EXPEDIENT FLAKED STONE TOOLS AT A MAYAN CENTER: ANALYSIS OF A LITHIC COLLECTION FROM BAKING POT, BELIZE

By

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Abstract

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This study focuses on chert artifacts from Baking Pot, a site in the Belize River Valley that served as a major center in the valley during the Late Classic Period (AD 600-900), with occupation spanning from the Middle Preclassic to the Late Postclassic periods (600 BC – AD 1300). I examined collections from the elite Palace Complex and the sub-elite Yaxtun Group. One primary goal of this project was to determine if there was evidence for tool production at Baking Pot. In particular, I sought to determine if production was influenced by the availability of local tool stone, which is abundant because Baking Pot is located on land with naturally occurring chert. I also examined the types of lithics being consumed at the site and looked at possible variance between elite and sub-elite contexts.

I found that the high quantities of debitage located in both the elite and sub-elite contexts provided evidence to support the interpretation that production was indeed occurring at Baking Pot. The availability of local toolstone also likely influenced tool production technologies employed at Baking Pot, with the majority of the tools being expedient in nature and made from low quality materials.

These expedient tools also represented the lithic products most commonly consumed at the site. The sub-elite area had a higher proportion of utilized flakes, while the elite context contained higher numbers of cores, supporting the idea that residents in the different contexts engaged in different activities relating to stone tool use.

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Introduction:

Despite their prevalence within archaeological contexts throughout Belize, lithic artifacts have received limited attention in the study and analysis of Mayan sites (Shafer and Hester 1983). I sought to fill some of these gaps within the discipline by analyzing some of the chert artifacts from Baking Pot, located roughly 10 km northeast of the modern day city of San Ignacio. In the Belize River Valley, Baking Pot was a major center that served as the capital of a small kingdom during the Late Classic period (AD 600-900), although it was occupied from the Middle Preclassic to the Late Postclassic periods (600 BC – AD 1300) (Audet 2006; Audet and Awe 2004; Conlon and Moore 2003; Hoggarth et al. 2010).

My study focused on two sections of the site, the elite Palace Complex and the sub elite Yaxtun Group. By analyzing the collections from these contexts, I sought to determine: 1. Is there evidence for tool production? 2. Did the availability of raw material influence the productive technologies represented at the site? 3. What types of lithic products were being consumed at the site? 4. Were there differences in the types of lithic products being consumed in the elite versus the sub-elite areas?

This thesis begins with the history of archaeological research at Baking Pot, providing a general overview of the studies conducted since the 1920's. I also focus more specifically on the areas of interest to this study: the Palace Complex, excavated during the 2004 field season, and the Yaxtun Group, excavated during the 1999 and 2001 field seasons. These sites provided the collections that I examined, technologically classifying them using methods developed over the past 30 years by several prominent researchers within the field of lithic studies.

Next, I provide the background in lithic studies that supported the development of my analytic approach, separating it into four sections: The history of lithic analysis, studies in experimental lithic technology, Mayan lithic studies, and raw material location studies. The researchers involved in these studies have highly influenced my approach to analyzing the artifacts from Baking Pot.

My analysis examined the chert artifacts at Baking Pot by separating them into three main categories: debitage, tools, and utilized flakes. I separated the debitage into diagnostic and undiagnostic flakes, with diagnostic flakes being those that can be classified into different reduction stages based on certain attributes. The tools I had access to at Baking Pot were largely expedient, as many formal tools were not available for analysis because they were separated from the collections I had. Because of this, my analysis focuses primarily on expedient tools at Baking Pot, which still provide new information about the production and consumption of lithics.

Using these results, I was able to make several inferences about stone tool production and consumption at Baking Pot, including how it was influenced by the abundance of locally available toolstone. While these inferences are an important contribution to the study of Mayan lithic artifacts, more studies of lithic artifacts must be conducted for us to gain a better understanding of stone tool production and consumption in the Maya region.

Baking Pot Site Background:

Baking Pot is a predominantly Late Classic Period (AD 600-900) Mayan site, located roughly 10 km northeast of the modern town of San Ignacio in the Cayo district of Belize (Figure 1). Baking Pot earned its name from the presence of several large cooking pots that were located near the monumental epicenter of the site. These vessels were leftovers from the 18th and 19th century when Baking Pot served as a processing location for *chicle* (Audet 2006:104). This site is located on a government agricultural station known as Central Farm, which is involved in the production of food and livestock husbandry (Willey et al. 1965:301).

Although the pinnacle of its political power and growth falls within the Late Classic Period, there is evidence indicating occupation from the Middle Preclassic to the Late Postclassic periods (600 BC – AD 1300), with only a minor hiatus during the Early Postclassic period (Audet 2006:105; Audet and Awe 2004:50; Conlon and Moore 2003:59; Hoggarth et al. 2010:2). From AD 250 – 830, Baking Pot served as the capital of a small kingdom and is considered one of the major Mayan centers in the Belize River Valley during that time period (Hoggarth 2009:2) (Figure 2).

The monumental center at Baking Pot is divided into two groups, A and B (formerly I and II), which are connected by a 200 m *sacbe*, or raised causeway. Group A includes three plazas that contain two temples, two ball courts, and long range structures. A long range structure appears to refer to a moderately sized residential structure, often associated with plazas. Group B is thought to have served a more residential function, because it contains the elite palace complex, more long range structures, one large temple, and one ball court (Audet 2006:104-105). Overall, the entire site consists of 408 house mounds separated into eight distinct settlement clusters (A-H) all located within an area measuring 9 km^2. Current population estimates suggest that at its peak, Baking Pot probably had roughly 2,040 residents. This estimate is based on a calculation of 5 individuals per mound (Hoggarth et al. 2010:7) (Figure 3).

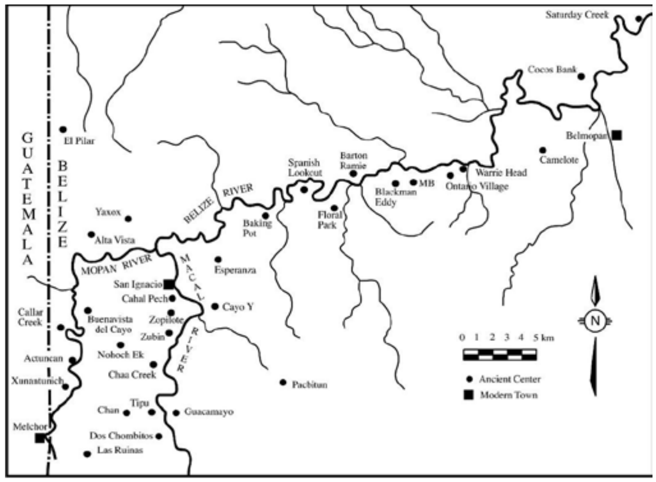

Figure 1: Map of the Upper Belize Valley (from Iannone 2002).

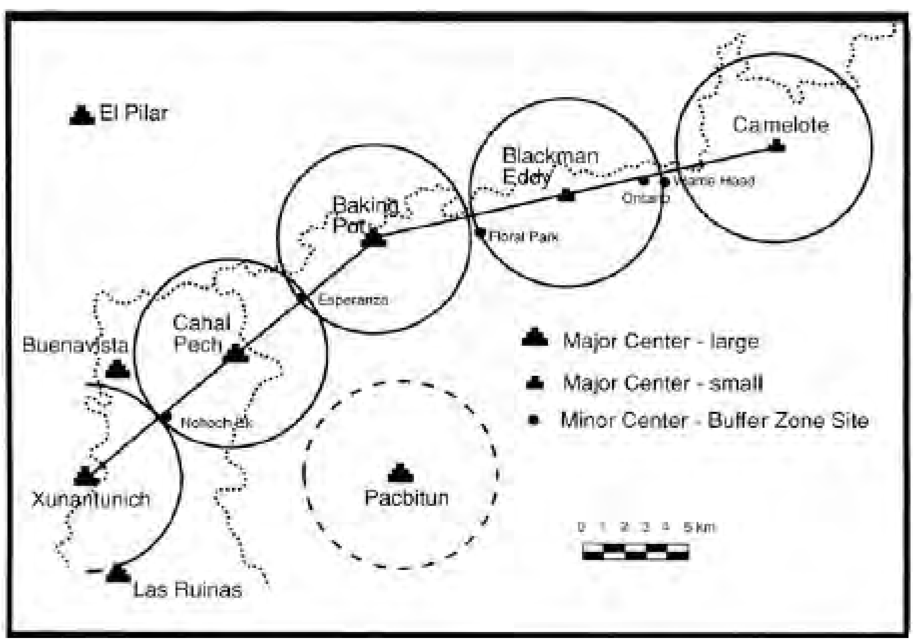

Figure 2: The Belize Valley highlighting center locations
(from Audet 2006:fig 3.7, after Driver and Garber 2004:fig 4)

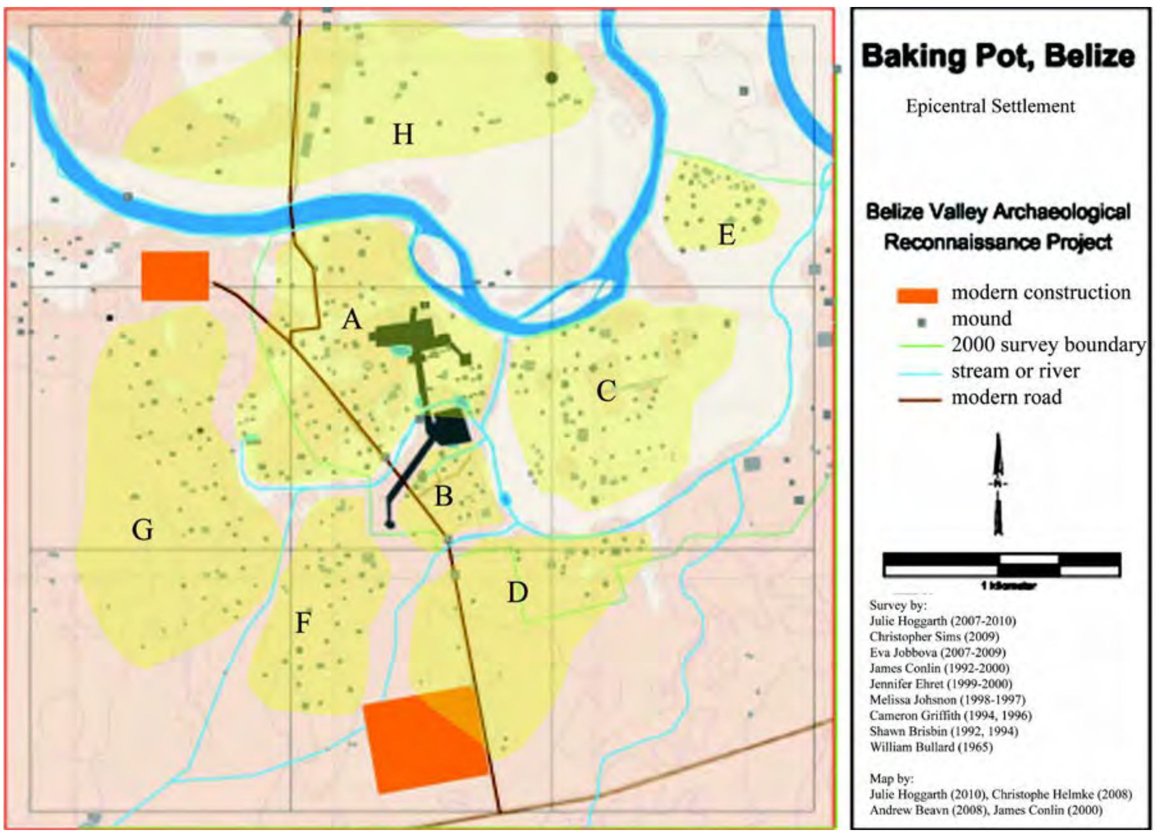

Figure 3: Map of Baking Pot (map by Hoggarth 2009)

Despite Baking Pot's relatively small size, low population estimates, lack of inscribed monuments and limited monumental architecture, excavations of the burials located at the site contain high status grave goods rivaling that of larger centers, including Tikal, Copan, and Palenque (Audet and Awe 2004:57). The wealth found at Baking Pot demonstrates the importance of Baking Pot within the Belize Valley, which overall was populated by smaller centers that still had significant wealth and power (Audet and Awe 2004:57). Other major centers within the Belize River Valley include Xunantunich, Buenavista del Cayo, and Cahal Pech (Figure 2), all of which were similar in size and population estimates to Baking Pot (Audet 2006:85, 112-113).

The first excavations at Baking Pot were conducted by O.G. Ricketson, Jr. in 1924, on the elite area referred to as Group A (Willey et al. 1965:301). His study of Baking Pot was relatively brief, predominantly focusing on an ancestral shrine atop one mound known as structure A17 (formerly structure G) (Audet and Awe, 2004:49).

It was not until 1949 that further excavation was conducted at Baking Pot. These excavations were led by A.H. Anderson, the District Commissioner of Cayo. He took an interest in the site upon learning that the main pyramid (Structure B1, formerly A) of Group B was being used as a quarry for road construction. Only minor work was performed on Structure B1 to clear debris and locate a staircase and masonry terraces, but luckily his timely intervention prevented the structure from being severely damaged (Audet and Awe 2004:49; Willey et al. 1965:304).

Gordon Willey was the next to work at Baking Pot, conducting a few test excavations as part of his larger settlement survey of the Belize River Valley from 1954-1956 (Audet and Awe, 2004:50). At this time, W.R. Bullard, Jr. extended Ricketson's earlier map to include Group B and some additional house mounds (Willey et al. 1965:301).

In 1961, William and Mary Bullard continued the work that Anderson had begun on Structure A, dating its construction to the Late Classic Period. They also expanded their excavation to include Group B, Structures B3-4 (formerly structure D) – a ball court that also dated to the Late Classic Period (Willey et al. 1965:304-305). Once they completed their excavations, no work was done at Baking Pot until it was integrated into the Belize Valley Archaeological Reconnaissance Project (BVAR) in 1992 (Audet and Awe 2004:50).

As part of the BVAR project, James Conlon performed his settlement research from 1992-2000, focusing on four major research questions:

> 1) what were the temporal patterns of occupation at the site? 2) what were the primary functions of causeway related architecture? 3) what was the economic base that supported the rise and affluence of the center? and 4) what role did Baking Pot play in the settlement hierarchy and socio-political landscape of the Belize Valley?" (Audet and Awe 2004:50).

In this phase of research, one of the primary goals was to understand the development of the *plazuela group* architecture, characterized by three or four structures organized around a small central patio. This goal was accomplished by comparing the very distinct Bedran and Atalaya Groups (Conlon and Moore 2003:60). The Bedran Group is located 2.27 km south of the epicenter of Baking Pot. It is considered to have been a rural plazuela group with a fairly high level of economic autonomy due to the ability of its inhabitants to produce surpluses of food for trade as evidenced by many wealth goods associated with its burials, and direct access to highly productive agricultural land (Conlon and Moore 2003:63-66). The apparent wealth of this plazuela group contrasts with that of the urban plazuela Group known as Atalaya. The Atalaya Group is located only 275 m south of Group B, and does not have the same access to high quality land as the Bedran Group. Although Atalaya was located much closer to the elite center, the lack of wealth goods found there implies that its residents were not as influential in the local economy (Conlon and Moore 2003:66-67). Conlon and Moore's discussion of plazuela groups is important for my analysis of the lithics from the Yaxtun Group, a plazuela group located in the monumental center of Baking Pot, because it aided in my classification of the Yaxtun Group as a sub-elite area within the larger site of Baking Pot.

The second phase of settlement research performed by BVAR at Baking Pot was initiated by Julie Hoggarth in 2007. This research had two major goals: to understand the relationship between the monumental epicenter of Baking Pot and its outlying settlement areas, and to understand its relationship to sites throughout the Belize River Valley (Hoggarth et al. 2010:2).

In the years between these two phases of settlement research, the primary focus of archaeological investigations at Baking Pot shifted to the monumental epicenter. One of the primary goals of these investigations was to understand the role Baking Pot played in the political organization of the Belize River Valley (Audet and Awe 2005:357). Scholars had formerly suggested that Baking Pot, as well as many of the other centers in the Belize Valley, were always under the control of a larger center in Guatemala known as Naranjo. Carolyn Audet and Jaime Awe sought to test this interpretation using evidence from excavations at Baking Pot. By examining grave goods associated with elite burials at the site, they were able to determine that during the Late Classic period, rulers at Baking Pot were not buried with any goods associated with Naranjo. This supported Audet and Awe's (2005) interpretation that during this time Baking Pot was likely autonomous (Audet and Awe 2005:361-362).

My research focused on two separate locations within the site, both excavated by Carolyn Audet: the Yaxtun Group and the Palace Complex. Throughout all of the excavations conducted by Carolyn Audet, a 1/4 inch mesh was used to screen all of the excavated deposits; the only exception to this method was the screening of deposits around burials and caches, which was accomplished using 1/8 inch mesh (Audet 2006:169) (Figure 4).

The Palace Complex is made up of structures B9-18 and B8 (formerly B and G) in Group B. The entire complex had at least three separate plazas associated with it, although excavations conducted in 2004 focused only on the part of the Palace located near the largest plaza. Three main units were opened in the excavation of structures B9-18, the eastern building in the palace complex, to locate architectural features throughout the structure. In addition to these main units, several test pits were opened in the fill to determine the construction sequence (Audet 2004:1) (Figure 5).

Structure B8, the northern building in the palace complex, was excavated less extensively than Structures B9-18 because of time and financial constraints. The goal of this excavation was to locate architecture and reveal the chronology of the occupation of the structure. Because of time constraints, none of the test units in B8 or B9-18 were excavated to sterile (Audet 2004:7-10).

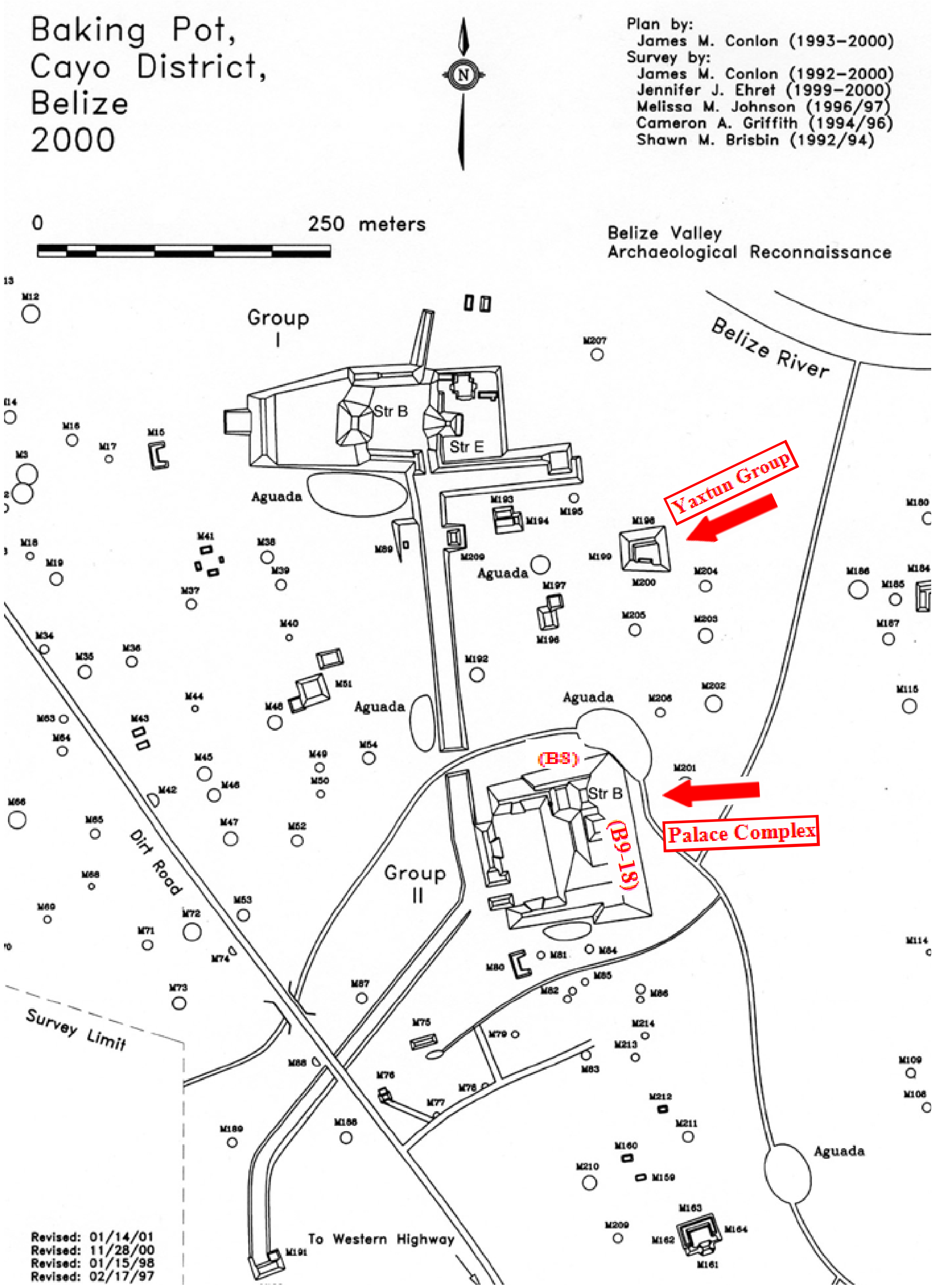

Figure 4: My Research Areas (From Audet 2006, after Conlon 1996)

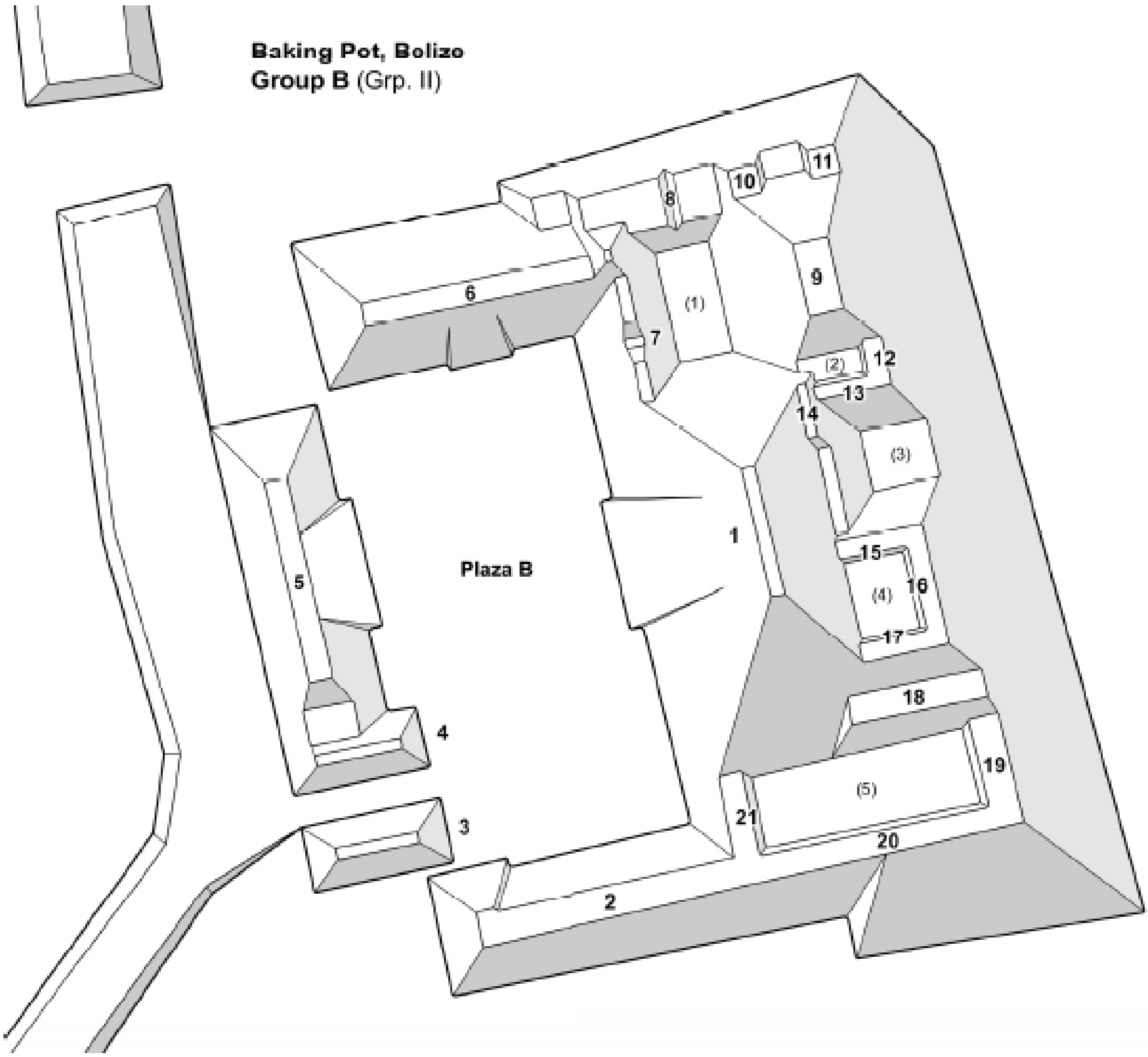

Figure 5: Plan of the monumental architecture of Group B showing new structure designations. Plan by Christophe Helmke (2007) based on preliminary survey by Christophe Helmke (2004) as well as plans and surveys by James Conlon (1992-2000). Plan aligned to UTM grid north.

The Yaxtun Group is a sub-elite residential plazuela group located about 11 m south of Group A. It is made up of three identified structures known as mounds 198, 199, and 200 (although there is a possible fourth structure) grouped around a small central patio. The excavation of the Yaxtun Group took place in the 1999 and 2001 field season (Audet 1999:6, 12; Audet 2001:91) (Figure 6).

In 1999, small scale excavations were conducted at Mounds 198 and 199 with the goal of revealing occupation phases. The excavations at Mound 198, located on the north side and representing the largest of the three mounds, revealed at least 5 separate construction phases, with the three oldest phases dating to the Late Preclassic (Audet and Awe 1999:7). The transition to the Late Classic construction phase at Mound 198 saw many changes in the structure. There is only one construction phase from this period, but it included the addition of 80 cm of fill, and the introduction of cut limestone blocks. The final construction phase dates to the Postclassic, which is a relatively late date of occupation in this area, although it is of very poor quality in comparison to the penultimate construction phase (Audet and Awe 1999:8-9).

Mound 199 is the western structure of the plazuela group, and connects with Mound 198 to form an L-shaped structure. This structure, which was built well after the construction of Mound 198, evidences only three construction phases, all of which only date to the Late Classic period. The most recent floor is similar in style and level of preservation to the 4th floor excavated at Mound 198, which suggests that during the Late Classic period these two structures were likely similar in height. There was no additional construction during the Postclassic phase, although it looks like both mounds were abandoned at the same time (Audet and Awe 1999:9-10).

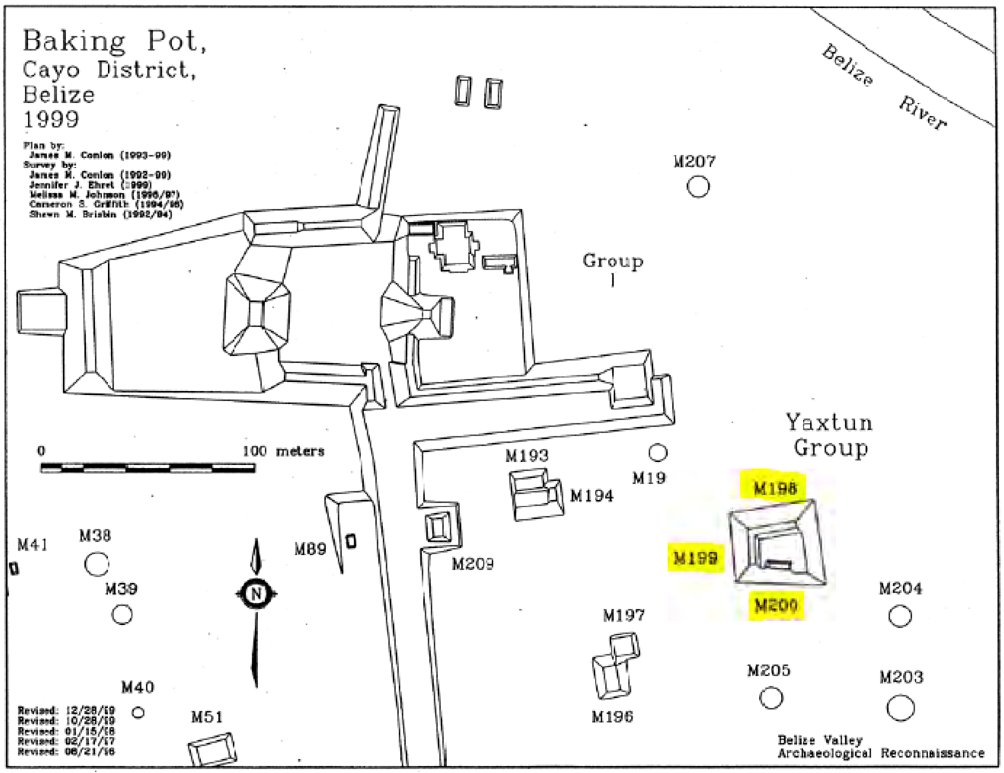

Figure 6: Map of Group A and the Yaxtun Group (from Audet 2001)

Because of the relatively unusual Postclassic remains found at Mound 198, excavations at the Yaxtun Group focused only on this period of Postclassic occupation during the 2001 field season. Initially, a grid of 96 two-by-two meter units was set up over this structure, but only 56 of them were excavated due to lack of funding and time. The majority of these units were intended only to expose the terminal architecture, but seven of them were excavated through all of the floors, and only three were excavated to sterile. With the exception of one unit, which was intended to determine construction chronology, all of the other units that were excavated through the floors did so with the goal of finding burials in the eastern side of the structure. Two additional units were placed on the corners of the structure in an attempt to locate caches (Audet 2001:91).

The foregoing units in both the Palace Complex and Yaxtun Group provided the materials for my study of lithic artifacts at Baking Pot. I conducted a technological analysis of them based on methods developed over the past 30 years by several prominent researchers in the discipline of lithic studies.

Background of Lithic Analysis

The methods used to conduct lithic analysis are dynamic and have changed much since their inception in the 1700's. Where once lithic studies focused only on complete tools, their focus now includes debitage as well as finished and reworked end products (Andrefsky 2005:3, 9). To understand how the work of the major researchers has influenced my analysis of the lithic collections from Baking Pot, it is necessary to provide a general understanding of how the field of lithic analysis has changed since its early beginnings, and how these changes have influenced modern studies.

Following the historical overview of the discipline, I will examine more closely the specific methodologies of several prominent lithic analysts and what they have added to lithic analysis as a field of archaeological study. The approaches of Don Crabtree, J. Jeffrey Flenniken, Kenneth Hirth, William Andrefsky, Douglas Bamforth, Harry Shafer, Thomas Hester, and Kazuo Aoyama have significantly influenced my research, and have contributed greatly to the field of lithic studies as we know them today.

History of Lithic Analysis

Stone tools have always been an important category of artifact for reconstructing past life ways. They represent the most commonly recovered type of artifact, due in large part to their durability. They provide us with a means of discerning where people lived and what behaviors they may have been engaging in (Andrefsky 2005:1).

The study of stone tools has been an important aspect of archaeological research for decades. Some of the first recorded findings of stone tools occurred in the 1700's. John Frere's discovery in 1797 of stone tools below the bones of extinct animals contradicted the popular theory of the time that the world was only 6000 years old (Andrefsky 2005:2). Findings such as these were important for changing initial views on the activities of early hominins, but it was not until 1894, when William Henry Holmes began researching stone tools, that the discipline began evolving into the scientific endeavor that it is today (Andrefsky 2005:3). William Holmes worked as an artist for the Bureau of American Ethnology. The goals that he outlined in his research included using stone tools as markers of time, examining how form and function in stone tools had evolved, and understanding how stone tools were produced and utilized. These goals are still central to lithic analysis, and most of the work carried out today has followed from his initial studies (Andrefsky 2005:4).

Lithic studies continued to advance throughout the early 20th century, becoming more comprehensive both spatially and temporally from the 1920's through 1940's, adding to a globally focused database of lithics during this period. Another important development in the history of lithic analysis was the shift towards replication studies; a movement that was popularized in the 1950's and 1960's by archaeologists such as Don Crabtree and François Bordes. Their studies took flintknapping out of the arts and crafts genre and helped it bridge the gap to become a reputable scientific study that provided valuable information on past behavior (Andrefsky 2005:4, 8).

The popularization of replication studies in the 1960's led to another important development in the history of lithic analysis: George Frison's 1968 study suggesting that stone tools should be viewed as dynamic and changing due to the reduction process over their use-life. This idea came from the move towards behavioral archaeology, championed by archaeologist Michael Brian Schiffer. Schiffer thought that it was important to understand the human-artifact relationship, and that artifacts could be used to better understand past behaviors (Schiffer 2004). This idea was not readily accepted by all archaeologists because many assumed that artifacts with the same form would always have the same function. His model presented the idea that different behavioral activities could result in similar products. What this new behavioral model meant for the world of archaeology was that lithic artifacts must be examined in their individual contexts within a site and by their association with other artifacts as part of a greater effort to understand the past behaviors that led to their production, rather than examining only the finished product. This new method was more compatible with the objectives of anthropology, which advocate a holistic and comparative approach to research (Andrefsky 2005:5; Schiffer 2004).

As replication studies advanced into the 1970's and 1980's, they attracted much criticism for not being well grounded in science because of the perception that they were not able to account adequately for variability. The innovation that changed this view allowing replication studies to be more widely accepted in academic circles was the shift towards debitage analysis rather than a sole focus on finished products (Andrefsky 2005:9).

Studies in Experimental Lithic Technology

Known as "the dean of American flintknappers", Don Crabtree was responsible for the training of many of the lithic analysts who succeed him (Knudson 1982:336). An Introduction to Flintworking, published in 1972, is considered by some to be his most important publication. It was an exhaustive collection of methods, principles and terms associated with flintknapping, which established a standardized methodology for replication experiments keeping them grounded in science, and became the most commonly used reference guide internationally in the education of lithic analysts (Crabtree 1972; Knudson 1982:340). His focus was primarily on understanding past behavior by looking at lithic artifacts; an approach that some think was influenced by his friendship with anthropologist Alfred Kroeber. Alfred Kroeber had worked extensively with the last surviving member of the Yahi tribe, Ishi. Ishi demonstrated flintknapping methods used by his tribe, allowing researchers to gain first-hand knowledge of these technologies (Knudson 1982:387)

Crabtree had little formal education, having dropped out of Long Beach Junior College after just one term (Knudson 1982:336). Despite his non-traditional academic background, Crabtree spent several years working in paleontological laboratories and perfecting his flintknapping skills. In the 1960's, when he became a research associate at Idaho State College and began publishing more regularly in several major journals, he began gaining respect as an influential lithic analyst (Knudson 1982:339).

Not only was he influential in the overall field of lithic studies, Crabtree was also an active participant in the analysis of lithics from Belize during the 1970's. His involvement with the 1976 Belize Lithics Conference led to a partnership with Harry Shafer and Thomas Hester, and in 1979 he became a consultant for their Colha Project. His influence on lithic studies in Belize likely would have been more profound had he continued his work there over the next several years, but his failing health kept him from further involvement (Knudson 1982:341).

Don Crabtree's work still has a profound effect on archaeology today. At the annual conference of the Society for American Archaeology, an award is presented in Crabtree's honor to an outstanding archaeologist. Several books on lithic analysis have also been published in his honor, including Stone Tool Analysis and Mesoamerican Lithic Technology (Hirth 2003; Plew, et al. 1985). Before his death in 1980, Crabtree organized the materials associated with his lifetime work and donated them to the Idaho State University library with the stipulation that they also be available to Washington State University students. He also set up annual scholarships at each of these institutions for graduate students studying lithic technology (Knudson 1982:342). The interest that he showed in Washington State University reflects his close relationship with one of his students, J. Jeffrey Flenniken, who spent much of his professional career there as a professor of lithic studies.

Flenniken (1981) developed what he called Replicative Systems Analysis, a model for analysis and classification that has become common in lithic studies. Replicative systems analysis builds on Don Crabtree's version of replication, in which it is a scientific endeavor meant to reveal the behaviors of prehistoric peoples. The principle behind this approach is that it is controlled, using only prehistoric techniques. An attempt is made to recreate the process so that the debitage, stages of production, and completed tools should be nearly identical to those that were created in prehistory (Flenniken 1981:2).

Flenniken defines a lithic system as, "the entire life of a stone tool from its inception to its deposition in archaeological context. In other words, a lithic system may involve the selection of raw material, heat treatment of the raw material, reduction of the raw material into patterned tool forms, hafting of the selected stone tools, and the uses and functions of those stone tools" (Flenniken 1981:3).

The major benefit of this model is that, by examining the entire reduction sequence from start to finish, it is possible to demonstrate the probable use-life of prehistoric tools. Rather than being speculation, replicative systems analysis is empirically testable, making it an important advancement in the study of lithics. This model was the first of its kind to combine the study of lithic systems with the actual process of replication. It is this combination that demonstrated the transitions between the different subsystems of the flintknapping process, bringing together a coherent sequence of lithic reduction (Flenniken 1981:5).

Although this model has been widely accepted in the field of archaeology, there are some lithic analysts who hold contrary views. David Hurst Thomas is one such scholar. He wrote a heated rebuttal directly to Flenniken, referring to his model as "The Phony Logic of "Replication" (Thomas 1986). One of his major arguments is that the archaeologist can only demonstrate one possible way that production could occur, and that this model is incapable of accounting for all of the variations that real world situations would call for (Thomas 1986:621). Thomas argues that the fintknapper's belief that he/she has an understanding of the truth behind prehistoric processes is not only false, but conceited (Thomas 1986:623). This criticism does not fully consider the purpose of replicative systems analysis, which is to use the prehistoric material as a control from which the analyst attempts to replicate artifacts. Flenniken clearly acknowledges that there are numerous ways to reduce stone, and that they can often result in similar looking formal tools. That is why, in this model, the study of the debitage is essential to understand the process used in the production of formal tools (Flenniken 1981:5).

Despite this strongly worded opposing viewpoint, many archaeologists accept Flenniken's classification system, and it forms the basis of my research at Baking Pot. John Clark, a lithic analyst who supports experimental replication studies thinks that the limited number of these studies done for Mesoamerica (only 24 published between 1968 and 2002) is in part what has led to this skepticism (Clark 2003:31-32). He thinks that the next big step in Mesoamerican lithic studies will be to increase the number and variety of experimental studies to add to the base of first-hand knowledge we presently possess about lithic production. J. Jeffrey Flenniken is the analyst who has had the most influence on my approach to lithic analysis because he served as the mentor for everyone who has contributed to my education in lithic studies.

Hirth and Andrews (2002) are also proponents of Flenniken's replicative systems analysis model. Hirth (2003) states that it "provides a heuristic framework for classifying flaked stone remains based on the behavioral decisions made by humans during the production and use-life of stone tools" (Hirth 2003:5). There is need for further studies in experimental replication because at present the number of questions about experimentation left to answer far exceeds the rate at which archaeologists are capable of answering them (Hirth et. al 2003:273). To these researchers, this situation is a call to action. The future of lithic studies will benefit from increasing the amount of competent flintknappers and increasing the amount of experimental studies being conducted throughout Mesoamerica (Hirth et al 2003:237).

Another lithic analyst who expanded Crabtree's initial replication experiments to focus more strongly on debitage analysis is Martin Magne (1985). Magne is a strong proponent of experimental archaeology using stone tool replication to inform about prehistoric tool making. One benefit he sees in experimental studies is that first-hand experience creating the tools increases the confidence of lithic analysts when it comes to classifying debitage, which leads to more accurate results (Magne 1985, 2001:22, 26).

Mayan Lithic Studies

As contributors to Mesoamerican lithic studies, the seminal work of Shafer and Hester (1983) stems from a longstanding partnership analyzing the lithics from the site of Colha in Belize, known for its high levels of chert tool production. Hence, their research is relevant to my study at Baking Pot. They were able to establish a long-term lithic sequence for Colha, covering the Preceramic to the Late Postclassic periods (Hester 1985; Hester and Shafer 1984; Shafer and Hester 1983).

This type of study was very rare for Mayan sites, as most chronologies were based predominantly on ceramic sequences. This contribution was important to the field of lithic studies in Belize because it brought some much needed attention to the lithic artifacts there – artifacts that have been largely overlooked by the majority of Mayan research. Lithic studies have been more popular in Mexican archaeology, but in Belize they have been largely neglected, partially because of the emphasis placed on the excavation of large monuments, hieroglyphs, burials, caches, and other impressive features that tend to garner more public interest (Shafer and Hester 1983:519). Studies of chert have been especially sparse, with the majority of lithic studies in the area focusing on obsidian. They therefore sought to remedy this lack of information with their ongoing analysis of chert tool production in Northern Belize (Hester and Shafer 1984:157).

Kazuo Aoyama (1999) has also carried out lithic research on the Maya, predominantly in Guatemala and Honduras. His analysis of the lithics from Aguateca provides an interesting and rare glimpse into Mayan civilization as it actually was. While most sites in the area were abandoned slowly allowing the former residents to take most of their items with them, Aguateca was abandoned rapidly when it was burned down during an enemy attack (Aoyama 1999, 2007).

The unique nature of Aguateca also allowed Aoyama to examine the differentiation in lithic production based on class structure, and he came to the unexpected conclusion that the elites of both genders were likely involved at least part time in the production of utilitarian chert goods. (Aoyama 2007:10). Chert tool production was not the only thing associated with elite residences; there was also evidence of food preparation, woodworking, and the production of leather goods, which suggests that in Mayan societies the elites were not solely consumers, but also producers of goods (Aoyama 2007:24).

During his study, Aoyama also focused on the presence of informal or expedient chert tools, which have not received much attention in lithic analyses. He found that more than 20 percent of the debitage recovered showed evidence of use, which suggests that it was common to use flakes as expedient tools (Aoyama 2007:12). Also, expedient tools comprised the most commonly recovered chert artifact in household contexts, along with an array of hammer stones suggesting that production was occurring in the households (Aoyama 2007:9).

Raw Material Location Studies

Perry and Kelly (1987) studied the effect that mobility strategies had on lithic technology. They argued that as a culture becomes sedentary stone tool production strategies will become more expedient. This phenomenon is because they no longer must travel long distances thereby requiring the efficiency of formal bifacial tools which would be best suited for highly mobile groups. While raw material location is a factor in the formation of productive technologies, Perry and Kelly (1987) think that it is secondary to settlement patterns (Perry and Kelly 1987).

Kelly's (1988) study explores the importance of raw material location in addition to mobility, arguing that in some cases raw material does play an important role in determining stone tool production technologies (Kelly 1988:719). Although some of Kelly's data support that conclusion, he is reticent to suggest that raw material location is more important than mobility. He suggests instead that raw material location and mobility strategies were equally important, and that the combination of these two factors influenced the technological organization of a society (Kelly 1988:731).

Among numerous publications, William Andrefsky (1994a, 1994b) has contributed two articles particularly relevant to my research at Baking Pot. These articles both focus on the effect of raw material location. Andrefsky (1994a) presents a new outlook on the traditional study of the organization of technology, arguing against the dominant belief among lithic analysts (Kelly 1988; Perry and Kelly 1987) that the types of stone tools produced were most representative of the mobility strategy of the group that produced them (Andrefsky 1994a:22). Andrefsky postulates that, while mobility does play a role in the reduction strategies employed, it is secondary to the availability of raw material (Andrefsky 1994a:23).

To support this idea, Andrefsky (1994a) presents several case studies throughout Australia and the western United States, in which tool variability had a much higher correlation with a groups' relative proximity to raw material than it did to settlement strategies. When large amounts of raw material were locally available, the technology predominantly reflected the production of expedient tools. When raw material was scarce, only formal tools that would more efficiently utilize the available raw material and last longer were produced. Raw material quality was also a factor when material was abundant, with higher quality material being associated with more formal tool traditions, and low quality material leading to more expedient tools. This is likely because low quality material is less predictable in the way that it fractures so it is better suited to expedient tools that require little preparation (Andrefsky 1994a:24-29).

Bamforth (1991) has conducted research on similar issues in California and the Mojave Desert. Considering hunter-gatherer land use, Bamforth (1991) presents his research as a case against reductionist interpretations that attempt to characterize technological organization as determined by one main cause. Instead, he thinks that a complex interaction between multiple dimensions determines technological organization, and that by examining a specific group rather than speaking in abstractions he can demonstrate this principle (Bamforth 1991:217).

In his research in the Central Mojave Desert, Bamforth analyzed a collection of stone tools representing roughly 12,000 years of occupation. Despite this enormous time depth, the morphology of the tools was relatively unchanged, even though the mobility and settlement structure of the group had changed drastically over this period. One possible cause for this phenomenon is the close proximity to a large amount of raw material, making it unnecessary for them to change their technological organization despite changes in mobility (Bamforth 1990:96-98).

Analysis Methods

In my analysis of the lithics from Baking Pot, I focused on two distinct areas of the site, as discussed in the site background section. The first were structures B9-19 and B8, (formerly B and G), which comprise part of the Palace Complex located in Group B. The second area was the sub-elite Plazuela group known as the Yaxtun Group, which includes structures 198, 199, and 200 (Figure 6). Although the excavations of the Yaxtun Group and Palace Complex were carried out several years ago, no formal analysis of the lithic artifacts was conducted (Audet 2001, 2004, 2006; Audet and Awe 1999, 2004, 2005).

Unfortunate storage conditions compromised the amount of provenienced material I could analyze. Also, the majority of artifacts that are considered valuable to looters were removed from the site and taken to another more secure location. Hence, many of the formal tools were not available for me to study, thus my research has focused on the expedient and informal implements.

As mentioned previously, during the initial excavations of these areas, materials were screened through 1/4 inch mesh, with the exception of the matrix removed from around burials, which were screened with 1/8 inch mesh (Audet 2006). Because many pressure bifacial reduction flakes are too small to retrieve with 1/4 inch mesh, if pressure reduction was an important activity at Baking Pot, evidence for it may be underrepresented in the collections.

The sample of lithics from the Palace Complex was completely analyzed, with a resulting count of 948 artifacts (Table 1). The collection from structure 198 of the Yaxtun Group was much larger, requiring sampling because of time constraints; I arbitrarily decided to analyze 25 percent of the collection. Because it was stored in twelve buckets, I selected three of them for my study, resulting in a count of 1,889 artifacts (Table 1). When selecting my sample, I chose bags of lithics from different parts of Structure 198 to ensure a representative view of the total assemblage. Structures 199 and 200 were not excavated as extensively as Structure 198, so I was able to analyze all the lithics in these collections with a resulting count of 204 and 37 artifacts, respectively (Table 1).

Table 1: Raw Material Distribution:

Raw Material	Structure				
	B8	**B9-18**	**198**	**199**	**200**
Chert	184	726	1846	200	37
Quartz	1	8	32	4	
Limestone		24	24		
Obsidian	1	1	9		
Sandstone		2			
Basalt		1			
River Cobble			1		
Gneiss			1		

In terms of raw material in the Palace Complex, structure B8 contained chert (n = 184), quartz (n = 1) and obsidian (n = 1). Structures B9-18 contained chert (n = 726), quartz (n = 8), limestone (n = 24), obsidian (n = 1), sandstone (n = 2), and basalt (n = 1) (Table 1).

In the Yaxtun Group I found a similar prevalence of chert artifacts, with Structure 198 containing chert (n = 1,846), quartz (n = 32), limestone (n = 9), gneiss (n = 1), and polished river cobble (n = 1). Structure 199 contained chert (n = 200) and quartz (n = 4). Structure 200 was comprised entirely of chert (n = 37) (Table 1).

I chose to focus my analysis on the chert artifacts from Baking Pot due to their prevalence among the collections in both the elite and sub-elite contexts. Although the presence of other material types in these assemblages is interesting, the predominance of chert artifacts found in both contexts makes chert most relevant for investigating my specific research questions.

I defined debitage as the unused, unmodified flakes that are removed during the production of formal stone tools, flake blanks, and expedient tools. The system I used was based on that of J. Jeffrey Flenniken, known as Replicative Systems Analysis (Flenniken 1981). This method of stone tool analysis focuses on using technologically diagnostic attributes of flakes and tools to determine how they were made. Through experimental replication, research has shown that different reduction techniques result in different diagnostic attributes apparent on the debitage, allowing the analyst to categorize debitage based on the reduction technology used to create it (Andrefsky 2005; Andrews et al. 2008; Flenniken 1981).

Debitage Analysis:

This system separates debitage into technologically diagnostic and undiagnostic flakes (Table 2). The diagnostic debitage is classified using a 6-stage reduction sequence. That is not to say that stone tools can only be produced in one way, and that materials destined for consumption must pass through each of these stages, but rather provides a continuum that separates the production process according to different tool making behaviors. The stages used are primary decortication flakes, secondary decortication flakes, early interior or early core flakes, late interior or late core flakes, percussion bifacial thinning flakes, and pressure bifacial thinning flakes.

Decortication flakes are usually the first flakes removed from raw material, with the purpose of shaping and refining the raw material for further reduction activities, which may involve the removal of the weathered outer cortex. A stage 1 primary decortication flake is one with 100% cortex on its dorsal surface and a stage 2 secondary decortication flake is one with less than 100% cortex on its dorsal surface (Figure 7A, 7B, 8A).

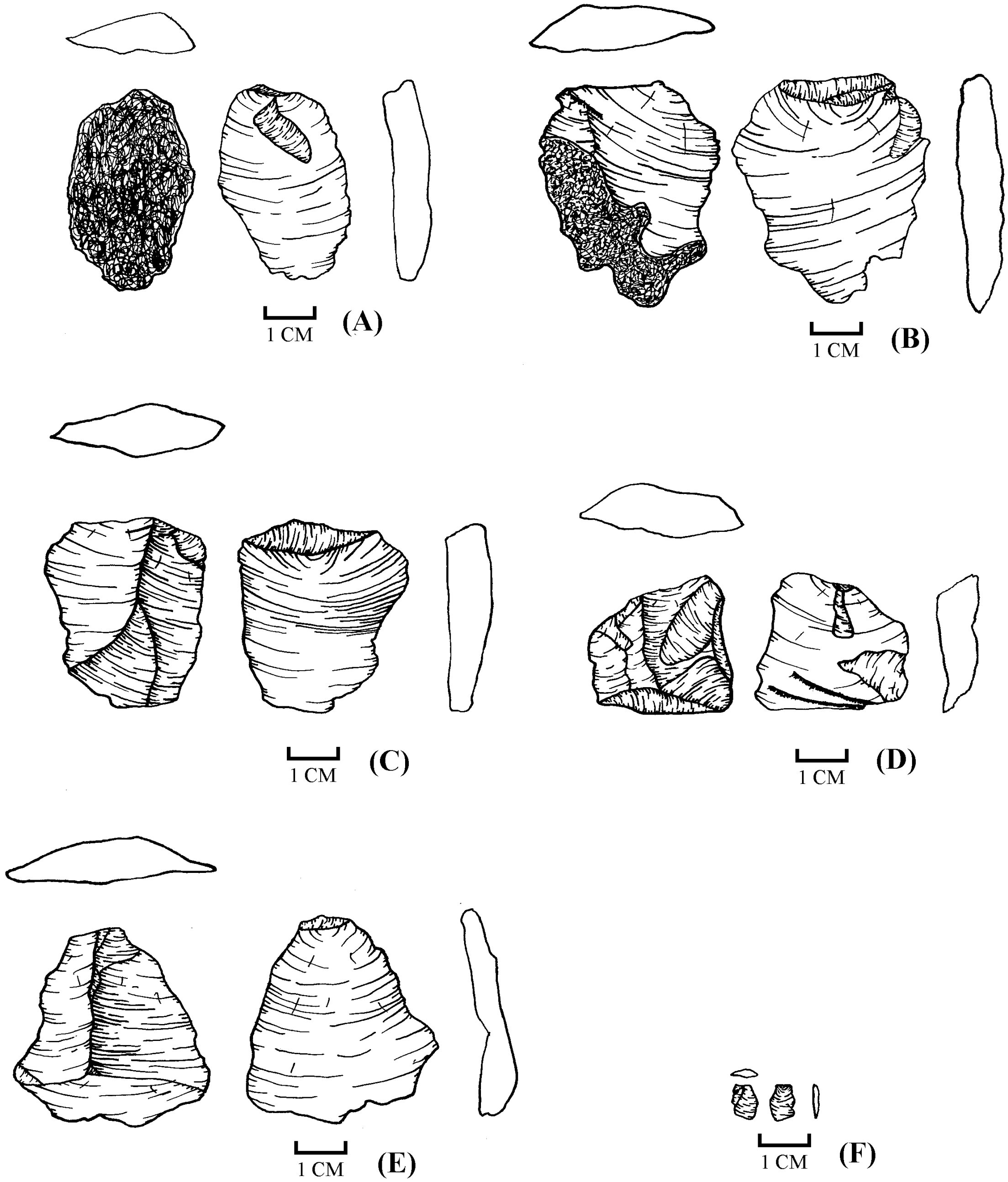

Figure 7: Debitage from Palace Complex. A: Primary Decortication Flake. B: Secondary Decortication Flake. C: Early Interior Flake. D: Early Percussion Bifacial Reduction Flake. E: Late Interior Flake. F: Pressure Bifacial Reduction Flake. All from Structure G. (Illustrations by author)

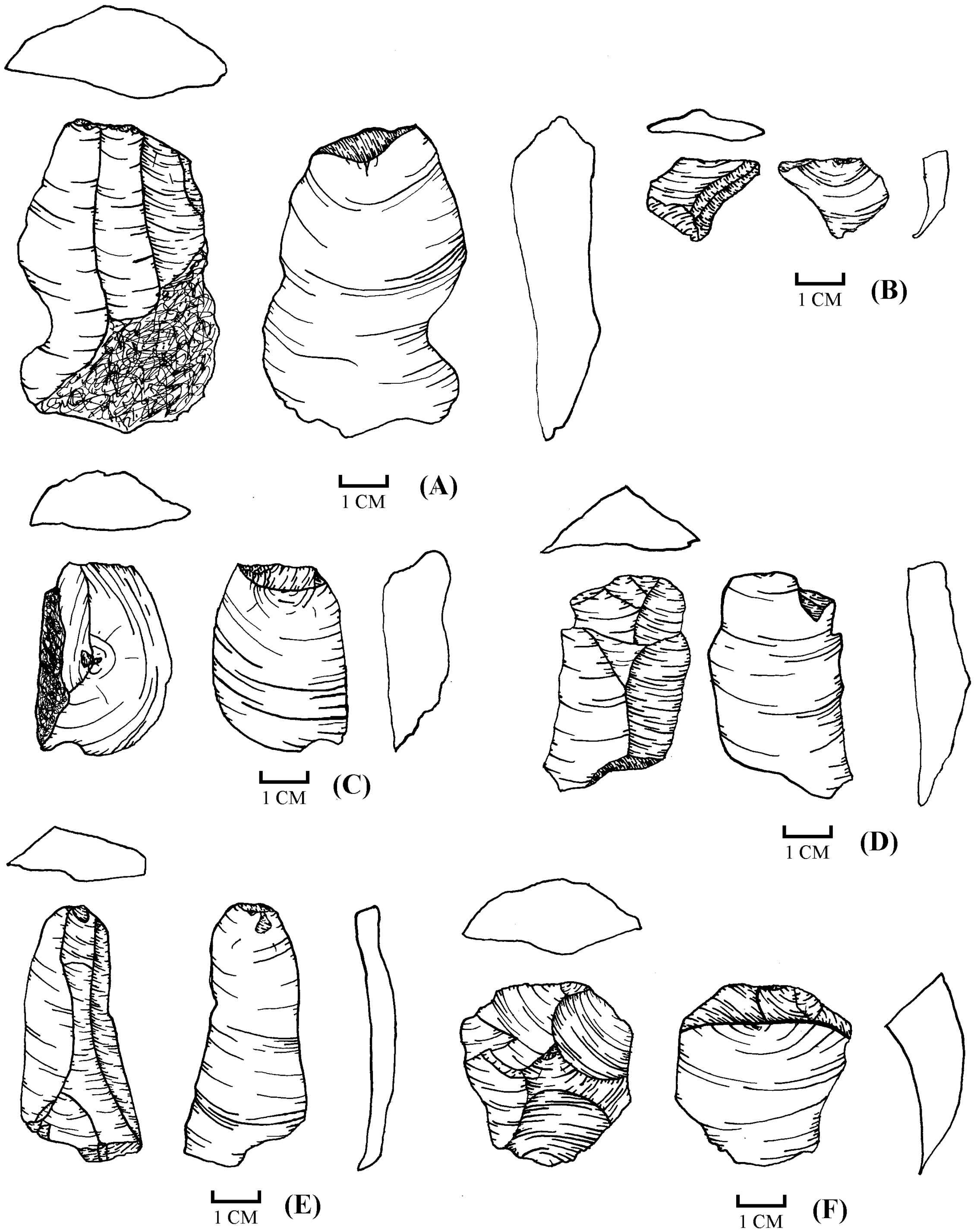

Figure 8: Debitage from Yaxtun Group. A: Secondary Decortication Flake. B: Late Percussion Bifacial Thinning Flake. C: Bulb Removal Flake. D: Early Interior Flake. E: Late Interior Flake. F: Margin Removal Flake. All from Structure 198. (Illustrations by author).

Table 2: Flake and Tool Totals

	Palace Complex (B9-19, B8)	Yaxtun Group (198, 199, 200)	Totals (%)
Diagnostic Flakes	490	1086	1576 (53%)
Undiagnostic Flakes	313	734	1047 (35%)
Tools	107	263	370 (27%)
Total:	910	2083	2993 (100%)

Stage 3 early interior flakes, also known as early core flakes, are typically devoid of cortex (Figure 7C, 8D). They usually have somewhat triangular or rhomboidal cross sections, and tend to be fairly thick. They are some of the earliest flakes removed in the reduction process, and as such may be used to eliminate flaws or difficult to work with sections of the raw material. Unlike later stage flakes, they usually do not display evidence of a well prepared platform, and they can have many different platform angles. These flakes are most commonly part of the reduction sequence for the early stages of bifacial reduction (Kelly 1988), or in the production of expedient multidirectional flake cores or polyhedral single facet cores (Andrews et al. 2008).

Stage 4 late interior flakes, also known as late core flakes are similar to stage 3 flakes, although they are usually thinner and more standardized in shape (Figures 7E, 8E). The cross section view of a stage 4 flake tends to be more rhomboidal and less triangular as the ridges they remove are usually less prominent than those removed during stage 3. These items can be used as expedient flake tools, or as flake blanks used in the production of more formal flake tools.

Stage 5 percussion bifacial thinning flakes are actually made up of several distinct kinds of flakes. Early bifacial thinning flakes are categorized by their formal, ground platform, and usually somewhat curved shape in their long-section view. In the early stage, their dorsal flake scars typically represent previous flakes removed from the same margin (Figure 7D). Late bifacial thinning flakes share most of these characteristics except they can show dorsal flake scars that demonstrate the removal of earlier flakes from the opposite margin of the biface. They also are more standardized in shape, with less noticeable long-section bend (Figure 8B).

Also included in stage 5 are margin removal and bulb removal flakes. Margin removal flakes are most often created when the biface is hit too far from the margin of the biface, causing a bending break that removes more of the biface edge than intended (Figure 8F). A bulb removal flake was detached to remove the part of a flake blank that contains the bulb from its initial removal, so these flakes have bulbs on both their ventral and dorsal surfaces (Figure 8C).

Stage 6 is the last technological stage, and it represents pressure bifacial thinning activities. Flakes removed during pressure reduction usually represent the final stages of tool production, and their removal creates a regularized edge on the tool. These flakes are usually small, but this is not always the case. They may also exhibit signs of grinding, and will have flake scars that vary between being fairly irregular in the early pressure flake removal process, to being more regularized during later stages of removal (Figure 7F).

There are also several types of debitage that are technologically undiagnostic because they cannot be linked with any one stage in the reduction sequence. Flake fragments are flakes that lack their platform-bearing ends so they are difficult to technologically classify. Chunks or shatter include pieces that break off during all stages of reduction. Pot lids are also non-diagnostic because they are unintentionally removed during the heating of the lithic material, either during systematic heat treatment or accidentally as a result of natural fires (Andrews et al. 2004; Johnson 1985; Mandeville and Flenniken 1974). In my analysis, I list them, only to provide information about all the lithic materials recovered from each site.

Stone Tool Analysis:

I loosely structured my analysis of tools following the model of Andrews and Greubel (2008), basing my classifications on the morphological and functional attributes of tools that demonstrated how they were made or used. I examined macroscopic use-wear found on the tools within the collection using a 10 x hand lens, hence my identifications are very conservative. It is probable that the amount of artifacts bearing use-wear would have been somewhat higher had I used a microscopic approach. My study differed from that of Andrews and Greubel (2008) in that it involved fewer formal tools because they were not available. I separated my tools into the following eight categories, separating them also by how formalized they were. Expedient tools included utilized flakes, expedient cores, choppers, and hammerstones, while the more formalized tools included cores, drills, unifacial blades or points, and bifaces or partial bifaces.

To begin with the more expedient tool types, utilized flakes are flakes that exhibit some sign of use-wear, modification, alteration, or any sort of retouching beyond their initial removal (Figure 9). For this category, I combined all of the utilized flakes into one group, but below I examine the distribution of utilized flakes based on flake type.

Expedient cores usually had extant cortex and indicated the removal of flakes from several platforms in multiple directions. Many also exhibited use-wear, suggesting that after they were used to make flakes, they were used for another purpose. In this category I included both unifacially and bifacially worked cores, as the focus seemed to be on flake production rather than the intentional shaping of a biface or a polyhedral core.

Choppers are similar to expedient cores, except that flakes were intentionally removed to create one sharp edge. This edge exhibits obvious use wear, with the rest of the artifact typically covered in cortex.

Hammerstones constituted the final category in my analysis of the expedient tools at Baking Pot. They were usually round and roughly baseball sized, with a very weathered outer cortex and evidence of heavy use. They might have been used in the production of expedient stone tools, in the production of ground stone tools, or as an all-purpose hammer.

Cores represent the first category of more formal tools within my collection. The cores were more formal than expedient cores, in that they had a single platform from which flakes were removed, and indicated more effort put into shaping them. Although they were slightly more formal, overall they still appear to be fairly expediently produced.

The drills in my collection were rather crudely made, although they still exhibit evidence for intentional shaping that would make them more formal than the expedient tools. Many of them still had cortex reflecting only minor alterations to form a point on their boring end. The unifacial blades or points were similar in that the retouching was roughly executed with no apparent focus on high quality tool production (Figure 10).

The bifaces and partial bifaces are the most formal of the tool categories I analyzed. I chose not to separate them because they were few, and many had been broken. The bifaces ranged in size and level of craftsmanship, with some being very thin and well made, while others were thick and rudimentary.

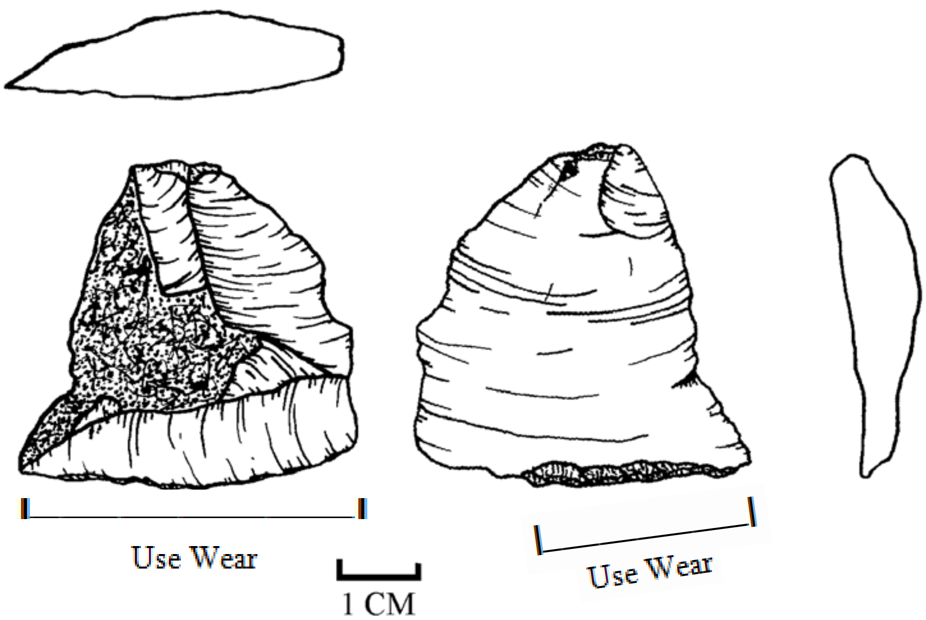

Figure 9: Utilized Secondary Flake, Structure G (illustrations by author)

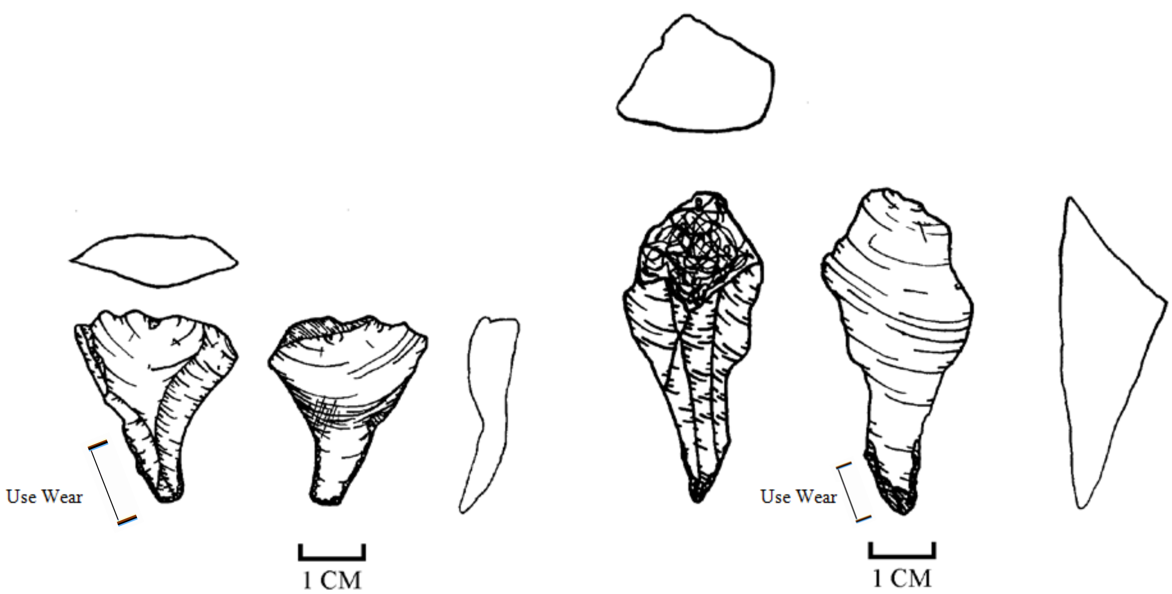

Figure 10: Drills, Structure 198 (Illustrations by author)

Utilized Flake Analysis:

After the initial calculations of tool types, I thought it was important to look more in-depth at the types of flakes that were being utilized in both elite and sub-elite contexts. This information helped me answer my research questions by focusing on both the differences in tool consumption by the two different socioeconomic groups, and the production of expedient tools as a result of locally available toolstone.

The first step in my analysis of utilized flakes was to return to the initial classification. Only some of the flake types were represented in the collections of utilized flakes. The types of expediently used flake categories included primary decortication flakes, secondary decortication flakes, early interior flakes, late interior flakes, flake fragments, and chunks or shatter.

The diagnostic attributes I used to separate utilized flakes are the same as those I used in the analysis of the debitage. The only difference these flakes exhibit is the presence of edge use wear or modification.

Results and Interpretations:

In my analysis of the lithics in the elite and sub-elite contexts at the Baking Pot site, I sought to determine:

1) Is there evidence for tool production?
2) Did the availability of raw material influence the productive technologies represented at the site?
3) What types of lithic products were being consumed at the site?
4) Were there differences in the types of lithic products being consumed in the elite versus the sub-elite areas?

Debitage:

Many of the formal tools that were initially collected during excavations in the Palace Complex and Yaxtun Group were unavailable for analysis, so this research has focused primarily on debitage and expedient tools. Hence, I can be fairly confident about the evidence for production, because debitage directly reflects such activities. Results concerning consumption, however, are based only on part of the picture. It is likely that the results would have been different had this collection been available for analysis, but these interpretations are based on the information available at the time. I think that the preponderance of debitage as well as expedient tools at the site do provide valuable information about Baking Pot as a whole.

The results of my debitage analysis can be found in tables three, four, and five. Table three contains the results for the entirety of the Palace Complex and the Yaxtun Group, and serves as a general summary. Tables four and five are the specific results for the Palace Complex and Yaxtun Group, respectively. They can be used for the comparison of results within the two individual contexts.

Of the total number of lithics I analyzed, 88 percent of the materials from both contexts were debitage (Table 2). This high proportion of debitage indicates that at least some form of reduction was occurring on a fairly notable scale at Baking Pot. What is also apparent is that the amount of debitage remained fairly similar between the elite and sub-elite contexts.

In the elite Palace Complex, 86.9 percent of the lithic material I examined was debitage, compared to 85.5 percent for the Yaxtun Group (Table 2). The presence of such similar percentages indicates that the production of tools does not seem to have differed much between these two social contexts. Once it was determined that production was indeed occurring at Baking Pot, the next step was examining the debitage to understand what types of tool production were taking place.

Although the percentages initially appear somewhat similar between the debitage from the Palace Complex and the Yaxtun Group, these similarities are largely superficial. By performing a Chi Square test, it can be seen that the difference between our observed results and our expected results was highly significant between the Palace Complex and the Yaxtun Group ($\chi^2 = 68.948$, $p < .001$) (Drennan 1996) (Table 6)

The debitage in both the elite and sub-elite areas was predominantly derived from decortication, interior flake removal, and flake fragments or shatter and chunks, most of which were of very low quality raw material. These decortication and interior flakes usually represent items removed early in the flintknapping process. Both areas had very little evidence of bifacial reduction (Tables 3-5). Because flake fragments as well as shatter and chunks can come from any stage of the reduction sequence, I will focus my analysis only on the diagnostic artifacts.

Chert Debitage Results:

Table 3: Summary: Palace Complex vs. Yaxtun Group:

Category	Palace Complex N	Palace Complex %	Yaxtun Group N	Yaxtun Group %
Primary decortication	48	**6.0**	59	**3.2**
Secondary decortication	264	**32.9**	564	**31.0**
Early interior flakes	81	**10.1**	264	**14.5**
Late interior flakes	56	**7.0**	181	**9.9**
Early percussion bifacial reduction	2	**0.2**	0	**0**
Late percussion bifacial reduction	2	**0.2**	1	**0.05**
Margin removal flake	7	**0.9**	3	**0.2**
Bulb removal	0	**0**	1	**0.05**
Pressure bifacial reduction	30	**3.7**	13	**0.7**
Pot lid	0	**0**	9	**0.5**
Flake Fragment	134	**16.7**	216	**11.9**
Chunk/Shatter	179	**22.3**	509	**28.0**
Total	**803**	**100**	**1820**	**100**

Table 4: Palace Complex

Category	Structure B8 (formerly G) N	Structure B8 (formerly G) %	Structure B9-18 (formerly B) N	Structure B9-18 (formerly B) %
Primary decortication	6	**3.6**	42	**6.6**
Secondary decortication	58	**35.4**	206	**32.2**
Early interior flakes	22	**13.4**	59	**9.2**
Late interior flakes	22	**13.4**	34	**5.3**
Early percussion bifacial reduction	1	**0.6**	1	**0.2**
Late percussion bifacial reduction	0	**0**	2	**0.3**
Margin removal flake	1	**0.6**	6	**1.0**
Bulb removal	0	**0**	0	**0**
Pressure bifacial reduction	0	**0**	30	**4.7**
Pot lid	0	**0**	0	**0**
Flake Fragment	36	**22.0**	98	**15.3**
Chunk/Shatter	18	**11.0**	161	**25.2**
Total	**164**	**100**	**639**	**100**

Table 5: Yaxtun Group

Category	198		199		200	
	N	**%**	**N**	%	**N**	**%**
Primary decortication	51	**3.2**	7	**4.0**	1	**3.6**
Secondary decortication	496	**30.7**	54	**30.9**	14	**50.0**
Early interior flakes	236	**14.6**	23	**13.1**	5	**17.8**
Late interior flakes	164	**10.1**	17	**9.7**	0	**0**
Early percussion bifacial reduction	0	**0**	0	**0**	0	**0**
Late percussion bifacial reduction	1	**0.05**	0	**0**	0	**0**
Margin removal flake	2	**0.1**	1	**0.6**	0	**0**
Bulb removal	1	**0.05**	0	**0**	0	**0**
Pressure bifacial reduction	12	**0.7**	0	**0**	1	**3.6**
Pot lid	0	**0.6**	0	**0**	0	**0**
Flake Fragment	195	**12.1**	21	**12.0**	0	**0**
Chunk/Shatter	450	**27.8**	52	**29.7**	7	**25.0**
Total	**1617**	**100**	**175**	**100**	**28**	**100**

Table 6: Debitage Chi Square Analysis

CHI SQUARE ANALYSIS Category	Palace Complex Exp.	Palace Complex Obs.	Yaxtun Group Exp.	Yaxtun Group Obs
Primary decortication	33	48	74	59
Secondary decortication	257	264	571	564
Early interior flakes	107	81	238	264
Late interior flakes	74	56	163	181
Early percussion bifacial reduction	1	2	1	0
Late percussion bifacial reduction	1	2	2	1
Margin removal flake	3	7	7	3
Bulb removal	0	0	1	1
Pressure bifacial reduction	13	30	30	13
Total	**489**	**490**	**1087**	**1086**

The early stage reduction debitage indicates that stone tool production at Baking Pot was largely expedient in nature (Tables 3-5). Although I only sampled a small portion of the total site, I think that if large scale percussion bifacial reduction had been taking place there would have been more evidence for it. While it is possible that there were workshops dedicated to the production of formal tools and bifaces elsewhere at Baking Pot, it was not occurring in the contexts represented by my sample.

A likely reason for an expedient reduction strategy is the abundance of locally available raw material at Baking Pot. Within the boundaries of the site is a large outcropping of chert, much of which is fairly low quality, with uneven or rough surfaces and many inclusions (Figures 11-13). Drawing on Andrefsky's (1994a, 1994b) work, I think that local raw material availability has influenced how Baking Pot flintkappers organized their technology. The low quality of this material would make the production of formal tools difficult, and the abundance of it would discourage onsite production of bifacial tools. Formal bifaces are most easily made from higher quality material (Andrefsky 1994b:383). Any high quality bifaces found at Baking Pot were likely produced elsewhere. One possible candidate that research has suggested was involved in formal tool production and export is Colha (Hester 1985; Hester and Shafer 1984; McAnany 1989; Shafer and Hester 1983, 1991). Expedient tools would be expected when poor quality material is close at hand, because they are less labor intensive to make. Also, when edges dull from use it is easy to make new flake tools because toolstone is abundant. This interpretation is consistent with what Andrefsky (1994a, 1994b), Bamforth (1990, 1991), and Kelly (1988), have suggested. Their research indicates that a large amount of locally available, low quality material will often result in the onsite use of expedient technologies.

Tools:

The tools I analyzed at Baking Pot also reflect the interpretation that expedient implements were the most common at the site. The results of the tool analysis are located in tables seven, eight, and nine, and they are structured in the same manner as the results for the debitage analysis. Although most of the formal tools were not available for my study, given what I examined I think that they were much less common than their expedient counterparts. Even the more formal tools in my collection, were often expediently made. Bifaces were usually thick, often bearing some cortex, with little to no evidence of pressure flaking. Drills often only had a minimal number of flakes removed to create a point on one end that exhibited use wear (Figure 10).

The existence of hammer stones in both elite and sub-elite contexts also supports the interpretation that production was occurring in both localities (Tables 7-9). It is possible that these hammer stones were used in activities other than the production of stone tools, but because they are commonly used for such activities, they support the inference of onsite tool production.

These results are consistent with Aoyama's study of Aguateca, in Guatemala, suggesting that expedient production was common throughout the region. He also reported large quantities of utilized flakes and other expedient tools as well as hammerstones at Aguateca (Aoyama 1999, 2007).

It is interesting that the tool distributions for the Palace Complex and the Yaxtun Group are different. In the elite Palace Complex, expedient cores are predominant (n =

58), but cores (n = 5) and choppers (n = 4) are also represented. In the Yaxtun Group, the relative number of utilized flakes was high (n = 174), representing two-thirds of the total tool sample (Table 7). The difference between the tool distributions for both contexts is highly significant ($\chi^2 = 69.499$, $p < .001$) (Drennan 1996) (Table 10).

One possible interpretation for this difference in tool types is that different behaviors were occurring in each area of the site. If indeed we are looking at an elite and sub-elite context, differences in the collections may be related to differences in status. Such differences could also relate to the types of activities that were carried out in each context. It is possible that the elites did not engage in the same level of daily domestic tasks as sub-elites, something that would be reflected in the types of tools recovered.

This interpretation would account for the higher frequency of utilized flakes, bifaces and drills found in the Yaxtun Group collection (Table 7, 9). These tools would also have been used more frequently by a working or sub-elite class, who likely resided in the Yaxtun Group, because they were engaged in more utilitarian activities. The evidence for production found in both elite and sub-elite contexts is consistent with the results of Aoyama's (1999, 2007) work at Aguateca, in which he recorded expedient chert tool production in all residential areas, regardless of social class (Aoyama 2007:9-10).

Chert Tool Results:

Table 7: Summary: Palace Complex vs. Yaxtun Group:

Category	Palace Complex		Yaxtun Group	
	N	%	N	%
Utilized Flake	30	**28.1**	174	**66.2**
Core	5	**4.7**	1	**0.4**
Expedient Core	58	**54.2**	63	**24.0**
Chopper	4	**3.7**	2	**0.8**
Drill	0	**0**	4	**1.5**
Unifacial Blade/Point	7	**6.5**	2	**0.8**
Biface/Partial Biface	1	**0.9**	13	**4.9**
Hammerstone	2	**1.9**	4	**1.5**
Total	**107**	**100**	**263**	**100**

Table 8: Palace Complex

Category	Structure B8 (formerly G)		Structure B9-18 (formerly B)	
	N	%	N	%
Utilized Flake	2	**10.0**	28	**32.2**
Core	3	**15.0**	2	**2.3**
Expedient Core	9	**45.0**	49	**56.3**
Chopper	0	**0**	4	**4.6**
Drill	0	**0**	0	**0**
Unifacial Blade/Point	0	**0**	1	**1.2**
Biface/Partial Biface	4	**20.0**	3	**3.4**
Hammerstone	2	**10.0**	0	**0**
Total	**20**	**100**	**87**	**100**

Table 9: Yaxtun Group:

Category	198		199		200	
	N	%	N	%	N	%
Utilized Flake	160	**69.9**	10	**40.0**	4	**44.4**
Core	0	**0**	1	**4.0**	0	**0**
Expedient Core	46	**20.1**	13	**52.0**	4	**44.4**
Chopper	2	**0.9**	0	**0**	0	**0**
Drill	4	**1.7**	0	**0**	0	**0**
Unifacial Blade/Point	2	**0.9**	0	**0**	0	**0**
Biface/Partial Biface	11	**4.9**	1	**4.0**	1	**11.1**
Hammerstone	4	**1.7**	0	**0**	0	**0**
Total	**229**	**100**	**25**	**100**	**9**	**99.9**

Table 10: Tool Chi Square Analysis

CHI SQUARE ANALYSIS Category	Palace Complex Exp.	Obs.	Yaxtun Group Exp.	Obs.
Utilized Flake	59	30	145	174
Core	2	5	4	1
Expedient Core	35	58	86	63
Chopper	2	4	4	2
Drill	1	0	3	4
Unifacial Blade/Point	3	7	6	2
Biface/Partial Biface	4	1	10	13
Hammerstone	2	2	4	4
Total	**108**	**107**	**262**	**263**

Utilized Flakes:

The proportions of utilized flakes are slightly more difficult to interpret because so few of them were recovered from the Palace Complex. The results of the utilized flake analysis are located in tables ten, eleven, and twelve are structured in the same manner as the results from the debitage and tool analyses. The utilized flakes in the Palace Complex were largely from the early stages of reduction, with 58.6 percent of them being primary or secondary flakes (Table 12).

In the Yaxtun Group the tendency to use early stage flakes as expedient tools was also prevalent. Over 80 percent of the collection is made up of secondary decortication flakes (61.9%) and early interior flakes (22.0%). Unlike the Palace Complex, only little evidence of utilized primary flakes was recovered (Table 11-13). The difference between the frequency of utilized flakes in the Palace Complex and Yaxtun Group is highly significant ($\chi^2 = 20.623$, $p < .001$) (Drennan 1996) (Table 14).

This pattern further supports my interpretation that the lithic production technologies employed at Baking Pot likely reflects the availability of local chert. It was unnecessary to produce high quality flake blanks for tools because even the early stage flakes could be utilized and easily replaced, making it unnecessary to produce flakes with the largest amount of useable surface area. The prevalence of utilized flakes in the Yaxtun Group (66.2% of the total tool sample) when compared to the Palace Complex (28.1% of the total tool sample) is also consistent with the inference that there were more domestic activities occurring in the Yaxtun Group.

Utilized Chert Flake Results:

Table 11: Summary: Palace Complex vs. Yaxtun Group:

Utilized Flakes	Palace Complex		Yaxtun Group	
	N	%	N	%
Primary decortication	3	**10.3**	1	**0.6**
Secondary decortication	14	**48.3**	104	**61.9**
Early interior flakes	7	**24.1**	37	**22.0**
Late interior flakes	2	**7.0**	10	**6.0**
Flake fragment	0	**0**	13	**7.7**
Chunk/Shatter	3	**10.3**	3	**1.8**
Total	**29**	**100**	**168**	**100**

Table 12: Palace Complex

Utilized Flakes	Structure B8 (formerly G)		Structure B9-18 (formerly B)	
	N	%	N	%
Primary decortication	0	**0**	3	**11.1**
Secondary decortication	2	**100.0**	12	**44.5**
Earlier interior flakes	0	**0**	7	**25.9**
Late interior flakes	0	**0**	2	**7.4**
Flake fragment	0	**0**	0	**0**
Chunk/Shatter	0	**0**	3	**11.1**
Total	2	**100**	**27**	**100**

Table 13: Yaxtun Group:

Utilized Flakes	198		199		200	
	N	%	N	%	N	%
Primary decortication	1	**0.7**	0	**0**	0	**0**
Secondary decortication	98	**62.8**	4	**50.0**	2	**50.0**
Earlier interior flakes	34	**21.8**	2	**25.0**	1	**25.0**
Late interior flakes	7	**4.5**	2	**25.0**	1	**25.0**
Flake fragment	13	**8.3**	0	**0**	0	**0**
Chunk/Shatter	3	**1.9**	0	**0**	0	**0**
Total	**156**	**100**	**8**	**100**	**4**	**100**

Table 14: Utilized Flake Chi Square Analysis:

CHI SQUARE ANALYSIS Utilized Flakes	Palace Complex		Yaxtun Group	
	Exp.	**Obs.**	**Exp.**	**Obs.**
Primary decortication	1	3	3	1
Secondary decortication	17	14	101	104
Early interior flakes	6	7	38	37
Late interior flakes	2	2	10	10
Flake fragment	2	0	11	13
Chunk/Shatter	1	3	5	3
Total	**29**	**29**	**168**	**168**

Conclusion:

Analysis of the lithic materials at Baking Pot has yielded the following conclusions:

1. There is evidence for the production of expedient tools at Baking Pot, as evidenced by the preponderance of early stage chert debitage and hammer stones recovered in excavations (Tables 3, 7).

2. The expedient technology utilized likely reflects the abundance of locally available chert, rendering more formal tool production unnecessary. Formal tools are easily made from high quality raw materials, which were not common at Baking Pot. They were producing what they needed for immediate use, but it was unnecessary for them to refine these tools further due to the availability of local toolstone. This is why there is an abundance of early stage debitage, but the later reduction stages are not as well represented in this collection. Expedient technologies are common when there are large quantities of locally available tool stone, especially if it is of inferior quality such as that found at Baking Pot.

3. Not surprisingly, the lithic products being consumed at the site included predominantly expedient tools, especially utilized flakes and expedient cores made of locally available toolstone (Table 7).

4. Both elite and sub-elite areas showed similar levels of stone tool production, but there was a much higher proportion of utilized tools in the sub-elite area, suggesting that the sub-elites were involved in a greater frequency of domestic activities.

Although my analysis of the lithic materials from The Palace Complex and the Yaxtun Group is only a small sample of the lithic artifacts available for study at Baking

Pot, it contributes information about local stone tool production and consumption, a topic that has heretofore received little attention. It has revealed the nature of stone tool production in a prominent Late Classic site, provided new data reflecting the relationship between raw material availability and lithic technologies, and examined and drew conclusions about the possible relationship between stone tool production and consumption among varying social statuses.

Because my research focuses on only a small portion of the lithic artifacts available for study at the site, I think that further examination of these data would be of great benefit to the archaeological community. Because of Baking Pot's prominence in the Belize Valley during the Late Classic period, it stands as an important site for understanding changing settlement patterns, social and political organization, and economics throughout the region.

Even though Baking Pot was occupied primarily during the Late Classic, the site is also important because of the longevity of its occupation, which spanned the Middle Preclassic to the Late Postclassic periods (Audet 2006:105; Audet and Awe 2004:50; Conlon and Moore 2003:59; Hoggarth et al. 2010:2). The collections I examined did not lend themselves well to a diachronic study of tool production and consumption at Baking Pot, so further analysis with a temporal focus, examining how production and consumption may have changed over time would be a fascinating addition to scholarship in this area.

Another topic of interest would be to study the high quality bifaces and other formal tools from Baking Pot to gain a better understanding of their technological characteristics, as well as to determine where the material originated. One of the major locations of formal stone tool production in the Belize Valley was the site of Colha, located approximately 100 km northwest of Baking Pot (Hester 1985; Hester and Shafer 1984; Shafer and Hester 1983, 1991). It would be interesting to compare the formal tools of high quality chert at Baking Pot to those recovered from Colha to determine if Colha is a possible source for the export of formal tools to Baking Pot.

Additional study of Baking Pot will provide researchers with new information about the Belize River Valley and the Maya as a whole. The study of lithics in particular will be an important addition to scholarship in the area in the coming years as the focus of Maya studies has shifted from exclusively monumental and ritual contexts towards sub-elites, commoners, and daily activities. Only through understanding the daily aspects as well can researchers begin to paint a more holistic picture of what life was like for the Maya, and I hope that my research will aid in this endeavor.

Figure 11: Raw Material at Baking Pot (photo by Rafeal Guerra)

Figure 12: Raw Material at Baking Pot (photo by Rafeal Guerra)

Figure 13: Raw Material at Baking Pot, located on what is now Baking Pot Road in Settlement Cluster B. (photo by Rafeal Guerra)

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