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Fred Valdez, Jr.

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Research Reports

Mono y Conejo

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Fred Valdez, Jr.
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Mono y Conejo provides a public medium for the description and reporting of anthropological interests. Flexible in format, the journal accepts and publishes works on archaeology, art history, ethnohistory and related cultural historical issues. Published at irregular intervals, each issue constitutes a single volume.

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Editorial Statement
Mono y Conejo, the Journal of the Mesoamerican Archaeological Research Laboratory, publishes contributions on all aspects of Mesoamerican archaeology, art history, ethnohistory, and related cultural historical issues. The primary focus of the journal is on the publication of research reports from the field. Mono y Conejo is a vehicle for the dissemination of anthropological research on Mesoamerica.
The authors would like to express their appreciation to Kay Sunahara for imaging the vessels depicted in this article.

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**References**

- Schmidt, Peter, Mercedes de la Garza, and Enrique Nalda (eds.): 1998. Maya. RCS Libri - CNCA INAH, Bompiani, Italy.
Greetings from the editors of Mono y Conejo: Journal of the Mesoamerican Archaeological Research Laboratory.

Dear Friends and Colleagues:

On behalf of the staff and students of the Mesoamerican Archaeological Research Laboratory (MARL) at the University of Texas at Austin, we welcome you to the second installment of the MARL journal, Mono y Conejo. In the premiere issue, we promised a publication at least twice a year. However, due to the incredibly busy schedules of the editors and scholars contributing to the journal, we’ve decided to produce a single volume in 2004 instead of the usual two. More specifically, there will be three volumes coming out in 2004, including a late summer as well as a fall issue!

In this second volume of Mono y Conejo we are pleased to bring you four interesting and insightful articles each focusing on aspects of the archaeology, geography, and ceramic art history of the Maya in the Classic, Postclassic, and Colonial periods. These are written by a diverse set of scholars--two postdoctoral students, two graduate students, one faculty member, and a visiting student. This is in keeping with one of the primary goals of the journal articulated in the initial volume, being that Mono y Conejo is an informal medium for the presentation and expression of ideas from established and new scholars alike.

The lead article, authored by Nicholas Dunning and Timothy Beach, two highly regarded scholars of ancient Maya cultural geography and soils science, is both a presentation of new data combined with a synthesis of previous data regarding the emerging study of indigenous soil knowledges. Dunning and Beach bring diverse modes of inquiry to bear in demonstrating the complexity of local and regional processes of soil formation and change in the Maya Lowlands. Their central argument, that the archaeological record of the Maya shows evidence of a highly developed and sophisticated understanding of soil formation and management, is supported by a wealth of field data from sites across the region. The authors use a range of analytical techniques, including isotopic analysis of bone and plant remains, as well as pollen and geochemical analyses of soils, to support their argument. Their findings suggest that the Maya had a deep understanding of the relationship between land use and soil formation, and that this knowledge was integrated into their agricultural practices and land management strategies.

In addition to the lead article, this volume also includes contributions from other scholars, each focusing on different aspects of the archaeology, geography, and ceramic art history of the Maya. The articles cover a range of topics, including the use of jade in Maya ceremonial life, the role of ceramics in the exchange of goods and ideas, and the impact of colonial-era events on Maya society.

We hope that you enjoy this volume of Mono y Conejo and the insightful set of readings contained herein. Due to the very positive response in terms of article contributions, we will continue to bring you the results of the latest research and support, and invite you to join us in the pursuit of knowledge and the rewards of engagement and participation.

With warm regards,

Richard Meadows
Fred Valdez
Editors
Austin, Texas
Spring 2004
Fruit of the Luum: Lowland Maya Soil Knowledge and Agricultural Practices

Nicholas Dunning
University of Cincinnati
Timothy Beach
Georgetown University

A growing, but still infant, body of ethnopedological research has shown the complexity of indigenous soil knowledge and soil conservation in many parts of the world. The historical record of soil degradation is evident in many regions, including the Maya Lowlands. We here selectively review the varied manner in which Maya people have toiled to wrest a living from the earth, or luum, enjoying much success, but also enduring acute failures. Much of this review centers on prehispanic agricultural practices. However, both the problems and solutions identified in prehispanic times are relevant for today's farmers. The lessons learned by ancient peoples form important analogues for their modern descendants as they recolonize sparsely inhabited lands.

Study area: the Maya Lowlands environment

The cultural region of the Maya Lowlands includes the Yucatán Peninsula, other low-lying contiguous areas of Central America, and a small area of higher elevation in the southeastern portion of the peninsula. The lowlands extend from about 70 km north of the U.S.-Mexico border in near-200 mm in the northern sections of the peninsula, to near-1200 mm in the southern sections of the Yucatán Peninsula.

The Maya Lowlands is characterized by a tropical, humid climate with a wet season from May to November and a dry season from December to April. The region is dominated by the tropical moist forest biome, with the most important factors influencing the distribution of vegetation being rainfall, topography, and soil type.

Natural vegetation across the Maya Lowlands follows patterns of rainfall and the seasonality of water supply, though edaphic factors, like soil drainage and chemistry, also play a role. The region is home to a diverse range of plant species, including many that are important for human use, such as food crops, medicinal plants, and construction materials.

Concluding remarks

Three zoomorphic vessels excavated from the ancient Maya site of Colha have been described and discussed. Each ceramic vessel has been defined by shape, metric data, and context. Part of the reason for this study was to make available for comparison the zoomorphic ceramic vessels from the Yucatán Peninsula. Possible meanings have been posited. The meanings behind the represented forms are difficult to interpret because of the variety of interpretations that have been made in the past. The interpretations presented in this paper are intended to help with further studies of the Colha material.

Figure 2. Shell effigy bowl from Colha, Belize.

Figure 3. Tapir effigy bottle from Colha, Belize.
Methodology

Our own field-investigations of ancient Maya soil use have included a variety of paleoenvironmental, soils, and settlement pattern studies in eight separate regions of the ancient Maya world (e.g., Rice and Culbert 1990). Throughout our research and writing, we have also considered the significant research of others. In the following pages, we summarize some of the major findings of our investigations and of studies by other researchers. We will look first at our own research, followed by a review of the prehispanic archaeology of the ancient Maya, primarily through the lens of contemporary Maya knowledge and practice. We also include a section on contemporary Maya soil management and use.

In the next section, we look at aspects of contemporary Maya soil knowledge and use. Dunning (1992a, 1992b) interviewed contemporary Yucatec Maya farmers in the southeastern Yucatán Peninsula, and comments about soil knowledge and practices in the Northwest Yucatán around Chunchucmil (Beach 1998a; Farrell et al. 1996).

Results and analysis

Scientific thinking on the Maya Lowlands environment and ancient Maya agriculture can be seen in terms of the growth and maturation. While we know a great deal about the prehispanic Maya, we still have much more to learn. We can also view our changes in thinking, as Turner (1993) has discussed, in terms of paradigm shifts or changing orthodoxies. Until the mid-1960s a view persisted that ancient Maya civilization represented an exception in world history: a complex civilization that emerged in a region devoid of advanced prehistoric societies. This viewpoint was based largely on the assumption that the ancient Maya did not have contact with or knowledge of other Mesoamerican cultures and their agricultural technologies. The Petén Lakes district has sometimes been used as the template for understanding human-environment relationships in the Maya Lowlands (Culbert and Rice 1990). Several scholars have estimated population densities (A.D. 550-800) at c. 200 km² for the end of the Late Classic in the central Maya Lowlands (Culbert and Rice 1990). By this time the central Petén landscape was essentially deforested, with most available soil nutrients depleted by centuries of intensive agriculture. The thin Rendolls of the Petén uplands are probably still truncated by ancient agriculture (Beach 1998b). Despite years of research, however, we still know comparatively little about the precise impacts of soil degradation or the nature of Classic Maya agriculture in the Maya Lowlands. A great deal of research remains to be done in this critical area.

In the aftermath of the collapse of Classic Maya civilization (c.a. 500 B.C. - 900 A.D.), we have seen the impact of soil erosion and degradation on the landscape. In the aftermath of the Classic period, the landscape was changing rapidly, with the collapse of the complex civilization they supported. Following the decline of the Classic Maya civilization around the Petén Lakes between 800 and 900 A.D. In the aftermath of the collapse of Classic Maya civilization (c.a. 500 B.C. - 900 A.D.), we have seen the impact of soil erosion and degradation on the landscape. In the aftermath of the Classic period, the landscape was changing rapidly, with the collapse of the complex civilization they supported. Following the decline of the Classic Maya civilization around the Petén Lakes between 800 and 900 A.D.

Figure 1. Map of Colha showing location in relation to other sites in northern Belize (from Hester 1981: 3).
The ceramic vessels reported in this paper look at three unique ceramic vessels from the ancient Maya site of Colha, Belize. Located in the chert-bearing zone of northeastern Belize, the Colha site was the focus of initial archaeological investigations and has contained some of the best preserved and most complete ceramic assemblages of the Preclassic Period. The zoomorphic ceramic vessels are particularly notable for their artistic and morphological description, context, and ideological interpretation.

### Morphological Description

- **Height:** 7.25 mm
- **Length:** 14.75 mm
- **Width:** 13.95 mm
- **Width (diameter) of opening:** 12.5 mm
- **Rim thickness:** 13.38 mm
- **Wall thickness:** 4.23 mm
- **Munsell color:** 10R 5/8 red, 10R 4/8 red, 2.4YR 5/8 red

### Ceramic Details

- **Vessel Shape:** Bowl
- **Ceramic Group:** Sierra Red
- **Ceramic Type:** Unnamed Red, Modeled, and Incised
- **Zoomorphic Form:** Shell

### Context

The ceramic vessels were studied for their morphological description, context, and ideological interpretation. Each vessel is described in terms of its morphological characteristics, context, and ideological meaning. The discussion on the possible meanings associated with the zoomorphic shape is an important aspect of the analysis.

### Regional Environment

The region around Colha, Belize, is characterized by bajos, perennial wetlands, and shallow lakes. The bajos contain seasonal swamps and have relatively limited agricultural potential, although many have contributed to the environmental history of the area.

### Cultural Context

The ceramic vessels from Colha, Belize, provide insights into the cultural practices of the ancient Maya. The vessels are not only works of art but also hold significant cultural and religious meanings. The Preclassic zoomorphic vessels contribute to our understanding of the cultural and social context of the ancient Maya society.

### Further Reading

For more detailed information on the ceramic vessels from Colha, Belize, and their cultural significance, refer to the sources listed in the bibliography.

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**Reference:**

Another common terrace type are large footslope terraces located at the base of steep slopes or along significant mid-slope gradient breaks. Many such systems were found on alluvial fans and colluvial slopes indicating that the Maya were trying to use lands with maximum soil clearance and agriculture resulted in moderate to severe soil erosion in many hilly parts of the Maya Lowlands (Dunning and Beach 1994, 2000; Beach and Dunning 1995; Beach 1998b; Dunning 1997). In some cases, the destruction of vegetation and soil clearance was dramatic and the evidence of this is preserved in the lithics of the Maya Lowlands (Kidder 1947). The optionsof terrace formation and construction probably remain the best means of soil conservation on cultivated land.

Research in the Río de la Pasión and Three Rivers regions of Guatemala and Belize has produced data on a wide variety of terrace systems (Dunning and Beach 1994, 2000, n.d.; Beach and Dunning 1995). This proximity suggests their use as small home gardens or seedbeds. In other cases, the Maya built footslope terraces in association with water control features such as channels and diversions. One such diversion used large boulders and buttressing to anchor them against swift channel flow and gravel beds or seep holes to facilitate drainage.

In most regions terrace mapping and excavation show an architecture that implies incremental evolution, likely paralleling the growth of nearby households and small village populations across large areas of the Central Hills (Turner 1983) and upper Belize River Valley (Fedick 1994; Neff 1994). Terracing is not evident in all hilly regions of the Maya Lowlands. For example, in the Puuc Hills of Mexico agricultural terracing is extremely rare despite evidence of high population densities (Dunning 2000). The thin Rendolls or Inceptisols of steeply sloping lands were therefore not the limiting factor; instead, the farmers had to find other land uses. An even more dramatic example of the creation of a garden city comes from the site of Chunchucmil, close to the most arid part of the Maya Lowlands on the Northwest Karst Plateau (Lee 1995). Here the Maya were able to bring additional groundwater into the dry areas through a series of underground channels, a sophisticated use of palm roots for binding together the soil and gravel beds, and drainage systems. They were also recycling fertilizer and household wastes and importing organic mucks from wet savannas some several kilometers distant (Beach 1998a).


Wright, Lori 1994b. A Preliminary Analysis of Middle Preclassic Burials from Operation 2012/12 at Colha, Belize. Unpublished manuscript on file, Texas Archeological Research Laboratory, The University of Texas at Austin, Austin.
th century and the introduction of Old World crops is laden with significance, particularly about the maize varieties that work best for a particular soil. Thus, the folk soilscape is conceptually a mosaic of potential planting surfaces (Figure 3).

A taxon is a term that refers to either a topographic, textural, or color attribute of the soil (Table 1). However, the Puuc folk soil names typically refer to either a topographic, textural, or color attribute of the soil (Table 1). These taxa clearly have meanings for farmers far beyond their descriptive implications of their names. Each taxon is subordinate (modifying) and numerous taxa are combined to describe a soil (Figure 3). These taxa are used to identify specific areas of the landscape that are suitable for different types of agriculture. For example, the Puuc region employs a complex folk soil taxonomy that includes seven principal arable land entrances during the Postclassic period (ca. 900-1500 A.D.).

The Maya seemed to have little need to reclaim the abandoned land, gradually enforcing what they considered to be the legal disenfranchisement of many Maya communities from ancestral land holdings (McAnany 1995; Restall 1997; Dunning and Beach 2000). Despite enduring nearly 500 years of colonialism and modern economic pressures, many traditional Yucatec Maya speaking farmers have retained a considerable amount of folk knowledge. Our knowledge of lowland Maya agriculture as successful, ingenious, and intensive as Maya agricultural systems became during the Late Classic, the Maya ultimately collapsed. Populations crashed across many parts of the Yucatan Peninsula, which was an important part of the "Classic collapse," but the mechanisms of this failure remain far from clear (Webster 2002).
Figure 3. Idealized diagram showing the topographic relationship of Yucatec Maya folk soil taxa in the Puuc Hills region (after Dunning 1992a).

Table 1. Taxonomic Classification of Puuc Soils (Revised from Dunning 1992b).

<table>
<thead>
<tr>
<th>Name</th>
<th>Literal Meaning</th>
<th>USDA Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tzekel</td>
<td>stoneland/infertile</td>
<td>lithic ustorthextoithct</td>
</tr>
<tr>
<td>Kaccab</td>
<td>elevated, fertile land</td>
<td>lithic haplustoll</td>
</tr>
<tr>
<td>Chacluum</td>
<td>red earth</td>
<td>rhodic lithic haplustoll</td>
</tr>
<tr>
<td>Pusluum</td>
<td>soft earth</td>
<td>cumulic lithic haplustoll</td>
</tr>
<tr>
<td>Ekluum</td>
<td>dark earth</td>
<td>vertic argiustoll</td>
</tr>
<tr>
<td>Yaxhom</td>
<td>low-lying land</td>
<td>chromustert</td>
</tr>
<tr>
<td>Kancab</td>
<td>yellow earth</td>
<td>rhodic paleustalf</td>
</tr>
</tbody>
</table>

Note: the complex group of bog and half bog soils collectively known as akalche is not included here. These are generally not agricultural soils and comprise no more than one percent of northern Puuc soils.

Table 3. Category II Shell Disk Beads

<table>
<thead>
<tr>
<th>Period</th>
<th>Number of Specimens</th>
<th>Average Diameter (cm)</th>
<th>S. D.</th>
<th>Average Thickness (cm)</th>
<th>S. D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early Middle Preclassic</td>
<td>260</td>
<td>9.54</td>
<td>1.90</td>
<td>3.07</td>
<td>1.35</td>
</tr>
<tr>
<td>Late Middle Preclassic</td>
<td>585</td>
<td>10.13</td>
<td>1.73</td>
<td>3.07</td>
<td>1.27</td>
</tr>
<tr>
<td>Late Preclassic</td>
<td>3</td>
<td>4.65</td>
<td></td>
<td>0.43</td>
<td></td>
</tr>
<tr>
<td>Protoclassic</td>
<td>2</td>
<td>4.82</td>
<td>0.27</td>
<td>1.64</td>
<td>1.84</td>
</tr>
</tbody>
</table>

Table 4. Averages and Standard Deviations of Category I and II Shell Disk Beads

<table>
<thead>
<tr>
<th>Period</th>
<th>Number of Specimens</th>
<th>Average Diameter (cm)</th>
<th>S. D.</th>
<th>Average Thickness</th>
<th>S. D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early Middle Preclassic</td>
<td>425</td>
<td>8.06</td>
<td>2.97</td>
<td>2.66</td>
<td>1.36</td>
</tr>
<tr>
<td>Late Middle Preclassic</td>
<td>724</td>
<td>10.13</td>
<td>1.73</td>
<td>3.07</td>
<td>1.27</td>
</tr>
<tr>
<td>Late Preclassic</td>
<td>118</td>
<td>4.73</td>
<td>0.61</td>
<td>2.31</td>
<td>0.70</td>
</tr>
<tr>
<td>Protoclassic</td>
<td>14</td>
<td>5.70</td>
<td>1.24</td>
<td>2.95</td>
<td>1.17</td>
</tr>
</tbody>
</table>

Late Preclassic/Protoclassic

Only two burials, one Late Preclassic and one Protoclassic, contained disk shell beads (n=117). In general, by the Late Preclassic at Colha, disk shell beads are no longer a common element in the burial furniture. The Late Preclassic and Protoclassic burials reflect a greater diversity in placement and associated furnishings.

Inter-site comparisons

Similar disk shell beads, recovered from Preclassic contexts, are reported from Altun Ha (Pendergast 1982:173), Barton Ramie (Willey et al. 1965:509), Blackman Eddy (Garber et al. 1999:124), and Cuello (Hammond 1999:54). The pattern of the inclusion of multiple disk shell beads in Middle Preclassic burials as illustrated from Colha, is primarily limited to northern Belize, and in particular at sites such as Oxkintok (Dunning 1992b). In the northern Belize area, the pattern of inclusion is varied and includes burials, construction related fill, primary middens, postholes, caches, and special deposits.

Concluding remarks

As illustrated, the disk shell bead subform is reported from Preclassic contexts from several sites in the Maya Lowlands. The pattern of including disk shell beads, as illustrated from Colha, is primarily limited to northern Belize, and in particular at sites such as Oxkintok (Dunning 1992b). By the Late Preclassic and into the Protoclassic this northern Belize pattern becomes less apparent.

It is clear that this bead form held significance during the Middle Preclassic. However, the specific significance is yet to be understood. It is possible that the beads were used in rituals or as personal adornments. The inclusion of disk shell beads in cache contexts supports the interpretation of both ritual and ideological significance.
In some areas, Maya soil terminology has been lost altogether. Such changes reflect a more general loss of traditional agricultural knowledge symptomatic of both lessened agricultural engagement and distance from active farming for more than two generations. It is no coincidence that these areas have very limited folk soil taxonomies and extremely low crop yields (Beach 1998a).

If folk soil taxonomies do truly reflect cultural adaptation to a particular environment, then they must change as a population shifts location. Indeed, we have observed that farmers who do not practice intensive plantations may “classify” as much as 60% of the local soilscape as non-arable and view arable lands in terms of a small number of folk taxa. However, after a few years of experimentation and, perhaps more importantly, interaction with more established residents, most farmers were using a variety of planting strategies and observing agricultural dynamics (Dunning and Beach 1998).

**Discussion and conclusions**

Research on soil and ethnopedology in the Maya Lowlands has uncovered intensive agriculture in wetlands and uplands, periods of erosion and sedimentation, debates about ancient plantations, and human versus natural changes of the bajos. For traditional Yucatec Maya farmers, the earth or luum is believed to impart itz, “sap” or “the holy substance of life” to growing plants and other things. This is part of cyclical system in which yiitz ka’an, “the holy substance of the sky,” is believed to bring fertility to the earth in the form of rainfall (Dunning 2003). A more sacred and life-sustaining view of soil and water is hard to imagine. In contemporary rituals, Maya shaman call forth the itz from the ground and from the sky at critical times in the agricultural cycle. Beliefs concerning the importance of itz in Maya cosmology can be traced back well into the Preclassic period (Freidel, Schele, and Parker 1993, p. 116-140). These beliefs thus appear to have evolved into the local land ethic. Only those people who can see their futures in the local soilscape will invest in its stewardship.

**References**


After examining the disk bead collection it was evident that two types (Category I and Category II) of disk shell beads, corresponding to edge finishing, were represented ... The majority of these are manufactured from gastropod body whorls and shoulders. Identifiable species represented include Strombus pugilis, Fasciolaria tulipa, and Spondylus, which have smooth, polished surface that may have been preferred due to ease of processing. Differences are probably a result of the subtractive nature of the production process and what the final form necessitated.

The disk bead subform at Colha is generally discoidal in shape with a central biconical or uniconical perforation (Figure 1). However, some specimens tend to be more squared, possibly indicating a shift in production techniques or cultural preferences. The second type, Category II, (Table 3) is comprised 691 beads that are generally discoidal or oval in shape, with a few beads being more squared. The edges are more pronounced in Category II, with some beads showing ridges.

The results of analysis of the assemblage of disk beads from Colha and their contextual patterns are presented in this paper (Buttles 2002). The production of disk shell beads appears to be a significant aspect of the site's economy and cultural expression, reflecting a complex interplay between material production and consumption.
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1979 Guns, Gunflints, Balls, and Shot. In *Hamilton, T.M.*

1954 Thompson, J. E. S.


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The raw material types excavated from San Pedro during the Late Postclassic and Historic periods document a changing pattern of stone use. Of the total assemblage of lithics from these periods, 72.5% were 'chert-bearing zone' chert, suggesting that a significant proportion of flake reduction was produced from these cherts. The percentage of miscellaneous thick biface fragments, flakes, and edges compared to the actual bifaces and biface fragments recovered.

Whereas the total assemblage from San Pedro indicates a focus on maximum use and conservation of raw materials, in the Late Postclassic and Historic periods this seems even more important with the recovery of fewer bifaces and fragments, more thinning flakes, more flake cores, and greater evidence for ad hoc flake production. With the Colha workshops gone by this point, the San Pedro Maya were unable to produce these tools themselves and could not acquire the amount of 'chert-bearing zone' chert they desired. By necessity, they were forced to exploit alternative sources of lithic raw material.

Concluding remarks

Although the overall pattern of behavior at San Pedro is fairly consistent over time, the lithic assemblage composition does demonstrate some changes from the Late Classic to Late Postclassic/Historic periods. In the Late Postclassic/Historic periods, the percentage of formal tools, specifically large bifaces, reduced percentages of 'chert-bearing zone' chert, and increased percentages of flakes and flake tools. The bifacial thinning and repair flakes that are removed from these bifaces are opportunistically used as ad hoc tools as well (see Nelson 1991:74). Moreover, some 'chert-bearing zone' cores and fragments were used to produce simple flakes or flake tools. The raw material conservation is seen in both the opportunistic and expedient use of stone flakes and some minor bipolar reduction of blocky fragments. The lithic sub-assemblages reveal a pattern of reduced percentages of formal tools, specifically large bifaces, reduced percentages of 'chert-bearing zone' chert, and increased percentages of flakes and flake tools. The bifacial thinning and repair flakes that are removed from these bifaces are opportunistically used as ad hoc tools as well (see Nelson 1991:74). Moreover, some 'chert-bearing zone' cores and fragments were used to produce simple flakes or flake tools.
Lithics and human behavior at San Pedro, Ambergris Caye, Belize

W. James Stemp
University of Victoria, B.C.

The non-obsidian chipped stone tool assemblage recovered from San Pedro, Ambergris Caye, Belize during excavations in the early 1990s indicates that, like many locations, the site was a dynamic part of Maya material culture and society. The assemblage indicates a range of activities typical of Maya communities, suggesting a balance between the use of local and traded materials. The non-obsidian chipped stone tools were utilized in various daily activities, and the assemblage provides insights into the procurement and use of raw materials in the Maya region.

San Pedro, Ambergris Caye, Belize

Located on the southern end of Ambergris Caye, the site of San Pedro currently lies under the modern fishing and resort town of the same name. Based on excavations at the site, the site was primarily a village during the Late Postclassic and Historic periods (Stemp 2001:9) (Figure 1). The San Pedro excavations were primarily salvage operations from three construction sites in the town. Inasmuch as evidence from foundation trenches and backdirt piles at the Sands Hotel/Parham properties that have been dated to the Late Postclassic and Historic periods (Stemp 2001:9) (Figure 1), the site has been occupied by various entities, including fishermen and possibly even earlier Maya inhabitants.

Problems in deciphering the occupational sequence at San Pedro have been hampered by the amount of modern hotel construction and the disturbance of the soil. In one instance, a combination of Victorian refuse, material from 19th and 20th century garbage pits, Spanish olive jar sherds, English earthenware and bits of glass, Late Postclassic Maya artifacts, and part of a house floor that capped the burial of an infant, exemplifies the difficulty of reconstructing past Maya behavior at the site (Pendergast and Graham 1991:3).

Numerous burials have been excavated from San Pedro that date to the Late Classic and Postclassic periods. These burials were distinguished by the fact that, in general, the number of artifacts associated with burial was relatively small, and the grave goods were relatively few. The burials also indicate that the Maya at San Pedro engaged in a range of activities typical of Maya communities, suggesting a balance between the use of local and traded materials.

Despite this disturbance of the site, enough archaeological evidence has been recovered to suggest that the Maya at San Pedro engaged in a range of activities typical of Maya communities, suggesting a balance between the use of local and traded materials. The assemblage indicates a range of activities typical of Maya communities, suggesting a balance between the use of local and traded materials. The assemblage provides insights into the procurement and use of raw materials in the Maya region.

Over time, it appears certain trends at San Pedro can be identified in terms of stone tool acquisition, formal vs. informal technology, tool recycling and use, and availability of raw material. For the locations of lithic material at San Pedro, the data from securely dated contexts were employed. Therefore, the numbers provided below represent 96.1% of all the 434 lithics recovered from the excavations at this site.

From the Late Classic to Middle Postclassic periods, lithic raw material at San Pedro was not abundant. Not surprisingly, conservation and recycling of stone are clearly evident. The average assemblage percentage of large flakes and biface edges is 18.9% of all raw materials (16.6% Late Classic, 21.1% Middle Postclassic). This is convincing evidence of a concerted effort to maintain the bifaces for as long as possible.

Finally, the types of raw materials at San Pedro during the Late Classic, Terminal Classic and Middle Postclassic periods reveal a concentration on 'chert-bearing zone' material (57.3%) and minimal reliance on basic local flake production from 'chert-bearing zone' and 'other' cryptocrystalline silicate material.

Occupation during the Late Postclassic/Historic periods at San Pedro reveals a slightly different pattern of tool use, curation and raw material consumption than observed in previous periods. The average percentage of large bifaces, biface fragments, bifacial thinning flakes, and biface edges is 22.6% of all raw materials (19.6% 'chert-bearing zone' chert, 1.2% 'other' cryptocrystalline silicate material). The data reveal the great effort to maintain the bifaces for as long as possible, and they further document that substantially fewer bifaces were used in finishing compared to the Late Classic and Middle Postclassic periods. The ratio of tertiary to secondary 3 to primary simple flakes (28:5:1:0 or 82.4%, 14.7%, 2.9% and 0%) manufactured from 'chert-bearing zone' chert reveals a slight increase in the production of simple flakes and a decrease in the production of bifaces and bifacial thinning flakes. The ratio of tertiary to secondary 3 to primary simple flakes (28:7 or 4:1) indicating that biface thinning or resharpening constituted a significant proportion of the reduction waste produced during these periods.
Based on these data and the fact that most formal tools recovered from San Pedro adhere to the typology established for Colha, and that 91.1% of these tools were manufactured from 'chert-bearing zone' chert (Stemp 2001:26, ... 1983; McAnany 1989a, 1989b), Marco Gonzalez (Stemp 2001), and San Juan, Ek Lum, and Chac Balam (Hult and Hester 1995).

The small number of formal tools and formal tool fragments, specifically the larger and smaller bifaces and finished blade tools, at San Pedro is assuredly due to a breakdown in supply networks in the later periods. The small number of formal tools and the variety of tool types encountered at San Pedro seem indicative of a generalized lithic assemblage that permitted the effective completion of a range of diverse tasks and met the local needs of a relatively small coastal population. The fact that there were very few task-specific tools, such as oval bifaces or scrapers, and there were no artifacts, such as burin or adze tools. The curation of the tool assemblage in general, in conjunction with the opportunistic use of what may be considered ad hoc flake tools and some bipolar reduction (Berman et al. 1999; Hayden 1980), was likely the best way of technologically adapting to a location devoid of locally available stone for tool production, while maximizing the extraction, use, and exchange of resources.
Lithic raw material types from San Pedro

Because there are no naturally occurring sources of cryptocrystalline silicates on Ambergris Caye, it is not surprising that the lithic assemblage from San Pedro primarily consisted of temperate and granitic cherts. The chalcedony recovered from San Pedro was made from sources that were not naturally occurring on Ambergris Caye. The majority of the chalcedony recovered from San Pedro was from one of the two main chalcedony sources found in the Chiquibul Mountains of Belize: Chris's Creek and La Venta. The chalcedony recovered at San Pedro was made from chalcedony from Chris's Creek and La Venta.

For the purposes of this analysis, the stone tool assemblage from San Pedro consisted of 434 chipped stone artifacts. The majority of the assemblage (~88%) consisted of more informal tools, including simple flakes, blade fragments, and retouched flakes. The assemblage also included a few formal tools, such as oval bifaces, general utility bifaces, biface hammerstones, lenticular bifaces, and miscellaneous thin bifaces. The assemblage was manufactured from various raw materials, including cherts, chalcedonies, and quartzite.

Table 1: Formal Tools by Lithic Raw Material Type at San Pedro

<table>
<thead>
<tr>
<th>Raw Material Type</th>
<th>Oval Bifaces</th>
<th>General Utility Bifaces</th>
<th>Biface Hammerstones</th>
<th>Lenticular Bifaces</th>
<th>Miscellaneous Thin Bifaces</th>
<th>Miscellaneous Thick Bifaces</th>
<th>Biface Edges</th>
<th>Blades</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBZ Chert</td>
<td>5 (9.8%)</td>
<td>9 (17.6%)</td>
<td>4 (7.8%)</td>
<td>1 (2%)</td>
<td>4 (7.8%)</td>
<td>14 (27.5%)</td>
<td>8 (15.7%)</td>
<td>4 (7.8%)</td>
</tr>
<tr>
<td>CMT Chert</td>
<td>3 (5.9%)</td>
<td>1 (2%)</td>
<td>1 (2%)</td>
<td>0</td>
<td>4 (7.8%)</td>
<td>1 (2%)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Black Chert</td>
<td>1 (2%)</td>
<td>1 (2%)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Brown Chalcedony</td>
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<td>0</td>
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<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Gray Chalcedony</td>
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<td>0</td>
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<td>0</td>
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<tr>
<td>Quartz</td>
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<td>0</td>
</tr>
</tbody>
</table>

The San Pedro chipped stone assemblage was manufactured from various raw materials, including cherts, chalcedonies, and quartzite. The assemblage was composed of variable quality cherts from a single source and a variety of different raw material types. The assemblage was composed of variable quality cherts from a single source and a variety of different raw material types. The assemblage was composed of variable quality cherts from a single source and a variety of different raw material types.