

M444
DUN
LD

**Summary Report of the 1997 Season
of the Maya Mountains Archaeological Project (MMAP)**

by

Peter S. Dunham
Department of Anthropology
Cleveland State University

with the assistance of

Keith M. Prufer
Southern Illinois University
(Carbondale)

Alan T. Whittemore
Gerrit Davidse
Douglas L. Holland
Missour Botanical Garden

Vish Mooleedhar
University of the West Indies
(Trinidad)

Thomas Miller
Division of Water Quality
(Idaho)

Paul Wenninger
Frostburg State University
(Maryland)

Deirdre Doherty
University of California
(Davis)

for

Department of Archaeology
Forest Department
Office of Geology and Petroleum
Government of Belize



Introduction

The Maya Mountains Archaeological Project (MMAAP) is an ongoing multidisciplinary investigation of ancient Maya resource exploitation and exchange in the southern Maya Mountains of Belize. It is the thesis of the MMAAP that much of the previous work on the subject has emphasized intensive exploitation, long-distance trade, and the role of these activities in the development and decline of the Maya. In an effort to help balance our perspectives on the Maya economy, the MMAAP is investigating the nature of close-range exchange, extensive production, and their place in the Maya developmental trajectory. The MMAAP is in the process of examining the hypothesis that many of the mineral and biotic resources employed by the Maya originated in at close range in the Maya Mountains and were exploited in a dispersed, extensive fashion.

Launched in 1992, the MMAAP completed its sixth season of field study in mid-June, 1997. The 1997 campaign was focused on the Snake Creek and upper Bladen Branch of the Monkey River. The main purpose of the 1997 season was to continue assessing the resource potential of the Maya Mountains and begin developing a chronological sequence for the region. Archaeological, biological, and geological operations were carried out.

Our principal activity was to expand excavations at the ruins of Muklebal Tzul and Ek Xux in the upper Bladen in order to obtain datable materials for constructing a regional chronology. In addition, we extended the cave reconnaissance, broadened the botanical survey, and further documented the aboriginal variety of cacao (chocolate) first encountered in 1996. We also collected more freshwater gastropod (jute) shells for oxygen isotope (paleoclimate) analysis, started mapping outlying settlement at both Muklebal and Ek Xux, and concluded efforts to locate two other sites thought to be in the area.

A number of significant finds were made. Among other things, we recovered ceramic materials from a tomb at Muklebal that appear to date to the end of the Classic (AD 700 – 900), confirming the late date based on surface remains. We also uncovered a modest but previously unknown ruin in the middle Snake Creek, Re Selipan. This discovery completes a regular pattern of centers in the upper Bladen that are optimally located for exploiting montane resources. Our twelfth “new” site, it is the eighth ruin that we have found unlooted. As such, it offers an unusually pristine window on mountain living. We also gathered evidence suggesting that the cacao trees reported in 1996 are concentrated in two clusters at the ruins of Muklebal and Ek Xux, likely representing the relic remains of two prehistoric chocolate groves at these sites.

Initial descriptions and interpretations of these finds are summarized here

throughout the cave, with the exception of a single articulated skeleton. This discovery raises two possibilities. First, it may represent evidence of human sacrifice based on the nonreverential scattering of the remains. Second, it may be an example of some type of special repository for community members, potentially related by lineage. It may be possible to assess the relationships between some of the individuals through DNA analysis. Many of the remains, including teeth, are completely coated in calcite. It is conceivable that material preserved in the root cavities of the teeth may be amenable to PCR analysis. One might expect to find, for instance, most of the males related, or some other distinctive pattern. Studies are ongoing. Interestingly, one of the ceramics recovered, a partial plate with a medial flange and waxy finish, may date to the Early Classic (AD 250 - 600), prior to any of the other finds from the vicinity. The other ceramics were nondiagnostic.

Jute Collection

Scholars have speculated on the possible role of climate change in the decline of the Maya since the beginning of this century. Lately, a number of students of the Maya have put forth the hypothesis that an extreme episode of drought contributed significantly to the Maya collapse. Until now, few empirical data have existed on prehistoric climate in the Maya area. Most relied on highly speculative extrapolations from paleoclimate in North America and Europe. Over the last several decades, however, limnologists have increasingly refined a technique for estimating ancient rainfall and by extension temperature patterns from oxygen isotopes in molluscs. Molluscs secrete their shells in equilibrium with the incidence of oxygen isotopes in their environments. Oxygen 16, the lighter isotope, evaporates more quickly than Oxygen 18, the heavier isotope. Molluscs encode this variation in their shells and with it a record of precipitation and temperature regimes in the past. Recently, a handful of specialists have begun reconstructing paleoclimate from oxygen isotopes in freshwater molluscs in the northern lowlands. Unfortunately, this region experienced the least decline and is the driest area within the Maya realm. These efforts are promising but do little to resolve the collapse of the Maya in the south.

In 1996, we collected jute (*Pachychilus indiorum*) snailshells from the eastern tombs at Muklebal and from living populations in the upper Bladen in order to conduct a pilot study of oxygen isotope variation among these freshwater gastropods. It is necessary to establish a baseline of known variation among contemporary specimens upon which to base interpretations of the archaeological samples. Before proceeding with a fully developed analysis of archaeological shells, it is necessary to demonstrate that they do, indeed, encode significant variation, variability that likely owes to climate change. Our trial assays suggest that these snails do, in fact, record meaningful variation. We have further innovated the use of a microprobe to sample growth whorls of the shells, thereby shedding light on the seasonal variation. Frequently, when an agricultural society is beset by drought it is not just that less rain falls but that precipitation does not occur when it is needed, during the growing season. We collected additional specimens of both modern and ancient shells, along with water samples and temperature data, in order to improve our understanding of the relationship between isotopic variation in the snails and climate

change. We hope to gather more longitudinal specimens in the future, to help establish a chronology of climate patterns.

Biological Operations and Finds

The biological operations of the 1997 MMAP season cast further illumination on biotic resource potential, as well as important conservation considerations. The research on cacao (*Theobroma cacao*) initiated in 1996 appears to have resulted this year in the recognition of two relic groves of aboriginal chocolate. The botanical survey identified a number of significant plants, including a rare first-time epiphytic yucca for Belize. The fish collection produced a number of specimens for the study of fish diets and food sources, a necessary concern for habitat maintenance. Conservation studies of Brocket deer (*Mazama americana*) and hunting impacts on prey animals were also conducted, and we gathered several new troglobytic or cave-dwelling species. The 1997 biological campaign was every bit as much of a success as the archaeological work already considered.

Cacao Investigations

The Maya Mountains were widely renowned at the time of the Conquest for the quantity and quality of their cacao production. Their acid volcanic soils favor cacao. In 1996, cacao scientist Vish Mooleedhar of the University of the West Indies (Trinidad), Cacao Research Unit, joined the MMAP to examine cacao populations in the upper Bladen. He recorded a tremendous range of diversity and very high density levels for the Bladen cacao. He returned in 1997 in order to further document, among other things, the distribution of the cacao. We surveyed cacao trees in two quadrats near Muklebal and Ek Xux and in the broader associated pockets. Cacao is distributed more evenly in the Ek Xux pocket, although it seems to be concentrated near the ruin. Around Muklebal, the vast majority of trees are clustered in one area northeast of the ruin. Either the inhabitants of these sites preferred soils similar to those favored by the cacao, producing a spatial association, or the trees represent relic orchard populations.

The very nature of the Bladen trees suggests that they may, indeed, constitute a remnant grove. The Bladen trees are clearly domesticated. Most of them do not drop their fruit effectively. The pods tend to rot on the tree before they fall and germinate. Few germinating beans were observed among heavily fruiting trees. On the path to domestication, people generally select fruitful plants that retain their fruit so that they can gather the fruit before it germinates. If the Bladen trees are not generally reproducing sexually through fruiting, then how is the population propagating itself? Cacao trees are also known to reproduce by shooting. If the Bladen trees are, in fact, shooting, then they and their descendants probably have not moved very far in the last 1,200 years. Tree populations disperse rapidly when they reproduce by fruiting. Animals collect the fruit and can carry them considerable distances in the process of consuming them. The Bladen trees do not appear to propagate in this fashion. Likely restricted mainly to shooting, the contemporary concentrations may reflect aboriginal clusters.

If such is the case, then the distribution of the Bladen trees may preserve something of their original ancient arrangement. Moreover, the trees would constitute living artifacts, a rare find in archaeology. The Bladen cacao trees may comprise the most substantial and best substantiated case of a biotic resource for the Maya Mountains. We hope to continue studying the Bladen cacao trees in the future. A major research front is presently developing for the MMAP in cacao research. Aside from finding a ceramic model of a cacao pod in a cave near Ek Xux in 1996, we also recovered a 1,600-year-old offering of ancient cacao beans, among the oldest remains of cacao ever documented, in a cave just west of Little Quartz Ridge. Thus, we may have both living and artifactual specimens of aboriginal Maya Mountains chocolate. It is unlikely that sufficient genetic material is preserved in the ancient beans, but if an adequate amount of intact DNA can be extracted from the prehistoric beans for comparison with that of the living plants, then we might be able to demonstrate the unity of the present and ancient remains.

General Botanical Survey

In 1996, with the assistance of personnel from the Missouri Botanical Garden (MBG) in St. Louis and Marie Shelby Botanical Garden in Sarasota, FL, the MMAP launched an effort to begin documenting the numerous plants available in the environs of Muklebal and Ek Xux, particularly those with any known resource value. The 1996 campaign produced a number of such specimens, as described in the 1996 report. This year, we endeavored to complete the sampling started in 1996. Several additional transects were surveyed for vascular plants along the alluvial flats in the Ek Xux canyon by Gerrit Davidse and Douglas Holland of the MBG. Alan Whittemore, likewise of the MBG, collected briophytes atop the main divide of the Maya Mountains above Mukleba. Dr. Whittemore has another National Geographic grant to support comparison of remnant flora in the Maya Mountains and the Caribbean. Plant populations in these two areas may have once been connected, and Dr. Whittemore's work is designed to help illuminate this link. Vascular and briophytic collections were also made in the middle Snake Creek, on the divide above middle Snake Creek, and in the large pocket at the western end of Snake Creek, filling in a major gap in a larger traverse along the mountain reaches of the Bladen.

The 1997 season produced few new plants of resource interest to the Maya. The major potential botanical resources appear to have been identified during the previous season. Nevertheless, the 1997 effort did yield a number of unusual specimens. Among the most notable of these is a variety of yucca that appears to be epiphytic, tree-dwelling. As far as we know, only two specimens of this species, *Yucca lacondonae*, have ever been collected before, both in Chiapas, Mexico, some years ago. We collected two more at the east end of the Muklebal valley, doubling the world collection. There appear to be others specimens of the yucca in the vicinity, as well. These are, obviously, the first recorded specimens of the species in Belize.

Ichthyological Work

Over the years, the MMAP has studied and collected a number of fish specimens from the waterways of the Maya Mountains. Most of this work was conducted in order to identify

the types of fish present in these waters. A necessary first step in conserving any species, suite of species, or habitat is to document precisely which species can be found in a given waterway. Recently, we have started examining fish diets in an effort to elucidate their food sources, information that can be very useful in efforts to protect populations or habitats. This year, we managed to recollect green swordtails (*Xiphophorus helleri*) in the upper Snake Creek and Esperanza/Central drainages. The reason for sampling the same populations again provides an interesting illustration of the tendency of complementary lines of multidisciplinary research to converge.

Earlier collections of specimens in both locations contained individuals with an unusual spotting on their skin. We had previously puzzled over the distribution of this trait, since neither drainage is connected at the surface above the sea. Prior investigations by MMAP hydrologist/speleologist Thomas Miller, however, raised an interesting possible explanation. His research last year on the chemistry and physical properties of water indicated that much of the upper Bladen feeds underground into drainages to the south. This hypothesis could be tested using biological data by sampling the two populations and calculating the genetic distance between them. If the DNA of the two groups is virtually identical, it would suggest that there is now or has recently been a subterranean connection between the upper Snake Creek and Esperanza/Central, the next major pocket to the south. Unfortunately, DNA in earlier collections was compromised by the use of formalin in their preservation. Our 1996 efforts to collect further individuals for conservation in alcohol, which does not corrupt DNA, were thwarted by flooding in the Esperanza/Central pocket. Our success in collecting additional specimens in each drainage this season should enable us not only to resolve the mystery of the spotted swordtails but also to determine whether or not the two drainages are now or have ever been linked underground.

This convergence of biological and geological research has important implications not just for science but for the management of the Bladen, and it provides a powerful illustration of the intellectual benefits of integrating complementary research. If the Snake Creek does, indeed, drain underground to the south, then it lies within the headwaters of the Rio Grande, not the Bladen, with which it is included in the Bladen Nature Reserve. There are potential administrative considerations here that involve one of the crown jewels of Belizean protected areas. Moreover, such an important broader realization would never have been possible if scientists from two disciplines that are often considered disparate had not communicated in the context of conducting collaborative research. The principal methodological tenet of the MMAP is that many of the most important phenomena in the world--precisely the ones that touch a number of disciplinary fronts--go inadequately addressed as long as we continue to evaluate them solely within the confines of our own disciplinary expertise. Significant phenomena do not respect our artificially imposed disciplinary boundaries. They are really only amenable to wider interdisciplinary collaboration. The attractiveness of such research is further underlined by the favorable economies of scale that it enjoys through the sharing of infrastructure.

Troglobytic Species

The MMAP may also have added four new cavuncular, cave-dwelling, species to science this year. Thomas Miller and company collected a white centipede from the AC Cave in the upper Bladen. They also gathered a pale blind catfish, crab, and shrimp from the Tusbil Pek Cave in the middle Snake Creek. Miller feels that the likelihood that these species have never been reported or collected before is quite high. Some troglobytic species are known or have been collected from caves on the northern slope of the Maya Mountains, but few if any collections have ever been made on the southern flank of the range. Cavuncular species on the south side of the divide are separated from those on the south by the volcanic spine itself. There are no doubt no caves connecting the two flanks of the Maya Mountains through this impenetrable volcanic barrier. We hope find qualified specialists to examine the specimens in order to finalize their identifications.

Conservation Activities

A number of the MMAP studies have useful implications for conservation, but two of the 1997 investigations were devised specifically for the purpose of advancing the cause of wildlife management. Graduate student Paul Wenninger of Frostburg State University in Maryland conducted a number of investigations in order to shed light on the diets of Brocket deer particularly in an effort to produce valuable information for the successful conservation of this popular prey mammal and its habitat. Unfortunately, despite the use of battery of techniques, few useful observations were possible. At the same time, another graduate student, Deirdre Doherty of the University of California (Davis) examined hunting impacts on prey animals, especially the much sought after agouti. She surveyed a nearly 4-km long transect along the length of the Ek Xux pocket, a lightly hunted area. Preliminary comparison with a cognate traverse at the lower end of the montane stretch of the Bladen, a heavily hunted area, suggests that the effects of human predation are substantial. Her quantitative measurements of these impacts may be useful in the management and planning of the Bladen Nature Reserve and similar protected areas

Geological Operations and Finds

The geological program was as productive as the archaeological and biological campaigns. The mineral survey is nearing completion and was limited in 1997 mainly to the collection of clay and sand samples principally for compositional analysis of pottery. These samples were extracted from both surface and subterranean deposits. Major advances were also made in the documentation of the region's caves, particularly in terms of their potential significance for reconstructing tectonic movements.

Cave Studies

One of my main goals this year was to finish exploring and documenting the AC and Tusbil Pek cave systems. The surveying of both caves was, in fact, completed in 1997. Under the direction of hydrologist/speleologist Thomas Miller with the assistance of veteran caver Peter Shifflett, the final km of each was surveyed. Tusbil Pek is primarily of significance for the extensive archaeological constructions that it contains, such as the

platform altar, dividing wall, stairway, symmetrical terraces, and jambed doorway described in 1996. AC was of interest for its highly developed levels, which are likely artifacts of tectonic activity.

The Tusbil Pek system did not continue much further beyond the point at which operations were suspended in 1996 (Figs. 3 and 4). Both the wet passage in the rear, which threatened flooding in 1996, and the shaft near the entrance ended in sumps. The cave appears to handle a fair amount of water. The presence of several troglobitic species, as introduced in the biology section above, indicates that Tusbil Pek may be one entrance to a large submerged system. The exploration of the underwater portions of the cave, however, could only be completed with proper diving gear and cave diving preparations. Communications have been engaged with several qualified personnel, although no firm arrangement has been concluded. Additional cultural features are unlikely, unless the Maya availed themselves of the shaft sump for a ceramic dump, as is occasionally the case in such formations.

The AC Cave survey was likewise completed. The primary passages total about 4 km in length (see Figs. 5 and 6). A second chamber with helictites, unusual and delicate cave formations, was identified. The primary wet passage, the source of water during the dry season, was followed to its conclusion. It continues underneath the headwall to the northwest toward the divide, whose water-resistant volcanic slopes undoubtedly provide the runoff catchment for the system. Further evaluation of the AC system confirms that it is indeed divided into several major levels, each very likely representing a new basal level of groundwater incision following quantum tectonic shifts. Such cave formations can be dated, offering by extension a means for dating tectonic movements along the North America-Caribbean plate boundary. This unusual coincidence of highly active developing caves with a very active tectonic boundary probably represents one of the premier global opportunities for reconstructing an accurate chronology of regional tectonic motion. We are considering further studies of this phenomenon for the future.

Mineral Sampling

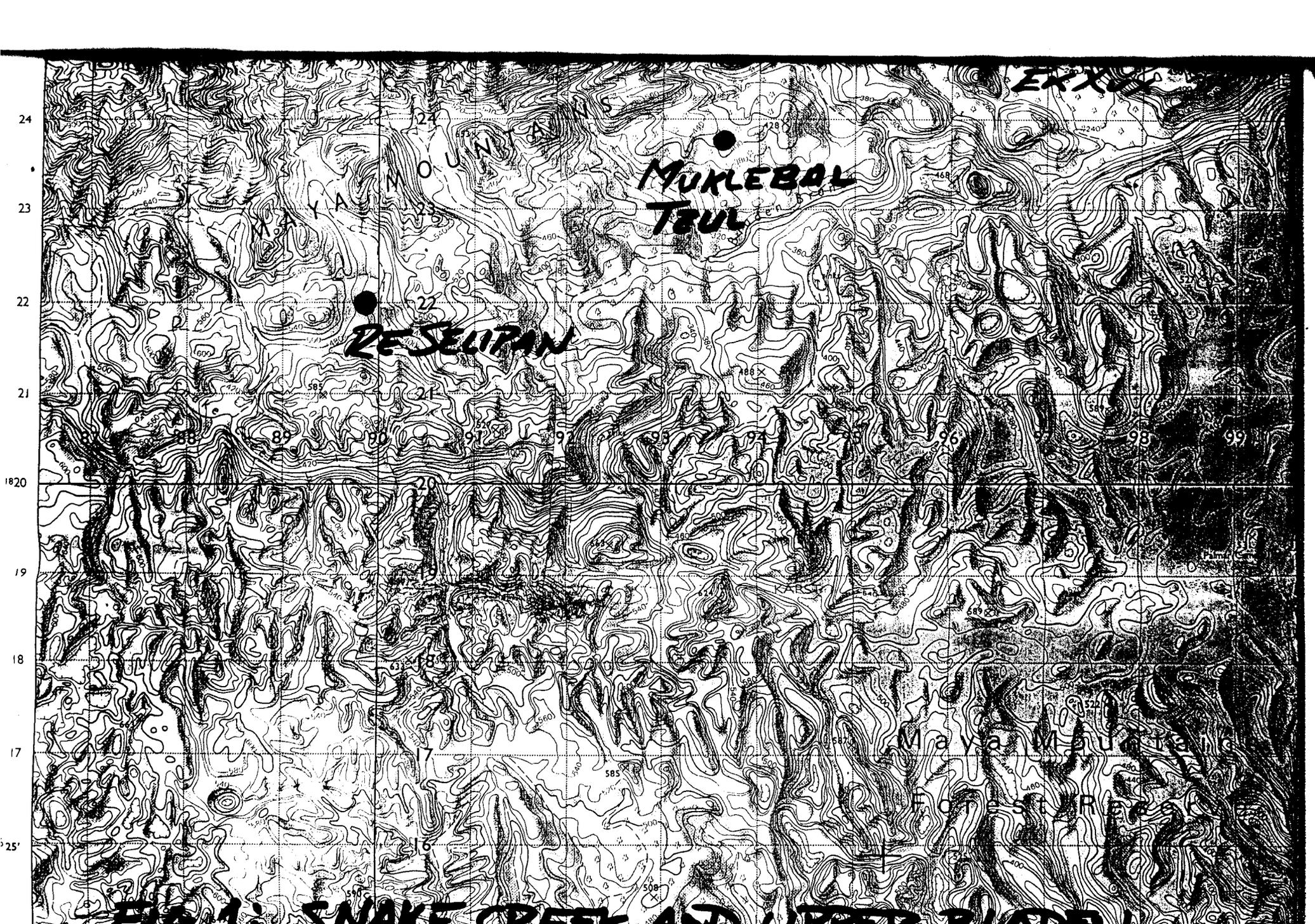
Extensive sampling of mineral resources was greatly reduced this year, as the collection of many of the target minerals is nearing completion. In 1997, collecting was restricted to clay and sand samples, mostly from surface deposits. Our primary reason for sampling these materials was to help sort out the resources and sources of materials consumed in the manufacture of ceramic items. The surface materials will provide a standard against which to contrast cave samples and artifacts likely made from them.

Our most recent analytical results suggest some interesting possibilities with regard to the procurement of pastes and tempers for pottery. Preliminary assays of MMAP ceramic samples by Inductively Coupled Plasma analysis and other analytical techniques conducted by geologist William Meurer of Duke University indicate that a principal ingredient in Maya Mountains temper is travertine, possibly from cave formations. We also suspect that the Maya made use of highly levigated, fine-grained clays from cave deposits for ceramic pastes. It is further possible that pottery made from cave materials

may have been imbued with supernatural powers by the Maya, who associated caves with the Other World. It is also conceivable that in depositing ceramic offerings within caves the Maya were not only honoring their ancestors and deities but also returning to the cave in a form of ritual reciprocity materials that originated in the caves. Further sampling of cave materials and analysis of cave and surface ceramics may shed additional light on these prospects.

Conclusions

The 1997 season of the Maya Mountains Archaeological Project (MMAAP) was highly successful. It produced important results on many fronts, especially the primary areas targeted for study this year. In particular, it has yielded a growing body of excavated and other ceramics recovered from primary contexts that point toward a Late Classic florescence, as elsewhere, between AD 600 and 800, with occupation likely persisting into the Terminal Classic, AD 800 to 900. The main resource discoveries of 1997 are clearly the possible remnant cacao groves uncovered in the upper Bladen, a previously unknown center well positioned to exploit and exchange montane resources in the middle Snake Creek, and the possibility that is emerging from highly technical constituent analyses that many of the Maya Mountains ceramics were fabricated of materials that originated in caves. The possibility that the Maya may have been exploiting cave resources may imply a host of other interpretations associated with their spiritual and supernatural concepts revolving around caves.



ERXX

MUKLEBAL
TEUL

ZESELIPAN

Ma ya Ma ya
Ho - S - V R

ERX 1: SNAKE CREEK AND UPPER RIVER

24

23

22

21

20

19

18

17

25

24

23

22

21

20

19

18

17

25

UN

YA

UN

UN