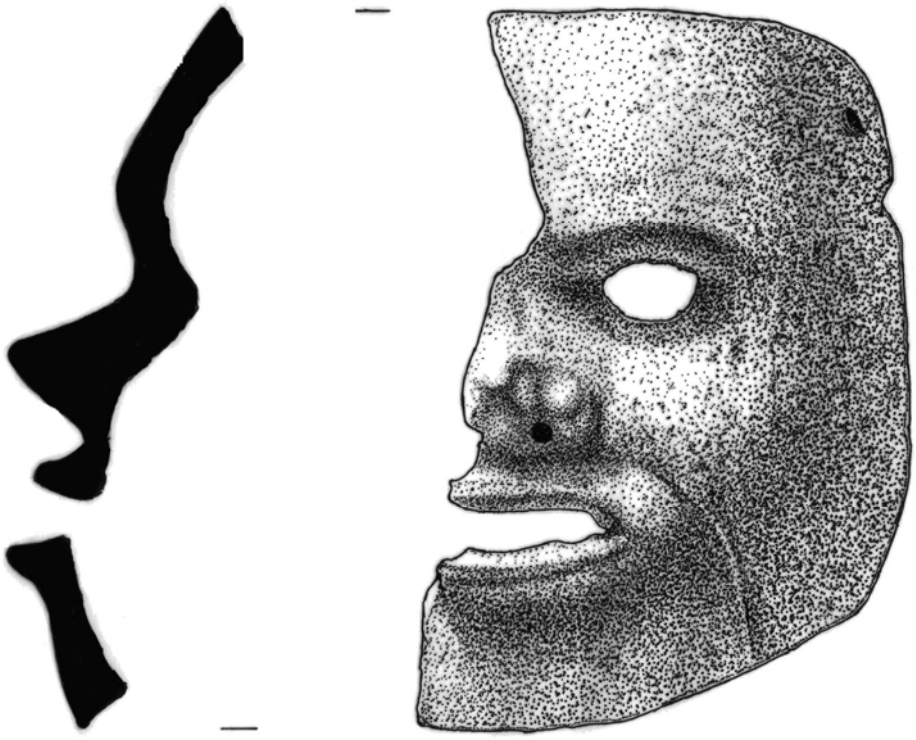
The Belize Valley Archaeological Reconnaissance Project:

A Report of the 2001 Field Season



Volume 1

EDITED BY JAIME J. AWE AND CAMERON S. GRIFFITH

Belize Department of Archaeology
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ACKNOWLEDGMENTS

The 2001 season of the Belize Valley Archaeological Reconnaissance project (BVAR) and the Western Belize Regional Cave Project (WBRCP) were conducted under the auspices of the Belize Department of Archaeology. Permission to conduct the archaeological investigations was provided by Acting Commissioner of Archaeology George Thompson and by the Minister of Tourism of the Government of Belize. We are grateful to all these individuals and institutions for their assistance, encouragement and support.

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Jaime J. Awe — San Ignacio, Belize, 2002

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ARCHAEOLOGICAL MAP OF BELIZE (ARCHMAPBZ): A GEOGRAPHIC INFORMATION SYSTEM FOR THE RECORDING AND ANALYSIS OF ARCHAEOLOGICAL INFORMATION

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INTRODUCTION

The Archaeological Map of Belize is a project to determine precise positions of pairs of intervisable three dimensional control points for mapping on archaeological sites. The purpose is to provide well-defined points in a common coordinate system that will permit analysis on a regional scale. The control points are located using geodetic survey techniques with dual frequency GPS receivers. GPS occupation of features such as road intersections provides the basis for geo-referencing a Landsat image of Belize that serves as the base map of the geographical information system.

GRID DATA

The maps most commonly used by archaeologists in Belize are the 1:50,000 Universal Transverse Mercator Grid series produced under the direction of the Director General of Military Survey, Ministry of Defence, United Kingdom. As a horizontal datum these maps use the North American 1927 datum (NAD27) and the vertical datum is Mean Sea Level (MSL). These conventions provide a strong argument for reporting data in these same systems. However, there are even stronger reasons for favoring the current WGS84 datum and Height Above Ellipsoid (HAE) as the vertical reference. WGS84 is the native system for GPS receivers and the receivers compute the UTM coordinates and the HAE directly from the WGS84 Cartesian Geocentric Coordinates. GPS receivers and post-processing software translate from WGS84 to NAD27 as well as to other coordinate systems and refer to a database to convert from HAE to MSL or to a Geoid model to convert to Orthometric height. Not all equipment and software support well these legacy systems. The greatest consistency given a variety of equipment and software is obtained by adhering to the WGS84 datum. The grounds of consistency and equipment capacity are compelling for reporting the data in WGS84 datum with HAE as the vertical datum.

INSTRUMENTATION AND METHODOLOGY

The instrumentation and methodology for gathering field data in this project is based upon and consistent with the guidelines of a number of publications listed in the bibliography. The controlling documents have been the Federal Geodetic Control Subcommittee, Federal Geographic Data Committee (USA), *Geospatial Positioning Accuracy Standards, Part 2: Standards for Geodetic Networks,* FGDC-STD-007.2-1998,

The Intergovernmental Committee on Surveying and Mapping (ICSM), (Australia), *Best Practice Guidelines, Use of the Global Positioning System (GPS) for Surveying Applications,* Version 2.0 - 1 November1997 and The National Geodetic Survey, (USA), *Guidelines for Geodetic Network Surveys Using GPS*. Draft 4, May 15, 2000. These documents are current, detailed in their description of appropriate field methods, and appropriate to the equipment used in this survey project.

Instrumentation

Three GPS receivers are used to collect the data for the control point survey. Two of the receivers are Trimble 4000SSE Geodetic Surveyors These are dual frequency L1/L2 receivers. As configured in this survey with geodetic antennas Trimble specifies a horizontal accuracy of 5 mm + 1ppm times the baseline length and a vertical accuracy of 10 mm + 1ppm times the baseline length. A 4000SE GIS Surveyor was used as a secondary reference receiver in order to produce additional independent baselines and to strengthen the geometry of the solution. For this receiver Trimble specifies an accuracy of +/- 10 mm + 2ppm times the baseline length.[1]

Primary reference station

A 24-channel 4000SSE[2] is used as the primary reference station. It is a dual-frequency receiver equipped with 5 megabytes of memory permitting it to record data at 5-second epochs for approximately 38 hours. The primary reference receiver was operated throughout the duration of the season at the temporary residence of the investigator in Santa Elena, Cayo, Belize. The geodetic antenna was mounted on a 4-meter pole and securely guyed. There was a clear view of the sky from the reference receiver antenna.

Over the course of several years of GPS data gathering in Belize it has typically been most convenient to locate the primary reference station at the residence of the investigator. This has two distinct advantages. The reference station antenna could remain in exactly the same position throughout the season. The alternative has been to reposition the reference station antenna over the same mark for each daily session. The second advantage is the use of household current to power the reference station, backed up by a battery. The disadvantage in this system is that the reference antenna is not positioned on a permanent monument. Each season the coordinates of the reference position are determined by occupation of a nearby permanent monument the coordinates of which had

[1] The GPS receivers were provided by Trimble Navigation Limited, Sunnyvale, CA.
[2] Primary reference GPS receiver

GPS Receiver	Trimble	**GPS Antenna**	Trimble
Model	4000SSE Geodetic Surveyor	**Model**	Geodetic with ground plane
Part No.	18292-01	**Part No.**	14177-00
Serial No.	3244A01763	**Serial No.**	
Firmware	7.29		

been determined in a prior season. The seasonal temporary reference station locations are designated Temporary Reference Stations (TRS) with a suffix representing the location. The 2001 reference station is designated TRS_AS, the AS being the initials of the owner of the residence where the reference station was located.

Secondary reference station

For each control point survey session a secondary reference receiver is placed on an arbitrary point near to the control points, typically within a hundred meters, to record data for the duration of the session. For each point recorded with the roving receiver the secondary reference receiver provides a second independent baseline. The secondary reference receiver is a 12-channel 4000SE[3] single frequency receiver and therefore requires a lengthier occupation than do the dual frequency receivers to acquire sufficient data for the required double difference fixed solution. The survey protocol described below provides a sufficient occupation time for the secondary reference station to achieve the fixed solution.

Rover GPS station

An 18-channel 4000SSE[4] dual frequency receiver is used as the rover. This receiver is equipped with a geodetic antenna with a ground plane.

DATA PROCESSING AND ANALYSIS

All of the GPS data were post-processed using by the program GeoGenius™ by Spectra Precision Terrasat GmbH, Höhenkirchen, Germany. This program is designed to integrate terrestrial and satellite data and produces a number of reports permitting evaluation of the quality of the data and providing for the transfer of the data to the GIS system.[5]

[3] Secondary reference GPS receiver

GPS Receiver	Trimble	**GPS Antenna**	Trimble
Model	4000SE GIS Surveyor	**Model**	Compact L1
Part No.	18292-01	**Part No.**	
Serial No.	3301A02301	**Serial No.**	
Firmware	7.23		

[4] Rover GPS receiver

GPS Receiver	Trimble	**GPS Antenna**	Trimble
Model	4000SSE Geodetic Surveyor	**Model**	Geodetic with ground plane
Part No.	18292-01	**Part No.**	14177-00
Serial No.	3610A14748	**Serial No.**	3017A00164
Firmware	7.29		

[5] The GeoGenius™ program was provided by Spectra Precision.

The final destination of the data is the GIS platform ArcView™ 3.2 by Environmental Systems Research Institute. A number of ESRI extensions to ArcView™ are also used, most importantly Image Analysis, Spatial Analyst and 3D Analysis.[6]

FIELD METHODS

Survey points and monuments

The objective of the project is to establish on each selected site a pair of recoverable intervisable three dimensional control points. These points must be secure, have a clear view of the sky for GPS measurements, and be separated by a distance sufficient to provide a reliable backsight for a person using an optical total station.[7] Where possible previously established survey monuments are used by this survey. Where the necessary criteria cannot be met by existing monuments this project places monuments in a manner designed to be least likely to damage the archeological record. On sites where monuments have been previously consolidated and where that consolidation is unlikely to be disturbed, the preferred monument is a concrete nail driven into a large and stable concrete slab that is part of the monumental consolidation. Where such locations are not available or do not meet the criteria new monuments are placed in locations deemed unlikely to be the subject of future archaeological investigation. Project monuments are concrete posts 5" x 5" x 18" (13 cm x 13 cm x 46 cm) with a ½" iron rebar rod centered in the monument, cut off flush with the top of the monument and dimpled to mark the point. The monument is placed so that it projects only a short distance above the ground level. This design and placement is to prevent the monument from being an impediment or a hazard to people or to livestock. This configuration makes the monuments less visible at a distance and thus more difficult to relocate. Monuments are marked with an aluminum tag fixed to the top of the monument or adjacent to the nail and stamped with a four-digit Station Identification Number.

Tripod and rover rod

Where possible fixed length rods stabilized by a bipod are used for the rover and the secondary reference receivers. The rod is plumbed carefully before beginning recording and checked at the end of the session. When the fixed length rod is used the antenna height is measured to the instrument height or Antenna Reference Point. In the case of the antennas used in this survey this point is at the base of the antenna. Where the fixed length rod could not be fixed in a stable manner over the monument, a slip-leg tripod is used, the antenna is leveled and plumbed over the mark, and the slope height of the antenna is measured at three points around the circumference of the ground plane before and after recording data.

[6] The ESRI software is under licensure to Sonoma State University, Rohnert Park, CA.

[7] Archaeologists seldom use total stations with a horizontal angular precision greater than 20 seconds. 20 seconds at 100 meters is approximately 1 cm. For this reason a separation of approximately 100 meters between the monuments has been deemed to be optimal.

ARCHMAPBZ LAYERS

Landsat imagery

A landsat image of Belize forms the base layer of the ArchMapBZ GIS system. The image is a Landsat 5 image with an acquisition date of 27 December 1989. The sun is at an azimuth of 140.21° and an elevation of 38.76°. The pixel spacing in the image is 28.5 meters. The geo-referencing for the image was corrected using data gathered mapping with GPS roads that are visible in the image.[8]

GPS Control Points - Data recording

Every effort has been made to design and implement a data recording protocol that meets the United States National Geodetic Survey User Densification Network standards and produces local accuracies of 1 cm horizontal and 2 cm vertical. The single exception to the NGS standards is the failure, for a number of reasons, to record meteorological data. These data are not currently used by GPS post-processing programs and it is unlikely that future programs will process them. There is little variability in the meteorological data during the course of the survey; it is hot, humid, clear to cloudy with fair to good visibility. It is not deemed a reasonable expenditure of human or other resources to record these data in the absence of clear reasons to do so.

A data recording session consists of both office and field components. The office component is composed of scheduling the field component using the planning software, operating the primary reference station, and the transfer to and post-processing of the data on the computer.

With data being collected at the primary reference station a GPS control point field session consists of two observation periods of a minimum of thirty minutes each at two monumented control points and a contemporaneous observation at a temporary peripheral point used as a secondary reference station to improve the geometry of the session and to provide redundancy for the least squares network adjustment. Data is also being collected, of course, at the primary reference station during this period. The control point locations are selected according to the criteria listed above and a location is selected for the secondary reference station where GPS data reception is likely to be optimal.

Having determined the locations of the control points and the secondary reference point, and having placing monuments as necessary, the observations are conducted according to the following schedule:

1. The single frequency 4000SE receiver is placed at the secondary reference position and recording to a static file is begun.

[8] The Landsat image was provided by Keith Clarke, Professor of Geography, University of California, Santa Barbara. The image is a part of the data base of the Geographic Information Center.

2. The dual frequency 4000SSE receiver is placed at one of the control points and recording to a fast static file is begun. This observation continues for a minimum of thirty minutes.
3. The 4000SSE receiver is moved to the other control point and observation at this point continues for a minimum of thirty minutes.
4. Steps two and three are repeated, again with minimum thirty-minute observations. Following the second of these repeated observations the fast static file on the 4000SSE is closed.
5. The static file on the 4000SE is closed.

ARCHMAPBZ CONTROL POINT NETWORK ACCURACY AND PRECISION

When used in the context of GPS mapping the term *accuracy* refers to the confidence with which the absolute location of the receiver is known and the term *precision* refers to the confidence with which the base line between the base station and the rover is known. Over the course of several years of research the present investigator has been unable to determine permanent reference monuments in Belize for which there is a high degree of confidence in the absolute location in the World Geodetic System 1984. There is a system of benchmarks established by the Interamerican Geodetic Survey in 1964 that provides a vertical control system.

Network accuracy

The network accuracy of the Archaeological Map of Belize was determined by a least squares adjustment of baselines between critical control points and the five closest Continuously Operating Reference Stations (CORS). These are located at Guatemala City, Tegucigalpa, San Lorenzo, San Salvador and Estili. The locations of the CORS stations are determined to the highest order of accuracy possible within the GPS system. The National Geodetic Survey (NGS) of the United States publishes the locations in both the NAD83 datum and the ITRF97 datum. The NAD83 datum locations do not change since the datum assumes that the North American plate does not move. The ITRF97 datum is an international datum and as such assumes and measures the changes in location based upon plate tectonics. The ITRF97 locations of the CORS stations include a date for the location and an annual velocity. For this study the ITRF97 locations of the five CORS stations were used with the location corrected to August 2001, the midpoint of the fieldwork. These CORS locations and the corrections are displayed in Appendix 1.

The network was first adjusted using only ArchMapBZ stations that had been occupied for significant lengths of time and were well positioned to provide a strong geometry and redundancy to the adjustment solution. The corrected locations of the five CORS stations were used as fixed horizontal and vertical control points. One of the stations occupied as a part of the ArchMapBZ survey is the Interamerican Geodetic Survey 1964 benchmark E10. Records in the office of Lands and Survey indicate an elevation of 231.7688 meters for this benchmark.[9] The initial network adjustment of the

[9] These records were graciously made available to the investigators by Mr. Rolando A. Rosado, Principal Surveyor, Department of Lands and Survey, Government of Belize.

GPS survey, using only the five CORS stations as control points, determined an orthometric elevation of this station of 231.897 meters. Particularly given the length of time between the surveys and the significant change in technology, the relatively small twelve-centimeter difference between these surveys can be considered insignificant. The data were then adjusted again using the CORS stations as horizontal and vertical control points and the Interamerican Geodetic Survey benchmark E10, with the IGS 64 elevation assigned as the orthometric elevation, as a vertical control point. The assignment of a local vertical control point along with the large number of long occupations at station TRS AS, the number of moderately long occupations at other stations in the network, the redundancy due to simultaneous occupations and the use of precise ephemeredes produced a high degree of accuracy for the network, particularly within the Belize Valley itself.

The five CORS control points, the Interamerican Geodetic Survey horizontal control point and the thirty-five other points in the network are connected by 244 baselines providing a high degree of redundancy. At the two sigma (95%) level of confidence the standard error of unit weight in the network is 0.386. The accuracy of the critical control points within the Belize Valley at Baking Pot and nearby at El Pilar falls within the Federal Geographic Data Committee 5-centimeter classification. (FGDC 1998a Table 2-1, Accuracy Standards, pp. 2f.) The critical points at Caracol and Lamanai have significantly longer baselines from the station at TRS AS and consequently have a lesser accuracy. Since this least squares adjustment is constrained by fixing the locations of the CORS reference points, it is said to be a biased adjustment. The degree of error in this adjustment is displayed in the table below. The post-processing program. *GeoGenius*, reports the adjustment error as error ellipses. The FGDC classification is based on a 95% Confidence Error Circle. This figure is computed as the mean between the two values of the error ellipse. (FGDC 1998b, pp. 3-6) It is this figure that is the basis for the assignment of the accuracy of a station to an FGDC horizontal classification. The vertical classification is based upon the height error reported. Future propagation of the control point network will begin with ties to the three points that fall within the 5-Centimeter classification, the first three points in the table below.

Network accuracy, adjustment biased by CORS

Station	Site	2 sigma error, mm.			mm.	H Class	V Class
		North	East	Height	95% circle		
1001	Cahal Pech	37.5	19.5	21.8	28.5	5-Centimeter	5-Centimeter
1002	Cahal Pech	37.4	19.4	21.7	28.4	5-Centimeter	5-Centimeter
1003	Baking Pot	32.7	23.2	24.2	28.0	5-Centimeter	5-Centimeter
1004	Baking Pot	42.9	28.0	29.8	35.5	5-Centimeter	5-Centimeter
1005	Xunantunich	52.5	38.4	39.9	45.5	5-Centimeter	5-Centimeter
1006	Xunantunich	52.3	38.2	39.8	45.3	5-Centimeter	5-Centimeter

1007	Caracol	94.9	83.7	84.8	89.3	1-Decimeter	1-Decimeter
1008	Caracol	94.9	83.7	84.8	89.3	1-Decimeter	1-Decimeter
1011	El Pilar	44.4	26.4	28.6	35.4	5-Centimeter	5-Centimeter
1012	El Pilar	44.6	26.6	28.8	35.6	5-Centimeter	5-Centimeter
1013	Lamanai	168.5	158.7	159.7	163.6	2-Decimeter	2-Decimeter
1014	Lamanai	168.5	158.7	159.8	163.6	2-Decimeter	2-Decimeter
1015	Lamanai	168.7	158.8	159.9	163.8	2-Decimeter	2-Decimeter
4001	Xunantunich	37.4	19.3	21.7	28.4	5-Centimeter	5-Centimeter
4005	Caracol	94.8	83.6	84.7	89.2	1-Decimeter	1-Decimeter
4006	Caracol	94.7	83.6	84.7	89.2	1-Decimeter	1-Decimeter
9001	Xunantunich	43.3	25.3	27.5	34.3	5-Centimeter	5-Centimeter
EPB1	El Pilar	87.3	69.9	71.7	78.6	1-Decimeter	1-Decimeter
PH06	Pook's Hill	123.6	106.2	108.0	114.9	2-Decimeter	2-Decimeter
PH08	Pook's Hill	123.7	106.3	108.0	115.0	2-Decimeter	2-Decimeter
PH21	Pook's Hill	123.7	106.2	108.0	115.0	2-Decimeter	2-Decimeter
TRS_ BP191	Baking Pot	36.7	24.8	26.2	30.8	5-Centimeter	5-Centimeter
TRS_ CR197	Caracol	90.3	82.2	83.0	86.3	1-Decimeter	1-Decimeter
TRS_ EP205	El Pilar	31.3	18.3	19.9	24.8	5-Centimeter	2-Centimeter
TRS_ LM204	Lamanai	166.5	158.1	159.0	162.3	2-Decimeter	2-Decimeter
TRS_ XU192	Xunantunich	64.4	43.0	45.4	53.7	1-Decimeter	5-Centimeter
TRS_ XU193	Xunantunich	48.9	36.8	38.1	42.9	5-Centimeter	5-Centimeter

These data are within the Network Accuracy Standards minimally acceptable levels of differential relative positional accuracy required of a United States Government cadastral survey. All of the data except that from Lamanai and Pook's Hill falls within the highest standard. Data with a 95% Confidence Circle less than 10 centimeters qualify for the *Cadastral Project Control* designation. The data from Lamanai and Pook's Hill, with a 95% Confidence Circle less than 20 centimeters qualify for the application *Cadastral Measurement* designation. (USDA, *et al.* 2000: 6).

Local accuracy, adjustment biased by previously fixed control points

The ArchMapBZ stations in the table above were selected for their utility in determining the absolute location of the control points in the WGS84 system. The following table displays all of the control points in the network with errors by axis, the 95% Confidence Error Circle and the resulting FGDC classification. The least squares adjustment process that produced the data from which this table was constructed was constrained by fixing TRS AS as a horizontal and vertical control point. In the cases of Lamanai and Caracol, since the base line with TRS AS is so long. The secondary reference station on those sites was also fixed as a control point with the values determined in the network adjustment above.

Station	Site	2 sigma error, mm.			mm.	FGDC	
		North	East	Height	95% circle	H Class	V Class
1004	Baking Pot	1.4	1.4	3.8	1.4	2-Millimeter	5-Millimeter
1003	Baking Pot	1.6	1.5	4.2	1.55	2-Millimeter	5-Millimeter
1002	Cahal Pech	8.4	7.7	24.7	8.05	1-Centimeter	5-Centimeter
1001	Cahal Pech	11.2	11.2	27.7	11.2	2-Centimeter	5-Centimeter
EPB1	El Pilar	21.6	21.6	58.6	21.6	5-Centimeter	1-Decimeter
1006	Xunantunich	28.1	15.7	17.3	21.9	5-Centimeter	2-Centimeter
1011	El Pilar	25.8	24.4	90	25.1	5-Centimeter	1-Decimeter
IGS E10	El Pilar	22.3	32.2	135	27.25	5-Centimeter	2-Decimeter
4001	Xunantunich	42	23.9	26.2	32.95	5-Centimeter	5-Centimeter
9116	Xunantunich	42.4	24.3	26.5	33.35	5-Centimeter	5-Centimeter
1005	Xunantunich	45.9	26.9	29.2	36.4	5-Centimeter	5-Centimeter
1007	Caracol	47.1	47.2	158.1	47.15	5-Centimeter	2-Decimeter
1012	El Pilar	31.2	65.9	170.3	48.55	5-Centimeter	2-Decimeter
1008	Caracol	65.5	61.4	193.1	63.45	1-Decimeter	2-Decimeter
4005	Caracol	67.9	74.1	362.4	71	1-Decimeter	5-Decimeter
4006	Caracol	99.4	83.4	303.3	91.4	1-Decimeter	5-Decimeter
1015	Lamanai	111.6	142.4	428.4	127	2-Decimeter	5-Decimeter
1013	Lamanai	138.1	147.4	375.5	142.75	2-Decimeter	5-Decimeter
1014	Lamanai	334.1	438.7	1008.7	386.4	5-Decimeter	2-Meter

With the exception of the data from Lamanai, these data are within the Local Accuracy Standards minimally acceptable levels of differential relative positional accuracy required of a United States Government cadastral survey. The data from

Caracol, with a 95% Confidence Circle less than 10 centimeters qualify for the *Cadastral Measurement* designation. All of the other data with a 95% Confidence Circle less than 5 centimeters qualify for the *Cadastral Project Control* designation. (USDA, *et al.* 2000, p.6)

GPS REFERENCE POINTS

GPS reference points have less demanding data collection procedures than those for GPS control points. The process is similar to that with control points without the redundancy. The reference point is occupied for a single occupation of at least twenty minutes. A secondary reference station is used so that there is sufficient redundancy to apply least-squares adjustment. These techniques have been used to record locations of permanent monuments that will not be used in the future as a reference position in the propagation of the control point network. Two monuments in the *plazuela* group at Pook's Hill as well as a number of monuments at the El Pilar Archaeological Reserve were recorded by these methods. The monuments at El Pilar include the reserve boundary monuments on the Belizean side of the reserve as well as two monuments that are a part of the original British demarcation of the border with Guatemala.

TOPOGRAPHY

Accurate and rapidly gathered data for topography is possible through the OTF (on-the-fly) initialization capabilities of the dual frequency rover receiver. The precision of the points in the kinematic file is a function of the total length of time that the receiver is recording with uninterrupted signal from a minimum of five satellites. At the site of Baking Pot topographic data was gathered on mounds on foot with the GPS antenna mounted on a rover pole and over a large part of the residential part of the site by using a magnetic antenna mount on the roof of a four-wheel-drive vehicle. Points were gathered at the rate of one every five seconds. The post-processed 95% precision is approximately 0.5 cm. horizontal and 2.5 cm. Vertical. The worst vertical precision in over 2,700 points collected is 7.5 cm. Contour maps with a 0.5 meter or less contour interval can be constructed with confidence in this way.

GEO-REFERENCED IMAGERY

A series of low platforms formed by stone walls with cobbled fill was a principal feature of a group excavated in the summer 2001 season of BVAR under the supervision of Carolyn Audet of Vanderbilt University. String and tape were strung between nails driven into the tops of these walls in the same manner as when preparing to do a plan of a wall top using a baseline and offset mapping technique. The nail points were located using the GPS reference point protocol. Photos were taken of the wall top approximately every half-meter with a hand held digital camera. Excel™ was used to create an ArcView™ feature marking the half-meter intervals along the string and tape line between the nail points on the wall line. The interval markings are clearly visible in the photographs. The Image Analysis™ extension of ArcView™ was used first to geo-reference and then to mosaic the wall images. In this manner features at the unit level can

be incorporated into the same mapping system that is used at the regional and the national scale.

SOIL MAPS

Additional material continues to be added to the GIS as it becomes available. Included in C. J. Birchall and R. N. Jenkin, *The Soils of the Belize Valley, Belize,* are a series of soil maps based upon the 1:50,000 map series. Personnel of the GIS Office of Sonoma County scanned the maps at 300 dpi with their large capacity scanner. These images were geo-referenced using Image Analysis™ and incorporated as a layer in the GIS.

EXPANSION OF THE GIS

During the 2002 season of the Belize Valley Archaeological Reconnaissance Project the principal focus for expansion of the GIS will be to incorporate additional sites into the control point network. Some of these sites will be from among a group chosen by the Department of Archaeology of Belize for evaluation. Other sites will be included at the request of archaeologists investigating the site.

It is the intent of the investigator to make the coordinate values of the control point network available through the Internet. At this point all of the sites in the system are well known to investigators. As the locations of lesser-known sites begin to be incorporated into the GIS, information will be selectively released through a protocol being developed with the Department of Archaeology.

APPENDIX 1: CORS LOCATIONS

Antenna Reference Point(ARP): **GUATEMALA CITY CORS ARP**											ITRF97	D
ITRF97 POSITION (EPOCH 1997.0)											Computed for	
Computed in Aug., 2000.000 using 13.000 days of data.									|	12	August 2001	mm.
X	=	-56063.621	m	latitude	=	14	35	25.454	N	12	-56063.618	0.003
Y	=	-6174978.673	m	longitude	=	90	31	12.660	W	12	-6174978.673	0.000
Z	=	1596665.233	m	HAE	=	1519.868		m	|	12	1596665.232	-0.001
|												
ITRF97 VELOCITY												
Predicted with HTDP_2.4 in Aug., 2000												
VX	=	0.004	m/yr	north	=	-0.001	m/yr	|				
VY	=	0.000	m/yr	east	=	0.004	m/yr	|				
VZ	=	-0.001	m/yr	east	=	0.000	m/yr	|				
|												
Antenna Reference Point(ARP): **TEGUCIGALPA CORS ARP** |												
Computed in June, 2000.000 using 11.000 days of data.									|	14		
X	=	301697.346	m	latitude	=	14	5	25.581	N	14	301697.351	0.005
Y	=	-6181025.110	m	longitude	=	87	12	20.148	W	14	-6181025.109	0.001
Z	=	1542919.832	m	HAE	=	948.825		m	|	14	1542919.834	0.002
|												
ITRF97 VELOCITY |												
Velocities computed using the model in XSITES May, 2000.000									|			
VX	=	0.005	m/yr	north	=	0.002	m/yr	|				
VY	=	0.001	m/yr	east	=	0.005	m/yr	|				
VZ	=	0.002	m/yr	east	=	0.000	m/yr	|				
|												

Antenna Reference Point(ARP): **SAN SALVADOR CORS ARP** |												
PID	=	AI8353	|									
|												
ITRF97 POSITION (EPOCH 1997.0) |												
Computed in Apr., 2001.000 using 32.000 days of data.									|	4		
X	=	95566.964	m	latitude	=	13	41	49.504	N	4	95566.965	0.001
Y	=	-6197785.598	m	longitude	=	89	6	59.745	W	4	-6197785.598	0.000
Z	=	1500590.479	m	HAE	=	626.631		m	|	4	1500590.479	0.000
|												
ITRF97 VELOCITY |												
Predicted with HTDP_2.4 in Oct., 2000.000 |												
VX	=	0.004	m/yr	north	=	0.000	m/yr	|				
VY	=	0.000	m/yr	east	=	0.004	m/yr	|				
VZ	=	0.000	m/yr	east	=	0.000	m/yr	|				
Antenna Reference Point(ARP): **SAN LORENZO CORS ARP** |												
ITRF97 POSITION (EPOCH 1997.0) |												
Computed in Jan., 2001.000 using 17.000 days of data.									|	7		
X	=	277528.923	m	latitude	=	13	25	26.105	N	7	277528.925	0.002
Y	=	-6198801.814	m	longitude	=	87	26	11.402	W	7	-6198801.814	0.000
Z	=	1471065.567	m	HAE	=	11.995		m	|	7	1471065.567	0.000
ITRF97 VELOCITY |												
Predicted with HTDP_2.4 in Jan., 2001.000 |												
VX	=	0.004	m/yr	north	=	0.000	m/yr	|				
VY	=	-0.001	m/yr	east	=	0.004	m/yr	|				
VZ	=	0.000	m/yr	east	=	0.001	m/yr	|				
Antenna Reference Point(ARP): **ESTELI NICARAGUA CORS ARP**												
Computed in June, 2000.000 using 13.000 days of data.									|	14		
X	=	394283.471	m	latitude	=	13	5	58.327	N	14	394283.477	0.006
Y	=	-6201541.433	m	longitude	=	86	21	43.661	W	14	-6201541.432	0.001
Z	=	1436325.757	m	HAE	=	852.670		m	|	14	1436325.760	0.003
|												
ITRF97 VELOCITY |												
Predicted with HTDP_2.3 in June, 2000.000 |												
VX	=	0.005	m/yr	north	=	0.003	m/yr	|				
VY	=	0.001	m/yr	east	=	0.005	m/yr	|				
VZ	=	0.002	m/yr	east	=	0.000	m/yr	|				

APPENDIX 2: ARCHMAPBZ CONTROL POINT COORDINATE VALUES

Control point descriptions

Station	Site	Local ID	Type	Monument
1001	Cahal Pech	1001	Primary	Nail, aluminum label
1002	Cahal Pech	1002	Secondary	Nail, aluminum label
1003	Baking Pot	1003	Primary	BVAR Concrete monument
1007	Caracol	1007	Primary	Nail, aluminum label
1008	Caracol	1008	Secondary	Nail, aluminum label
1009	Blackmun Eddy	1009	Secondary	Concrete property monument
1010	Blackmun Eddy	1010	Primary	BVAR Concrete monument
1011	El Pilar	C5	Primary	BVAR Concrete monument
1012	El Pilar	C6	Secondary	BVAR Concrete monument
1013	Lamanai	1013	Primary	Existing concrete monument
1014	Lamanai	1014	Secondary	Existing concrete monument
1015	Lamanai	1015	Secondary	Existing concrete monument
4001	Xunantunich	4001	Reference	Existing nail in consolidated material
4005	Caracol	4005	Reference	Nail, aluminum label
4006	Caracol	4006	Reference	Nail, aluminum label
9116	Xunantunich	91_16	Reference	Existing concrete monument
1004	Baking Pot	1004	Secondary	BVAR Concrete monument
1005	Xunantunich	1005	Primary	Nail, aluminum label
1006	Xunantunich	1006	Secondary	Nail, aluminum label
EPB1	El Pilar	EPB1	Secondary	BVAR Concrete monument
IGS E10	El Pilar	IGS_E10	Reference	IGS Benchmark

Control Point WGS84 coordinates

Station	WGS84 X	WGS84 Y	WGS84 Z
1001	98508.922	-6095830.848	1868298.274
1002	98527.515	-6095814.543	1868321.660
1003	105366.062	-6093793.883	1874067.534
1007	94076.125	-6108571.800	1827970.582
1008	94025.486	-6108582.149	1827853.994
1011	90861.923	-6092515.472	1879585.349
1012	90865.903	-6092486.251	1879678.625
1013	142857.223	-6074203.072	1933713.722
1014	142868.829	-6074204.640	1933707.086
1015	143160.831	-6074067.356	1934115.155
4001	91315.516	-6097729.112	1862472.114
4005	93718.586	-6108603.246	1827851.187
4006	93758.801	-6108617.548	1827797.198
9116	91312.443	-6097767.410	1862338.956
1004	105398.265	-6093831.729	1873936.044
1005	91353.597	-6097813.369	1862309.619
1006	91305.377	-6097720.421	1862524.439
EPB1	91057.536	-6092649.808	1879154.236
IGS E10	91045.837	-6092561.770	1879395.529

Control Point UTM coordinates, latitude and longitude

Station	UTM 16N					
	Northing	Easting	HAE	Ortho. Ht.	Latitude	Longitude
1001	1896848.837	279348.974	179.391	183.480	N 17°08'44.44972"	W 89°04'27.04083"
1002	1896875.703	279368.120	170.994	175.085	N 17°08'45.33005"	W 89°04'26.40295"
1003	1902856.510	286303.981	46.505	50.821	N 17°12'02.20640"	W 89°00'33.88909"
1007	1854624.403	274264.057	537.953	540.494	N 16°45'49.51996"	W 89°07'03.63401"
1008	1854510.541	274212.040	513.489	516.026	N 16°45'45.79904"	W 89°07'05.34887"
1011	1908730.816	271881.946	236.651	241.239	N 17°15'08.20106"	W 89°08'44.05743"
1012	1908828.509	271887.448	236.469	241.060	N 17°15'11.37987"	W 89°08'43.90796"
1013	1965039.667	324788.472	13.242	19.384	N 17°45'56.67093"	W 88°39'09.81867"
1014	1965032.684	324799.977	12.969	19.111	N 17°45'56.44712"	W 88°39'09.42602"
1015	1965458.451	325098.879	13.341	19.490	N 17°46'10.38125"	W 88°38'59.40607"
4001	1890832.494	272059.875	171.441	175.363	N 17°05'26.23087"	W 89°08'31.34698"
4005	1854506.408	273904.745	528.363	530.902	N 16°45'45.55797"	W 89°07'15.72027"
4006	1854449.978	273944.141	527.076	529.613	N 16°45'43.73652"	W 89°07'14.37009"
9116	1890693.995	272054.705	168.868	172.785	N 17°05'21.72513"	W 89°08'31.47032"
1004	1902719.205	286334.107	44.303	48.614	N 17°11'57.75116"	W 89°00'32.82155"
1005	1890651.817	272094.714	204.762	208.678	N 17°05'20.36784"	W 89°08'30.10181"
1006	1890885.225	272050.444	178.368	182.292	N 17°05'27.94225"	W 89°08'31.68548"
EPB1	1908276.182	272070.534	239.875	244.447	N 17°14'53.48508"	W 89°08'37.50431"
IGS E10	1908532.929	272062.999	227.189	231.769	N 17°15'01.83142"	W 89°08'37.85576"

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OXMULCAB VALLEY TERRACE SYSTEMS

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INTRODUCTION

Agricultural terraces are well known in the Maya lowlands in Belize, Guatemala and Mexico. Maya agricultural terraces in Belize south of the Belize River have been reported for at least three quarters of a century, beginning with Ower, Thompson, Lundell through Wright (Wright 1962) and Turner (Turner 1979), extending to the recent research conducted by Healy, Lambert, Arnason and Hebda (Healy et al 1983). These are not the only Maya terraces known in Belize. Terraces have also been identified north of the Belize River and in northwestern Belize (Beach and Dunning 1995; Fedick 1994, 1996).

Maya terraces in Belize are variously described as serving to prevent soil erosion (Turner 1978), to trap silt in order to create or increase the size of fertile fields (Wright 1962), to create house gardens for intensive cultivation (Fedick 1994), to serve as retaining walls or "footslope terraces" (Beach and Dunning 1995) or as "weir dams", to slow water flow and increase soil moisture to enhance dry season plant growth (Beach and Dunning 1995; Healy et al 1983). Another possible role for terraces built across ravines with year-round or extended seasonal streamflows is as reservoirs or "fresh flowing ponds" for jute and other aquatic foods (Healy 1983; Turner and Johnson 1979).

Whatever the specific intent of their builders, it is clear that the construction of terraces and other agrosystems requires more effort than use of unmodified land. There are at least two situations in which such additional effort could be expected. In the first case, extension of current practices to additional land is not feasible because the land is not available. In this case, after Boserup (Boserup 1965), land use is intensified through terrace construction to compensate for the inability to expand land area. Another possibility is that land is available, but that another scarce resource, such as water or precipitation to grow crops, must be captured and utilized more efficiently. A third possibility might be that the location itself is of such importance that proximity value justifies the labor investment to modify the land resource, as for example, Renfrew's Locations of High Devotional Expression.

Leaving aside the discussion of motivation for terrace construction, the question is whether the labor cost can be calculated and compared to potential benefits from the terrace system. In other words, since the Maya engaged in significant construction

activity, presumably they anticipated that their effort was worth it. Can modern investigations demonstrate that it was?

SITE DESCRIPTION

Oxmulcab, "Land of the Three Mounds", is located approximately eight kilometers southeast of Benque Viejo on the northwest shoulder of the Vaca Plateau between the Mopan and Macal Rivers. Its stream system drains northeast five kilometers, entering the Macal River at Negroman. Approximately nine hundred meters north of where the east and west stream branches join is the lower entrance (Entrance 1) to Actun Chapat, a cave under study by the Western Belize Regional Cave Project during 1999 and 2000. In 1999 Jaime Awe, BVAR director, and Cameron Griffith, co-director of the cave project, invited William Poe to map with GPS suspected agricultural terraces in the western valley, which was being used as cattle pasture. In 2000 Josalyn Ferguson, in charge of WBRCP archaeological investigations in Actun Chapat, reported terraces in the downstream area, exposed by *milpa* creation. GPS mapping here was more challenging, due to the narrowness and steepness of the valley sides and the uncleared bush further downstream. A well and what appear to be additional terraces are in the next 75 meters north of the final mapped terrace, but the GPS equipment could not collect the necessary mapping data. The east branch was not mapped at all in those years, since much was in bush in 2000 and there was not time to locate the *milpero* to arrange access to the cultivated parts.

There are no observable terraces or terrace remnants in the joint watershed between the southernmost terrace wall and the zone where the upper drainages join. The channel is narrow and cuts through and over bedrock for 350 meters or so. There may be some terraces between the lowest terrace mapped in the west branch and the junction, but bedrock is at or near the surface in part of this zone, also. The mapped area of the west branch is approximately five hundred meters east-west and four hundred meters north-south at the west end, tapering to about one hundred meters at the east end. The lower valley is much narrower, although on its east side the hill forms a shoulder and appears to slope much less steeply, creating a larger, more easily worked area than the steep west slope. This area, in low bush, could not be mapped. The mapped area in the lower valley is about one hundred sixty by seventy meters.

There are at least five residential or ceremonial sites in the west valley. All but one are located against or close to steep hillsides. Some sites contain remains of several structures. In one case, which appears to be public architecture, the hillside seems to have been used to provide maximum impact while minimizing building materials, a sort of "false front" effect. Three springs or seeps, an *aguada*, a significant depression and possibly a collapsed cave entrance or sinkhole are within the mapped area, while another small cave, deemed uninteresting by the land owner and a local cave guide, is just beyond the mapped area on the southwest corner.

TERRACES

The six terraces mapped in the lower valley area are short, but wide, averaging 23.74 meters in length and 2.71 meters in width. Height varies, since slope to the streambed is steep, with occasional sections close to two meters high at the center, or as near the center as the terrace remains, tapering at the sides of the ravine. The terraces are closely spaced, six within 160 meters, while the drainage drops eight meters, a five percent slope. Terrace height diminishes moving downstream, and the mass of the terrace walls also decreases. The width of the most intact upstream terrace averages 3.56 meters and it is also the tallest, while further downstream the lowest most intact terrace is less than 2.2 meters wide and correspondingly lower. The lengths range from 20.59 meters to 29.81 meters.

In the west upstream valley the variety of terrace dimensions and locations is much greater. Terrace length ranges from 10.18 meters to 89.8 meters for the longest cross-valley terrace. This is also the single terrace with adequate surface exposure to measure the width, which averages 2.42 meters. The best estimate of terrace wall height is approximately one meter, with some taller portions. What can be seen of terrace construction in the lower valley, where they have been cut (blown out) by the stream, or in the roadcut through the largest terrace in the west branch is similar to the generalized forms of terrace walls from the Cayo District depicted in Healy et al, that is, two rock walls with smaller rock fill.

LABOR COST ANALYSIS

What was the cost of constructing these terrace walls? In the lower valley materials should have been readily available close at hand, minimizing the labor and time needed for collection and transportation. In the west valley, some stone probably had to be brought from a greater distance or quarried from the exposed bedrock. Abrams, Erasmus, Hard et al, Turner and Wilken (Abrams 1994; Erasmus 1977; Hard et al 1999; Turner 1983; Wilken 1971) have variously analyzed or estimated the labor requirements for construction in different areas of Mesoamerica and Northern Mexico, by volume and by time required. Based on the various calculations of the labor involved in construction utilizing stone both for the walls and the fill, the Wilken estimate of 1.4 cubic meters per person per day appears to be appropriate to calculate the person days required to construct the lower valley terraces. Given the likely additional carrying distance and possible quarrying effort required to construct the west valley terrace walls, the labor demand might need to be revised upward. More precise measurement of wall heights and widths, both currently complicated by soil accumulation, could also necessitate recalculation of wall volumes, which would also change the estimate of person days.

Making the simplest assumption, that terrace heights average one meter, volume in cubic meters can be calculated as length times width times one meter. Dividing the wall volume by the average volume constructed per person day will yield the total person days required. In the lower valley, total terrace wall length is 142.44 meters; average width is 2.71 meters, which gives a total volume of 386.01 cubic meters. Dividing by 1.4

cubic meters yields a labor input requirement of 275.72 person days. The west valley has many more nonresidential terrace walls, totaling 653.61 meters in length, but the width of the measured wall was less, 2.42 meters. Terrace wall volume is calculated as 1,581.74 cubic meters; 1,129.96 person days would have been required for west valley construction. Despite the fact that the labor requirement for the west valley is over four times that of the lower valley, particularly when the residential terraces and building platforms are added to the calculations, there may have been less time pressure in the west valley construction. In the lower valley, the drop of the stream through the narrow stone streambed above the terraces may have required not only more massive, but more rapid construction of at least the upper terrace walls, in order to handle the hydraulic forces.

PURPOSE OF THE TERRACES

What were the benefits anticipated from construction of Oxmulcab terrace walls? In the lower valley, as was previously stated, the terraces are of relatively equivalent length, perpendicular to the stream flow, and of massive construction, particularly at the head of the valley. They seem clearly intended to slow the movement of water down the valley and to increase the amount absorbed at each stage. In this precipitation zone, maize cultivation would not require the additional moisture. In fact, creation of these terraces to enhance maize production would not offset the loss of production from plantable areas on the parts of the slopes which would be buried by the terraces. The present *milpero*, taking advantage of the prior existence of these terraces, is utilizing both the terraces and the hill slopes for maize. Certainly modern land use in Belize and other parts of the lowland area does not display construction of any types of agrosystems to cultivate maize. In fact, it is difficult to visualize a situation in which anyone would be willing to invest over 275 days of labor to create relatively flat areas totaling less than half a hectare, 3,798.4 square meters, or .379 hectare, to be more accurate, on which to grow maize which might yield, according to Cowgill's study (Cowgill 1962) during the first two years of cultivation, assuming 1400 kilograms per hectare, about enough to feed one person per year, with the yield decreasing after that as soil fertility declined.

Assuming maize cultivation was not the intended purpose of the planting areas created by the terrace wall construction, what might have been the alternatives? A number of annual crops known to the Maya would have had higher yields per hectare than maize. Among these are beans, estimated by Wiseman (Wiseman 1978) to produce 2400 kg/ha, squash, 7400 kg/ha or manioc, 2600 kg/ha. Some perennial cultigens, such as jicama (7800 kg/ha), malanga, sweet potato (6600 kg/ha) and bird peppers could have been grown on the terraces (Hayes 1999).Any of these could have substantially augmented a maize based diet, both nutritionally and calorically. While orchards composed of trees such as aguacate, annona, cohune, copal, guanacaste, guayaba and papaya might have been planted in the west valley, the lower valley terraces do not demonstrate damage consistent with the presence of large trees. One possibility is that cacao (*Theobroma cacao*) was planted on at least some of the terraces. Cacao is an understory tree of moderate size which requires moister growing conditions than could be supported from available precipitation in the Vaca flank zone (Bergmann 1969; Whitkus

et al 1998). A system which channeled water or concentrated moisture in terraces might create a more favorable environment for cacao. It should be noted that in the contact period the Belize River area, particularly around what became the mission at Tipu, at modern Negroman (Jones 1982), five kilometers downstream from Oxmulcab, was a significant producer of cacao.

Aside from the value of agricultural production of the lower valley terraces, the possible contribution to the domestic water supply needs to be considered. About ten meters north of the lowest mapped terrace is an old well, presently dry and unused. Fedick and Taube (Fedick and Taube 1995) report that modern Maya in Yucatan prefer water sources less than ten meters below the surface. The value of maintaining a water table high enough to support convenient access to domestic water may not be quantifiable, but surely must have been considerable.

In the west valley interpretation of the intended purpose of terraces is much more complicated. Some terraces, such as those in the east end, appear to have been built to retard drainage or to reduce speed of runoff. Just above them, however, is an area where bedrock is at present very close to the surface or is exposed. Could the westernmost wall of this series have been constructed adjacent to the bedrock outcrop in order to trap silt and create deeper soil? The next two long terraces crossing the valley northwest-southeast may have been constructed to enhance distribution of water from present or past springs, while the northernmost pair of walls, adjacent to a residential site and a steep hillside, appear to be positioned to collect soil eroding from the slope. A similar function might have been served by the northwestern terrace walls between the residential sites in that fork, while the larger construction south of the track on the steep hillside appears to be a platform and part of the public architecture located there, and the adjacent terrace may have been a house platform/garden area.

Of the mapped area of the west valley, approximately ten hectares appear to have been usable for water-intensive agriculture. The location of most building sites on the periphery of the valley indicates the value of the valley floor lands for agriculture. Here, as in the lower valley, the ability to channel rainfall and spring water and to store moisture in the soil would expand the production possibilities for Maya cultivators. Orchards, higher yielding perennials and annual crops, and multiple cropping all become more feasible if the water supply is more abundant and reliable. The investment in intercropping and in improving soil quality through amendments and domestic waste (Wilken 1987) is justified if productivity is increased, so the labor cost of terrace building can in turn create conditions which encourage further effort. It is unlikely that shifting swidden cultivation was not practiced at Oxmulcab, but the contribution of household gardens and other higher productivity planting areas could reduce dependence on long-fallow agriculture and the extensive land use it would require.

2001 MAPPING

Mapping activity in the 2001 season was divided between the east valley and the lower valley. Beginning at the Hydro road and extending along the access road/trail to the

valley system, several hectares had been cleared and planted in corn. Under direction of William Poe, the east valley area was mapped by field school students[1]. Over a period of two days they mapped built and infill terraces, contours and features. In addition to the agricultural terraces, which were constructed with a variety of techniques, two residential sites, one substantial and the other in current seasonal use, and surrounding hillside areas were mapped.

In the north (lower) valley, one day was spent using the same equipment listed above to map terraces, a diversion wall, a house site, an ancient well, and hillside contours between the lower margin of the *milpa* area mapped in 2000 and the stream-bottom trail to Actun Chapat**.**

CONCLUSION

Work remains to be done in future seasons to complete the mapping of the east valley to its junction with the west valley and the north valley above the 2000 and below the 2001 areas mapped, as well as the east bench in the north valley next to the area mapped in 2000. All these areas are currently in fallow or in bush and will be mapped as they are exposed by agricultural activity. Since current use is pasture or *milpa*, there is little likely disturbance of terrace structures that would require more rapid mapping.

A labor cost analysis has been conducted on the 1999 and 2000 mapped areas to estimate the time and labor needed to construct the terrace walls. Additional analysis may be done on the 2001 data, but will probably be delayed until complete data on the valley system are collected.

[1] Mapping the lower valley and the east valley in the 2001 season combined GPS methodology described elsewhere in this volume (Poe, "The Archaeological Map of Belize") with the use of an Impulse 200™ Laser Rangefinder and an Angle Encoder™ manufactured by Laser Technology, Inc. The one sigma range accuracy of the Laser Rangefinder to a white target at 50 m. is 3 cm. To a grey target at 150 m. it is 5 cm. The range resolution of the Laser Rangefinder is 0.01 meters. The angle accuracy of the Angle Encoder when mounted on a tripod, as in this study is 0.05°.

The Laser Rangefinder and Angle Encoder were tripod mounted with a 4000SSE GPS antenna mounted on a bracket to position it in the same horizontal axis. The Angle Encoder was oriented to north with an electronic compass and the positions were shot as offsets from the GPS determined position of the tripod.

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REPORT ON THE THIRD YEAR OF ARCHAEOLOGICAL INVESTIGATIONS IN ACTUN HALAL

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INTRODUCTION

The 2001 season marked the third year of archaeological investigations in the small cave site of Actun Halal. Excavations were conducted to further explore a possible Archaic or Paleoindian context within the cave. Further investigations of the rock art in Actun Halal were also carried out. This paper reports the findings of the excavations and presents examples of the Modified Speleothem Sculpture within the cave.

LOCATION AND PHYSICAL DESCRIPTION

Actun Halal is situated just south and uphill from a small arroyo in the Macal River Valley. The cave has two clamshell-shaped entrances separating a passage 26 meters long, which varies in width from 4.5 to 8 meters (Figure 1). Although the cave contains two small chambers (each approximately 3 m in diameter), one in the dark zone and one in the penumbral zone, the majority of the surface area of the cave is in the light zone, which effectively makes Actun Halal more like a rockshelter than an extensive cave system.

While Actun Halal is a dry cave, with a soil matrix comprised primarily of dusty guano, there are numerous active formations within the cave. A large majority of the stalagmites, stalactites, and flowstone formations throughout the site exhibit varying degrees of modification. There are a few simple face petroglyphs typical of Maya cave sites within Actun Halal (Griffith and Helmke 2000, Griffith and Morehart 2001). While these were being further investigated in the 2001 season it became apparent that there were several more elaborate modifications present that resulted in monumental artworks rendered in the living cave rock.

EXCAVATIONS

During investigations in Actun Halal in the year 2000 one of the excavation units (Unit 4) yielded a small assemblage of crude stone tools and some unique faunal material

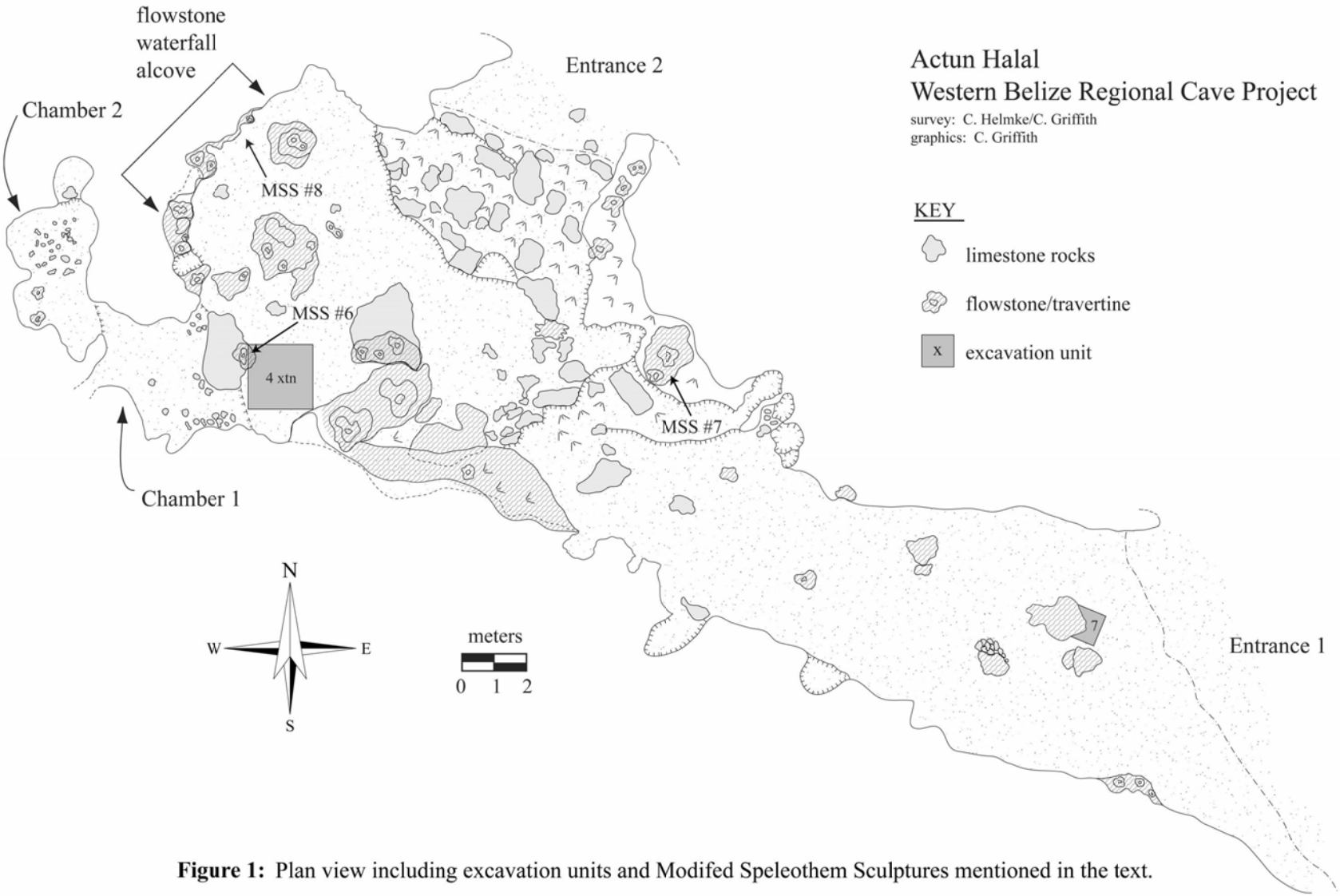

Figure 1: Plan view including excavation units and Modifed Speleothem Sculptures mentioned in the text.

well below the deepest levels with Maya artifacts (Griffith and Morehart 2001). One of the faunal bones was tentatively identified as a molar from an extinct species of horse or camelid (ibid). Due to the fact that these materials were encountered in the screen rather than in situ, excavations in the 2001 season were initiated in hopes that more material of this type would be located and point provenienced.

Two excavation units were initiated in Actun Halal during the 2001 field season. These units were numbered in keeping with the previous excavation sequence established in the previous season in 2000. Unit 4-extension was established around Unit 4 from 2000. Unit 7 was established as an expedient unit to clear away soil and humic material that partially covered a modified area of a flowstone formation within Entrance One.

Unit 4-extension

The matrix in Level 1 was largely loose dry soil containing numerous small limestone rocks and pebbles. Leaves, sticks, nuts and heart of plum seeds could be found within the matrix, along with land snail shells. Artifacts recovered include 158 ceramic sherds, 3 lithics, 2 travertine lozenges (seeds or pebbles coated in smooth travertine, likely from natural dripwater activity) and 1 speleothem fragment, while 34 chunks of carbon (1 cm to 6 cm length) were retrieved from the surface of the unit, which may resulted from fires by recent visitors to the cave. The southeast and southwest corners of the unit marked the greatest level depth at 5.5 cm below the surface.

Level 2 differed from Level 1 due to a more compact soil, though the matrix, for the most part, was similar to that of the level above, consisting of loose, dry, gritty soil containing limestone rocks and pebbles, as well as numerous ceramic sherds. 179 such sherds were recovered, as well as 6 lithic flakes, 7 faunal bones, 1 piece of shell, 4 speleothems, 4 carbon fragments and a polished cave stone or travertine lozenge (length 2.59 cm; width 1.77 cm). Matrices from the four quadrants of the unit were screened separately, though the artifacts have since been combined. The maximum depth of the level was 14 cm below that of the previous level, at 16.5 cm below surface in the northwest corner.

The soil matrix in Level 3 was drier and more compact than that of the previous level, containing fewer small pebbles. Ash deposits were also identified and collected as matrix samples. A total of 216 sherds were retrieved, together with 10 lithic flakes, 32 faunal bones, 3 shells, 7 speleothems and 15 carbon chunks. An obsidian blade fragment was also recovered (3.3 cm length, 1.2 cm width, 0.2 cm thickness), as was a biface fragment (length 3.6 cm; width 2.8 cm; thickness 0.4 cm). The maximum depth of Level 3 (from the end of Level 2) was in the southwest corner of the unit, at 10.4 cm. The greatest depth below surface was 20 cm in the southeast corner.

A soil change from brown to partly yellow prompted the initiation of Level 4. The matrix could also be recognized as grainy and as drier than that of the previous level

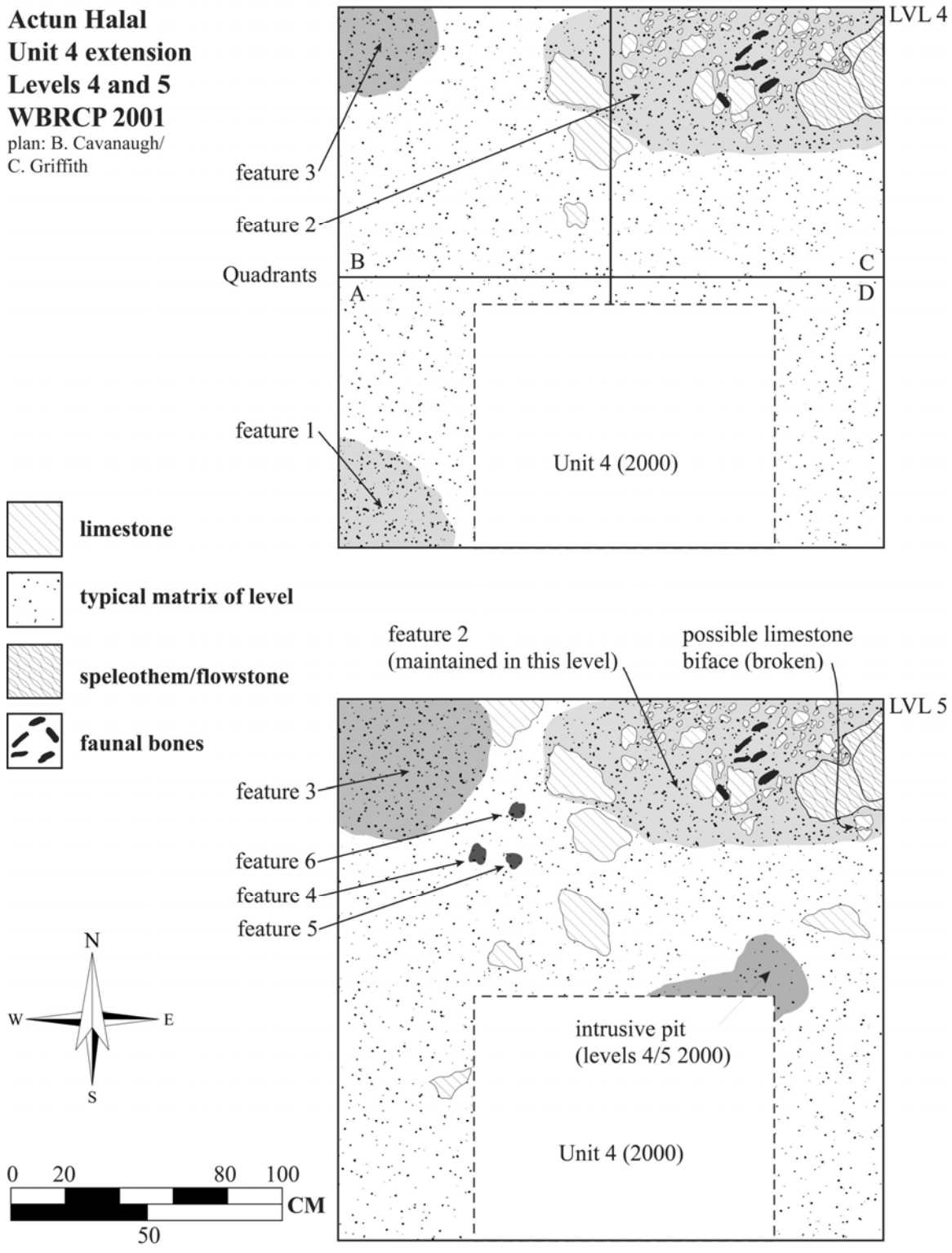

Figure 2: Plan view of Levels 4 and 5, Unit 4 extension

(Figure 2). No cultural material was initially recognized, indicating the likelihood of the matrix being backfill from Unit 4 (2000). A total of 115 ceramic sherds, 5 lithic flakes, 40 faunal bones, 1 human bone (left second metacarpal), 4 speleothems and 24 carbon pieces were retrieved, as well as four bags of matrix, two of which contained burnt limestone (20 pieces and 12 pieces). A chalcedony biface fragment (length 4.28 cm, width 2.26-0.74 cm, thickness 0.98-0.40 cm) and a rectangular nodule of unknown material (a small square of pyrite/mica, length 1.1 cm, width 1.1 cm, thickness 0.5 cm) were also recovered.

Quadrants A and D (Level 4) were noted for their yellow-brown color, and both contained concentrations of white ashy matrix, which may have been areas of burning episodes or possible fire hearth (labeled Features 1 and 2). Features 1 and 2 were comprised of compact, ashy white conglomeration of nodules (possibly deteriorated ash), each nodule ranging in diameter from 3 mm to 4 mm (Figure 2). One possible jaguar bone was found in association with Feature 2. Also in Feature 2 small fragments of possible ceramic sherds (less than 1 cm length) were also found to be present following screening, though these disintegrated when handled due to their fragile nature. These fragments were ash tempered with minute calcite inclusions (~0.1 mm diameter). The center of Feature 1 was 15 cm below surface at the top, and 25 cm below surface at the bottom. This 10 cm depth marked the greatest thickness of the ash concentration, both in the northwest corner and at the center. Level 4 descended to a maximum depth of 28 cm below surface in the northwest corner.

The matrix of Level 5 comprised silty, dirty-brown soil with inclusions of small rocks and pebbles. The soil was damper and more compact than that of the previous level. The matrix of the original Unit 4 (2000) was grainier with a yellow tinge. Having removed the ashy deposits or possible fire hearths in Quadrants A and D, a number of faunal bones were found in association with an arrangement of stones (Feature 2), again in Quadrant D (Figure 2). The matrix here in Feature 2 was silty clay loam, which contained a greater number and variety of rocks than in other areas, as well as having loose soil. Rock fragments (approx. 1-8 cm length) included Fire Altered Rocks (with blackened exterior), grey-blue rocks (burnt limestone), white-colored rock resembling plaster, possible river cobbles limestone rocks, and speleothem fragments. One ceramic sherd appeared to have possible calcified dirt on the exterior. Two matrix samples were taken (one of matrix having passed through a 1/8”screen and another which did not pass through).

In Quadrant C (Level 5) on the east wall of the unit, a humped and more compact matrix comprised of more white limestone/saturated dirt was encountered. (This was further revealed at a later point during excavations of Level 6). It is likely this represents an area underneath a source of dripwater in antiquity, or was due to its location near flowstone. The Level 5 artifacts recovered include 176 ceramic sherds, 23 lithic flakes, 217 faunal bones, 4 shell fragments, 11 speleothems, 31 chunks of carbon and one slate piece (length 5.0 cm, width 3.8 cm, thickness 0.9 cm), as well as a polished crystal fragment (length 2.8 cm, width 1.3 cm, thickness 0.9 cm), 3 fruit seeds, a possible limestone biface (length 13.5 cm, width 6.1 cm, thickness 2.6 cm) and an obsidian blade

fragment (length 2.4 cm, width 1.1 cm, thickness 0.3 cm). Level 5 descended to a maximum depth of 45.5 cm below surface.

From the profile of the previous Unit 4 (2000) it was apparent that an ash lens approximately 4 cm thick was situated directly below Level 5, and was viewed as Level 6. It is likely that this lens of ash and dirt marked a floor surface on top of an earlier floor surface (likely tamped earth and ash). Two roughly circular charcoal concentrations were encountered in Level 5, which prompted the initiation of Level 6. These two features, one with diameter 6 cm, the other 7 cm, were labeled Features 4 and 5 respectively (Figure 3). As the excavation of Level 6 progressed a similar circular "posthole" of the same dark matrix with charcoal inclusions was identified as Feature 6.

Feature 4 contained buckshot sherds and burnt limestone, as well as charcoal flecks and chunks. In addition to the circular shape of this possible posthole, the presence of upright sherds further indicated that this feature was intrusive. Feature 5 also contained charcoal flecks (but not chunks) and burnt limestone, as well as one very small shell fragment (5 mm) and two small faunal bones, probably those of a bat. Ceramic sherds were not present in Feature 5. Feature 6 also contained charcoal flecks and burnt limestone. The matrix of these features consisted of very fine, silty, dark brown dirt with charcoal flecks and small limestone pebble inclusions, the limestone pebbles appearing burnt and blue. These features may have been postholes, possibly for torches placed in the ground at some point in time in front of MSS# 6, yet this interpretation is preliminary at best. Feature 4 had a depth of 13 cm, descending to 51 cm below surface, Feature 5 was 15 cm deep, descending to 53 cm below surface, and Feature 6 was 12 cm deep, descending to 53 cm below surface.

Artifacts retrieved from Level 6 include 22 sherds, 1 lithic fragment, 47 slate pieces, 1 speleothem, 1 possible granite groundstone fragment (length 5.0 cm, width 2.9 cm, maximum width 1.4 cm) and 1 possible calcified fruit seed. The level descended in the southeast corner 49 cm below surface, marking the level's deepest point.

In Level 7, finely sorted tamped earth and possible travertine or ash was encountered (Figure 3). Five root stains were present throughout the unit in Level 7. These stains were darker than the surrounding matrix and contained charcoal flecks within the area of staining. This may have been due to the roots burning *in situ* under the surface dirt, and could affect carbon dating. 29 ceramic sherds, 6 lithic flakes, 201 faunal bones, 1 bag of carbon and 2 speleothems were collected. In the east wall of the unit in Quadrant C (the same area as was humped in Level 6), it was suspected that travertine concretion was what was present. The level was terminated when white and gray extremely compact matrix was encountered. It is likely, however, that this represents a continuation of Level 7 as seen in most of the rest of the unit, yet is more compact due to dripwater activity in this portion of the unit. The southeast corner descended to a depth of 48 cm below surface, while the maximum depth throughout the unit for Level 7 was in the southwest corner at 83 cm below surface.

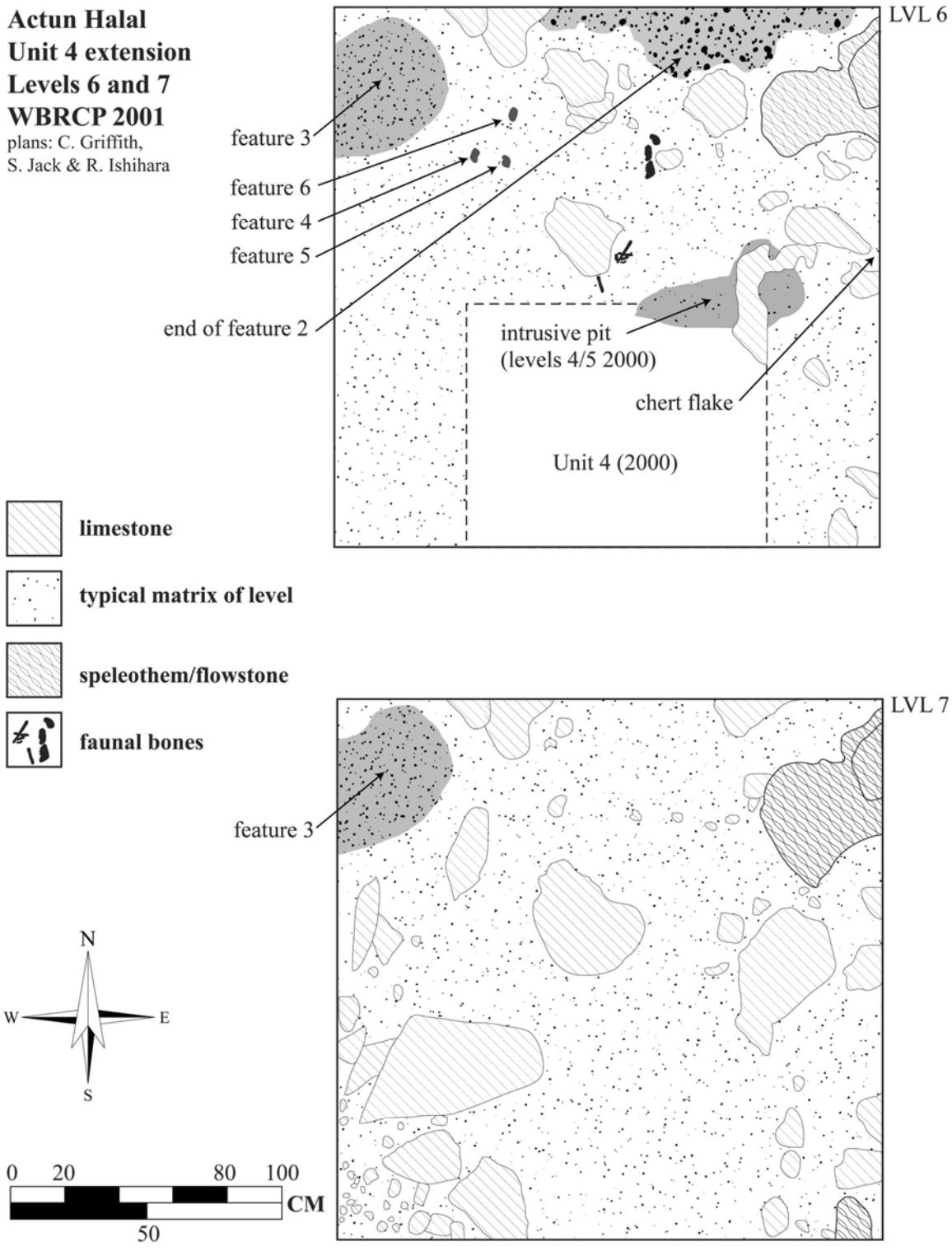

Figure 3: Plan view of Levels 6 and 7, Unit 4 extension

Quadrant C of Level 8 consisted of an extremely compact matrix of limestone rocks (3-10 cm), limestone pebbles and light brown silty dirt, unlike the (hard) orange matrix characteristic of the remainder of the level. Level 8 was likely a layer of travertine over dirt, and was screened by quadrant due to its complex stratigraphy throughout the unit. Ceramic sherds were no longer present, though 8 lithic flakes were retrieved. 80 faunal bones were recovered, as well as 1 human tooth (mandibular left incisor I1), 3 speleothems, 1 bag of carbon, 2 wood fragments (length 1.0-2.4 cm, width 0.7-0.6 cm, thickness 0.1-0.2 cm) and three fire altered rocks (approx. 2 cm-4 cm length and width). Features 4, 5 and 6 all ended at the start of the level (Level 8), while the maximum depth of the level was 83 cm below surface in the southwest corner.

The matrix of Level 9 was an orange, compact, clay-like soil with rocks and pebbles (Figure 5). Some bones were found to have a travertine coating. A total of 25 lithics, 3 shell fragments, 1 piece of burnt wood (length 2.8 cm, width 1.1 cm, thickness 0.5 cm), 2 chunks of possible ochre (approx. 1-3 cm diameter) and 1 white chert chopper (length 8.3 cm maximum width 6.5 cm, maximum thickness 3.4 cm) were retrieved. 24 Small fragments of bone were also evident, predominantly in Quadrant C (Figure 4). All of these bones were classified as faunal in the field. One faunal bone, approximately 7 cm long, was found in the side-wall area of Quad C, 66 cm below surface. Possible rodent disturbance with root activity in the crux of the southwest corner may have altered the stratigraphy. A large tooth (canine) was also found in the eastern wall, Quadrant C. The maximum depth of Level 9 was in the center of the unit at 92 cm below surface.

Level 10 was begun to investigate beyond the 2000 excavation depths (Figure 4). The matrix characteristic of Level 10 (brown/orange clay-like soil with pebble and shell (land snail) inclusions) ended at a maximum depth of 133 cm below surface in the southwest corner and center of the unit, where the matrix shifted to a layer of sand and small pebbles (1-2 mm). The level and unit was ended with 11 lithics, 20 faunal bones, 3 possible Fire Altered Rocks (approx. 3-5 cm) and 2 pieces of burnt wood (approximate length 2.2 cm, width 1.1-1.3 cm) were recovered.

Unit 7

Unit 7 was established around the eastern aspect of a stalagmitic formation in Entrance I. This unit was initiated to remove dirt around the lower part of the formation in order to expose possible modifications to the stalagmite. The excavation amounted to merely the removal of the humus/guano layer down to a depth of 8 cm. Unit 7 yielded 31 ceramic sherds (the vast majority being small buckshot pieces), 4 lithics, 84 faunal bones, and 8 fragments of shell.

PRELIMINARY FAUNAL ANALYSIS

An analysis of the faunal material recovered from Unit 4-extension is currently being conducted by Charles Egeland and Dr. Travis Pickering of Indiana University.

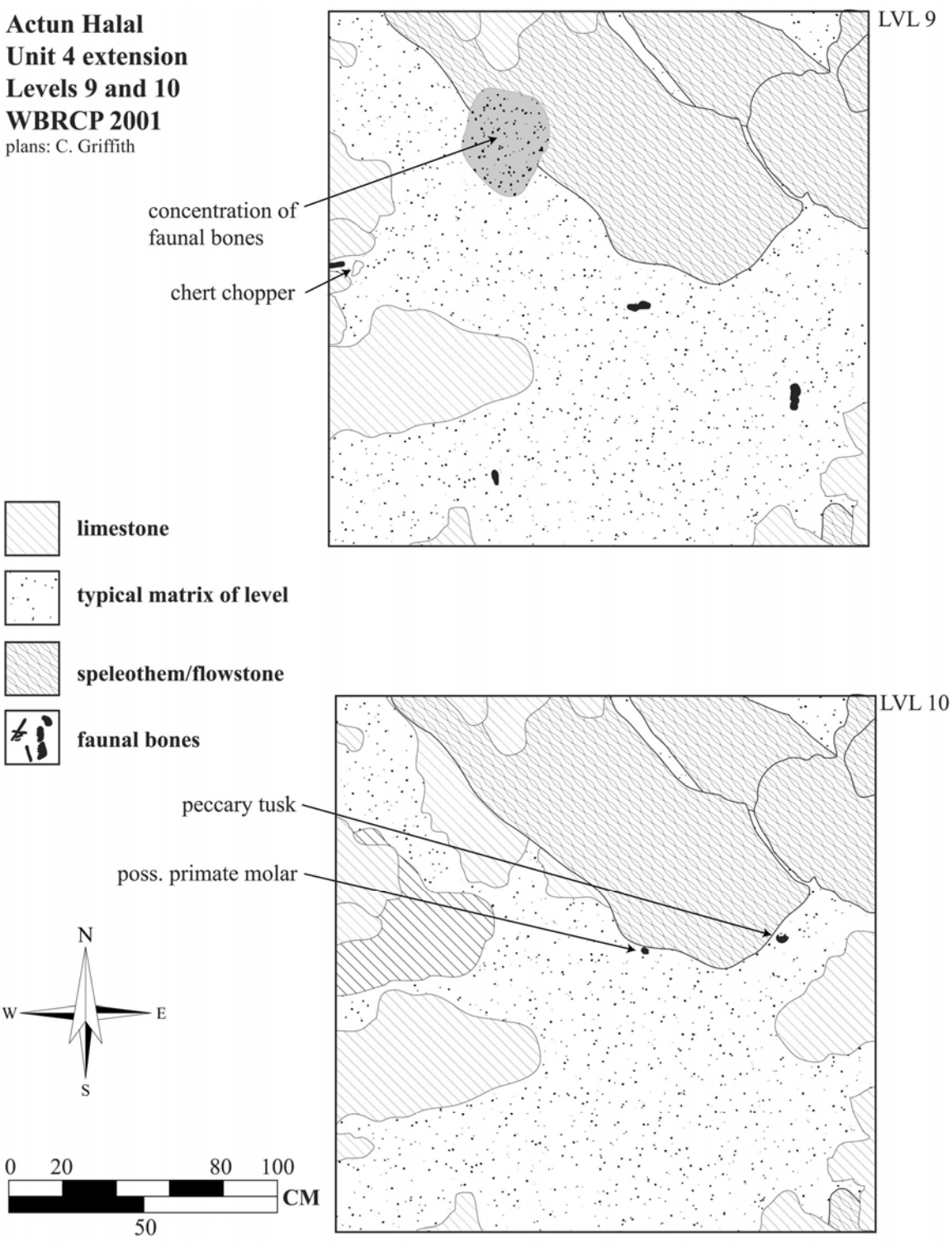

Figure 4: Plan view of Levels 9 and 10, Unit 4 extension

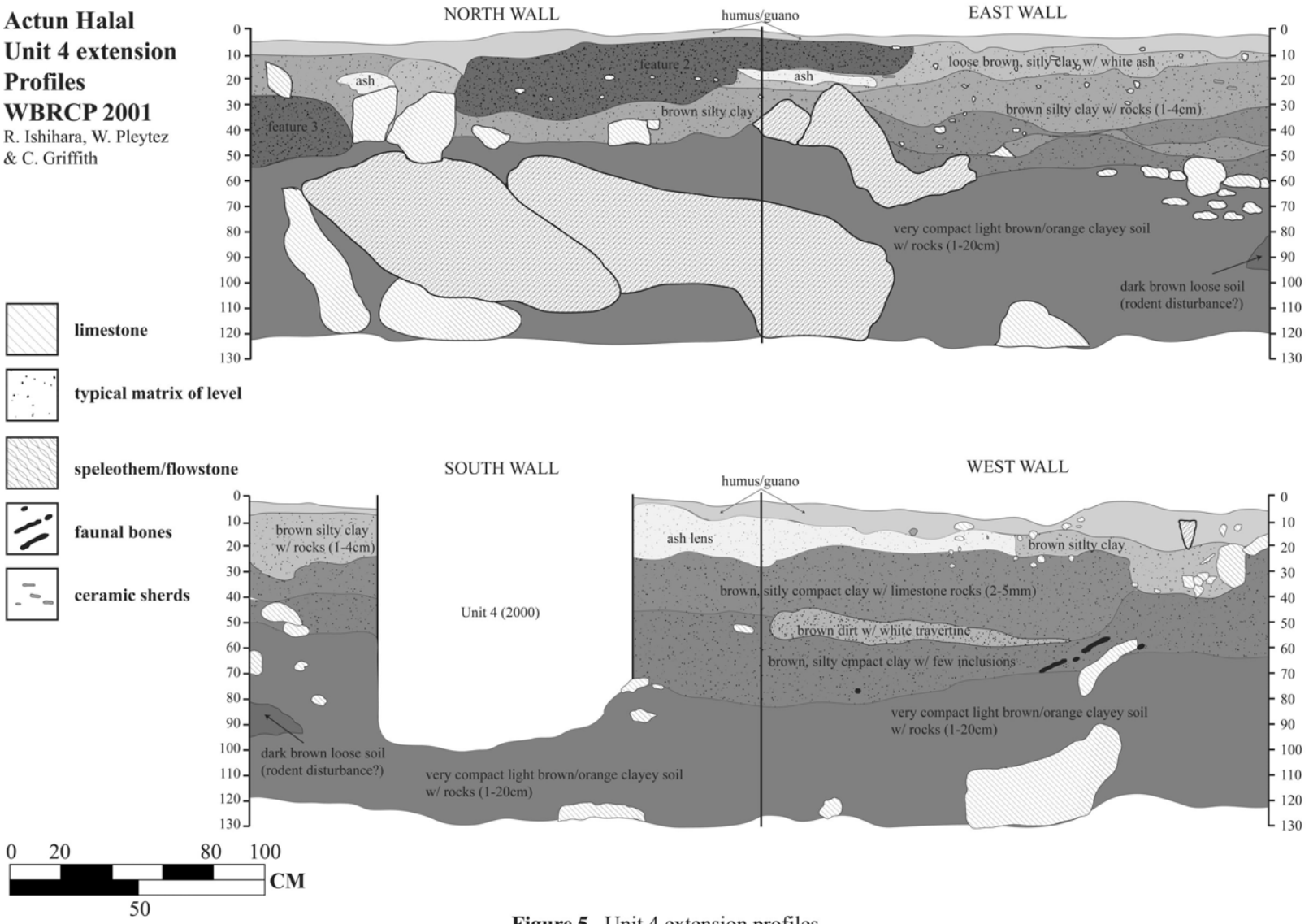

Figure 5. Unit 4 extension profiles.

Preliminary analyses indicate that one canine tooth recovered from Level 9 is from the Equidae family. The geographical location of the site, however, precludes any definitive lower-level classifications at this time. In South America during the terminal Pleistocene, there were three sympatric horse groups, genus designations Onohippidium, Hippidion, and Equus (MacFadden, 1997). Because the site is located in Belize, along the major migration route between North and South America, it is difficult to make a definite identification based on geography alone. However, qualitative size comparison with modern *Equus caballus* specimens suggests that the tooth represents Equus (Charles Egeland, personal communication 2001).

Two molars recovered from Level 9 have been preliminarily identified as a species of cave bear. These teeth likely came from *Tremarctos floridanus*, a Pleistocene period spectacled bear. Future investigations and dental metrics (if possible based on preservation) will shed further light on these intriguing faunal materials.

CAVE MODIFICATIONS AND ROCK ART

The 2001 investigations in Actun Halal were designed to include some follow-up work on the documentation, photography, and recording of the rock art identified in the cave in previous seasons. During the course of the summer it became clear that a number of the artworks in the cave previously identified as petroglyphs, or hollowed-eye visages (Griffith and Morehart 2000) were actually more complex than previously understood. The watershed of discovery began when crewmember Sarah Jack set out to illustrate the hollowed-eye visage labeled Petroglyph #12 in the 2000 season (Griffith and Morehart 2000: Fig. 6). Miss Jack brought to everyone's attention that the overall effect resulting from the modifications to the speleothem material was a rather elaborate face in profile (see Figure 8, below). This prompted further critical evaluation of other areas of speleothem modification in the cave and resulted in a number of revelations regarding the nature of Maya cave art.

Previous investigations of Maya cave modifications and carved art in caves has led to the identification of a wide range of modifications, from simple petroglyphs to more elaborate forms (Anderson 1962:331; Brady and Cobb 1998:5; Pendergast 1970:8; Siffre 1979:82, Stirling 1947:139). Due to this range of complexity within the ancient Maya tradition of cave sculpture the literature has been subject to classificatory disparities by scholars, with the terms *petroglyph, engraving, carving*, and *sculpture* all being used to describe the same art forms. This problem arises as modified speleothem sculptures in some Maya cave sites show a gradation from simple petroglyphs to more elaborate artworks. To address this problem some scholars have chosen to intermix different terms for the art or explain why the term petroglyph was reluctantly used to categorize all forms (Brady 1999; Griffith and Morehart 2001).

The history of research clearly demonstrates that basic terms such as petroglyph do not adequately address the diversity of art forms in Maya speleothem art. Following the discoveries in Actun Halal during the 2001 field season Griffith proposed the term

Modified Speleothem Sculpture as a solution to this problem. This term, developed with the assistance and advice of Andrea Stone, is comprised of three critical descriptors that address artworks of this type: *modified*, to emphasize that modifications have been identified; *speleothem*, to encompass the wide range of water-borne mineral deposits in which the modifications were executed; and *sculpture*, to denote human modifications contributing to the three-dimensionality of the final product (Jack and Griffith 2002).

In this study speleothems of all shapes and sizes were examined for evidence of breakage, carving, and other modification (see Brady et al. 1997). During the course of the research it became clear that there were a number of cave formations that exhibited previously unrecognized alterations in unique patterns. The areas of breakage and modification were documented and, where applicable, certain features such as simple petroglyphic faces were identified. Breakage and alterations to speleothems were documented as byproducts of human endeavors when alterations to the speleothem material could not be accounted for by natural formation process of the mineral deposits. As post-formation breakage occurs as a result of natural processes (e.g. falling rock, animal and insect disturbance, and spalling) any inferences or suppositions regarding human agency involved in the modifications was based upon the overall pattern of modification. Building upon the system developed by Helmke and Awe in their analysis of Maya cave art (1998), when specific features of petroglyphs or sculptures are described herein directional aspects such as “left” and “right” or “medial” and “lateral” refer to the perspective of the viewer when facing the art form. A selection of the MSS corpus in Actun Halal is presented below.

Modified Speleothem Sculpture #6

Modified Speleothem Sculpture #6 is a complex sculptural form that combines traditional petroglyphic carving with modifications that yield three-dimensionality within a flowstone formation (Figure 6). It appears that there may be multiple carvings comprising different images involved in MSS#6. There are shallow vertical lines and ovoid shapes pecked into the vertical aspect of the formation, although the erosion and spalling present make it difficult to ascertain the nature and extent of the modifications. However, it does appear that the formation has a simple face comprised of two eyes. The eyes are gouged out of the flowstone and are both 4 cm in diameter and 1 cm deep.

Below these eyes there is a stalactite that has been shaved and clipped giving the overall appearance of a “snout” or trunk-like feature. The distal end of the snout exhibits a fracture line, which indicates that the formation was cleaved or broken. Both the right and left sides of the snout demonstrate shaving that results in a tapering in of the snout in the approximate center. Similar shaving or gouging is present on the anterior aspect of the snout in two places, which gives it the appearance of a slight undulation. Below and to the left of the snout there are fracture marks that clearly indicate that speleothem material was removed from the formation in this area. The overall effect resulting from

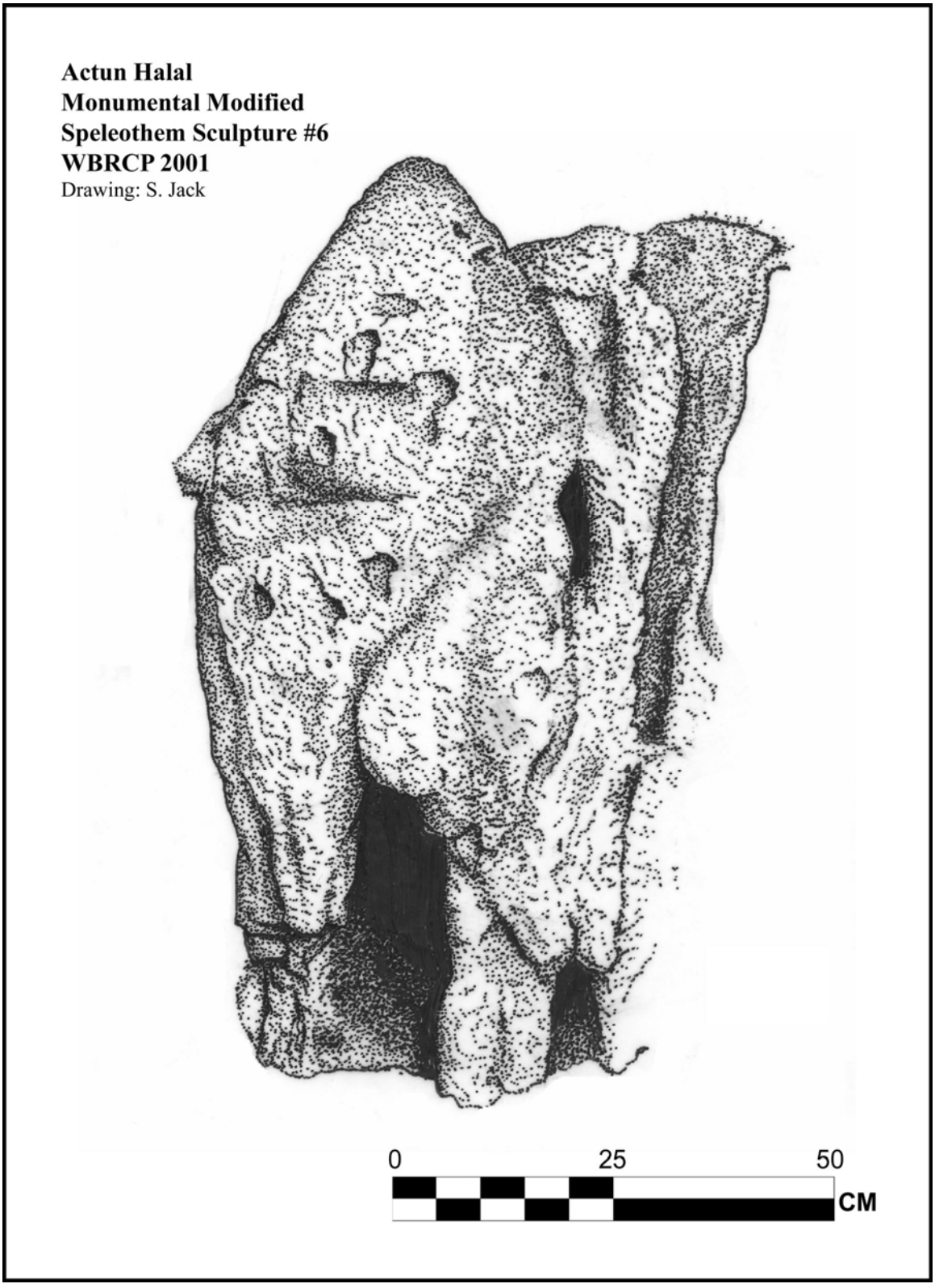

Figure 6: Modified Speleothem Sculpture #6, Actun Halal.

this speleothem removal is that the snout stands out more prominently from the rest of the formation.

Modified Speleothem Sculpture #7

The pattern of modification in modified speleothem sculpture #7 appears to be an elaboration on the pattern seen in MSS #1, 2, and 3. The area of modification is located on a large stalagmitic formation that contains multiple bulbs. There is a hollow "eye" feature which demonstrates evidence of clipping and shaving to the bell formations within the body of the stalagmite resulting in negative space within the body of the formation. This feature is 20 cm wide and 20 cm deep. The superior aspect of this orbit is somewhat jagged and uneven, which is due to calcium deposits that appear to have covered portions of the carving in this area. The medial and lateral aspects of the orbit appear to have been shaved to nearly vertical configurations. Within the orbit gouge marks on the speleothem material are evident.

To the left of this eye there is another hollow space within the speleothem that has similar gouging within, as well as clipping resulting in a linear feature. However, the shaving that defines this linear feature extends laterally downward, and curves around to the underside of another bell formation. This line defines the bridge and tip of a "nose" in profile, pointing to the viewer's left (Figure 7). The line of modification continues below and to the right of the underside of the nose to define a drooping upper lip, an upturned mouth, and prominent chin, all in profile. The upper lip is similar in shape and appearance to that in MSS #3. The overall effect is that of a smiling frontal face or a screaming toothless old man in profile, measuring nearly one meter high.

Modified Speleothem Sculpture #8

Modified Speleothem Sculpture #8 is 4 meters in height, 2 meters wide, and is comprised of a crescent-shaped series of modified stalagmites, stalactites, and flowstone formations with a lateral protrusion in the center. The stalactite formations on the top of the crescent exhibit evidence of clipping that define the center arch and truncate the downward extent of the curve. The body of the crescent has been scraped in three areas, which effectively maintains the inner curve. The lower portion of the crescent is comprised of connected stalagmitic bulbs, the sides of which have been scraped resulting in a jagged appearance.

The protrusion in the center of the crescent is a stalagmitic bulb that is by far the most intensively modified area in the formation. The bulb demonstrates clipping on the underside and scraping in numerous places. These modifications give the appearance of a head in profile with a defined hairline or angular headgear, as well as vertical strands of hair. There is a darkened area in the middle that appears to serve as an eye for an individual facing to the viewer's right. Scraping to the right side of this formation defines what might be interpreted to be a nose, chin, and sloping neck (Figure 8).

SUMMARY

The 2001 season efforts in Actun Halal yielded interesting results in both the excavations and the rock art investigations. The rock art investigations revealed speleothem modification on a large scale, and a degree of elaboration that prompted the development of a new term: Monumental Modified Speleothem Sculpture. Excavations yielded ceramic material dating from the Preclassic to Late Classic time periods (see appendix) as well as faunal material (horse and cave bear) in association with crude stone tools in pre-Maya levels.

Acknowledgements

We would like to thank Dr. Jaime Awe, director of the Western Belize Regional Cave Project, and Archaeological Commissioner George Thompson for their continued support of cave archaeology in the Macal Valley. We would also like to thank the summer field crew: Krista Jordan, Takashi Ochiai, Jenny Guerra, Jonathan Forbes, Alicia Daigle, René Torres, Brian Cavanaugh, Sarah Jack, Brianne Bolstetter, Brian Dema, and Oscar Chi; and the follow-up crew: Franz Lauer, Aaron Juan, Patrick Warrior, Pablo "Duck" Darimple, Mary-Ellen McKee, Meghan Burritt, and Amber Jimerson. We extend our special thanks to Christophe Helmke and William Pleytez for their exceptional efforts and assistance throughout the season.

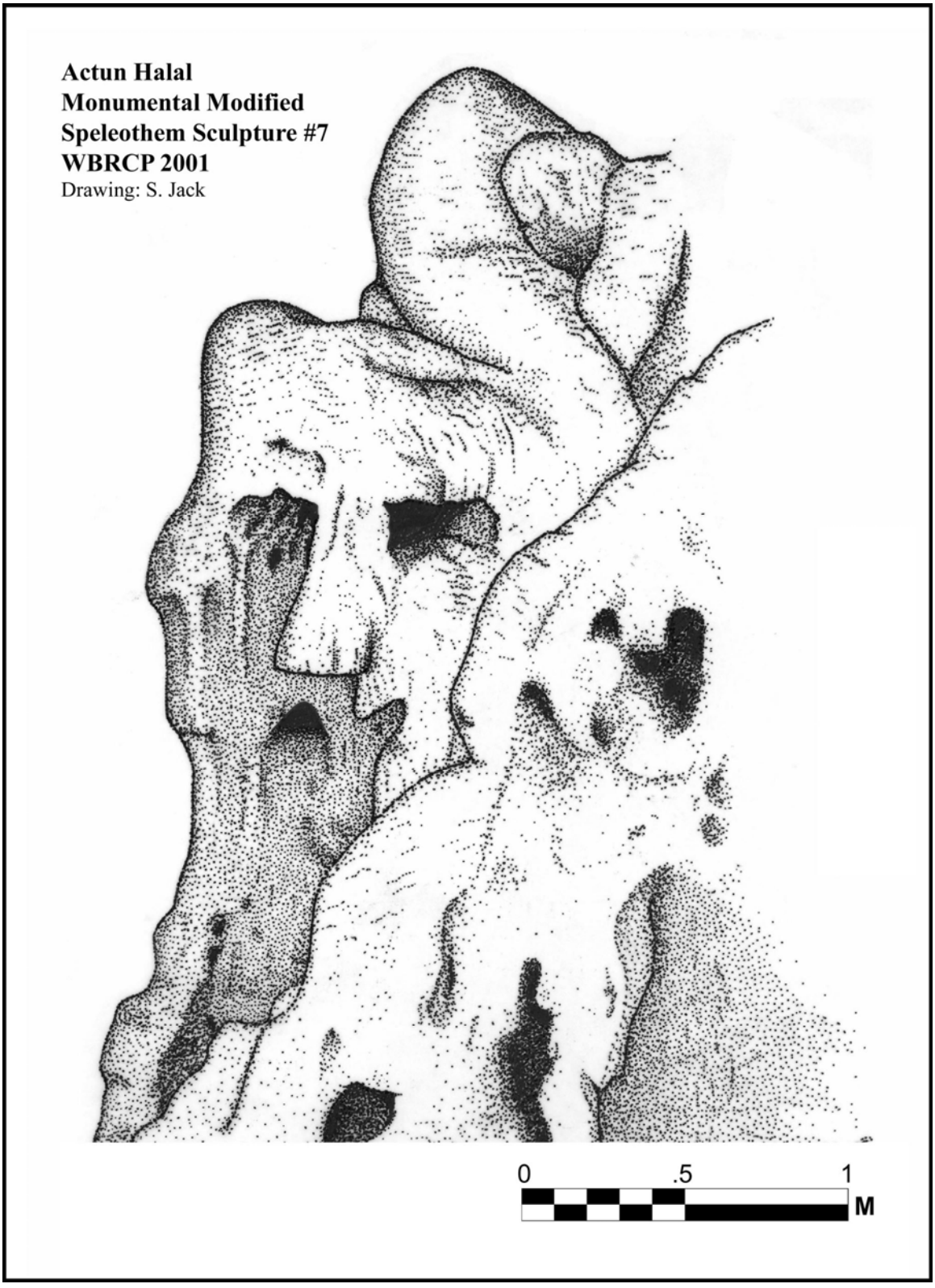

Figure 7: Modified Speleothem Sculpture #7, Actun Halal.

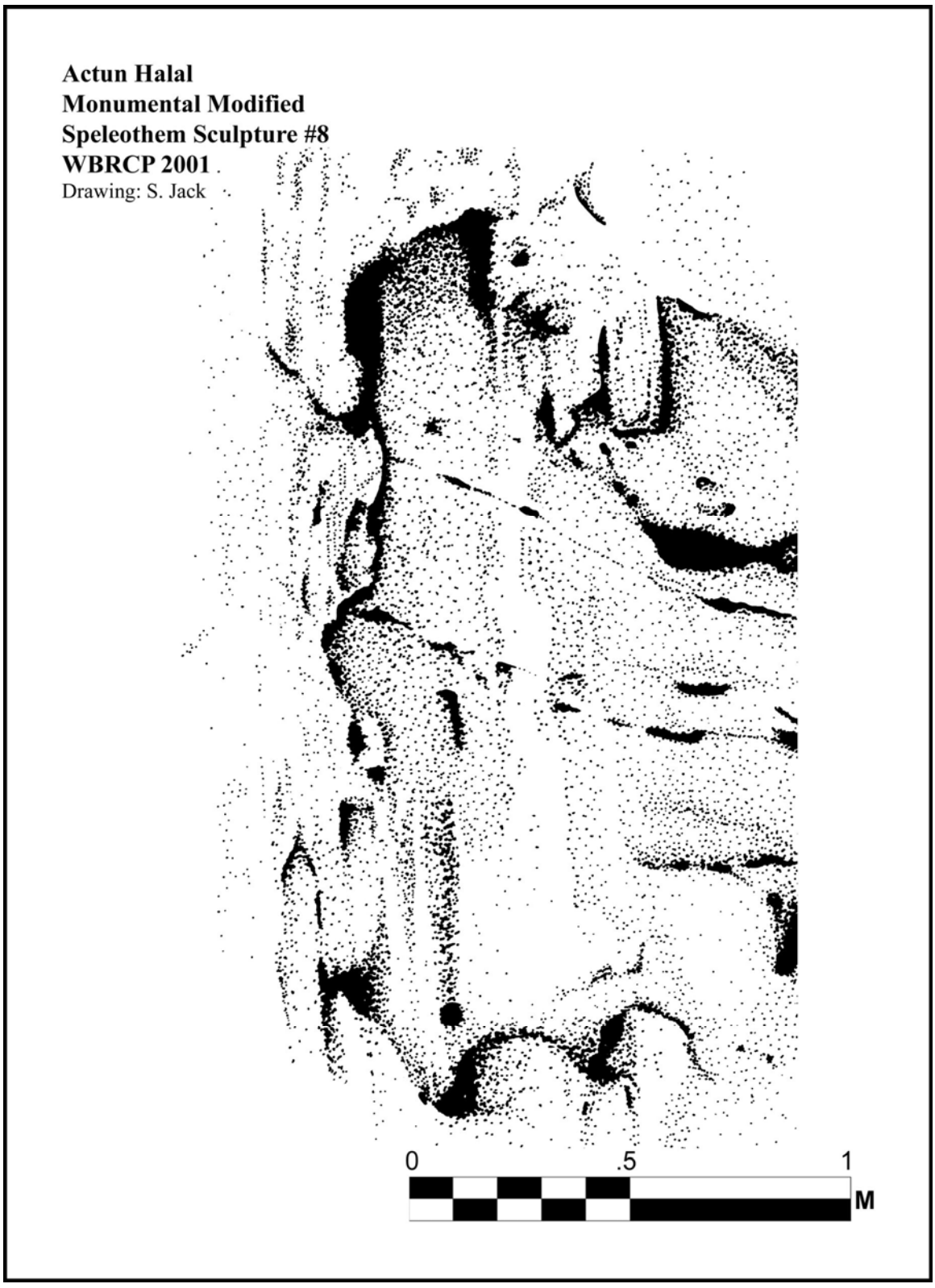

Figure 8: Modified Speleothem Sculpture #8, Actun Halal.

APPENDIX: CERAMIC ANALYSIS

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University of California, Riverside

This appendix presents the preliminary results of the ceramic analysis conducted on the material recovered from Unit 4 extension and Unit 7. Typological and formal constituents of each respective unit by level will be briefly discussed, and an interpretation of the temporality of the unit will be attempted. Formal attributes of the ceramic ware found in the unit will be presented as well, in order to assess possible functional differentiation in the utilization of the areas within the cave.

METHODOLOGY

The methodology used in this ceramic analysis is based on that developed and established in previous seasons by WBRCP and is explained in more detail in the ceramics report of the 2000 field season (see Ishihara 2001). The type:variety analysis was implemented, primarily referring to the typologies established by Gifford (1976), and in part, Sabloff (1975), of the ceramics from the sites Barton Ramie, Belize and Seibal, Guatemala, respectively. An emphasis has been placed on identifying and recording formal attributes of the sherds in an attempt to assess functional utilization of the cave (see Table 1 for the complete listing of ceramics by level). In this report I omit the various attributes observed and recorded, but as part of a future regional analysis, I intend to summarize the types and attributes to modify and adapt the typology specifically to the Macal Valley area. In the analysis, the following main attributes were observed: vessel form, rim or base diameter, other pertinent dimensions, surface treatment, and paste and temper. Sketches of rim profiles, and if appropriate, exterior and/or interior views were drawn (Ishihara 2001: Figs. 2 and 6). For non-diagnostic body sherds, only sherd counts were noted.

As noted above, Unit 4-extension was initiated, in part, to augment the chronological information learned from the original Unit 4 excavated in 2000. Thus, the information presented here should be compared and examined in conjunction with the results of the ceramic analysis reported for the 2000 excavation.

Unit 4-extension

During the previous season in 2000, Unit 4 yielded few ceramics that were highly weathered and fragmentary. Therefore, the extended unit this field season allowed for a more complete sampling although quantitatively diagnostic rim sherds still did not amount to much. Nonetheless, what was recovered adds to the understanding of the temporal framework of the utilization of the cave.

Among the ceramics recovered from Level 1, which includes the surface collection, there are 4 Cayo Unslipped jar rims, 1 Zibal Unslipped jar rim, 2 Mount Maloney Black jar rims, 1 unidentified jar rim, 1 unidentified black-slipped bowl base, 1 bowl or dish rim with formal similarities to Belize Red but with calcite temper (possibly Dolphin Head Red), and 1 unidentified red-and-black-on-orange polychrome bowl or dish rim. Parallel to the material recovered from Unit 4 in 2000, the number of jar specimens (8 specimens) far outnumbers the serving-type bowl or dish specimens (2 specimens, based on rim count).

Level 2 produced the following: 2 jars, 4 bowls, and 1 miniature of a form unidentified. Body sherds from an unidentified brown-and-red-on-cream polychrome was also found. Interestingly, there was 1 questionable Mars Orange body sherd. Types represented include Cayo Unslipped (1 jar rim), Zibal Unslipped (1 jar rim), Alexanders Unslipped (1 bowl rim), Mount Maloney Black (1 LCII bowl rim), Meditation Black (1 LC I bowl rim), Uacho Black-on-Orange (1 bowl rim, same vessel as in level3). Although there is 1 questionable Early Classic sherd (1 unidentified black ware of unidentified form) and 1 questionable Preclassic sherd, the remaining material all date to the Late Classic period.

Like level 1, jars are more numerous than open-mouthed bowls in level 3. Level 3 contained 9 jars, 4 bowls, and 1 body sherd each of a bowl and/or vase and of a bowl and/or dish. Types assigned include Alexanders Unslipped (1 jar rim), Zibal Unslipped (5 jar rims representing 5 vessels), Kaway Impressed (1 bowl body sherd), Garbutt Creek (1 bowl rim), Teakettle Bank Black (1 LCI bowl rim), Mount Maloney Black (1 LCII bowl rim, 3 bowl body sherds), Sotero Red-brown (1 bowl/vase body sherd), and Dos Arroyos Orange Polychrome (1 bowl or dish flange, 1 body sherd). All except the Dos Arroyos Orange Polychrome sherds are of a Late Classic date.

Level 4 revealed 4 jars and 6 bowls (basal sherds included in count), all of which are of Late Classic types. Among the recovered ceramics from this level, there were 1 Zibal Unslipped jar rim, 1 Cayo Unslipped jar rim, 1 Alexanders Unslipped jar rim, 1 Mount Maloney Black jar neck/shoulder sherd, 1 Roaring Creek Red chamfered jar shoulder sherd, 1 Garbutt Creek Red bowl base, 1 Dolphin Head Red bowl base, and 2 rims of a Classic-period, unidentified "cache" vessel (see Culbert 1993).

In Level 5, more Preclassic material was encountered, namely 1 Starkey Incised jar shoulder, 1 Savana Orange jar or bowl shoulder, and several sherds of a Mars Orange Ware (possibly Savana Orange). Throughout the level, there were 4 jar rims, 1 bowl or jar rim, 5 bowls (4 rims and 1 basal sherd), and 1 polychrome bowl or dish flange/ridge sherd. During excavations while the unit was in progress, there was a non-archaeological visit in our absence disturbing the northwestern and northeastern quads of the unit. From the disturbed matrix, 1 possible Dos Arroyos Orange Polychrome rim sherd and 2 non-diagnostic body sherds were found. It should be noted that these sherds may have fallen from the baulk of the unit, and may not be attributable to this level. Aside from the Preclassic material, Late Classic specimens were also found. These include 1 Zibal

Unslipped jar rim, 1 Roaring Creek Red chamfered jar shoulder, 2 Mount Maloney Black bowl rims (1 vessel), 1 Vaca Falls Red bowl rim (or may be Alexanders Unslipped since no slip remains), and 1 Saxche Orange Polychrome flange/ridge sherd. The last level to contain any ceramic material was level 6, but the 6 sherds recovered from this level were non-diagnostic body sherds. Feature 4, which spanned both levels 5 and 6 did not reveal any diagnostic sherds (4 non-diagnostic body sherds).

Unit 7

Unit 7, which consisted of a probing around a cave formation near Entrance 1 (see main text above), only revealed 3 non-diagnostic body sherds from the surface. Because Entrance 1 is at the lower end of the water flow, these sherds most likely were displaced by the water movement flowing from the higher areas toward Entrance 2.

SUMMARY

It is noteworthy that Late Classic ceramics are prevalent in all of the levels of Unit 4-extension excavated this season. This is curious because one of the primary objectives in opening the unit was to reveal the stratigraphic sequence. The location of Unit 4-extension is at the end of a downslope that comes in from Entrance 2. When the rains were heavy this field season, water seeped and a thin stream flowed toward the unit. Over time, it can be inferred that water flow carried soils, ceramic sherds, and other material to the back wall of the cave where Unit 4 is located, hence the seeming temporal mixture of the ceramics down through level 5. However, the presence of Late Classic material in all levels can also be interpreted as the primary temporal utilization of the cave to be in the Late Classic. Yet level 5 contains all but one of the Preclassic sherds (3 sherds). Early Classic ceramics are rarer in this unit (2 Dos Arroyos Orange Polychrome sherds). Certainly, the presence of Preclassic sherds does not prove a Preclassic use of the cave nor does it disprove Preclassic use and explain the 3 specimens simply to be heirlooms. Likewise, Early Classic use cannot be ignored, but material evidence denies heavy utilization of the cave that would have presumably left artifactual remains.

It certainly should be taken into consideration the possibility that ancient cleaning or sweeping of the area may have led to the lack of earlier ceramics recovered. As I mention in the ceramic analysis of Chamber 3b in Actun Chapat (Ishihara this volume), a perusal of the ethnographic literature may aid in obtaining information regarding such cleaning/clearing practices after ritual activities. I am only heeding caution in interpreting the ceramic material found in caves because much of the cultural and environmental transformational processes are not clearly understood, and a naïve equation of quantitative ceramic data to intensity of cave utilization should be avoided. Further ceramic and artifactual data from Maya cave sites combined with information from ethnographic analogies will help to clarify this issue.

UNIT 4 extension

LEVEL 1			Time period
120 nondiagnostic body			
JAR	Cayo Unslipped: Cayo V	1 rim	LC
JAR	Cayo Unslipped: V Unsp (red-slipped)	1 rim	LC
JAR	Cayo Unslipped: Cayo V	1 rim	LC
JAR	Cayo Unslipped	1 rim	LC
JAR	Zibal Unslipped	1 rim	LC
JAR	Mt Maloney Black	1 rim	LC
JAR	Mt Malaney Black	1 rim	LC
JAR	Mt Maloney Black	11 body	LC
JAR?	unidentified	1 rim	n/a
JAR	1 striated; 1 gouged	2 body	n/a
BOWL	Belize Red: Belize V	1 body	LC
BOWL	Mt Maloney Black: Mt Maloney V (1 has poss kill hole)	5 body	LC
BOWL	unidentified--black slipped interior	1 base	n/a
BOWL	unidentified	8 body	n/a
BOWL/DISH	Belize Red: Belize V but calcite-tempered (poss Dolphin)	1 rim	LC
BOWL/DISH	unid polychrome (red-and-black on orange)	1 rim	EC/LC

LEVEL 2			
24 nondiagnostic body			
JAR	Zibal Unslipped	1 rim	LC
JAR	Cayo Unslipped	1 rim	LC
JAR	unidentified--punctated	2 body	n/a
JAR	unidentified--striated	1 body	n/a
BOWL	Alexanders Unslipped ?	1 rim	LC
BOWL	Mt Maloney Black	1 rim	LCII
BOWL	Meditation Black	1 rim	LCI
BOWL	Uacho Black on Orange ?	1 rim (same vess as U4xtnL3)	LC
BOWL?	unidentified--red slipped exterior	1 body	n/a
DISH/BOWL	polychrome--brown and red on cream	2 body	n/a
miniature?	miniature, unslipped	1 rim	n/a
unid	Mars Orange??	1 body	PreCl
unid	Peten Gloss? Black ware	1 body	EC/LC
unid	unidentified--dark red slipped exterior	1 body	n/a
unid	unidentified--black slipped exterior, brown/deep red slip int	1 body	n/a

LEVEL 3			
180 nondiagnostic body; 1 nondiagnostic body w/burnt residue on interior of sherd			
JAR	Alexanders Unslipped: Beaverdam V	1 rim (same vessel as U4xtnL4)	LC
JAR	Zibal Unslipped: V Unsp (Brown)	5 rims (5 vessels)	LC
JAR	unidentified	3 rims (3 vessels)	n/a
JAR	Mt Maloney Black	4 body	LC
JAR ?	unidentified--striated	9 body	n/a
JAR ?	unidentified--punctated	3 body	n/a
BOWL	Kaway Impressed: Kaway V	1 body	LC
BOWL	Garbutt Creek Red: Paslow V	1 rim	LC
BOWL	Teakettle Bank Black: Teakettle Bank V	1 rim	LCI
BOWL	Mt Maloney Black: Mt Maloney V	1 rim, 3 body	LCII
BOWL	Peten Gloss Black ware	1 body, 1base	LC
BOWL	unidentified--"cache" vessel	1 rim? (same "cache" vess as U4xtnL4)	n/a
BOWL	Uacho Black on Orange: V Unsp	1 rim (same vessel as U4xtnL2)	LC
BOWL/VASE	Sotero Red-Brown: Sotero V	1 body	LC
BOWL/DISH	Dos Arroyos Orange Polychrome	1 flange, 1body	EC
BOWL ?	unidentified--light orange slipped exterior	1 body	n/a
unid	unidentified--red ware	5 body	n/a

Table 1: Tabulation of the ceramics recovered from Actun Halal. 2001.

LEVEL 4			
81 nondiagnostic body; 3 body, form n/a, carbonized residue on interior sides			
JAR	Zibal Unslipped	1 rim	LC
JAR	Cayo Unslipped: V Unsp (red slipped)	1 rim	LC
JAR	Alexanders Unslipped: Beaverdam V	1 rim	LC
JAR	unidentified	1 rim	n/a
JAR	Mt Maloney Black: Mt Maloney V	1 neck/shoulder	LC
JAR	Roaring Creek Red: Roaring Creek V (chamfered)	1 shoulder	LC
JAR	possible Tinaja Red?	1 body	LC
JAR ?	unidentified--striated	4 body	n/a
BOWL	unidentified--"cache" vessel: Classic, Ucum (Tikal, Culbert)	2 rims (1 vessel)	n/a
BOWL	Garbutt Creek Red: V Unsp (Brown int) ?	1 base	LC
BOWL	Mt Maloney Black (LCI)	1 rim	LCI
BOWL	Mt Maloney Black: Mt Maloney V	1 body	LC
BOWL	Peten Gloss Black ware	1 body	LC
BOWL	Roaring Creek Red: Roaring Creek V	2 rims, 3 tiny body (2 vessels)	LC
BOWL	Roaring Creek Red: Roaring Creek V (Brown)	1 rim	LC
BOWL	Roaring Creek Red: Roaring Creek V	1 body	LC
BOWL	Dolphin Head Red	1 base	LC
BOWL/DISH	unidentified--red slipped interior?	1 base	n/a
unid	unidentified--red slip; orange slip	2 body	n/a

LEVEL 5			
110 nondiagnostic body (incl 1 thin, tiny orange-slip on exterior); 9 sherds w/burnt residue on interior of sherds			
JAR	Starkey Incised: Starkey V	1 shoulder	PreCl
JAR	Zibal Unslipped	1 rim	LC
JAR	Roaring Creek Red: Roaring Creek V (chamfered)	1 shoulder	LC
JAR	unidentified	1 rim	n/a
JAR	unidentified	1 rim	n/a
JAR	Peten Gloss Black ware	1 body	LC
JAR	unidentified--striated	4 body	n/a
JAR	unidentified--incised	1 body	n/a
JAR	unidentified	1 shoulder	n/a
BOWL or JAR	Savana Orange	1 shoulder	PreCl
BOWL	Mt Maloney Black: Mt Maloney V ?	2 rims (1vess)	LC
BOWL	Vaca Falls Red form, no slip (may be Alexanders Unslipped)	1 rim	LC
BOWL	Roaring Creek Red: Roaring Creek V	1 body	LC
BOWL	possible Roaring Creek Red	1 body (tiny)	LC
BOWL	unidentified--LC:conglomerate of various types (see below*)	1 body	LC
BOWL	unidentified--red slip interior/exterior	1 rim	n/a
BOWL	Mars Orange Ware (Savana Orange) ?	1 base, 1 shoulder, 2 body	PreCl
BOWL	unidentified	3 body	n/a
BOWL/DISH	Saxche Orange Polychrome	1 flange/ridge	LC
unid	unidentified--red-orange slip	3 body (tiny)	n/a
unid	unidentified--black on orange	1 body	n/a
unid	unidentified--orange slip interior, exterior unslipped	1 body	n/a

LEVEL 5 (disturbance 1: NW Quad-poss Looters' area)			
21 nondiagnostic body			
BOWL/DISH	poss Dos Arroyos Orange Polychrome	1 rim	EC

LEVEL 5 (disturbance 2: NE Quad-Looters' area)	
2 nondiagnostic body	

LEVEL 6	
6 nondiagnostic body	

LEVEL 5,6 (Feature 4)	
4 nondiagnostic body	

UNIT 7	
SURFACE	
3 nondiagnostic body	

*conglomerated forms are Teakettle Bank Black (ash)+Dolphin Head Red (slip)+Garbutt Creek Red :Paslow (slip color)
LC=Late Classic; EC=Early Classic; PreCl=Preclassic

Table 1 continued.

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PRELIMINARY RESULTS OF THE CERAMIC ANALYSIS FROM CHAMBER 3B, ACTUN CHAPAT, MACAL VALLEY, CAYO DISTRICT, BELIZE.

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INTRODUCTION

In this report, I present preliminary results of the ceramic analysis conducted on the material recovered from Chamber 3b of Actun Chapat during the 2000 field season, under the auspices of the Western Belize Regional Cave Project. Surface collections and excavations of Chamber 3b were led by Josalyn Ferguson and the results are reported elsewhere (Ferguson 2000). The ceramic data presented here are part of a larger ceramic database consisting of data accumulated from previous seasons, which include ceramics from numerous cave sites in the Macal Valley: Actun Chechem Ha (Ishihara 2000; Ishihara, Awe and Helmke 2000), Actun Halal (Griffith and Helmke 2000, Griffith and Morehart 2001, Griffith and Ishihara this volume), Yax Caan chultun #1 (Griffith et al. 2000), and Entrance 2 of Actun Chapat (Ishihara 2000). The Project's objectives as stated in Awe (1998) are (1) "to enhance our knowledge of the role of caves in ancient Maya society," and (2) "to determine whether there were temporal, social, and regional differences in the use of caves in the Maya lowlands" (Awe 1998:2). A regional examination of the ceramic remains plays a critical role in attaining the Project's larger goals. Not only can we look at temporal utilization of the caves and changes in spatial utilization through time, but we can also focus on modal attributes to aid us in the understanding of functional, social and perhaps political aspects involved in ancient cave activities.

METHODOLOGY

The methodology used in this ceramic analysis is based on that used in previous seasons by WBRCP and is explained in more detail in the ceramics report of the 2000 field season (see Ishihara 2001). Here I will briefly outline the format used to obtain data and the attributes collected. First of all, a type-variety analysis based on the typologies established by Gifford (1976) at Barton Ramie and by Sabloff (1975) at Seibal was undertaken (Table 1). Additionally, for each diagnostic sherd, the following attributes were observed and documented: vessel form, rim or base diameter, other pertinent dimensions (i.e., neck height for jars, rim/body sherd thickness), surface treatment (i.e., slip, punctations, incisions, gouges, impressions, appliqués, etc.), and paste and temper (i.e., paste color, paste consistency, core, temper type, temper size). Sketches of rim profiles and exterior and/or interior views (to illustrate notable surface treatments) were made as well. For non-diagnostic body sherds, only sherd counts were noted.

Ceramic material was recovered from surface collections on Terraces 20, 22, 23, 24, 25, in the Central Boulder area, and from excavations in Units 10, 11, and 12. Formal and temporal aspects of the ceramics recovered from each area will be discussed below, followed by a summary of the entire area of Chamber 3b.

Terrace 20

Three of the five looter pits (LP1-3) found in Chamber 3b were encountered on Terrace 20, suggesting that this area originally contained artifacts or features attractive to looters. Interestingly, this terrace was one among several that had "dense concentrations of sooty ash, with charcoal flecking and pieces interspersed throughout, located along the cave wall" (Ferguson 2000). The ceramic remains point to a predominantly Late Classic date. At least 12 different vessels appear to be represented: 7 jars, 2 monochrome bowls, 1 bichrome bowl, 1 polychrome bowl or dish, and 1 intact pot stand. Types represented are Cayo Unslipped (5 jar rims of 3 vessels), Zibal Unslipped (1 jar rim), Mount Maloney Black (4 jar body sherds), Vaca Falls Red (1 bowl base), McRae Impressed (1 bowl basal flange/ridge), a possible Garbutt Creek Red (1 bowl body), a possible Macal Orange-Red (1 intact pot stand), and an unidentified Pine Ridge Carbonate Red ware (1 jar body). I have typed 2 jars (3 rim sherds) as Chan Pond Unslipped, but due to a paucity of typological research on jar forms, I only tentatively assign them as such based on rim forms, surface treatment, and paste characteristics as defined in Gifford (1976). The majority of the sherds date to the Late Classic time period, although earlier specimens may be present (i.e., the orange polychrome may or may not be earlier, and if the tentatively typed jars mentioned above are correctly assigned, then they would be of a Preclassic date).

Terraces 22, 23, 24, and 25

Ceramic material recovered from surface collections on Terraces 22, 23, and 24 were minimal. From Terrace 22, 1 Saxche Orange Polychrome bowl body sherd (Tiger Run), 1 Mount Maloney Black jar basal or body sherd, and 1 unidentified ring base of a bowl were found. Terrace 23 only yielded a few body sherds, including Mount Maloney Black jar body sherds. A Zibal Unslipped jar rim sherd and several body sherds of Mount Maloney Black jars (3 vessels) were found with additional body sherds of unidentified types on Terrace 24. Only 1 unidentified jar body sherd was found on Terrace 25. The lack of artifacts on the surface lends some credibility to the idea suggested by Ferguson (2000) that terrace surfaces were swept clean of debris from burning activity (and, I will add, of the artifactual material associated in the activity) that appears to have taken place. However, the high degree of modern activity by non-archaeologists in Actun Chapat in general may account for the displacement and/or lack of archaeological material on the surface.

Central Boulder area

North: Both Early Classic and Late Classic types are found in similar quantities in this area. Of the Late Classic types, there are 6 rim sherds representing 4 Cayo

Unslipped jars and 2 Mount Maloney Black bowls (3 rim sherds and 6 body) (these may be typed to be of LCI and LCII: see LeCount 1995 for micro-seriation). The Early Classic specimens consist of 1 Pucte Brown jar (2 rims that refit), 1 Dos Arroyos or Minanha Red bowl flange sherd, and 1 Balanza Black bowl rim sherd.

South: The majority of the ceramics found in this area consisted of Late Classic types, but one Middle Preclassic sherd was encountered. Five jars of Alexanders Unslipped (2 rim sherds of 1 vessel), Cayo Unslipped (3 rims of 3 vessels), and Zibal Unslipped (1 rim sherd) were found as well as 1 unidentified (Late Classic form, may be Belize Red or Tinaja Red) hollow bulbous foot of a bowl or dish and 1 Roaring Creek Red bow rim sherd. Additionally, there were body sherds of Mount Maloney Black (3 jar, 4 bowl), Vaca Falls Red (2 body), and 5 unidentified types. The single Middle Preclassic sherd is a Savana Orange: Rejolla Variety base sherd.

Unit 10

As noted by Ferguson (2000), not many artifacts were recovered and only 36 sherds were found from Unit 10, of which the greater majority of them were non-diagnostic body sherds. A possible Early Classic Balanza Black jar neck/shoulder sherd from level 1, and Chan Pond Unslipped jar sherds (tentatively typed) and an orange polychrome rim (Dos Arroyos or perhaps Ixcanrio Orange Polychrome) from levels 2 are the only diagnostic sherds from this unit. From level 4, marked as having burnt matrix, were 2 tiny non-diagnostic body sherds with carbon adhering to one broken edge of a sherd. The last cultural level, level 5, yielded 5 non-diagnostic body sherds. It is difficult to assess the temporal framework of this unit, which would provide time frame for the construction/use of the terrace, because of the questionable typological assignments and the extremely limited number of ceramic specimens, not to mention the shallow stratigraphy (32cm dbd).

Unit 11

This unit was placed partly as a salvage excavation of looter pit 4 on Terrace 26. Because only the top two levels were noted to be disturbed, it is noteworthy that sherds from only one vessel appear to have been recovered from the entire unit. Sherds from the possible Tinaja Red jar (9 body sherds and no rims) are found throughout all of the levels of the unit, down up to where the plastered, artificial floor was encountered. This suggests that the jar was placed or disposed after the plastered floor and terrace had been built, indicating that the floor is contemporary with or earlier than Late-Terminal Classic. Additionally, a speck of carbon adhered to the single sherd found on the floor, suggesting this vessel had some sort of association with burning activity in the area on the plastered floor. Interestingly, upon removal of the rocks comprising the terrace wall, a drilled conch shell fragment was found (Ferguson 2000). No ceramic material was recovered from underneath the floor, which indicates that there was a lack of activity or limited activity in the area before the terrace was constructed (or perhaps cleaned well prior to construction leaving no material remains).

Unit 12 and 12-extension

Regardless of the fact that the largest number of artifacts (104 sherds) was recovered from this unit, rim sherds were minimal (only 5 jar rims and 1 bowl rim), hence assessment of the temporal and formal attributes is difficult. The ceramic types present in the sample are: for jars, Cayo Unslipped (4 rims of 3 vessels), Mount Maloney Black (22 body sherds), Chan Pond Unslipped (tentative) (15 body sherds), Zibal Unslipped (2 rims), Vaca Falls Red (3 body), and Peten Gloss Ware (1 body); for bowls, Rubber Camp Brown (1 body), and Uacho Black-on-Orange (1 rim). Based on the quantitatively limited data, a Late Classic to Terminal Classic date can be assigned to the shallow (38cm dbd for Unit 12, 27cm dbd for Unit 12-extension; Ferguson 2000) stratigraphy present in the unit.

Level 3 of Unit 12 is reported to be comprised of a burnt matrix with soot and ash (Ferguson 2000). It is interesting to note that a modified conch shell fragment with an incision was found in this level. Level 3 of the extended unit revealed a cluster of ceramic sherds (Feature 1) and a 1 lithic. The ceramics from this feature were entirely comprised of body sherds, and because of this, the typological assessment is not reliable. This level of Unit 12-extension was the bottom-most level as it terminated upon reaching the cave wall. Samples of the burnt matrix were collected and are presently being analyzed (Morehart pers. comm.).

SUMMARY

Any assessment of the area with regards to time period of utilization (and with construction of the architecture even more so) and functional uses, based on the limited number of specimens and small number of rim sherds or other diagnostic vessel sherds, must be approached with caution (i.e., quantity may or may not equate so easily to degree or intensity of use). The concentration of looter pits in the area augments this difficulty, but does point to some significance to the area if looter pits are considered an indication to the archaeologist. Temporally, the majority of the ceramics point to a Late-Terminal Classic date, likely signifying that the latest use was during the Late-Terminal Classic. From the ceramic material that remains, jar forms (23 jars) are more numerous than bowls and/or dishes (15 bowls/dishes) (the conservative number is based on diagnostic sherds representing separate vessels). It should be noted that a direct correlation between the paucity of ceramics from earlier time periods and lack of use during those time periods must not be made; it is plausible that sweeping and clearing of the area after and/or before each activity occurred, if the area was used on numerous occasions and not a single-time event. Therefore, consideration of behavioral processes and other site formation processes is imperative, and examination of the ethnographic literature may provide insight.

TERRACE 20, LP1-3, southern terrace			
cat#: CHP00-CH3B-063			
36 nondiagnostics, body			time period
JAR	Cayo Unslipped	5 rims (3 vessels)	LC
JAR	unidentified	1 rim	n/a
JAR	Zibal Unslipped	1 rim	LC
JAR	Chan Pond Unslipped (tentative)	1 rim	Precl?
JAR	Chan Pond Unslipped ? (tentative)	2 rims (1 vessel)	Precl?
JAR	unidentified-striated	2 body	n/a
JAR	Mt Maloney Black	4 body	LC
JAR	unidentified, brown slip exterior	2 body (refits)	n/a
JAR	Pine Ridge Carbonate Red ware	1 body	LC
BOWL	Vaca Falls Red	1 base	LC
BOWL	Pine Ridge Carbonate Red ware	2 body	LC
BOWL	Garbutt Creek Red ?	1 body	LC
BOWL	McRae Impressed: McRae V	1 basal flange/ridge	LC
BOWL/DISH	unidentified (LC form) bichrome	1 rim	LC
BOWL/DISH	Orange Polychrome	2 body+1 ring base	LC/EC
unidentified	unidentified	1 body	n/a
unidentified	unifentified	1 body	n/a
POTSTAND?	Macal Orange-Red ?	whole	LC

TERRACE 22, surface			
cat#: CHP00-CH3B-058			
3 nondiagnostics, body			time period
JAR	unidentified-punctated	1 body	n/a
JAR	Mt Maloney Black: Mt Maloney V	1 base or body	LC
BOWL	unidentified	1 ring base	n/a
BOWL	Saxche Orange Polychrome	1 body	LC

TERRACE 23, surface			
cat#: CHP00-CH3B-062			
8 nondiagnostics, body			time period
JAR	Mt Maloney Blk: Mt Maloney V	2 body	LC
JAR	unidentified-striated	1 body	n/a

TERRACE 24, surface			
cat#: CHP00-CH3B-060			
14 nondiagnostics, body			time period
JAR	Zibal Unslipped: V Unspecified (Brown)	1 rim	LC
JAR	Mt Maloney Blk: Mt Maloney V	4body+1shoulder(3ves	LC
JAR ?	horizontally incised	1 body	n/a
unid	striated	1 body	n/a

TERRACE 25, surface			
cat#: CHP00-CH3B-061			
16 nondiagnostics, body			time period
JAR	unidentified	1 body	n/a

Central Boulder-north, surface			
cat#: CHP00-CH3B-056			
48 nondiagnostics, body			time period
JAR	Cayo Unslipped	6 rims (4vessels)	LC
JAR	Pucte Brown	2 rims (refits)	EC
JAR	Mt Maloney Black	5 body	LC
BOWL	Mt Maloney Black (LC I, LC II)	3rims+1body (2 vess)	LCI/II
BOWL/DISH	Dos Arroyos or Minanha Red	1 flange	EC
BOWL/DISH	Balanza Black: V Unspecified	1 rim	EC
BOWL/DISH	unid:similar to Belize Red/Vaca Falls	1 body	LC

Central Boulder-south, surface			
cat#: CHP00-CH3B-057			
66 nondiagnostics, body			time period
JAR	Alex Unslipped	2 rims (1 vessel)	LC
JAR	Cayo Unslipped	3 rims (3 vessels)	LC
JAR	Zibal Unslipped	1 rim	LC
JAR	Mt Maloney Black	2 body, 1 shoulder	LC
JAR	Vaca Falls Red ?	2 body	LC
JAR	unidentified	5 body	n/a
BOWL	Savana Orange: Rejolla V	1 base	LC
BOWL	Mt Maloney Black	1 body	LC
BOWL	Roaring Creek Red: Roaring Creek V	1 rim	LC
BOWL or DISH?	LC:similar to Belize Red, possibly Tinaja Red	1 hollow bulbous foot	LC

UNIT 10			
Level 1			
cat#: CHP00-CH3B-002			
10 nondiagnostics, body			time period
JAR ?	Balanza Black: Cadena Creek ?	1 neck/shoulder	EC
LEVEL 2			
cat#: CHP00-CH3B-005			
11 nondiagnostics, body			time period
JAR	Chan Pond: Chan Pond V? (tentative)	1 shoulder, 1 body	Precl?
BOWL	Ixcanrio Orange-Polychrome: Ixcanrio V.	1 rim	Precl

LEVEL 4 (burnt matrix)		
cat#: CHP00-CH3B-010		time period
2 tiny nondiagnostics, body--carbon on 1 broken edge of sherd		n/a

LEVEL 5/6			
cat#: CHP00-CH3B-014			time period
5 nondiagnostics, body			n/a

UNIT 11			
LEVEL 1			
cat#: CHP00-CH3B-052			time period
JAR	possible Tinaja Red	1 body	LC

LEVEL 4			
cat#: CHP00-CH3B-034			time period
JAR	possible Tinaja--same vessel as above	2 body	LC

LEVEL 5			
CHP00-CH3B-041,043			time period
JAR	possible Tinaja Red--same vessel as above	1 body	LC
JAR	possible Tinaja Red--same vessel as above	5 body	LC
unid	burnt? exterior is unslipped	2 body	LC

LEVEL 6 (artificial floor)			
CHP00-CH3B-044			time period
JAR-1 speck of carbon on she	possibly Tinaja Red:same vessel as above	1 body	LC

Unit 12			
surface, w/in 75cm radius			
cat#: CHP00-CH3B-064			
74 nondiagnostics, body			
2 nondiags, ext burned and charred (jars)			time period
JAR	Cayo Unslipped-1 pie-crust, 1no pie-crust but everted	2 rims	LC
JAR	unidentified-brown slipped	4 body (3 refit)	n/a
JAR ?	unidentified	1 shoulder?	n/a
BOWL	Rubber Camp Brown ?	1 body	LC

disturbed surface			
cat#: CHP00-CH3B-028			
40 nondiags, body			time period
JAR	Mt Maloney Black or Peten Gloss Black Ware	1 body	LC
JAR	Cayo Unslipped: Matte Brown-smudged	2 rims (1 vessel)	LC

Level 2			
cat#: CHP00-CH3B-027			
8 nondiagnostics, body			time period
unidentified	unidentified-orange-red slipped exterior	1 body	n/a

Level 3 (burnt/ash/stone)			
cat#: CHP00-CH3B-024			
34 nondiagnostics, body			
1 interior highly charred sherd			time period
JAR	Zibal Unslipped ?	1 rim	LC
BOWL	Uacho Black on Orange	1 rim	LC
unid	unidentified-red slip ext/int-tiny sherd	1 body	n/a

Level 4 (SW)			
cat#: CHP00-CH3B-022			
8 nondiagnostics, body			time period
JAR	Zibal Unslipped ?	1 rim	LC
JAR	unidentified-striated	1 body	n\a
JAR	Vaca Falls Red	3 body	LC
unidentified	unidentified-orange slip exterior	1 body	n\a

UNIT 12-extension			
surface			
cat#: CHP00-CH3B-030			
13 nondiagnostics, body			time period
JAR	Peten Gloss Black ware	1 body	LC
JAR	unidentified-brown slipped	1 body	n/a
JAR	Chan Pond Unslipped ? (tentative)	8 body	Precl?

Level 3, Feat#: CHP001-F1			
cat#: CHP00-CH3B-033			
14 nondiagnostics, body			time period
JAR	Mt Maloney Black ?	21 body	LC
JAR	Chan Pond Unslipped ? (tentative)	7 body	Precl?
JAR	unidentified-striated	6 body	n\a
unidentified	unid:interior dark red, exterior glossy black	1 body	n/a

Table 1: Tabulation of the ceramics recovered from Chamber 3b, Actun Chapat.

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PRELIMINARY ARCHAEOLOGICAL INVESTIGATIONS IN ACTUN OXYEHUB, SIBUN VALLEY, BELIZE

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INTRODUCTION

In June of 2001 the Belize Department of Archaeology notified the Western Belize Regional Cave project of the discovery of a new cave in the Sibun Valley. Workmen from David Shaw's logging camp in the Sibun discovered the cave during the course of their work. Upon hearing their report, Mr. Shaw visited the cave, took photographs, and contacted the Department of Archaeology and his friend Tom Greenwood of Melmish tours. Prior to the DOA/WBRCP visit the cave was unnamed. The cave was given the name Actun Oxyehub ("Three Shell Cave") due to the presence of numerous conch, jute, and pomacea shells throughout the site.

Tom Greenwood, in conjunction with the Department of Archaeology, helped to organize the reconnaissance mission to Actun Oxyehub. Manuel Esquivel and Luis Guerra Jr., both of Melmish tours, led René Torres of the DOA and a small group of the WBRCP to the cave site. Esquivel and Guerra indicated that they had visited the cave frequently in the past and guided tourists to the cave and other caves in the area. Esquivel and Guerra also noted that they are well aquatinted with the area around Actun Oxyehub and that they know the location of 30 caves or more in the area between David Shaw's camp and Indian Church.

LOCATION

David Shaw's logging camp is located off of the coastal road in the Manatee Reserve. This camp may be reached via a dirt road leading West off of the coastal road. The logging camp is located at UTM 16Q 341259E 1908209N. From this location Actun Oxyehub may be reached via a 25-minute hike on logging trails. Based on pace and compass traverse readings taken along the trail UTM coordinates for Actun Oxyehub are UTM estimated to be 16Q 340801E 1908330N. All UTM coordinates are based on datum WGS84.

RECONNAISSANCE METHODOLOGY

The preliminary reconnaissance of Actun Oxyhehub took place over the course of two days. Archaeological endeavors included exploration of the site, tape and compass

mapping, documentation and inventory of surface artifacts, and the recording and illustration of rock art. Artifacts were tabulated *in situ* by chamber or entrance location and left in their original locations. The cave was mapped by establishing baselines on cardinal directions with a Brunton compass and taking perpendicular offsets at 50 cm intervals along the baseline. When significant cave features and/or artifacts were encountered outside of the 50m offset interval these features were point provenienced from the baselines. No permanent datums were established during the time of the survey and all mapping materials were removed upon the completion of the reconnaissance mission.

SITE DESCRIPTION

Actun Oxyehub is comprised of a series of limestone phreatic solution chambers within a small karst outcrop approximately 25 m high and 40 m in diameter (Figure 1). A total of six entrances into the karst outcrop were documented during the reconnaissance of the cave, four of which are rockshelter-like overhangs with the other two being small entrances to constricted tunnel passages.

Entrance 1

Entrance 1 is a clamshell-shaped entrance measuring 14 m wide and a maximum of 9 m deep. The height of Entrance 1 is approximately 14 m at maximum, yet there are varying degrees of ceiling height due to fact that there are numerous flow stone formations growing out of the karst. Entrance 1 has numerous ledges and pockets in the karst as well as several flowstone formations within the entrance. At approximately the centerline of entrance 1 there is a bedrock outcropping and a number of small limestone rocks, some of which may be cut stones. Outside the drip line directly in front of Entrance 1 is a roughly rectangular feature that has a uniform surface at a 22-degree slope, running 18m north-south and 9m east-west. This feature may be a staircase or ramp although a definitive classification is not possible without further investigation.

There are numerous potsherds scattered in Entrance 1. Within Entrance 1 there is a small niche that contains four large complete ollas. Based on information from the local guides is likely that the ollas are not in their original context but were originally located elsewhere inside the cave. The ollas have a strip of red slip from the rim down 4 inches towards the base, while the rest of the vessel bodies are unslipped. All of the ollas are roughly 35 cm in height with 22 cm rim diameters. All 4 vessels contain small kill-holes and calcium carbonate accretion. This accretion further supports the idea that the ollas were removed from their original location, as the small niche does not contain flowstone formations.

Entrance 2

Entrance 2 is 5 m wide and 4.5 m high, with depth of 4 m at maximum. Above the ceiling of entrance 2 there is a ledge approximately 4 m wide with a ceiling

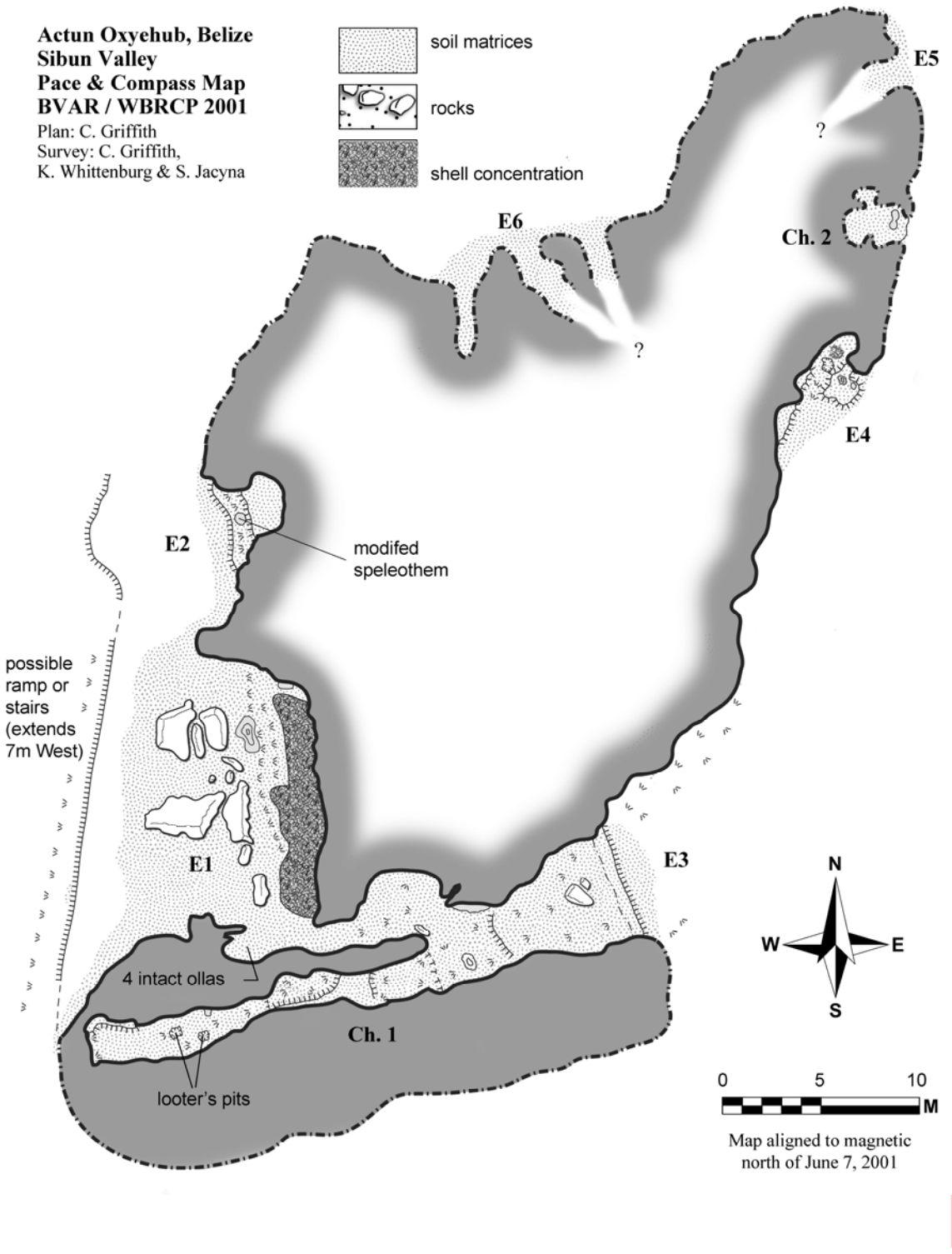

Figure 1: Plan View of Actun Oxyehub.

approximately 3 m high (this ledge was not visited but only inspected visually from the surface of Entrance 2). A prominent stalagmitic formation measuring 1.12 m high with a maximum diameter of 34 cm is located in the middle of Entrance 2. This formation has two distinct "eye hole" modifications at the top (Figure 2) and it is possible that other areas of the formation were modified in antiquity, yet these modifications are superficial. The area behind the formation is flat and appears to have been modified to result in an altar-like or ledge like platform. The formation has a constant flow of drip water that lands directly on the top of the formation.

Entrance 3

Entrance 3 is approximately 6 m in height and 6 m wide. This entrance can also be accessed by a small tunnel or hallway 4 m in width that connects entrances one and three. Just within the dripline there are several large boulders on the surface, all of which are extremely pitted and eroded. Five meters above the surface of Entrance 3 there is a ledge 1.5 m above the surface, which spans the width of the entrance and extends back approximately 5 m. There are several badly eroded flowstone formations hanging from this ledge and attached to the walls of Entrance 3. From the mouth of Entrance 3 the ground slopes steeply downhill and east to the valley floor 6 to 7 m below.

Entrance 4

Entrance 4 is a shallow overhang 6 m wide with a small recess at the north end that contains a concentration of various shells. The walls are much smoother than Entrance 3 with much less erosion. The main overhang has a flat roof about 7 m wide extending up to 5 m from the back wall.

Entrance 5

Entrance 5 is situated north of entrance 4 on the eastern rockface of the karst formation. This entrance was not surveyed due to limited time frame however it leads in to a tunnel of approximately 7-8 m long and 3-4 m wide.

Entrance 6

Entrance 6 is located in the northern part of the karst outcrop. This entrance is approximately 10 m high, 12 m wide, and ranges from 2 to 5 m deep, although time constraints prevented a detailed survey and account of this entrance. There are at least three tunnels that feed in to the karst from Entrance 6, yet these were not explored during the reconnaissance efforts.

Chamber 1

Chamber 1 is a narrow passage extending west into the karst from Entrance 3. The chamber is 18 m long and a maximum of 2 m wide, which makes it resemble a

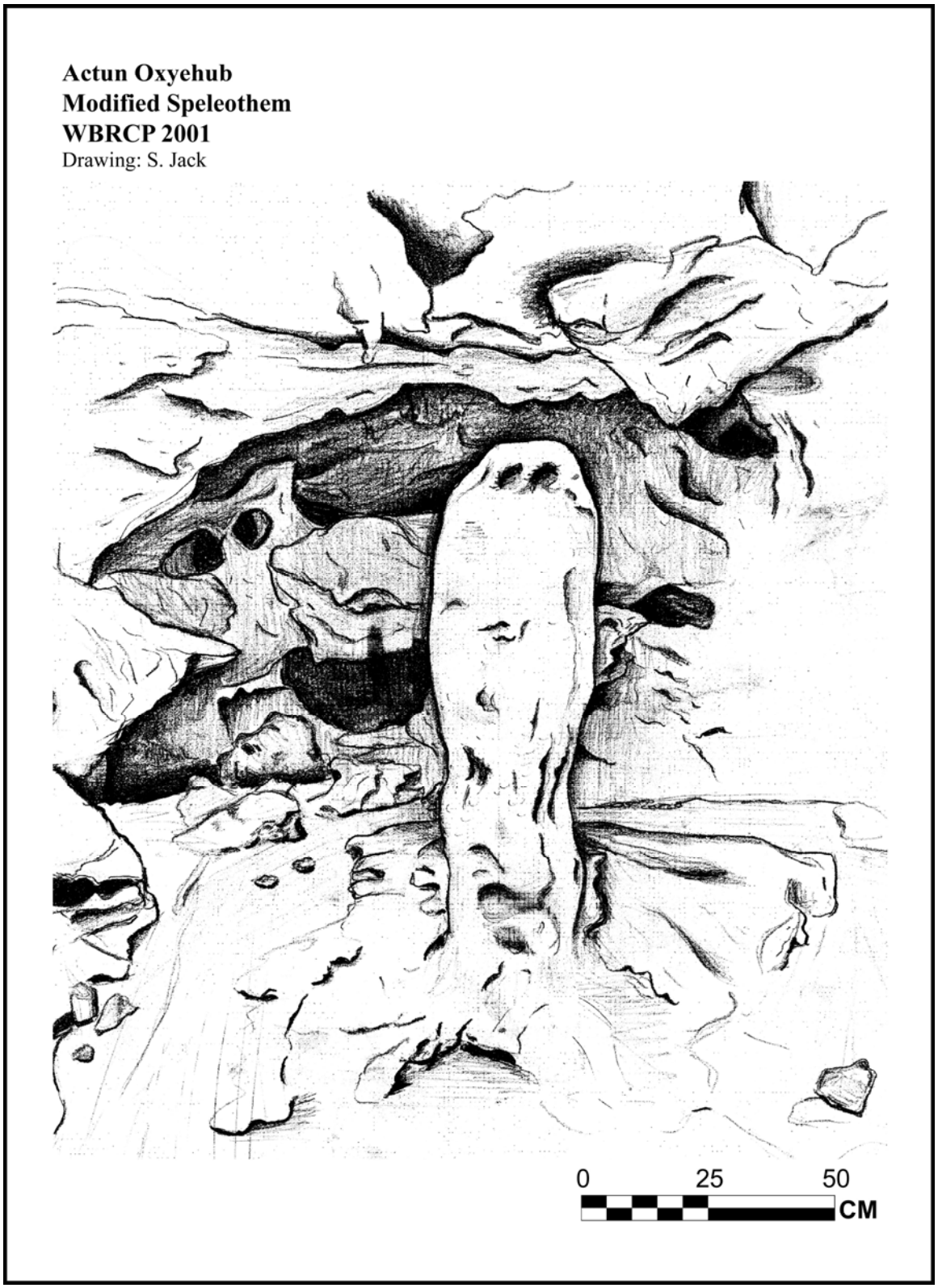

Figure 2: Modified Speleothem (active) in Entrance 2, Actun Oxyehub.

Area	Artifact	Total	Comments
Entrance 1	intact ollas	4	All 4 pots are the same size and have kill holes. All exhibit a red slip 4 cm below rim. All are missing fragments from rim.
	rim sherds	16	
	body sherds	16	
	Pomacea shells	523	
Entrance 2	modified stalagmite	1	Stalagmite is still active and in location of natural growth.
Entrance 3	body sherds	13	
Entrance 4	Pomacea shells	336	
	small conch shells	6	
	jute shells	107	
Entrance 5	N/A		(Time constraints prevented documentation).
Entrance 6	intact dish	1	Discovered outside of dripline--likely left behind by looters.
Chamber 1	conch shells	2	
	human bone	2	1 vertebra, 1 femur fragment
	faunal bones	n/a	Numerous bones, not tabulated due to time constraints
Chamber 2	ceramic sherds	n/a	1 polychrome sherd and other body sherds noted. (Time constraints and difficult access prevented full documentation).

Table 1: Preliminary artifact inventory of Actun Oxyehub.

passage more so than a chamber. At the entrance of the chamber there are several large limestone rocks. Based on similar contexts from other caves it is likely that this passage was once walled in by the ancient Maya.

The floor matrix is ashy dirt with numerous pieces of carbonized material pieces scattered through out the passage. The karst rock on the ceiling and flowstone on the walls are blackened and charred, indicating the area was subject to intense burning. The end of the passage contains a trapezoidal karst formation, which may have been modified, along with fist size rocks, all of which are blackened as well. The trapezoidal formation has a flat, square top that measures roughly 25 cm on a side. It is difficult to tell whether or not this limestone formation is part of the bedrock or was imported.

In the center of the passage there is a small looters' pit measuring approximately 30 cm in diameter and 15 cm deep. Within the pit distinct stratigraphic layers and ash lenses are evident. The matrix below the ash and soot lenses is a reddish-brown silty dirt. Human and faunal bone fragments and bone shatter are within the pit and scattered around the pit. All of the human remains, aside from those subjected to post-depositional trauma by the looters, are well preserved.

Chamber 2 (Entrance 7)

Chamber 2 is located 1.5 m above the ground surface between entrances 4 and 5. The chamber is approximately 2 m deep by 2 m wide. The passage leads to a drop-off and a conically shaped passage, which limits human access. Time constraints and the limited access prevented full documentation and exploration of this chamber.

ARTIFACT ASSEMBLAGE

During the course of the exploration and mapping procedures in Oxyehub the crew tabulated and recorded artifacts present on the cave floors (Table 1). This documentation was expedient and basic field assessment, and thus by no means a thorough or complete inventory or analysis of the materials inside the cave.

SUMMARY

The brief reconnaissance mission by members of the WBRCP and the DOA produced important information about the cave site Actun Oxyehub. However, these efforts must be considered preliminary and incomplete at best due to the limited time and resources allotted to the reconnaissance. Actun Oxyehub has fallen prey to limited looting, and is subject to more in the future, as hunters, loggers and other people passing through the area have visited the site on various occasions. Tour guides have been conducting expeditions to the cave, most likely due to the accessibility of the site and because exploration of the cave does not require the use of elaborate caving gear.

In many respects the artifact assemblage of Actun Oxyehub is similar to those found in the majority of the caves previously investigated by the WBRCP. Intact vessels,

ceramic sherds, human and faunal bone, and modified speleothem formations are quite common within the caves of Belize. However, the overwhelming abundance of various shells (marine, lacustrine, and riverine) is an intriguing aspect of the assemblage within Actun Oxyehub and thus makes this site an excellent candidate for future archaeological investigations.

PRELIMINARY INVESTIGATIONS IN ACTUN CHUPLAL, MACAL VALLEY, BELIZE

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INTRODUCTION

During the 2001 season investigations in the Macal River Valley members of the Western Belize Regional Cave Project (WBRCP) discovered a small cave in close proximity to entrance one of Actun Halal. The cave was mapped and explored between mid July and early August over a period of five days. The investigations included identifying Maya cultural artifacts and modifications to the cave, mapping, and surface collections of ceramics and lithic materials.

Actun Chuplal contains ceramic sherds, lithic tools, ash deposits, manuport speleothems, modified sections of the cave wall, and one petroglyph. The cave also contains a large, active speleothem formation with evidence of modification (Modified Speleothem Sculpture #1). This paper presents the preliminary investigations and findings in this small yet important Maya cave site.

SITE DESCRIPTION

Actun Chuplal ("Young Woman Cave") is a small cave 30 meters to the East of Actun Halal (see Griffith et al., this volume). The entrance of the cave is 5 m wide by 4.5 m high and opens up into the same karst outcrop that contains Actun Halal. The floor of the cave slopes upward from the entrance for most of the length of the cave at an angle of approximately ten degrees. The cave floor is a fine tan-colored matrix covered with dried bat guano, seeds and fruit shells from animal activity, and fist-sized breakdown stones. The ceiling of the cave slopes downward from the entrance so mush so that most of the cave necessitates crawling or stomach-crawling. Outside the cave entrance the ground slopes steeply approximately 40 meters down to the dry arroyo below.

Actun Chuplal consists of one main passage, Passage 1, extending South from its entrance, which constricts to define a smaller passage, Passage 2 (Figure 1). Passage 1 is divided by large flowstone formations and boulders in the center of the cave. The light

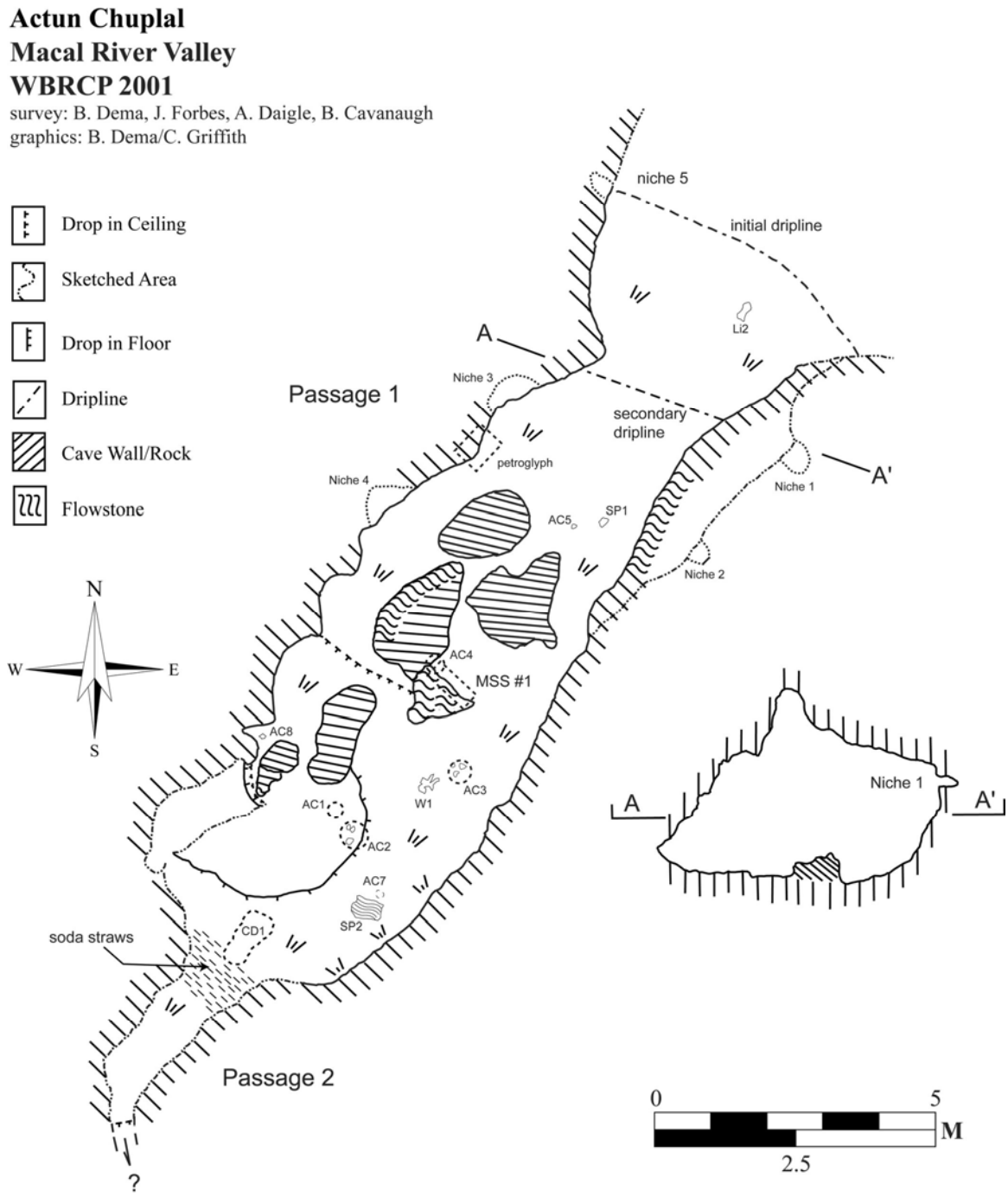

Figure 1: Map of Actun Chuplal with areas of interest mentioned in the text.

zone of the cave extends just past these boulders about 12 meters into the cave. The walls on either side of the main cave passage are spotted with small niches. Fifteen meters into the cave the passage constricts sharply in width and height. This area was labeled Passage 2, and extends south from the Eastern portion of Passage 1. This passage is extremely small and has a floor piled high with mud and guano. This passage extends off to the East but has not been mapped or fully explored because of its constricted size. At the junction between Passages 1 and 2 the ceiling is covered with numerous soda straw formations. This is the most active dripwater section of the cave. Beyond this junction the rest of the cave space falls within the dark zone. The Western side of the main passage ends with a squeeze into a small area (Chamber 1) that measures 1 m wide and 8 cm high.

Actun Chuplal is also home to many forms of troglodytic animal life including sparrows, bats, assassin beetles, tarantulas, scorpions, flies, cave crickets, and scorpion spiders. The cave also shows signs of human usage. We identified eight artifact clusters composed of ceramic sherds and lithic hand tools. The abundance of bat guano on the floor of the cave and the substantial number of breakdown pebbles likely conceal many cultural remains from surface inspection.

SURVEY AND MAPPING

Due to the small size of the cave a scale of 1:50 was chosen for the survey and mapping of Actun Chuplal. This scale allowed us to point-provenience the morphological and cultural features of the cave. The survey was accomplished by establishing baselines between four datums and taking offset measurements. The baselines were established with a Brunton Pocket Transit, and a Suunto orienteering compass with a clinometer was employed to determine the slope of non-horizontal baselines. Some areas of the cave were only sketch-mapped because of their difficult access and constricted size. These areas are the southernmost end of Passage 2 and Chamber 1. The areas of flowstone, the modifications in the cave walls, and the “large pebbly breakdown” were also sketched. Although the cave’s small size made certain aspects of mapping difficult, it also allowed us to point-provenience every artifact including single ceramic sherds. The positions of all artifact clusters were point-provenienced except for Artifact Cluster 6, which was sketched. All the niches in the cave wall were provenienced. The location of Modified Speleothem Sculpture #1 was also mapped in detail.

The entrance of the cave was profiled at an area labeled the secondary dripline. This is the point at which the cave initially begins to constrict and proceed into the cliff face. This profile is extremely accurate with nearly 50 offset measurements taken to map an area 3 m wide by 3 m high. Except for the primary datum outside of the cave (AX1), all datums were removed upon completion of the survey of Actun Chuplal.

CULTURAL MATERIAL

The corpus of artifacts recovered and subsequently investigated at Actun Chuplal is unfortunately small and incomplete. The artifacts identified include ceramic sherds,

lithic tools, faunal material, an ash deposit, and manuport speleothems. Several small ceramic sherds were found on the ground outside the cave, which may indicate that the cave was subject to looting. However, animal activity, water flow, and cave traffic could also account for some artifact displacement. Despite the disturbed context of the portable artifacts found in the cave, measures were taken to properly document their locations. All artifact clusters, even solitary sherds, were tagged, mapped, and then photographed in situ. They were then collected from the surface of the cave floor for future analysis.

Lithic Matrial

Two mano fragments and two chert flake tools were recovered from Actun Chuplal. One of the mano fragments is a granite mano broken on one end but retaining one rounded grinding edge. This fragment is approximately 14 cm long, 8 cm wide, and 8 cm thick. It was found just inside the entrance of the cave. The other mano fragment is not made of granite but possibly of chert, and was collected deep within Passage 2. The two chert flake tools are each about 5 cm in diameter. They are quite thin and may have acted as cutting or scraping blades. One of these flakes has a small hole running through it that was either manually drilled, or formed through natural processes. These flakes were found at the base of MSS #1.

Faunal Material

One small shell was also found with the artifacts at the base of MSS #1. Its exact species has not been determined, but the shell resembles those of common land and river snail found in the area. It may or may not have cultural significance.

Ash and Charcoal Deposit

There was a large area of grayish-white ash found at the transition between Passages 1 and 2. This deposit covers an area of approximately 50 cm by 1 m, and is contains numerous small chunks of black charcoal. While the presence of the charcoal particulates indicate that this area was subjected to burning, it has not been determined whether this burning occurred during the time of the Maya usage of the cave. A sample of this deposit was collected for future analysis.

Manuport Speleothems

Perhaps the most interesting portable artifacts recovered from the cave are two speleothems that seem to have been brought into Actun Chuplal from other caves. Manuport speleothems have been found at both surface and cave sites, and are associated with ritual practice (Ferguson 1999). The manuport speleothems from Actun Chuplal are stalagmites or stalactites that do not resemble any of the natural formations found in Actun Chuplal. One of these manuport speleothems is approximately 7 cm in length and 3 cm in width. The type of cave formation this artifact came from is unclear. It was recovered from deep within the constricted Passage 2, and its position was only sketched.

The other manuport speleothem is a very large and heavy one 35 cm long by 15 cm wide. Both of its ends have been broken off. This was found on the Eastern side of Passage 1.

Ceramics

The ceramics identified at Actun Chuplal are few and fragmentary. Most of these sherds were found strewn about the floor of the cave, yet several seem to be directly associated with specific aspects of the cave. One sherd (in Cluster 4) was found next to two lithic tools and a shell at the base of MSS #1. A relatively large concentration of sherds was also found on one boulder-like outcropping of the cave floor in the main passage. One sherd was also found next to a manuport speleothem.

Artifacts were collected and bagged separately by localized artifact clusters (Artifact Clusters #1-8). All ceramics were found in the first passage (Passage 1). The surface collections yielded 11 small, highly weathered non-diagnostic body sherds. In addition, one weathered red-on-orange bichrome rim sherd was encountered with an unusual rim curvature for a vessel. The interior side (or underside) of the sherd is completely slipped orange, and the exterior side (or upper side) has a dark red band on the rim with patches of red paint remaining on areas farther from the rim. The paste is characteristic of fine ware: a bright orange, fine paste with minute (approx.<0.1-1.0mm) calcite temper. The sherd is thin-walled (3.5-4.5mm). The rim curvature and the placement of the paint are indicative of the sherd being a fragment of a lid of a bichrome or a polychrome, but a typological assessment deems difficult. The numerous bichrome/polychrome lids reported from Uaxactun (Smith 1955) and Tikal (Culbert 1958) suggest a Classic date for the possible lid fragment. However, due to the extremely limited data no temporal framework can be firmly assigned to Actun Chuplal, yet a Classic period date parallels that with the majority of the material recovered from the adjacent cave, Actun Halal (Ishihara 2001).

Modified Speleothem Sculpture

The most notable feature of Actun Chuplal is the prominent Modified Speleothem Sculpture just within the entrance of the cave. This feature is very similar to those found at Actun Halal (Griffith, this volume) and is what sparked the initial interest in Actun Chuplal. Modified Speleothem Sculpture #1 in Actun Chuplal is a face-like representation carved out of a white flowstone formation in the middle of Passage 1. More elaborate than a simple petroglyph, this sculpture consists of two deep and dark recesses in the flowstone to create eyes, and a mouth formed by the removal of flowstone "bacon" formations at the base of the formation. The bacon formations remaining in this gaping mouth area resemble teeth. Interestingly, this MSS faces directly out of the entrance to the Northeast and can be seen from outside of the cave (Fig. 2).

On the western cave wall there is petroglyph in the limestone karst. This petroglyph is comprised of two depressions in the wall forming eyes and a triangular depression resembling a nose or mouth. This petroglyph is 1.5 m above the cave surface

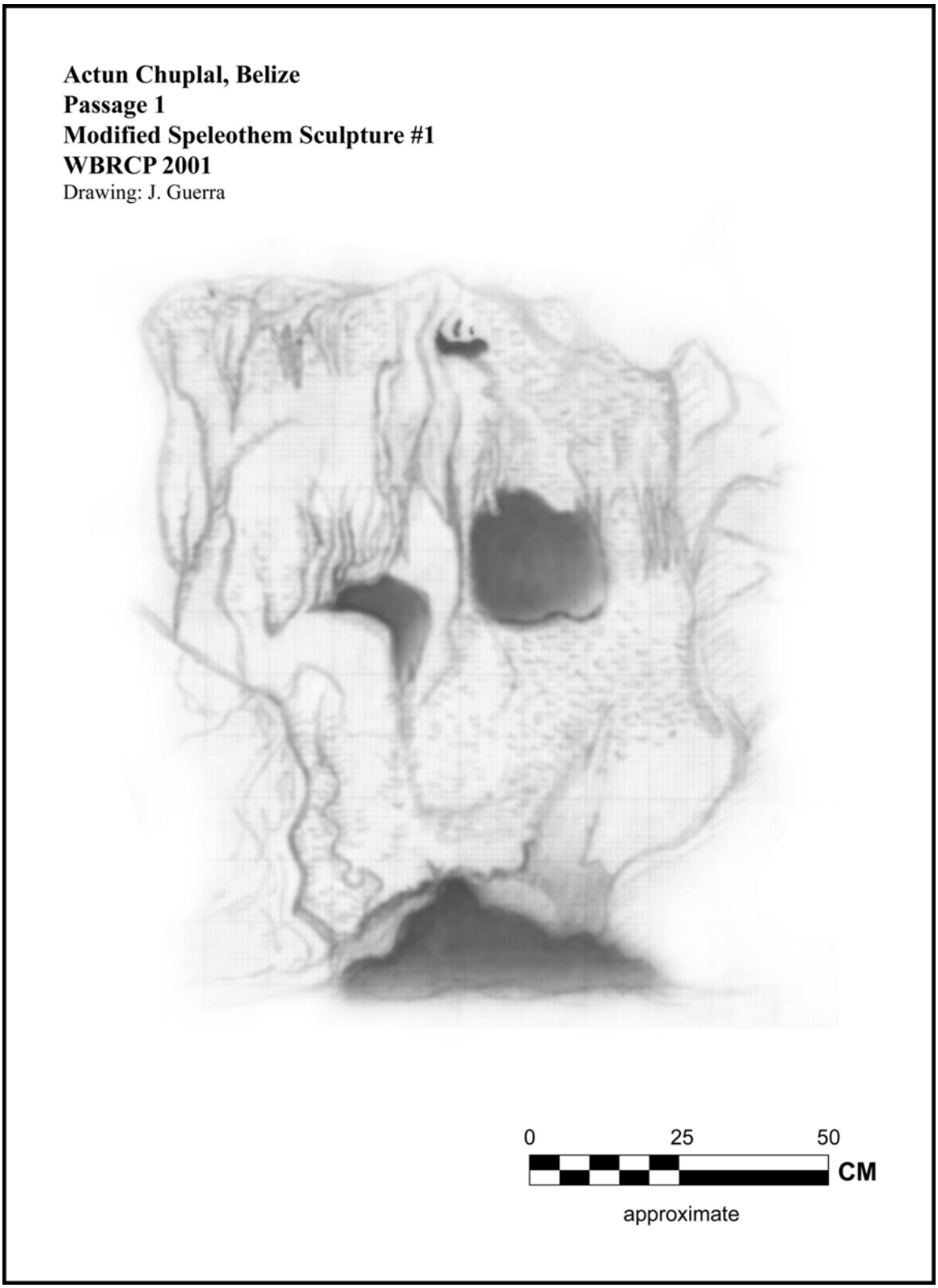

Figure 2: Modified Speleothem Sculpture #1, Actun Chuplal.

and faces out of the cave to the Northeast. This petroglyph was photographed but not illustrated.

Modified Niches

Sections of the karstic cave walls in Actun Chuplal show signs of being altered by humans. As previously described, the walls of the cave's main passage contain small recesses in the walls of the cave. These small niches vary in size from 10 cm to 80 cm wide, and from 4 cm to 60 cm deep. Our investigation identified and labeled five of these niches. Niches are normal morphological features found in caves and karstic limestone, yet at least two of Actun Chuplal's niches appear to have been modified. One very small niche (Niche 1) on the Eastern wall near the entrance appears as if it has been carved or sculpted into a rectangular shape. Approximately 12 cm deep into the niche the sides and back of the niche appear to have been scraped to form right angles with each other. Another niche on the Western wall (Niche 2) resembles a small arch. The ceiling and sides of this niche appear to have been scraped or rounded and extend 60 cm deep into the niche. It is entirely possible that both Niche 1 and Niche 2 were created through natural processes but their symmetrical nature and apparent scraping indicate human modification.

Modified Stalagmitic Shelf

One final aspect of the cave that deserves attention is a modified section of the Eastern wall near the entrance. This area resembles a small basin or seat carved into the wall. This type of cave modification has been recognized at nearby Actun Halal and labeled as a Modified Stalagmitic Shelf (Griffith and Morehart 2001). This shelf is 1.5 m across and has clipped stalagmites and flattened areas in the bulging limestone. It appears as if these stalagmites were cut off and rounded resulting in a horizontal plane within the wall. A person seated on this feature would have faced almost directly North out of the cave towards Actun Halal.

SUMMARY

Actun Chuplal is a small cave with a relatively sparse artifact assemblage on the surface. Nonetheless, the materials within and the modifications to the cave indicate that even small, seemingly insignificant cave sites were places of ritual for the ancient Maya of western Belize. The easy access and relatively non-constricted opening into the small cave may account for the lack of artifacts on the surface as well as for the exposure of the artifacts to natural elements. The surface material recovered in 2001 is inconclusive with regard to a full assessment of the nature of the utilization of this cave by the ancient Maya.

Acknowledgements

We would like to thank the Belize Department of Archaeology and project director Dr. Jaime Awe for allowing us to study Actun Chuplal. We also give thanks to the Dart family, the wonderful people at Chechem Hah Resort, Krista Jordan for discovering the cave for the project, Takashi Ochiai for his photographic expertise, and Jenny Guerra for drawing petroglyphs and teaching us how to multiply. We would like to give special thanks to Jonathan Forbes and Alicia Daigle, whose efforts were instrumental in the completion of the preliminary research in Actun Chuplal.

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EXCAVATIONS AT STRUCTURE 203, BAKING POT, BELIZE

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INTRODUCTION

During the 2001 field season extensive horizontal excavations were conducted in Structure 203 of Baking Pot. The primary goal of this excavation was to further understand the nature of household occupation among the ancient Maya. The secondary goal was to examine domestic rituals of termination and dedication. Structure 203 was selected for investigation because its relatively small size allowed for complete horizontal excavation in a single field season. The solitary mound measures 16 m in length, 14 m in width, 1.5 m in height, and lies 80 m to the northeast of Group 2. While there are no surface remains that indicate the structure was part of a larger cluster, it is possible that perishable structures were associated with Structure 203 (Marcus 2000). Structure 203 was horizontally excavated, which completely exposed the terminal phase architecture as well as four m of ambient space surrounding the walls. The architecture and the artifact assemblage indicate that Structure 203 was a residential structure.

ARCHITECTURE

The final architectural phase of Structure 203 was constructed with moderately well-faced cut limestone. The form of the structure is rectangular, with the southern wall serving as the front face of the structure (Figure 1). Ranging from 2-4 courses in height, the wall has an outset staircase and is abutted by an additional room to the west and a plastered terrace (or porch) to the south stretching the entire length of the structure.

The eastern and western walls are of similar construction, being constructed of cut limestone four courses in height. The eastern wall is approximately 3 m in length, terminating by the remains of the northern wall. The western wall, however, runs north for less than one meter before the stone abruptly disappears. The clean break and lack of stone nearby suggests part of this wall may have been scavenged for construction in nearby Postclassic structures. The northern wall is badly eroded, consisting only of scattered limestone in rough alignment. The surface of the platform was plastered and remnants of daub indicate a perishable superstructure. The only evidence of a previous architectural phase is a possible section of plaster one meter below the terminal floor (Figures 2 and 3).

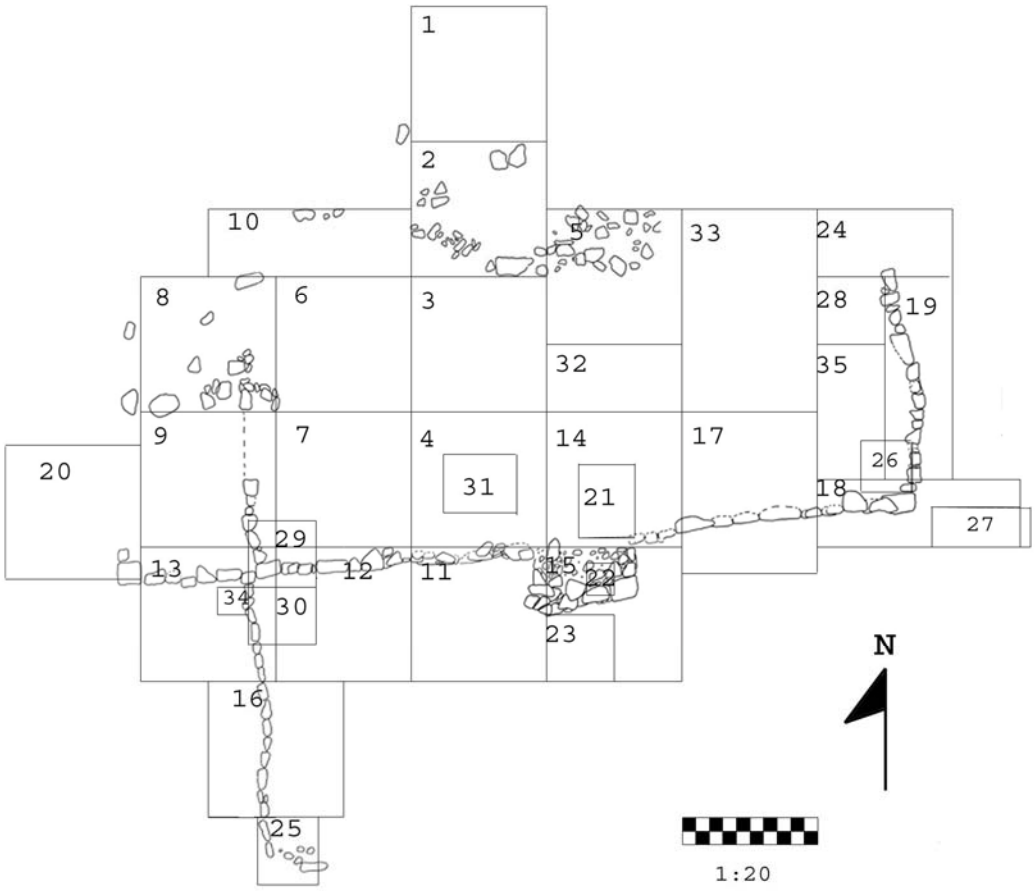

Figure 1: Plan of Structure 203

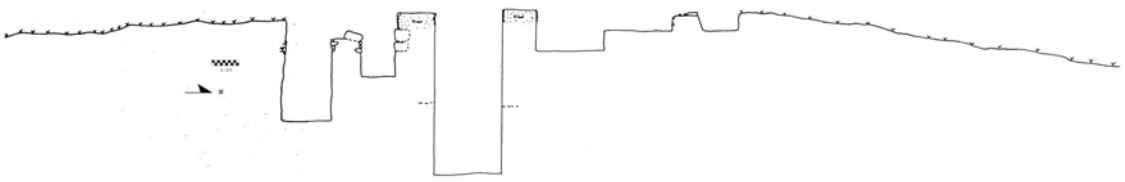

Figure 2: Profile of Structure 203, including unit excavated to sterile soil.

CERAMIC MATERIAL

The ceramic assemblage from Structure 203 is composed of 7,649 sherds, 5,788 of which are undiagnostic. The vast majority of this category consists of body sherds, likely belonging to olla vessels and serving vessels. Sherds successfully classified according to Gifford's classificatory system number 1,844, while 17 sherds are unidentified and possibly constitute new types not accounted for by Gifford (1976).

The ceramics firmly fall within the Spanish Lookout ceramic complex of the Late-Terminal Classic period, termed Spanish Lookout (Gifford 1976: 225-303). The most dominant types are in the Belize and Vinaceous Tawny Ceramic groups, including Belize Red, Platon Punctated-incised, Gallinero Fluted, McRae Impressed, and Martins Incised. The abundance of these types is typical for the period and recovered in numerous household investigations at nearby Barton Ramie (Willey *et al*. 1965). Red-slipped pottery, including Roaring Creek Red, Vaca Falls Red, Dolphin Head Red, Garbutt Creek Red, and Kaway Impressed, in combination with Belize Red, form over 80% of the ceramic assemblage recovered from Structure 203. This abundance of red-slipped pottery is also very typical of the area (Gifford 1965: 380). Unslipped ceramic types (Cayo unslipped, Alexanders unslipped, and Tu-tu Camp Striated) occur in the next highest frequency with 6.5%, followed by bichrome painted vessels (Xunantunich Black-on-orange, 5.9%) and polychromes (Benque Viejo Polychrome, Palmar Orange-polychrome, 3.4%). Black slipped ceramics, represented by Mount Maloney Black, Meditation Black, Achote Black, and Cubeta Incised, occur in the lowest percentage (2%). Negligible amounts of cream wares (Yaha Creek Cream), molded-carved sherds (Adams 1971: 49), brown-red slipped wares (Rubber Camp Brown), and a miniature vessel were also recovered (Figure 4).

Ceramics of the above type associated with humus, floor and fill contexts are almost exclusively Late-Terminal Classic in date, with only select types from previous time periods: Aguacate Orange (Floral Park, AD 0-300, 1 vessel foot), Dos Arroyos Orange Polychrome (Hermitage phase, AD 300-600, 1 flange), Zibal unslipped (Tiger Run phase, AD 600-700, 1 olla sherd), and three sherds similar to the Terminal-Early Postclassic (AD 900-1100) Daylight Orange. In addition to ceramic vessels, one ash tempered spindle whorl was recovered from the humus.

The ceramic assemblage is dominated by ollas and serving vessels and is indicative of a household structure. Multiple households have been excavated at Baking Pot, providing a basis of comparison for the Structure 203 ceramics. Structures 102, 131, 193, 194, 198, and 199 all share ceramics similar to Structure 203 and all have been determined to be household structures (Piehl 1998, 1999; Audet 2000).

CHIPPED STONE

The lithic assemblage from Structure 203 includes formal and ad hoc tools, debitage, and cores. The tool assemblage of 21 chert implements, accounting for only

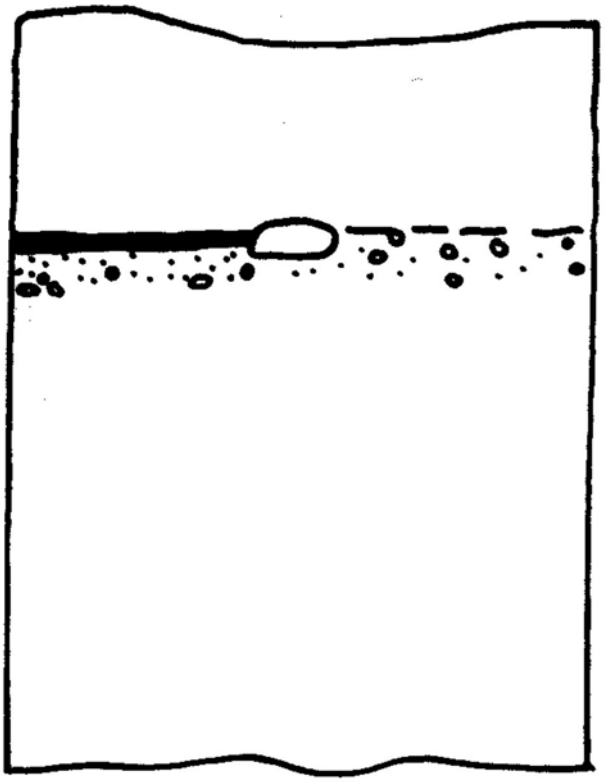

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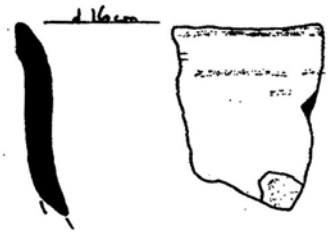
Figure 3: Profile of east baulk of Unit 31, showing possible penultimate floor.



a. Dolphin Head Red

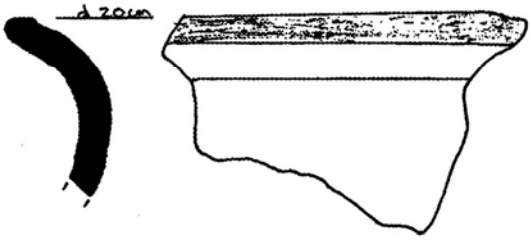
b. Garbutt Creek Red

c. Belize Red

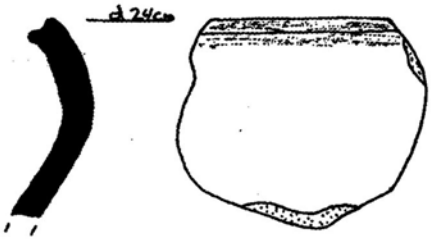
d. Mt. Maloney Black

e. Mt. Maloney Black

f. Dolphin Head Red



g. Cayo unslipped



h. Alexanders unslipped

Figure 4: Examples of ceramic types from Structure 203.

1.69% of the total lithic assemblage, was classified using Willey *et al*'s work on Barton Ramie (1965). Four scrapers were recovered. Two scrapers are of the prismatic End- and Side-scrapers types. They are likely polished and possibly imported from Colha in northern Belize (Payson Sheets, personal communication, 2002).

The other two scrapers are of the type End- and/or Side-scrapers, Plano-convex (Willey et al. 1965: 437). Choppers were the most numerous tools recovered from Structure 203. Three pounders, evidenced by extensive battering on artifact edges, and ten general utility bifacial tools were in evidence, including two complete bifaces. Also included in the tool assemblage are one single side notched bifacial point, two bifacial point fragments, and one blade (Figure 5). All tools, with the exception of the two scrapers described above, appear to have been made from locally procured chert and range in color from white to brown.

Expedient Tools

This category, comprising 4.75% of all lithic artifacts recovered, includes tools that were not formal but appear to have been used as they were knocked from a core, with very limited retouch. Tool edges were examined visually and at low-powered magnification (10X) for use-wear and to evaluate the possible functions. Forty-six informal blade tools, defined as flakes used when they were struck from the core, were classified. In addition the following expedient tools were identified: one informal blade, one informal biface, two informal pounders, and five informal scrapers. Two preforms were also included and they were likely on their way to becoming bifaces but because of errors were simply used in their current form. Seven chert cores were found in humus, fill, and cache contexts. As use-wear is not always visible at the macroscopic and low magnification level, the lack of high-powered microwear analysis in this study likely resulted in an under-representation of ad hoc tools. Macrowear analysis can result in the misidentification of use-wear, particularly when failing to take post-depositional processes into account. Natural processes affecting artifact edges can easily be misinterpreted as evidence of use (Bamforth 1988).

Obsidian

Obsidian blades, 5.39% of the lithic artifacts, occur in a proportion similar to combined formal and informal tools, but clearly in lower quantity than chert artifacts. Sixty-seven (67) obsidian blades from multiple contexts were recovered, which range in color from gray-black to gray-black banded. Two small pieces of obsidian wastage were also recovered. No obsidian cores were encountered, which suggests that blade manufacture was not being undertaken at the structure.

Chert Debitage

One thousand and ninety (1,090) pieces of debitage, ranging in color from white to red to brown, accounts for 87.76% of the total lithic assemblage. Debitage was

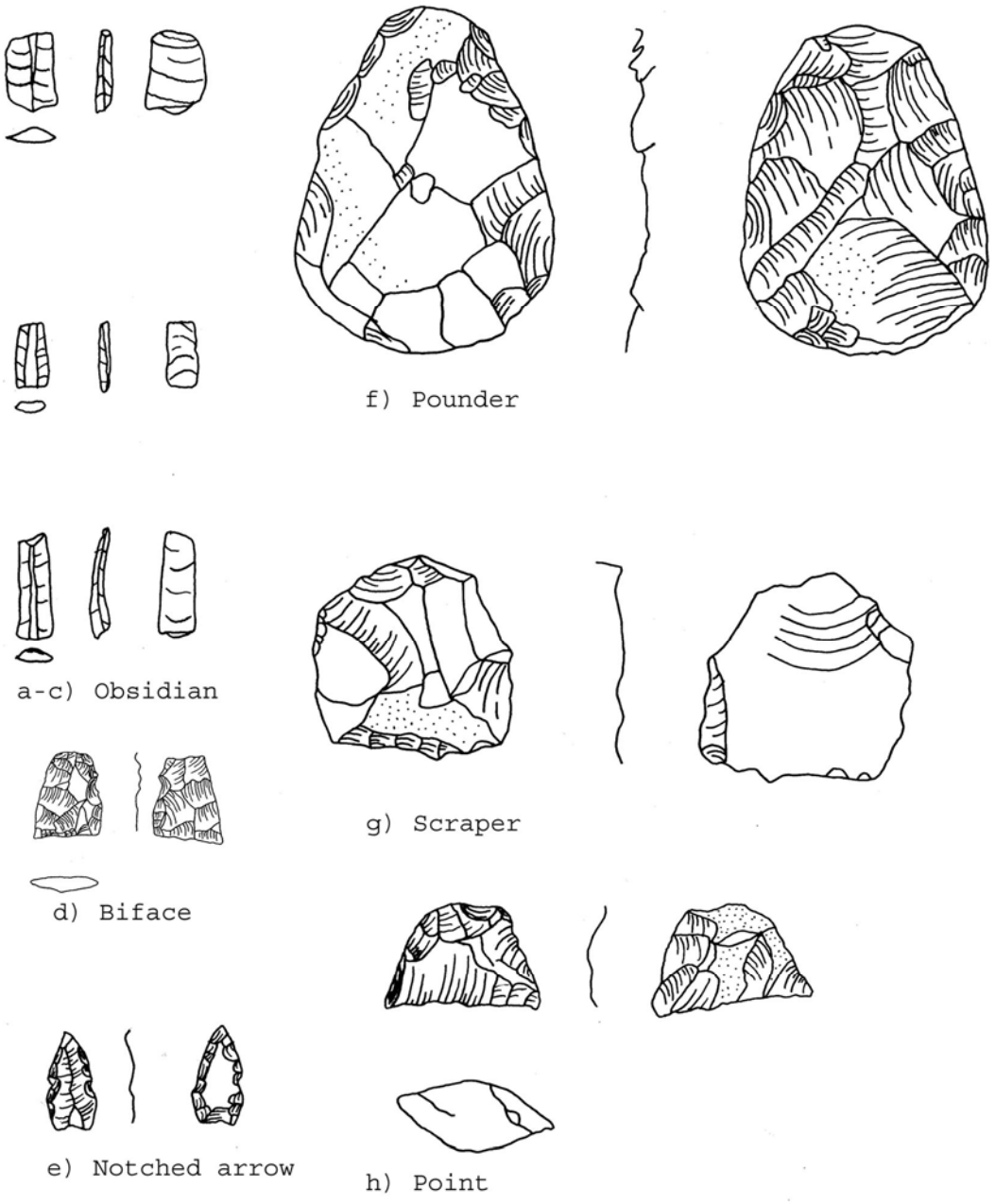


Figure 5: Various lithic artifacts.

classified into the traditional system of primary, secondary, and tertiary flakes assuming that these types correspond to stages in the reduction sequence. This typology has come under heavy criticism (Sullivan and Rozen 1985) as cortex alone is not found to be a reliable variable in classification. In this study, an additional criterion of the number of flake scars was added. The reasoning behind this addition was that pieces exhibiting dorsal flake scars were likely removed later in reduction, despite the amount of cortex.

Primary flakes are defined as those that have 50-100% cortex coverage on the dorsal surface or 0-3 flake scars. Secondary flakes have 1-49% cortex coverage or 4-7 flake scars. Tertiary flakes are defined as those having 0% cortex or more than 8 flake scars. Thinning flakes removed during tool manufacture and shatter were also classified. Nine hundred and seventy (970) flakes were recovered; 192 primary, 400 secondary, and 378 tertiary, plus an additional 97 pieces of shatter and 23 thinning flakes. The low number of shatter and thinning flakes may be due to recovery techniques (using a ¼ inch screen) that may have missed smaller debitage.

At Structure 203, formal and expedient tools occur in a low percentage (11.83 %) when compared with the amounts of debitage. The presence of chert cores, large numbers of primary, secondary and tertiary flakes, and the close proximity of the structure to the Belize River suggest the inhabitants had easy access to raw material and were producing tools as the necessity arose. Households, defined by Ashmore and Wilk to be a "social unit, specifically the group of people that shares in a maximum definable number of activities, including production, consumption, pooling of resources, reproduction, coresidence" (Ashmore and Wilk 1988), dating to the Late-Terminal Classic have been excavated at Baking Pot, including Structures 102, 131, 193, and 194, and similarly exhibit a low rate of formal tools and evidence for an opportunistic lithic industry.

Wauchope and subsequent archaeologists have established a typical Maya household form of a platform with a stone retaining wall. On top of this platform was constructed a house of wattle-and-daub with a thatched roof (Wauchope 1938; Willey et. al 1965). The plan of Structure 203, the techniques of platform construction, and the surface area of approximately 36 square m (falling between Wauchope's estimates of 8.0-39.5 m^2) suggest a residential function. Structure 203 also bears similarity to Structure 193, excavated by Piehl in 1997 as part of her dissertation research combining archaeological and osteological data to investigate questions of socio-economic status. Structure 193, like 203, is formed by a platform terrace with a southern outset stair. Structure 198, a household structure 20 m to the north of Structure 203, also shares this form (Audet 2000). In addition to architecture, the artifacts of Structure 203 can be examined. The ceramics of Structure 193 are typical of a household, as is the lithic assemblage discussed. Structures 102, 131, 194, 198, and 199 all share similar assemblages and all have been determined to be household structures (Piehl 1998, 1999, 2000; Audet 2000). It is clear that Structure 203 shares artifact similarity with other households at the site.

Despite the depleted inventory of lithic artifacts, it is apparent that Structure 203 was a fully functioning unit engaged in the manufacture of goods for household

consumption and exchange for higher quality tools and raw materials from great distances, including chert from Colha and obsidian from Guatemala. While not a highly affluent household, the tools suggest a wide-range of activities for the inhabitants, from food processing to land clearing to working raw materials. It is quite probable that the household was engaged in a type of specialized manufacture for trade with other households in goods that are not preserved archaeologically.

GROUNDSTONE

Mano and metate fragments were recovered from the humus overlying the terminal phase of architecture. The fragments are made from pink and gray granite, likely from the Maya mountains. In total, six metate fragments were excavated, three fragments forming one-third of a beveled rim metate and three fragments of the turtleback type (Willey et al 1965: 456). One square mano fragment, one circular mano fragment, and one round-flat mano fragments were also in evidence. The remains indicate food processing was occurring at the structure.

Mano and metate fragments were not the only groundstone artifacts from Structure 203. In addition, two grooved stones were found, one stone in excess of 20 cm in length in the fill of the structure and one grooved river cobble 5 cm in length from the humus. The function of these grooved stones is still uncertain, but they were likely net weights or, in the case of the much larger stones, boat or dock anchors (Willey et al. 1965: 466). One jadeite bead, light green in color and polished, was found on the terminal floor of Structure 203. The bead is spherical in shape and biconically drilled.

FAUNAL AND SHELL REMAINS

Faunal and shell remains occur in limited quantities at Structure 203. The paucity of these remains may be due to the combination of acidic soil leading to poor preservation and the absence of a midden. The remains present at the structure are varied, ranging from shell to deer to gibnut, with the largest quantities represented by *Pachychilus* and *Pomacea* shells used for food.

Unworked shell includes *Pachychilus indiorum* (34 specimens) and *Pachychilus glaphrus* (77 specimens), representing jute shells, were recovered as well as freshwater *Pomacea flagellata arata* (12 specimens). Some examples of jute, particularly those from cache contexts, were large, measuring up to seven cm in length. Two bivalves, likely *Nephronaias*, were also excavated as were two pieces of unworked *Strombus*. One *Olivia* tinkler shell, 2.7 cm in length and 1.3 cm in width, came from humus above the terminal floor and one perforated shell *adorno* (*Strombus*) with one centrally drilled hole and two smaller holes, perhaps for suspension, came from fill context.

The majority of faunal bone was discovered near the base of the Structure 203 platform walls, with only limited quantities in fill and cache contexts. Forty-eight pieces of turtle shell were identified, the largest single faunal category. The fragments likely all belong to a single specimen that was recovered in a corner by the outset staircase.

Twenty-four bones in a combination of cache and humus context provide evidence of gibnut, the remains consisting primarily of teeth and ribs. Deer (*Odocoileus virginianus*) is identified by 17 different bones while 11 bones can only be preliminarily classified as small mammals and twenty-nine bone fragments were unidentifiable.

DAUB

Nine hundred and eleven pieces of daub, many with impressions of poles, provide ample evidence of a perishable superstructure atop the platform of Structure 203. The clustering of the daub near the edges of the platform and not in the central portion also provides evidence for the collapse of the superstructure walls after abandonment.

SPECIAL DEPOSITS

Lot 7: Located in the fill beneath the terminal floor, this cache deposit measured almost 2 m at its widest point and reached a maximum depth of 20 cm. Many of the recovered vessels were extremely fragmentary, accounting for the high sherd count of this lot. Two partial Belize Red bowls were recovered, along with the remains of a Gallinero Fluted cylindrical vase, a partial bichrome tripod dish (Xunantunich Black-on-Orange), two partially complete polychrome tripod dishes (Benque Viejo Polychrome), and at least two partially complete ollas. In addition, numerous body sherds which could not be firmly identified as belonging to a vessel or to a type were recovered, many of which were the remains of ollas. The placement of this ceramic cluster suggests it was placed as a dedicatory offering to the structure.

Lot 46: Located beneath the terminal floor in the northeastern corner of the structure, this cache consisted of an inverted finely-made complete olla of the Cayo unslipped type (Figure 6). Most of the 145 undiagnostic sherds likely belonged to this olla, although their fragmentary nature made identification and reconstruction difficult. Miscellaneous red and black slipped sherds were also recovered. The positioning of this cache suggests it was associated with the initial construction of the structure.

Lot 58: Located 50 cm beneath the terminal floor on the primary axis of the structure, this ceramic concentration included approximately ¼ of a red slipped vessel identified as Garbutt Creek red, one Early Classic polychrome flange classified as Dos Arroyos Polychrome, and scattered olla sherds**.** The lot's location beneath the floor and on the primary axis also suggests it was dedicatory.

Lot 13: Placed immediately below the terminal floor, this lot contains ten olla sherds stood on end around a lithic core. While the sherds could not be firmly typed, they appear to belong to a single olla. The placement of this cache is unusual and its status as dedicatory is uncertain.

Lot 33: Unfortunately, this ceramic concentration was looted by unknown persons, so the original arrangement is unknown. However, ⅛ of a well-fired bowl, likely Belize Red, was placed at the base of the southwestern corner along with unclassified olla

sherds. This lot could be the result of the collapsing wall or it could be a possible termination deposit associated with the abandonment of the structure.

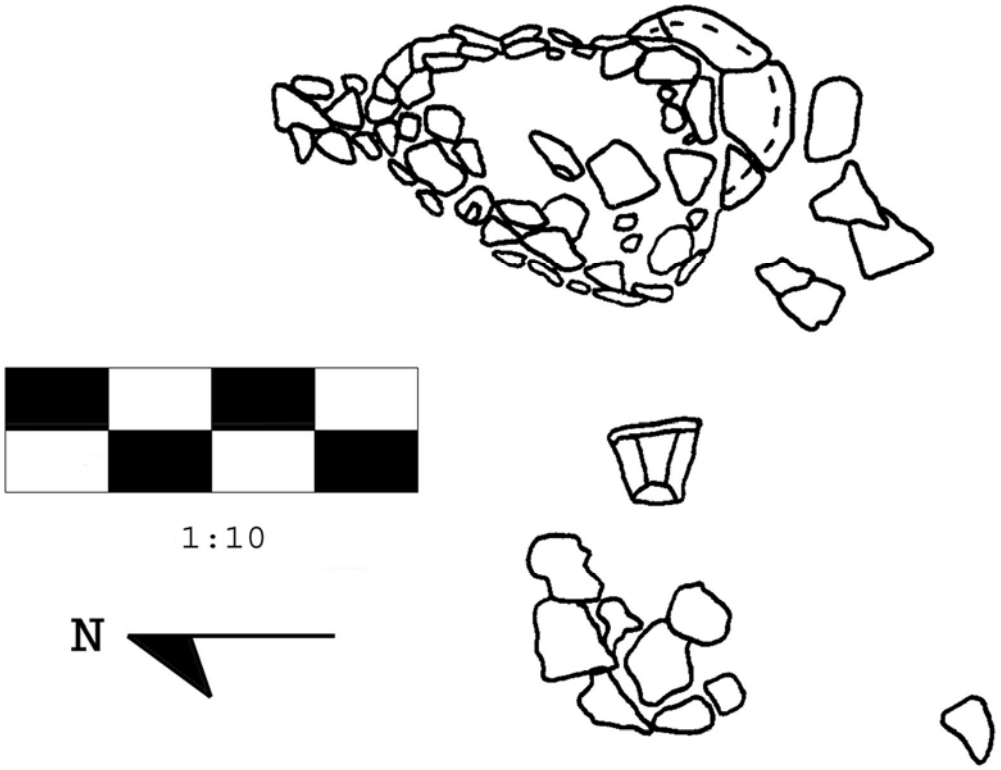


Figure 6: Lot 46 cache.

DISCUSSION

No systematic study of the location of dedicatory caches in households has been undertaken. I attempted to employ the rules posed by monumental and high status architecture that caches are placed at locales of religious power (Pendergast 1998) and placed penetrating units in three out of four corners (the northwest corner could not be definitively located) and along the preliminary axis of the structure. One corner cache (Lot 46) and one primary axis cache (Lot 58) were recovered, but the placement of Lot 7 and Lot 13 appears anomalous. Lot 7 is in line with Lots 46 and 58 on an east-west subsidiary axis along the northern wall of the structure. Only after the western room addition, would Lot 7 would have been located on the primary axis. Lot 33, the possible termination deposit, was located on the southwestern basal corner, also a locale of power.

The location of the deposits preliminarily suggests the inhabitants may have been familiar with the ideological tenants governing cache placement. However, the deposits are not of the high quality found in higher status residences. Initially, the status of Lots 7 and 58 as caches was uncertain because they failed to fit within the more established norm of finely made whole ceramic vessels. Upon observing their organized nature, their location, and considering the overall low density of ceramic remains at the structure, it was apparent these were caches and the inhabitants were placing offerings within their socio-economic means. The presence of ollas and serving vessels also suggests further exploration of organic remains. In well-preserved cave contexts (Stone 1995), offerings of corn are recovered and it is possible perishable remains were being placed in cache contexts (Pendergast 1998). Preliminary comparisons with other households also suggests structures of different status were engaged in similar caching activity, the most striking of which is the presence of an inverted olla directly south of the northern (back) wall of Structure 193 (Piehl 1998), a location and content extremely similar to Lot 46.

CONCLUSION

Ceramic remains firmly identified as Spanish Lookout in Gifford's type-variety system date Structure 203 to the Late-Terminal Classic. Other household structures excavated at Baking Pot share a similar ceramic assemblage, reinforcing this date. Additionally, comparison of the remains of these structures to Structure 203 reinforces the conclusion of a domestic function, an interpretation further supported by the presence of manos and metates for food preparation, spindle whorls, and domestic architecture. The ceramics, particularly the molded-carved sherds, in combination with the few exotic artifacts recovered and moderately expensive architecture (the nearest limestone source is 2 miles away) suggest some level of status for the inhabitants (Helmke 1999). While likely in the lower sector of Maya society, the household was not lowest on the socio-economic ladder.

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EXCAVATIONS OF STRUCTURE 198, BAKING POT, BELIZE

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INTRODUCTION

Baking Pot is a medium sized center located eight kilometers northeast of San Ignacio town and five kilometers upstream from Barton Ramie (Audet 2000). The site core is composed of two major plazas that are connected by a causeway 300 meters in length (Figure 1). Numerous household groups and single mounds radiate from the site core for several kilometers (Ricketson 1931). During the 2001 field season two separate loci were selected for excavation at the site of Baking Pot: Structure 203 (Weller, this volume) and Structure 198. The latter is the northern mound of a large plazuela referred to as the Yaxtun Group, which is located 80 meters southeast of Group I and 300 meters northeast of Group II (see Audet 2000).

RESEARCH DESIGN AND ORGANIZATION

Structure 198 was first excavated during the 1999 field season (Audet 2000; Audet and Awe 2000). During the initial excavations, early Postclassic artifacts and construction were located at the group. Because of the rarity of such findings in the Belize Valley, and the limited nature of the 1999 excavations, further investigations were planned for the 2001 field season. The goals in 2001 were threefold. The first goal was to increase the data base of Postclassic Period cultural remains at Baking Pot. The second goal was to strip a large portion of the terminal phase of construction in an effort to locate Postclassic architecture. The third goal was to expose a Postclassic midden in order to recover data that would confirm or negate the late phase of occupation recorded during the previous year. Although no Postclassic construction was located, considerably more data on the Postclassic Maya at the Yaxtun Group was recovered.

Initially, a grid consisting of 96 2x2 meter units were set up on Structure 198 (Figure 2). Because of time constraints, however, only 54 units were actually excavated. The majority of the excavations focused on south side of the mound, with a two-meter wide strip extending to the back (or northern) side of the plazuela. Most of the excavations were terminated after reaching the terminal phase architecture, but seven units penetrated the building or the plaza floors. Two units were continued until reaching sterile levels. Five of the penetrating units focused on the eastern side of the structure, in an effort to search for possible burials and caches. Units 51 and 59, located on the eastern side of the building, descended to sterile level. Unit 20, also excavated to sterile level, was located near the center of the building to determine construction chronology. Units 100 and 101 were placed in the corners of the structure (100 in the plaza, 101 in the building) to look for caches.

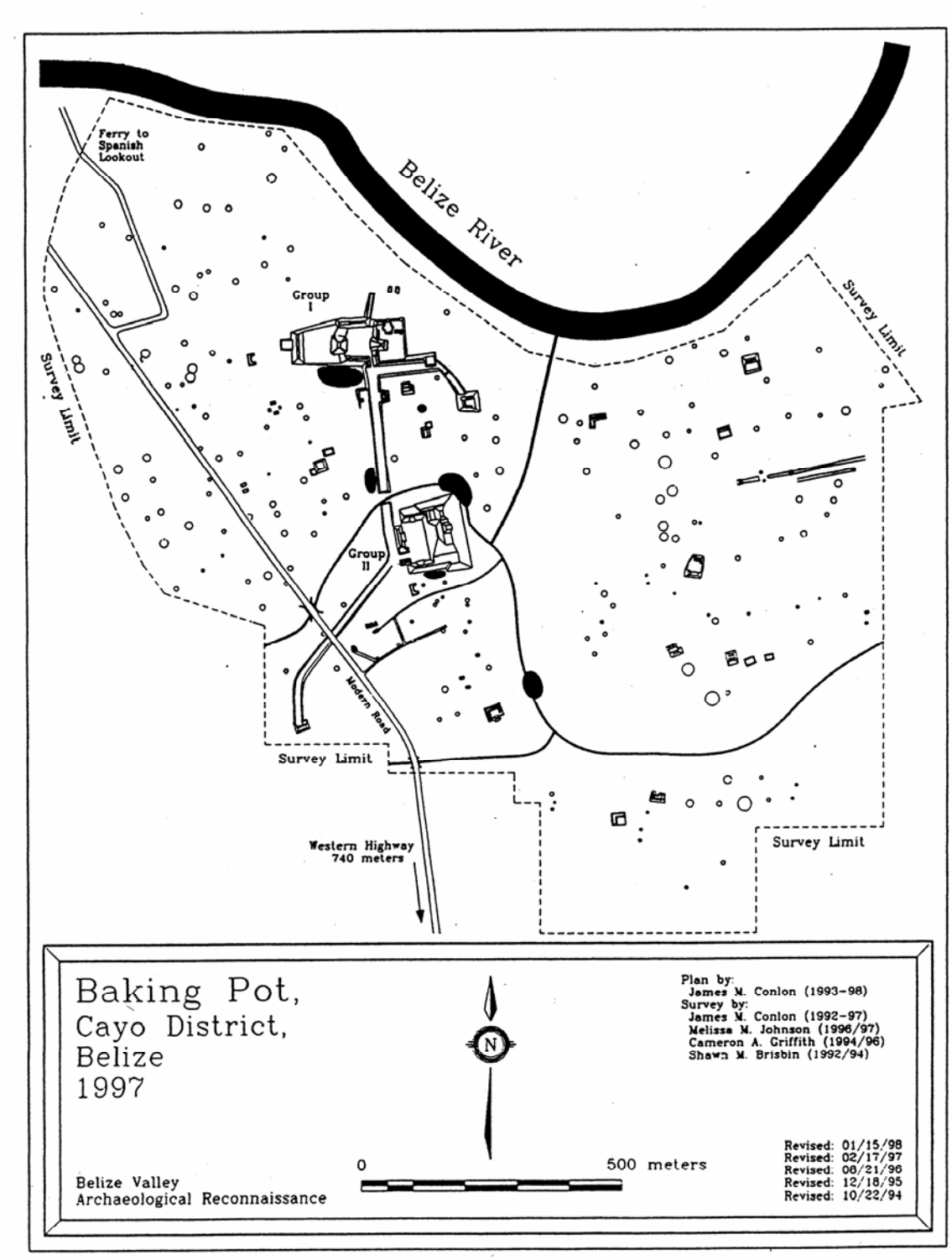

Figure 1: Map of Baking Pot.

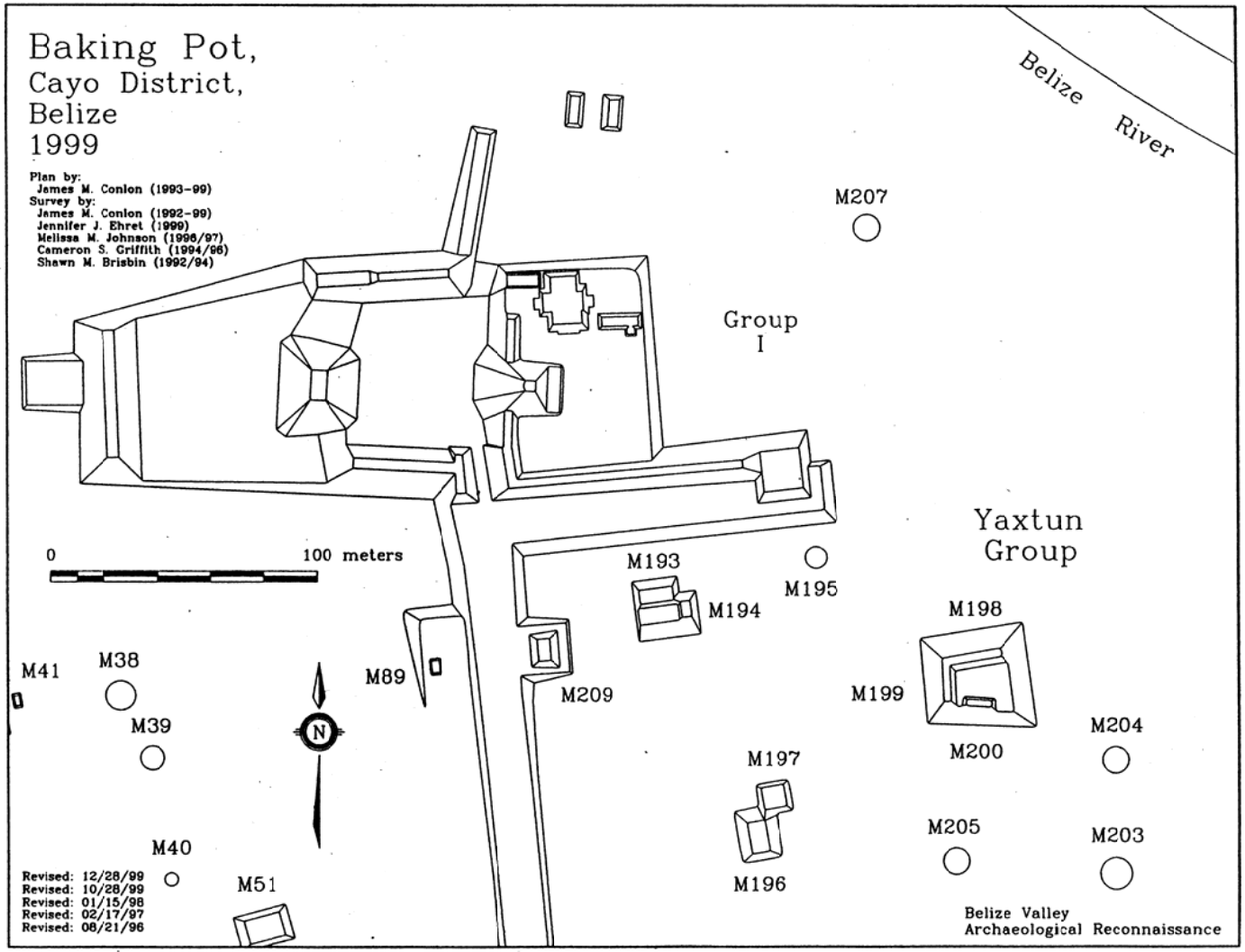

Figure 2: Map of Group 1 and the Yaxtun Group.

EXCAVATION RESULTS

Structure 198 is the tallest mound (2.8m in height) in the plazuela. Its long and low retaining walls suggest that it may have originally served as a building platform that supported a perishable superstructure. This is further supported by the discovery of daub fragments both inside and outside the retaining walls. Excavations in 1999 and 2001 provided evidence that the plazuela likely served domestic functions, including the possible production of textiles and stone tools (Audet 2000; Audet and Awe 2000).

Preclassic Occupation

The earliest phase of construction on Structure 198 dates to the late Preclassic period. Three units (Units 20, 51 and 59) exposed a single phase of Preclassic architecture. Unit 20 yielded a typical assemblage of household artifacts at this level, including one bone needle, two fragments of modified bone, one fragment of modified conch, six obsidian blade fragments, a single chert biface, and 2 metate fragments.

Units 51 and 59 yielded Preclassic ceramics, chert debitage and a single piece of obsidian. The pottery included fragments of the unslipped Sapote and Paila Groups as well as red-slipped types of the Savana and Sierra Groups. A whole conch shell was also located in the fill, suggesting, along with the fragment of modified conch in Unit 20, that the Baking Pot community was acquiring trade goods from the Caribbean coast by the Late Preclassic period.

Burials

A single burial of a young child was uncovered in association with Late Preclassic ceramics in Unit 20 (approximately 2.4 meters below modern surface). Nothing of the skull remained, but the long bones and preserved teeth suggest that the child was between 3 and 5 years old at the time of death (White 2000). No grave goods were found in association with the individual.

Ritual Activity

Cache #6: Unit 59 uncovered a cached, partially complete, olla and the base of a bowl/dish in the fill of the third floor.

Late Classic Occupation

The last two phases of construction dated to the Late/Terminal Classic period. There is also evidence of numerous minor modifications that were made to the building during this time. It appears that the eastern half of the building was originally a free standing structure that was extended twice westward before being incorporated into the larger central building. The main (or central building to the north) also displays evidence of modification. Twice it was extended east (by approximately four meters each time) before being joined with the eastern building and was extended south at least once by one

meter. All the earlier retaining walls were left in place and covered over by the modifications.

The construction technique in all modifications was typical of other Baking Pot housemounds. All the platforms have retaining walls made from dressed limestone blocks, alluvial clay fill and floors that appear to have been surfaced with a thin layer of lime plaster (Audet 2000; Piehl 1998, 1999). During the terminal phase, the retaining walls of Structure 198 enclosed a platform that was over 30 meters long and 7 meters wide. The front walls were at least 4-6 courses high, but it appears that recent mechanized plowing, especially on the structure's eastern side, has significantly damaged the building.

Structure 198 was built in an L-shape, the same as Structure 199 to the west (Audet and Awe 2000). The eastern section juts out approximately 4 meters from the main shaft of the L and appears to be a crude addition. This is hypothesized because the stones are not cut (faced) like the retaining wall stones comprising the central part of the building, and some of the wall stones comprising the addition are river rocks.

The reoccupation of the Yaxtun group in the Postclassic period made it difficult to determine whether an artifact was associated with the Postclassic inhabitants or their Classic period precursors. To address this problem, artifacts located in close proximity to Postclassic ceramics (i.e. the Postclassic midden or copper bells) were deemed Postclassic, while artifacts located near the areas of concentrated Classic period ceramics were considered to be from the Late-Terminal Classic. Although this method of classification is not perfect, it served to delimit materials in the field. After the artifacts were washed and cleaned, more accurate chronological designations were made in the laboratory.

Artifacts

Numerous household artifacts, status objects, and caches dating to the Late Classic period were uncovered during the 2001 field season. The household objects located in and around the structure include 20 manos, 34 metates, several hundred obsidian blade fragments, numerous ceramics, spindle whorls, and celts, 15 chert bifaces, and 4 hammer stones. Objects indicative of status were also uncovered, including three tinkler shells, two jadeite beads, 10 ceramic beads, a canine tooth pendant, as well as conch shell beads and adornments. These objects were generally located on floors or near terminal phase walls and suggest that the Classic period inhabitants were relatively affluent.

Burials

A single burial dating to the Late Classic period was uncovered on the eastern side of Structure 198. This individual was a child, 20 months (± 8 months) old and was buried with a single conch shell bead placed near the pelvis. Jennifer Piehl analyzed the burial and reported that no pathologies that may have caused death could be discerned from the remains.

Ritual Activity

Five caches were discovered on Structure 198 that date to the Classic period.

Cache #1 consisted of a partially complete Balanza Black dish that was uncovered 30 cm below the plaza floor in Unit 100. This latter unit (70cm x 70cm) was placed in the plaza in the corner where the structure begins to jut southward. Although no other artifacts were located in direct association with the Early Classic vessel, other ceramics from that level dated to the Terminal Classic period. Given the discrepancy in dates between the cached vessel and other ceramics it is possible that the Balanza Black vessel may have been an heirloom that was cached sometime after its original production.

Cache #2 was a partially complete Platon Puncated Incised bowl that was placed at the juncture between the two walls where the eastern section and the central section of Structure 198 meet. This vessel dates to the Terminal Classic period.

Cache #3 was a ceramic cluster located in Unit 11, level 1. The ceramics included numerous fragments of Mount Maloney Black jars, Belize Red dishes, and Roaring Creek Red sherds, which were located directly on the terminal phase floor.

Cache #4 was located in Unit 51 and 59 (level 2) and consisted of several objects, including three manos, two metates, 4 chert bifaces, and a complete Belize Red dish. The bowl had been broken in half and placed leaning against a wall of the penultimate building.

Cache #5 was a large concentration of Late to Terminal Classic ceramics in Unit 20, level 2. The concentration of ceramics was largely limited to Unit 20 (2 x 2m) and the pottery was stacked over 20 cm thick. Many of the vessels were utilitarian and none were complete, but the immense volume of pottery led us to classify the feature as a cache.

Postclassic Occupation

Evidence for Postclassic occupation on Structure 198 is extensive. A midden dating to the Middle-Late Postclassic period was located three meters in front of the building and numerous other artifacts were found in association with Postclassic ceramics and metal artifacts. Although no masonry architecture dating to the Postclassic period was noted during the excavations this year, it was apparent that the Postclassic inhabitants had re-occupied an extensive section of the Late Classic building.

Eighty percent of units excavated yielded some Postclassic material above floor 1, but there were two particular areas where this material was concentrated. The first concentration was a midden exposed in Units 1, 9, 97, and 98. The midden area was approximately 3 x 4 meters in size though it probably continued both to the east and west. The second concentration was found on the eastern side of the building, in Units 43, 44, 51 and 52. These units yielded three copper bells and limited Postclassic ceramics. The midden, however, contained the largest concentration of Postclassic material found on Structure 198. It included numerous partially complete ceramic vessels, ceramic beads, a

partially complete ceramic mask, ceramic net sinkers, faunal remains, obsidian blades (including two complete blades) and projectile points, chert debitage, a complete mano, two crystal beads, and several shell beads.

All of the pottery recovered from the midden dates to the Postclassic period. The relative lack of Postclassic pottery in the Belize Valley make it necessary to look to other regions for comparative ceramic data. Elizabeth Graham (Tipu and Lamanai) and Prudence Rice (Peten) believe that the pottery from Baking Pot dates from the Middle to Late Postclassic period (personal communication). Our assessment of the material found on Structure 198 concurs with the middle to late Postclassic dates (AD 1100-1500) suggested by Graham and Rice. This is supported by both the form of the vessels and by the artifacts found in direct association with them.

A number of partially complete vessels were located in the midden. These include one Picu Incised: Paxcaman Variety vessel (Figure 3), numerous Paxcaman Red: Paxcaman Variety scroll foot and hourglass support dishes (Figure 4), one Ixpop Polychrome: Ixpop Variety dish, numerous Augustine Red: Augustine Variety scroll supports, as well as a number of untyped vessels that are clearly a break from the Late - Terminal Classic period but have yet to be identified. These vessels include one miniature polychrome scroll foot dish (probably Ixpop Polychrome: Ixpop Variety), one red slipped incised jar rim, a large orange slipped jar rim, and an incurving tecomate with a black design band beginning approximately 2 cm from the rim (probably Mul Polychrome: Manax Variety). There is relatively little information regarding Postclassic ceramics in the Belize Valley, so the author has relied heavily on data originating from the Peten (Cecil 2001; Rice 1987), from Chichen Itza (Coggins and Shane 1984), and from Mayapan (Smith 1971).

Two of the vessels located in the midden were grater bowls. One has scroll feet (Paxcaman Red ware, Figure 4) while the other has smaller feet with two holes (possibly Tulum Red ware). These bowls were introduced to the Maya area from Mexico during the Terminal Classic period, but become common in the archaeological record in the Postclassic period (Smith 1971).

Other artifacts found in this midden that date to the Postclassic period are notched chert arrowheads of less than four centimeters (Figure 6a). Three were found in the midden, while 10 additional chert and two obsidian arrowheads were located elsewhere around the building. According to Willard (1926) these arrowheads were attached to the Maya *hulche* (the Maya equivalent of the Nahuatl *atlatl*) and projected into their intended victims. Numerous wooded *hulche* with chert points were found in the *cenote* at Chichen Itza. These arrowheads almost always date to the Late Postclassic period (Coggins and Shane 1984; Elizabeth Graham personal communication; Rice 1987; and Thompson 1938) although Rice reports finding two in Early Postclassic lots on Macanche Island (Rice 1987:213). One of the obsidian arrowheads from the Yaxtun Group (Baking Pot) had nine notches along the blade, suggesting that its use was ritual and not utilitarian. Similar forms have been located in gold, copper, chert, and obsidian at the sites of Chichen Itza and Mayapan (Coggins and Shane 1984).

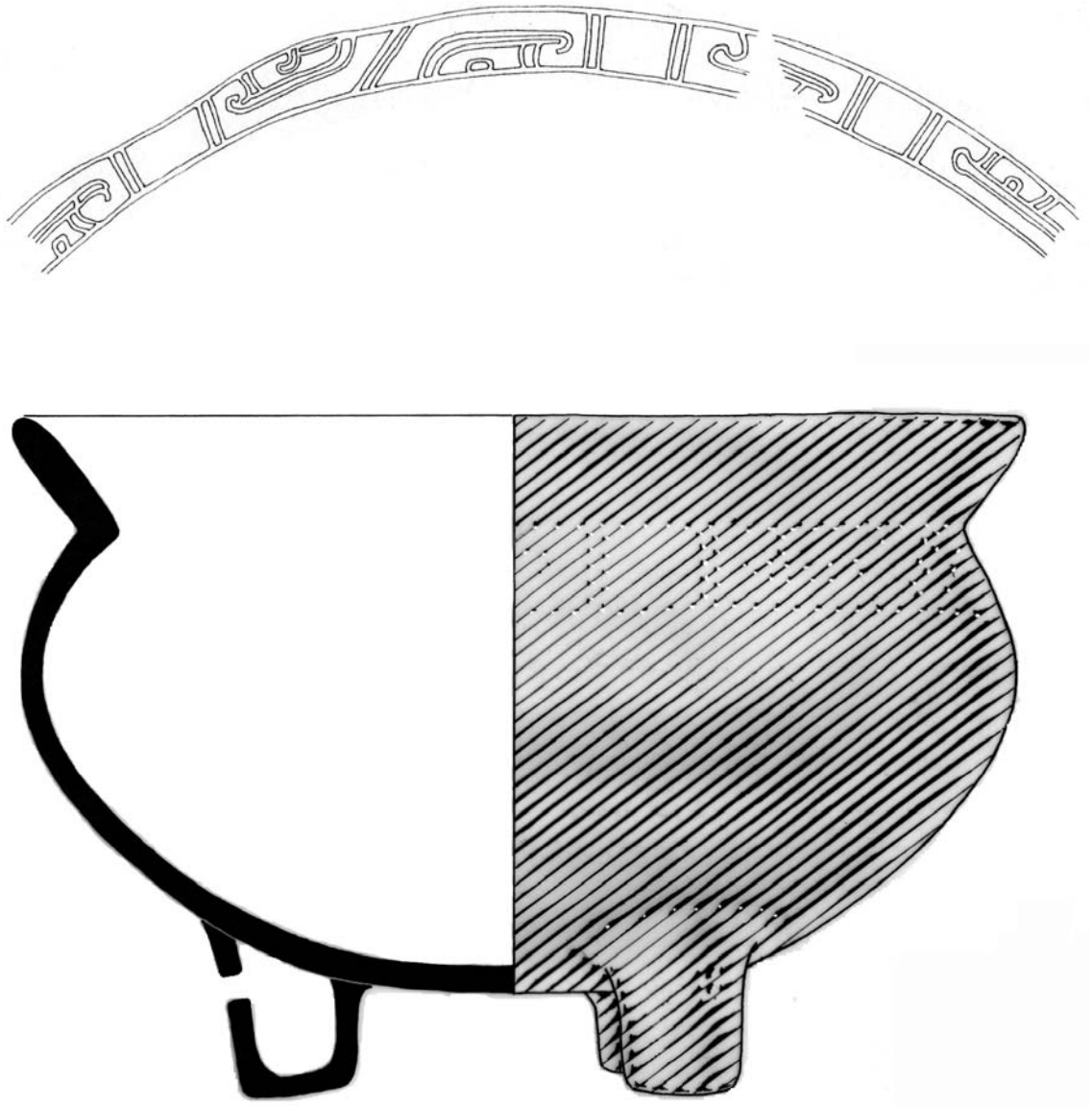

Figure 3: Picu Incised vessel from Postclassic Midden (100%).

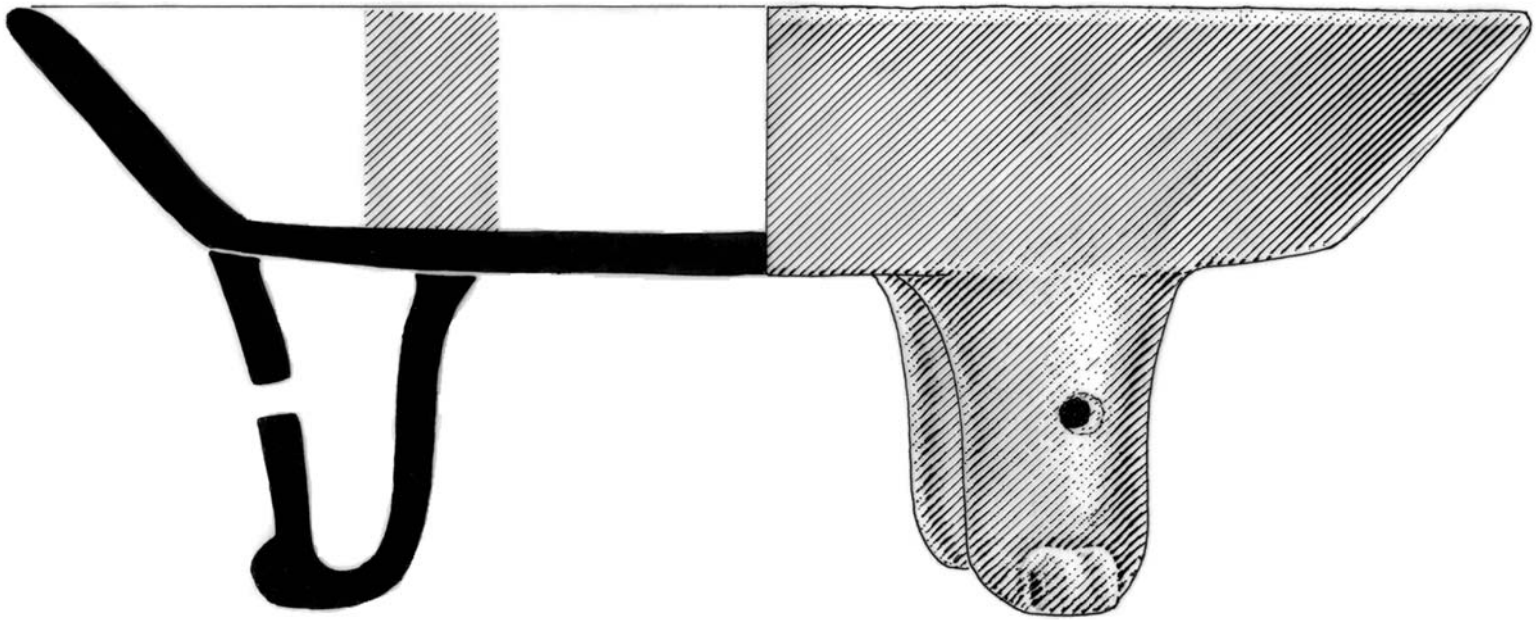

Figure 4: Paxcaman Red: Paxcaman Variety.

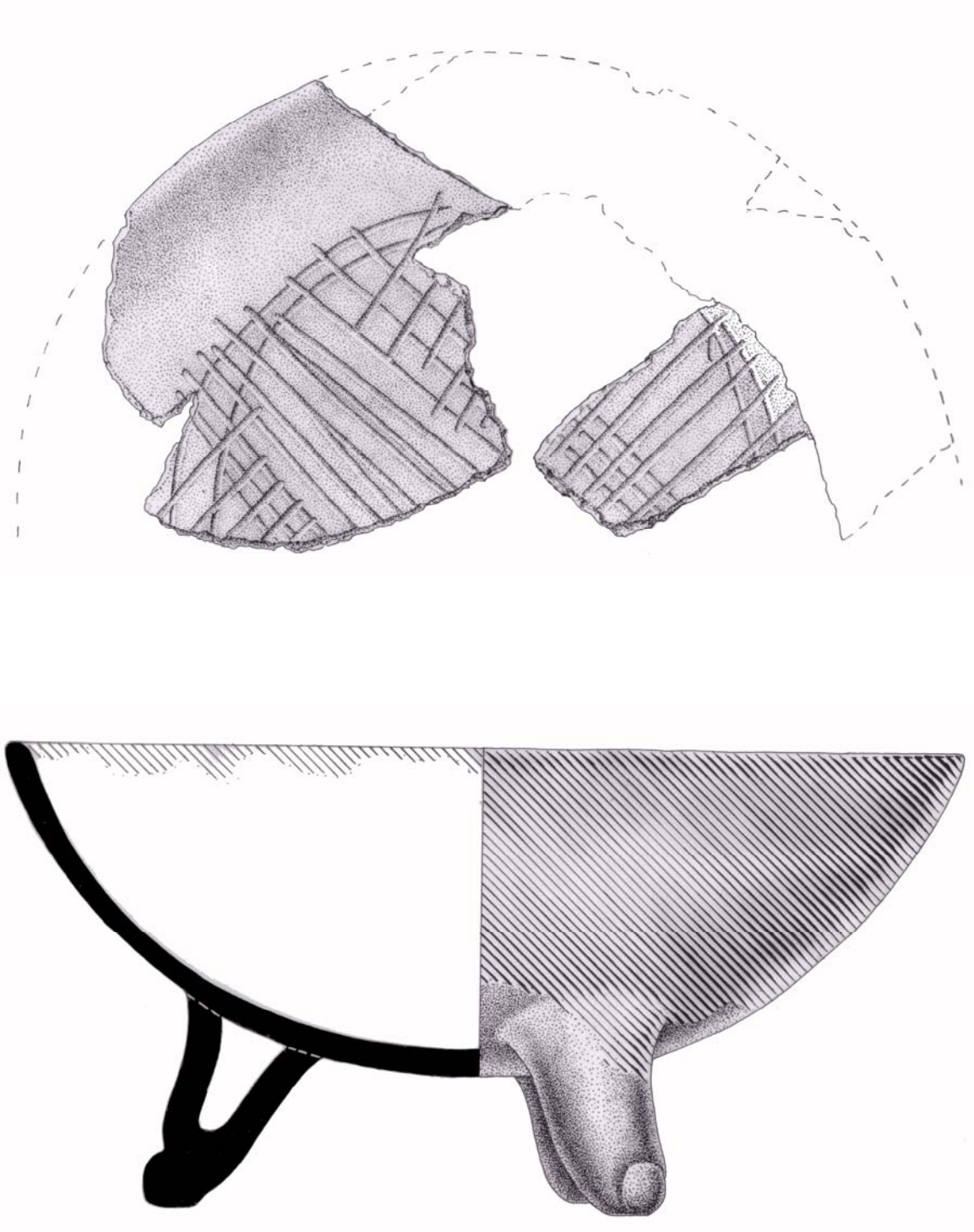

Figure 5: Grater bowl from Postclassic midden (50%).

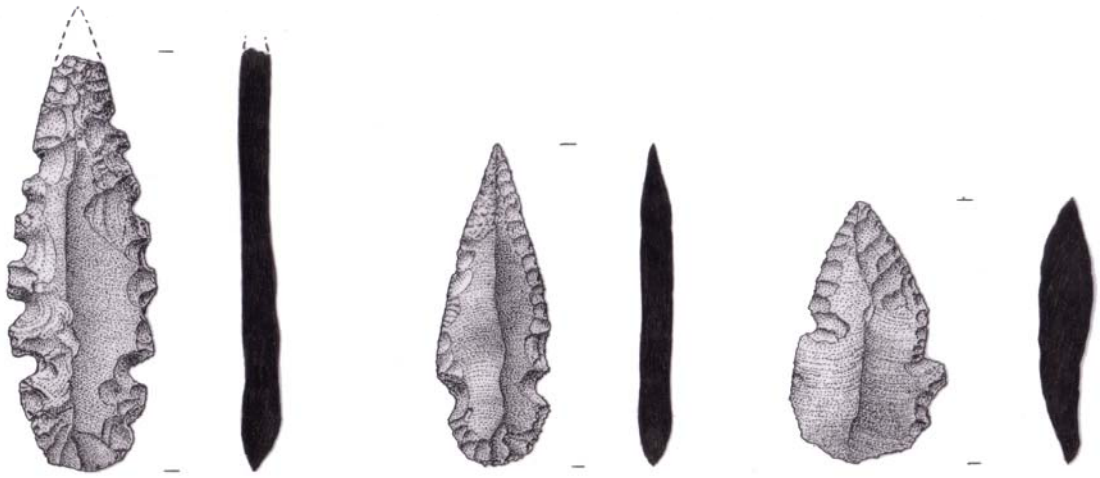

Figure 6a: Postclassic chert arrow points (200%).

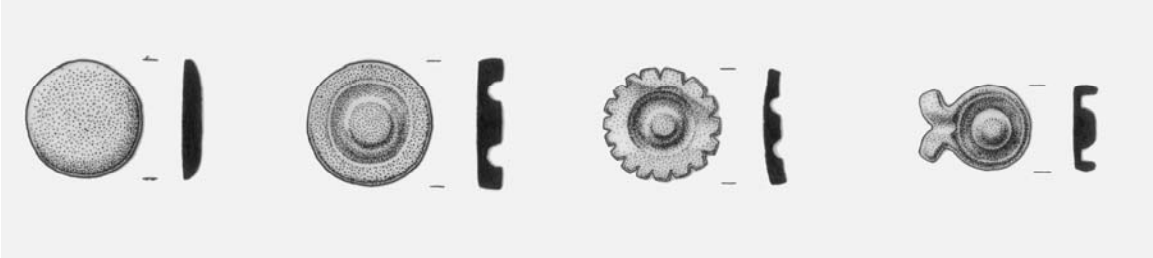

Figure 6b: Conch shell adornments (200%).

Figure 6c: Crystal beads (100%).

Two crystal beads were also found in the midden (Figure 6c). Although no similar beads are previously reported from Belize they have been found in both tombs and the *cenote* at Chichen Itza (Coggins and Shane 1984; Thompson 1938; Hurtado 1961; Willard 1926) and in the *cenote* at Dzibilchaltun (Andrews 1959). Thirty-eight crystal beads were found in tombs 4-7 and in the shaft below the temple known as "The High Priest's Grave" at Chichen Itza (Thompson 1938; Willard 1926). These beads were located with copper bells and Postclassic ceramics but neither Thompson nor Willard are specific about the dates of the tombs. Similarly, Andrews does not give a date for the crystal beads recovered in the *cenote* at Dzibilchaltun. Elizabeth Graham, however, suggests that these crystal beads date to at least 1200 A.D (personal communication 2001).

Two modeled ceramic net sinkers from the midden also date to the Postclassic period. Net sinkers are common in the archaeological record throughout the ages, but in the Classic period they were predominantly made from modified pottery sherds. In the Postclassic period the sinkers are modeled from clay into their desired shape and then fired (Chase 1984).

A unique artifact that was recovered in the Postclassic midden is a ceramic mask (Figure 7 & 8). The mask was located at the bottom of the midden, with a Paxcaman Red: Paxcaman Variety dish followed by a Picu Incised: Paxcaman Variety vessel on top of it. It was discovered face down, and no traces of paint or stucco were found on it. The mask has an unusual pointed nose and has holes for suspension near the temple. According to Rice (personal communication 2002) and Cecil (personal communication 2002) these masks are made in molds and date to the Postclassic period. They note that similar masks (along with molds) have been found in the Peten region of Guatemala. Rice notes that the mask was probably covered in stucco and painted for ritual use. Similar masks have been found at Mayapan (Smith 1971:55) where they are called Chen Mul Modeled type and are thought to be the face of Xipe Totec. These masks also have holes near the temples for suspension but do not have the same pointy nose of the Baking Pot mask. The masks from Mayapan date to the Late Postclassic period. Elizabeth Graham suggests that the mask may represent the pointy-nosed Ek' Chuwah god who is sometimes located in Terminal Postclassic-Historic deposits (personal communication 2001).

Postclassic material was also concentrated on the eastern side of the building in Units 43, 44, 51, and 52. In this location three copper bells were uncovered along with some Postclassic pottery (Figure 9 a, b, c). Copper bells have been found in Belize at the sites of Lamanai and Tipu (Graham personal communication 2001), and are common on the islands off the coast of Belize. They are also common at Postclassic sites in the Yucatan (i.e. Chichen Itza, Mayapan, and Dzibilchaltun) where they are first found in Early Postclassic lots (Coggins and Shane 1984; Littlehales 1961). These bells were most likely cast by the lost wax method. This involves pouring molten copper into a mold containing a wax replica of the bell. The small flair on the suspension ring (found on all three Baking Pot specimens) was the pouring spout for the copper that was not filed off (Coggins and Shane 1984).

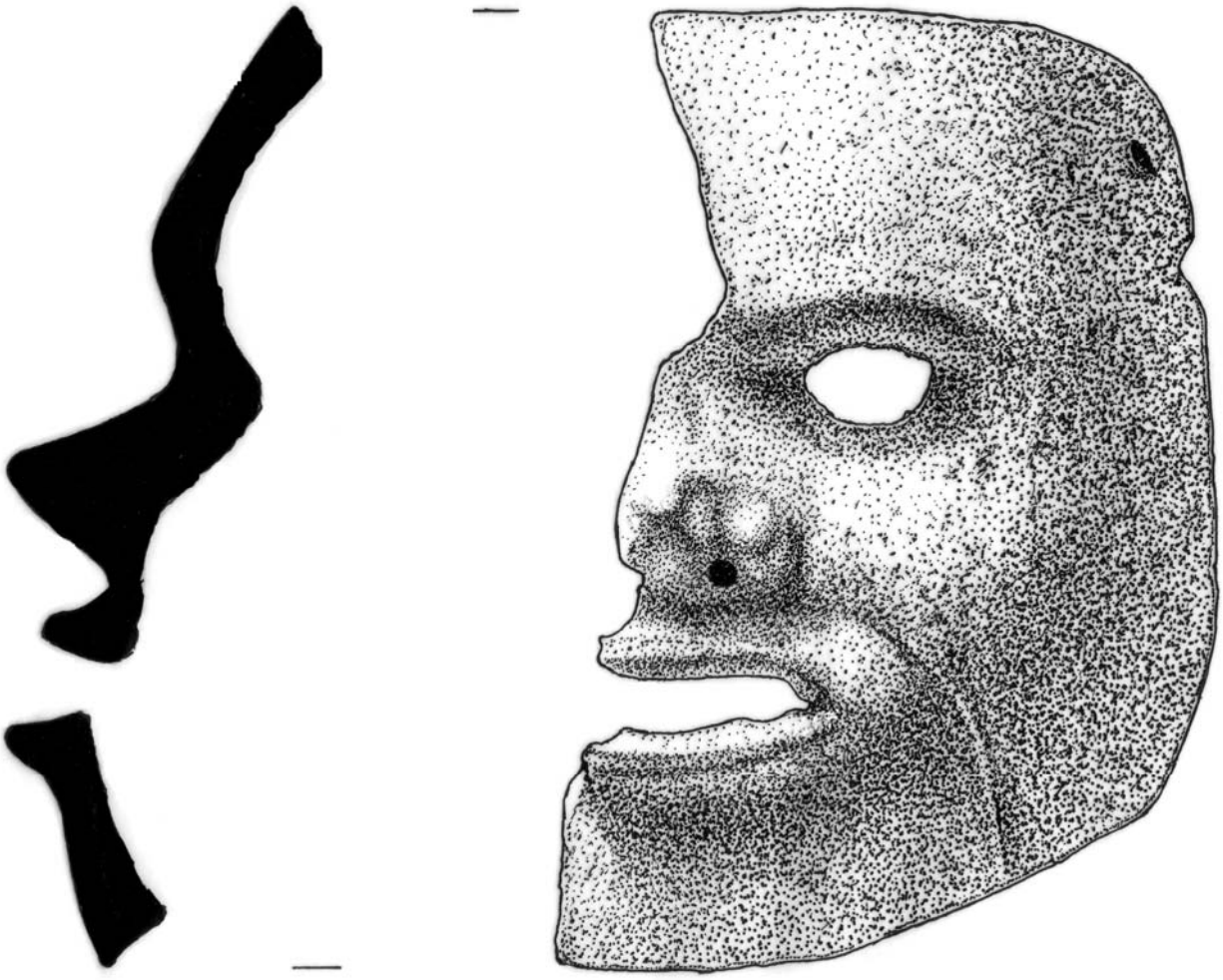

Figure 7: Drawing of Postclassic ceramic mask (100%).

Figure 8: Photograph of Postclassic ceramic mask.

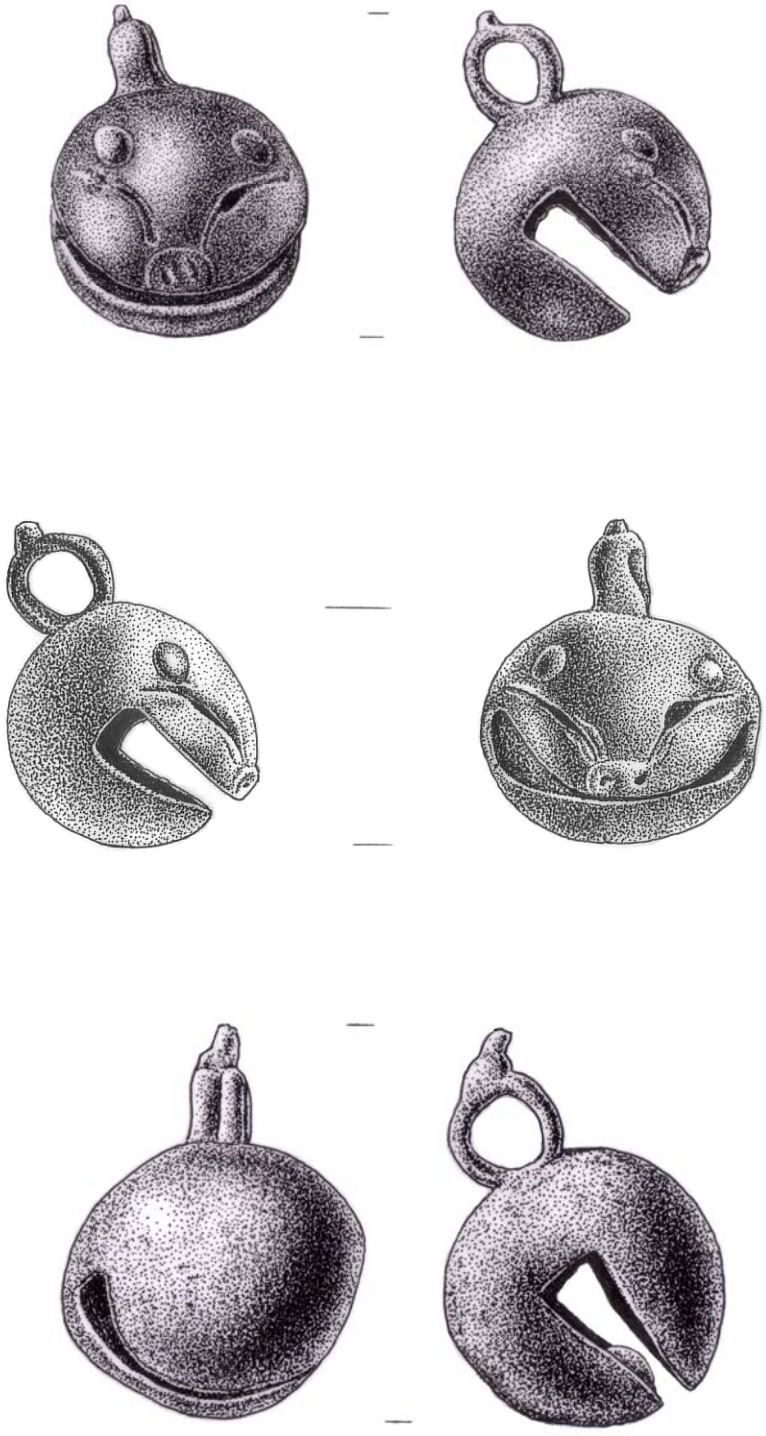

Figure 9: Copper bells from Structure 198 (200%).

Copper bells were probably used as a form of currency (along with cacao seeds) and for ceremonial purposes. The chronicler Padre Cogolludo says, "The monies they use were copper bells and [they were] valuable according to their size" (in Willard 1926). The bells, however, also had an important ritual component. They were strung around the wrists, ankles, and necks of people and would jingle during ritual dances. Most commonly, they were a part of the regalia of the death god, which might account for their frequency in tombs at Chichen Itza (Willard 1926). They were the most common metal offering in the *cenote* at Chichen Itza (found in both copper and gold form) and the majority of those found dated from the Middle to Late Postclassic period (Coggins and Shane 1984:106). Like ceramics, copper bells change in style over the years and Early Postclassic bells are generally distinct from those made in the Late Postclassic period. Of the three bells found at Baking Pot, the two with feline faces are distinctly Late Postclassic (ibid: 124). The third bell can only be dated to the Postclassic period due to its poor preservation.

A jadeite bead and 4 conch shell artifacts were uncovered in association with the copper bells, as were four Postclassic ceramic vessel supports. One of the shell artifacts was an earplug in the form of a flower, while the other three were flower adornments. A single complete obsidian blade was also located in the vicinity. The conch, jadeite, and obsidian artifacts suggest that trade with the highlands of Guatemala and the Caribbean coast continued in the Postclassic period.

Although we have no radiometric dates for the Postclassic occupation of the Yaxtun Group, most of the materials from this phase suggest a Late Postclassic rather than an Early Postclassic date of occupation. It is hoped that further excavations will help to clarify this point.

DISCUSSION

It was noted above that the goal of the 2001 excavations was to gain a better understanding of Postclassic developments at the Yaxtun Group at Baking Pot. This included questions concerning diet, status indicators, travel/trade practices, and the origins of the inhabitants. Some of these questions can now be addressed by the data uncovered on Structure 198 while others will have to be addressed following a more detailed analysis of the cultural remains.

The data recovered from Structure 198 suggest that it likely served a residential purpose. The size and morphology of the structure reflect the forms of building platforms that supported perishable superstructures. The presence of daub fragments with pole impressions suggests that poles that were covered with clay enclosed the walls of the buildings (see Weller, this volume, for a similar context elsewhere in the Baking Pot periphery). A relatively diverse number of household objects recovered by the excavations support this interpretation. At Barton Ramie, Willey et al. (1965) noted that mano, and metate fragments, utilitarian chert bifaces, obsidian blades, spindle whorls and utilitarian pottery were among the typical artifact types recovered in households. The artifact assemblage from Structure 198 included these types of objects with the addition of net sinkers and arrow points.

Although there was a wealth of faunal remains uncovered in the midden this material has yet to be analyzed. However, a cursory review of the bones suggests that the Postclassic inhabitants ate large quantities of meat (particularly deer), turtles, and shellfish (including *jute* and *Pomacea*). Soil samples were also collected for floatation however this has yet to be completed.

Determining the status of ancient people is never an easy task, and the lack of monumental architecture in the Belize Valley communities of the Postclassic period makes this task even more difficult. Given the absence of large architecture and elaborate tombs we must therefore rely more heavily on other traits for defining status. The objects buried in elaborate tombs in the Yucatan, for example, include copper and gold bells, gold rings, crystal beads, and ceramic vessels. Perhaps these objects and other exotica, and not monumental architecture, can be used more effectively for determining status and wealth.

Unfortunately, we still have no solid evidence as to the origins of the Postclassic Maya that settled at Baking Pot. We do not know what language they spoke or if they were living in the region during the Classic period. We do know, however, that they were in contact with people from distant communities, particularly with those from the Yucatan. Both the copper bells and crystal beads most likely originated in central Mexico, the obsidian from highland Guatemala, and tinkler shells were from the Caribbean Coast. It is also likely that the people at Baking Pot were in close contact with the inhabitants at Lamanai and Tipu, two Postclassic centers in west-central Belize. Tipu is only 12 miles upstream, and Lamanai could be reached by traveling down the Belize River, with a portage over to the New River lagoon.

CONCLUSION

Evidence gathered during the 2001 field season supports our previous conclusion that the Yaxtun Group was a household complex that was first occupied during the Late Preclassic period. Caches containing Early and Late Classic period ceramics suggest that occupation continued to the end of the Terminal Classic period, when the plazuela was abandoned. During the Postclassic period (around 1200 A.D.) the site was reoccupied and once again served as the location of a household. It is possible that the Postclassic inhabitants were related to the people from Lamanai and Tipu and that like the latter communities, were in contact through trade and exchange with other groups living along the coast, Mexico and Guatemala.

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ARCHAEOLOGICAL RECONNAISSANCE OF CUEVA MIGDALIA, BARTON CREEK VALLEY, CAYO DISTRICT, BELIZE

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INTRODUCTION

This report presents preliminary observations made on the recently reconnoitred archaeological site named Cueva Migdalia. As this site had not been registered with the Belizean Department of Archaeology prior to the visit of the authors, this report serves to set its existence in the government records as well as in the archaeological literature. In summary form, this report presents the location of the site, a morphological description of the cave, a preliminary inventory of artifactual materials contained therein, as well as ancient modifications of this subterranean environment represented by archaeological features and speleothem breakage. Descriptions of the archaeological data presented –although preliminary– allow temporal placement of the principal phases of cave usage as well as basic assessment of the principal loci of activities conducted therein in antiquity. The data thus gathered as part of the reconnaissance and presented here are thus deemed highly insightful with regard to assessment of the site's potential for future research, preservation, and/or development.

PURPOSE & OBJECTIVES

The reconnaissance was conducted on Monday, June 25th, 2001 by a crew comprised of members of the Western Belize Regional Cave Project (hereafter WBRCP). The reconnaissance team was lead by the authors and guided by Bernard Neal (who in previous seasons has assisted WBRCP investigations at Barton Creek Cave and its vicinity). As the site had not been registered with the Belizean Department of Archaeology, the primary purpose of the reconnaissance was to document its existence and location in the government records as well as in the archaeological literature (through the issuing of the present report). Assessment of the potential of the cave –as a prospective site of future archaeological investigations– represented an additional, secondary objective. In keeping with the latter, the reconnaissance expedition subjected the site to: 1) exhaustive exploration; 2) preliminary survey; and 3) preliminary inventorying of the artifactual assemblages and cultural features contained therein. The detail and precision of the data generated by the reconnaissance are a function of the expedition's short duration (i.e. one day). Despite the restricted temporal extent of the reconnaissance, all objectives outlined at the outset were achieved.

SETTING & LOCATION

The cave site is located in the Alexanders area of the Barton Creek Valley, amidst the northern foothills of the Mountain Pine Ridge of the Cayo District (Figure 1). More specifically the site is situated 1.5 km due west of the Barton Creek River and between 1 and 1.3 km south of the settlement known as Seven Miles (also known as Siete Milas, Progreso, or San Juan; Rafael Guerra personal communication 2001) (Figure 2). As the name of the settlement implies, its embranchment is proximate to the 7-mile mark on the Chiquibul road (from Georgeville). To reach the site the reconnaissance crew drove through Seven Miles to the southeastern extremity of the settlement to the point where the dirt road is no longer passable. UTM coordinates of this location were secured using a portable hand-held GPS unit (Garmin GPS III; obtaining an Estimated Position Error radius of 5 m without Selective Availability encryption). UTM coordinates obtained during the reconnaissance are not reported here in order to protect the site from unauthorized visits. From this point the crew proceeded on foot along a SSW bearing on a path for about 850 m. The path followed had the appearance of a roughly cut and abandoned logging road, winding through a narrow dell subsequently following the dry streambed of an *arroyo*. The partly overgrown path terminated in a small valley bottom, where a *milpa* had been established. The local *milpero* was encountered, assisting our guide in relocating overgrown trails. From the *milpa* we continued southeast for ca. 250 m along the valley bottom, at which point we reached the cave entrance at the base of the southern range of hills of this small valley. UTM coordinates of the entrance were secured (again obtaining an EPE radius of 5 m without SA encryption). Based on the available sheet maps the cave entrance is at an approximate elevation of 300 m above MSL (Directorate of Overseas Surveys 1992).

The geology of the area may be characterized as intermediate to mature karst (Jennings 1985: 233-237), which apparently has been affected by considerable seismic activity, corrosion and mass wasting as is evidenced by taluses of large limestone boulders. Examination of topographic maps (cf. Directorate of Overseas Surveys 1992), subsequent to the reconnaissance, revealed that the dell referred to previously, is in fact the threshold of a small blind valley, whose intermittent stream has considerably affected the banks by corrosion and dissolution, thereby forming steep lateral escarpments and the *arroyo* itself (cf. Jennings 1985: 95-97). The blind valley measures as much as 1 km long (N-S) and 250 m wide (E-W), the *milpa* referred to above being sited at the southern end of the counterslope (Figure 2). Some apparently older areas along the northern perimeter of the blind valley's threshold exhibit karst columns some slightly in excess of 5 m high, their summits partly swathed in jungle growth. Based on the drainage patterns of the surrounding valleys, it appears that these columns may have been formed by the overflow of the intermittent stream (cf. McDonald 1975), at a time when the area may have assumed the form of a half-blind valley (Jennings 1985: 95).

Most of the area is covered by a very thin (ca. 10-15 cm or less) humic layer of ferrous color (presumably stained by ferric oxides), with bedrock outcrops and large

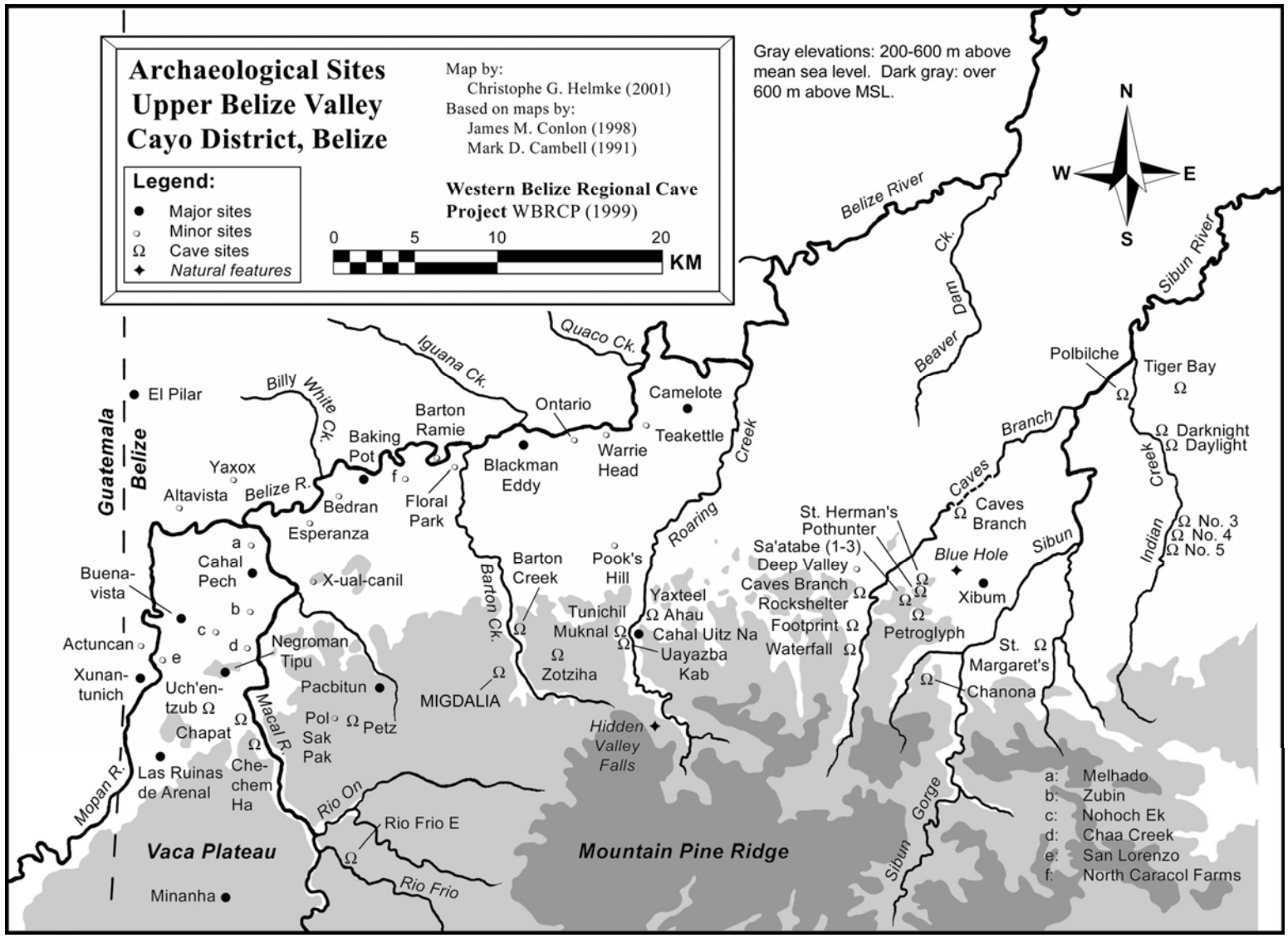


Figure 1: Map of the Upper Belize Valley showing the location of Cueva Migdalia in relation to neighboring archaeological sites.

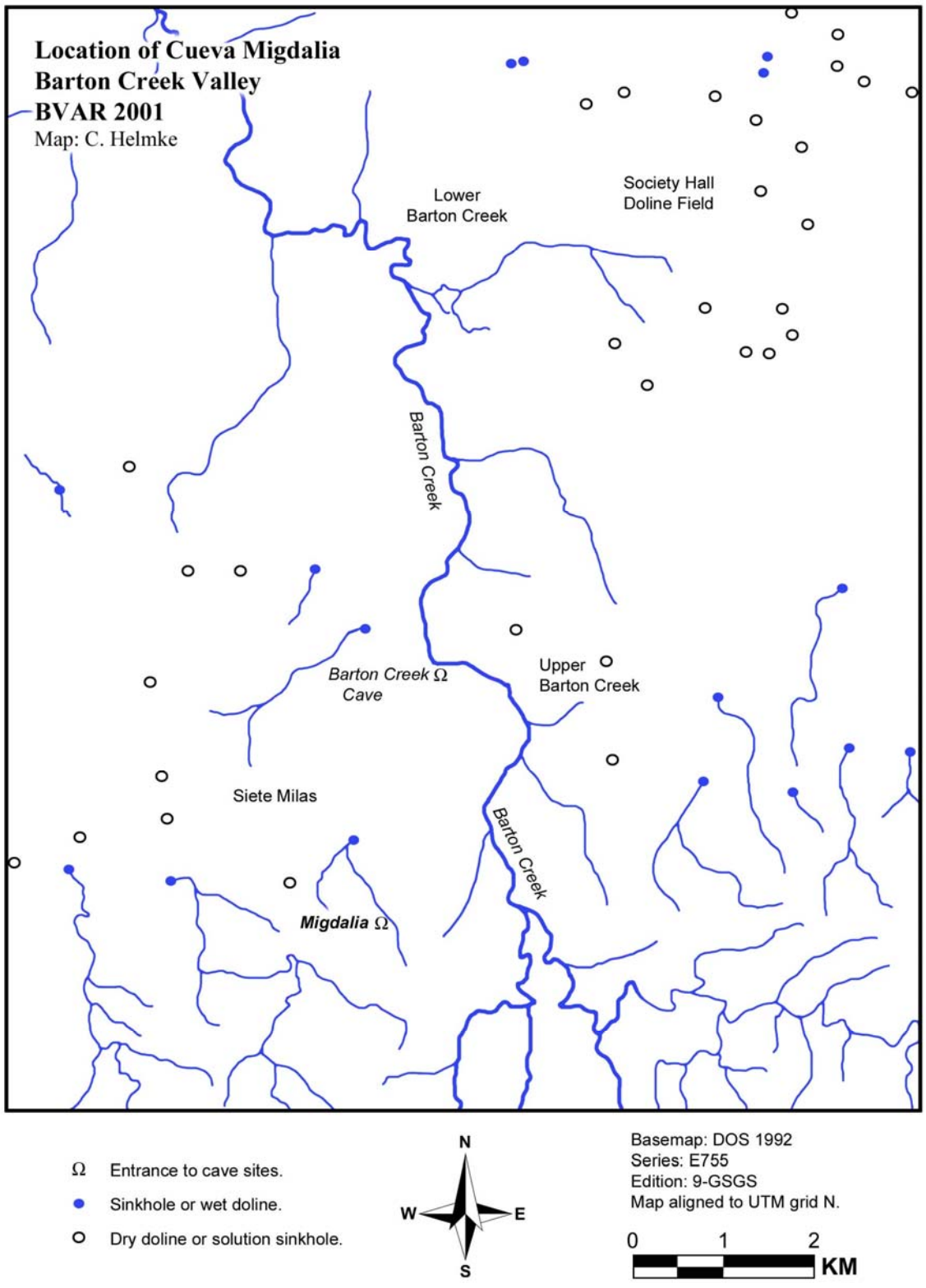


Figure 2: Map of the Barton Creek valley showing the location of Cueva Migdalia.

breakdown-like rocks typifying the area. Areas not subjected to *milpa* cultivation were covered in tall grasses and secondary *wamil* growth. The steeper escarpments or hill ranges were covered with a mixture of low jungle growth and pine trees. The *milperos* were found to use the small patches of soil in and around bedrock outcrops, between large limestone boulders, and within dissolution holes to cultivate their crops (i.e. maize and watermelon).

METHODOLOGY

Reconnaissance of the cave site consisted of two phases. The first entailed a thorough and exhaustive speleological exploration of the site (5 personnel). The second phase of the reconnaissance consisted of the implementation of survey operations (3 personnel), and inventorying of cultural assemblages and features (2 personnel).

Exploration

The exploration was conducted so as to assess the size and morphology of the site for descriptive purposes. Exploration also allowed superficial evaluation of the frequency and spatial distribution of archaeological assemblages and features, relative to the size and configuration of the cave. This assessment allowed scheduling time allotment for the inventory of the archaeological assemblages and features. The scale and survey method to be employed, which would allow rapid and complete coverage of the site in plan, were determined prior to the initiation of the mapping operations, through considerations of estimates of the cave's size, brought about by the primary phase exploration. Having gained a degree of familiarity of the cave by the completion of the exploration, chambers and concentrations of breakdown were designated numerically from the entrance to the rear of the cave, in anticipation of the survey.

Survey

The scale deemed most efficient for the survey was 1:1000 and consisted of schematic renditions of pace and compass data. Paces of the survey personnel were set as close to 1 m as possible so as to eliminate subsequent calculations of proportionate metric conversions. Plotting of the site's plan took place as the survey unfolded, so as to ensure precise plots as well as to overcome potential errors at once. Baselines aligned to magnetic cardinal directions were employed from which paced, perpendicular offsets (rectangular tie-ins) were taken (cf. Kavanagh 1997: 4, 5). Survey of the cave wall was secured by offsets taken at regular ca. 5 m intervals along the baselines. The locations of features of archaeological significance were secured by *ad hoc* intervals projected perpendicularly along the baselines. The survey was initiated from the rear of the cave and brought to completion at the entrance, so as to minimize travel time expenditure within the cave. The survey was conducted as a single traverse, comprised of baselines set at right angles, measuring between ca. 5 and 35 m long consisting in exclusivity of ca. 5 m increments. No permanent datums were established for the survey.

Inventory of Archaeological Assemblages and Features

The inventory entailed at its most basic level the identification and definition of spatially discrete 'areas,' exhibiting concentrations of material culture, or evidence of ancient activity. 'Areas' were designated numerically from the rear of the cave to the entrance in the order in which these were recorded. The inventory crew followed closely behind the survey team during the second phase of the reconnaissance. The position of the two crews in relation to each other allowed the areas defined by the inventory personnel to be plotted on the plan by the survey personnel. Consequently, contextual association between artifacts and areas, and the location of specific areas within chambers, were secured. Based on previous experience it has been determined that ceramic remains represent the most abundant artifact class present in Belizean caves, a point that is also corroborated in the case of Migdalia. Consequently, a specific methodology was established at the outset for the tabulation of ceramic material. This method is presented in the section outlining ceramic data, below. Photographs of hearths, skeletal remains, a small sample of apparently ancient speleothem breakage, and a sample of unusual or remarkable ceramic specimens were also secured. For fear of subsequent illicit removal, two significant archaeological specimens were recovered for analyses, which are briefly presented below.

SITE DESCRIPTION

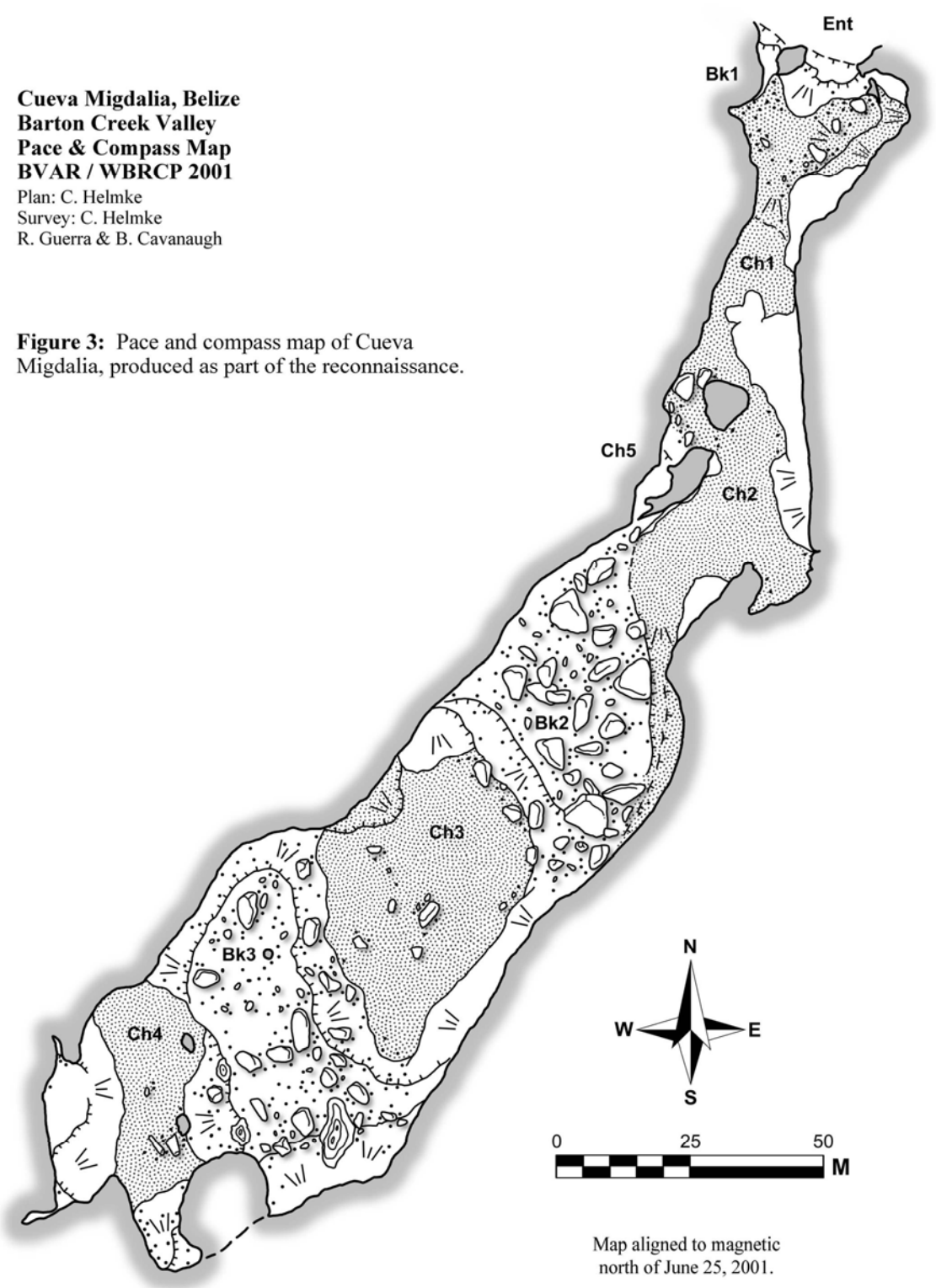
The total documented length of the cave is ca. 280 m, with passage widths ranging between ca. 2 and 58 m (Figure 3). The heights of chambers were not determined (due to lack of proper survey instruments), but the majority of cave passages have sufficiently high ceilings to allow easy walking. Estimates of ceiling heights place the average range between ca. 5 and 10 m (perhaps at most), with ca. 1 m separating the lowest ceilings from floor surfaces. The difference in elevation from the surface of the valley floor at the entrance, to the rear of the cave (i.e. deepest point in the cave) may be as much as ca. -45 m. Nonetheless, this represents an estimated measure that was not secured by the survey. From the entrance, the long axis of the cave is roughly aligned to a ca. S 50^{o} W bearing or an approximate 230^{o} azimuth in relation to magnetic north (Figure 3).

Geomorphology

The longitudinal section of the cave was recorded in a schematic profile during the reconnaissance (Figure 4a) and reveals that it conforms to that of epiphreatic caves (Jennings 1985: 147-148, Fig. 54d). Lateral cross-sections of the cave conform to two types: horizontal ellipsis (Jennings 1985: 54b) and vertical ellipsis (Jennings 1985: Fig. 54c). The former (Figure 4b) spans the majority of the cave's length (i.e. in excess of 170 m), the latter being restricted to the entrance chamber (Figure 4b). The orientations of the elliptical cross-sections apparently follow the orientations of the limestone bedding planes, which were most actively dissolved by dynamic phreatic action. Of note is the shift from horizontal to vertical bedding that coincides closely with the surrounding topography: the overlying limestone hill and the adjacent valley floor, respectively. The juncture of this discrepancy is located near the entrance, thereby suggesting that the foot of the escarpment

Cueva Migdalia, Belize
Barton Creek Valley
Pace & Compass Map
BVAR / WBRCP 2001
Plan: C. Helmke
Survey: C. Helmke
R. Guerra & B. Cavanaugh

Figure 3: Pace and compass map of Cueva Migdalia, produced as part of the reconnaissance.



Map aligned to magnetic north of June 25, 2001.

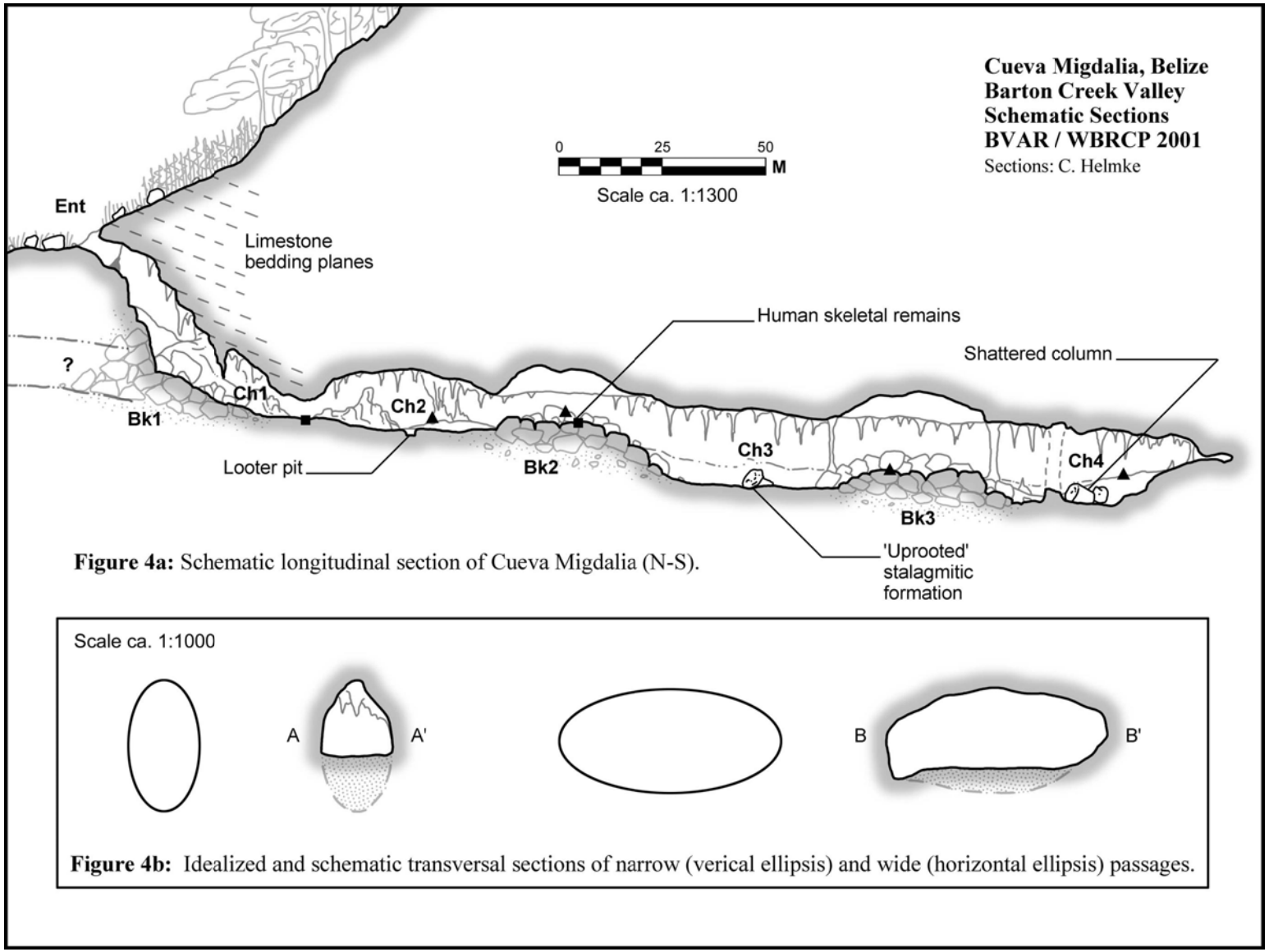


Figure 4a: Schematic longitudinal section of Cueva Migdalia (N-S).

Figure 4b: Idealized and schematic transversal sections of narrow (verical ellipsis) and wide (horizontal ellipsis) passages.

may align to a minor fault separating divergent limestone series. Based on the orientation of limestone bedding planes exposed along the cave's entrance (i.e. ca. -23^{o} gradient from north to south) it is speculated that the putative fault may be anticlinal (Figure 4a).

The geomorphology of the cave is described from the entrance to the rear, according to discrete ambient spaces. All chambers and breakdowns were numbered from the entrance inward and this sequence is utilized as the structure of the following site description (Figure 5)

Entrance, Chamber 1 and Breakdown 1

A collapse sinkhole is the only entrance to the cave currently known (a.k.a. "collapse doline": cf. Jennings 1985: 110-111, Fig. 37a). This entrance measures ca. 3 m wide by 2 m high, faces northeast and does not exhibit signs of cultural modification. The rock face exposed at the entrance reveals that the limestone bedding planes dip along a ca. -23^{o} gradient from north to south (Figure 4a). This indicates that the bedding planes to the south of the collapse sinkhole are in a structurally vulnerable position. It is thus stipulated that the cave's entrance was created by continued, lateral, southward expansion of the sinkhole through collapse of the cave's ceiling, along the weakened bedding planes. The collapse of the cave's ceiling at this location has blocked off the northern continuation of the phreatic passage, and thus the entirety of the cave amenable to human exploration is represented by the passages disclosed to the south of this sinkhole.

From the entrance the floor drops off significantly (by as much as 13 m) along the slope of the breakdown talus (Breakdown 1). The portion of the talus immediately adjacent to the entrance is covered by flowstone and small stalagmitic formations. Nearest the entrance, the base of the cave walls and the foot of the talus, are covered with thick deposits of clayey alloctonous sediment (cf. Jennings 1985: 168-170). At the base of this mass of sediment the passage opens up onto the first chamber (Chamber 1) of a series of four (Figure 4a and 5), which measures up to 32 m wide. Aside from the broadened dome of the collapse sinkhole, the chamber is noticeably constricted, forming more a corridor than a chamber, which measures between ca. 3 and 10 m wide and as much as ca. 75 m long. The southern extent of this corridor passes by a gap in stalagmitic columns defining the entrance to Chamber 2 and terminates at the entrance to Chamber 5.

Chamber 2

From Chamber 1, ceiling heights drop considerably, to those of Chamber 2. The entrance providing access to Chamber 2 from the corridor of Chamber 1 is framed by two speleothem formations. The ambient space of Chamber 2 is defined by a passage measuring between 23 m wide and 43 m long and is surrounded on all sides by speleothem formations. The southern end of the chamber constricts widthwise considerably and leads off into an area of breakdown (Breakdown 2), defining the southern extent of the chamber. Small concentrations of dry and powdery bat guano were noted along the base of walls, suggesting a roosting area for bat populations that no longer frequent the cave. Otherwise, the floor of the chamber is defined by a hard, densely packed and nearly level surface of

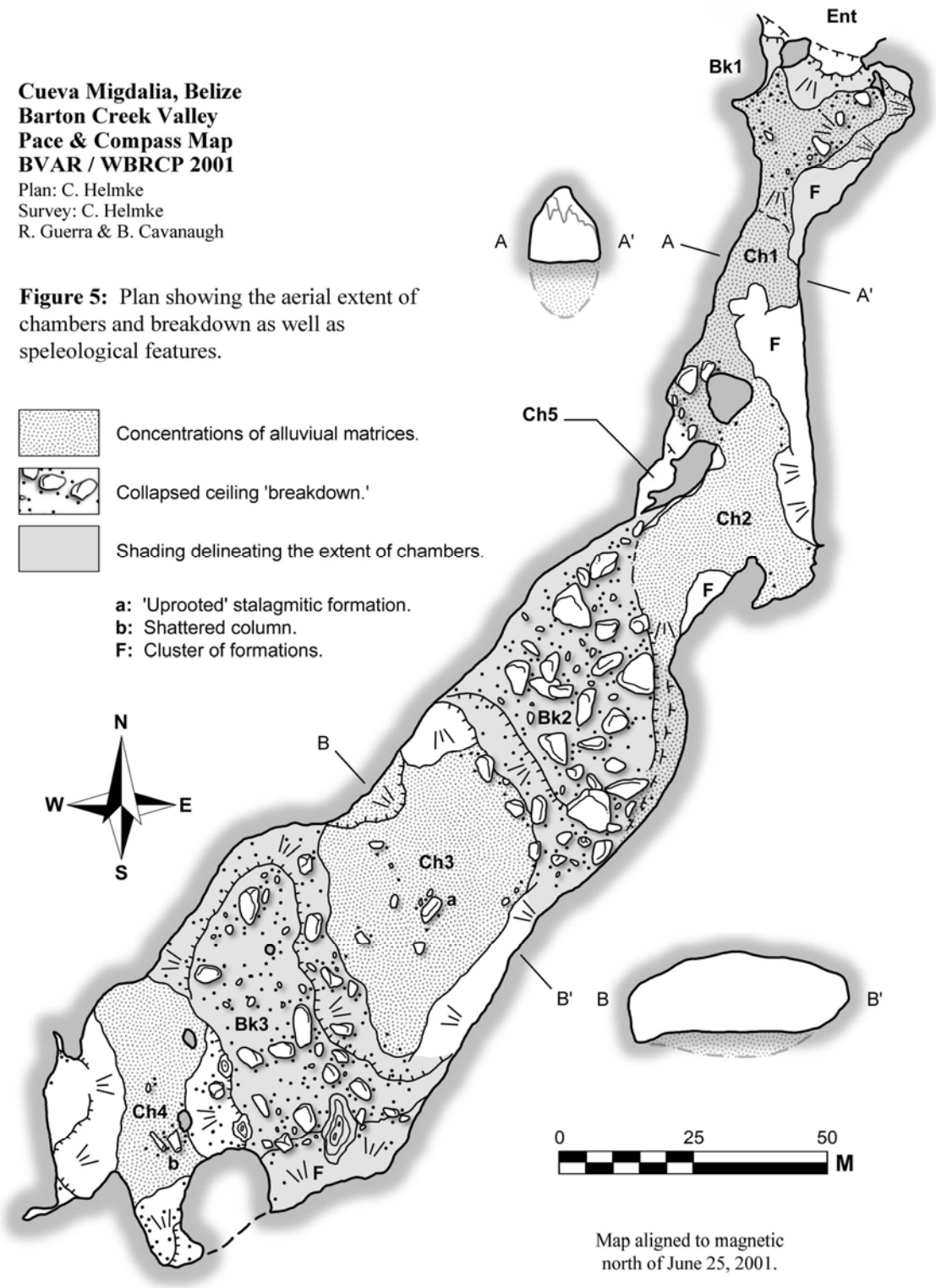


Figure 5: Plan showing the aerial extent of chambers and breakdown as well as speleological features.

sedimentary deposits.

A looters pit excavated at the approximate center of the chamber allowed documentation of the stratigraphic succession and composition of these sedimentary deposits. The facies exposed in the baulks revealed sharply banded multicolored stratigraphy, whose spectrum of coloration is similar in all respects to that of the micro-stratigraphy uncovered in the Stela Chamber of Actun Chechem Ha, located in the Macal Valley (Brady n.d.; Hecker 1999; Spenard n.d.). The physical properties of the stratigraphic profiles of Chechem Ha versus Migdalia are noticeably divergent, however, with fewer, thicker strata and fewer lenses in the case of the latter, suggesting divergent formation processes at both sites. Nonetheless, the stratigraphy of both sites exhibit fine-grained (silt-sized and clayey-sand) and well-sorted matrices, as is characteristic of most cavernicole deposits (Jennings 1985: 165-168). In the case of Cueva Migdalia, a horizon of dark brown (possibly clastic) silt represents the uppermost stratum. This stratum is the thickest deposit documented in the profile and appears analogous to the sedimentary deposits at the entrance, although being less clayey in consistency (cf. Jennings 1985: 166). Consequently, initial deposition of this stratum may correlate to the formation of the collapse sinkhole entrance. Directly beneath, a thin lens of a marl-like substrate occurred between an underlying, nearly black, almost loamy stratum –possibly formed by organic decomposition or pyrite staining. A thin orange stratum followed in the sequence, which may represent a layer of marl-like deposits stained with ferric oxides. Completing the exposed stratigraphic sequence was a layer of dark brown alluvium, comparable to the uppermost level. Based on this stratigraphic sequence and the proposed correlation of the uppermost stratum to alloctonous entrance deposits, it is thought that the lower strata may represent a sequential succession of autochtonous deposits and alluvial matrices deposited during various phases of desiccation of the principal phreatic current.

Chamber 5

This chamber represents a small and low phreatic maze-like ambient space. During exploration access to this chamber was gained at its northernmost extent by crawling through an entrance defined by a gap in a curtain of small speleothem formations. At this juncture Chamber 5 articulates with the southernmost extent of the corridor of Chamber 1. Due to the constricted aspect of Chamber 5, and ceilings under 1 m in height, the majority of the passage only lends itself to exploration by means of crawling. The principal chamber measures between ca. 5 m and 10 m in diameter and is biconvex in section all floors represented by limestone bedrock with little or no accumulations of sediment matrices. Small rimstone dams were noted along the flooring surface. The ceiling is characterized by small stalactitic formations, few of them broken in modern times, suggesting little traffic in this area of the cave. To the south, the chamber connects to diagonal fissures in the bedrock, large enough to squeeze through, which open up into a small breakdown chamber filled with small formations. The principal fissure continues south of this area of breakdown, opening up onto Chamber 2, near the point of interstice with Breakdown 2.

Breakdown 2

Breakdown 2 is a broad expanse of ceiling collapse. The area is characterized by large rocks and boulders (some several meters across) forming a large pile elevated several meters above the surrounding alluvial floor surfaces. The dissolution chamber has a roughly horizontal elliptical cross-section, the lower half of which has been filled with breakdown, the upper half having obviously been modified by the episode of ceiling collapse. The extent of the breakdown measures between 35 and 45-m northeast-southwest, its width corresponding to that of the natural dissolution passage at an average of 40 m (NW-SE). On account of this area's formation through breakdown, the ceiling height is also higher in this area than that of adjacent chambers (i.e. Chambers 2 and 3). Since the bedding planes of the limestone noted at the entrance are analogous to those of this area, the breakdown resulted in the collapse of a greater rock mass in the northern half than in the southern half, thereby yielding a roughly triangular lateral cross-section (cf. Jennings 1985: 28-32). As the natural alluvial floor surface is at a lower elevation in Chamber 3 to the south, than that of Chamber 2 to the north, the southern edge of the breakdown talus is represented by a relatively steep slope.

Chamber 3

Chamber 3 is the ambient space of the natural dissolution passage defined on its northern side by the southern base of Breakdown 2's talus, and on its southern perimeter by the northern base of Breakdown 3's talus. The flooring surface is defined by alluvial deposits, which although sloping southwards a little, are otherwise nearly level E-W. The chamber measures between 40 and 45 m in width, corresponding to that of the natural dissolution passage. The elliptical section of the dissolution passage gives the bedrock sections bordering on walls a steep-sided character. The depression in the flooring surface in the western portion of the chamber, near the base of the bedrock wall, may have been formed by the dissolution of highly soluble marl-like deposits in the bedrock, an area which still absorbs great quantities of aqueous substances, as is suggested by humid clayey deposits in the area. Presumably the depression may also represent a more recent locus of vadose seepage (Jennings 1985: 140-141, Fig. 10). Roughly in the center of the chamber is a large 'uprooted' stalagmitic formation. The collapse of the stalagmitic column is thought be the result of seismic activity, and while it is possible that this may have occurred during Precolumbian times (cf. Stuart 2001) this possibility needs to be assessed by future geomorphological analysis. The entirety of the speleothem formation was set on the surface of alluvial deposits, forming the natural floor of the chamber. This attests to the antiquity of the alluvial flooring, since it is at least as old as the column itself.

Breakdown 3

Breakdown 3 shares all the physical characteristics of Breakdown 2. The former, however, has speleothem columns rising from the surface of this pile to the ceiling, which under future analysis may eventually allow determination of the date after which the breakdown occurred. Along the southern extremity is another large mass of stalagmitic formations, partly covering the breakdown, which attributes a constricted appearance to

the cave passage. The width of the breakdown also corresponds to the width of the original dissolution passage, measuring between 35 and 66 m wide at this junction. The length of the breakdown pile is on average 30 m from SW to NE, roughly proportionate to Breakdown 2. The southern slope is again quite steep, leading down into the ambient space designated as Chamber 4.

Chamber 4

Chamber 4 is defined by the southern base of the talus of Breakdown 3 and the bedrock walls of the dissolution passage. The central area of the chamber is characterized by the alluvial flooring noted in most other chambers. Near the center of the chamber are sizeable fragments of speleothem formations, apparently the remains of large columns that stood proximate to this point. On account of the size of these columns it is thought that these may have been shattered either by seismic activity and/or during the collapse of Breakdown 3. The western and southern extremities are defined by bedrock outcrops and rise sharply away from the floor area. Consequently, the chamber is considerably pinched to the south, where the bedrock floor rises and ceiling drops at which point the principal component of the cave ceases. Presumably aqueous flows continued southward by passing through small fissures formed in the softer bedding planes separating two hard dolomitic limestone planes. The variance of hardness of the bedding planes relative to each other is thought to account for the prominent bedrock outcrops that characterize the area as well as the shape of the lateral and transversal cross-sections of the area. Conversely, the cave passage may have silted up here and originally may have penetrated further south. Small dissolution tubes were noted at the western extremity of the chamber, which suggest that seepage continued at least at that point. The southern extremity of the chamber contains an accumulation of breakdown forming small cavities, large enough to permit human passage. Apparently this breakdown represents spillover from Breakdown 3, which was subsequently covered by flowstone, thereby separating it from the expansive concentration of ceiling collapse to the NW.

Archaeological Areas and Features

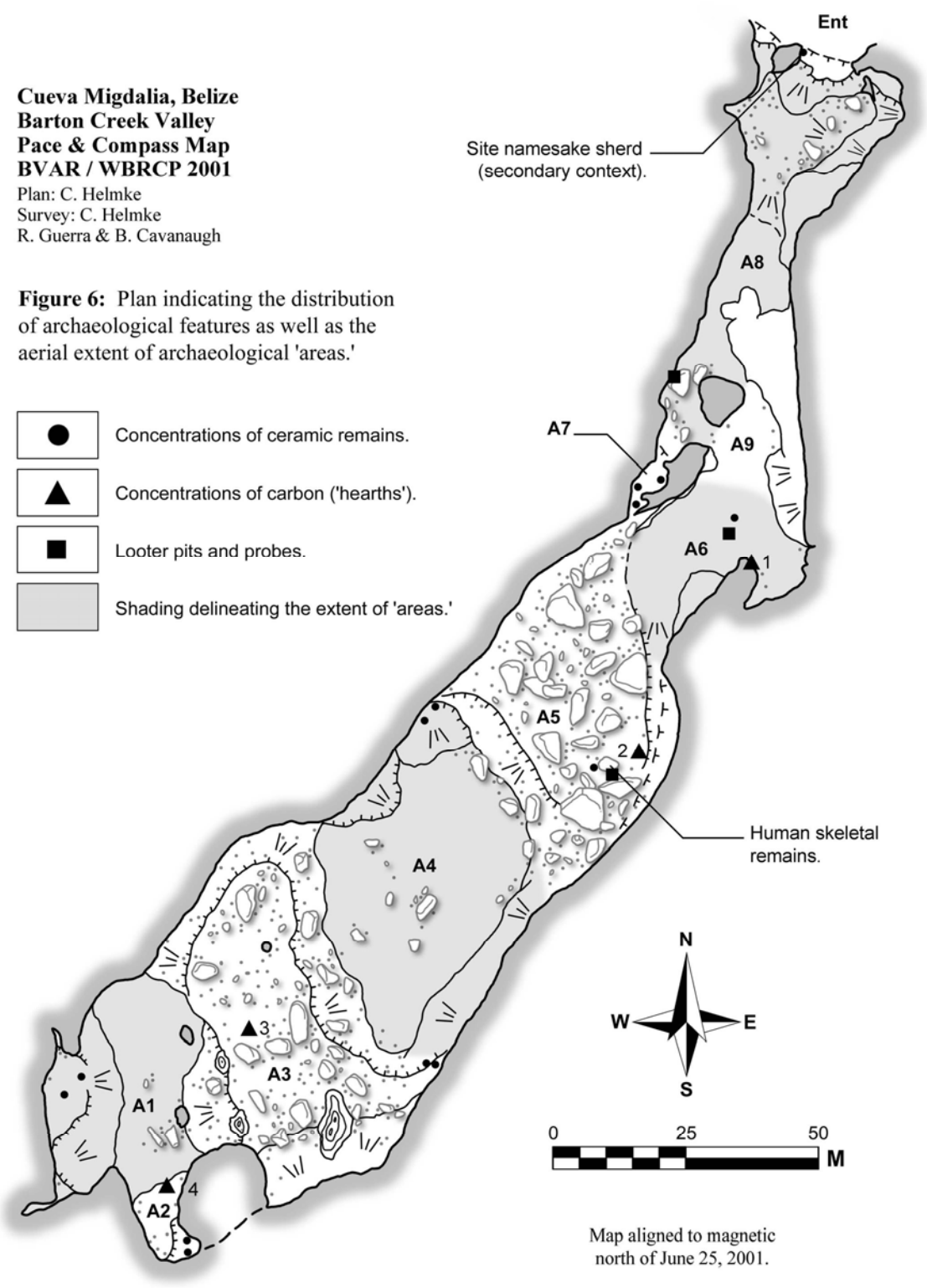
'Areas' of archaeological significance were designated numerically from the rear of the cave to the entrance in the order in which these were recorded, and included 1) concentrations of artifactual assemblages, 2) accretive features (e.g. hearths, burials, clusters of speleothems), and/or 3) subtractive features (e.g. speleothem breakage, excavation pits –most of the latter being apparently modern) (Figure 6). Brief, summary descriptions of 'areas' of archaeological features and artifactual materials are presented in this section, with detailed data and analyses of the ceramic assemblages provided separately in the following section. The two specimens recovered from the site are presented below, according to the area in which these were found, despite their secondary context occurrences.

Area 1 (Chamber 4)

Area 1 encompasses a surface scatter of ceramic remains measuring ca. 7 (E-W) by

Cueva Migdalia, Belize
Barton Creek Valley
Pace & Compass Map
BVAR / WBRCP 2001
Plan: C. Helmke
Survey: C. Helmke
R. Guerra & B. Cavanaugh

Figure 6: Plan indicating the distribution of archaeological features as well as the aerial extent of archaeological 'areas.'



10 m (N-S). Most ceramic specimens were found lying directly atop a somewhat level bedrock outcrop near the center of the western wall of Chamber 4, although a few sherds were found in a small niche to the north as well. In all 132 sherds were documented in the inventory, representing 9 identified types, and 2 form categories. The sherd of a vessel bearing the form, surface treatment and 'curvilinear bracket' decorations of typical Xunantunich Black-on-orange (Gifford 1976: 268-269, Fig. 171g; Gifford & Kirkpatrick 1996: 156) or Benque Viejo Polychrome (Gifford 1976: 269-272, Fig. 174a; Gifford & Kirkpatrick 1996: 17), although made of calcite paste (apparently Peten Gloss Ware), represented a notable specimen in this cluster.

Area 2 (Chamber 4)

Area 2 comprises the southernmost recess of Chamber 4 and includes Hearth 4, and ceramic remains occurring in the small breakdown voids. These cultural features are restricted to a section measuring ca. 6 (E-W) by 14 m (N-S), with the hearth representing the northernmost and the sherds the southernmost extent of the area. A total of 128 sherds were discovered, representing 8 types, and 4 form categories. The base of a fragmentary Cabrito Cream-polychrome vase (cf. Ball 1993, 1994) represents a rare and thus notable ceramic specimen in the assemblage of Cueva Migdalia. The form, banding, and selection of color palette of slips are next to identical to the Cabrito-cream polychrome vessel from the Anderson collection in the Caves Branch Valley. The major difference is in its size with the Anderson specimen being smaller and bearing a cormorant (Helmke 1999a).

Hearth 4 is represented by a concentration of gray ash and carbon fragments, measuring ca. Ø 40 cm, in a shallow depression of outcropping bedrock. The hearth incorporates a broken medium-sized speleothem column, set horizontally and thereby defining the northern perimeter. Presumably the speleothem was placed so as to create a somewhat level surface upon which organic materials could be set ablaze. This hearth is located amidst breakdown on a relatively steep bedrock slope draped in colluvium, hence the need for a small retaining feature. Visual inspection suggested that the hearth did not contain artifactual materials and no direct associations to artifactual materials in the vicinity could be drawn.

Area 3 (Breakdown 3)

Area 3 covers the majority of Breakdown 3 and includes near its center Hearth 3, as well as a sparse distribution of ceramic remains on the surface with sherds and a fragmentary *olla* also occurring as a cluster located ca. 35 m to the east of the hearth. In all 66 ceramic sherds were documented, conforming to 2 identified types, and 1 form category.

Hearth 3 was not sufficiently examined to provide a detailed description of any sort. Nonetheless, the feature was identified based on the presence of gray ashes and fragments of carbon within a cluster measuring ca. Ø 30-40 cm.

Near the cluster of ceramics and extending to the SW along the eastern cave wall,

an area of speleothem breakage was noted. The speleothem breakage is represented by broken stalagmitic shafts with some so-called 'bacon' flowstone formations (cf. Bull 1983: 302-304) also exhibiting signs of fractures. Most formations appear to have been broken in antiquity based on the weathered appearance of the fractures. If the formations were broken by human agency, these do not appear to have been deemed of particular significance, as most speleothems were found close to their stalagmitic bases, as if these had been simply tossed aside subsequent to breakage. Consequently, it would seem that the formations were broken in order to facilitate paths of travel, since subsequent to breakage most speleothems were deposited as *de facto* 'refuse' (cf. Binford 1981; Schiffer 1972, 1983, 1987). Despite the apparent prevalence of deliberate and ancient speleothem modification in the Maya Lowlands (Brady et al. 1997) the possibility that the speleothem breakage documented here is the result of non-human processes such as seismic events, must be considered.

Area 4 (Chamber 3)

Area 4 covers the entirety of Chamber 3 and despite the broad surface area covered this area yielded the least evidence of ancient human activity. A mere 4 ceramic sherds, representing 1 type and 1 form category were identified.

Area 5 (Breakdown 2)

Area 5 was defined so as to encompass the entirety of Breakdown 2. Near the middle of the southern extent of the breakdown, Hearth 2 was identified. Less than 5 m west of the hearth, a concentration of human remains was discovered. A surface scatter of ceramic remains was noted proximate to the interment with another cluster of fragmentary *ollas* occurring ca. 40 m east of the hearth. In all 69 sherds of 5 types and 3 form categories were inventoried.

Hearth 2 measures ca. Ø 40 cm, and is located close to the eastern wall of the cave, near the edge of the breakdown talus. Most notable is the use of three medium-sized, uncut, limestone blocks each ca. Ø 20 cm. This feature is comparable to the three-stone-hearths of ancient and modern Maya households as well as those discussed in Maya mythology (cf. Freidel et al. 1993: 66-67, 79, 105, 130, 387; Moyes 2001; Wagner 2001: 283-284). As such this hearth may be analogous to that documented near Skeleton 1 in the Main Chamber of Actun Tunichl Muknal, in the Roaring Creek Valley (cf. Gibbs 1997, 1998, 2000; Moyes 2001). This proposed analogy is notable based on the association of both features to human remains.

The human remains are represented by approximately 40 fragments, some occurring *in situ* in a shallow pit (measuring ca. 40 cm N-S by 30 cm E-W), others stacked on an adjacent boulder, both clear indications of recent looting efforts. The context of the apparently *in situ* fragments suggests that the individual was buried in the colluvial matrices rather than deposited on the surface. The skeletal remains stacked on the boulder include cranial fragments, very small long bone fragments, and a small fragment of a more complex and unidentified bone. No teeth were noted in the looters pit or in the stack of

bones piled nearby. The guide informed us that during his initial visits (five to ten years prior) looting had not disturbed the interment, although at the time the skull was already visible amidst gaps in the rocks and colluvium (Bernard Neal pers. comm. 2001). This visibility may have prompted the illicit excavation of the pit from which the additional fragments were recovered. Nonetheless, the looting efforts were quickly abandoned, to judge from the shallow depth and small diameter of the pit, presumably because few if any artifacts of commercial value were encountered. Based on the configuration of the pit and the skeletal elements uncovered by the looters, it seems probable that the remainder of the skeleton lies buried and still articulated in the colluvial matrices. The Cayo Unslipped (Gifford 1976: 276-283; Gifford & Kirkpatrick 1996: 28) ceramic specimens associated with the stacked human remains that were apparently recovered by the looters from the interment suggest a Late Classic (ca. AD 700-950) temporal placement for this feature.

Area 6 (Chamber 2)

Area 6 covers the southernmost portion of Chamber 2, is centered upon Hearth 1, its associated ceramic component, and includes the sparse surface scatter of ceramics within a ca. 5 m radius from the hearth. Clustered in this relatively small area a total of 96 sherds was identified, representing 6 identified types and 2 form categories.

Hearth 1 measures ca. Ø 50 cm. This hearth, located on a somewhat level flowstone surface and amidst stalagmitic formations, is associated with smaller speleothem fragments, circling around a large concentration of moist gray ashes and minor carbon fragments. Some speleothems have turned a light gray, similar in color to the ashes, presumably due to exposure to fire and/or heat. A concentration of Late Classic sherds, predominantly *olla* forms, and some black ware sherds were found in association with the hearth. Notably 1 rim sherd of a Garbutt Creek Red bowl (Gifford 1976: 230-233; Gifford & Kirkpatrick 1996: 59) assignable to the LC III phase (cf. LeCount 1992, 1996) was found directly within the ashes of the hearth, thereby suggesting that the hearth was set during the 9th century or later. On the whole the hearth shares similarities with a contemporary feature excavated as Unit 4 in the Main Chamber of Actun Tunichil Muknal, Roaring Creek Valley (Griffith 1998: 53).

In the immediate vicinity and extending as much as 5 m to the NE and SW of Hearth 1, an area of broken speleothems was noted. Most of these are represented by breakage scars of small stalactitic formations and fractured 'bacon' formations, which were apparently included into the hearth. No attempt was made at refitting the speleothems from the hearth to the breakage scars noted on the low, overarching ceiling nearby.

Area 7 (Chamber 5)

Area 7 was designated so as to encompass the entirety of Chamber 5. The artifactual assemblage documented in this area represents the highest frequency at Cueva Migdalia, suggesting that it was a locus of intensive usage. The density of ceramic remains is comparable to the highest frequencies of partial vessels and sherd concentrations documented for both Actun Chechem Ha in the Macal Valley (Ishihara 2000a; Ishihara et al.

2000) and Ledge 1 of Actun Yaxteel Ahau, in the Roaring Creek Valley (Mirro and Awe 1999). Ceramic remains were concentrated along the base of walls in the principal chamber as well as within the small breakdown chamber to the south. In addition, a specimen tentatively identified as Postclassic, on the basis of its form, was found at the northern entrance to Chamber 5. In all 447 sherds were documented, representing ca. 44 % of the total assemblage inventoried for Cueva Migdalia. This relatively large sub-sample represented 11 identified types and 4 form categories. Notable due its rarity, is a ceramic specimen tentatively identified as a Zacatel or Cabrito Cream-polychrome vase (cf. Smith & Gifford 1966: 164; Gifford 1976: 251Fig. 157f-h; Ball 1993, 1994; Gifford & Kirkpatrick 1996: 160).

Since few sherds and stalactitic formations exhibited fresh breaks, the area does not appear to have been heavily impacted by modern traffic. Two minor areas of small broken stalactites were noted, one near the entrance, the other further within the principal chamber, both apparently the result of ancient human activity (antiquity of these features was not assessed).

Area 8 (Chamber 1)

Area 8 is represented by a cluster of artifacts recovered by looters from a small illicit excavation set along the base of the western cave wall (Figure 7). The excavation was located in the corridor of Chamber 1, underneath a large breakdown boulder (measuring several meters across) which leans up against the western cave wall. The excavation represents a shallow probe along the foot of the wall, measuring as much as ca. 70 cm long (N-S), at most ca. 20 cm wide (E-W) and deep. The artifactual materials recovered by the looters were stacked to the side as if expecting to rearticulate complete vessels from conjoining sherds. Apparently these efforts were rapidly forsaken, based again on the small size of the excavation as well as the toppled stacks of ceramic sherds left behind. A total of 37 sherds were recovered, representing 8 identified types, and 3 form categories. Amidst the stacks were sherds of a fragmentary Late Classic (ca. AD 700-950) dish with Tau-shaped tripod supports, the exterior being decorated with punctations, gouging and incising. While the specimen may be assigned to the Silver Creek Impressed: Silver Creek Variety (Gifford 1976: 228-230, Fig. 139e, h; Gifford & Kirkpatrick 1996: 128), the vessel finds its best analogs within the Platon Punctated-incised type (Gifford 1976: 257-259, Fig. 164a, c, g, k; Gifford & Kirkpatrick 1996: 110-111). However, as this specimen was made of calcite paste, it seems to represent a sub-regional manifestation of the Platon Puctated-incised form, possibly affiliated with Tinaja Red, and was thus collected for further study.

Found amidst the Late Classic sherds was a large molar (Figure 7), partially encrusted in clastic concretions, which judging from its size is assumed to derive from an extinct herbivore species. Although the occurrence of late Pleistocene or early Holocene animal bones in the entrance facies of caves is not uncommon (Jennings 1985: 168-170), its discovery was nonetheless unexpected, particularly due to the focus placed on Maya remains during the reconnaissance and the rarity with which specimens of such antiquity are recovered from sites in the central Lowlands. In order to verify the presumed antiquity

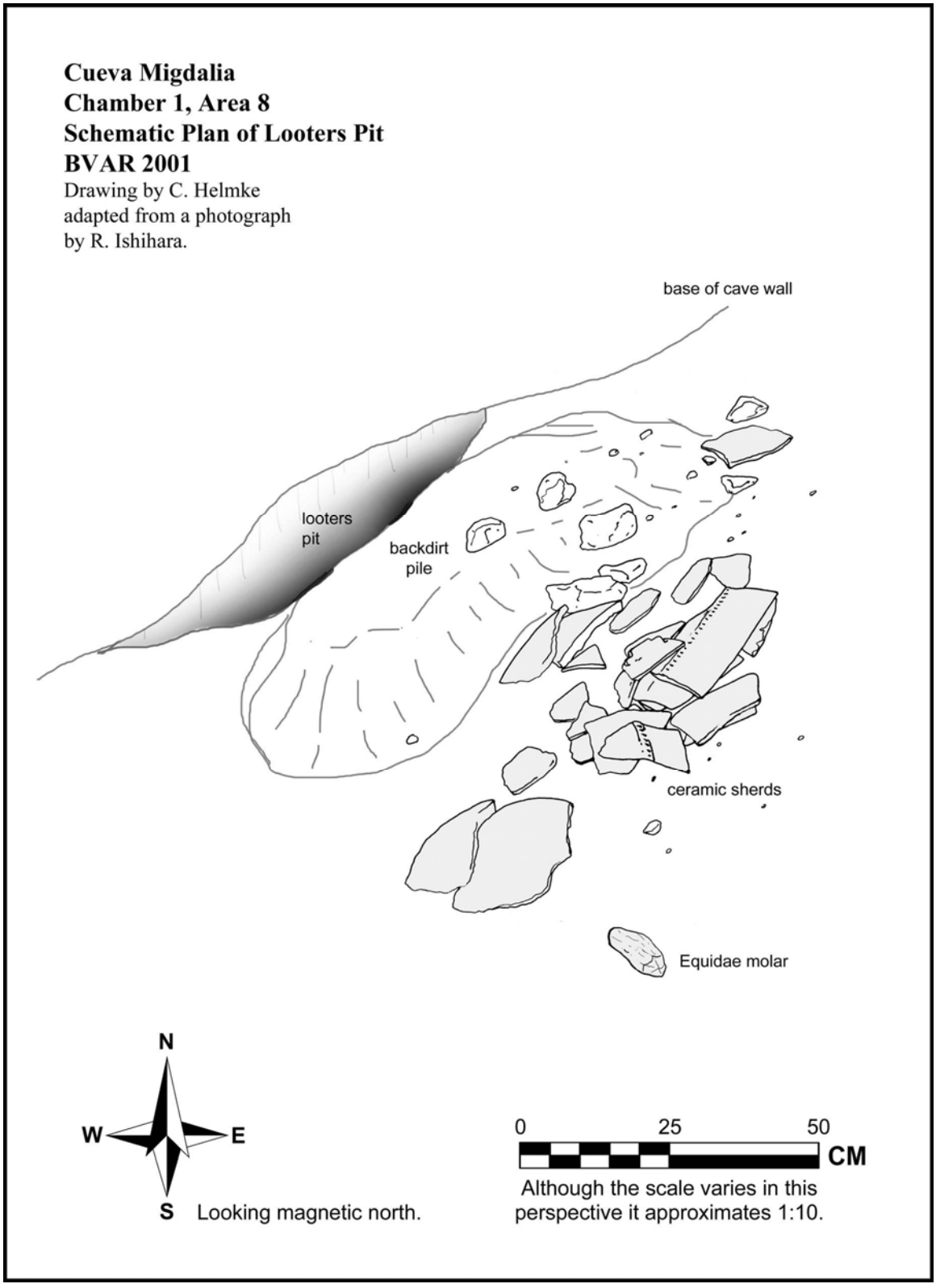


Figure 7: Schematic plan of the looters pit and associated artifacts of Area 8.

of this molar, through secure identification of the genus or species affiliation, this important specimen was recovered from the site for further analysis. Preliminary analyses by Charles P. Egeland of the CRAFT Research Center of Indiana University identify this specimen as belonging to the Equidae family (Cameron Griffith personal communication 2002). Due the fragmentary condition of the molar and the coexistence of three Equidae species in South America at the time (i.e. Equus, Hippidion, Onohippidium) secure species identification is still wanting at the time of writing (Charles Egeland and Cameron Griffith personal communication 2002).

In addition to the cluster of artifacts recovered by the looters, described above, a single probable Sierra Red sherd (Smith & Gifford 1966: 163; Gifford 1976: 85-90; Gifford & Kirkpatrick 1996: 127-128), dating to Late Preclassic (300-100 BC), was found at the entrance of the cave, resting on a small bedrock shelf. This sherd had obviously been transported by looters from the interior of the cave (possibly from the cluster described above) based on the coloration and texture of small patches of matrix still adhering to portions thereof. In addition to removal from the cave, the exterior of the sherd had also been modified by modern incisions, bearing a crude inscription reading "Migdalia" –the namesake of the site. Migdalia being a popular female given name, its presence on a sherd implies endearment by an unidentified looter. Note should also be made of the two empty rum bottles found at the entrance, which the local *milpero* assured us had not been present the week before the reconnaissance.

Area 9 (Chamber 2)

Area 9 was defined so as to account for a cluster of ceramic materials in the northern reaches of Chamber 2. This concentration is associated with a looters pit located just 7 m NW of Hearth 1 (Area 6), but extending as sparse surface scatters still farther north. This looters pit, located near the center of Chamber 2, is nearly rectangular measuring ca. 35 cm by 50 cm and reaches a maximum depth of ca. 45 cm. This excavation is the looters pit referred to in the geomorphology section from which stratigraphic data were adduced. In addition to the looters pit, modern human disturbance is represented by debris left behind by casual visitors, hunters, or looters. Notably most such garbage was found proximate to the looters pits, and included chewing gum/*chicle* wrappers and a blue fragmented plastic object of unidentified function. In all Area 9 encompasses a section measuring as much as ca. 15 (E-W) by 25 m (N-S). In all 39 sherds were documented, representing 4 identified types and 3 form categories.

CERAMIC ANALYSIS

In the inventory, absolute frequency distributions of ceramic specimens were tabulated in each area according to three criteria: 1) form, 2) type: variety, and 3) component. The first criterion includes *ollas*, bowls, dishes, vases, and unidentified forms (cf. Sabloff 1975). The second criterion refers to the nomenclature of the standard typological system employed in the Maya Lowlands for the classification of ceramic specimens (cf. Gifford & Kirkpatrick 1996). Specimens whose type was only tentatively identified are postfixed by a question mark; those that could not be identified at all,

although bearing diagnostic attributes, were referenced as "Unidentified." Due to limitation of time spent within the cave, undiagnostic sherds were also referenced within the "Unidentified" category.

The type:variety assignations of sherds were based predominantly on the typologies developed for the sites of Barton Ramie (14 km distant; Gifford 1965, 1976) and Xunantunich (22.5 km distant; LeCount 1996), with minor references being made to the Uaxactun sequence (Smith 1955; Smith & Gifford 1966) as well as the most recent and comprehensive index of type:varieties (i.e. Gifford and Kirkpatrick 1996). The component of sherds refers to the portion of ceramic containers represented, including: rim, body, base, or other modes. Due to limitations of time, no attempt was made at estimating the minimum number of ceramic vessels represented, by conjoining / refitting analyses or other means (cf. Rice 1987; Orton et al. 1993). All frequencies therefore refer to sherds as the lowest denominational unit, although fresh breaks were excluded from counts. The preliminary frequencies presented herein (Table 1) are thought to closely approximate those that might be generated by a more thorough and exhaustive investigation of surface contexts. Due to active and apparently prolonged looting, no means of estimating the 'representativeness' of the sample (in relation to that originally present) are available, on account of the probable illicit removal of highly decorated or intact specimens. Illicit removal of decorated sherds was in fact suggested by the guide who informed us that the cave had contained more 'painted' ceramics during his original visit to the site over a decade ago (Bernard Neal personal communication 2001).

The small size and presumed 'representativeness' of the documented ceramic sample (in relation to Cueva Migdalia's complete assemblage of still extant surface contexts), lends itself well to simple, albeit preliminary, statistical analyses. The attributes investigated are manifested in the variance of frequency distributions of characteristics readily attainable by all ceramicists. The characteristics scrutinized in these analyses are those which were documented during the inventory phase of the reconnaissance, i.e. vessel form and type: variety affiliation, in relation to dimensional attributes such as spatial distribution and temporal placement. Absolute and relative frequency distributions of sherds exhibiting one or several of these characteristics represent the most significant aspects of documented variance generated by the inventory, and therefore are the starting point and basis of computations. The quantity of attributes exhibited by individual sherds directly determined the composition of various statistical samples (of differing size), each lending itself to the analysis of the different attributes. Emphasis is placed on relative frequency distributions so as to render conclusions reached by these preliminary analyses comparable to samples of other cave sites. In addition, reliance on relative frequencies is thought to allow similar conclusions to be reached by the present analyses as would be by potential exhaustive analyses of the complete assemblage represented within Cueva Migdalia.

In light of these variables, the sample was subjected to three separate analyses, each with the purpose of ascertaining the principal characteristics exhibited by this sample of cave ceramics. The first analysis considers the spatial distribution of ceramic remains within the cave, in relation to distance or proximity to the entrance. The second assesses

the distribution of vessel forms within the sample as a whole as well as in relation to spatial distribution. The third analysis investigates the temporal breadth of the entire assemblage as well as in relation to spatial distribution within the cave. The principal objective of these analyses is the identification of diagnostic statistical distributions of attributes of speleological ceramic assemblages. The secondary objective is inferentially related to the first and aims at the identification of diagnostic attributes of ancient cave activities as represented by the most prevalent material precipitate of these activities, namely ceramic remains.

Spatial Distribution

The spatial distribution analysis considers the distribution of all sherds documented within the cave (n=1019), according to 'area' in relation to the distance of these from the cave entrance. The most notable trend is the occurrence of the largest sub-assemblage (ca. 44 %) in Area 7 (Chamber 5) in relative proximity to the entrance. This concentration is notable considering the small surface area encompassed by Chamber 5. All other areas exhibit low to moderate distributions of ceramics remains, when compared to the peak of Area 7 (Figure 8). The second highest concentrations of ceramic sherds are found at the rear of the cave in Areas 1 and 2 (both Chamber 4). Also of note, is the near absence of ceramic remains in Area 4 (Chamber 3) despite the broad surface area encompassed by that ambient space.

These trends suggest intensive usage of Area 7, minimal usage of Area 4, and moderate usage of all other areas. Nonetheless, it must be conceded that an exact correlation between the frequency distribution of ceramic remains and the intensity of usage is still wanting and problematic considering aspects of ancient behavior in light of the obstacle of equifinality (cf. Hodder 1978; Hodder & Orton 1976; Johnson 1999: 99; Sabloff 1981; Trigger 1990: 301, 361, 394). Thus, while distributions of ceramic materials may duplicate degrees of intensity of usage of particular areas, a cohesive model justifying these assumptions is still warranted (cf. Griffith & Helmke 2000).

It is important to note, however, that the highest frequencies of ceramic remains are spatially restricted to areas characterized by important geomorphological features, i.e. Area 7 as well as Areas 1 and 2. The former represents a small chamber that differs noticeably from the remainder of the cave's morphology, which is located at a point of embranchment, while the latter areas comprise the rear of the cave. Noteworthy are the considerably lower frequencies occurring within the broader passages, more characteristic of the cave as a whole (i.e. Areas 3, 4, 5, 8 and 9). This clustering conforms to the ethnographically-derived model of Maya cave usage, wherein it is stipulated that major artifact concentrations should occur at important processional points, the latter in turn being located at important geomorphological features of the cave (i.e. at the entrance, points of embranchment, small subsidiary side chambers or alcoves, and the rear of chambers or the cave) (Stone 1997, 1999; cf. Bassendale & Ransom 2001).

Area	Form	Type: Variety	Component			Totals	Total
			Rim	Body	Base	by Type	by Form
Area 1	Jar	Cayo Unslipped	15	63	---	**78**	**125**
		Cayo Unslipped with filleting	2	---	---	**2**	
		Tinaja Red	---	3	---	**3**	
		Tinaja Red with tan surface	2	---	---	**2**	
		Unidentified	---	40	---	**40**	
	Bowl	Xunantunich Black on Orange (calcite)	1	---	---	**1**	**5**
		Dolphin Head Red form? (calcite)	2	---	---	**2**	
		Unidentified (Pine Ridge Carbonate)	1	---	---	**1**	
		Tinaja Red ?	1	---	---	**1**	
	Unidentified	Unidentified	---	2	---	**2**	**2**
Area 2	Jar	Cayo Unslipped	13	39	---	**52**	**99**
		Tinaja Red form with black slip	1	5	---	**6**	
		Tutu Camp Striated	---	3	---	**3**	
		Tinaja Red form with brown exterior	2	36	---	**38**	
	Bowl	Rubber Camp Brown ?	1	---	---	**1**	**1**
	Dish	Daylight Orange: Darknight Variety	3	3	1	**7**	**8**
		Pine Ridge Carbonate	1	---	---	**1**	
	Vase	Cabrito Cream Polychrome	1	2	1	**4**	**4**
	Unidentified	Pine Ridge Carbonate	---	16	---	**16**	**16**
Area 3	Jar	Cayo Unslipped	5	11	---	**16**	**48**
		Tinaja Red form with brown exterior	1	30	---	**31**	
		Unidentified (with strap handle)	1	---	---	**1**	
	Unidentified	Unidentified	---	18	---	**18**	**18**
Area 4	Jar	Cayo Unslipped	1	3	---	**4**	**4**
Area 5	Jar	Cayo Unslipped	6	26	---	**32**	**32**
	Bowl	Garbutt Creek Red (LC2)	3	4	---	**7**	**10**
		Rubber Camp Brown	1	1	---	**2**	
		Tinaja Red ?	1	---	---	**1**	
	Dish	San Pedro Impressed ?	4	---	---	**4**	**4**
	Unidentified	Unidentified	---	23	---	**23**	**23**
Area 6	Jar	Cayo Unslipped	8	15	---	**23**	**29**
		Roaring Creek Red	1	---	---	**1**	
		Tinaja Red	3	---	---	**3**	
		Tutu Camp Striated	---	1	---	**1**	
		Unidentified	1	---	---	**1**	
	Bowl	Garbutt Creek Red (LC3)	2	1	---	**3**	**4**
		Rubber Camp Brown	1	---	---	**1**	
	Unidentified	Unidentified	---	63	---	**63**	**63**

Table 1: Tabulation of Cueva Migdalia's ceramic assemblage.

Area	Form	Type: Variety	Component			Totals	Total
			Rim	Body	Base		by Form
Area 7	Jar	Cayo Unslipped	29	21	---	**50**	**69**
		Cayo Unslipped with filleting	7	---	---	**7**	
		Tinaja Red	3	1	---	**4**	
		Alexanders Unslipped	8	---	---	**8**	
	Bowl	Mount Maloney Black (LC2)	2	1	---	**3**	**4**
		LC form	1	---	---	**1**	
	Dish	Rosario Incised ?	2	---	---	**2**	**9**
		Dolphin Head Red form ? (calcite)	1	---	---	**1**	
		Rubber Camp Brown	3	---	---	**3**	
		Pine Ridge Carbonate	1	---	---	**1**	
		Mountain Pine Red	1	---	---	**1**	
		Mountain Pine Red ?	1	---	---	**1**	
	Vase	Zacatel or Cabrito Cream Polychrome	---	---	2	**2**	**2**
	Unidentified	Post-Classic ?	1	---	---	**1**	**363**
		polychrome (red & black on orange)	---	3	---	**3**	
		Unidentified	---	359	---	**359**	
Area 8	Jar	Cayo Unslipped	2	---	---	**2**	**29**
		Tinaja Red	2	1	---	**3**	
		Tutu Camp Striated	---	10	---	**10**	
		Alexanders Unslipped	---	13	---	**13**	
		Unidentified	---	1	---	**1**	
	Bowl	Meditation Black (LC2)	1	---	---	**1**	**4**
		Dolphin Head Red	3	---	---	**3**	
	Dish	Daylight Orange: Darknight Variety	2	---	---	**2**	**4**
		Platon Punctated Incised (calcite / LC2)	2	---	---	**2**	
	Unidentified	Sierra Red ?	---	1	---	**1**	**1**
Area 9	Jar	Tutu Camp Striated	1	5	---	**6**	**22**
		Tinaja Red	1	15	---	**16**	
	Dish	Uacho Black on Orange	1	---	---	**1**	**1**
	Vase / Bowl	Santa Teresa Incised	---	16	---	**16**	**16**
Totals:			160	855	4	**1019**	**1019**

Table 1 continued.

The sole discrepancy between the Migdalia assemblage and this model is the low frequency of ceramic remains at the entrance to the cave (i.e. Area 8), a locus which based on the stipulation that processions begin and end at that point (cf. Brady 2001: 305-307 *passim*; Schuster 1997; Stone 1997) should exhibit the largest artifactual assemblage, a feature documented at some but not all sites investigated by the WBRCP (e.g. Actun Uayazba Kab, Actun Yaxteel Ahau, or Actun Chapat). Thus, while the intensity of usage of particular areas may indeed be consonant with spatially-discrete and high frequency artifact concentrations, as is supported by the processional model (Stone 1997), the low frequency of artifacts at the entrance to Cueva Migdalia requires an explanation. In a speculatory vein it may be posited that processions were in fact initiated and terminated at a nearby and as yet unidentified surface structure, not the cave entrance itself, a function which has tentatively been suggested for Structure ATM-1 (a.k.a. Str. XN-1) near the eastern entrance to Actun Tunichil Muknal, in the Roaring Creek Valley (Helmke 2000a; Song and Zubrzycki 2001).

Form

Considering the Migdalia assemblage on the whole, it is immediately apparent that just under half (ca. 48 %) of the sherds inventoried (n=1019) could not be identified as to vessel form (Figure 9a). This high figure was brought about by the lack of distinction between slipped *olla* and bowl body sherds. This problem could have been resolved by detailed attention to surface characteristics and paste attributes, an aspect of the inventory disabled by the short duration of the reconnaissance.

Unidentified specimens aside, it is clear that *ollas* are by far the dominant form, of the assemblage, amounting to ca. 45 % of the total assemblage (n=1019) and ca. 86 % of the identified assemblage (n=533) (Figure 9a). Bowls (ca. 5 %), dishes (ca. 5 %) and vases (ca. 4 %), although representing comparable frequencies of the identified assemblage, comprise only a small minority (Figure 9a). The predominance of *ollas* in cave assemblages has been noted for other sites in western Belize, such as Laberinto de las Tarantulas (Helmke 1999b; Ishihara & Helmke 2002), Actun Chechem Ha (Ishihara 2000a, 2001a), Eduardo Quiroz Cave (Pendergast 1971), Actun Polbilche (Pendergast 1974), and the lower levels of Entrance 2 of Actun Chapat (Ishihara 2000b). In addition, it has also been remarked that vases represent the most infrequent vessel form in the assemblages of western Belizean caves (cf. Helmke 1999b), a trend which is also exhibited by the Migdalia assemblage (Figure 9a). Based on preliminary analyses, bowls and dishes in the caves of the Macal and Roaring Creek Valleys typically represent either the second or third highest frequencies in site-whole considerations of assemblages. The statistical position of bowls and dishes in the Migdalia assemblage represents a discrepancy *vis-à-vis* the assemblages of other sites, not as regards hierarchical standing, but in view of numerical abundance. While the Migdalia assemblage statistically adheres to the trend of bowls in second position, it is surmised that the majority of unidentified sherds belong to bowls, the remainder probably representing yet additional *ollas*. Were these patterns verified by future analyses, the frequency distribution of ceramic forms of the Migdalia assemblage would conform perfectly to the trends noted for many other western Belizean caves. Consequently, these statistical attributes are thought to be diagnostic of most

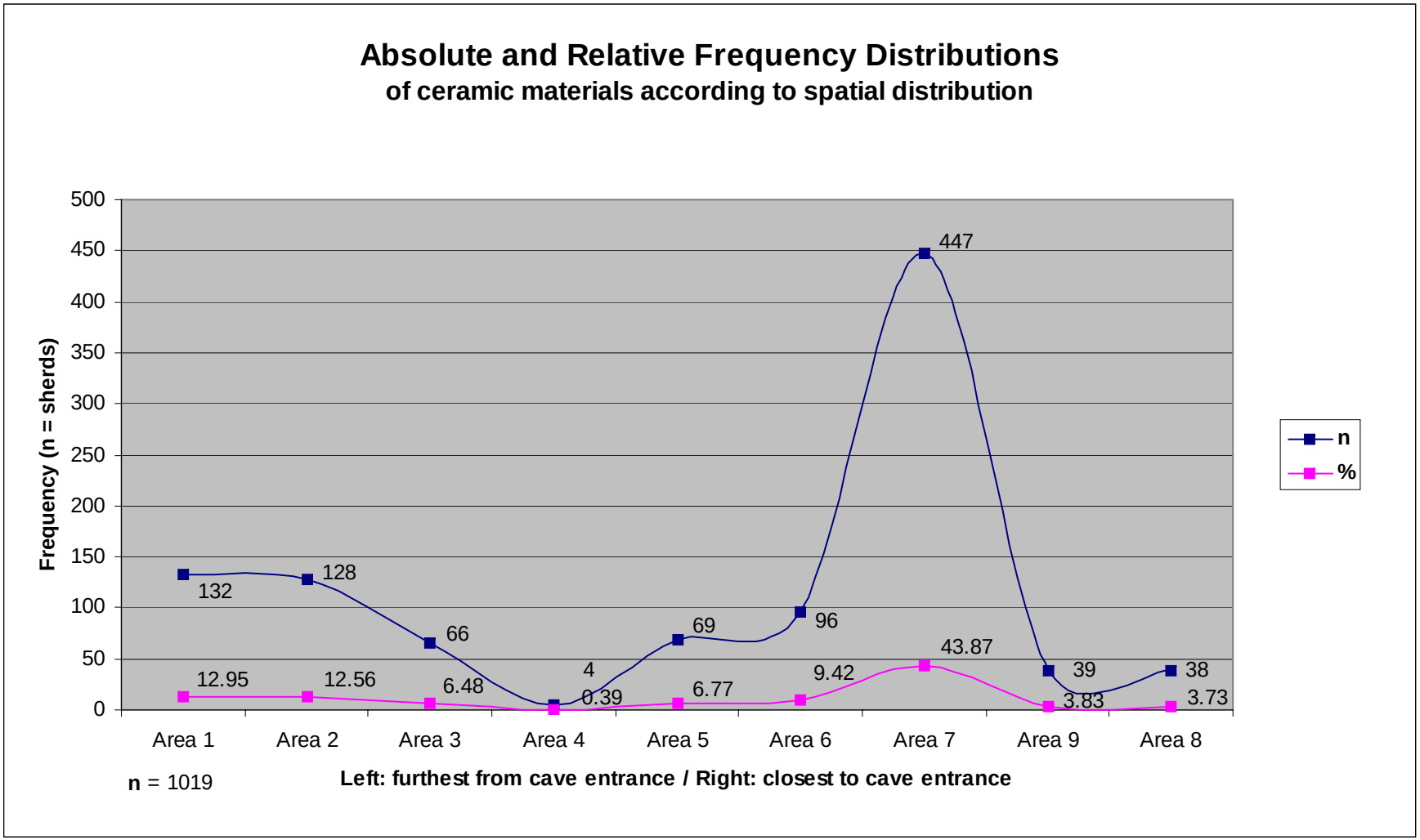


Figure 8: Graphic representation of the spatial distribution of ceramics within Cueva Migdalia.

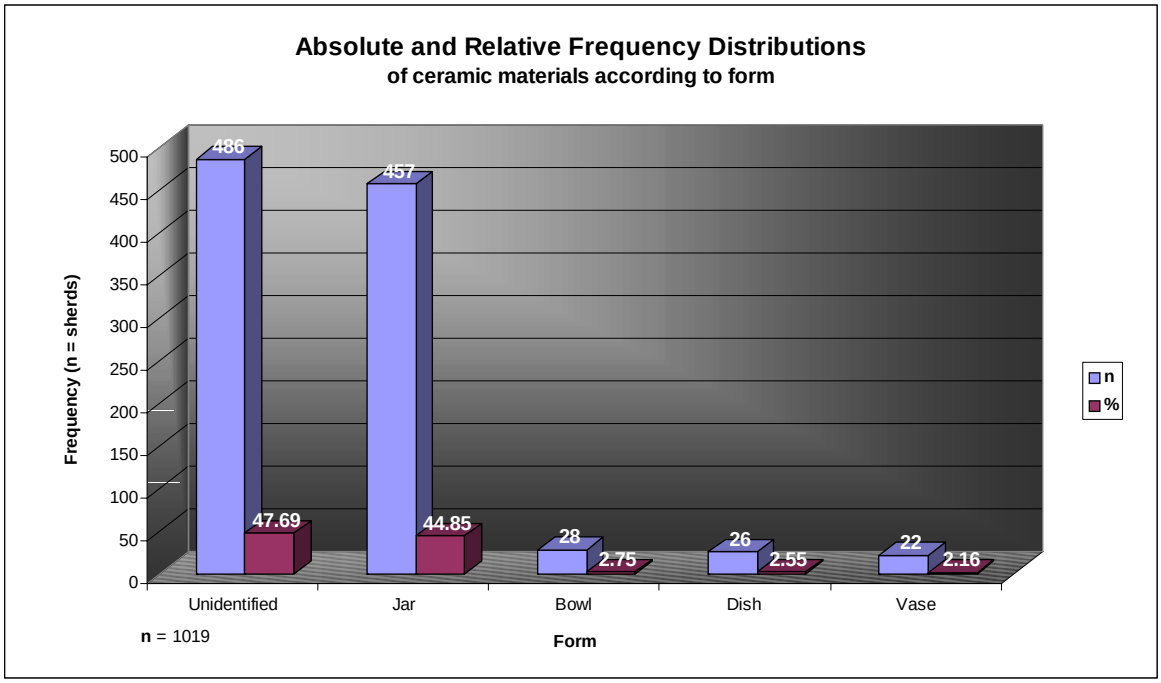


Figure 9a: Vessel form distributions of Cueva Migdalia's ceramic assemblage.

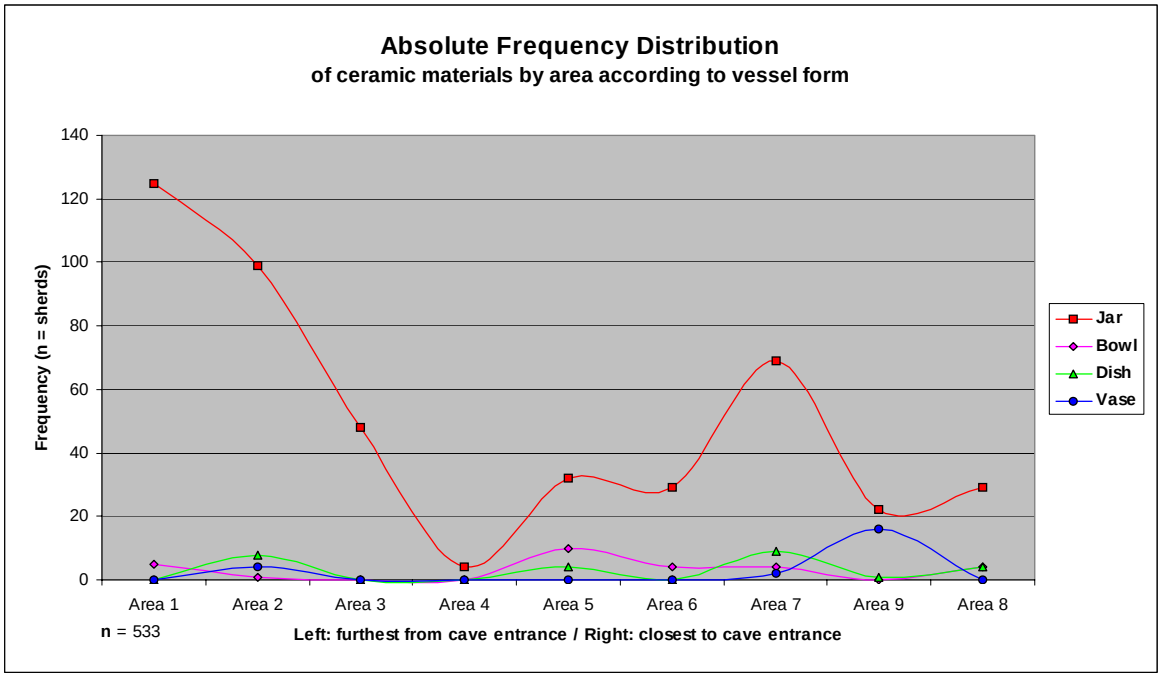


Figure 9b: Spatial distribution of vessel forms within Cueva Migdalia.

western Belizean cave ceramic assemblages. While these attributes may be representative of caves in other areas of the Maya Lowlands (e.g. Yucatan and Peten), correlations have not yet been established confirming this possibility. Importantly, the consistency of form distributions relative to site-specific assemblages suggests that these assemblages are the accretive product of similarly consistent human activities. Consequently, these data may serve as the blueprint from which to infer the types of activities conducted in caves (cf. Helmke 2000b). Nonetheless, despite the trends noted here, exceptions to these have been noted (e.g. Actun Nak Beh or Actun Halal), although these represent a minority of cases.

Plotting the absolute frequency distribution of sherds identified as to vessel form (n=533) according to area and in relation to the distance from the cave entrance (Figure 9b), it is clear that the distribution curve of *ollas* closely mimics that of the overall assemblage, with high frequency peaks for the areas at the rear of the cave and Area 7, as well as a dip for Area 4 (compare Figure 8 and 9b). This graphic similarity is due to the statistical preeminence of *ollas* in the Migdalia assemblage, indicating that this form sub-set is in fact representative of the spatial distribution of the entire ceramic assemblage within the cave, despite a low linear correlation coefficient of 0.44. Based on this trend it is suggested that clusters of *ollas* may in and of themselves be representative of areas of intensive usage (for assemblages within western Belizean caves also exhibiting high total frequencies of *ollas*). Verification of this hypothesis (through continued analyses) may eventually allow elaboration of a short-cut index that could be of considerable assistance during future reconnaissance explorations of brief duration to other uninvestigated sites.

Chronology

The temporal dimension of the ceramic remains documented within Cueva Migdalia proceeded along several analytical stages. The first comprised the tabulation of sherds according to type: varieties of known temporal breadth within broad ceramic horizons and areas of discovery (Table 1). This table reveals that Cueva Migdalia's use spans from the Late Preclassic (ca. 300-100 BC) to the Early Postclassic (ca. AD 950-1150), a considerable temporal span, but intimately comparable to several other western Belizean caves, including Actun Yaxteel Ahau in the Roaring Creek Valley (Awe & Helmke 2000; Mirro and Awe 1999) and possibly Uchentzub in the Macal Valley (Ishihara 2001b; Schmidt 1977). Examination of the table also reveals that the majority of types belong to Late Classic (AD 700-950) ceramic horizons. All horizons preceding or ensuing the Late Classic exhibit adherence of few identified types.

The distinction between sub-phases of the Late Classic is problematic, as some types are known to be restricted to the early facet (Late Classic 2: ca. AD 700-830) or late facet (Late Classic 3: ca. AD 830-950), while still others span both (Late Classic 2 & 3: ca. AD 700-950). During the analyses an effort was made to segregate types into discrete Late Classic sub-phases, a process which has had to rely entirely on intersite seriations of modal attributes. This situation is difficult due to the documented overlap of types between the Late Classic (LC2) and Terminal Classic (LC3) at several Lowland Maya sites (Chase & Chase in press; Griffith et al. 2000; LeCount 1992, 1996). While this overlap makes precise dating of Late Classic ceramic assemblages difficult, it may reveal re-structurations

Ceramic Phase	Type: Variety Designation	Area 1 (Ch 4)	Area 2 (Ch 4)	Area 3 (Bk 3)	Area 4 (Ch 3)	Area 5 (Bk 2)	Area 6 (Ch 2)	Area 7 (Ch 5)	Area 8 (Ch 1)	Area 9 (Ch 2)	Totals
Late Formative (ca. 600-300 BC)	Sierra Red?								1		**1**
Early Classic (ca. AD 250-600)	Santa Teresa Incised									16	**16**
Late Classic 1 (ca. AD 600-700)	Mountain Pine Red							2			**2**
	San Pedro Incised ?					4					**4**
	Uacho Black on Orange									1	**1**
Late Classic 1 & 2 (ca. AD 600-830)	Rosario Incised ?							2			**2**
Late Classic 2 (ca. AD 700-830)	Garbutt Creek Red (LC2)					7					**7**
	Mount Maloney Black (LC2)							3			**3**
	Meditation Black (LC2)								1		**1**
	Platon Punctated Incised (calcite) LC2								2		**2**
	polychrome (red & black on orange)							3			**3**
	Xunantunich Black on Orange (calcite)	1									**1**
	Zacatel or Cabrito Cream Polychrome							2			**2**
	Cabrito Cream Polychrome		4								**4**
Late Classic 2 & 3 (ca. AD 700-950)	LC form							1			**1**
	Pine Ridge Carbonate		16					1			**17**
	Tinaja Red	6	38	31		1	3	4	3	16	**102**
	Cayo Unslipped	80	52	16	4	32	23	57	2		**266**
	Dolphin Head Red	2						1	3		**6**
	Tinaja Red form w/black slip		6								**6**
	Tutu Camp Striated		3				1		10	6	**20**
	Rubber Camp Brown		1			2	1	3			**7**
	Roaring Creek Red						1				**1**
Late Classic 3 (ca. AD 830-950)	Daylight Orange: Darknight Variety		7						2		**9**
	Garbutt Creek Red (LC3)						3				**3**
	Alexanders Unslipped							8	13		**21**
Early Postclassic (ca. AD 950-1150)	Unidentified							1			**1**
	Unidentified (with strap handle)			1							**1**
Unidentified (???)	Unidentified	43	0	18	0	23	64	359	1	0	**508**
Totals:		**132**	**127**	**66**	**4**	**69**	**96**	**447**	**38**	**39**	**1018**

Table 2: Tabulation of Cueva Migdalia's diagnostic ceramic assemblage according to phase.

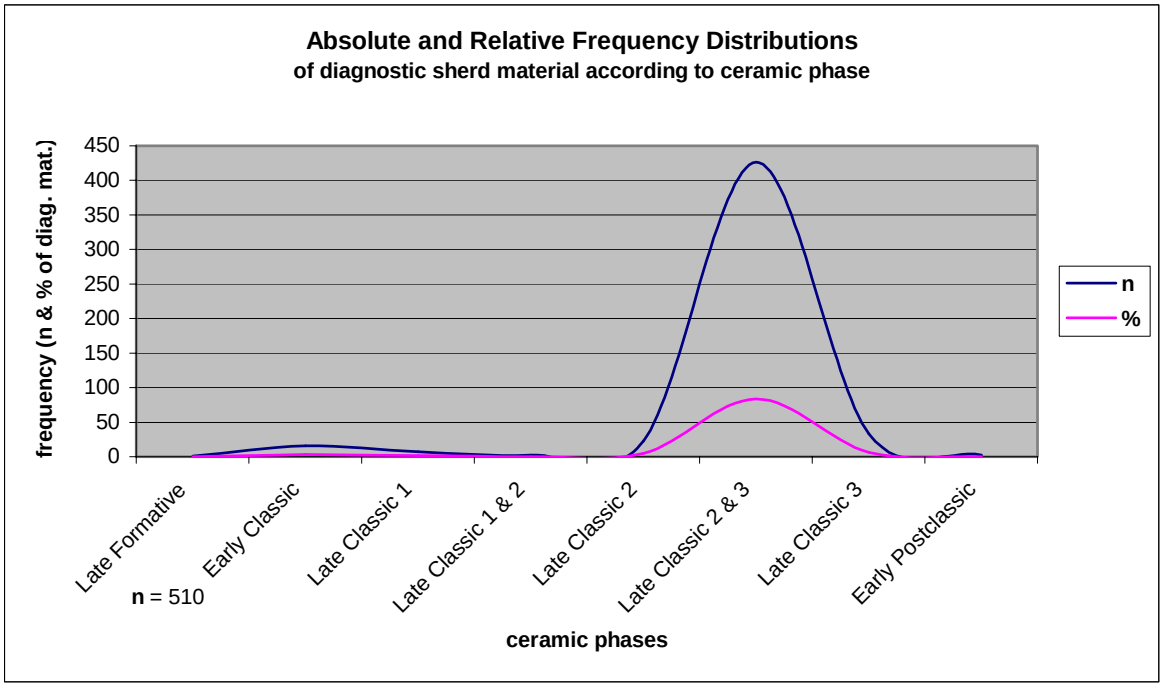


Figure 10a: Graphic representation of the chronological distribution of diagnostic ceramics according to ceramic sub-phases.

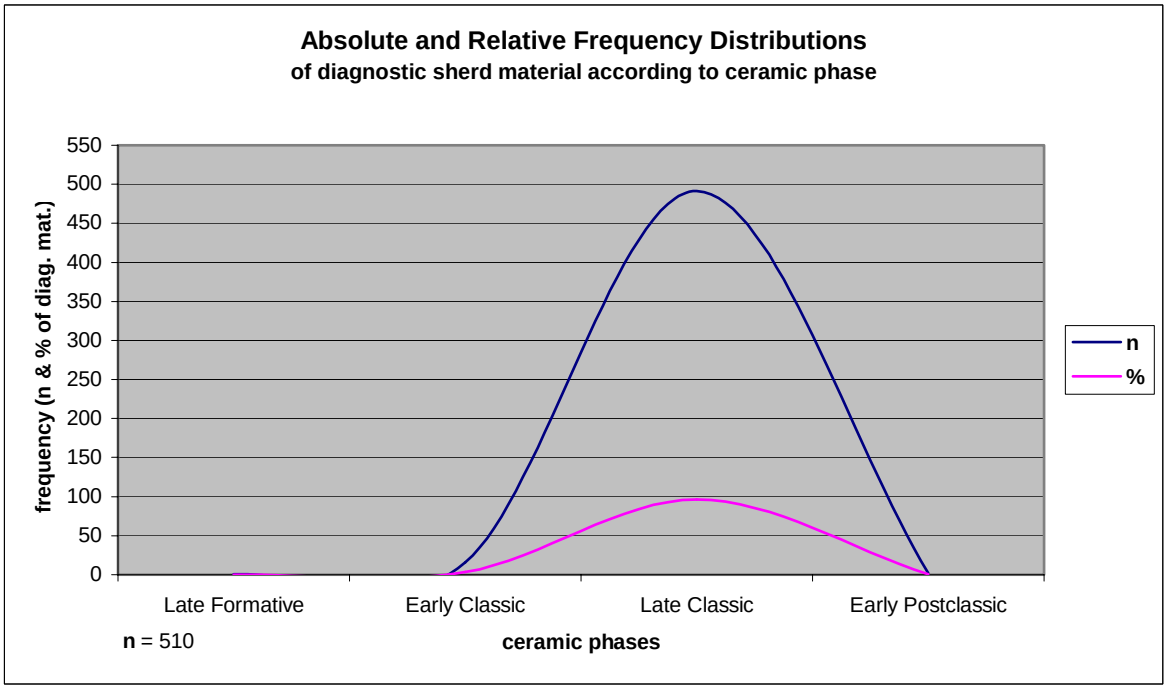


Figure 10b: Graphic representation of the chronological distribution of diagnostic ceramics according to major ceramic phases.

of ceramic assemblages along the lines of increasingly divergent socio-political strata if the model formulated for Caracol holds true for the ancient users of Cueva Migdalia as well (cf. Chase & Chase in press).

The second phase of analysis entailed the graphic plot of ceramic distributions according to specific ceramic sub-phases (Figure 10a) as well as broad ceramic phases (Figure 10b). These graphs clearly display the phase of most intensive ceramic deposition, by a singular peak representing ca. 47 % of the total assemblage and ca. 84 % of the typed assemblage (n=510), the whole dating to the combined Late Classic interval (ca. AD 700-950) (Figure 10). Nonetheless, in reference to the problem of type overlap cited above, it cannot be determined at present whether the pinnacle of Migdalia's use corresponds to the Terminal Classic (ca. AD 830-950) or the preceding Late Classic 2 (ca. AD 700-830). While assemblages from other cave sites exhibit a culmination of cave usage in the Late Classic intensifying since the earliest attested specimen (e.g. Griffith & Helmke 2000), that of Migdalia seems unequivocally and exclusively centered on the Late Classic. Consequently, it seems that Migdalia witnessed few activities of any consequence or an undetermined number of low impact activities, prior to the onslaught of the Late Classic.

The third and last phase of the chronological analysis plotted the temporal breadth of the sub-assemblages of each area, according to the distance of these from the entrance. The resulting graph (Figure 11) displays the maximum temporal breadth of each sub-assemblage as well as a temporal median point corresponding to the maximum frequency for each sub-assemblage. This plot reveals that the majority of areas witnessed usage between AD 700 and 950, thereby conforming to the trend of Late Classic emphasis demonstrated by the foregoing analyses. Two divergent trends from this norm are noted, however. The first is the continued usage of Areas 3 and 7 into the Early Postclassic. The second is the clustering of earliest materials in areas proximate to the entrance. This latter trend was originally identified qualitatively by Dr. Jaime Awe (1998) for several caves in central Belize, and has thus received considerable attention over the course of WBRCP investigations (e.g. Helmke 1999c; Ishihara et al. 2000). As with the overall frequency distribution of sherds, the temporal distributions of sub-assemblages away from the Late Classic norm are again focused at important geomorphological features. In this case Area 3 may be associated with the rear of the cave, Area 7 with the small Chamber 5 at the point of embranchment, and Areas 8 and 9 cluster close to the cave's entrance. The emphasis placed deductively on entrances as a result of the processional model introduced above (Stone 1997) may thus be supported not by high absolute or relative frequencies of artifacts at the cave entrance, but by the longevity of the temporal breadth exhibited by artifacts recovered from the entrance. Note should be made, however, that the ceramic specimen pushing the sub-assemblage of Area 8 into the Preclassic is the sherd recovered in a secondary context bearing the site's modern namesake graffito. Consequently, too much emphasis should not be placed on the clarity of the temporal graph (Figure 11) despite the likelihood that the sherd was indeed recovered proximate to the entrance (to judge from the color of the matrix still adhering to it).

The picture of a protracted period of minimal usage preceding the Late Classic (Figure 10) must consider the possibility of earlier sealed deposits remaining buried within

unexcavated matrices. The putative presence of earlier sealed deposits is particularly suggested for Area 8 by its skewed temporal median (Figure 11), which if it were to follow the trend of the adjacent Areas 7 and 9 should be centered on the transition between the Early Classic 2 and 3 phases (ca. AD 375). While this assumption is valid in principle, the stratigraphic sequence documented in Chamber 2 suggests that only the uppermost stratum may contain buried cultural materials (see above). The recovery of earlier assemblages from this shallow stratum may thus do little to change the picture of a protracted phase of initial use lasting as much as a millennium, prior to the surge of Late Classic ceramics. Nonetheless, recovery of substantial frequencies of earlier materials may suggest continued intensification of usage from the Late Preclassic onwards, rather than the sudden surge of Late Classic activities documented thus far (cf. Brady & Scott 1997).

SUMMARY & CONCLUSIONS

Any archaeological assessment of a cave that shows indications of modern disturbances and/or looting activities should be approached with caution. Consequently, the preliminary conclusions presented above, being far from complete due to the limited nature of the reconnaissance survey of Cueva Migdalia, should also be considered subject to change were additional data brought about by future investigations. Nonetheless, considering the possibility that Cueva Migdalia may not be the subject of detailed archaeological investigations in years to come, every effort was made in this report to provide as many of the data and their interpretations as possible so as to satisfy interested readers.

Based on the analyses described above, several points can be observed. With regard the spatial distribution of artifacts in the cave, Area 7, which is relatively close to the entrance in Chamber 5, displayed the largest percentage and highest concentration of artifacts and is particularly significant for the density of artifacts in the area's relatively restricted and small space. Areas 1 and 2, both of which are in the rear of the cave in Chamber 4, contained the second highest concentration of artifacts. Also, the near absence of ceramic remains in the majority of areas (i.e. Areas 3, 4, 5, 8, and 9) calls for attention because of its low density of artifacts despite the more open, broader surface area compared to the areas of higher artifact deposition. It is noteworthy that the highest frequencies of archaeological evidence are located in spatially restricted areas, namely in a small chamber and the rear of the cave. The notion of restricted versus open space has been discussed by Brady (1989) for cave settings in terms of private versus public space (i.e. minimal number of people in a secluded area as opposed to a larger crowd of people in a spacious area). Perhaps complementing this notion, the clustering of artifacts at certain parts of the cave, which are characterized by presumably significant geomorphological features, may be explained by the ethnographically-derived model of Maya cave usage as suggested by Stone (1997, 1999).

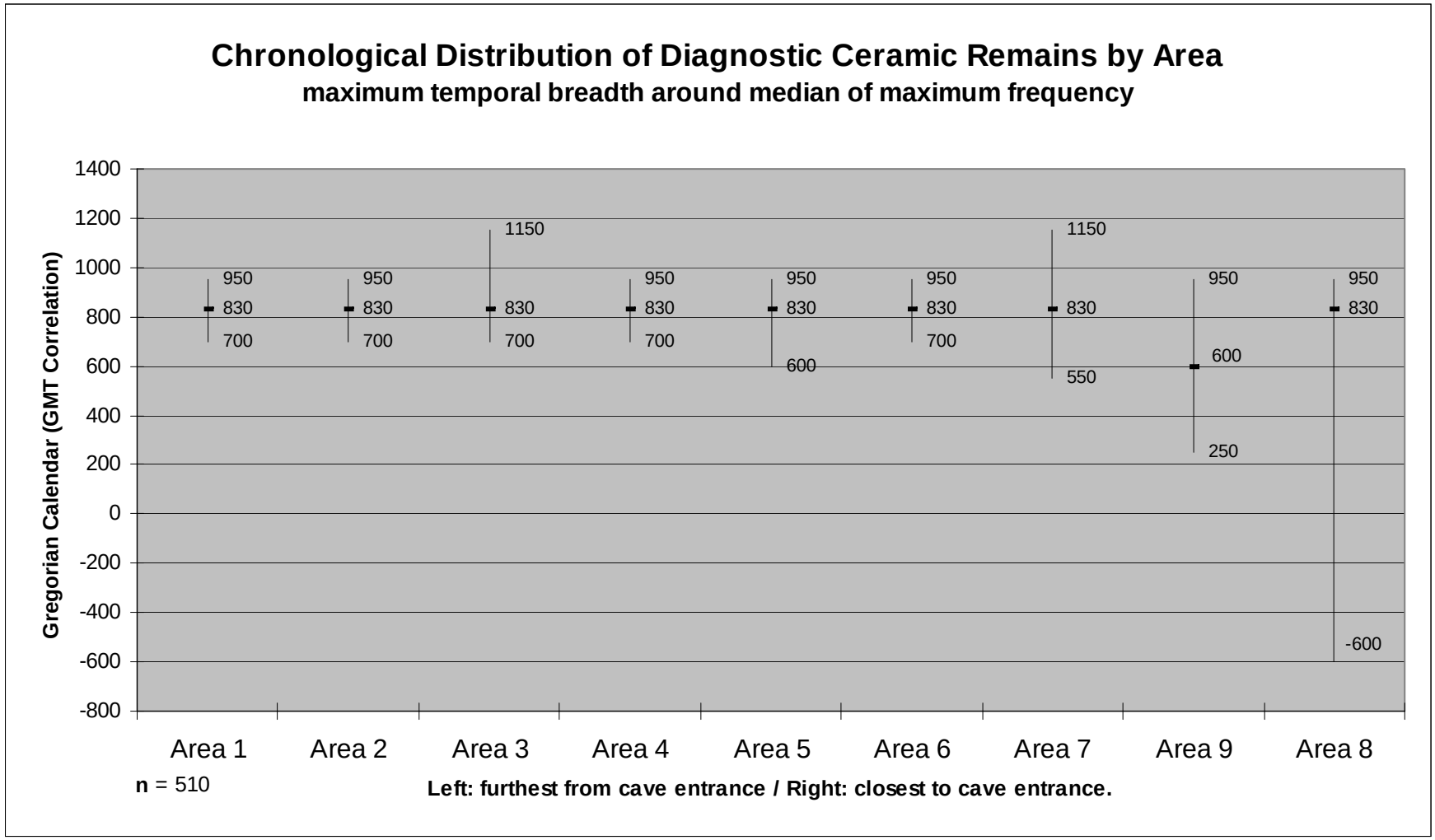


Figure 11: Graphic representation of the chronological distribution of diagnostic ceramics according to spatial distribution. Note that central nodes correspond to high frequency clusters about the median date of corresponding ceramic sub-phases. Distributions around the node correspond to the maximum and minimum temporal breadths of area-specific samples.

As mentioned above, it would be simple to suggest that Area 7 provided the setting for the most intensive use, and contrarily, in Area 4 the least amount of activity. However, it must be reiterated that a direct correlation between the quantity of artifactual remains and intensity of cave usage may not necessarily hold true. Behavioral processes and other site formation processes must be taken into consideration, such as sweeping and clearing of the area after and/or before activities were carried out. Also, with regard functional uses of the cave, it is difficult to discern whether the cave or areas within a cave were used on different occasions for a prolonged period of time, numerous visits were made for a single purpose, or the remains represent a single-time event. Further archaeological studies at cave sites as well as ethnographic accounts may provide patterns and clues to such inquiries.

With regard vessel forms in the Cueva Migdalia ceramic assemblage, *ollas* comprise the predominant form, while bowls, dishes, and vases are a minority. This is a trend observed in certain caves or particular areas within caves investigated by WBRCP among others. A common interpretation of the abundance of *olla* forms in caves is the collection of *zuhuy ha* by catching drip water in caves, as suggested by Thompson (1975). However, investigations by WBRCP and others have revealed evidence that questions the simplistic equation of *ollas* to *zuhuy ha* and the universality of this cave function. More attention should be placed on examination of vessel forms rather than type:variety designations since vessel forms may be more related to cave use due to its presumed equation to ancient emic vessel functions. Nonetheless, the incidence of high quality polychromes despite the documented looting suggests affinities to elite strata of ancient Maya society. While these conclusions are in no way final they do shed some light on the broad categories of users and the activities that were played out in Cueva Migdalia in antiquity.

In sum, the reconnaissance expedition is deemed successful on account of the accomplishment of all objectives sighted at the onset. Securing the location of the site, completion of a preliminary survey, descriptions of the geomorphology and archaeological features, as well as compilation of a preliminary artifact inventory all point to the success of the reconnaissance, particularly considering the short duration of this expedition. The methodology implemented thus appears effective and is suggested for future reconnaissance expeditions.

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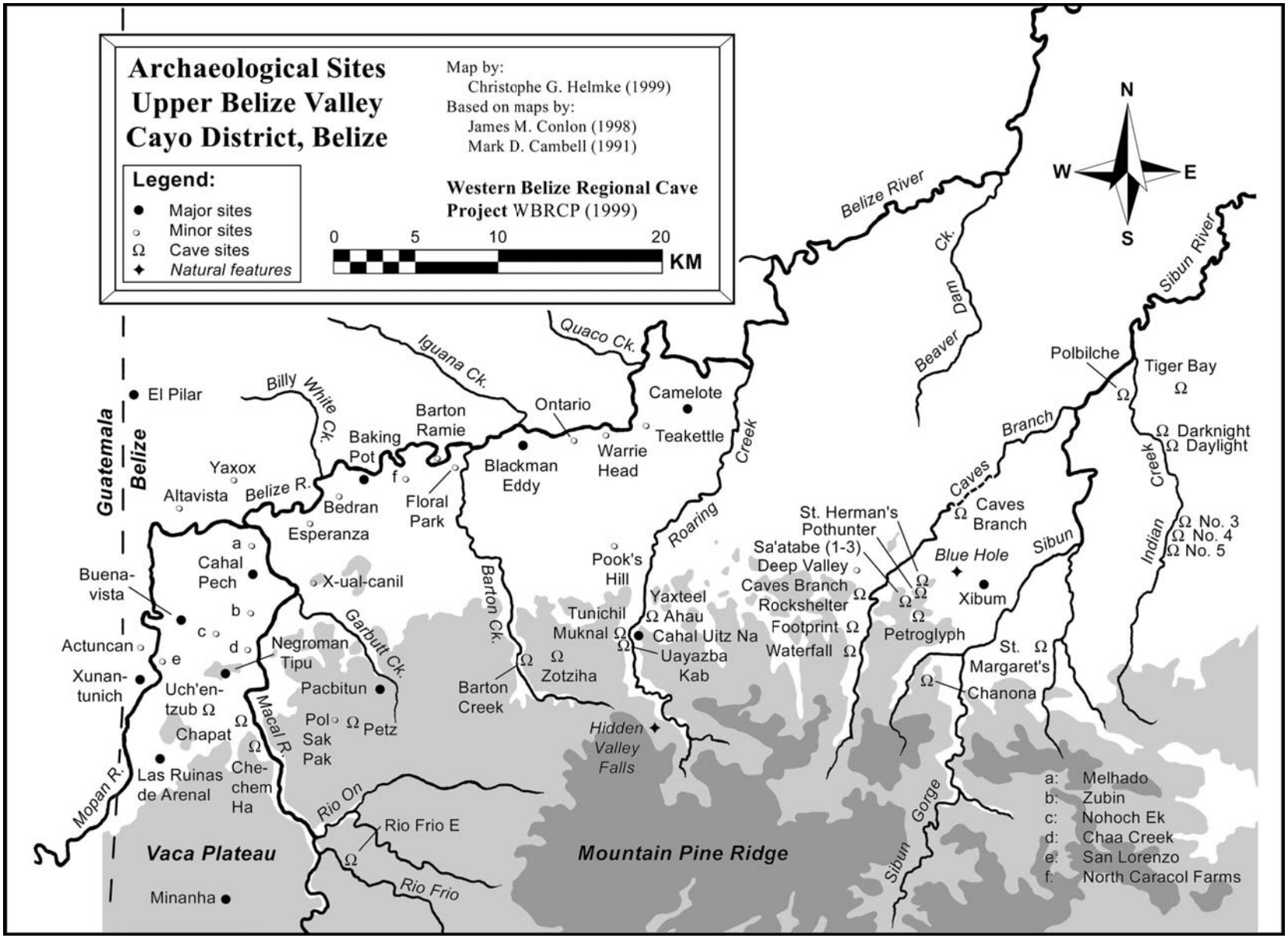

Figure 1: Map of the Upper Belize Valley indicating the location of cave sites investigated.

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