low powered (2x to 10x) magnification shows rounding and polish indicating use-wear at the distal end. This type of use-wear may have been made from a rotating motion. One such core-drill from Suboperation C32C/7 shows a great deal of this type of use-

Figure 3. Trimmed Flakes: a) C32C/1-1; b) C32C/6-6; c) C32A/4-6; d) C41A/2-3a; e) C41A/2-3b; f) C41A/2-3c; and Drills: g) C32C/2-3; h) C32C/8-2e; i) C32A/4-6; j) C41A/2-3d; k) C41A/2-3e; l) C41A/2-3f.

TABLE 2: Quantities and Weights of Drills

Group and Operation	Whole Drills		Drill Fragments	
	Qty.	Wt. in grams	Qty.	Wt. in grams
Structure B19 trench, Op. C4C	217	256.7	1	1.0
Mosquito, Op. C32	137	336.2	1	0.7
Midway, Op. C41	182	256.4	29	40.1
Dove, Op. C48	81	98.0	0	0.0
Tiger, Op. C50	193	162.9	7	7.1
Blanca, Op. C52	216	238.4	5	2.1
Rita, Op. C53	315	409.6	0	0.0
Cerrita, Op. C56	689	746.2	21	8.2
Jester, Op. C62	32	37.1	4	2.5
Earth, Op. C103	758	749.8	21	17.0
Total	2820	3291.3	89	78.7

wear. This artifact is 3.5 cm in length and 2.1 cm in width.

There are many trimmed flakes found in the lithic material from the ten operations included in this study. Trimmed flakes are a somewhat problematic category representing flakes which were trimmed by flaking and retouching of the flakes' lateral edges. This type was formed as a broad based category for flakes which show additional retouch and for which identification as a tool type was not clear; however, a similar manufacturing technique was employed. The trimmed flake category includes flakes formed by preparing a ridge or set of ridges along a lateral edge of the core. This ridge flake was then removed by a blow to the core in order to create a flake which was smooth and flat along its ventral surface with one or more ridges along its dorsal surface. The trimmed flakes are generally lozenge-shaped. The majority of these flakes are trapezoidal in cross-section, but many are also triangular in cross-section. The ridge flake is then trimmed by removing tiny flakes along the lateral edges to create a steep angle. When measured, with a goniometer, the majority of the trimmed flakes have edge angles of between 75 and 90 degrees. Examples of trimmed flakes are given in Figure 3:a,b,c,d,e, and f.

Many wedges have been found at both the Midway and Mosquito groups. These are characterized by a working edge showing minute step-fractures and parallel lateral fractures. Working edges often show heavy crushing and may have been produced from bi-polar flaking. Some of these tools resemble the piece esquillee tool form, described be Hayden (1980) which is basically rectangular in shape. These wedges may have been used to break shells by either using them as chisels, placing one end against the shell and striking the other or, alternatively, they were hafted for support and struck against the shell.

The next tool types is a biface. A small number of bifaced flakes have been found in different excavations at the Mosquito group. The majority of these are irregular in shape. The bifaces may have been used for cutting or sawing wood and are not from excavation units associated with craft activities which utilized drills.

Of particular interest are three tiny flat disc-shaped bifaced flakes from Sub-operation C32C. These may have served as gaming pieces or may have been decorative items worked into the clothing.

CHAPTER 5: LITHIC ANALYSIS OF ARTIFACTS FROM TEN ARCHITECTURAL GROUPS AT CARACOL

A sample of 10 different architectural groups were included in this study of the small chert tools and the related debitage. Nine groups were selected from excavations conducted up to Operation 62 midway during the 1991 field season. Another group, Operation 103, was included after the 1994 field season because it exemplifies a primary deposit. The excavations are described, followed by the results of the lithic analysis for each architectural feature. Quantities of the small chert tool types and debitage types are given after each excavation description. Chert artifact quantities and related weights are summed for each suboperation. Detailed descriptions of each excavation lot are listed in Appendix A. Tables of lithic totals and weights per lot are in Appendix B.

STRUCTURE B19 TRENCH, SUBOPERATION C4C

Suboperation C4C was assigned to the excavation of a north to south aligned axial trench through Structure B19 and a portion of its supporting plaza at the summit of the Caana Structure (A. Chase and D. Chase 1987, 1989). Caana is a tiered pyramid structure which rises 43.5 meters above the B-Plaza in the epicenter of Caracol. A plaza platform is found at the summit of Caana which supports three pyramidal structures, one of these being Structure B19 on the northern side of the plaza. The unique distinction of the chert material found within this trench excavation is that it is the only sample of its type associated with large architecture in the site epicenter.

The trench was 2 m wide by 25 m long extending down the front face of Structure B19. This trench was expanded in order to uncover architectural features. The chert material from the trench is from two basic types of secondary deposits. The first includes small quantities of chert debitage scattered throughout the trench. This material was mixed into the construction fill and may or may not be associated with the making of small drill related stone tools. The second type of deposit consists of chert material located within special deposits which were intentionally cached or dumped by the Maya. Three areas either contained small chert tools as a part of a special deposit or contained small chert tools which were adjacent or related to a special deposit.

Construction fill often contains miscellaneous pieces of chert material which is dumped into the fill as discard. As walls breakdown and collapse, the chert may be redeposited into the layers containing rubble or humus. Chert material found scattered throughout the trench included 21 pieces weighing 461.7 grams.

Special Deposit SD#C4C-1 included pottery vessels, censers, and a carbon sample located above a cut made through a plaster floor. A large quantity of small chert tools and related debitage were deposited in the cut through the plaster floor. The chert here consisted of 216 drills, seven trimmed flakes, 28 cores, 30 primary cortex removal flakes, 177 secondary cortex removal flakes, 393 tertiary flakes, and one piece of shatter. Other lithic material found with the chert included three granite metate fragments, one quartzite pebble, and one granite pebble that may have been used as hammerstones. Three marine shell fragments were also found.

Special Deposit SD#C4C-3 consisted of a tomb placed under the plaza level within the remains of an earlier construction, Structure B19-2nd (A. Chase and D. Chase 1987, 1989). Stairs leading down to an earlier plaza supporting Structure B19-2nd were constructed on either side of a niche area. This niche area held Special Deposit SD#C4C-2, which consisted of pottery sherds and other artifacts. The back wall of the niche was removed. More artifactual material was found behind the niche (A. Chase and D. Chase 1987). Chert material found in association with the niche deposit included one core, one primary cortex removal flake, five secondary cortex removal flakes, nine tertiary flakes and one blocky fragment.

Removal of a stone slab behind the niche area revealed an open-air stairway leading into a tomb (SD#C4C-3). Material removed to clean up the stairs contained one broken drill fragment, one core, five primary cortex removal flakes, 23 secondary cortex removal flakes, 34 tertiary flakes and one blocky fragment. The interior of the tomb contained one core, four core fragments, one primary cortex removal flake, six secondary cortex removal flakes, and 15 tertiary flakes.

The total chert material analyzed as of the 1986 field season, from Suboperation C4C is 984 pieces weighing 4,174.6 grams.

<u>MOSQUITO, OPERATION C32</u>

The Mosquito plaza group is located 1.09 kilometers SE from the site epicenter and 52 meters west of the Conchita causeway (Figure 2). This plaza group consists of a platform which supports four small structures, M11 through M14, each approximately 0.5 meters in height. Excavations at Mosquito, conducted by Susan Jaeger (1991) as part of a settlement pattern survey, were undertaken in: an open chamber in the northern structure, M11; a tomb in eastern structure, M12; and the plaza in front of Structure M12 (Liepins 1994:52-53). A total of 1482 pieces of chert weighing 4965.4 grams came from these excavations. The chert material was sorted and analyzed into different tool and debitage types.

Suboperation C32A was assigned to an excavation placed over an open chamber in the northern structure, M11. Excavation of the interior of the chamber showed that it had been used for trash and contained marine shell debris, chert debitage and small chert tools. The interior of the chamber was 1.56 cubic meters in size (A. Chase and D. Chase 1989). Sherds from five reconstructible pottery vessels, found on the floor of the M11 chamber, dated to the Late Classic period or between A.D. 692 and 771 (Jaeger 1991). These vessels were deposited either before or at the same time as the other trash so that the occurrence of small chert tool manufacture and shell working activities can be dated to the Late Classic Period.

Suboperation C32A contained shell debris which included partially worked rings, beads, adornos, and cut shell fragments in various stages of manufacture. The association of the marine shell debris with the chert material suggests that the small chert tools were used in processing the marine shell jewelry and ornaments.

The chert recovered from Suboperation C32A totaled 449 pieces and weighed 976.1 grams. The lithic material in the open chamber included 44 trimmed flakes, 36 drills, 17 wedges, 10 primary cortex removal flakes, 81 secondary cortex removal flakes, 226 tertiary flakes, three cores, 10 pieces of shatter, 17 blocky fragments, one ridge blade, and four burned chert fragments. Provenience by lots are shown in Appendix I. Associated artifacts from Suboperation C32A include 19 pieces of slate (two of which may have been used for grinding or drilling), six sandstone fragments, and one greenstone fragment. The presence of these stone fragments may indicate their use in related craft activities to the small chert tools.

Suboperation C32B was the excavation of a collapsed tomb in the eastern structure, M12. The tomb measured 1.8 m x 0.75 m oriented along a north-south axis, and was 1.84 cubic meters in size (A. Chase and D. Chase 1989). This tomb contained burials, pottery, chert debitage, and small tools, and an abundance of marine shell debris. The 392 marine shell fragments totalled 283.0 grams (Jaeger 1991) and included a portion of a carved shell ring decorated with a series of incised notches and a round shell adorno which measured 15 mm in diameter and 3 mm thick. A bird bone was found containing two drill holes along the same side. A carved animal bone was also found. A granite river cobble possibly used as a hammerstone was found on the tomb floor. A ground basalt tool was found on the tomb floor. This tool was measured 3.4 cm long by 2.6 cm at its widest point in the middle of the tool. The tool may have been hafted in the middle. Use-wear from grinding in a circular fashion may be from its use as a drill to grind and smooth larger holes in shell. Use-wear showing battering on the distal and proximal ends may indicate its use as a hafted hammerstone. Two pieces of slate were also found.

The lithics analyzed from Suboperation C32B totaled 319 pieces and weighed 1000.0 grams. Chert debitage from within the tomb excavation, C32B, included 16 primary cortex removal flakes, 83 secondary cortex removal flakes, 138 tertiary flakes, seven blocky fragments, and one burned tertiary flake. The small chert tools found in the tomb included 25 drills, 43 trimmed flakes, five wedges, and one bifacially retouched flake. Individual lot descriptions are given in Appendix I.

The third excavation, Suboperation C32C, was a 1.5 m x 1.5 m test unit situated in front of and on axis to the eastern structure, M12. It was designed to gather datable information on the use of the platform. The excavation covered an area of 2.25 cubic meters (A. Chase and D. Chase 1989). No plaster floor was located, indicating that the platform was eroded (Jaeger 1991). Special Deposits included cache vessels centered in front of the building, one of which was associated with small chips of obsidian. The test unit contained 561 fragments of marine shell debris, a large quantity of pottery sherds, small chert tools and chert manufacturing debitage, and three basalt tools similar to the one from C32B (described above as being either drills or hafted hammerstones). The largest of these basalt tools measured 36 mm in length by 15 mm in width.

A crypt containing an adult burial was set into bedrock in the north portion of the test unit. Grave goods included a flat circular chert adorno and a shell pendant which was made by cutting a cross-section lengthwise through a whole shell displaying the interior chambers. The pendant had two drill holes so that it could be strung and worn. Chert debitage and shell manufacturing debris were also deposited in the crypt. The crypt was covered by large limestone slabs. An almost intact Queen conch shell, <u>Strombus gigas</u> (Cobos n.d.), was recovered from between these slabs. The chert debitage and marine shell debris found during the excavations of the platform and the crypt is thought to have been deposited around the time of the construction of the crypt.

The lithics found in C32C test pit above the crypt totaled 616 pieces of chert weighing 2758.0 grams and included 66 drills, 122 trimmed flakes, seven large drills made from cores, 19 wedges, three bifacially retouched flakes, 15 cores, eight core fragments, 12 primary cortex removal flakes, 142 secondary cortex removal flakes, 212 tertiary flakes, three ridge blades, two pieces of shatter, four blocky fragments, and one burned debitage fragment.

Lots C32C/6 and C32C/8 represent the excavation of the crypt, Special Deposit SD#C32C-2, and included 98 chert pieces weighing 231.3 grams. The lithics found within the crypt include 10 drills, 10 trimmed flakes, one broken drill fragment, one scraper, two disc shaped adornos, two cores, five primary cortex removal flakes, 19 secondary cortex removal flakes, 43 tertiary flakes, one ridge blade, and four blocky fragments.

The marine shell debris, chert tools, and chert debitage are clearly associated with this plaza group. Chert and shell pieces were found within the platform, thus indicating that craft activity played an important role in the plaza functions. How the workshop area was arranged is not clear because the Maya at this group dumped the chert material into trash creating secondary deposits. Dumping miscellaneous refuse into the open chamber and tomb may have helped clean the plaza and workspace areas. It is likely that the Maya did not carry the refuse far for disposal, but rather deposited it in or near the group where it was worked.

Excavations conducted at the Mosquito plaza group uncovered an abundance of chert tools and debitage in association with marine shell debris. This association indicates that the small chert tools were used to carve shell pieces into jewelry and ornamental objects (ie adornos). Of the nine architectural groups included in this study, the Mosquito plaza group stands out by containing large quantities of marine shell debris.

Suboperation C32A, the open chamber used by the Maya as a trash pit, gives the best evidence for shell working at Caracol. The excavation contained shell debris which included partially worked rings, beads, adornos, and cut shell fragments in various stages of manufacture. The association of the marine shell debris with the chert material suggests that the small tools were used in processing the marine shell jewelry and ornaments. Replicative experiments confirm that the chert tools work very well in cutting, drilling, and smoothing shell.

The eastern Structure M12 at the Mosquito group presumably served a ritual function, as indicated by the presence of the tomb within the building and the burial and caches placed in front of the structure. A Late Classic age of approximately A.D. 690 was estimated for the use of the platform, based on the ceramic style of a face cache vessel and a correlation to pottery sherds recovered in the excavation (A. Chase and D. Chase 1989). This age provides an estimate on the time of occurrence of the small chert tool making and the shell working activities.

MIDWAY, OPERATION C41

The Midway Group is adjacent to the Conchita Causeway and is located approximately 1.5 kilometers from the site center (Figure 2). Midway consists of a plaza with five structures, M6 to M10. Excavations at the Midway group consisted of two test pits into the plaza. A total of 1,892 chert pieces weighing 3,253.7 grams were analyzed from the Midway Group.

Suboperation C41A consisted of a 1.5 m X 2.95 m test pit aligned east to west in front of the eastern structure, M7. Approximately 4.43 cubic feet of material was excavated from C41A (A. Chase and D. Chase 1989), consisting of a dark brown soil matrix, above a layer of rock. The majority of the chert material was recovered from the soil matrix and the underlying rock layer. The rock layer was deposited in an effort to build a hard packed plaza surface (Jaeger 1991). Underlying the rock layer was another dark soil matrix from an earlier soil surface. Very few pieces of chert were found this deep. The few chert pieces found in this layer may have shifted downward over time through root action. Below this was soft marl bedrock.

A total of 1,891 chert pieces were analyzed from Suboperation C41A. The total weight of the chert was 3,249.7 grams. Small chert tools from this test pit consisted of 182 drills, 29 broken drill fragments, 96 trimmed flakes, two wedges, and one wedge fragment. The chert manufacturing debitage included four cores, three core fragments, 67 primary cortex removal flakes, 520 secondary cortex removal flakes, 961 tertiary flakes, 21 blocky fragments, three pieces of shatter, and two burned tertiary flakes.

Suboperation C41D was a 1.5 m by 1.5 m test pit placed in front of the northeast building, Structure M6. An area of 2.25 cubic meters was excavated (A. Chase and D. Chase 1989). This excavation unit was designed to test the plaza platform fill material. Only 1 tertiary flake weighing 4.0 grams was found in the whole excavation. Lot C41D/2 also contained two mano fragments, and a quartz pebble possibly used as hammerstone or grinding stone. Jaeger (1991) suggests the structure's main function was that of a residence.

DOVE, OPERATION C48

The Dove architectural group is located 60 meters east of the Pajaro-Ramonal Causeway approximately 2.1 kilometers extending south from the site center (Figure 2). Excavations at the Dove architectural group, Operation C48, consisted of two test pits in the plaza floor in front of the east and north structures. A total of 505 chert pieces weighing 2068.8 grams were analyzed as to tool and debitage type.

Suboperation C48A consisted of a 2 m by 1.5 m test pit set on axis to, and situated in front of, the east structure. An area of 2.97 cubic meters was excavated (A. Chase and D. Chase 1989). A small scattering of drills, trimmed flakes, and some pieces of debitage were encountered in the humus layer, lots C48A/1 and 4 (see

Appendix A). A brown soil layer, mixed with stones and found beneath the humus, also contained a few scattered lithics. The underlying limestone bedrock was cut by the Maya to form a north/south aligned crypt. Inside the burial crypt, Special Deposit SD#C48A-1, were six drills, three secondary cortex flakes, and seven tertiary flakes. These chert pieces may have fallen into the crypt from the overlying soil matrix. Other than the crypt, the remainder of the test pit contained seven drills, three trimmed flakes, two cores, eight secondary cortex removal flakes, and 13 tertiary flakes. No marine shell material was found.

<u>Suboperation C48B</u> was assigned to the excavation of a 1.5 m by 1.5 m test pit on axis to and in front of the north structure of the Dove group. The excavation of this test pit encompassed an area of 2.25 cubic meters (A. Chase and D. Chase 1989). The majority of the chert material found in this excavation came from lot C48B/1, a gray/brown humus level above a badly eroded plaster floor. Chert material below the floor level may have been pushed through the broken floor when walked upon by the Maya, or the chert may have worked downward after deposition by root action. The total amount of small chert tools from this entire test pit is 68 drills and 20 trimmed flakes. The debitage is

composed of 26 cores, four core fragments, 33 primary cortex removal flakes, 122 secondary cortex removal flakes, 178 tertiary flakes, four blocky fragments, and one burned tertiary flake.

The two test pits at the Dove architectural group, suboperations C48A and C48B, did not contain marine shell debris. It is possible that the small chert tools were used for processing other material such as wood. Alternatively shell material may have been deposited in another location. Operation C48 contained a smaller amount of lithics than the other sites explored in this study.

TIGER, OPERATION C50

Operation C50 was assigned to excavations conducted at the Tiger architectural group. This plaza group is located approximately one kilometer southeast from the site center and situated halfway between the Conchita Causeway and the Pajaro-Ramonol causeway (Figure 2). Tiger consisted of four low structures arranged on top of a platform. Three investigations were conducted at the site: excavation of a collapsed tomb in the center of the eastern structure; a plaza test in front of the eastern structure; and another plaza test in front of the western structure. From these three excavations a total of 749 pieces of chert were uncovered, weighing 979.3 grams. These were sorted and analyzed as to tool and debitage types.

A sunken area in the eastern structure with a nearby capstone was believed to be a collapsed tomb. This area was investigated as Suboperation C50A. A total of four chert pieces weighing 42.6 grams was recovered from C50A. Collapsed material within the tomb included two secondary cortex removal flakes and two tertiary flakes. These flakes probably worked out of the structure collapse- as opposed to being a part of the burial- and, thus, represent a secondary deposit.

Suboperation C50B was the excavation of a 2 m by 2 m test pit placed in the plaza area in front of the east structure. The total amount of chert found in C50B was 53 pieces weighing 128.8 grams. The humus level did not contain any lithics. Soil and rubble from the collapse of the east structure, lots C50B/2 and C50B/3, was uncovered above a plaster floor. Lithics contained within these two lots represent a secondary or tertiary deposit. Lots C50B/2 and C50B/3 contained four drills, one broken drill fragment, six trimmed flakes, four primary cortex removal flakes, 17 secondary cortex removal flakes, 10 tertiary flakes, two blocky fragments, one ridge blade, one biface and one burned secondary cortex removal flake. Two basalt tools similar to those described from Op. C32; being either possible drills or hafted hammerstones, were found. Additionally, two slate fragments were associated with this collapsed material.

Excavation of the rubble beneath the plaster floor contained no chert. Lots C50B/10 and C50B/11 contained chert material associated with a simple burial SD#C50B-3, contained within the northeast portion of the test unit. The chert consisted of seven pieces which weighed 83.3 grams. The analysis showed the chert to contain two drills, one biface, one primary cortex removal flake, and three tertiary flakes. These lithics were associated with the burial but were perhaps included in fill material used to cover the interment. A polished igneous rock was also found with the burial. This burial also contained nine worked pieces of bone, a square shell bead, and three shell fragments (one which was incised with lines). Apparently the individual buried here had access to carved marine shell. The cut and worked bone pieces may be an indication that the small chert tools were used to work materials other than shell. It is possible that both bone and marine shell were carved by the same tools, as the technique used in carving both materials is much the same.

Suboperation C50C was assigned to the excavation of a

1.5 m by 1.5 m test pit in the plaza on axis to, and in front of, the west structure. In this test pit chert material was encountered from the humus level down to the bedrock in a dark brown matrix mixed with rubble. For the entire test pit, lithic analysis showed that 693 pieces were found, weighing 731.9 grams. The chert included 187 drills, six broken drill fragments, 31 trimmed flakes, six cores, 37 primary cortex flakes, 135 secondary cortex removal flakes, 286 tertiary flakes, two shatter, and one burned tertiary flake. A carved and drilled limestone spindle whorl was also recovered. Perhaps the small chert tools were also used to carve some limestone objects.

The majority of the recovered lithic material at the Tiger group came from the vicinity of the west structure.

BLANCA, OPERATION C52

The Blanca architectural group (group 2) is located approximately 2.2 kilometers south of the site center along the Conchita causeway and approximately .3 kilometers southwest of the causeway (Figure 2).

Suboperation C52A consisted of the excavation of a chultun adjacent to the largest east structure. The excavation was conducted by Clarissa Hunter-Tate as part of a study on chultuns at Caracol (Hunter-Tate 1994). A 1.5 m by 1 m test pit aligned east-to-west was placed over half of the chultun opening. The excavation continued inside the chultun in order to examine the contents and use of the chultun (Hunter-Tate 1994). The humus lying above the original chultun entrance contained some lithics. Inside the chultun was a brown dirt matrix composed of accumulated soil which fell inside from the exposed opening. Beneath this layer was a limestone dirt matrix which was composed of accumulated dirt fallen from the limestone walls and ceiling. Pieces of chert found in these layers seem to have fallen into the chultun from the exposed opening since it was found in soil matrix and not on the floor of the chultun. Therefor, the lithics represent a secondary deposit. One marine shell fragment was found within the chultun.

Lithics found in the soil layers above the chultun opening included one core, one core fragment, one secondary cortex removal flake, one tertiary flake and one chunk of raw material. These four lithics totaled 56.9 grams.

Chert material found within the chultun totaled 10 pieces weighing 248.3 grams. No tools were found but the chert debitage included one core, one primary cortex removal flake, two secondary cortex removal flakes, four tertiary flakes, and two blocky fragments.

Suboperation C52B was the excavation of a 1.5 m by 1.5 m test pit placed in front of the largest structure on the east side of the plaza. Chert debitage was scattered throughout the humus level and continued down to a hard packed dark brown zone mixed with small rocks. The debitage found in this test pit represented the entire lithic reduction sequence. No drills were found; however a few trimmed flakes were recovered.

Suboperation C52B contained 52 lithics weighing 798.2 grams. The lithics included: two unifacial scrapers, two trimmed flakes, one medial blade fragment, nine cores, four core fragments, two primary cortex removal flakes, nine secondary cortex removal flakes, 20 tertiary flakes, and three blocky fragments.

Suboperation C52C consisted of a 1.5 m by 1.5 m test pit placed in front of a small structure on the eastern side of the plaza, from which approximately 2.25 cubic meters of material was excavated. Within this test pit 699 lithics were found which weighed 1483.5 grams. Lithics were found throughout both the humus and a lower dark brown matrix. Beneath these levels a plaster floor was found. Lithics continued to be found in the plaza fill material under the floor. The chert material above the floor contained 215 drills, five broken drill fragments, 89 trimmed flakes, nine cores, two core fragments, 11 primary cortex removal flakes, 81 secondary cortex removal flakes, 267 tertiary flakes and three blocky fragments.

Chert material located under the plaster plaza floor was deposited prior to, or during, the last plaza construction phase. Lithics found beneath the plaster floor did not include drills but did include one trimmed flake, two cores, three core fragments, six secondary cortex removal flakes, and five tertiary flakes.

The entire lithic reduction sequence is represented here but it is likely that the material was redeposited within the construction. These materials are the remnants of small chert tool manufacturing and are indicative of other craft activities as well. Small chert tools which were discarded in this area were well worn and showed a lot of use-wear. Additionally one marine shell fragment was associated with the small chert tools.

Suboperation C52D was assigned to a 1 m by 1 m test pit located on top of the larger east structure, on the slope of the front steps. The test pit was excavated to expose a burial found during the excavation of Suboperation C52B. Lithics were found in a dark brown soil matrix found beneath the humus level. The tools found here were two unifacial scrapers which do not seem to be related to the small chert tools used for making shell jewelry or woodworking. Five tertiary flakes were also found in this level.

This test pit also uncovered a cache, SD#C52D-1, and a crypt, SD#C52D-2, which was located under and in front of the steps to the structure. A few lithics were found in the crypt, including one drill, one secondary cortex removal flake, and two tertiary flakes. The entire test pit contained 11 chert pieces weighing 182.7 grams.

Suboperation C52E was assigned to an excavation extension of the C52B test unit, designed to expose a burial encountered in a prior excavation. The test pit is 1.5 m by 1 m aligned north to south. Lithics were again encountered in the dark brown soil matrix beneath the humus. Five chert pieces were analyzed as being one core, two secondary cortex removal flakes, and two tertiary flakes. The lithics weighed a total of 37.8 grams.

RITA, OPERATION C53

The Rita plazuela group is located 2.15 kilometers southeast from the epicenter of Caracol and 140 meters south of the Conchita causeway (Figure 2). The Rita group consisted of a platform supporting Structures 3F1, 3F2 and 3F6-3F8 (Liepins 1994:59, Figure 6.12), mounds ranging from

.5 to 1 m in height. Three excavations were conducted in this group which uncovered 1622 pieces of chert weighing 5587.6 grams.

Archaeological investigations at the Rita architectural group were recorded by Susan Jaeger Liepins (Jaeger 1991; Liepins 1994:61), who states that the Rita architectural group is a Type 4 group in the Caracol Typology. This designation means that the plazuela group is a non-structure focused group with no special focus on any one structure (A. Chase and D. Chase 1989). The group was built on two terrace surfaces (Jaeger 1991). This may indicate that agriculture was an important aspect of the activities of individuals living here. Therefore, any craft activities could have been conducted on a part-time basis, fitting the model of a cottage industry.

Suboperation C53A was assigned to the excavation of an open tomb located in the east structure, 3F2. A 1.20 m by .75 m test pit, aligned east-to-west, was placed over the tomb opening on the south side of the structure. No human bone was found within the chamber and it is possible that the chamber was not used for permanent interment, but possibly served as a charnel house (Jaeger 1991). A total of 1.25 cubic meters of material was removed from the entire test pit. Within the material removed from the tomb and from the area above the tomb entranceway, a total of 66 chert pieces weighing 398.8 grams were recovered.

Chert found in the excavation levels above the tomb contained one trimmed flake, two cores, two primary cortex removal flakes, four secondary cortex removal flakes, nine tertiary flakes, and three blocky fragments. Within the tomb chamber itself more lithics were encountered. The chert within the tomb consisted seven drills, five trimmed flakes, six cores, two primary cortex removal flakes, three secondary cortex removal flakes, 10 tertiary flakes, nine blocky fragments, and three chunks of raw chert material.

Suboperation C53B was assigned to a 2.35 m by 1.5 m test pit aligned east-to-west and placed on the plaza situated in front of another eastern structure, 3F1. A total of 1,519 chert pieces weighing a total of 5006.8 grams were removed from this excavation.

A badly fragmented floor was found 24 cm to 30 cm below the humus level. Below the Unit 1 floor were a series of special deposits consisting of pottery caches and a burial SD#C53B-5 (Jaeger 1991, Liepins 1994:60). The burial contained two secondary cortex removal flakes and one blocky fragment. Jaeger states that the burial contained a child placed on top of a plaster floor preserved only where the burial was placed. Considering that other structural modifications were conducted at this time, it appears that the lithics found with the burial were secondarily deposited along with other construction fill material. During the removal of the floor bedding for the burial, lithic material was found which consisted of one core, two tertiary flakes, one blocky fragment, and one chunk of raw material.

During the excavation of this test pit a tomb was discovered in Structure 3F2 just inside the front wall. The tomb had a volume of 3.88 cubic meters, and contained two individuals. Individual 1 was between 25 and 35 years of age and had at least one notched incisor inlaid with jadeite (Jaeger 1991). A shell shaped bead and three carved shell adornos were also found with the burial. Other grave goods included two limestone spindle whorls, a polished green celt, a hematite mirror fragment, and two small rectangular bars of limestone. Lithic material removed from the tomb included: 304 drills, 42 trimmed flakes, 54 cores, eight core fragments, 83 primary cortex removal flakes, 386 secondary cortex removal flakes, 626 tertiary flakes, two blocky fragments, three chunks of raw material, two hammerstones and one burned secondary cortex removal flake. Two additional hammerstones made of quartzite were also found. The total weight of chert tools and debitage removed from the tomb was 4804.8 grams.

Based on the artifacts found with the internment, SD#C53B-6, Jaeger felt that the occupants of the Rita group were members of the elite sector of Caracol society and that the occupation of the group occurred during the Late Classic Period (Jaeger 1991).

Suboperation C53C was assigned to a 1.5 m by 1.5 m test pit placed on the plaza in front of the west structure, 3F8. No floors were recovered in this structure. Based on the building size and the material recovered from in front of this structure, Jaeger (1991) determined that the structure served a domestic function. For the entire test pit a total of 37 chert pieces weighing 182.0 grams were found. The chert consisted of four drills, two trimmed flakes, 22 cores, and nine tertiary flakes. Two obsidian blade fragments were also recovered from this unit.

Suboperation C53D was assigned to a 1.5 m by 1.5 m test pit placed on the terrace behind Structure 3F7. Lithic material was not recovered from this excavation unit.

CERRITA, OPERATION C56

The Cerrita Group is located approximately 3.5 kilometers from the epicenter of Caracol, midway between the Pajaro-Ramonal and Conchita Causeways. Of the eight architectural groups off of these two causeways, Operation C56 contains those excavations furthest from the epicenter of Caracol. Operation C56 consisted of three excavations: one at the summit of the south building; a test pit into the plaza in front of the largest south structure; and a test pit into the plaza in front of the largest east structure.

Suboperation C56A consisted of a test pit placed over collapse found at the summit of the largest south structure. No human remains were found within the presumed tomb. The chamber was approximately 1 cubic meter in size and had a floor carved out of bedrock. Humus, collapsed dirt, and rubble were removed from the interior of the chamber. Within this area six pieces of chert were found consisting of two cores, two secondary cortex removal flakes, and two tertiary flakes weighing 232.2 grams.

Suboperation C56B consisted of a 1.5 m by 1.5 m test pit into the plaza adjacent to and centered on the north wall of the largest south structure. A few chert pieces were found within the humus level. Below the humus was a layer of large rubble. The soil matrix surrounding the rubble contained some chert material. In a layer of small to medium-sized rubble and a brown soil matrix, at a depth ranging from 39 cm to 60 cm below the surface level, a lithic scatter was found concentrated in the northeast section of the test pit. The lithic scatter consisted of small chert tools and the resulting debitage from their manufacture. The test pit sampled 1.35 cubic meters of material. A total of 3585 chert artifacts, weighing 3551.7 grams, were recovered in the test pit. The small chert tools included 673 drills, 21 broken drill fragments, 107 trimmed flakes, one hammerstone, and eight wedges. The debitage included 235 primary cortex removal flakes, 767 secondary cortex removal flakes, 1744 tertiary flakes, seven cores, five core fragments, two core preparation tablets, five blocky fragments, seven pieces of shatter, one chunk of raw material, and four burned chert fragments. A burned groundstone fragment was also found, which possibly may have been used as a hammerstone. Other lithic material found in the test pit included one slate fragment, three groundstone fragments, two mano fragments, one sandstone rock, one piece of cinnabar, one hematite fragment, and one obsidian blade fragment. This lithic material plus pottery sherds seems to have been dumped into construction fill used to level the plaza surface.

<u>Suboperation C56C</u> was assigned to a 2 m by 2 m test pit aligned east-to-west on the plaza surface centered in front of the west wall of the largest eastern structure at the Cerrita group. Few pieces of chert were found within the humus level. Below the humus was a brown soil matrix mixed with stones which contained a number of lithics. The soil matrix removed from a step leading up to the structure also contained small chert tools and debitage. Special Deposits for the test pit consisted of two caches and two crypts aligned north-to-south. Both crypts contained chert tools and debitage and the space between the crypts was also full of chert tools and debitage. A detailed description of the chert artifacts for each lot of the excavation of the test pit are found in Appendix A.

The entire test pit contained 401 chert pieces weighing 15,271.8 grams. Results of the analysis showed the chert tools to consist of 16 drills, six hammerstones, and one scraper. The chert debitage consisted of 21 primary cortex removal flakes, 95 secondary cortex removal flakes, 176 tertiary flakes, 34 cores, five core fragments, 16 blocky fragments, one piece of shatter, and 29 burned miscellaneous pieces of debitage.

JESTER, OPERATION C62

The Jester Group consists of several small structures arranged on a plaza platform. Excavations conducted at the Jester group were assigned Operation C62. The Jester plaza group is located approximately 3.1 kilometers south from the epicenter of Caracol along the Pajaro-Ramonal Causeway and approximately 50 meters east of the causeway. Excavations here consisted of a test pit in front of the east structure, a test pit in front of the north structure, and a test pit placed at the junction of a terrace wall which abuts the south structure. A total of 322 chert artifacts weighing 2475.4 were analyzed from these excavations.

Suboperation C62A consisted of a 1.5 m by 1.5 m test pit placed on the plaza surface in front of the eastern structure. Approximately 0.79 cubic meters of material was removed from the test pit. The humus layer contained some chert artifacts, as did the underlying layer which consisted of black soil and stones. A total of 275 chert pieces weighing 2072.4 grams were recovered in this excavation. Small chert tools consisted of 29 drills, nine trimmed flakes, and four broken drills. Chert debitage consisted of 15 cores, four core fragments, nine primary cortex removal flakes, 58 secondary cortex removal flakes, 127 tertiary flakes, 14 blocky fragments, six pieces of shatter, and seven chunks of raw material. Other lithics found with the chert included one quartzite pebble which may have been used as a hammerstone, two mano fragments, and one slate fragment. Two marine shell fragments were also found.

Suboperation C62B was assigned to a 1.5 m by 1.5 m test pit placed on the plaza surface in front of the north structure of the Jester group. Chert artifacts were recovered in the humus zone and extended to a lower layer of a black/clayey soil matrix. Lithics were also recovered in a lower orange/brown soil down to bedrock at 50 cm below the surface level. A total of 1.13 cubic meters of material was removed from the test pit. Chert material recovered from the excavation unit totaled 28 pieces weighing 304.2 grams. The chert included one drill, one core, two primary cortex removal flakes, 14 secondary cortex removal flakes, five tertiary flakes, four blocky fragments, and one piece of shatter. Other associated lithics included six quartzite pebbles and one groundstone fragment.

Suboperation C62C was a 1.5 m by 1.5 m test pit placed 70 cm away from a terrace wall near the plaza; the test pit abuts the south structure. As with the other two test pits, this unit contained a few pieces of chert from the humus layer to the underlying black/clayey soil matrix. A total of 1.10 cubic meters of material was removed and included 19 chert artifacts weighing 98.8 grams. The chert consisted of two drills, three primary cortex removal flakes, five secondary cortex removal flakes, eight tertiary flakes, and one blocky fragment.

EARTH, OPERATION C103

The Earth group is located in the northeast section of the site and consists of several small structures arranged on top of a plaza platform. Investigations here consisted of three test pits investigating different areas: 1) the plaza in front of the eastern structure, 2) the plaza in front of the western structure, and 3) the west side of the western structure. An additional soil sample was taken from the south structure mound to test for the presence of microflakes from tool manufacturing.

Suboperation C103B consisted of a 2 m x 1.5 m plaza test pit aligned north to south in front of the eastern structure. No lithic material was recovered from the humus layer. Below the humus layer was a dark brown soil matrix which extended down to a floor approximately 0.15 m below the surface level. This matrix contained one core fragment, two primary cortex flakes, two secondary cortex flakes, one tertiary flake, and one unifacial scraper.

Beneath the floor, there was a dark reddish brown matrix which showed evidence of burning and ended with limestone slabs at .47 m below the surface. This matrix contained chert debitage in the form of nine cores, two core fragments, 12 primary cortex flakes, 34 secondary cortex flakes, and 34 tertiary flakes, and four pieces of raw material. Tools from this matrix included one trimmed flake, 14 drills, one broken drill, and one uniface.

Detailing of these stones continued into a sterile soil matrix ending the test pit at 0.52 m below the surface level.

Suboperation C103C consisted of a 1.5 m x 1.5 m plaza test pit placed in front of the western structure. Lithics were found immediately in the humus, in the northwest quadrant of the test pit, from the surface to 5 cm in depth. The lithic scatter continued into a dark brown matrix which grew darker as the test pit was deeper. Large limestone slabs from the architecture were found in the test pit at 1.2 m below the surface. The test pit ended with a gray/brown bedrock at approximately 2.5 m below the surface level.

A total of 7131 pieces of chert weighing 26,438.3 g were recovered from the test pit. The chert debitage consisted of 248 cores, 121 core fragments, 35 shatter, 43 blocky fragments, 500 primary cortex flakes, 1997 secondary cortex flakes, 3249 tertiary flakes, 21 miscellaneous burned pieces, and 13 chunks of raw material. Tools recovered from this excavation included 691 drills, 178 trimmed flakes, one hammerstone, two utilized flakes, 16 drill fragments, one wedge, one uniface, one biface, one unifacial scraper, and 12 unknown tool fragments.

Suboperation C103D was the excavation of a 1.5 m x 1.5 m test pit placed behind or west of the western mound. The levels consisted of humus overlying a dark gray/brown matrix containing limestone slabs and rocks, overlying a light ash gray matrix. Beneath this was bedrock ending the test pit at .55m below surface level. Lithic material was recoverd throughout the test pit and included 15 trimmed flakes, 53 drills, four drill fragments, 41 cores, two utilized flakes, 16 core fragments, 109 primary cortex flakes, 345 secondary cortex flakes, 430 tertiary flakes, five blocky fragments, four pieces of shatter, and two pieces of burned debitage.

Suboperation C103E was assigned to investigations at the south structure at the Earth Group. A soil and surface collection was taken from the northeast quadrant of the south structure mound. The sample was collected in a 40 cm x 40 cm test area less than 5 cm deep and consisted of 2,647.1 g of soil and lithic matrix.

CHAPTER 6: DISCUSSION

In this discussion, statistical data is used to compare a sample of drills from different architectural groups. Additionally, some observations from the analysis are given. This chapter also discusses the goals of the thesis and states some problems encountered during the analysis.

Drills as a Tool Type

The drills from Caracol are usually made from modified tertiary flakes, which are further reduced by trimming along the lateral edges. During manufacture of the drills, a ridge is formed by rotating a core creating more than one platforms, thus forming an "amorphous" shaped core. A flake is then removed by a blow to a core platform, causing the ridge to be found on the dorsal side of the tertiary flake (i.e., ridge blade). Tiny flakes are then removed from each of the lateral edges to trim the width of the flake, making the lateral edges parallel. Usually, the flake was trimmed by being struck from the ventral side removing small flakes along the lateral edges. This technique left small flake scars on the dorsal side along the lateral edges. At this point the piece can be considered a trimmed flake. Sometimes the distal end, and infrequently the proximal end, is also reduced by removing small flakes. The trimmed flake may have served as a blank which was further retouched to make a drill. The distal end was trimmed to form a drilling tip and sometimes both ends were made into drilling tips.

Some drills show a slightly different manufacturing technique. The distal end was trimmed with two snap fractures, broken at angles to form a point which was further retouched to form a drilling tip. Drills formed in this manor resemble tools identified as burin-spall drills at other sites (Johnson 1976, Potter 1980, Shafer 1983), named as such for appearing similar to burins. Burins show use-wear indicating a back and forth motion rather than rotation. The majority of the drills examined from Caracol indicated use-wear from a rotating and revolving motion. One example, when examined with a scanning electron microscope at 50x to 500x magnification, showed use-wear from rotation in addition to a few striations that may have been made from an engraving motion; however, this tool's main function was that of a drill. Using the "burin spall drill" definition is problematic. Arnold (1987) cautions against using the term "burin-spall drill" to define or describe drills because it is misleading and indicates primary use as an engraving, chiseling, or incising tool. The term burin refers to the technique of preparing a blade, flake, or core so that one or more of its corners takes on a sharply angled, chisel-like shape (Crabtree 1972, Pitzer 1977). The term "burin spall drill" was avoided in this study because even when the distal end was broken at angles, a similar technique used in making burins (Sackett 1989), further bifacial trimming was still required to shape the angled tip into a sharp and usable drill point.

Drills show use-wear from rounding which forms a rounded ball at the drilling tip. This use-wear is made by a circular or semi-circular motion from drilling by either holding the tool in the hand or by hafting the tool. The majority of the drills appeared to be hand-held, but a few of them, especially from Op. C56, show possible evidence of being hafted (Figure 10).

Arnold (1987) in her description of microblade-drills from the late prehistoric Channel Islands, California, described the use of a palm tool (after Holmes 1919). In this case the drill, made from a narrow modified microblade was inserted into a split-wrapped shaft of wood, allowing the tool to be rotated back and forth between the palms of the hands (Arnold 1987, Holmes 1919).

Research conducted at Tikal by Puleston (1969) suggests that some of the pointed chert tools may be awls and were used in a back and forth motion to incise a line in the shell material. This type of motion produces short, light striations when viewed under the microscope. Tools used for incising were determined by Puleston to have a flat tip with rounding at the corners. Those tools used by rotating show a rounding of the complete tip under magnification. The majority of the drills from Midway show complete rounding of the tip. Specimens from the Mosquito group show both types of wear. However, drills examined from Caracol which had a flat appearance at the tip seems to be due to breakage of the very end of the tip rather than a different type of functional wear. These tips were broken with a tiny snap fracture removing the very tip. Usually no use-wear existed along the edges of this snap fracture. Thus, indicating the tool was discarded immediately or shortly after the tip was broken. Reports have been made of drill-like tools from a few other sites in the Maya area.

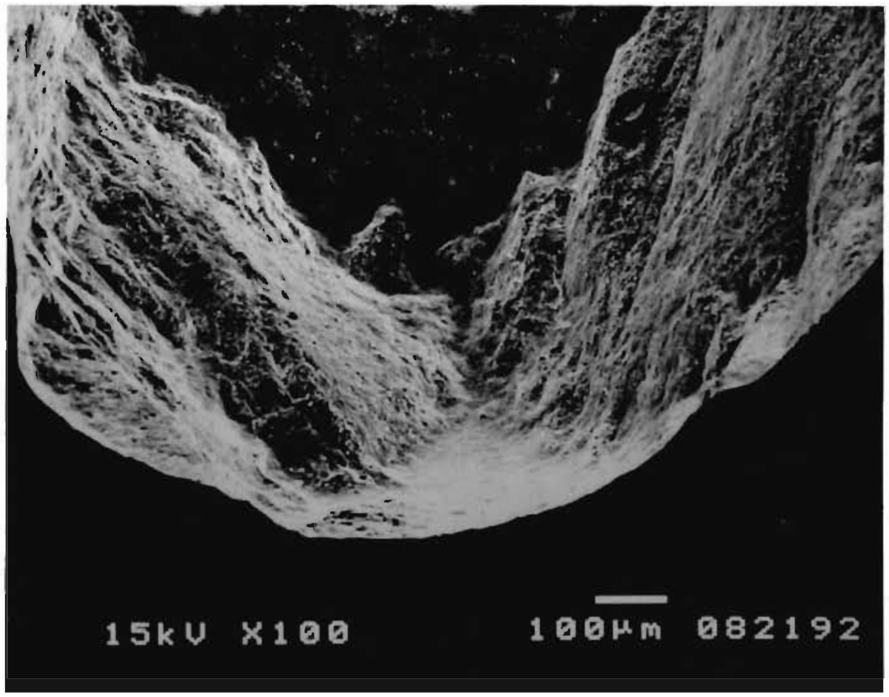
Examination of marine shell adornos indicated drilling was often used to form depressions which were then inlaid with small circular pieces of pyrite and polished jade. Among the jewelry found at Caracol is a marine shell ring with inlays of pyrite from an internment beneath the front stairs of structure C13. Some adornos contained patterns made with a series of holes drilled part-way through the shell.

Examination of drills at low (2x to 25x) and high power (50x to 500x) magnification showed use-wear in the form of rounding and smoothing at the tips with a shiny polish. An example of rounding can be seen with drill C56B/2-3a (Figure 4:a and b). Often striations are found at the tip of the drills running perpendicular to the lateral edges going around the tool in concentric circles, giving evidence of movement in a rotating fashion. Striations can be seen encircling the tip of drill C56B/2-3a in both the view of the ventral surface (Figure 5:a) and the dorsal surface (Figure 5:b).

A sample of drills was measured for the diameter of the drilling area at the tip. Use-wear in the form of rounding can be seen at the tip of the tool extending down the length of the tool where the rounding ends at the unused portion of the tool. Each drill bit was measured at the maximum diameter of the used area representing the largest hole which could be made by that drill. Sizes of the drill tips vary from less than 1 mm to 6 mm in width (Table 3), with the vast majority being approximately 2 mm

Figure 4. Use-wear/rounding on drill C56B/2-3a

a)



b)

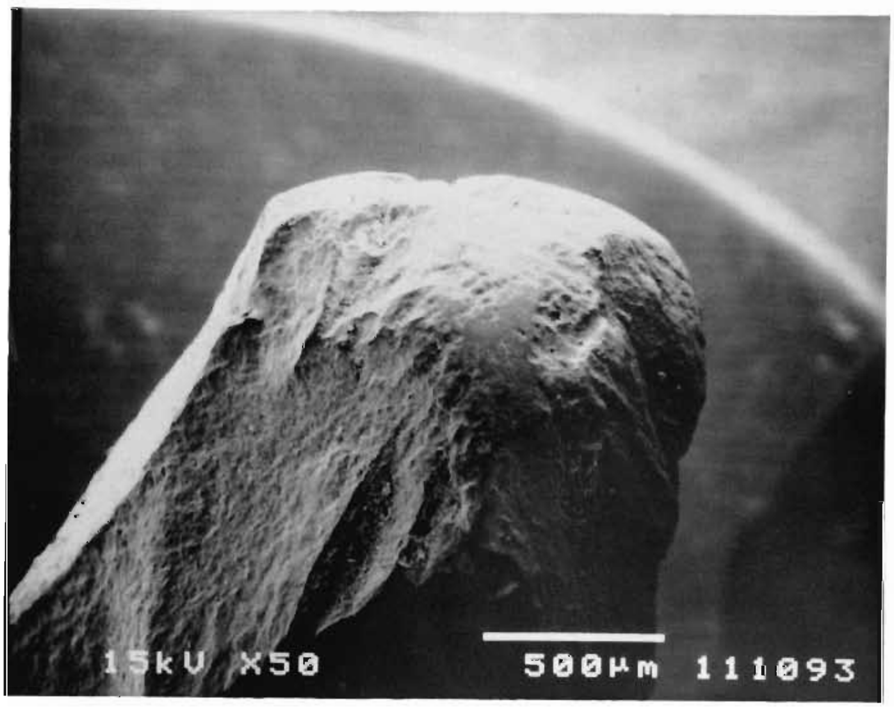
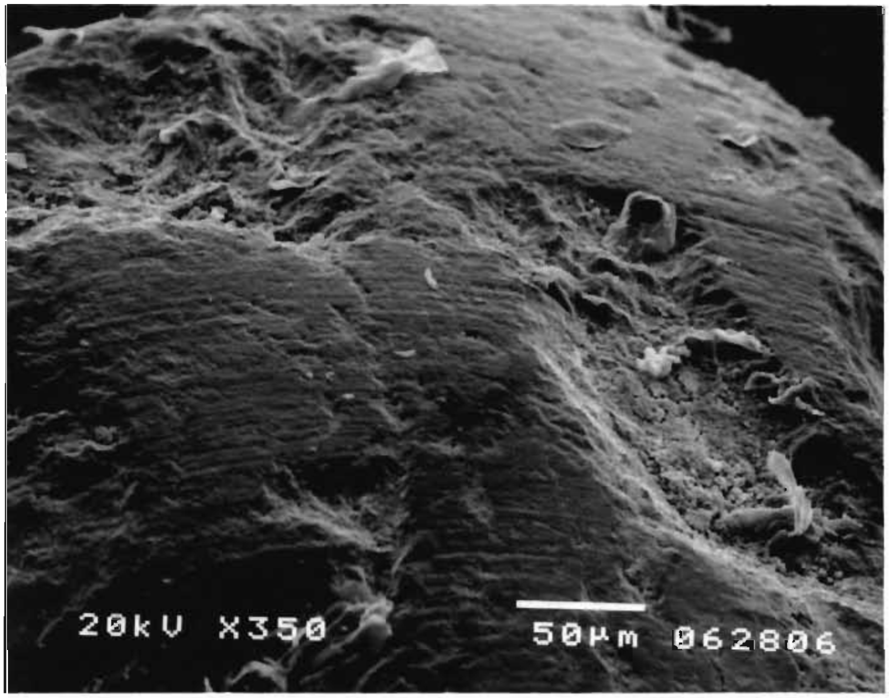
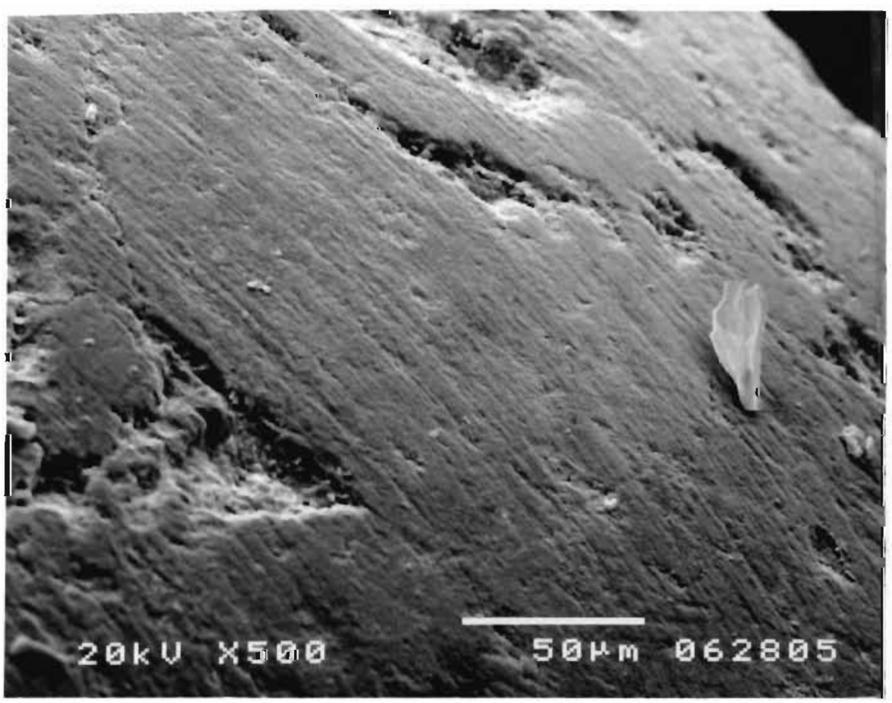


Figure 5. Striations on drill C56B/2-3a

a)



b)



to 3 mm in width.

Table 3. Drill Tip Sizes, Lot C41A/2 at Midway	
N=99	Maximum Diameter of Drill Tips in mm
Minimum	1.2
Maximum	5.7
Mean	3.01
Median	2.95
Mode	2.7
Standard Deviation	0.89
Variance	0.79

Holes made by chert drills would be conical in shape. Examination of shell jewelry from Caracol showed the majority of holes were drilled from each side of the shell until the holes met in the middle. In cross-section, shell beads would often show a hole with an hour-glass shape made from this type of drilling.

A cache from Structure B19 was noted during its excavation in 1986 as containing many chert drills made from the best quality chert material found at Caracol. In 1988, excavations at the Mosquito group contained a trash midden of various artifactual materials including chert manufacturing debitage. Upon closer examination of the Mosquito (C32) plaza group deposits small chert tools were found, including drills and trimmed flakes. This material was found in association with marine shell manufacturing debris. This close association suggested small chert tools were used for shell working. Drills were later found in fairly large quantities from several other architectural groups excavated at Caracol totaling ten suboperations.

Research conducted at Tikal by Puleston (1969) suggests that some of the pointed chert tools may be awls and were used in a back and forth motion to incise a line in the shell material. This type of motion produces short, light striations when viewed under the microscope. Tools used for incising were determined by Puleston to have a flat tip with rounding at the corners. Those tools used by rotating show a rounding of the complete tip under magnification. The majority of the drills from Midway show complete rounding of the tip. Specimens from the Mosquito group show both types of wear. However, drills examined from Caracol which had a flat appearance at the tip seems to be due to breakage of the very end of the tip rather than a different type of functional wear. These tips were broken with a tiny snap fracture removing the very tip. Usually no use-wear existed along the edges of this snap fracture, indicating the tool was discarded immediately or shortly after the tip was broken. Reports have been made of drill-like tools from a few other sites in the Maya area.

Statistical Data on Drills

The collection consisted of too many drills to conduct a complete statistical analysis so a sample of drills from four different areas was used for comparison. The drills were measured for size. The length was taken from the distal to proximal ends along the longitudinal axis. The width was measured at the maximum point between the lateral edges. The thickness was measured at the maximum distance between the dorsal and ventral surfaces.

The statistics presented include the minimum, maximum, mean, median, mode, standard deviation, and the variance.

Operation C32 at the Mosquito Plaza Group gave the best evidence for chert tools found in association with marine shell manufacturing debris. Chert drills from C32C/1, 2 and 3 were sampled for statistical analysis (Table 4). Mean drill sizes, in length, width, and thickness, vary a little between different proveniences, while those from the Mosquito group show more variation in size and shape than any other group examined.

Table 4. Drill Size Ranges, Subop. C32C at Mosquito			
N=43	Length in mm	Width in mm	Thickness in mm
Minimum	15	7.3	2.5
Maximum	43.3	22.5	14
Mean	26.39	12.89	7.97
Median	26.2	12.3	7.7
Mode	31.9	11.4	9.3
Standard Deviation	6.05	3.3	2.66
Variance	36.65	10.9	7.09

Drills from the Mosquito group, C32, are shown in Figure 6. A scatter plot (Figure 7) demonstrates the range of the drill sizes by plotting each drill according to length (x-axis) and width (y-axis). The variance of the length is high and is shown by a loose clustering of the drills in the scatter plot.

Drills from the Midway excavation, C41A/2-3 (Figure 8), show a great deal of standardization in form, size, and use-wear. At the Midway group drills range in length from 13.0 mm to 26.0 mm and in width from 8.0 mm to 14 mm, indicating an overall standardization of size (Table 5). This group of drills showed less variation than those from

Figure 6. C32 drills

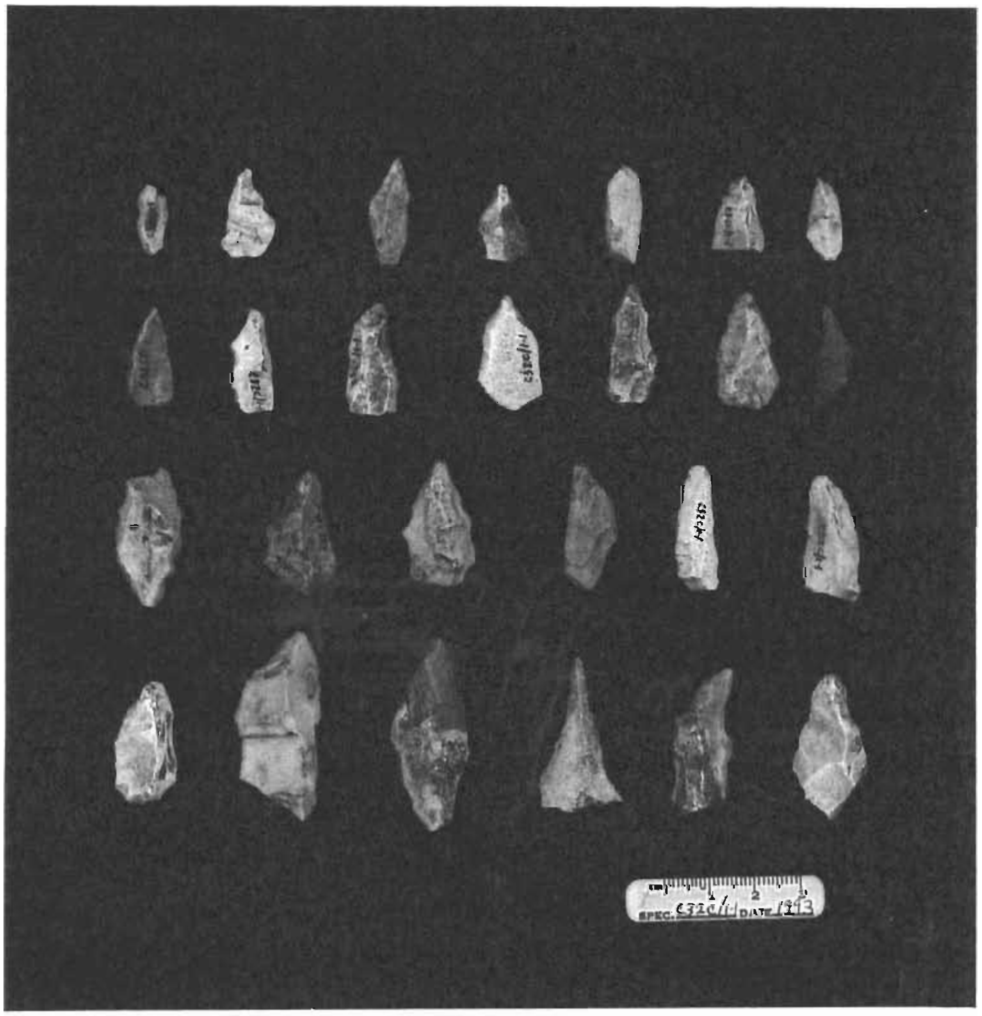


Figure 7. Scatter plot of drill sizes, C32

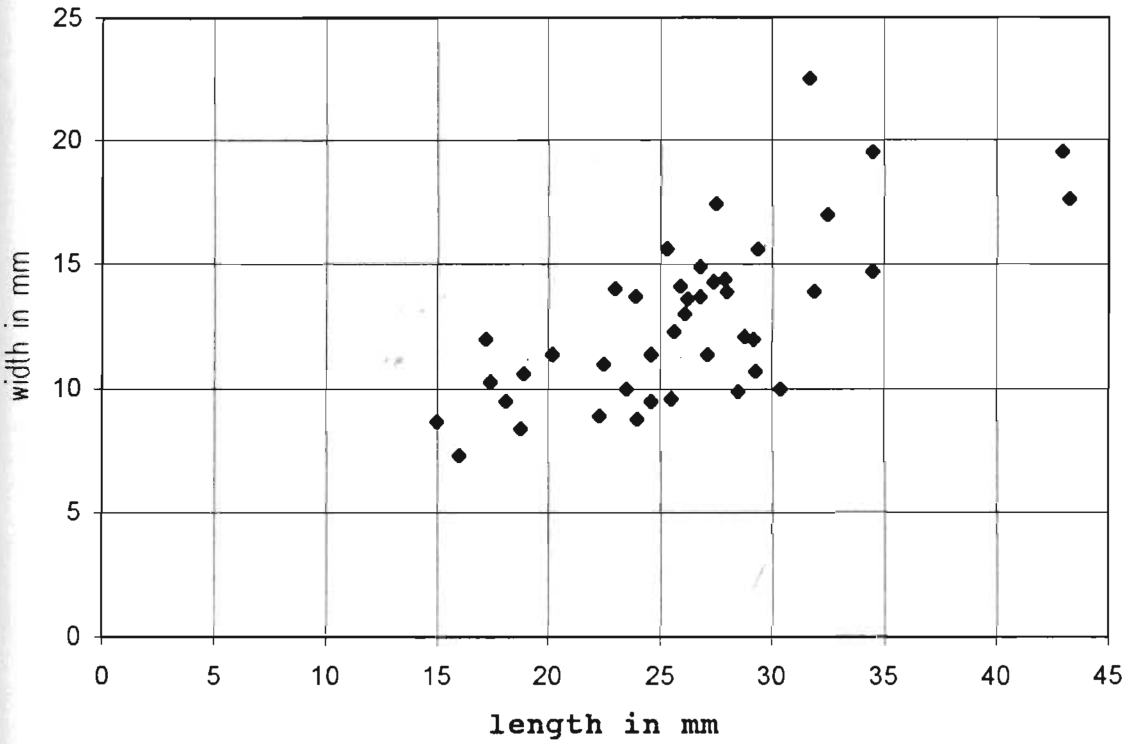
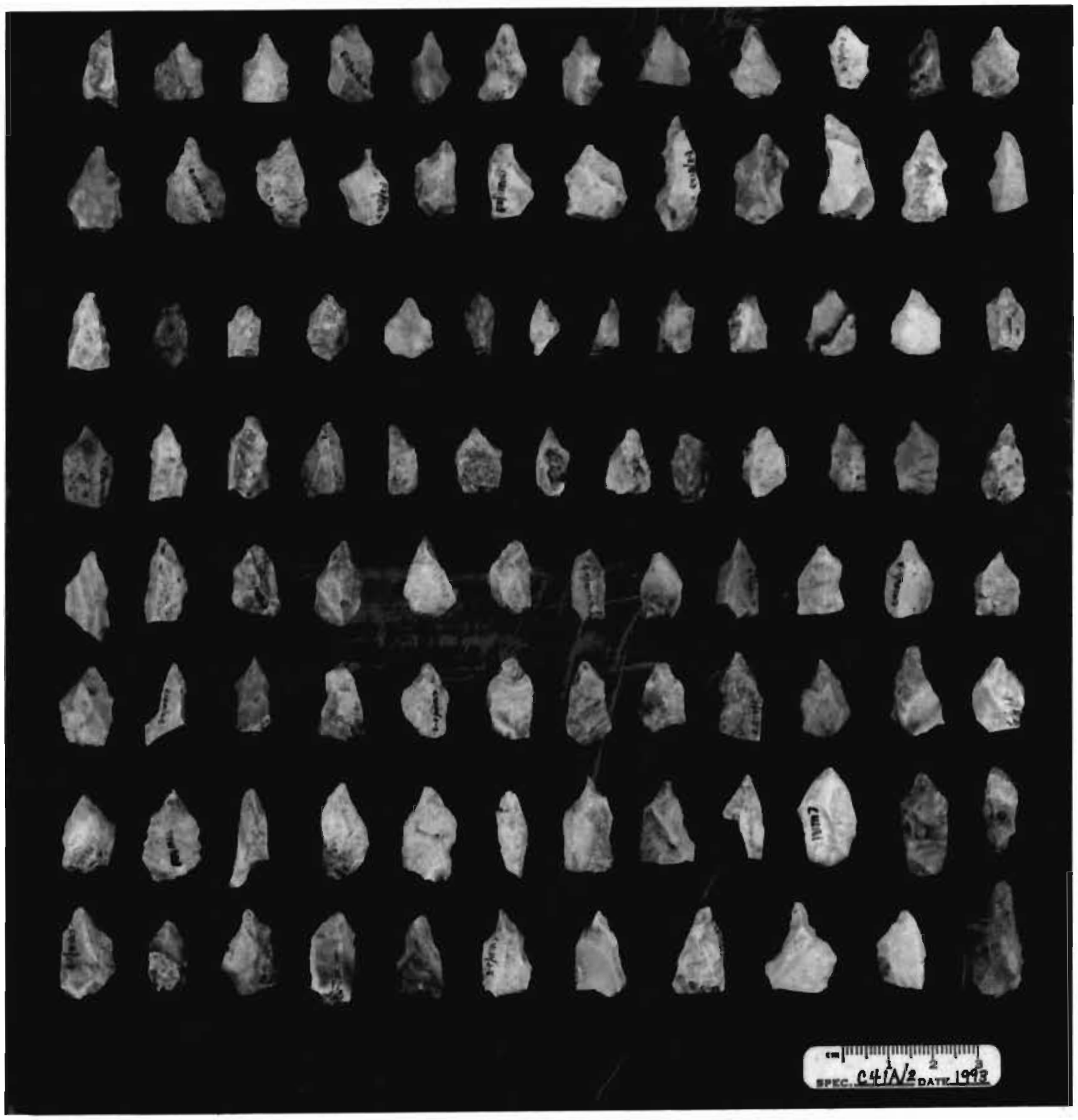


Figure 8. C41A/2 drills



op. C32 and just slightly less variation than those from C56B/3. The majority of the drills from C41A/2 are uniform in shape and size with a few falling outside the central cluster of drills in the scatter plot (Figure 9). The drills from Midway, C41A/2-3, are similar in size and morphological style to those from C56B/3. The Midway drills are more uniform in size and shape than any other group.

Table 5.
Drill Size Ranges, Lot C41A/2 at Midway

N=98	Length in mm	Width in mm	Thickness in mm
Minimum	12.1	5.8	2.4
Maximum	26.3	18.3	9.5
Mean	17.8	10.7	6.1
Median	17.9	10.7	6.1
Mode	18.0	11.2	6.6
Standard Deviation	2.7	2.0	1.6
Variance	7.3	4.1	2.5

Drills from the Cerrita architectural group (Figure 10) were chosen for statistical analysis. A group of 669 drills were measured for length, width and thickness. Statistical measures for Cerrita drills, C56B/3, are shown

Figure 9. Scatter plot of drill sizes, C41A/2

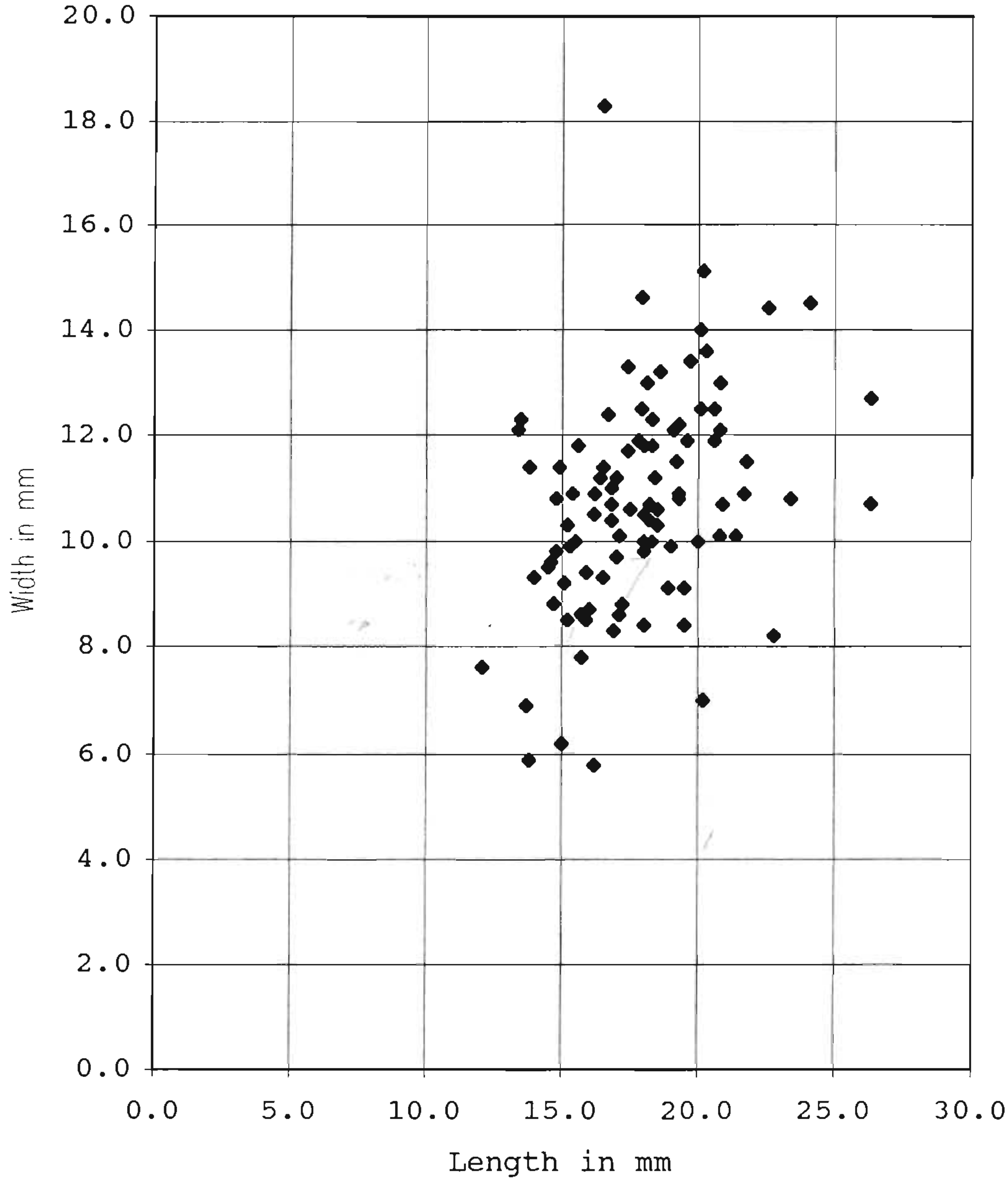
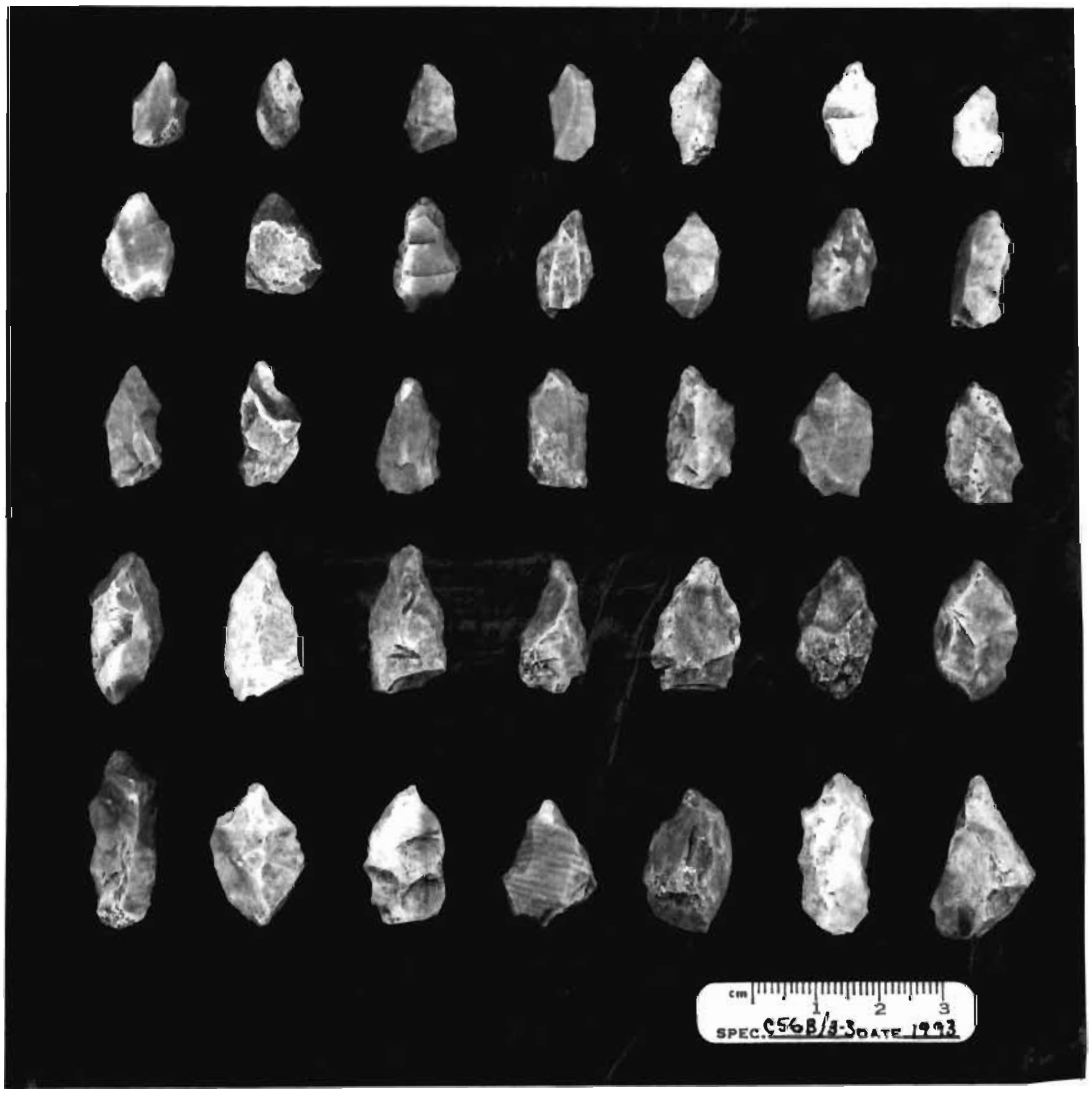


Figure 10. C56B/3-3 drills



in Table 6. Drills from this group showed less variation in size than the drills from the Mosquito group, and the uniformity of the drills indicates a uniform style of tool manufacture. This uniformity is illustrated in the scatter plot of the Cerrita drills, C56B/3 (Figure 11), where the drill size measurements cluster together.

Table 6.
Drill Size Ranges, Lot C56B/3 at Cerrita

N=669	Length in mm	Width in mm	Thickness in mm
Minimum	8.7	4.6	2.0
Maximum	28.5	19.9	17.0
Mean	16.41	9.98	5.70
Median	15.9	9.8	5.6
Mode	15.8	9.8	6.0
Standard Deviation	8.4	1.92	1.67
Variance	8.4	3.67	2.78

The fourth sample of drills (Figure 12) in this analysis includes those found in a cache placed over a sealed tomb entrance in Structure B19 2nd (A. Chase and D. Chase 1987: Figure 20). The statistics (Table 7) indicate that there is a great deal of variation in the length of these tools, but less variation in the width and thickness.

Figure 11. Scatter plot of drill sizes, C56B/3

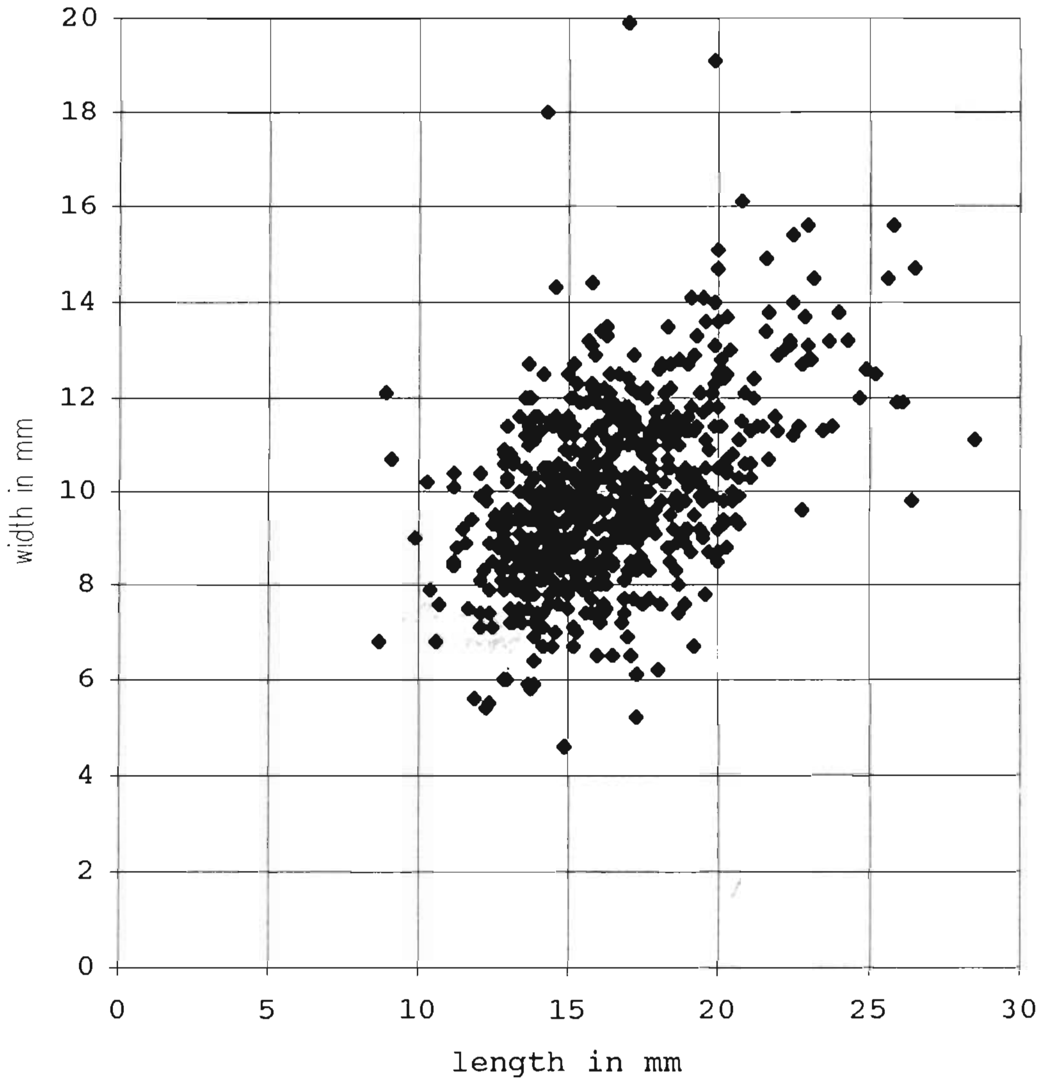
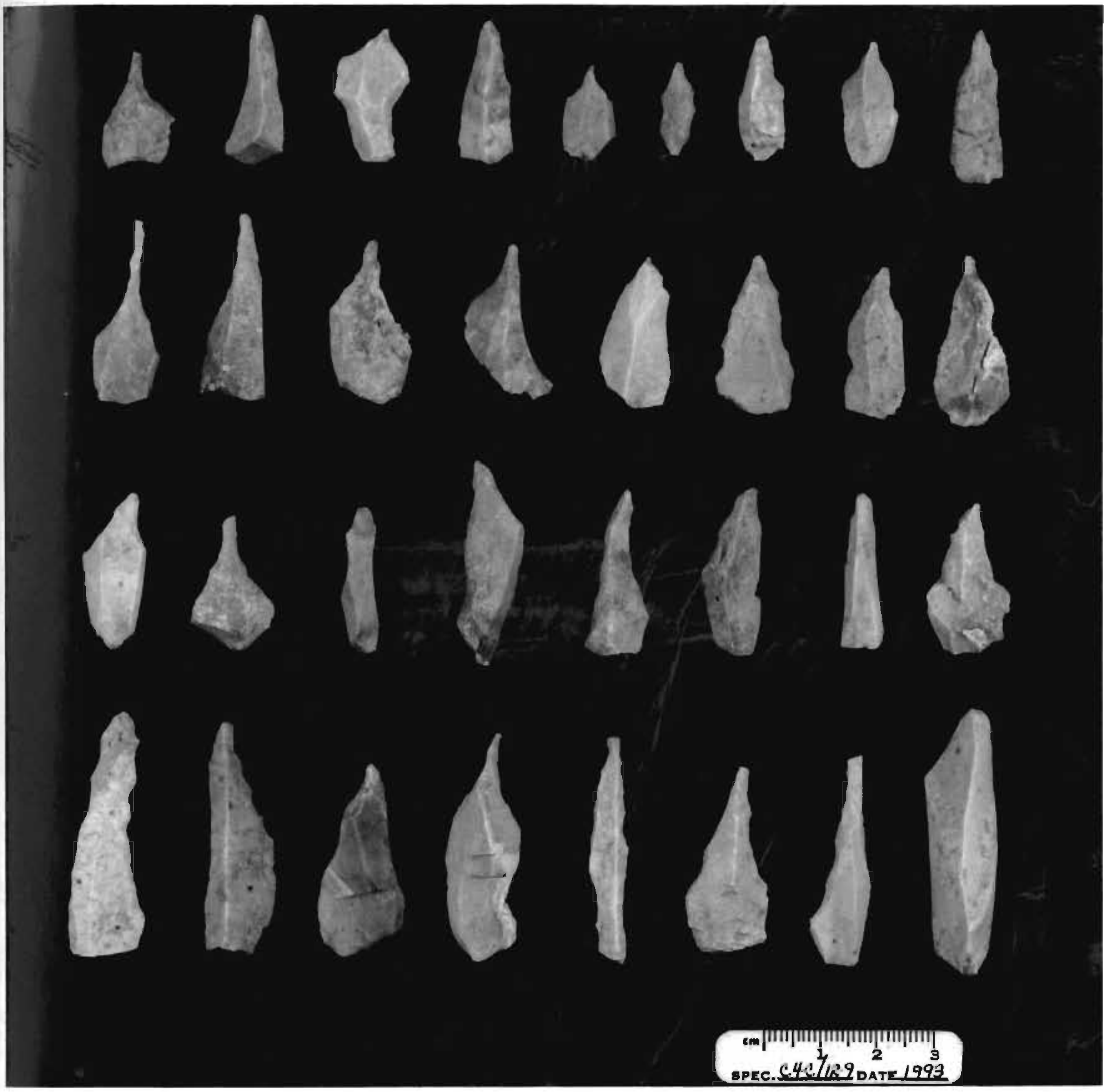


Figure 12. C4C/12-9 drills



This is illustrated in a scatter plot (Figure 13). There is more variation in the length of the C4C/12 drills than those from C32C. However, there is less variation in the width and thickness of the C4C/12 drills than the C32C drills. The drills from C4C/12 included some with exceptionally long and narrow drill bits. These showed use-wear only on the very tip and not along the entire narrow bit. While these long-tipped drills showed use-wear, there were more used drills in C4C/12-9 which were formed with a shorter tip. Considering the fragile nature of an extremely long and narrow tip it does not appear to be advantageous but may have been partly for show. The ceremonial placement of these drills within a cache associated with a tomb burial in the largest structure (Caana) in the site epicenter indicates a great deal of importance was placed on these tools. The question of whether the craftsperson made these long narrow drill bits for show or if they had a unique type of function remains to be resolved. Another factor to explain the unusually long drill tips is that the raw material from C4C/12 is the best chert quality found at Caracol. Use of a good quality chert may have given the knapper the opportunity to successfully manufacture long drills.

Figure 13. Scatter plot of drill sizes, C4C/12

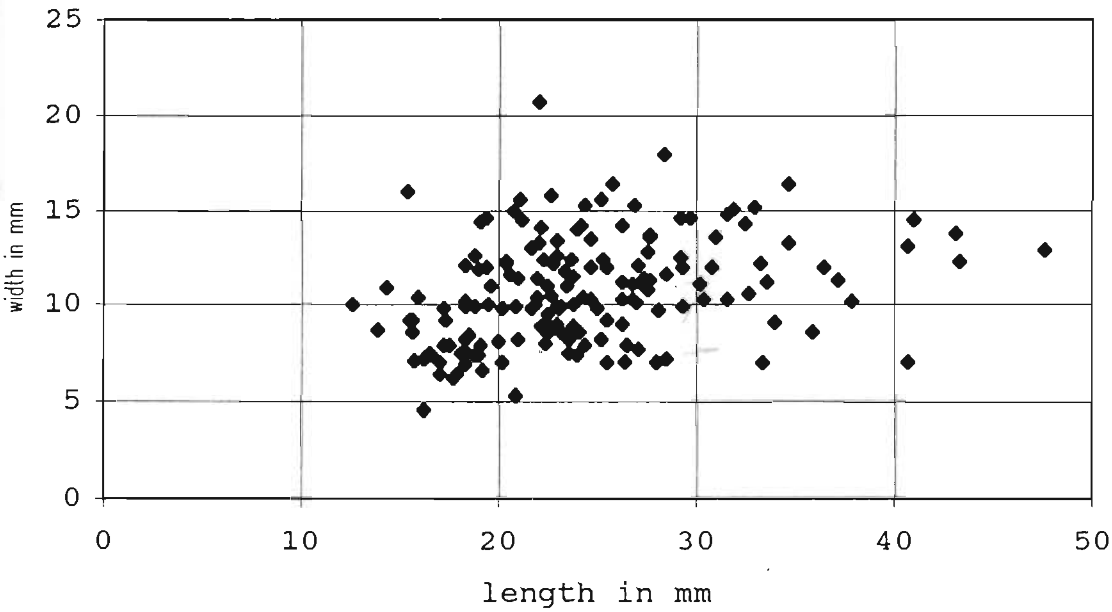


Table 7. Drill Size Ranges, Lot C4C/12 the Structure B19 Trench			
N=164	Length in mm	Width in mm	Thickness in mm
Minimum	12.6	4.6	2.3
Maximum	47.6	20.7	12.2
Mean	24.39	10.70	4.72
Median	23.5	10.3	4.4
Mode	18.3	7.0	3.6
Standard Deviation	6.28	2.79	1.63
Variance	39.5	7.79	2.65

Trimmed Flakes as a Tool Category

The trimmed flake category was described in Chapter Four, and was defined as thick tertiary flakes containing a dorsal ridge (i.e., ridge blades) which were further reduced by trimming along one or two lateral edges to form steep edge angles. The trimmed flake category is a general classification based on technological attributes. After classification, several trends were noted in the trimmed flakes. The majority of the trimmed flakes are lozenge shaped. In addition to having trimmed lateral edges the distal or proximal ends, or both, sometimes are also trimmed to a steep angle. Other trimmed flakes show trimming to remove the bulb of percussion and platform which creates a tapered proximal end. This tapered end may actually be formed when a drill tip is broken off and a snap fracture results. Most trimmed flakes still retain the platform and bulb of percussion. An example of trimmed flakes from C41A/2 can be seen in Figure 14.

In order to determine the nature of the trimmed flakes, a use-wear analysis was conducted. A portion of the trimmed flakes do not show any evidence of use-wear under low (2x to 25x) and high (50x to 200x) power magnification. Often step fractures are present along the lateral edges which were formed during the manufacturing process while trimming the edges. These unused trimmed flakes may have served as blanks from which to form drills. The tip of the drill would be trimmed and prepared when needed, thus preventing accidental breakage.

Use-wear is evident along the lateral edges on many of the trimmed flakes. The steeply angled lateral edges are quite sharp and sturdy and may have been used for incising lines in a hard material such as marine shell or wood. Other trimmed flakes show another kind of use-wear, consisting of a rounding of the stone's working edges, and a shiny, coarse polish visible under low power (2x to 25x) magnification. Repeated usage created undercutting of the

Figure 14. C41A/2 trimmed flakes

working edges and suggests a scraping or planing use.

Trimmed flakes may have been utilized as a scraping tool then later trimmed into drills, however they may also be failed drills which were recycled and used as another tool function, such as scraping or planing. Both categories of trimmed flakes and drills contain several examples of tools that were recycled.

Trimmed flakes exist at all ten architectural groups but each group has subtle variations in their attributes. Trimmed flakes from the Midway group are less uniform in size and shape than those from the Mosquito group. They are also thinner and smaller in length and width but still show a steep angle. Trimmed flakes from the test pit in front of structure M12 at the Mosquito group, sub-operation C32C/1 seem to be composed of several standardized forms. The group of trimmed flakes in general range in size from 20 mm to 37 mm in length and from 11 mm to 22.0 mm in width with a thickness ranging from 7.0 mm to 15.0 mm.

Many of the trimmed flakes, from C32C/1, exhibit a concave flake scar at the distal end. Others show a steep angle at the distal end. Some seem to have a bulbous end with a tapered point, and another repeated form has a slight crescent shape. These repeated styles of trimmed flakes for the Mosquito group may represent different functions which are not yet understood. Differences between the assemblages from different architectural groups may represent individual craftsperson's different tool manufacturing styles, or may represent different tool functions for manufacturing various types of shell jewelry and ornaments and/or wood, etc.

The use and purpose of the trimmed flakes is not clearly understood and more work is needed in this area. Keeley (1980) states in his study of replicative use-wear experiments, the distinctions between technological and utilization edge damage were difficult to isolate and in some cases no appreciable differences seemed to exist. The same problem has been somewhat of a difficult matter in interpreting the trimmed flakes from Caracol. Step fractures along the lateral edges at first appeared to be use-wear from a scraping or planing motion. Upon trying to duplicate the lithic material both Allen Bettis and myself created identical step fractures solely in manufacturing the pieces. A hard hammer percussion technique, with a small hammerstone and gentle knapping, most closely reproduced the trimmed lateral edges on the trimmed flakes. Chert raw material found in backdirt piles at Caracol and a similar chert from Texas were used to duplicate trimmed flakes. Both produced step fractures that appeared to be identical to those found on the trimmed flake artifacts. However, examination by low powered magnification (2x to 25x) and high powered magnification (50x to 200x) indicated that many of the trimmed flakes showed some rounding of the edges, and had a coarse, pitted, and shiny polish that was absent in the reproductions. This use-wear along the lateral edges of many of the trimmed flakes, may be from an incising action caused by moving the tool edge in a back and forth motion along a hard surface material such as marine shell. A use-wear experiment was conducted using a trimmed flake reproduction which was used to create an incised line approximately the same size, width, and shape of incised lines found in the monkey-skull shell pendant from an excavation at Caracol (Jaeger 1991). Microscopic use-wear of the trimmed flakes showed evidence of rounding in varying degrees. There were definite distinctions on the tools between rounded areas along a scraper edge and a sharp unused edge portion elsewhere on the tool.

Lateral edges of trimmed flakes may have been used to incise lines in marine shell and deepening of these incisions could have completely cut the shell. Some of the shell pieces showed smooth cut edges which may have been manufactured by this method. Other shell fragments showed smooth cutting, part way through the shell wall, then a slightly jagged break. These pieces may have been broken by placing a wedge in an incised line, then striking the wedge to break the shell.

Comparing the Flakes

Removal of flakes from the core is a behavior that allows the knapper to shape a tool form which exists in the maker's mind. It has already been stated that examination of the flakes shows the type of tool manufacturing techniques employed. The percentages, of each of the three types of non-retouched flakes composing the debitage, have been calculated for each architectural group (Table 8). Primary cortex removal flakes compose the smallest group, while the greatest amount of flakes are tertiary flakes. It is important to remember that cortex removal flakes are generally larger than tertiary flakes and that secondary cortex removal flakes also remove cortex from the core. Tertiary flakes are generally smaller, have no cortex and tend to be removed in the final stages of tool formation.

Table 8. Percentages of Flake Debitage Types				
	Primary Cortex Removal Flakes	Secondary Cortex Removal Flakes	Tertiary Flakes	Total Number of Flakes
Structure B19 Trench, C4C	5.36%	30.18%	64.46%	709
Mosquito, C32	4.36%	32.93%	62.71%	987
Midway, C41	4.33%	33.57%	62.10%	1549
Dove, C48	9.07%	36.54%	54.39%	364
Tiger, C50	8.45%	30.99%	60.56%	497
Blanca, C52	3.32%	24.17%	72.51%	422
Rita, C53	7.645%	34.71%	57.645%	1138
Cerrita, C56	8.42%	28.40%	63.18%	3042
Jester, C62	6.06%	33.33%	60.61%	231
Earth, C103	9.30%	35.40%	55.30%	6718

Deposition of Lithic Material

Deposits of lithic debitage and small chert tools were examined in an attempt to identify the presence of craft activities and craft workshops. Use-wear of chert tools indicates that the chert tools were made at these locations, and that these tools were used in craft activities at the sites. More excavations may give insight into this problem of interpretation.

Excavations at Structure B19 (Subop. C4C), Midway (Op.

C41), Tiger (Op. C50), Blanca (Op. C52), Rita (Op. C53), Cerrita (Op. C56), Jester (Op. C62), and Earth (Op. C103) did contain some cut and worked marine shell pieces and manufactured fragments which were found in association with lithic material. However, these marine shell pieces were recovered in very small quantities. Plaza groups which contained marine shell material found in the fill dirt of plazas include Mosquito (Op. C32), Midway (Op. C41), Blanca (Op. C52), Cerrita (Op. C56), and Jester (Op. C62). The scatter of lithic debitage and shell debris may indicate primary deposition during craft activities such as the manufacturing of small chert tools and the making of marine shell jewelry. The Dove architectural group (Op. C48) did not have any shell items found in the same contexts as the lithic debitage and small chert tools. Some caches and structural deposits were found to contain shell material at Structure B19, Mosquito and Cerrita. These secondary deposits may have been ceremoniously placed within the structure as a type of building dedication ritual. Tombs and burials have yielded beautifully crafted jewelry items such as rings, pendants, earflares, beads, and bracelets. Other adornos included disks, decorated disks, sun and star shaped markers, a circle with a plus sign inside (perhaps part of the Caracol emblem glyph) and variously shaped mosaic pieces. Tombs, crypts and burials containing shell material were excavated at Structure B19, Mosquito, Midway, Tiger, Rita, and Cerrita.

A convenient refuse dumping location at the Mosquito plaza group, was within an old tomb in one of the house structures. This was a practical dumping location for the plaza group's residents and the inorganic refuse was found in the cavity in the architectural structure. Material may have been kept in a temporary disposal area near or within a house structure and often with the intent to dispose or rework the material later. This type of disposal area may explain the disposal of chert, marine shell, ceramic and bone material within the reused tomb at the Mosquito group. This may have provided a temporary holding area for these materials which could be recycled into useful tools or shaped into art objects. Lithic material could have been reworked or resharpened into reusable drills or other tools.

Due to the close association of marine shell manufacturing debris and small chert tools and related lithic debitage, it seems that the chert tools were used in the manufacturing of marine shell ornaments and jewelry (C. Pope 1991, 1994).

It is possible that the same people who produced chert tools also worked marine shell into jewelry and adornos. At the Mosquito plaza group, the close association of small chert tools, chert debitage, and worked marine shell fragments, indicates that the small chert tools were probably produced in the same vicinity as the shell jewelry. Additionally use-wear patterns found on the tools indicate that they were probably used to carve the marine shell. This household group may have consisted of one person working both craft activities; one person making the chert tools and another fashioning the shell into jewelry; or, a group of individuals producing the crafts. The presence of only a few pieces of marine shell debris found in excavations at a plaza group may indicate that marine shell debris was collected from the craft activity area and placed in a secondary location, and stored for later reuse.

The limited presence of the small chert tools indicates that only specific areas at Caracol were used to produce the chert tools and shell items. In contrast, the jewelry is found in far more architectural groups and burials than the tools used to make them or the debris from their manufacture, suggesting that the shell craft items were indeed traded or presented to others in the larger community by a select group of craftsmen who produced these special items in quantities higher than needed for their own household use.

Meeting the Goals of the Thesis

The first goal of this study was to conduct a comparison of lithic data from different architectural groups which exhibit the same kind of lithic debitage and tools. The Mosquito, Op. C32, architectural group served as a model for the type of lithic material which would be included in this study. Archaeological evidence at the Mosquito group indicated that small chert tools were made at this architectural plaza and were used to carve marine shell into jewelry, adornos, and beads. Nine other plaza groups were found to contain the same type of lithic material, indicating that the same type of craft activity may have occurred at these areas as well.

The goal then became to find chert material which represented lithic workshops and craft activity areas. To determine where specific areas existed, provenience needed to be considered and careful attention was paid to the type of deposit and especially the presence of primary deposits (Chapter 5).

Excavations were conducted with other research questions in mind, as a result, when lithic material was encountered only 1/4 inch screen was used to catch the artifacts. Flakes smaller than 1/4 inch size would have been lost. Soil samples were not available for this study for any of the operations with the exception of the lithic workshop in Op. C103. This sample was carefully examined for the existence of tiny microflakes that occur in primary deposits by final knapping preparations or resharpening tools. An approximate volume of 20 mls of soil matrix and lithic material, equal to 2,647.1 g was examined for microflakes smaller than 5 mm in size and the quantity exceeded 1000+ microflakes. The presence of larger flakes and tools in various stages of the linear reduction sequence also suggests a primary deposit and a craft activity workshop.

The second goal was to conduct an analysis of the lithic debitage to determine the technique used to manufacture the tools. The entire lithic reduction sequence was represented in the debitage and it was determined that a bipolar flaking technique was used to initially reduce small nodules of locally available raw chert material. Further reduction of the tools was conducted by removing tiny flakes with a hard hammer percussion technique.

The third goal was to conduct a functional and morphological analysis to determine the tool types for better comparison of the tools between sites. Debitage and tool types were based on types already established in the literature (Chapter 4). Debitage categories followed the linear reduction model based on steps taken during the manufacturing process from the removal of cortex to the finished tool form. Tool types were based on morphology, however to clarify the function of the tools, a use-wear analysis was conducted addressing goal four.

Due to the high patination of the recovered material, striations are seldom visible on the tools through a light microscope but do show up with a scanning electron microscope. All of the tools seemed to have had the same sort of glossy polish and rounding. However, the use-wear analysis was limited and future work in this area may reveal more information than was found here. On examination of the drills, it was found that most showed striations that followed a circular pattern around the tip of the drill indicating that the rounding at the tip was due to use-wear from a circular or rotating motion. Rounding of the lateral edges and well rounded step fractures along the lateral and proximal edges proved to be a good indicator of use-wear for both the drills and trimmed flakes.

The fifth goal was to determine the relationship between the stone tools and the related marine shell debris; specifically, whether these tools were used only to carve marine shell or if they were used to carve various other types of material (such as wood, limestone, jadeite, teeth, and bone). It appears that the same people who produced the chert tools were also the ones who worked marine shell at the Mosquito plaza group. The findings at the Mosquito group indicate that the small chert tools were produced in the same vicinity as the shell jewelry and partially worked shell debris, and that the tools showed wear from use.

In order to shed light on this problem, comparisons were made between the Caracol lithics and lithic material from other Maya sites, as well as other prehistoric cultures of Mesoamerica and North America. Many areas were found to have similar stone tools which were used to cut marine shell and form beads or jewelry (Chapter 3).

Associations between marine shell debris and small chert tools at Caracol were also noted. The Mosquito group, Op. C32, contained the clearest association between these two types of materials. Other artifacts, such as limestone spindle whorls, carved limestone stelae, carved jadeite jewelry, carved bone and drilled teeth have also been found at Caracol. While it is possible that the small chert tools may have also been used in these types of activities, no clear associations have been made between these tools and the materials used in this type of craft work. Additionally, it is possible that these tools may have been used to carve wood which does not show up in the archaeological record due to the poor preservation of wood in the tropics. However, use-wear experiments using replicated tools of the same type found that these small tools were much more useful for working shell than wood working. A more intensive study of use-wear polishes and striations may also produce more information concerning this issue.

The sixth goal was to determine the time period in which these craft activities occurred. The study of temporal variation was limited. Age determinations of pottery found in association with burials occur at nine of the architectural groups and date to the time of use of the structures which contain lithic debitage and tools from craft activities. All groups except the Jester group, Op. C62, have been associated with the Late Classic period (A. Chase and D Chase 1989; D. Chase 1994a). Structure B19, Subop. C4C has been associated to both the Late Classic and Terminal Classic (A. Chase and D. Chase 1987; D. Chase 1994). Changes in the techniques used for the manufacturing of lithics or in the production of craft activities over a range of years at any particular group could not be determined.

The final goal was the examination of socio-political and economic influences this craft activity may have had on the Maya of Caracol. Craft specialization is affected by the political and social views of a culture and reflects the economic system. Some observations about craft activities are noted. The archaeological evidence at Caracol suggests that there did exist some restrictive access to the raw material, and the knowledge needed to produce this specific technology. Out of a sample of 62 excavations at architectural groups conducted up to March, 1991, only 9 areas contained small chert tools and related debitage. From this sample only 14.06% of the excavated areas contained this type of lithic material. More recent excavations also revealed that not all residential groups contained craft activity materials. This may indicate that only a small percentage of the population was taught the techniques necessary to produce these tools. However, the sample may be biased since these excavations were conducted to answer other questions and were not specifically intended to find craft activity areas.

Of the 10 excavations analyzed for this study, small chert tools from craft activities were found in nine residential plaza groups while one recovery was from a cache within the largest architectural structure in the epicenter of Caracol. The knowledge and raw materials necessary for making the tools may have been controlled by the elite but there is no evidence that the occupants of the residential house groups were of any special lineage. Shell artifacts associated with craft activities are abundant in middle social level interments (D. Chase 1994:133; Cobos 1994). During the Late Classic period when craft activities took place at nine of the study areas, there was a decrease in the gap between the upper elites and the middle social levels and indicates there may have been a prosperous "middle class" at Caracol (D. Chase 1994:134; Jaeger 1994:62-63). Caracol residents may have been able to make crafts by choice as a cottage industry for those who wanted to increase their income and status.

Agricultural terraces near the residential groups indicate that the residents may have spent some of their time on agrarian practices and part-time working on crafts. It is possible that only select members of a residential group worked on crafts while other family members tended to agricultural practices. These residents may also have managed agricultural practices (Liepins 1994:63).

Trade and exchange of the raw materials may have been controlled by select members of the society, family lineages, or the Maya elite. It appears that the chert raw material came from nearby sources which may be related to land ownership. The raw material resources vary a great deal in quality, texture and color of chert and may be from local resources which worked out of the limestone as terraces were built. Examples of elite control of chert resources can be found at the Maya site of Colha, Belize (Shafer and Hester 1991, Shafer 1991). Chert resources at Caracol and trade in obsidian may have been controlled or taxed by elite members of society. The caching of small chert tools and the related debitage within Structure B19, at the summit of the Caana pyramid, in association with the placement of a stelae and a tomb burial indicates the great importance of this chert material to the elites. This chert material was of the best quality noted at these craft activity areas. Additionally, differential distribution of chert workshop and craft activity areas at Caracol indicates limited access to this important chert resource. However, the majority of lithic craft activities were conducted in what has been identified as residential groups (A. Chase and D. Chase 1989, Liepins 1991, 1994). The presence of tombs have traditionally been associated with elite status burials, however Caracol has a tomb burial in almost all east structures of residential groups (A. Chase and D. Chase 1994b). Caracol may have had a large "middle class" or " bourgeoisie" population which could afford some of the trappings usually associated with elites (A. Chase 1992, Liepins 1994). Furthermore, the lowest class of residents may have had little in the way of structures and goods, and may be underrepresented in the archaeological record.

Trade and exchange of the marine shell indicates the existence of a complex system. Precious marine shells were brought over 100 miles along trade routes from the Caribbean Sea to Caracol (Cobos 1994) and trusted only to specialists that could carve them into beautiful beads, jewelry and ornamental objects.

Perhaps the knowledge of carving marine shell also accompanied these resources to Caracol from the coast, while it is equally possible that a trade network was established to provide craftsmen with the marine shell to carve, after the knowledge was acquired from another site such as Tikal (Puleston 1969). It is interesting that the craft workshops came into existence after a war with Tikal recorded for 562 A.D. when a large influx of population was noted for Caracol (A. Chase and D. Chase 1989).

Elites may have had some control over marketing centers, essential goods, raw materials, status items and distribution of trade items (Sharer 1994). Elites may have collected tribute from craftspersons who moved their products in a market center even if the craftspersons produced craft items in a cottage industry. Elites may also have collected some kind of tribute from craftspersons acquiring trade goods, such as marine shell or other raw material, for the purpose of making craft items. Family lineages or elites may have controlled the final products of craft activities as they were traded, exchanged, or sold in markets.

CHAPTER 7: SUMMARY

This analysis on the small chert tools and the related debitage at Caracol has produced some interesting information. Small nodules of chert were locally available at Caracol. The Late Classic and Terminal Classic period Maya used bipolar and hard hammer percussion techniques to reduce the chert and manufacture small tools.

Chert material analyzed from 10 architectural groups revealed the use of very small chert tools which were likely to have been used to carve jewelry and ornamental objects (i.e., adornos) out of marine shell. The vast majority of the chert tool forms consisted of drills and trimmed flakes. There was a great deal of uniformity in the way these tools were made. Bipolar flaking of small chert nodules was used to create thick chert flakes. These were further reduced by trimming the lateral edges to create uniformly shaped trimmed flakes and small pointed drills. The steep sided, sharp edges of the trimmed flakes and drills often show use-wear from being used to cut away rough edges or to incise lines in marine shell and possibly other materials. The majority of the small chert tools consisted of drills. The sharp, pointed tips of the drills showed use-wear consisting of rounding into a smooth ball-shape after extended use from a rotating motion. Additionally, a coarse but shiny polish formed along the working edges of the tools from extended use cutting, planing, and drilling a hard material.

Marine shell beads and ornate shell adornos have been found in great abundance in archaeological excavations at Caracol. Excavations at the Mosquito architectural group found marine shell and the chert tools and debitage in association. It would appear from this evidence that these drills were used to form holes in the centers of marine shell beads. The steeply angled scraper-like edges of trimmed flakes and drills could have been used to carve and incise lines forming decorations in shell beads, rings pendants, earflares, and other adornos.

It is also possible that the small chert tools were used in the manufacture of other products such as carved jadeite, bone, hematite, and limestone, and used to drill teeth and sherds. It may be possible that these tools were used for carving wood which does not show up in the archaeological record at Caracol due to its poor preservation. The small chert tools may have been used for more than one type of raw material.

A cache from Structure B19 was noted during its excavation in 1986 as containing many chert drills. These artifacts were made from the best quality chert material found in the collections of lithic material recovered from excavations at Caracol. In 1988, excavations at the Mosquito group included a trash midden of various artifactual materials including chert manufacturig debitage. Upon closer examination of the Mosquito (C32) plaza group deposits small chert tools were found, including drills and trimmed flakes. This material was found in association with marine shell manufacturing debris and unfinished jewelry. This close association suggested small chert tools were used for shell working. Drills were later found in fairly large quantities from several other architectural groups excavated at Caracol totaling ten suboperations. Examination of lithic material from these 10 excavation areas indicated there was a great deal of uniformity in the manufacturing techniques of the small chert tools. These tools were similar in size, shape, morphology, and showed similar use-wear patterns.

Small chert tools used in craft activities, found in site deposits, provide useful information about the intersite and intrasite socioeconomic activities of the Maya. Craft activity deposits were found at nine residential groups of a middle level of social status. Agricultural terraces found near residential groups may indicate that craft activities were conducted on a part-time basis with the rest of the time spent on agrarian activities. These workshops may have served as a cottage industry to supplement the income of the residents.

Only a small percent of the residential groups so far tested at Caracol contain craft workshop material. This may indicate some sort of control of the resources and technology by a merchant class, lineage, or elite members of society. The same type of small chert tools and debitage were found in a cache associated with a burial in Structure B19 atop Caana, the largest structure at Caracol. The presence of this cache of lithic material suggests the importance of this craft activity to the elite members of society.

Future research will be conducted at other architectural groups at Caracol in an effort to locate additional workshops and deposit areas of these small chert tools and associated debitage. This will lead to a better understanding of craft specialization, craft manufacturing techniques, socioeconomic factors and political control of craft production at the site of Caracol.

Appendix 1: Provenience Data for Excavations Containing Small Chert Tools and Debitage

Excavations at Structure B19

Operation C4 This operation includes investigations in the vicinity of Structure B19.

Suboperation C4C This excavation unit is a North-South axial trench cut through structure B19. The trench is 2 m wide, and 25 m long from the top of the mound to the bottom along the front face of the structure.

Lot C4C/1 This lot includes the humus layer, from the surface to a depth of .10 m to .20 m. Measuring from the south end of the trench this lot is 0 to 3.25 m in length.

Lot C4C/2 This lot includes the humus layer. Measuring from the south end of the trench, this lot extends from 3.25 m to 7.0 m.

Lot C4C/3 This lot is the humus layer. Measuring from the south end of the trench this lot extends from 7 m to 11 m.

Lot C4C/4 This lot includes the removal of dry core fill rubble, 0 to 4.4 m from the south edge of the trench. This lot only includes the plaza area before the mound rises.

Lot C4C/5 This lot includes fill from the removal of a construction wall and wall facing which maybe a stair balk in the main trench.

Lot C4C/6 This lot includes the removal of matrix down to two plaster floors, one at the top of the stair balk and another a few centimeters higher. The lot ends at 5.50 m from the southern excavation limit at a wall facing.

Lot C4C/7 This lot is assigned to a rubble-filled brown matrix. The lot extends from the wall facing, 5.50 m from the southern excavation limit, to another wall facing 1.40 m more to the north.

The bottom of the lot ends at the top of the first wall facing.

Lot C4C/8 This lot includes the dry core fill material from 3.70 m north to 5.30 m north of the trench to expose the west wall of the stair balk.

Lot C4C/9 This lot contains humus on top of Structure B19, cleared to expose the first architecture.

Lot C4C/10 Fill from the removal of first architecture to expose the floor and steps of B19. Included SD#C4C-1 which consisted of censor vessels and a small carbon sample near a cut found in the floor (Chase and Chase 1987). This special deposit was found near the stair balk.

Lot C4C/11 Fill from the removal of the first architecture to expose the floor and steps of B19 in an area adjacent to lot 10.

Lot C4C/12 Removal of rubble fill immediately below the original circular cut in the SD#C4C-1 floor.

Lot C4C/13 Removal of dark soil and rubble in a 2 m wide extension of the axial trench, directly below C4C/10 and C4C/11.

Lot C4C/14 This lot includes the removal of rubble to expose the floor and steps of Structure B19.

Lot C4C/15 This lot includes the fill material inside a niche area in which a sherd concentration was located, a part of the C4C/13 pit.

Lot C4C/16 Excavation in front of, and south of the niche area of B19.

Lot C4C/17 Clean up of soil behind the niche wall. The niche was .38 m deep.

Lot C4C/18 Clean up under the floor of the niche.

Lot C4C/19 Clean up of stairway behind the first slab inside the niche area of structure B19.

Lot C4C/20 Clean up and detailing of the ledge area inside the Structure B19 tomb.

Lot C4C/21 This lot included the excavation of SD#C4C-3, a tomb in structure B19. This tomb contained a red painted text on the north wall (A. Chase and D. Chase 1987).

Excavations at the Mosquito Plaza Group

Operation C32 This operation includes excavations at the Mosquito plaza group, structures M11 through M14. This plaza group is located on the west side of the Conchita causeway (Figure 2).

Suboperation C32A This investigation included excavations of a collapsed chamber on the north side of the northern structure, M11.

Lot C32A/1 This lot includes fill from the removal of humus and collapsed chamber construction material from the northeast quadrant of the chamber. This lot level extends from .90 m to 1.10 m below the remaining capstone.

Lot C32A/2 This lot includes brown soil and small rubble fill from the west half of the chamber, approximately 1 m below the capstone.

Lot C32A/3 This unit includes the excavation of a "garbage deposit" (SD#C32A-1) in the eastern half of the chamber, from 1 m to 1.2 m below the capstone.

Lot C32A/4 Continuing the excavation of SD#C32A-1, this lot lies below lots 2 and 3, beginning at 1.2 m below the capstone. This deposit contained not only a large quantity of shell debris but also gives evidence of shell jewelry manufacturing. There were several pieces of modified shell and broken and incomplete jewelry pieces.

Suboperation C32B This unit includes the excavation of a collapsed chamber in the eastern structure M12. The collapsed chamber measures about 1.8 m NS x 0.75 m EW.

Lot C32B/1 This lot includes humus from above the collapsed capstones and extends from .47 m to .65 m below a remaining vault stone.

Lot C32B/2 This lot included the removal of rubble below lot 1.

Lot C32B/3 This lot includes the removal of dark brown matrix and rubble below lot 2.

Lot C32B/4 This lot includes the removal of dark brown soil and rubble below a second layer of stone, beginning .40 m below the original surface level. Lot is located below lot 3 and exposes SD#C32B-1.

Lot C32B/5 This lot includes the excavation of the tomb floor, including burials and scattered pottery.

Suboperation C32C This unit includes the excavation of a 1.5 m EW x 1 m NS test pit located in front of and on axis to the eastern structure, M12, at the Mosquito group. This test pit was later extended by .50 m to the south in order to expose a crypt SD#C32C-2.

Lot C32C/1 Removal of humus from the east half of the original test pit exposing 2 large stone slabs covering a crypt.

Lot C32C/2 This lot includes the removal of the humus from the west half of the test pit.

Lot C32C/3 This lot is assigned to the removal of dark brown soil and rubble from the west half of the test pit, below lot 2. Beginning .20 m below the surface of the humus level. The excavation exposed SD#C32C-1 and a soft marl floor of bedrock.

Lot C32C/4 This lot included the excavation of SD#C32C-1, a cached face vessel located just west of the crypt.

Lot C32C/5 This lot was assigned to the removal of a dark brown soil in order to detail the crypt slabs.

Lot C32C/6 This lot included the excavation of a crypt, SD#C32C-2, located in the eastern half of the test pit.

Lot C32C/7 Assigned to the removal of the humus from the excavation extension, .5 m from the south border of the test pit to expose entire crypt.

Lot C32C/8 This lot was assigned to the removal of marl and .30 m of bedrock, to level the test pit with the crypt floor.

Lot C32C/9 This lot partially exposed a burial in the west excavation wall, SD#C32C-3.

Lot C32C/10 This excavation included the exposure of a special deposit, SD#C32C-4, which consisted of a cache of three miniature vessels located within lot 7.

Excavations at the Midway Plaza Group

Operation C41 Test excavations were conducted at the Midway architectural group, structures M6 through M10, and included a nearby causeway junction with an agricultural terrace.

Suboperation C41A This investigation included a 1.5 m north to south by 2.95 m east to west test pit in front of the east structure M7.

Lot C41A/1 This lot included the humus layer.

Lot C41A/2 This lot included the removal of dark brown matrix .40 m to .62 m from an arbitrary datum.

Lot C41A/3 Removal of a rock layer .43 m to .75 m in depth from an arbitrary datum.

Lot C41A/4 This lot removed a dark brown matrix and soft marl limestone bedrock, .70 m to .86 m below the datum.

Lot C41A/5 This lot included a test pit extension designed to discover the significance of a hole in the bedrock and included humus down to the bedrock.

Lot C41A/6 This lot included sherds found in backfill.

Suboperation C41B This investigation included excavation of a 1.2 m N-S x 1.5 m E-W test pit on the NE edge of the causeway at the terrace junction.

Suboperation C41C This excavation was of a 2.5 m EW x 0.9 m NS on the SW edge of the causeway to define the wall.

Suboperation C41D Excavation of a 1.5 m x 1.5 m test pit situated in front of the northeast building, Structure M6.

Lot C41D/1 Removal of the humus layer.

Lot C41D/2 This lot included the removal of dark brown matrix to detail stones and burial found at a depth of .86 m below arbitrary datum.

Lot C41D/3 Excavation of SD#C41D-1 which uncovered bones and sherds in the SE corner of the test pit.

Excavations at the Dove Plaza Group

Operation C48 This operation included investigations at the Dove architectural group located 60 m east of the Pajaro-Ramonal causeway.

Suboperation C48A This excavation included a 1.5 m x 1.5 m test pit set at axis to and in front of the east structure at the "Dove" architectural group.

Lot C48A/1 Removal of humus .10 m to .24 m thick, above and around large stones.

Lot C48A/2 Removal of stones and brown soil beneath the humus layer.

Lot C48A/3 Excavation of north to south aligned burial, SD#C48A-1, which was dug into the bedrock.

Lot C48A/4 Excavation of humus material from a .50 m extension to remove the burial.

Lot C48A/5 This lot includes the lower depth of the .50 m excavation extension.

Suboperation C48B Excavation of a 1.5 m x 1.5 m test pit located on axis to and in front of the north structure at the Dove architectural group.

Lot C48B/1 This lot includes the removal of a gray/brown humus down to an eroded floor level, approximately .20 m below the surface.

Lot C48B/2 Excavation of the construction matrix below the rough floor level.

Excavations at the Tiger Plaza Group

Operation C50 This operation includes investigations at the Tiger, N43 architectural group.

Suboperation C50A Excavation of a collapsed tomb in the center of the eastern structure.

Lot C50A/1 This lot included the removal of the humus layer. A capstone was found outside the excavation.

Lot C50A/2 Removal of a light brown soil matrix and collapsed material, 1 m from datum down to 1.36 m.

Lot C50A/3 Removal of a light brown soil and collapsed material from 1.36 m to 1.5 m.

Lot C50A/4 This lot included the removal of matrix from 1.5 m at the top of a niche in the wall, down to 1.7 m.

Lot C50A/5 Removal of material from a .20 m x .20 m niche in the north wall of the tomb.

Lot C50A/6 Investigation of collapsed material containing artifacts approximately .10 m above a floor, extending 1.8 m to 1.7 m below the datum.

Lot C50B Excavation of a 2 m x 2 m test pit situated on the plaza floor to the west of the eastern structure.

Lot C50B/1 This lot includes the removal of a dark brown humus layer.

Lot C50B/2 Removal of brown rubble from .95 m to 1.4 m below an arbitrary datum.

Lot C50B/3 Excavation of collapsed material above the eastern steps of the eastern structure, which covers an area of 2 m x .60 m and is from 1.3 m to 1.47 m below the datum.

Lot C50B/4 Removal of material from within the plaster flooring.

Lot C50B/5 This lot includes the removal of rubble west of the steps, starting below the plaster floor at 1.49 m down to 1.68 m below the datum.

Lot C50B/6 This lot included the excavation a cache in a 20 cm3 area located in the NW quarter of the test pit. The cache consisted of two dish shaped pottery vessels stacked lip to lip and contained three bones from a finger within.

Lot C50B/7 This lot was assigned to the removal of a light brown compact soil matrix situated in the center of the test pit.

Lot C50B/8 This lot included the excavation of a 20 cm3 area containing a cache consisting of two dish like vessels. This was located along the north excavation wall.

Lot C50B/9 This lot included the excavation and removal of steps from in front of the eastern structure. This lot covers an area of 2 m x .60 m and extends from 1.47 m to 1.56 m below the datum.

Lot C50B/10 This excavation included SD#C50B-3, which is a burial consisting of a cache vessel and some human bone beneath the steps in the NE quadrant of the East test pit from 1.56 m to 1.7 m below datum. This lot contained lithics associated with 9 worked pieces of bone, a shell fragment with incised lines and a shell bead. This could indicate that the chert tools were used for more than one purpose, such as both shell and bone working.

Lot C50B/11 Excavation of loose dirt matrix containing small rocks below SD#C50B-3 to bedrock.

Suboperation C50C This excavation included a 1.5 m x 1.5 m test pit at the plaza level and situated just to the east of the western structure at Tiger.

Lot C50C/1 This lot included the humus layer.

Lot C50C/2 Excavation of this lot removed a rubble and brown soil east of the steps ending at .59 m to .62 m below the datum.

Lot C50C/3 Excavation of dark brown matrix between the two steps.

Lot C50C/4 This lot included the excavation of an area in the SE quarter of the test pit and .87 m below the datum which contained cranial fragments.

Lot C50C/5 This lot included removal of rubble and dark brown soil below a plaster floor at the base of a step, from .53 m to bedrock at 1.07 m below the datum.

Excavations at the Blanca Plaza Group

Operation C52 The Blanca plaza group (group 2) is located approximately 2.2 kilometers south of the site center along the Conchita causeway and approximately .3 kilometers southwest of the causeway (Figure 2).

Suboperation C52A This lot includes the excavation of a chultun with a 1.5 m EW x 1 m NS test pit across half of the chultun opening.

Lot C52A/1 This lot covered surface collections.

Lot C52A/2 This lot included removal of humus lying above the bedrock ceiling of the chultun.

Lot C52A/3 Descriptions are unavailable.

Lot C52A/4 This lot included the excavation of the top layer of brown dirt fill within the chultun which fell in from outside the opening.

Lot C52A/5 Limestone dirt which fell from the ceiling and walls of the chultun were removed. The chert material from within the chultun may have fallen into the chultun from the exposed opening, since it was found in soil matrix and not on the floor of the chultun. This may indicate a knapping incident on the plaza floor or could be from plaza fill matrix.

Suboperation C52B This operation included a 1.5 m x 1.5 m test pit placed in front of the East structure.

Lot C52B/1 This lot included surface collection.

Lot C52B/2 This lot included the removal of humus.

Lot C52B/3 This lot included the excavation of a dark brown soil matrix with small rocks which was hard packed. In addition to lithic material listed in Table 6, a worked piece of flowstone which was a cross-section of a stalactite was found in this lot. This area may represent primary deposits as the entire knapping sequence is represented. The smallest tertiary flake is so small it may not have been collected if items were gathered up and removed by the Maya for fill or dumping.

Lot C52B/4 A lot description is unavailable.

Lot C52B/5 This lot included removal of a dark brown matrix to a depth of .73 m as measured in the center of the unit.

Lot C52B/6 An excavation extension of the unit's north was conducted to remove a capstone.

Lot C52B/7 This lot uncovered a burial in the north excavation wall under a capstone.

Suboperation C52C This suboperation included a 1.5 m x 1.5 m test unit placed in front of a small eastern structure.

Lot C52C/1 This lot included surface collection.

Lot C52C/2 This lot uncovered the top 8 cm of the unit and included humus.

Lot C52C/3 This lot included the removal of a dark brown soil matrix filled with small rocks.

Lot C52C/4 A lot description is unavailable.

Lot C52C/5 Excavation of a layer beneath a plaster floor which contained a brown matrix with large and small size stones.

Lot C52C/6 This lot included the removal of a medium brown rubble matrix containing large rocks at approximately 1 m in depth.

Suboperation C52D Excavation of a 1 m x 1 m test unit placed on top of the larger Eastern structure.

Lot C52D/1 This lot includes surface collections.

Lot C52D/2 This lot includes the removal of the humus.

Lot C52D/3 This lot includes a dark brown soil at approximately 1 m below the datum.

Lot C52D/4 Excavation of a pottery cache, SD#C52D-1.

Lot C52D/5 Excavation of a crypt in front of the steps of the building.

Suboperation C52E Excavation of a test unit, 1.5 m EW x 1 m NS, extending unit C52B, in order to expose the remainder of a burial.

Lot C52E/1 This lot includes surface collections.

Lot C52E/2 Excavation of the humus layer.

Lot C52E/3 This lot includes the level below the humus to approximately .65 m below the datum.

Excavations at the Rita Plaza Group

Operation C53 This operation includes investigations at the Rita architectural group.

Suboperation C53A Excavation of a test unit, .75 m x .75 m, placed in front of the East structure to expose the opening to a tomb.

Lot C53A/2 This lot includes the removal of humus.

Lot C53A/3 This lot excavated a medium gray-brown soil in the entranceway of the tomb.

Lot C53A/4 Removal of a dark brown matrix extending down to .50 m below the tomb entrance.

Lot C53A/5 This lot includes the excavation of a hard packed dark brown matrix at depth of 2.12 m to 2.44 m below arbitrary datum inside the tomb.

Suboperation C53B Excavation of a 1.5 m x 1.5 m test unit placed in front of the east structure (3F1).

Lots C53B/1 to 10 Lot descriptions are unavailable.

Lot C53B/11 This lot includes the excavation of a burial, SD#C53B-5, located 1.08 m below an arbitrary datum.

Lot C53B/13 Removal of floor bedding 1.17 m to 1.28 m below the test unit datum.

Lot C53B/14 This lot includes the layer beneath floor bedding between 1.28 m to 1.75 m below datum.

Lot C53B/15 A lot description is unavailable.

Lot C53B/16 This lot includes the excavation of a tomb which is the extension of the east test unit.

Suboperation C53C Excavation of a 1.5 m x 1.5 m test unit placed in front of the West structure.

Lot C53C/1 to 3 A lot description is unavailable.

Lot C53C/4 This lot includes the excavation of a level from 1.06 m to 1.34 m below a datum.

Excavations at the Cerrita Plaza Group

Operation C56 This operation includes the investigations at the Cerrita plaza located approximately 3.5 km from the epicenter of Caracol, midway between the Pajaro-Ramonal and Conchita Causeways (Figure 2).

Suboperation C56A This lot includes the excavation of an E to W aligned tomb in the largest south structure at Cerrita.

Lot C56A/1 This lot includes the removal of humus within the tomb, 0 to .35 m below the surface.

Lot C56A/2 This lot includes the removal of rubble and collapsed dirt from above, down to bedrock level. The tomb chamber was empty.

Suboperation C56B This lot includes the excavation of a 1.5 m x 1.5 m test pit centered in front of the north wall of the largest south structure.

Lot C56B/1 Removal of humus in the south test pit located on the northern side of the south structure. The humus level is from 0 to .30 m below the surface at the north end of the test unit.

Lot C56B/2 This lot includes detailing around the large rubble, from .30 m to .39 m in depth at the north end of unit.

Lot C56B/3 Removal of medium to large size rubble, from .39 m to .60 m below surface level as measured at the north end of the test pit.

Lot C56B/4 Removal of soil under a sherd and lithic scatter. This excavation of the test pit removed material from .60 m below surface to bedrock at .60 m in the west section and .67 m in the east side of the unit.

Suboperation C56C Excavation of 1.5 m x 1.5 m test pit centered in front of the west wall of the largest eastern structure at the Cerrita group.

Lot C56C/1 Removal of humus from 0 to .30 m below the surface.

Lot C56C/2 This lot included the removal of brown soil and stones from .30 m to .55 m. A step was uncovered in front of the structure.

Lot C56C/3 Removal of a step in the eastern .32 m of the test pit, from .30 m to .55 m deep.

Lot C56C/4 Removal of soil and small rubble to reveal capstones, from .55 m to .60 m below surface level.

Lot C56C/5 Excavation of an extension to the original test pit, which extends .50 m west of the original west boundary. This lot includes removal of the humus layer from 0 to .30 m below the surface.

Lot C56C/6 Removal of soil and detailing of the capstones in the extension from .30 m to .60 m below the surface.

Lot C56C/7 Removal of soil beneath the capstones from the western portion of the test pit to expose the crypt burial SD#C56C-1. This included detailing of the burial down to the bedrock floor. In addition to lithic material, this lot also contained 10 slate fragments and 1 cinnabar fragment which may have been used in craft activities. Also a flowstone fragment was incorporated into the wall of the crypt.

Lot C56C/8 This lot included the removal of the humus from surface level to .30 m in depth, in an extension of the test pit which extends the unit to the south by .50 m.

Lot C56C/9 Removal of soil and stones to detail the capstones of the crypt in the eastern section of the test pit, under lot 8 in the 2nd extension to the test pit.

Lot C56C/10 Removal of soil under the capstones and detailing of a crypt burial, SD#C56C-3 and 4, down to the bedrock floor.

Lot C56C/11 Removal of soil to detail bedrock lying between the two crypts, which includes pottery vessel caches SD#C56C-2, and SD#C56C-5.

Excavations at the Jester Plaza Group

Operation C62 This operation includes the investigations of the Jester architectural group located on the north side of the Pajaro-Ramonol Causeway before the Royal plaza group.

Suboperation C62A Excavations of the 1.5 m x 1.5 m test unit placed in front of the eastern structure.

Lot C62A/1 Removal of the humus layer which contained a dark brown to black clay.

Lot C62A/2 Removal of a black soil matrix and stones below humus to .35 m below the surface.

Lot C62B Excavations of a 1.5 m x 1.5 m test pit placed in front of the north structure at Jester.

Lot C62B/1 This lot includes the removal of humus.

Lot C62B/2 This lot includes the removal of a black clayey soil beneath the humus to .36 m below the surface.

Lot C62B/3 This lot includes the removal of an orange/brown soil .36 m to .50 m below surface level.

Suboperation C62C Excavation of a 1.5 m x 1.5 m test pit at the Jester architectural group. It was located .70 m from a terrace wall and abuts the south building.

Lot C62C/1 Removal of brownish black humus layer.

Lot C62C/2 Removal of black clayey soil beneath the humus to .49 m below the surface.

Earth Plaza Group

Operation C103 was assigned to the investigations at the Earth Group. This group of structures in located at ~1150 m on the NS transect #2 in the NE section of the site and the map location is not available.

Suboperation C103A was assigned to the surface collections at the group.

Suboperation C103B was assigned to a 1.5 m x 1.5 m test pit at plaza level placed in front of the eastern structure.

Lot C103B/1 This lot includes the humus layer.

Lot C103B/2 This lot was assigned to the removal of a dark brown fill material which extended down to a floor.

Lot C103B/3 This lot included a dark brown fill matrix and loose dirt below the floor. Evidence of burning which stained the soil dark was found. Large limestone slabs were uncovered.

Lot C103B/4 This lot included a dark reddish brown matrix with large limestone rubble. The limestone slabs continued to be uncovered and had more stones at their base.

Lot C103B/5 This lot included a cache vessel Special Deposit, SD#C103B-1 at a depth of approximately 80 cm below the surface and level with the large limestone slabs.

Lot C103B/6 This lot was assigned the humus layer in a .5 m eastern extension to the test pit.

Lot C103B/7 This lot in the extension corresponds to lot 2 assigned to the removal of a dark brown fill material down to a floor.

Lot C103B/8 This lot in the extension corresponds to lot 3 and includes a dark brown fill matrix below the floor.

Lot C103B/9 This lot is in the extension and corresponds to lot 4 with a reddish brown matrix and rubble.

Lot C103B/10 This lot extends the test unit 5 cm down below the capstones into a sterile reddish orange matrix.

Lot C103B/11 This lot contained a badly preserved burial with a cylinder vessel.

Suboperation C103C This excavation included a 1.5 m x 1.5 m test unit situated in front of Earth's western structure. The test pit contained a lithic concentration which was screened with 1/8 inch mesh.

Lot C103C/1 This lot included humus material and contained a heavy lithic scatter in the northwest quarter of the unit. The lot extended to approximately 5 cm below surface level.

Lot C103C/2 This lot uncovered a loose dark brown dirt matrix which contained more of the lithic scatter encompassing the west half of the test unit. The depth of the lot is 0.1 m below the surface.

Lot C103C/3 A darker brown fill matrix was uncovered in this lot. The western half of the unit still contained large quantities of lithics. The depth of this lot is at 1 m below the surface.

Lot C103C/4 The lithic scatter is present in the western third of the test unit at a depth of approximately 1.2 m below the surface. This lot included a brown/black matrix with large limestone chunks and a large amount of chert cores. Limestone building stones were located at the western edge of the unit.

Lot C103C/5 This lot consisted of the removal of a loose brown dirt matrix containing large stones along the west excavation wall and a lithic concentration in the west half of the test pit.

Lot C103C/6 This lot contained a tan fill matrix with a lithic concentration and large limestone rocks.

Lot C103C/7 This lot contained a grayish brown fill matrix with small limestone rocks and ended with sterile bedrock. This lot was not screened.

Lot C103C/8 This lot included the removal of a 242.2 g sample of the matrix from the test unit to check for the presence of microflakes.

Suboperation C103D This excavation included a 1.5 m x 1.5 m test unit behind (or, west) the western mound at the Earth Group.

Lot C103D/1 Removal of humus with an unusual ash gray color and extending 0.1 m below surface level.

Lot C103D/2 This lot included a gray brown matrix extending down 3 cm and uncovering 3 large limestone slabs.

Lot C103D/3 This lot included a gray brown matrix with large limestone chunks.

Lot C103D/4 This sterile lot included a light ash gray matrix ending with bedrock at 0.55 m below the surface.

Suboperation C103E This operation included investigations at the south structure of the Earth Group.

Lot C103E/1 This lot includes surface collections and a soil and lithic matrix sample collected to test for microflakes. The sample was taken in a 40 cm x 40 cm test area less than 5 cm deep and consisted of 2,647.1 g of soil and lithic material.

APPENDIX II:

LITHIC DATA TABLES

Table 9.
Small Chert Tools from Structure B19

Lot Numbers	Trimmed Flakes		Drills		Broken Drill Fragments	
	no.	wt.	no.	wt.	no.	wt.
C4C/2	0	0	0	0	0	0
C4C/3	0	0	0	0	0	0
C4C/4	1	3.4	0	0	0	0
C4C/5	0	0	0	0	0	0
C4C/10	0	0	1	1.4	0	0
C4C/12	4	5.9	189	223.8	0	0
C4C/13	0	0	0	0	0	0
C4C/14	3	4.7	27	31.5	0	0
C4C/16	0	0	0	0	0	0
C4C/17	0	0	0	0	0	0
C4C/18	0	0	0	0	0	0
C4C/19	0	0	0	0	1	1
C4C/20	0	0	0	0	0	0
C4C/21	0	0	0	0	0	0
TOTAL	8	14.0	217	256.7	1	1.0

Quantities and weights in grams are arranged by lots.

Table 10.
Debitage from Str. B19

Lot Number	Primary Cortex Flakes		Secondary Cortex Flakes		Tertiary Flakes	
	no.	wt.	no.	wt.	no.	wt.
C4C/2	0	0	2	6.2	2	3.4
C4C/3	0	0	0	0	0	0
C4C/4	0	0	0	0	0	0
C4C/5	0	0	0	0	2	8.1
C4C/10	1	5.6	1	1.1	1	1
C4C/12	25	45.1	160	369.7	350	304.2
C4C/13	0	0	0	0	1	0.7
C4C/14	5	3.5	17	62.5	42	41.7
C4C/16	0	0	0	0	0	0
C4C/17	1	17.1	5	16	9	30.5
C4C/18	0	0	0	0	1	0.2
C4C/19	5	43.8	23	127.7	34	54.1
C4C/20	0	0	0	0	1	0.2
C4C/21	1	35.3	6	94.9	14	32.1
Total	38	150.4	214	678.1	457	476.2

Quantities and weights in grams are arranged by lots.

Table 10 continued.
Debitage from Str. B19

Lot Number	Cores		Core Fragments		Shatter		Blocky Fragments	
	no.	wt.	no.	wt.	no.	wt.	no.	wt.
C4C/2	0	0	0	0	0	0	3	149.2
C4C/3	1	11	0	0	0	0	1	58.8
C4C/4	4	169.7	0	0	0	0	0	0
C4C/5	0	0	0	0	0	0	0	0
C4C/10	1	42.8	0	0	0	0	0	0
C4C/12	20	664.1	0	0	0	0	0	0
C4C/13	6	704.5	0	0	0	0	0	0
C4C/14	2	27.8	0	0	1	2.5	0	0
C4C/16	1	30.7	0	0	0	0	0	0
C4C/17	0	0	0	0	0	0	1	50.2
C4C/18	0	0	0	0	0	0	0	0
C4C/19	1	375	0	0	0	0	1	28.1
C4C/20	0	0	0	0	0	0	0	0
C4C/21	1	65.9	4	211.2	0	0	0	0
Total	37	2,091.5	4	211.2	1	2.5	6	286.3

Quantities and weights in grams are arranged by lots.

Table 11.
Small Chert Tools from the Mosquito Plaza Group

Lot Numbers	Trimmed Flakes		Drills		Broken Drill Fragments	
	no.	wt.	no.	wt.	no.	wt.
C32A/1	0	0	1	1.8	0	0
C32A/3	18	59.8	3	8.7	0	0
C32A/4	26	65.1	32	42.7	0	0
C32B/4	9	27.9	14	28.1	0	0
C32B/5	34	124.3	11	23.9	0	0
C32C/1	78	302.2	34	132.7	0	0
C32C/2	24	130.2	8	26.7	0	0
C32C/3	6	22	9	17.6	0	0
C32C/4	0	0	1	1.7	0	0
C32C/5	1	2.3	0	0	0	0
C32C/6	10	34.2	9	19.7	1	0.7
C32C/7	13	52.2	14	31.4	0	0
C32C/8	0	0	1	1.2	0	0
Total	219	820.2	137	336.2	1	0.7

Quantities and weights in grams are arranged by lots.

Table 12.
Debitage from the Mosquito Plaza

Lot Number	Primary Cortex Flakes		Secondary Cortex Flakes		Tertiary Flakes	
	no.	wt.	no.	wt.	no.	wt.
C32A/1	0	0	1	1	4	9.3
C32A/3	4	5	12	32.7	58	96.4
C32A/4	6	17.7	68	154.3	164	203
C32B/4	10	67.5	26	95.6	60	109.8
C32B/5	6	25	57	188.5	78	203.1
C32C/1	8	42	61	278.2	114	266.5
C32C/2	0	0	32	211.5	33	121
C32C/3	3	9.6	17	99.2	30	73.1
C32C/4	0	0	1	0.3	0	0
C32C/5	0	0	2	12.6	3	3.3
C32C/6	5	16.7	19	50	39	49.2
C32C/7	1	2.1	29	176.4	32	115.6
C32C/8	0	0	0	0	4	10.4
Total	43	185.6	325	1,300.3	619	1,260.7

Quantities and weights in grams are arranged by lots.

Table 12 continued.
Debitage from the Mosquito Plaza Group

Lot Number	Cores		Core Fragments		Shatter		Blocky Fragments	
	no.	wt.	no.	wt.	no.	wt.	no.	wt.
C32A/1	0	0	0	0	0	0	0	0
C32A/3	1	16.7	0	0	3	11.4	9	36.4
C32A/4	2	37.7	0	0	7	13	8	60.7
C32B/4	0	0	0	0	0	0	6	28.7
C32B/5	0	0	0	0	0	0	1	2.3
C32C/1	10	118.4	1	16.7	0	0	4	31.2
C32C/2	4	118.1	3	35.3	0	0	0	0
C32C/3	0	0	2	16	0	0	0	0
C32C/4	0	0	0	0	0	0	0	0
C32C/5	0	0	0	0	0	0	0	0
C32C/6	2	10.5	0	0	0	0	4	20.7
C32C/7	1	7.6	2	11.3	2	9.3	0	0
C32C/8	0	0	0	0	0	0	0	0
Total	20	309.0	8	79.3	12	33.7	32	180.0

Quantities and weights in grams are arranged by lots.

Table 13.
Small Chert Tools from the Midway Plaza Group

Lot Numbers	Trimmed Flakes		Drills		Broken Drill Fragments	
	no.	wt.	no.	wt.	no.	wt.
C41A/1	8	13.9	12	21.4	3	4.1
C41A/2	52	71.7	103	131.0	18	24.6
C41A/3	27	35.4	51	83.3	5	6.9
C41A/4	0	0	0	0	0	0
C41A/5	9	16.7	16	20.7	3	4.5
C41D/2	0	0	0	0	0	0
Total	96	137.7	182	256.4	29	40.1

Quantities and weights in grams are arranged by lots.

Table 14.
Debitage from the Midway Plaza Group

Lot Number	Primary Cortex Flakes		Secondary Cortex Flakes		Tertiary Flakes	
	no.	wt.	no.	wt.	no.	wt.
C41A/1	10	43.2	58	109.9	101	122.8
C41A/2	34	75.4	324	511.9	642	526.6
C41A/3	16	52.3	105	361.8	171	237.1
C41A/4	0	0	2	3	2	2.2
C41A/5	7	12.3	31	90	45	115.5
C41D/2	0	0	0	0	1	4
Total	67	183.2	520	1,076.6	962	1,008.2

Quantities and weights in grams are arranged by lots.

Table 14 continued.
Debitage from the Midway Plaza Group

Lot Numbers	Cores		Core Fragments		Shatter		Blocky Fragments	
	no.	wt.	no.	wt.	no.	wt.	no.	wt.
C41A/1	0	0	0	0	0	0	6	59.4
C41A/2	0	0	1	5.4	2	6	10	155.3
C41A/3	3	32.8	1	6.4	1	4.8	4	192.8
C41A/4	0	0	0	0	0	0	0	0
C41A/5	1	42.8	1	12.3	0	0	1	12.8
C41D/2	0	0	0	0	0	0	0	0
Total	4	75.6	3	24.1	3	10.8	21	420.3

Quantities and weights in grams are arranged by lots.

Table 15.
Small Chert Tools from the Dove Plaza Group

Lot Numbers	Trimmed Flakes		Drills		Broken Drill Fragments	
	no.	wt.	no.	wt.	no.	wt.
C48A/1	2	1.7	3	3.5	0	0
C48A/2	1	4.5	4	2.8	0	0
C48A/3	0	0	6	6.5	0	0
C48A/4	0	0	0	0	0	0
C48A/5	0	0	0	0	0	0
C48B/1	19	25	59	72.2	0	0
C48B/2	1	1.6	9	13	0	0
Total	23	32.8	81	98.0	0	0.0

Quantities and weights in grams are arranged by lots.

Table 16.
Debitage from the Dove Plaza Group

Lot Number	Primary Cortex Flakes		Secondary Cortex Flakes		Tertiary Flakes	
	no.	wt.	no.	wt.	no.	wt.
C48A/1	0	0	1	1.5	3	5.2
C48A/2	0	0	4	36.6	8	23
C48A/3	0	0	3	5.3	7	14.3
C48A/4	0	0	2	19.8	1	0.3
C48A/5	0	0	1	6.7	1	4.8
C48B/1	32	202.6	105	498.4	153	378.3
C48B/2	1	8.2	17	90.9	25	76
Total	33	210.8	133	659.2	198	501.9

Quantities and weights in grams are arranged by lots.

Table 16 continued.
Debitage from the Dove Plaza Group

Lot Numbers	Cores		Core Fragments		Shatter		Blocky Fragments	
	no.	wt.	no.	wt.	no.	wt.	no.	wt.
C48A/1	0	0	0	0	0	0	0	0
C48A/2	2	45	0	0	0	0	0	0
C48A/3	0	0	0	0	0	0	0	0
C48A/4	0	0	0	0	0	0	0	0
C48A/5	0	0	0	0	0	0	0	0
C48B/1	24	350.6	4	57.3	0	0	4	61.6
C48B/2	2	49.7	0	0	0	0	0	0
Total	28	445.3	4	57.3	0	0.0	4	61.6

Quantities and Weigts in grams are arranged by lots.

Table 17.
Small Chert Tools from the Tiger Plaza Group

Lot Numbers	Trimmed Flakes		Drills		Broken Drill Fragments	
	no.	wt.	no.	wt.	no.	wt.
C50A/2	0	0	0	0	0	0
C50A/6	0	0	0	0	0	0
C50B/2	6	5.9	3	5	1	2
C50B/3	0	0	1	0.7	0	0
C50B/10	0	0	1	1.6	0	0
C50B/11	0	0	1	1.8	0	0
C50C/1	0	0	1	2.6	0	0
C50C/2	4	2.8	30	24.7	0	0
C50C/3	27	24.0	152	124.5	6	5.1
C50C/5	0	0	4	2	0	0
TOTAL	37	32.7	193	162.9	7	7.1

Quantities and weights in grams are arranged by lots.

Table 18.
Debitage from the Tiger Plaza Group

Lot Number	Primary Cortex Flakes		Secondary Cortex Flakes		Tertiary Flakes	
	no.	wt.	no.	wt.	no.	wt.
C50A/2	0	0	0	0	1	0.4
C50A/6	0	0	2	30.3	1	11.9
C50B/2	4	5.5	15	36.3	10	18.8
C50B/3	0	0	2	2.1	0	0
C50B/10	1	1.3	0	0	3	5.2
C50B/11	0	0	0	0	0	0
C50C/1	0	0	3	3.9	4	4.9
C50C/2	3	2.9	17	31.0	29	13.1
C50C/3	34	49.6	114	121.5	249	156.0
C50C/5	0	0	1	4.3	4	2.8
Total	42	59.3	154	229.4	301	213.1

Quantities and weights in grams are arranged by lots.

Table 18 continued.
Debitage from the Tiger Plaza Group

Lot Numbers	Cores		Core Fragments		Shatter		Blocky Fragments	
	no.	wt.	no.	wt.	no.	wt.	no.	wt.
C50A/2	0	0	0	0	0	0	0	0
C50A/6	0	0	0	0	0	0	0	0
C50B/2	0	0	0	0	0	0	2	5.7
C50B/3	0	0	0	0	0	0	0	0
C50B/10	0	0	0	0	0	0	0	0
C50B/11	0	0	0	0	0	0	0	0
C50C/1	2	15.8	0	0	0	0	0	0
C50C/2	0	0	0	0	0	0	0	0
C50C/3	4	127.6	0	0	2	5.5	0	0
C50C/5	0	0	0	0	0	0	0	0
Total	6	143.4	0	0.0	2	5.5	2	5.7

Quantities and weights in grams are arranged by lots.

Table 19.
Small Chert Tools from the Blanca Plaza Group

Lot Numbers	Trimmed Flakes		Drills		Broken Drill Fragments	
	no.	wt.	no.	wt.	no.	wt.
C52A/2	0	0	0	0	0	0
C52A/4	0	0	0	0	0	0
C52A/5	0	0	0	0	0	0
C52B/2	0	0	0	0	0	0
C52B/3	1	5	0	0	0	0
C52B/5	1	2.5	0	0	0	0
C52B/6	0	0	0	0	0	0
C52B/7	0	0	0	0	0	0
C52C/2	15	24.7	23	29.7	0	0
C52C/3	74	101.5	192	207.8	5	2.1
C52C/5	0	0	0	0	0	0
C52C/6	1	1.3	0	0	0	0
C52D/3	0	0	0	0	0	0
C52D/5	0	0	1	0.9	0	0
C52E/3	0	0	0	0	0	0
Total	92	135.0	216	238.4	5	2.1

Quantities and weights in grams are arranged by lots.

Table 20.
Debitage from the Blanca Plaza Group

Lot Number	Primary Cortex Flakes		Secondary Cortex Flakes		Tertiary Flakes	
	no.	wt.	no.	wt.	no.	wt.
C52A/2	0	0	1	3	1	1.6
C52A/4	1	7.4	2	17.2	2	2.8
C52A/5	0	0	0	0	2	3.3
C52B/2	0	0	1	1	5	16
C52B/3	1	0.7	5	21.2	13	111.6
C52B/5	1	30.1	3	21.2	1	2.2
C52B/6	0	0	0	0	1	2.4
C52B/7	0	0	0	0	0	0
C52C/2	5	35.5	11	52.8	43	119.7
C52C/3	6	19.5	70	184.6	224	297.6
C52C/5	0	0	6	91	5	12.1
C52C/6	0	0	0	0	0	0
C52D/3	0	0	0	0	5	34.1
C52D/5	0	0	1	0.4	2	1
C52E/3	0	0	2	2.1	2	2.1
Total	14	93.2	102	394.5	306	606.5

Quantities and weights in grams are arranged by lots.

Table 20 continued.
Debitage from the Blanca Plaza Group

Lot Number	Cores		Core Fragments		Shatter		Blocky Fragments	
	no.	wt.	no.	wt.	no.	wt.	no.	wt.
C52A/2	1	40.1	1	12.2	0	0	0	0
C52A/4	1	134.6	0	0	0	0	2	83
C52A/5	0	0	0	0	0	0	0	0
C52B/2	0	0	2	30.3	0	0	0	0
C52B/3	8	338.6	0	0	0	0	1	30.5
C52B/5	1	44.1	0	0	0	0	2	42.8
C52B/6	0	0	0	0	0	0	0	0
C52B/7	0	0	2	17.8	0	0	0	0
C52C/2	1	9.5	2	15.2	0	0	0	0
C52C/3	8	88.2	0	0	0	0	3	21.8
C52C/5	2	73.3	2	70.2	0	0	0	0
C52C/6	0	0	1	25.4	0	0	0	0
C52D/3	0	0	0	0	0	0	0	0
C52D/5	0	0	0	0	0	0	0	0
C52E/3	1	33.6	0	0	0	0	0	0
Total	23	762.0	10	171.1	0	0	8	178.1

Quantities and weights in grams are arranged by lots.

Table 21.
Small Chert Tools from the Rita Plaza Group

Lot Numbers	Trimmed Flakes		Drills		Broken Drill Fragments	
	no.	wt.	no.	wt.	no.	wt.
C53A/2	1	1.1	0	0	0	0
C53A/3	0	0	0	0	0	0
C53A/4	0	0	0	0	0	0
C53A/5	5	8.2	7	11.7	0	0
C53B/11	0	0	0	0	0	0
C53B/13	0	0	0	0	0	0
C53B/14	0	0	0	0	0	0
C53B/16	41	66.7	304	380.3	0	0
C53C/4	2	19.9	4	17.6	0	0
Total	49	95.9	315	409.6	0	0.0

Quantities and weights in grams are arranged by lots.

Table 22.
Debitage from the Rita Plaza Group

Lot Number	Primary Cortex Flakes		Secondary Cortex Flakes		Tertiary Flakes	
	no.	wt.	no.	wt.	no.	wt.
C53A/2	1	14.7	1	2.1	2	1.2
C53A/3	0	0	3	8.8	7	21.8
C53A/4	1	0.8	0	0	0	0
C53A/5	2	1.6	3	5.7	10	9.3
C53B/11	0	0	2	4.2	0	0
C53B/13	0	0	0	0	1	4.2
C53B/14	0	0	0	0	1	1.8
C53B/16	83	207.3	386	1026.5	626	787.4
C53C/4	0	0	0	0	9	17.9
Total	87	224.4	395	1,047.3	656	843.6

Quantities and weights in grams are arranged by lots.

Table 22 continued.
Debitage from the Rita Plaza Group

Lot Number	Cores		Core Fragments		Shatter		Blocky Fragments	
	no.	wt.	no.	wt.	no.	wt.	no.	wt.
C53A/2	0	0	0	0	0	0	0	0
C53A/3	2	188.4	0	0	0	0	2	28.5
C53A/4	0	0	0	0	0	0	1	10.3
C53A/5	6	52.9	0	0	0	0	9	16.5
C53B/11	0	0	0	0	0	0	1	38.7
C53B/13	0	0	0	0	0	0	1	20.1
C53B/14	1	12.8	0	0	0	0	0	0
C53B/16	55	1616.6	8	124.4	0	0	2	9.5
C53C/4	22	126.6	0	0	0	0	0	0
Total	86	1,997.3	8	124.4	0	0	16	123.6

Quantities and weights in grams are arranged by lots.

Table 23.
Small Chert Tools from the Carrita Plaza Group

Lot Numbers	Trimmed Flakes		Drills		Broken Drill Fragments	
	no.	wt.	no.	wt.	no.	wt.
C56A/1	0	0	0	0	0	0
C56A/2	0	0	0	0	0	0
C56B/1	0	0	0	0	0	0
C56B/2	0	0	2	3.2	0	0
C56B/3	107	141.4	671	710.4	21	8.2
C56B/4	0	0	0	0	0	0
C56C/1	0	0	0	0	0	0
C56C/2	0	0	1	1.4	0	0
C56C/3	0	0	0	0	0	0
C56C/4	0	0	10	9.9	0	0
C56C/5	0	0	0	0	0	0
C56C/6	0	0	1	3.1	0	0
C56C/7	0	0	0	0	0	0
C56C/9	0	0	0	0	0	0
C56C/10	0	0	1	0.9	0	0
C56C/11	0	0	3	17.3	0	0
Total	107	141.4	689	746.2	21	8.2

Quantities and weights in grams are arranged by lots.

Table 24.
Debitage from the Cerrita Plaza Group

Lot Number	Primary Cortex Flakes		Secondary Cortex Flakes		Tertiary Flakes	
	no.	wt.	no.	wt.	no.	wt.
C56A/1	0	0	2	22.7	0	0
C56A/2	0	0	0	0	2	4.8
C56B/1	1	10.3	1	3.1	4	20.7
C56B/2	0	0	8	128.9	5	9.6
C56B/3	234	353	756	632.2	1731	820.6
C56B/4	0	0	2	3.8	4	4.2
C56C/1	0	0	2	8.3	1	3.3
C56C/2	2	35.4	12	93.9	18	33.2
C56C/3	0	0	1	19	1	16.5
C56C/4	3	1.3	19	54.5	32	49.5
C56C/5	1	10.6	0	0	2	5.5
C56C/6	0	0	0	0	0	0
C56C/7	2	34.5	14	102.7	29	148
C56C/9	0	0	1	20.8	1	2.4
C56C/10	1	23.9	10	114.4	16	46.2
C56C/11	12	311.1	36	447.6	76	503.7
Total	256	780.1	864	1,651.9	1,922	1,668.2

Quantities and weights in grams are arranged by lots.

Table 24 continued.
Debitage from the Cerrita Plaza Group

Lot Number	Cores		Core Fragments		Shatter		Blocky Fragments	
	no.	wt.	no.	wt.	no.	wt.	no.	wt.
C56A/1	1	88.6	0	0	0	0	0	0
C56A/2	1	116.1	0	0	0	0	0	0
C56B/1	0	0	0	0	0	0	0	0
C56B/2	2	70	1	26.1	0	0	0	0
C56B/3	5	71.7	4	22.2	7	19.2	5	234.2
C56B/4	0	0	0	0	0	0	0	0
C56C/1	3	145.4	0	0	0	0	0	0
C56C/2	4	515.4	0	0	0	0	0	0
C56C/3	0	0	0	0	0	0	1	49.2
C56C/4	0	0	0	0	0	0	1	49
C56C/5	3	123.2	0	0	1	7.7	1	14.6
C56C/6	0	0	0	0	0	0	0	0
C56C/7	3	333.5	0	0	0	0	4	63
C56C/9	0	0	0	0	0	0	0	0
C56C/10	6	360.2	0	0	0	0	0	0
C56C/11	115	2414.1	5	111.9	0	0	9	276.5
Total	43	4,238.2	10	160.2	8	26.9	21	686.5

Quantities and weights in grams are arranged by lots.

Table 25.
Small Chert Tools from the Jester Plaza Group

Lot Numbers	Trimmed Flakes		Drills		Broken Drill Fragments	
	no.	wt.	no.	wt.	no.	wt.
C62A/1	1	1.9	7	6.9	0	0
C62A/2	8	6.8	22	28.9	4	2.5
C62B/1	0	0	0	0	0	0
C62B/2	0	0	0	0	0	0
C62B/3	0	0	1	0.7	0	0
C62C/1	0	0	0	0	0	0
C62C/2	0	0	2	0.6	0	0
Total	9	8.7	32	37.1	4	2.5

Quantities and weights in grams are arranged by lots.

Table 26.
Debitage from the Jester Plaza Group

Lot Number	Primary Cortex Flakes		Secondary Cortex Flakes		Tertiary Flakes	
	no.	wt.	no.	wt.	no.	wt.
C62A/1	6	15	22	124	50	73.2
C62A/2	3	18.1	36	129.9	77	139.8
C62B/1	2	51.4	2	17.1	1	3
C62B/2	0	0	10	58.2	4	16.8
C62B/3	0	0	2	8.4	0	0
C62C/1	3	18.1	4	61.8	2	8.1
C62C/2	0	0	1	0.2	6	2.5
Total	14	102.6	77	399.6	140	243.4

Quantities and weights in grams are arranged by lots.

Table 26 continued.
Debitage from the Jester Plaza Group

Lot Numbers	Cores		Core Fragments		Shatter		Blocky Fragments	
	no.	wt.	no.	wt.	no.	wt.	no.	wt.
C62A/1	6	291.3	0	0	6	16.3	7	160.6
C62A/2	9	908.4	2	31.5	0	0	7	76.6
C62B/1	1	67.1	0	0	1	5.9	2	28.2
C62B/2	0	0	0	0	0	0	2	47.4
C62B/3	0	0	0	0	0	0	0	0
C62C/1	0	0	0	0	0	0	0	0
C62C/2	0	0	0	0	0	0	1	7.5
Total	16	1,266.8	2	31.5	7	22.2	19	320.3

Quantities and weights in grams are arranged by lots.

Table 27.
Small Chert Tools from the Earth Plaza Group

Lot Numbers	Trimmed Flakes		Drills		Broken Drill Fragments	
	no.	wt.	no.	wt.	no.	wt.
C103B/2	0	0	0	0	0	0.0
C103B/3	1	1.0	14	12.8	3	1.8
C103B/4	0	0	0	0	0	0.0
C103B/8	0	0	0	0	0	0.0
C103B/9	0	0	0	0	0	0.0
C103C/1	2	2.7	7	23.4	0	0.0
C103C/2	22	15.9	50	47.3	1	1.8
C103C/3	4	9.9	2	1.2	0	0
C103C/4	55	60.8	185	166.4	0	0
C103C/5	53	57.3	211	193.6	5	2.6
C103C/6	38	46.4	221	211.0	8	5.1
C103C/7	4	6.5	15	15.5	0	0
C103D/1	0	0	6	7.6	0	0
C103D/2	6	13.8	19	24.4	0	0
C103D/3	9	11.0	28	46.6	4	5.7
Total	194	225.3	758	749.8	21	17.0

Quantities and weights in grams are arranged by lots.

Table 28.
Debitage from the Earth Plaza Group

Lot Number	Primary Cortex Flakes		Secondary Cortex Flakes		Tertiary Flakes	
	no.	wt.	no.	wt.	no.	wt.
C103B/2	2	2.7	2	26.0	1	0.5
C103B/3	12	192.1	31	361.7	32	76.1
C103B/8	0	0	1	7.2	2	39.4
C103B/9	0	0	2	12.4	0	0
C103C/1	6	26.6	49	166.6	32	61.7
C103C/2	60	207.0	236	752.8	302	482.4
C103C/3	9	43.3	48	325.1	44	197.8
C103C/4	142	570.7	467	1583.4	1078	1324.4
C103C/5	161	661.7	240	671.5	156	1360.4
C103C/6	115	318.7	463	1256.8	735	900.1
C103C/7	7	25.4	21	91.7	47	54.6
C103D/1	2	8.6	31	185.2	23	39.8
C103D/2	18	69.1	68	230.4	93	108.4
C103D/3	89	465.0	246	258.8	314	572.5
Total	623	2590.9	1905	5929.6	2859	5218.1

Quantities and weights in grams are arranged by lots.

Table 28 continued.
Debitage from the Earth Plaza Group

Lot Numbers	Cores		Core Fragments		Shatter		Blocky Fragments	
	no.	wt.	no.	wt.	no.	wt.	no.	wt.
C103B/2	0	0	1	7.1	0	0	0	0
C103B/3	6	255.7	0	0	0	0	0	0
C103B/4	2	178.4	2	98.0	0	0	0	0
C103B/8	0	0	0	0	0	0	0	0
C103B/9	1	9.0	0	0	0	0	0	0
C103C/1	3	71.1	6	168.8	0	0	0	0
C103C/2	30	689.2	9	106.5	1	10.1	10	82.9
C103C/3	15	715.4	9	275.7	1	7.2	5	224.1
C103C/4	57	1992.1	46	638.9	17	108.6	8	168.4
C103C/5	107	4389.0	29	435.4	13	29.3	8	126.0
C103C/6	27	567.7	15	188.4	3	4.4	12	109.2
C103C/7	9	178.2	6	132.5	0	0	0	0
C103D/1	8	262.2	0	0	0	0	0	0
C103D/2	4	129.1	3	45.4	4	13.0	1	7.6
C103D/3	29	683.7	13	183.9	0	0	4	101.4
Total	298	10120.8	139	2280.6	39	172.6	48	819.6

Quantities and weights in grams are arranged by lots.

References Cited

Andrews, E. Wyllys and Norman Hammond
1990 Redefinition of the Swasey Phase at Cuello, Belize, American Antiquity 55(3):570-584.

Anonymous
1985 The American Heritage Dictionary, Second College Edition, Houghton Mifflin Co., Boston.

Arnold, Jeanne E.
1987 Craft Specialization in the Prehistoric Channel Islands California. University of California Press, Berkeley and Los Angeles.

Bateson, J. H. and I. H. S. Hall
1977 The Geology of the Maya Mountains, Belize. Institute of Geological Sciences, Overseas Memoir 3. Her Majesty's Stationary Office, London.

Beetz, Carl P. and Linton Satterthwaite
1981 The Monuments and Inscriptions of Caracol, Belize. The University Museum, University of Pennsylvania.

Buttles, Palma J.
1992 Small Finds in Context: the Preclassic Artifacts of Colha, Belize. Unpublished thesis, Dept. of Anthropology, University of Texas at Austin.

Caso, Alfonso
1965 Lapidary work, Goldwork, and Copperwork from Oaxaca. In Handbook of Middle American Indians, Vol. 3, Part II, pp. 896-930. University of Texas Press, Austin.

Chase, Arlen F.
1992 Elites and the Changing Organization of Classic Maya Society. In Mesoamerican Elites: An Archaeological Assessment, edited by D. Z. Chase and A. F. Chase, pp. 30-49. University of Oklahoma Press, Norman.

1994 A Contextual Approach to the Ceramics of Caracol, Belize. In Studies in the Archaeology of Caracol, Belize, Monograph, 7, edited by Diane Z. Chase and Arlen F. Chase, pp. 157-182. Pre-Columbian Art Research Institute, San Francisco.

Chase, Arlen F. and Diane Z. Chase

1987 Investigations at the Classic Maya City of Caracol, Belize: 1985-1987, Monograph, 3. Pre-Columbian Art Research Institute, San Francisco, California.

1989 The Investigations of Classic Period Maya Warfare at Caracol, Belize. Mayab 5:5-18. Sociedad Espanola de Estudios Mayas.

1994a Details in the Archaeology of Caracol, Belize: An Introduction, In Studies in the Archaeology of Caracol, Belize, Monograph, 7, edited by Diane Z. Chase and Arlen F. Chase, pp. 1-11. Pre-Columbian Art Research Institute, San Francisco.

1994b Maya Veneration of the Dead at Caracol, Belize. In Seventh Mesa Redonda de Palenque, Vol. viii, edited by M. G. Robertson and V. M. Fields, pp. 55-62. Pre Columbian Art Research Institute, San Francisco.

Chase, Arlen F. and P. M. Rice, eds.

1985 The Lowland Maya Postclassic. University of Texas Press, Austin.

Chase, Diane Z.

1988 Caches and Censerwares: Meaning From Maya Pottery, In A Pot for All Reasons: Ceramic Ecology Revisited, edited by L. Lackey and C. Kolb, pp. 81-104. Temple Univ. Press, Philadelphia.

1994 Human Osteology, Pathology, and Demography as Represented in the Burials of Caracol, Belize, In Studies in the Archaeology of Caracol, Belize, Monograph, 7, edited by D. Chase and A.Chase, pp. 123-138. Pre-Columbian Art Research Institute, Sacramento.

Clark, John E.
1988 The Lithic Artifacts of La Libertad, Chiapas, Mexico: An Economic Perspective. Brigham Young University Print Services, Provo.

Cobos, Rafael
1994 Preliminary Report on the Archaeological Mollusca and Shell Ornaments of Caracol, Belize. Studies in the Archaeology of Caracol, Belize, Monograph, 7, edited by Diane Z. Chase and Arlen F. Chase, pp. 148-156. Pre-Columbian Art Research Institute, San Francisco.

Coe, Michael D.
1987 The Maya. 4th ed. Thames and Hudson Inc., New York.

Coe, William R.
1959 Piedras Negras Archaeology: Artifacts, Caches, and Burials. Museum Monographs 4, University Museum, Philadelphia.

1965 Artifacts of the Maya Lowlands. In Handbook of Middle American Indians, Vol. 3, Archaeology of Southern Mesoamerica, Part II, edited by R. Wauchope and G. R. Willey, pp. 594-602. University of Texas Press, Austin.

Coggins, Clemency
1975 Painting and Drawing Styles at Tikal: An Historical and Iconographic Reconstruction. Unpublished Ph.D. Dissertation, Harvard University, Cambridge.

Collins, Michael Bruce
1974 A Functional Analysis of Lithic Technology Among Prehistoric Hunter-Gatherers of Southwestern France and Western Texas. Ph.D. Dissertation, University of Arizona, University Microfilms, Ann Arbor.

Crabtree, Don E.
1982 An Introduction to Flintworking. 2nd ed., Idaho Museum of Natural History, Pocatello, Idaho.

Culbert, T. P.
1977 Maya Development and Collapse: An Economic Perspective. In Mesoamerican Archaeology: New Approaches, pp. 509-530. University of Texas Press, Austin.

Dreiss, Meridith L.
1982 An Initial Description of Shell Artifacts From Colha, Belize. In Archaeology at Colha, Belize: the 1981 Interim Report, edited by T. R. Hester, H. J. Shafer, and Jack D. Eaton, pp. 208-224. Center for Archaeological Research, the University of Texas at San Antonio.

1994 The Shell Artifacts of Colha: The 1983 Season. In Continuing Archaeology at Colha, Belize, edited by T. R. Hester, H. J. Shafer, and J. D. Eaton, pp. 177-200. Texas Archaeological Research Laboratory, the University of Texas at Austin.

Drollinger, H. D.
1989 An Investigation of a Late Preclassic Maya Chert Workshop from Colha, Belize. Unpublished M.A. Thesis, Department of Anthropology, Texas A&M University, College Station.

Dunham, Peter S., Thomas R. Jamison, and Richard M. Leventhal
1989 Secondary Development and Settlement Economics: The Classic Maya of Southern Belize. In Research in Economic Anthropology: Prehistoric Maya Economies of Belize, edited by P. A. McAnany and B. L. Isaac, pp. 255-295. JAI Press Inc., Greenwich, Conneticut.

Eaton, Jack D.
1974 Shell Celts From Coastal Yucatan, Mexico. In The Bulletin of the Texas Archeological Society 45:197-208.

Ensor, Blaine
1991 The Lubbub Creek Microlith Industry, Southeastern Archaeology 10(1):18-39.

Feinman, Gary M., Linda M. Nicholas, and Scott L. Fedick
1991 Shell Working in Prehispanic Ejutla, Oaxaca (Mexico): Findings from an Exploratory Field Season. Mexicon 13(4):69-77.

Ford, Annabel and Kirsten Olson
1989 Aspects of Ancient Maya Household Economy: Variation in Chipped Stone Production and Consumption. In Research in Economic Anthropology: Prehistoric Maya Economies of Belize, edited by P. A. McAnany and B. L. Issac, pp. 185-214. JAI Press Inc., Greenwich, Conneticut.

Fowler, William R., Jr.
1991 The Formation of Complex Society in Southeastern Mesoamerica. CRC Press, Boca Raton.

Garber, James F.
1981 Material Culture and Patterns of Artifact Consumption and Disposal at the Maya Site of Cerros in Northern Belize. Ph.D. dissertation, Southern Methodist University, University Microfilms.

1989 The Artifacts, Volume II. In Archaeology at Cerros, Belize, Central America. Edited by David A. Freidel. Southern Methodist University Press.

Geier, Clarence R.
1973 The Flake Assemblage in Archaeological Interpretation. Missouri Archaeologist 35(3-4):1-36.

Gibson, Eric C.
1989 The Organization of Late Preclassic Maya Lithic Economy in the Eastern Lowlands. In Research in Economic Anthroplogy: Prehistoric Maya Economies of Belize, edited by P. A. McAnany and B. L. Isaac, pp. 115-138. JAI Press Inc., Greenwich, Conneticut.

Hammond, Norman
1982 Ancient Maya Civilization. Rutgers University Press, New Brunswick.

Hayden, Brian
1977 Lithic Use-Wear Analysis. Academic Press, New York.

1980 Confusion in the Bipolar World: Bashed Pebbles and Splintered Pieces. Lithic Technology IX(1).

Hayden, Brian and Aubrey Cannon
1983 Where the Garbage Goes: Refuse Disposal in the Maya Highlands. Journal of Anthropological Archaeology 2:117-163.

Healy, Paul F., John D. H. Lambert, J. T. Arnason, and Richard J. Hebda
1983 Caracol Belize: Evidence of Ancient Maya Agricultural Terraces. Journal of Field Archaeology 10(397-410).

Hester, Thomas R.
1985 The Maya Lithic Sequence in Northern Belize. In Stone Tool Analysis: Essays in Honor of Don E. Crabtree, edited by M. G. Plew, J. C. Woods, and M. G. Pavesic, pp. 187-210. University of New Mexico Press, Albuquerque.

1986 On the Misuse of Projectile Point Typology in Mesoamerica. In American Antiquity 51(2): pp. 412-414.

Hester, Thomas R., Harry Iceland, Dale Hudler, Robbie Brewington, Harry J. Shafer, and Jon Lohse
1993 New Evidence on the Preceramic Era in Northern Belize: A Preliminary Overview. In Newsletter of the Friends of the Texas Archaeological Research Laboratory (1)2:19-23. University of Texas at Austin.

Hester, T. R., G. Ligabue, J. D. Eaton, H. J. Shafer, and R. E. W. Adams
1982 Archaeology at Colha, Belize: The 1981 Season. In Archaeology at Colha, Belize: The 1981 Interim Report, edited by T. R. Hester, H. J. Shafer, and J. D. Eaton, pp. 1-10. Center for Archaeological Research, The University of Texas at San Antonio.

Hirth, Kenneth
1984 Trade and Exchange in Early Mesoamerica. University of New Mexico Press, Albuquerque.

Holmes, W. H.
1919 Introductory: the lithic industries. Handbook of Aboriginal American Antiquities, Part I. Bulletin 60. Smithsonian Institution Bureau of American Ethnology, Washington, D.C.

Houston, Stephen D.
1987 Notes on Caracol Epigraphy and Its Significance, Appendix II, In Investigations at the Classic Maya City of Caracol, Belize: 1985-1987, Monograph, 3, edited by A. F. Chase and D. Z. Chase, pp. 85-100. Pre-Columbian Art Research Institute, San Francisco.

Hunter-Tate, Clarissa C.
1994 The Chultuns of Caracol, In Studies in the Archaeology of Caracol, Belize, Monograph, 7, edited by Diane Z. Chase and Arlen F. Chase, pp. 64-75. Pre-Columbian Art Research Institute, San Francisco.

Jaeger, Susan E.
1991 Settlement Pattern Research at Caracol, Belize: the Social Organization in a Classic Period Maya Site. Unpublished PhD. Dissertation, Department of Anthropology, Southern Methodist University, Dallas.

Johnson, Jay K.
1976 Chipped Stone Artifacts From the Western Maya Periphery. Unpublished Ph.D. Dissertation, Department of Anthropology, Southern Illinois University, Carbondale.

Jones, John G.
1991 Pollen Evidence for Agricultural Origins and Maya Subsistence Patterns in Northern Belize. Ph.D. dissertation, Dept. of Anthropology, Texas A&M University, University Microfilms, Ann Arbor.

1992 Microbotanical Evidence of Prehistoric Forest Modification in Northern Belize. Paper presented at the 57th Annual Meeting of the Society for American Archaeology, Pittsburg.

1994a Settlement and Agriculture at Colha: Pollen Evidence from Cobweb Swamp. Paper presented at the 59th Annual Meeting of the Society for American Archaeology, Anaheim.

1994b Pollen Evidence for Early Settlement and Agriculture in Northern Belize. Palynology 18:207-213.

Kamminga, Johan
1979 The Nature of Use-Polish and Abrasive Smoothing of Stone Tools. In Lithic Use-Wear Analysis, edited by Brian Hayden, pp. 143-157, Academic Press, New York.

Keeley, Lawrence H.
1980 Experimental Determination of Stone Tool Uses: A Microwear Analysis. The University of Chicago Press, Chicago.

Kidder, Alfred V.
1947 The Artifacts of Uaxactun, Guatemala. Carnegie Institution of Washington, Pub. 576. Washington, D.C.

Lewenstein, Suzanne M.
1987 Stone Tool Use at Cerros. University of Texas Press, Austin.

Liepins, Susan Jaeger
1994 The Conchita Causeway Settlement Subprogram, In Studies in the Archaeology of Caracol, Belize, Monograph 7, edited by Diane Z. Chase and Arlen F. Chase, pp. 64-75. Pre-Columbian Art Research Institute, San Francisco.

MacNeish, Richard S., Antoinette Nelken-Terner, and Irmgard W. Johnson
1967 The Prehistory of the Tehuacan Valley: Volume Two, Nonceramic Artifacts. University of Texas Press, Austin.

MacNeish, Richard S., J. K. Wilkerson, and Antoinette Nelken-Terner
1980 First Annual Report of the Belize Archaic Archaeological Reconnaissance. Phillips Academy, R. S. Peabody Foundation for Archaeology.

Martin, Simon and Nikolai Grube
1995 Archaeology

McAnany, Patricia Ann
1986 Lithic Technology and Exchange Among Wetland Farmers of the Eastern Maya Lowlands. Unpublished Ph.D. Dissertation, Dept. of Anthropology, University of New Mexico, Albuquerque.

Michaels, George H.
1986 A Description and Analysis of Early Postclassic Lithic Technology at Colha, Belize. Unpublished Master's Thesis, Department of Anthropology, Texas A&M University.

1989 Craft Specialization in the Early Post-classic of Colha. In Research in Economic Anthropology: Prehistoric Maya Economies of Belize, edited by P. A. McAnany and B. L. Isaac, pp. 139-183. JAI Press Inc., Greenwich, Conneticut.

Mitchum, Beverly A.
1991 Lithic Artifacts from Cerros, Belize: Production, Consumption, and Trade. In Maya Stone Tools: Selected Papers from the Second Maya Lithic Conference, edited by T. R. Hester and H. J. Shafer, pp. 45-54. Prehistory Press, Madison.

Moholy-Nagy, Hattula
1963 Shells and Other Marine Material from Tikal. In Estudios de Cultura Maya 3:63-83, Mexico.

1985 Social and Ceremonial Uses of Marine Molluscs at Tikal. In Prehistoric Lowland Maya Environment and Subsistence Economy, edited by M. Pohl, pp. 147-158. Peabody Museum of Archaeology and Ethnology, Harvard University, Cambridge.

1990 The Misidentification of Mesoamerican Lithic Workshops. Latin American Antiquity 1(3):268-279.

Moholy-Nagy, Hattula, H. F. Asaro, and F. H. Stross
1984 Tikal Obsidian: Sources and Typology. American Antiquity 49:104-117.

Morley, Sylvanus G.
1920 The Inscriptions at Copan, Carnegie Institution of Washington Publication 219, Washington, D.C.

Pitzer, J. M.
1977 Basic Sources for the Study of Burins. Archaeological Research Facility, University of California, Berkeley

Pohl, Mary, Kevin Pope, John Jones, Fred Valdez, and Ray Neck
1994 Maize Agriculture in Mesoamerica: the Lowland Maya Case. Paper presented at the 59th Annual Meeting of the Society for American Archaeology, Anaheim.

Pope, Cynthia L.
1991 Chert Debitage and Shell Working Tools from the Midway and Mosquito Groups at Caracol, Belize. Paper presented at the 51st Annual Meeting of the Society for American Archaeology, New Orleans.

1994 Preliminary Analysis of Small Chert Tools and Related Debitage at Caracol, Belize. In Studies in Archaeology of Caracol, Belize, Monograph, 7, edited by Diane Z. Chase and Arlen F. Chase, pp. 148-156. Pre-Columbian Art Research Institute, San Francisco.

Pope, Melody K.
1989 Microtools from the Black Warrior Valley: Technology, Use and Context. Unpublished M.A. thesis, Dept. of Anthropology, State University of New York at Binghampton.

Potter, Daniel
1980 Archaeological Investigations at Operation 2012. The Colha Project, Second Season, 1980: Interim Report, edited by T. R. Hester et. al., pp. 173-184. Center for Archaeological Research, the University of Texas at San Antonio.

1991 A Descriptive Taxonomy of Middle Preclassic Chert Tools at Colha, Belize. In Maya Stone Tools: Selected Papers from the Second Maya Lithic Conference, edited by T. R. Hester and H. J. Shafer, pp. 21-30. Prehistory Press, Madison.

Prentice, Guy
1983 Cottage Industries: Concepts and Implications. Midcontinental Journal of Archaeology 8(1):17-48.

Proskouriakoff, Tatiana
1950 A Study of Maya Sculpture, Carnegie Institution of Washington Publication 593, Washington, D.C.

1962 The Artifacts of Mayapan. In Mayapan, Yucatan, Mexico, edited by H.E.D. Pollock et al., pp. 321-442. Carnegie Institution of Washington, Washington, D.C., Publication 619.

Puleston, Olga S.
1969 Functional Analysis of a Workshop Tool Kit From Tikal. Unpublished M.A. thesis, Dept. of Anthropology, University of Pennsylvania.

Roemer, Erwin Jr.
1984 A Late Classic Maya Lithic Workshop at, Colha, Belize. Unpublished M.A. thesis, Dept. of Anthropology, Texas A&M University.

Sackett, James R.
1989 Statistics, Attributes and the Dynamics of Burin Typology. In Alternative Approaches to Lithic Analysis, Archaeological Papers of the American Anthropological Association Number I, edited by Donald O. Henry and George H. Odell, pp. 51-82. Washington, D.C.

Saville, Marshall H.
1900 An Onyx Jar from Mexico in the Process of Manufacture. In American Musem of Natural History, Bulletin 13:105-107.

Schele, Linda and Mary Ellen Miller
1986 The Blood of Kings. Kimbell Art Museum, Fort Worth.

Semenov, S. A.
1973 Prehistoric Technology. Barnes and Noble, New York.

Shafer, Harry
1982 Maya Lithic Craft Specialization in Northern Belize. In Archaeology at Colha, Belize: the 1981 Interim Report, edited by T. R. Hester, H. J. Shafer, and J. D. Eaton, pp. 31-38. The Center for Archaeological Research, the University of Texas at San Antonio.

1991 Late Preclassic Formal Stone Tool Production at Colha, Belize. In Maya Stone Tools: Selected Papers from the Second Maya Lithic Conference, edited by T. R. Hester and H. J. Shafer, pp. 31-44. Prehistory Press, Madison.

Shafer, Harry J. and Thomas R. Hester
1983 Ancient Maya Chert Workshops in Northern Belize, Central America. In American Antiquity 48(3):519-543.

1986 Maya Stone-Tool Craft Specialization and Production at Colha, Belize: Reply to Mallory. In American Antiquity 51(1):158-166.

1991 Lithic Craft Specialization and Product Distribution at the Maya Site of Colha, Belize. World Archaeology 23(1):79-97.

Sharer, Robert
1994 The Ancient Maya. Stanford Press.

Shea, John Joseph
1991 The Behavioral Significance of Levantine Mousterian Industrial Variability. Vol. I and II. Ph. D. dissertation, Harvard University, University Microfilms.

Sidrys, Raymond V.
1983 Archaeological Excavations in Northern Belize, Central America. Monograph XVII, Institute of Archaeology, University of California, Los Angeles.

Sievert, April Kay
1992 Maya Ceremonial Specialization: Lithic Tools from the Sacred Cenote at Chichen Itza, Yucatan. Monographs in World Archaeology No. 12, Prehistory Press, Madison.

Suarez Diez, Lourdes
1981 Tecnicas Prehispanicas en los objectos de Concha. Coleccion Cientifica, 14: Arqueologia. 2nd edition. Instituto National Antropologia e Historia, Mexico.

Taschek, Jennifer T.
1994 The Artifacts of Dzibilchaltun, Yucatan, Mexico: Shell, Polished Stone, Bone, Wood, and Ceramics. Middle American Research Institute, Publication 50, Tulane, New Orleans.

Weaver, Muriel Porter
1981 The Aztecs, Maya, and Their Predecessors, Archaeology of Mesoamerica. 2nd edition. Academic Press, New York.

Weyl, Richard
1980 Geology of Central America. 2nd edition. Gebruder Borntraeger, Berlin, Stuttgart.

Willey, Gordon R.
1974 The Classic Maya Hiatus: A Rehearsal for the Collapse? In Mesoamerican Archaeology: New Approaches, edited by N. Hammond, pp. 417-444. University of Texas Press, Austin.

1977 The Rise of Maya Civilization: A Summary View. In The Origins of Maya Civilization, edited by R. E. W. Adams, pp. 383-423. The University of New Mexico Press, Albuquerque.

Wyckoff, Don G.
1992 Refitting and Protohistoric Knapping Behavior: The Lowrance Example. In Piecing Together the Past: Applications of Refitting Studies in Archaeology, edited by Jack L. Hofman and James G. Enloe, pp. 83-127. BAR International Series 578, Tempvs Reparatvm, Oxford.

Yerkes, Richard W.
1987 Prehistoric Life on the Mississippi Floodplain. University of Chicago Press, Chicago.

1989 Mississippian Craft Specialization on the American Bottom. Southeastern Archaeology 8(2):93-106.

1991 Specialization in Shell Artifact Production at Cahokia. In New Perspectives on Cahokia, Views From the Periphery, edited by James B. Stoltman, pp. 49-64. Prehistory Press, Madison, WI.

VITA

Cynthia Pope Jones was born April 25, 1957 in Lawrenceburg, Indiana. The daughter of Armon David Pope and Barbara Estelle Lowe, Cynthia attended Boone High School in Orlando Florida, where she was graduated in 1975. Cynthia attended Valencia Community College from 1976 through 1978 receiving her Associate of Arts degree in General Studies at that time. She then attended the University of Florida from 1979 through 1981, at which time she received her Bachelor of Arts degree in Anthropology. Cynthia entered the Graduate School at the University of Texas at Austin in September 1990. In 1991, Cynthia married John G. Jones. Her permanent address is 3036 Baytree Drive, Orlando, Florida, 32806.