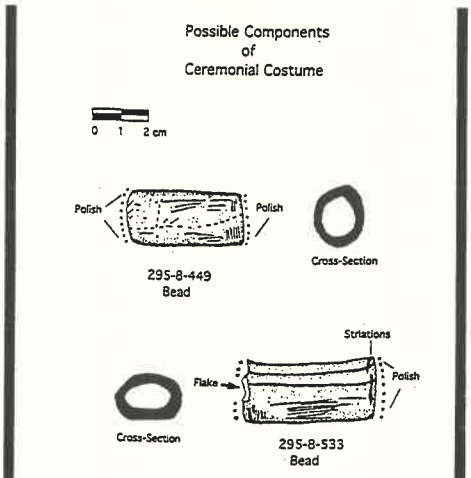
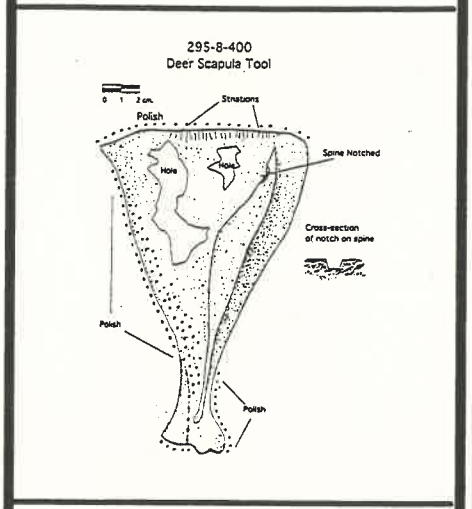
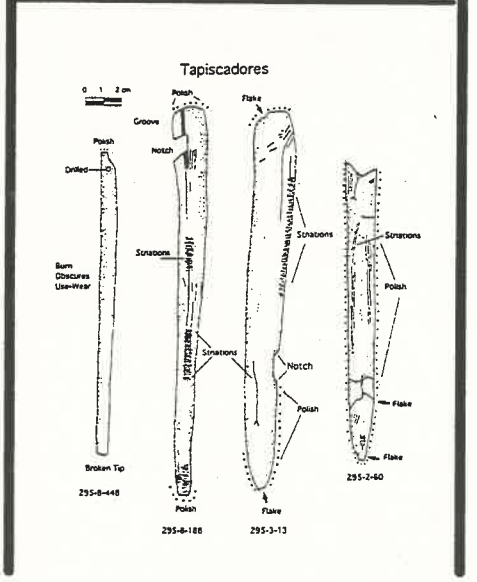
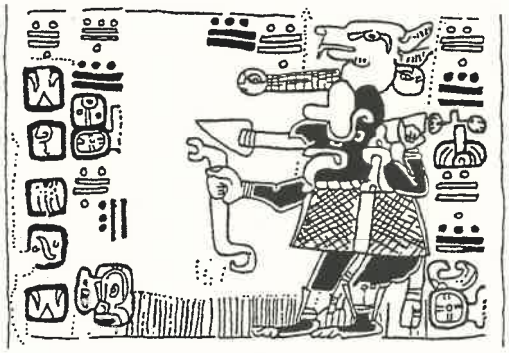






Preliminary Report of the Cerén Research Project 1996 Field Season



Department of Anthropology
University of Colorado, Boulder

Preliminary Report of the Cerén Research Project 1996 Field Season

Edited by Payson D. Sheets and Linda A. Brown

1996

Department of Anthropology
University of Colorado, Boulder
80309-0233

Patrimonio Cultural, CONCULTURA

Patrimonio Nacional

Jardin Botanico

Patronato Pro-Patrimonio Cultural

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CHAPTER 1
INTRODUCTION TO THE 1996 FIELD SEASON PRELIMINARY REPORT

Payson Sheets and Linda Brown, University of Colorado, Boulder

The limited 1996 field season was supported by small grants from the University of Colorado Council on Research and Creative Work and the Graduate Committee on Arts and Humanities, and their assistance is greatly appreciated. The field and laboratory work had multiple objectives including architectural conservation, public access, objects conservation, and research.

This report, organized in numerical order by operation, begins with a description and interpretation of excavated materials in a 1-meter wide zone to the east and south of Structure 11, the kitchen of Household 1 in Operation 1. The building is too moist, and the excavations were conducted to provide a zone for capillary ground moisture to rise outside of the building and evaporate. The principal objective in Operation 2 was to excavate what was thought to have been a structure. The excavations encountered only a part of a structure, which turned out to be the missing eastern extension of the high shelf ("tabanco") that was detached from Structure 2 and blown southeast by the eruption. Agrarian research encountered a significant portion of the Household 2 cornfield, with the intriguing bundle of maize plants carefully tied together with two-ply twine. An objective of public access was met by excavating a walkway along the eastern side of the operation, so people can view the maize field and the three excavated buildings and associated features.

Operation 7, a series of deep and large test pits, were excavated to the "tierra blanca joven" Classic period ground surface to determine the best place to put the columns of a new roof over Structure 4 and environs. The six test pits encountered significant information on cultigens that had not been discovered at Cerén previously. Particularly striking were a series of large mature chile bushes.

Harriet Beaubien and Ellen Rosenthal continued with the artifact conservation program, and their report is included. Also included is the report by Emily Kaplan and Harriet Beaubien of artifact conservation conducted during 1994, as it had not been widely distributed previously.

The report ends with a description and interpretation of animal use at the Cerén site by Linda Brown. A more detailed account of animal use may be found in her M.A. thesis from the University of Colorado, Denver.

CHAPTER 2
EXCAVATIONS IN OPERATION 1 DURING 1996, CERÉN, EL SALVADOR.

Payson Sheets, Anthropology, University of Colorado, Boulder CO 80309

Introduction

The kitchen of Household 1, designated Structure 11, was excavated by the Cerén Project during 1990 during the second year of research after the project resumed operations. The structure originally had a thin thatch roof and thatch walls supported by a wooden framework, all on top of a very low platform. The structure itself as well as surrounding areas to the structure's north and west were excavated during 1990, but the volcanic ash adjoining the structure to the east and south were not excavated in 1990 because of limitations in duralite roofing at that time. That left the structure, particularly its southern and eastern portions, with too much humidity that was allowing the growth of microorganisms. The microorganisms were not damaging the structure, but they could change in the future to a damaging type. Also, the microorganisms created an unsightly discoloration of the building. Therefore the decision was made to excavate a trench a meter wide along the eastern and southern sides of the structure, to allow capillary moisture to evaporate from the surrounding ground surface rather than from the structure floor. Following the 1996-97 dry season, the structure and moisture should establish a more suitable equilibrium. Also, a small tephra block that was located to the northwest of Structure 10 was excavated to the original ground surface. It originally supported a post that was part of a previous duralite roof. The block measured 1 x 1.60 m, and was located 6 meters east of Structure 6.

Excavations

The excavations began on Friday the 12th of July of 1996, by removing the top portions of Unit 3 tephra, leaving a sloping talud that should be a stable surface, given maintenance, and because of the protection of the large roof that covers the entire operation. To the south of the excavations is a pathway used by maintenance and conservation workers, and in order to conduct these excavations that pathway had to be moved a meter farther south, adjacent to the southern wall of the protective building. The principal objective of the excavations was to improve the ambient conditions of the Structure 11 floor.

Also, the removal of the small tephra block between Structures 6 and 10 was accomplished during July. Only tephra units 3, 2, and 1 were present, and they were removed down to the original "tierra blanca joven" or TBJ. There were no plant remains or artifacts within the tephra units. Because of the location at the juncture of the patios of Household 1 and the religious association at Structure 10, it was not anticipated to find plants or artifacts in the tephra units. A total of 20 sherds were found in the 1.6 m^2 area, on a surface that was not particularly compacted or smooth.

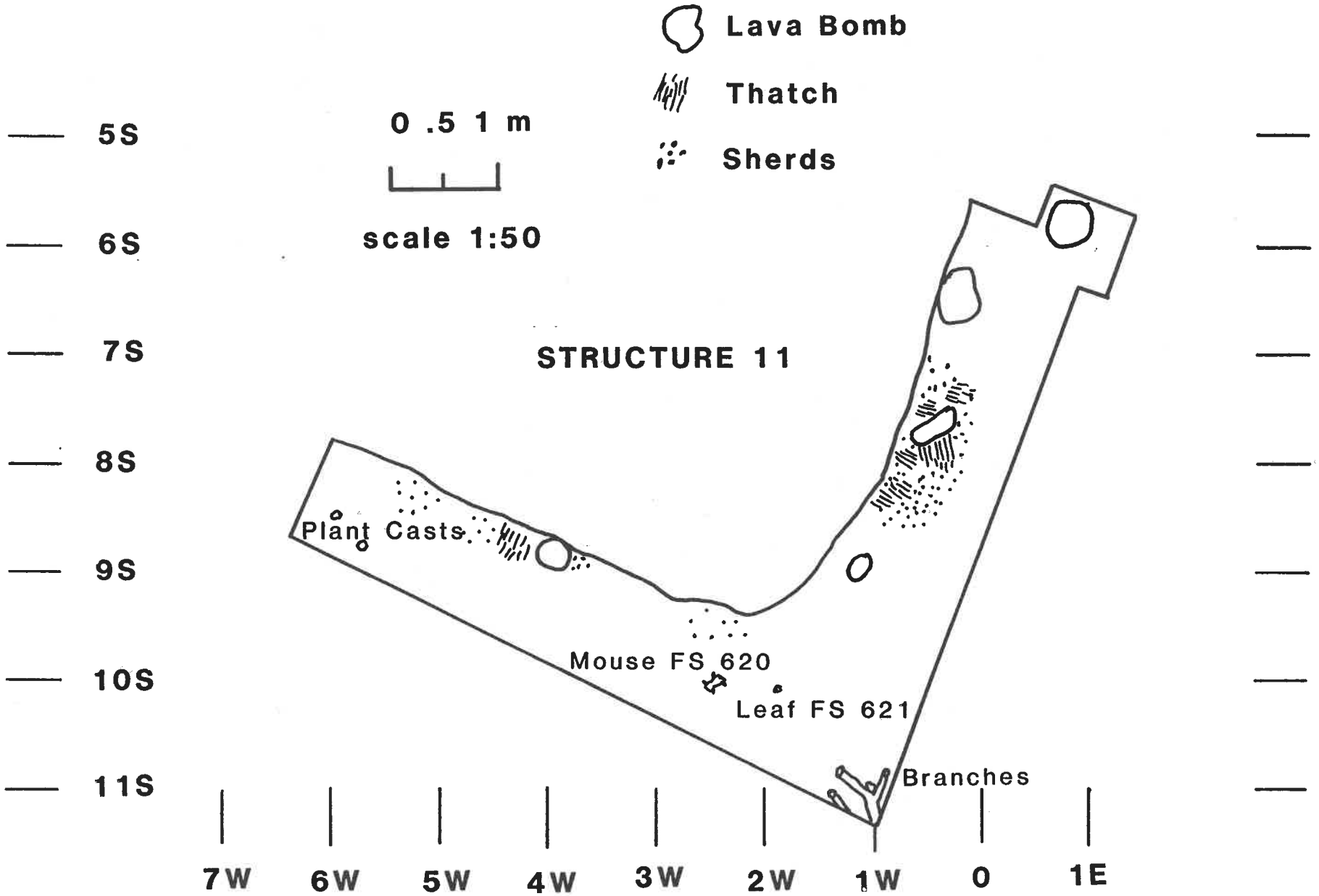
The first item identified within the tephra near Structure 11 was a large branch of a tree that was found southeast of the structure, in the middle of Unit 3. The branch presumably was blown into the location from a tree that was growing in the Household 1 area.

The excavations from the 18th to the 21st of July exposed the upper surface of Unit 1 around both sides of Structure 11. Most of the unit's surface was culturally sterile, with the exception of three localities (Fig. 1) where highly fractured sherds were encountered. Lava bombs had fallen nearby and displaced sherds into these three localities, in total measuring 6 m^2. The other square meters of the Unit 1 surface were devoid of artifacts.

In the southwest corner of the excavations we encountered three hollow spaces where plants were growing at the time of the eruption, each with a diameter of about 0.7 cm. One probably is maize, and likely is a second planting, after the first crop had matured. Another has a curving stalk and remains unidentified. The third has a straight stalk, but the form in which the leaves connect to the stalk is not characteristic of maize, and this plant is also unidentified. The three cavities were filled with dental plaster and lifted for curation and future study. Two of the plants were growing on field ridges that are a part of the *Milpa* ridges encountered in Test Pit 2 during the 1978 excavations. The other cavity was 12 cm north of the end of the maize ridge, and probably is a "volunteer" plant growing outside the formal Milpa area. The field ridges begin at distances of 1.5 to 2.0 m from Structure 12, leaving a walkway or path a meter or more wide for foot traffic walking around the building.

A very short time before the kitchen's roof collapsed, midway in the accumulation of Unit 1, a mouse was in the thatch roof, presumably along its south side. It was pushed out of the thatch by the lateral blasts from the steam explosions, and fell 180 cm from the edge of the roof to the south. It presumably died

Fig. 1. Excavations near Str. 11, 1996. Operation 1: Top of Unit 1.



almost immediately from asphyxiation. We found the mouse, christened with the name "Chivo," in the form of a tiny cavity that represented its body, along with most bones loose in the body cavity. The loose bones were removed from the cavity prior to casting; the leg bones and skull were firmly attached in the cavity and were left there during casting. Later, it was block lifted and the tephra excavated away from it by the project objects conservator Ellen Rosenthal.

Upon excavating to within a few millimeters of the contact between the TBJ and the Loma Caldera tephra, a total of 10 samples were taken for flotation and pollen analyses.

After exposure and study of the TBJ surface, it was clear that four zones could be identified in the 1996 excavations. One zone is the Milpa, with the maize ridges and a maize plant preserved, probably a continuation of the juvenile maize field excavated in 1978.

The other three zones are between the maize field and the structure. The northeastern zone has few sherds, and those found there are flat to the surface and partially to thoroughly implanted into that surface. The surface itself is very flat and moderately compact, as if there had been a moderate amount of foot traffic as well as maintenance in a reasonably "clean" condition. It was not as compacted and cleaned as the area to the north of Str. 11 and east of Str. 6.

The zone south of the structure had the most sherds of any of the zones. It almost appeared to be a provisional trash area. Many sherds were at an angle or were vertical, and the ground surface was irregular and not compacted. It appears to have been an area with little maintenance and relatively low foot traffic.

The zone to the southwest of the structure was most similar to the area east of it, in that it had relatively few sherds and received some maintenance, but the ground surface was much more irregular and less compacted. It appears to have received much less foot traffic than the eastern zone, but a roughly similar amount of maintenance and cleaning.

Conclusions

It appears that the principal objective, to improve the humid conditions of Structure 11, will be realized. It will take a year to see the degree to which a new equilibrium among structure, capillary moisture, and ambient conditions, is more suitable to long-term architectural conservation. In addition to the conservation efforts, the excavations contributed a little more information to our understanding of Household 1 within the Cerén village.

FS List.

FS#	Date	Location		Context	Identification
614	07/23/96	7-8 S	0-1 W	encima de Unidad 1	Tiestos, 39
615	07/23/96	8-9 S	0-1 W	encima de Unidad 1	Tiestos,183
616	07/23/96	9-10 S	3-4 W	encima de Unidad 1	Tiestos, 7
617	07/23/96	8-9S	3-4W	encima de Unidad 1	Tiestos, 9
618	07/23/96	8-9 S	4-5W	encima de Unidad 1	Tiestos, 12
619	07/23/96	8-9 S	5-6W	encima de Unidad 1	Tiestos, 4
620	07/23/96	10.02 S	2.48 W	med Unidad 1	Huesos de raton
621	07/25/96	10.05S	2.10 W	med Unidad 1	Hoja de arbol
622	07/30/96	0-1 E	6-7 S	TBJ	muestra de suelo
623	07/30/96	0-1 W	7-8 S	TBJ	muestra de suelo
624	07/30/96	0-1 W	8-9 S	TBJ	muestra de suelo
625	07/30/96	0-1 W	9-10 S	TBJ	muestra de suelo
626	07/30/96	1-2 W	9-10 S	TBJ	muestra de suelo
627	07/30/96	2-3 W	9-10 S	TBJ	muestra de suelo
628	07/30/96	3-4 W	9-10 S	TBJ	muestra de suelo
629	07/30/96	4-5 W	9-10 S	TBJ	muestra de suelo
630	07/30/96	5-6 W	8-9 S	TBJ	muestra de suelo
631	07/30/96	1-2 E	0-1 S	TBJ	muestra de suelo
632	08/01/96	1-2 E	0-1 N	TBJ	Tiestos, 5
633	08/01/96	1-2 E	0-1 S	TBJ	Tiestos, 11
634	08/01/96	1-2 E	0-1 S	TBJ	Tiestos, 4
635	08/01/96	6-7 S	0-1 E	TBJ	Tiestos, 13
636	08/01/96	7-8 S	0-1 W	TBJ	Tiestos, 7

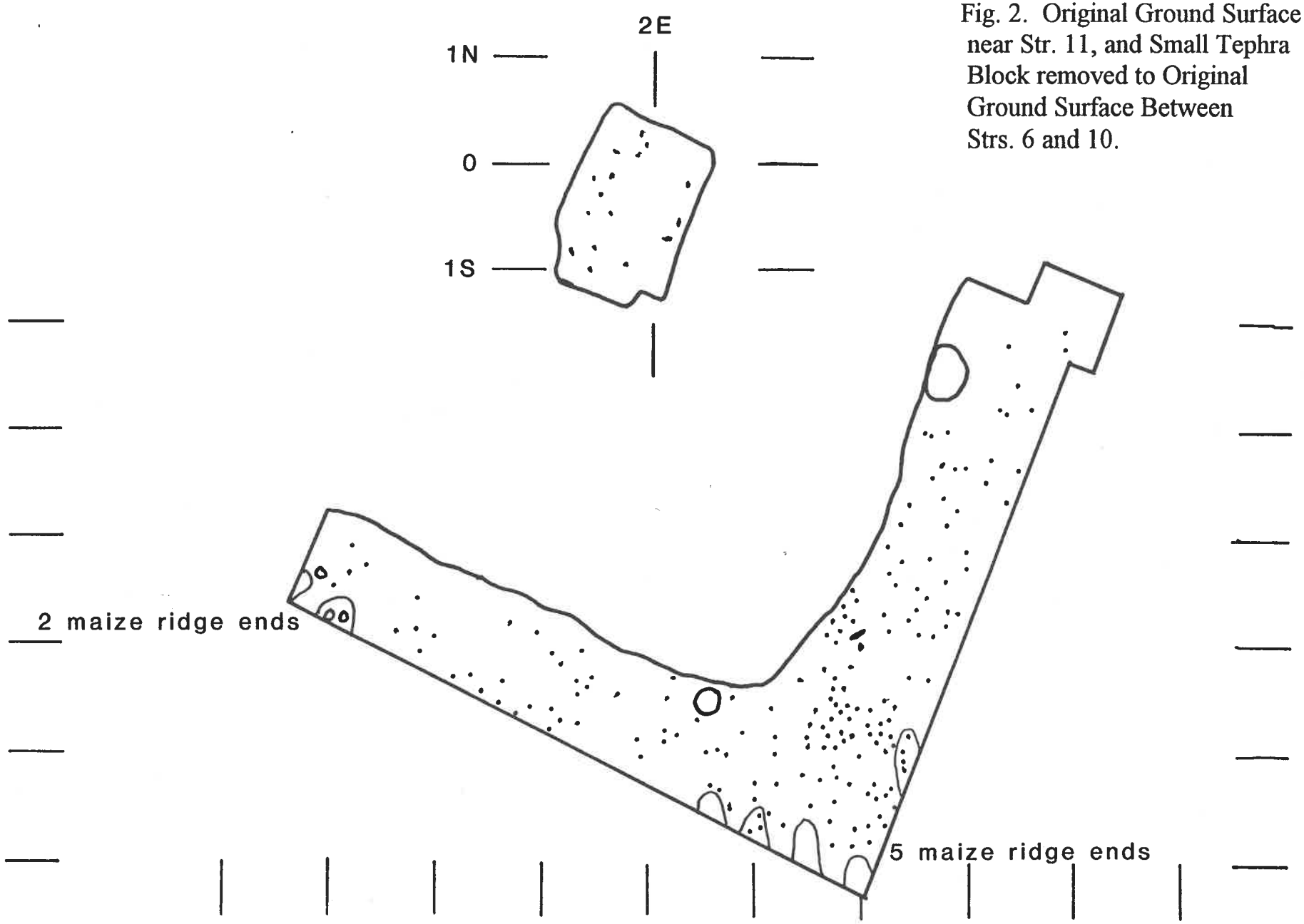


Fig. 2. Original Ground Surface near Str. 11, and Small Tephra Block removed to Original Ground Surface Between Strs. 6 and 10.

637	08/01/96	7-8 S	0-1 E	TBJ	Tiestos, 5
638	08/01/96	8-9 S	0-1 E	TBJ	Tiestos, 10; lasca de laja
639	08/01/96	8-9 S	0-1 W	TBJ	Tiestos, 27
640	08/01/96	9-10 S	0-1 W	TBJ	Tiestos, 36
641	08/01/96	9-10 S	1-2 W	TBJ	Tiestos, 45
642	08/01/96	9-10 S	2-3 W	TBJ	Tiestos, 17
643	08/01/96	9-10 S	3-4 W	TBJ	Tiestos, 15
644	08/01/96	9-10 S	4-5 W	TBJ	Tiestos, 5
645	08/01/96	10-11 S	0-1 W	TBJ	Tiestos, 12
646	08/01/96	10-11 S	1-2 W	TBJ	Tiestos, 16
647	08/01/96	10-11 S	2-3 W	TBJ	Tiestos, 4
648	08/01/96	8-9 S	4-5 W	TBJ	Tiestos, 3
649	08/01/96	8-9 S	5-6 W	TBJ	Tiestos, 9
650	08/03/96	8.72 S	6.00 W	bajo U 1	molde de planta (prob. maize)
651	08/03/96	8.75 S	6.02 W	bajo U 1	molde de planta
652	08/03/96	8.35 S	6.10 W	bajo U 1	molde de planta

CHAPTER 3
ARCHAEOLOGICAL INVESTIGATIONS IN OPERATION 2, JOYA DE CERÉN, 1996

Brian R. McKee, Anthropology, University of Arizona

I. Introduction

Operation 2 investigations conducted in 1996 exposed considerable extramural areas near structures 2, 7, and 9. We originally planned to excavate a structure, designated Structure 8, that was believed to be located southeast of Structure 2. The presence of the structure was suspected on the basis of clay architectural elements observed in 1989 (McKee 1989) and 1994 (D. Tucker personal communication 1996) and interpretation of ground-penetrating-radar data collected in 1980 (Conyers 1995). We realized early in the season, however, that the elements had been removed from Structure 2 and redeposited to the southeast by the Unit 5 pyroclastic flow, and that no in-situ architecture was present in the area.

At that time, our research goals were adjusted. On the basis of several holes observed in Unit 3, we inferred that the area was a continuation of the cornfield first observed east of Structure 9 (McKee 1990). Because of the size of the area, and its limited research potential, we decided to determine the limits of the cornfield in this area, rather than excavate it completely. We also requested and received permission to excavate the "peninsula" separating Structures 7 and 9. Our goals in excavating this area were twofold. First, we wanted to improve air circulation around Structure 7 and allow evaporation to the south of the structure, alleviating problems with excess humidity, as well as improving the general appearance of the operation in preparation for its opening to the public. We also had research goals for excavating this area. We wanted to see the nature of the connections between Structures 7 and 9. By carefully observing patterns of discard and compaction we hoped to infer patterns of foot traffic, and possibly gain insights into who was using and caring for the Structure 9 sweat bath. We also excavated a 4 x 20 meter area to the top of Unit 8 to prepare for the construction of a footpath for tourist access to Operation 2.

The project hired workers from the community of Joya de Cerén. All had worked with us in previous seasons, and some had also worked on the 1996 San Andres project. The team worked together extremely well, and the quality of excavation and data recording was uniformly high.

III. Research Methods

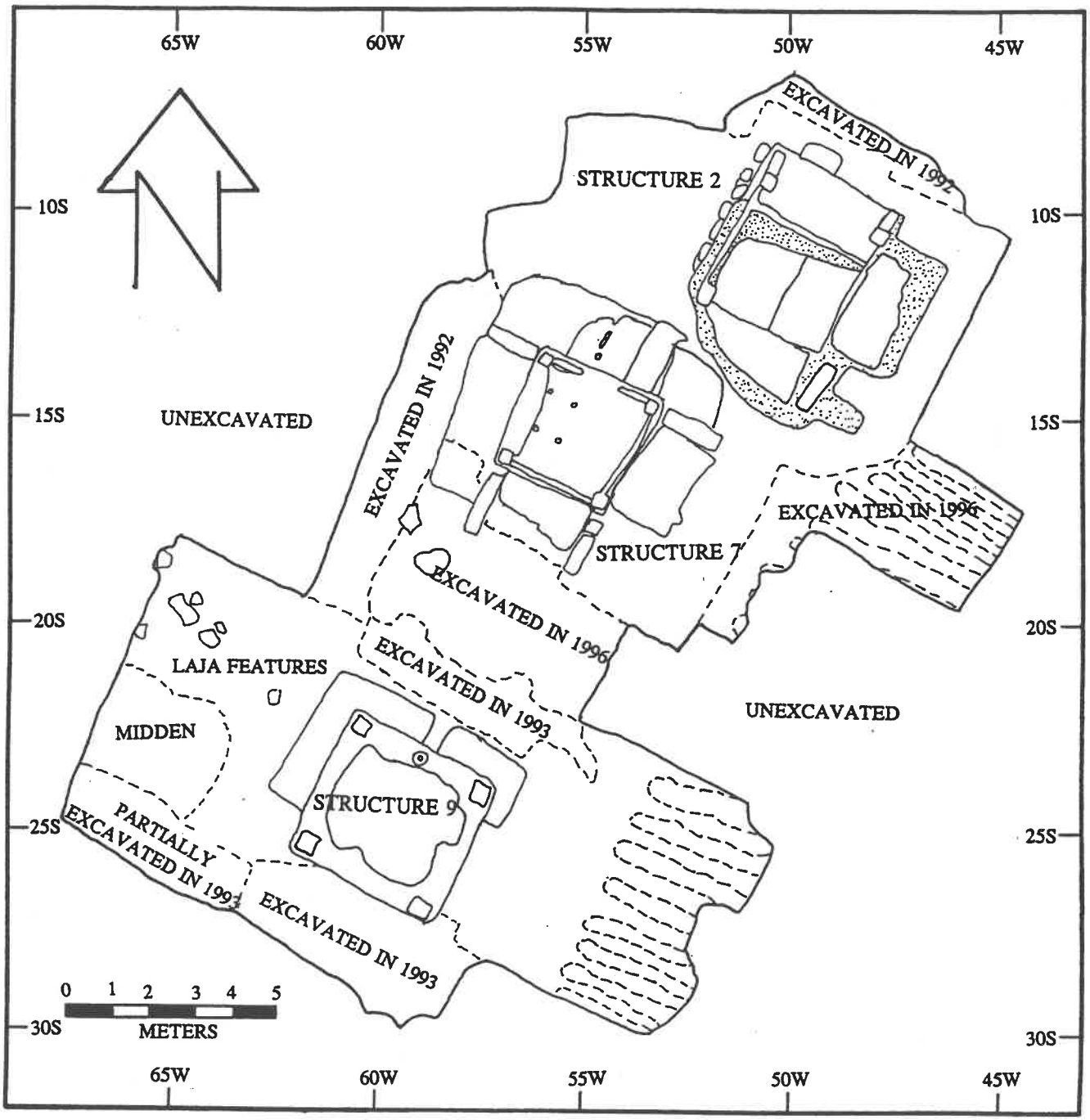
The field methodology used in 1996 was similar to that used during previous seasons (McKee 1989, 1990a, 1990b, 1992, 1993). All excavations were by hand, using picks, shovels, and azadones in upper levels, and trowels, brushes, dental picks, and other smaller tools in areas with a high probability of encountering intact cultural materials. Excavation was in stratigraphic levels, utilizing the stratigraphy defined by Miller (1989, 1990).

Artifacts from the Postclassic levels were collected in lots, with each lot representing the materials from a single 2 x 2 meter unit. The 2 x 2 meter units were defined by the grid established by David Tucker in 1994 (D. Tucker personal communication 1996). The Postclassic deposits were relatively shallow and therefore they were not subdivided vertically. Because of time concerns, we were unable to screen the sediments completely, but we did spot screen every fifth shovel full to search for small or unusual items except in the case of the footpath excavations. Because of the paucity of materials in other areas and of time concerns, no sediments from the footpath area were screened. The screening only recovered a few sherds and obsidian blade fragments.

All Classic Period materials were mapped in three dimensions using the grid established in the 1989 season (Tucker 1989), and the stratigraphic position and associations of all materials was recorded. In cases where holes were encountered, they were carefully explored, and most were mapped. Holes that were likely to represent the locations of decayed plants were then filled with dental plaster using the methods described by Murphy (1989).

Samples were collected for pollen analysis and for flotation separation and analysis from each square meter. The samples were collected by scraping the area close to the pre-Loma Caldera ground surface, and then scraping off the final 1-2 mm above and including the surface for collection. The pollen samples measured 100-200 ml, and the flotation samples measured 1.0 liter. The pollen samples were placed in clean paper bags and sealed, while the flotation samples were placed in clean cloth bags. Flotation methods are described by McKee (1992). Artifacts were cleaned, labeled, and analyzed by industry.

FIGURE 1. PLAN OF OPERATION 2 SHOWING LOCATIONS OF STRUCTURES AND EXCAVATIONS CONDUCTED SINCE 1991.



IV. Results

Post-Loma Caldera Occupation

We found evidence of an occupation post-dating the Loma Caldera eruption in two areas. The first was in the area above the corn field, above the supposed location of Structure 8. Most of the post-Loma Caldera deposits in this area were mechanically removed in 1989 and 1990 prior to our knowledge of a substantial late occupation at Cerén. Twenty square meters were excavated, and approximately sixty ceramic sherds, four obsidian blades, and one piece of bone were recovered. No features were encountered.

The second area where post-Loma Caldera deposits were encountered was in the area immediately to the east of Operation 2, where the proposed footpath for tourist access will be constructed. This area measured 4 x 20 meters. The deposits in this area had also been largely been removed during previous seasons, and only a very small quantity of artifactual material was recovered. Less than 100 sherds and a handful of obsidian blade fragments were found, and there were no indications of intact features. All deposits in both areas appeared to be related to a general low density artifact scatter found in many areas of the site.

Classic Period Occupation

Classic Period materials were encountered within the Loma Caldera deposits and resting on the Tierra Blanca Joven (tbj) deposits from Ilopango Volcano. Two features were found in stratigraphic Unit 5.

Feature A consisted of a 140 cm long carbonized pole that was in contact with numerous clay fragments (Figure 1). This feature was what we originally identified as Structure 8. The underside of the clay fragments was covered with fine vegetal impressions similar to those found on the raised shelf on the east side of Structure 2. We believe that Feature A is a portion of that shelf that extended past the eastern wall of Structure 2, and was transported laterally by the Unit 5 pyroclastic flow. The shelf appears to have been constructed by extending horizontal poles past the wall tops, covering those poles with grass, and then with wet clay to leave a smooth polished surface. Payson Sheets (personal communication 1996) has seen structures along the Rio Marañon in Peru with second story floors constructed in a similar manner.

Feature B (Figure 2) consisted of clay fragments measuring approximately 1 meter by 80 cm. This feature also had some pole impressions, and had similar vegetal impressions on its underside to those present on the tabanco east of Structure 2 and in Feature A. Feature B is probably also from the tabanco, but its likely origin is on the west side of Structure 2, given the direction of the eruptive blasts. This is our first evidence that the tabanco was present on the west side of the structure. The raised shelf apparently extended across the full width of the structure inside, and extended for an unknown distance on the outside on each side.

We excavated to the tbj in two areas. A cornfield was located in the area where we thought that Structure 8 was located. This field is an extension of the cornfield originally encountered to the east of Structure 9 (McKee 1990). Rather than excavating the entire Milpa, we concentrated on defining the northern and western portions of the field. The western edge of the field slanted to the east to avoid the eaves of Structure 7. The pattern of planting was similar to that encountered earlier; there was a pattern of ridges and furrows, with the corn plants on top of the ridges. The spacing between ridges varies from 70 to 100 cm, and the tops of the ridges are about 10 to 15 cm above the level of the bases of the furrows. The overall terrain of the field is relatively flat, without an overall slope. The corn was planted in groups of two to five plants, and the spacing between groups of plants was 70 to 100 cm. The surcos were slightly mounded at the location of the plants in some cases. The corn plants were mature, and many contained cobs that ranged from 10 to 15 cm long. Many plants were doubled over, but we are not sure whether this was intentional, for in field storage of corn (Smyth 1990), or due to the force of the eruption. The former seems more likely.

One very interesting feature was encountered on the final day of excavation. At least five corn plants had been tied together using 2-ply twine at the western edge of one of the surcos. Several hypotheses have been proposed, including mutual support for protection against strong winds, and marking plants for next year's seed, but the reason for the feature is still not known.

The corn field was relatively free of debris. The ground surface averaged fewer than two sherds per square meter. The surface was also quite loose, having experienced little compaction.

The second area where we exposed tbj was at the location of the peninsula of volcanic ash that separated structures 7 and 9. The area excavated measured between 15 and 20 square meters. The

FIGURE 2. PLAN OF FEATURE 2A.

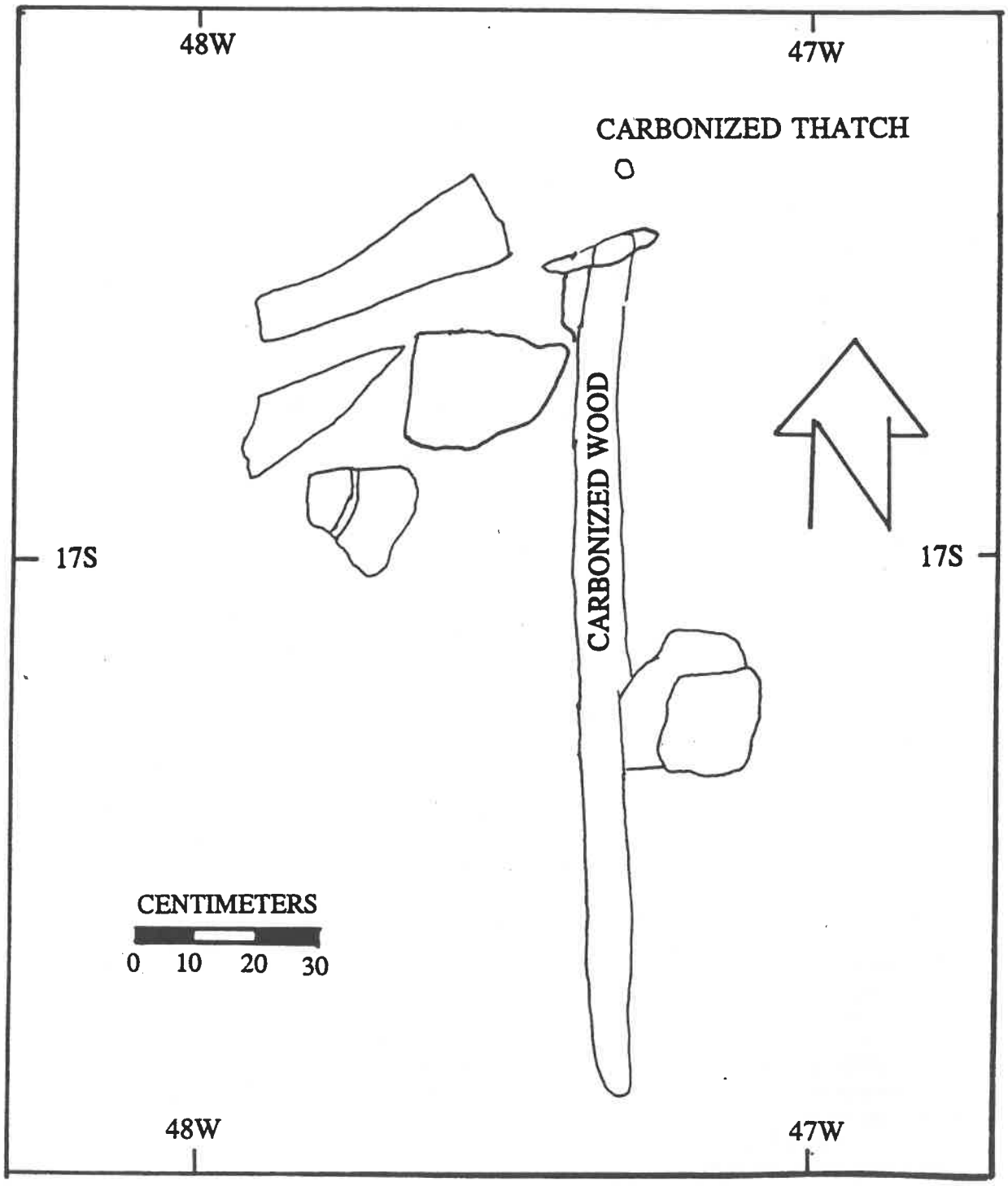
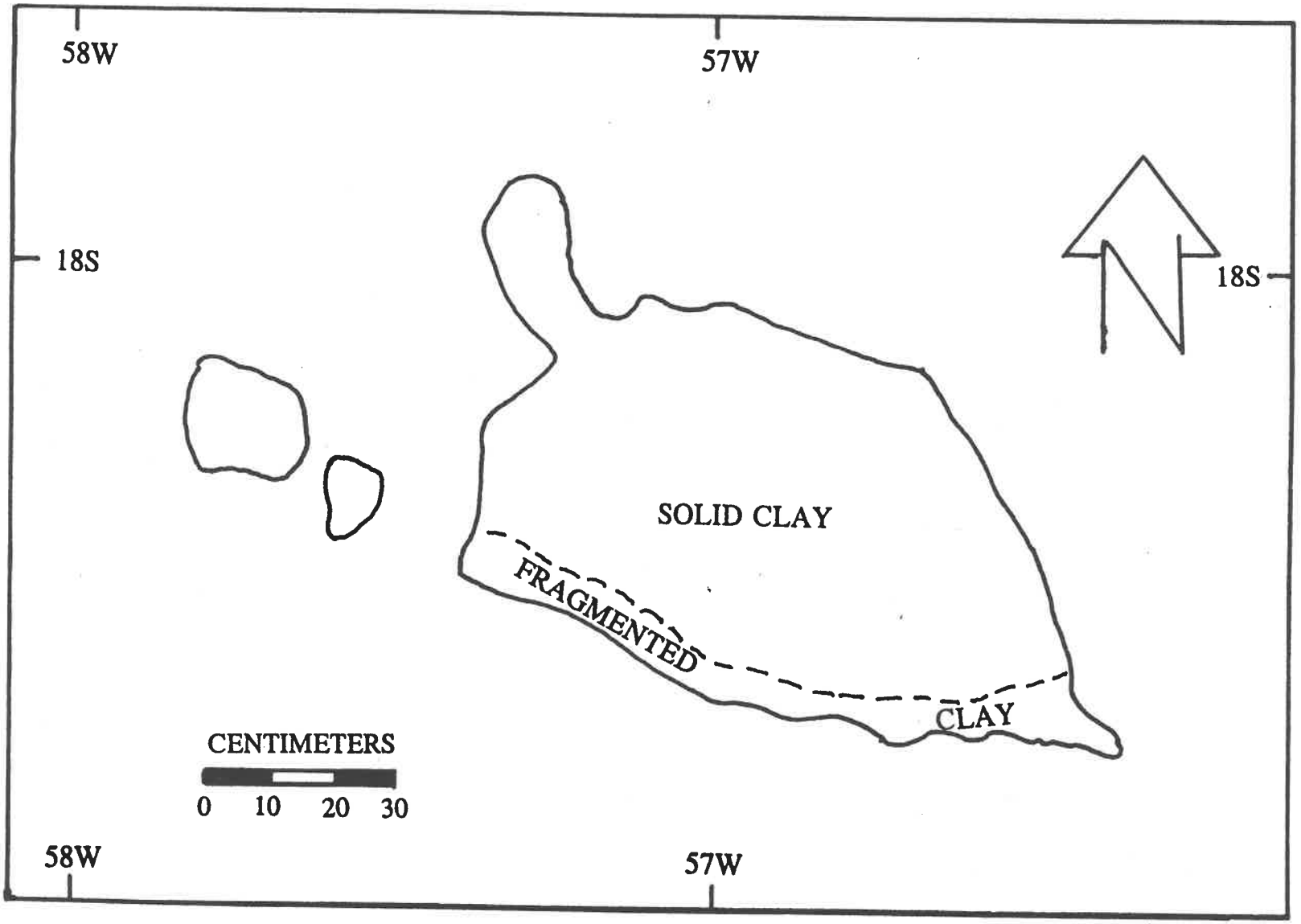


FIGURE 3. PLAN OF FEATURE 2B.



excavation exposed the southwesternmost portions of structure 7, as well as a three meter wide area separating Structures 7 and 9. A thin layer of thatch was present to the west of the southwestern column of Structure 7. This thatch was only 2-3 cm thick, considerably thinner than the thatch that we excavated over the platform. We also exposed the southwesternmost portion of the Structure 7 platform. This was a clearly prepared clay platform with a level surface, but it was highly weathered, with some large cracks. The presence of the wide flat platform on the western side of Structure 7, as well as the clay step, makes us believe that the structure may have originally had an entrance on this side that was closed during a remodeling episode. An interesting feature was present in this platform. There was a hole in the clay, and a large ceramic handle had been embedded in the hole. It was apparently used as a tie-down.

There were several interesting features between structures 7 and 9. A large pit that measured 74 x 57 x 45 cm was about 150 cm south of Structure 7. There were no clear indications of its functions. We also found holes where several corn cobs had been impressed into the surface, as well as two marks that appeared to have been human footprints. The footprints were extremely faint, and were impossible to photograph. We also cast several holes that turned out to be the remains of large roots. Nothing extended upwards at these locations, which indicates that whatever plants were related to the roots had been cut shortly before the Loma Caldera eruption.

The TBJ surface between structures 7 and 9 was generally kept clear and was quite clear of artifacts. The surface averaged less than one sherd per square meter. The surface was also highly compacted. The compaction was greater and the artifact density was lower in the western part of the peninsula than in the eastern part.

Discussion and Conclusions

The 1996 excavations in Operation 2 served purposes related to research and to conservation and tourism development. We helped to prepare the area to be open for tourism and we also improved air circulation and respiration related to Structure 7. Features A and B provided new details regarding the nature of the tabanco in Structure 2. The excavations showed the western limit of the cornfield in the area around Structure 7 and provided an example of an interesting feature with several plants tied together. The peninsula excavations exposed remaining portions of Structure 7 and allowed us to observe the Classic Period ground surface between Structures 7 and 9. The 1996 Operation 2 excavations provided many new insights and allowed us to relate the findings of various previous seasons to one anther.

Lista de Muestras de Flotacion y Polen de Operación 2, 1996

FS#	N-S	E-W	Fecha
1310	Relleno del alrededor de la Estr. 18		
1317	19-20S	51-52W	2 Agosto
1318	18-19S	51-52W	2 Agosto
1319	18-19S	50-51W	2 Agosto
1320	17-18S	50-51W	2 Agosto
1321	17-18S	49-50W	2 Agosto
1322	16-17S	50-51W	2 Agosto
1323	16-17S	49-50W	2 Agosto
1336	17-18S	48-49W	7 Agosto
1337	16-17S	48-49W	7 Agosto
1338	17-18S	47-48W	7 Agosto
1339	16-17S	47-48W	7 Agosto
1340	18-19S	59-60W	7 Agosto
1341	19-20S	59-60W	7 Agosto
1342	18-19S	58-59W	7 Agosto
1343	19-20S	58-59W	7 Agosto
1344	20-21S	57-58W	7 Agosto
1346	18-19S	57-58W	7 Agosto
1347	19-20S	57-58W	7 Agosto
1348	20-21S	56-57W	7 Agosto

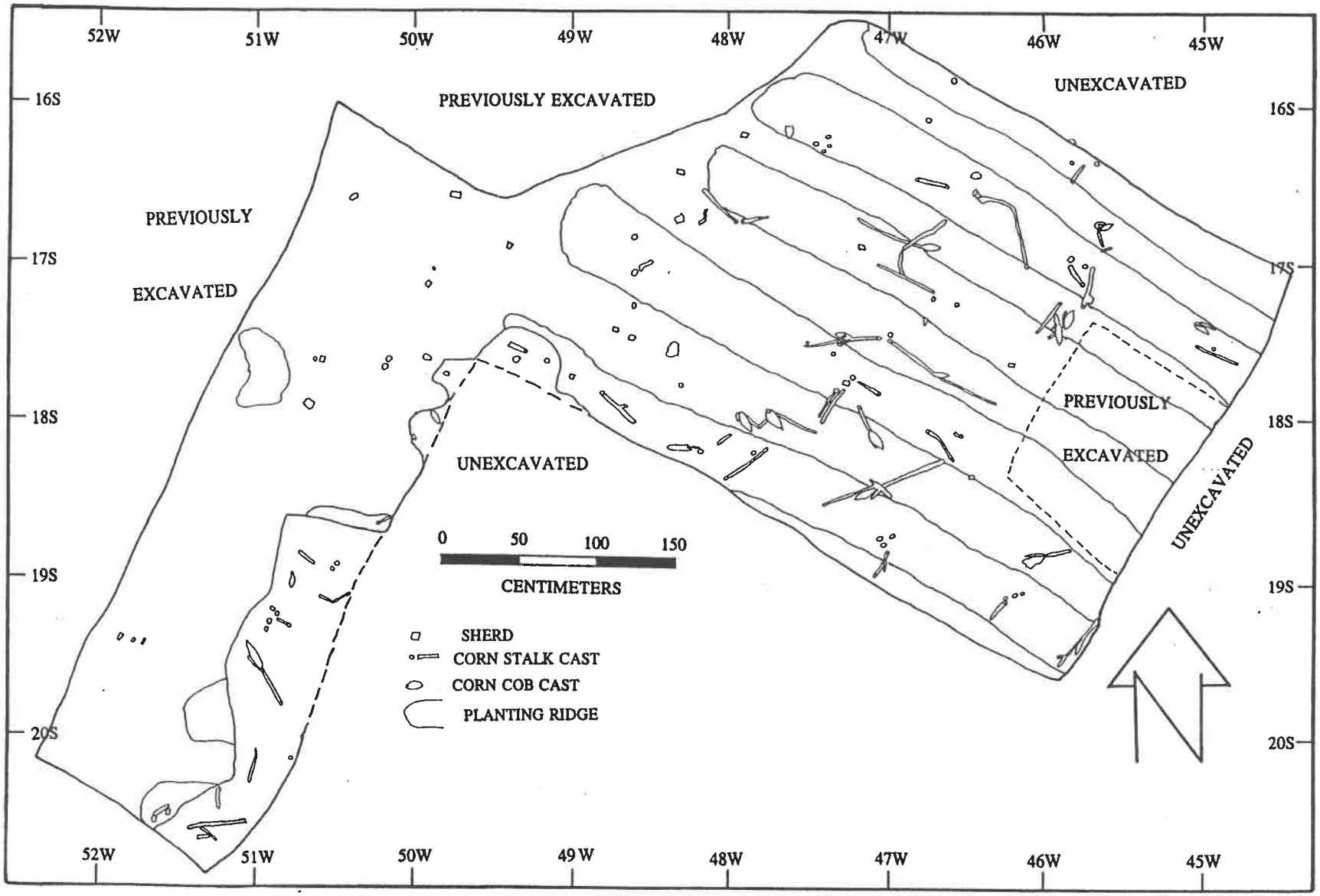


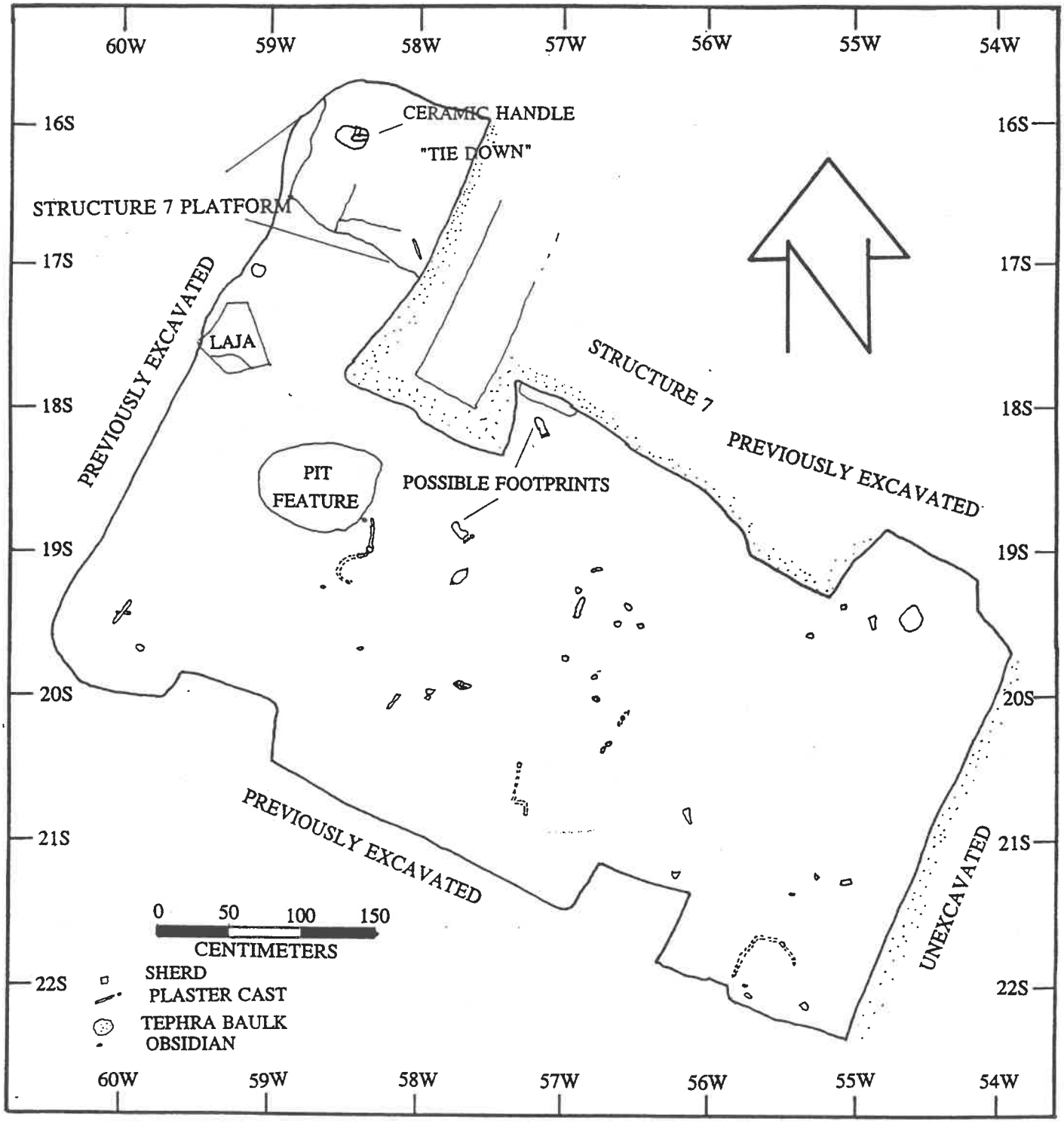
FIGURE 4. PLAN OF 1996 CORNFIELD EXCAVATIONS.

FS#	N-S	E-W	Fecha
1349	19-20S	56-57W	7 Agosto
1350	20-21S	55-56W	7 Agosto
1351	21-22S	55-56W	7 Agosto
1352	20-21S	54-55W	7 Agosto
1353	18-19S	45-46W	8 Agosto
1354	16-17S	44-45W	8 Agosto
1355	18-19S	46-47W	8 Agosto
1356	16-17S	46-47W	8 Agosto
1357	17-18S	46-47W	8 Agosto
1358	19-20S	54-55W	8 Agosto
1359	19-20S	55-56W	8 Agosto
1360	18-19S	56-57W	8 Agosto
1361	17-18S	58-59W	8 Agosto
1362	16-17S	58-19W	8 Agosto

Coleciones Postclasicas de la Operación 2 1996

FS#	N-S	E-W	Descripción
1300	0-2S	59-61E	Tiestos (5)
1301	0-2S	59-61E	Tiestos (36)
1302	0-2S	59-61E	Navaja de Obsidiana (1)
1303	0-2S	59-61E	Hueso (1)
1304	0-2S	61-63E	Tiestos (14)
1305	0-2S	61-63E	Obsidiana (2)
1306	2-4S	61-63E	Tiestos (3)
1307	4-6S	61-63E	Tiestos (2)
1308	4-6S	61-63E	Obsidiana (1)
1311	2-4N	60-62E	Tiestos
1312	2-4N	60-62E	Obsidiana
1324	7-9N	61-63E	Tiestos (2)
1325	5-7N	61-63E	Tiestos (9)
1326	3-5N	61-63E	Tiestos (20)
1327	1-3N	61-63E	Tiestos (26)
1328	1-3N	61-63E	Obsidiana (1)
1329	1S-1N	61-63E	Tiestos (28)
1330	1S-1N	61-63E	Obsidiana (1)
1331	1-3S	61-63E	Tiestos (6)
1332	3-5S	61-63E	Tiestos (5)
1333	5-7S	61-63E	Tiestos (2)
1334	7-9S	61-63E	Tiestos (2)
1335	9-11S	61-63E	Tiestos (7)
1363	1-3N	59-61E	Tiestos (10)
1364	1-3N	59-61E	Obsidiana (1)
1365	1-3S	59-61E	Tiesto (1)
1366	3-5N	61-63E	Obsidiana (1)
1367	3-5N	59-61E	Tiestos (11)

FIGURE 5. PLAN OF 1996 EXCAVATIONS BETWEEN STRUCTURES 7 AND 9.



Coleciones Clasicas Operación 2 Joya de Cerén, 1996

FS#	N-S	E-W	Descripción
1309	20.20S	46.01E	Tiesto (1)
1314			Tiesto
1315			Madera carbonizada
1316			Madera carbonizada
1345	19.13-19.66N	56.30-56.50W	Rama - en yeso
1368	16.06-16.18S	57.70-57.08W	Tiestos (4)
1369	16.20S	57.90W	Molde en yeso
1370	19.35-19.50S	59.95-60.05W	Molde en yeso
1371	19.63-19.67S	59.87-59.93W	Molde en yeso
1372	19-20S	58-59W	Tiestos (2)
1373	19.95-20.05S	58.12-58.21W	Molde en yeso (mazorca)
1374	19-20S	57-58W	Tiestos (2)
1375	19-20S	56-57W	Tiestos (3)
1376	19-20S	56-57W	Moldes en yeso (5)
1377	21-22S	56-57W	Tiestos (2)
1378	21-22S	55-56W	Tiestos (3)
1379	20.43-20.80S	57.25-57.35W	Molde en yeso (raiz)
1380	18.73-19.18S	58.32-58.57W	Molde en yeso (raiz)
1381	19.56-19.57S	55.28-55.31W	Molde en yeso (semilla)
1382	21-22S	55-56W	Navaja de obsidiana (1)
1383	21.61-21.92S	55.40-55.85W	Molde en yeso (raiz)
1384	21-22S	55-56W	Tiestos (2)
1385	20.06-20.17S	56.53-56.60W	Molde en yeso (raiz)
1386	20.29-20.38S	56.67-56.73W	Molde en yeso (raiz)
1387	19-20S	56-57W	Moldes en yeso
1388	19-20S	51-52W	Tiestos (3)
1389	17-18S	50-51W	Tiestos (5)
1390	16-17S	50-51W	Tiesto (1)
1391	16-17S	49-50W	Tiestos (2)
1392	17-18S	49-50W	Tiestos (4)
1393	16-17S	48-19W	Tiestos (2)
1394	17-18S	48-49W	Tiestos (7)
1395	16-17S	47-48W	Tiestos (3)
1396	17-18S	47-48W	Tiesto (1)
1397	17-18S	46-47W	Tiestos (2)
1398	20-21S	56-57W	Tiesto (1)

CHAPTER 4
EXCAVATIONS IN OPERATION 7

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Introduction

The objective of Operation Seven during the 1996 summer field season was the excavation of six pits to facilitate the installation of a new roof over Structure 4. The six pits, designated P-51 through P-56, measured four by four meters at the surface. However, due to logistical and safety reasons, each pit is approximately two by two meters at the Classic Period ground surface. The goal of Operation Seven was to excavate the pits necessary for the new roof supports and document all archaeological material found in the pits.

The excavations were carried out under the supervision of Payson Sheets, and were under the direction of Paul Cackler, with various workers paid by the Patronato pro-Patrimonio Cultural. Colleagues Linda Brown and Inga Calvin also assisted with the excavations and contributed to this report. The conservation of artifacts and fragile organic material was under the direction of Ellen Rosenthal.

Postclassic Material

A post-Loma Caldera occupation has been found throughout the site of Joya de Cerén. The strata containing these artifacts is typically encountered between 30 to 90 cm below the present ground surface. The Postclassic artifacts recovered this season include ceramic sherds and obsidian artifacts (blades and cores). The artifact density per grid unit is illustrated in Figure 1.

Most of the artifacts were found scattered throughout the Postclassic soil horizon rather than being deposited in primary contexts. The only exceptions were 28 human teeth found in P-53. We believe these to be part of a human burial excavated by David Tucker in 1994. According to Tucker's field notes, he recovered at least 8 human teeth from the burial. Since a total of 36 teeth have now been recovered, we can conclude that teeth from at least two individuals were present in the burial. In addition to the human teeth we also found one non-human tooth, probably that of a deer (*Odocoileus virginianus* or *Mazama americana*), one biconically-drilled jade bead, and 15 small bone fragments, each less than one centimeter in length.

Classic Period Material

P-51

Fortunately, no structures were encountered with this pit, but a number of items of interest were found both on and above the tierra blanca joven (TBJ) marking the Classic Period ground surface. A large piece of carbonized wood (FS# 2533) was encountered in Unit 5. Its function is unknown, but its thin concave shape suggests that it may be a naturally occurring piece of old wood. Several sherds (FS# 2487) were also found in Unit 5; since Unit 5 is a fast-moving pyroclastic flow (Miller 1989), the sherds may indicate that a structure is located upblast to the northeast of P-51.

P-51 measures 2 by 2.5 meters at the TBJ. Scattered fragments of deteriorated roofing thatch were found within lower Unit 3 along the eastern edge of the pit. We are confident that the thatch was part of the large roof over Structure 3. Additionally, two plant casts (FS# 2720, 2721) were recovered from an unidentified species apparently displaced during Unit 3 of the eruption. Four plant molds were located in Unit 1. Preliminary field identifications suggest that one plant (FS# 2733) is chile (Capsicum annum), two clusters of plants (FS# 2727, 2737) may be medicinal, and one plant (FS# 2732) remains unidentified (Julio Cesar Gonzales A. personal communication 1996). Additionally, Gonzales A. identified a seed mold (FS# 2724), recovered just below the surface of the TBJ, as an *ujushte* seed -- an edible seed currently used in tortillas. Four directly-preserved leaves (FS# 2700, 2701, 2738, 2740) and an unidentified organic smear (FS# 2702) were recovered in lower Unit 1. All specimens were collected by the project conservator, Ellen Rosenthal. Thirty-three pot sherds were recovered on the TBJ surface. Additionally, three small unfired clay balls were noted on the TBJ. The original ground surface was smooth with no evidence of furrows.

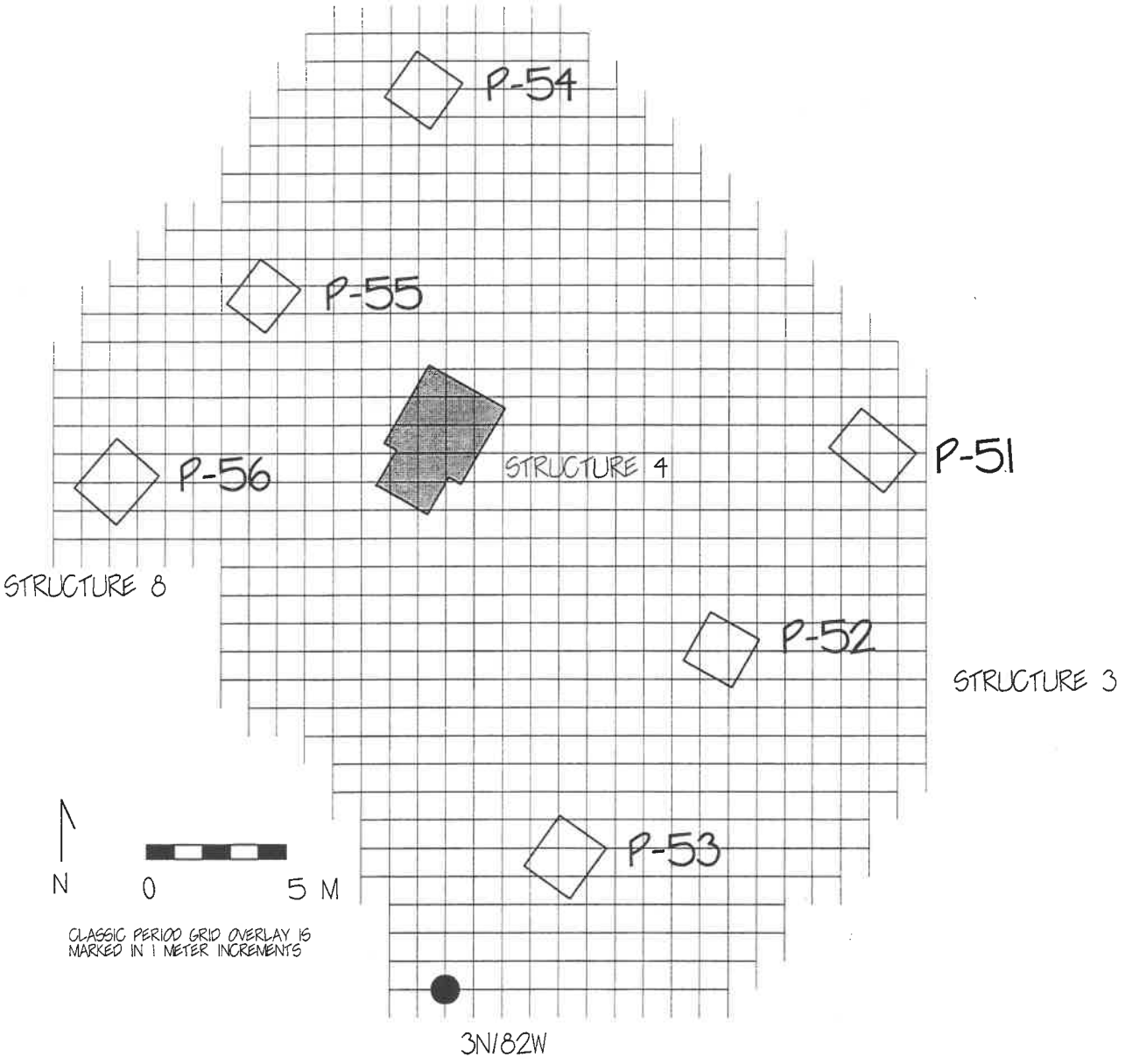


Figure 1. Location of test pits.

P-52

This pit, located to the west of Structure 3, measures 2 by 2 meters at the TBJ surface. Several short, horizontal voids found within Unit 3 were not cast with plaster because they likely represent non-diagnostic segments of tree branches. No additional voids were encountered. Further excavation revealed many small flecks of charcoal scattered across the surface of the TBJ and two small stones were embedded into the central portion of this pit. The original ground surface sloped steeply towards the southwest of the unit. A scattered grouping of broken pottery (FS# 2527) was located along the eastern wall of the pit. These included refittable sherds from a large vessel (Guyate striated) similar to the complete vessel found by Andrea Gerstle in Structure 3 (Gerstle 1989).

P-53

The 2 by 2 meter section of TBJ exposed by this pit slopes dramatically to the south and west. The surface appears to have been shaped by water run-off, which cut a channel across the unit. Excavation and cleaning of plaster-filled holes revealed three distinct clusters of multiple-stalk plants that each radiated from a single source at the TBJ ground surface. Botanist Gonzales A. suggested that these plants were either a *Graminia* or a type of palm, and likely were used for horizontal bajaraque reinforcement. Two plants (FS# 2539, 2540) were removed during excavation, while the third, located to the north of the zone affected by the support for the new roof, was backfilled and left for future excavation. A plaster cast within the TBJ (FS# 2541) was tentatively identified as a camote plant (Gonzales A. personal communication 1996). A void left by the trunk of a large mature palm tree was found in the southeast corner of the pit.

P-54

Pit 54 measures 2 by 2 meters at the TBJ surface. A total of 27 plant molds were cast and recovered in Unit 1,and all plant molds appear to be from similar species. Many of the plants had fallen during the Unit 1 phase of the eruption. The plants appeared to form a sinuous line, trending south-east, through the pit, and no evidence of furrows were noted. Preliminary field identification suggests that these plants may be madre de cocao or laurel trees, although there are other possibilities (Julio Cesar Gonzales A. personal communication 1996). Two directly-preserved leaves and one directly-preserved vine were recovered from lower Unit 1. These were excavated and consolidated by Ellen Rosenthal for future identification (FS# 2493). Six ceramic sherds were recovered from the TBJ surface.

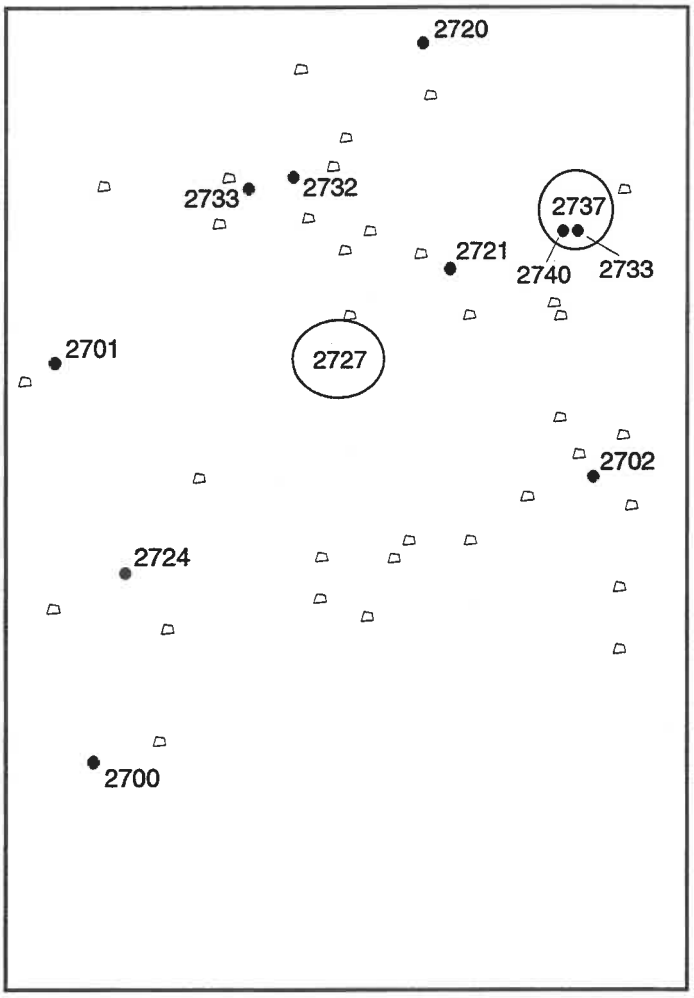
P-55

No structures were encountered with this pit, but a ceramic pothandle (FS# 2473) was found in Unit 3. It is possible that this sherd was blown in during the eruption from a structure located to the northeast. The 2 by 1.8 meter exposure on the TBJ surface revealed a high diversity of plant species. Bean (vines and pods), including a few actual beans, were found directly preserved. Other vines were excavated, both cast in dental plaster, and directly preserved. Gonzales A. has suggested that one vine (FS# 2596) may be a medicinal plant (Rubiaceae). Two maguey plants (FS# 2616, 2623) were located along the eastern side of the unit, and may mark the end of the maguey garden around Structure 4. If this is indeed the case, then the maguey garden probably included more than 50 plants. In addition to maize (FS# 2606, 2617), composite plants known as "jalacate" were also identified by Gonzales A. (e.g., FS# 2625). Jalacate works well for horizontal reinforcements in bajareque architecture.

P-56

At the TBJ surface, P-56 measured 2 by 2.3 meters. We observed a strong slope to the south and southeast in the Unit 3 ash layers, which suggested that the unit was located very close to a structure. Preserved roofing thatch was subsequently found along the southern edge of the pit. Most of the thatch was concentrated in a 10 cm wide band along the southern edge, with some scattered pieces falling further into the unit. This is direct evidence that a structure is located immediately south of pit 56. The structure has been named "Structure 8." The structure is located just outside of the area to be used for the new roof support, and will not affect the placement of the Operation 4 roof.

A number of maize plants, replete with ears, were growing on the Classic Period ground surface (FS# 2754, 2755, 2765). Gonzales A. identified two mature chile bushes (Capsicum annum; FS# 2760, 2769), and at least one small laurel tree (FS# 2751). The TBJ was flat and no furrows were found. The



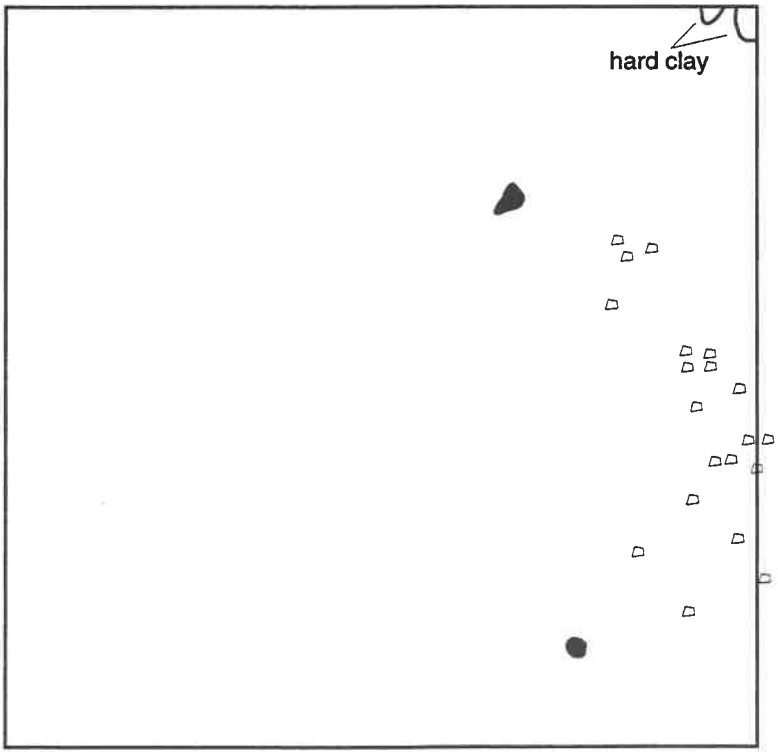
P-51

- plant mold or organic feature
- cluster of plant molds
- sherd

N

0 50 cm

Figure 2. Plan Map of TBJ in P-51.



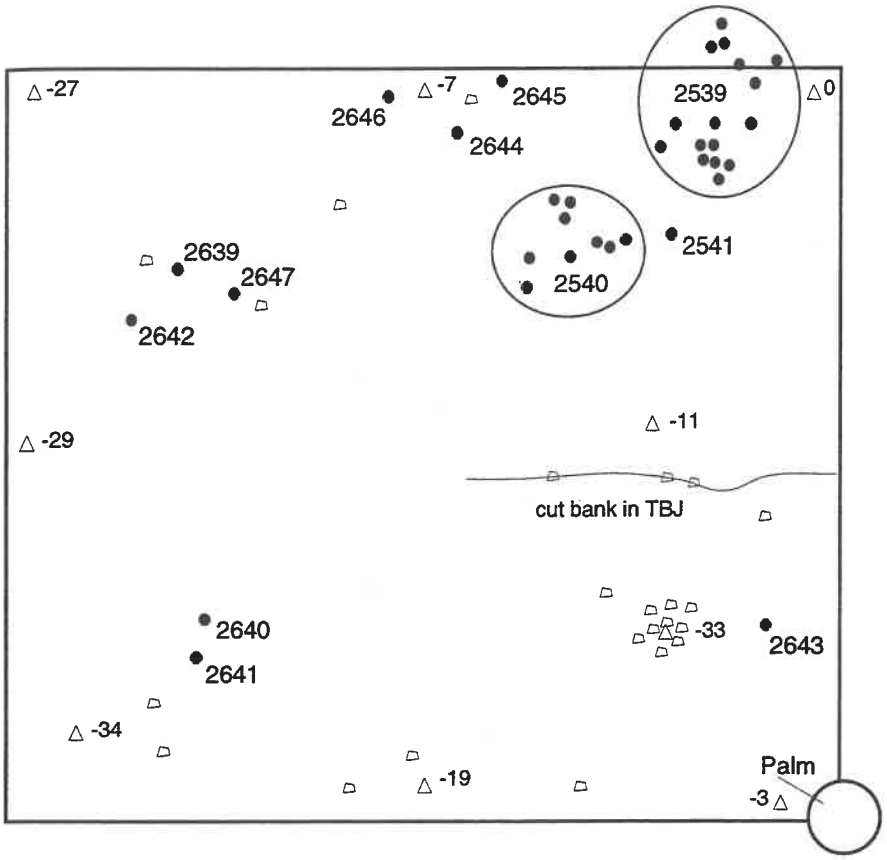
P-52

- rock
- sherd

N

0 50 cm

Figure 3. Plan Map of TBJ in P-52.



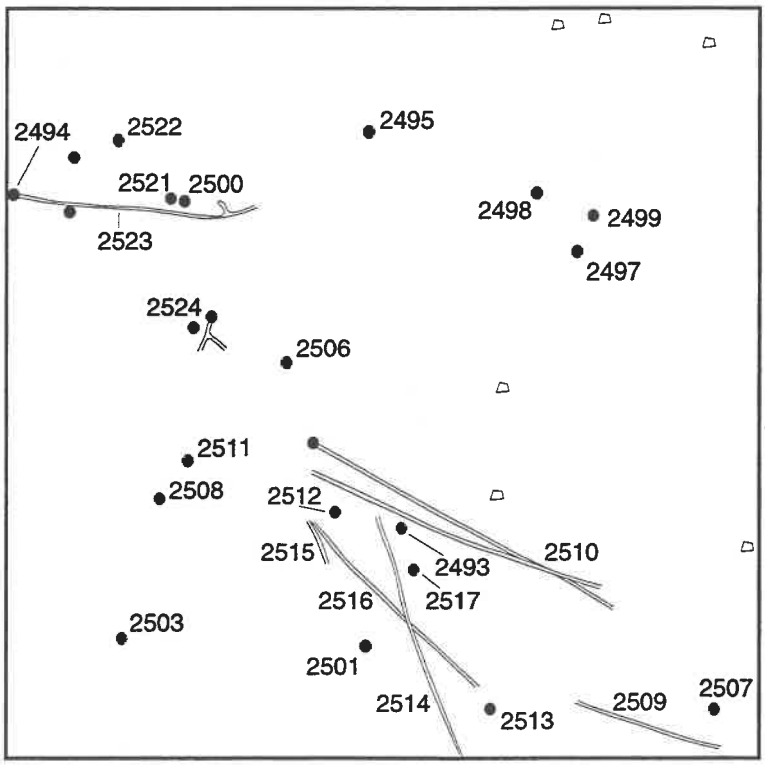
P-53

- plant mold
- cluster of plant molds
- sherd
- elevation in cm

N

0 50 cm

Figure 4. Plan Map of TBJ in P-53.



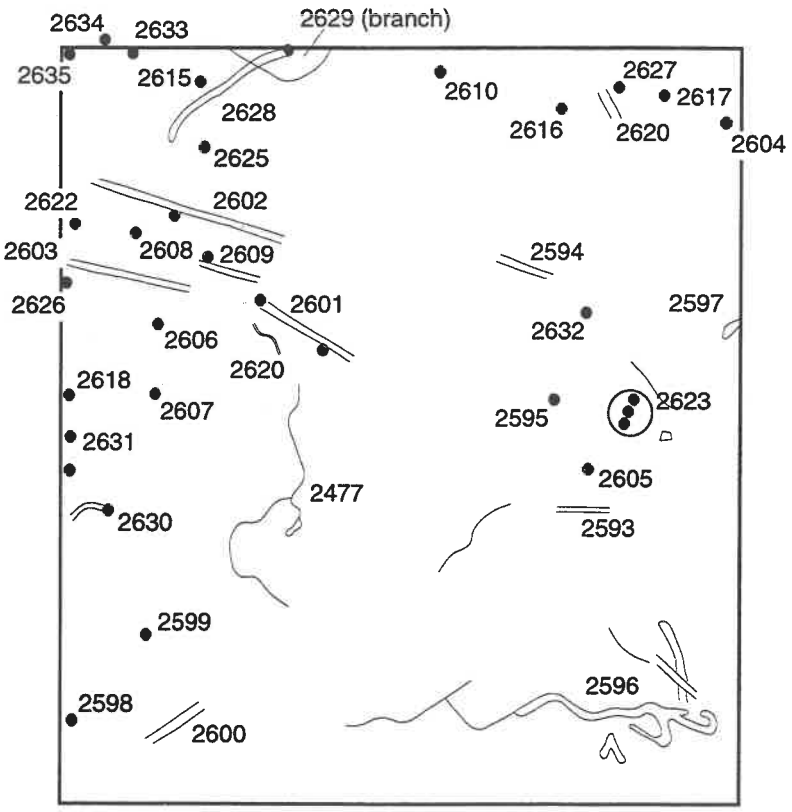
P-54

- plant mold
- horizontal plant mold
- sherd

N

0 50 cm

Figure 5. Plan Map of TBJ in P-54.



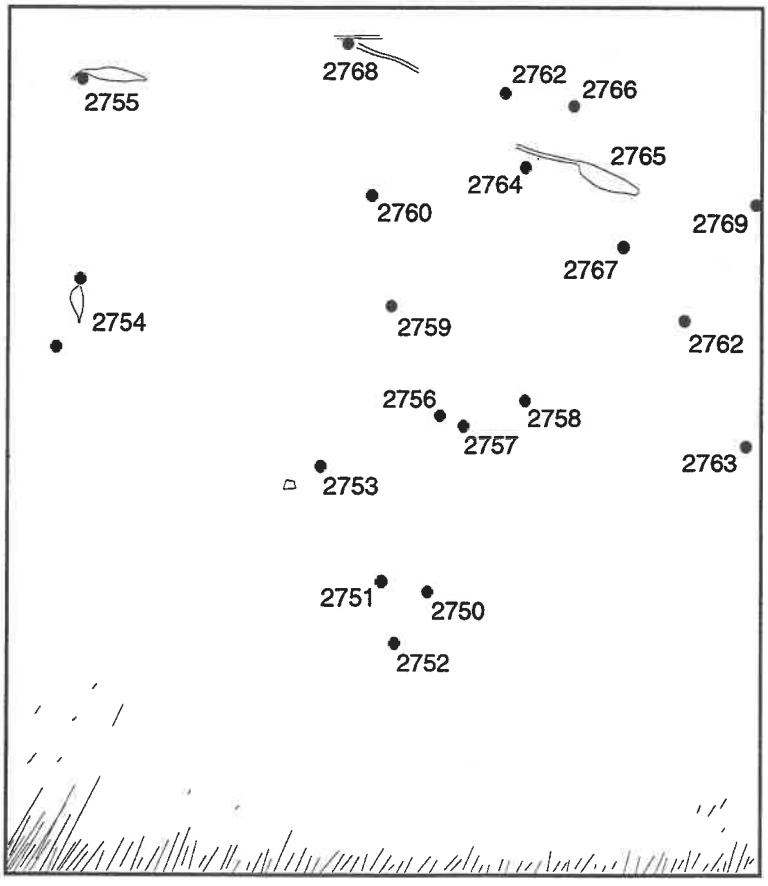
P-55

- plant mold
- horizontal plant mold
- directly preserved vine
- cluster of plant molds
- sherd

N

0 50 cm

Figure 6. Plan Map of TBJ in P-55.



P-56

- plant mold
- horizontal plant mold
- directly preserved thatch
- sherd

N

0 50 cm

Figure 7. Plan Map of TBJ in P-56.

distribution of plants in front of the structure leaves ample space for a walkway along the edge of the building.

Conclusions

The test pitting program in preparation for the new roof over Structure 4 was successful. No structures were found in areas to be affected by the planned roofing supports. However, we did find evidence which indicates that a structure is located south of P-56. The new structure has been designated Structure 8.

The variety of cultigens revealed by the pits surpasses that which has been found in other excavations throughout the site, and is indicative that there was more biodiversity at Cerén than previously thought. We now have better information about cultigens and other types of plants utilized by the residents of Cerén. Cerén is the first site in the world where beans have been excavated in the locations where they were grown. In addition, it is also the first site where chile plants have been found growing *in situ*.

Another important result of the 1996 excavations is the discovery of the apparent border of the eastern edge of the maguey garden. If the plants in P-55 do mark the actual border, then the domestic unit represented by Structure 4 was growing and processing perhaps as many as 50 maguey plants. Evidence for maguey fiber processing at Structure 4 has been described by Simmons (1996), and it now seems certain that they were capable of producing and processing an excess amount of maguey for exchange. This result is important in understanding economic relations between domestic units and within the community.

FS#	Location	Description
2442	16-17N 16-18E	obsidiana (1)
2443	16-17 N 16-18E	tiestos (16)
2444	22-24N 5-1W	tiestos (5)
2445	21-23N 16-18E	tiestos (11)
2446	13-14N 18-20E	tiestos (43)
2447	13-14N 18-20E	obsidiana (15)
2448	19-21N 16-18E	tiestos (8)
2449	20-22N 3-5W	obsidiana (1)
2450	10-12N 18-20E	obsidiana (1)
2451	10-12N 18-20E	tiestos (1)
2452	10-12N 18-20E	dentes de humanas
2453	10-14N 3-5W	obsidiana (3)
2454	10-14N 3-5W	tiestos (17)
2455	10-12N 18-20E	greenstone bead
2456	10-12N 18-20E	dente de animal
2457	19-21N 16-18E	madera carbonizada
2458	10-14N 1-3W	tiestos (4)
2459	19-23N 1-5W	tiestos (15)
2460	19-21N 3-5W	tiestos (37)
2461	19-21N 1-3W	tiestos (25)
2462	30-32N 3-5W	tiestos (4)
2463	19-21N 3-5W	obsidiana (3)
2464	21-23N 3-5W	tiestos (1)
2465	21-23N 1-3W	tiestos (2)
2466	30-32N 3-5W	tiestos (5)
2467	30-32N 3-5W	navaja de obsidiana (1)
2468		

2469	28-30N 3-5W	tiestos (1)
2470	28-30N 3-5W	obsidiana (3)
2471		
2472	28-30N 16-18E	tiestos (1)
2473	P-55	tiestos (1)
2474		
2475	P-52	tiestos (2)
2476	P-55	lone bean with vine portion
2477	P-55	bean pod and vine
2478	P-55	3 loose beans and 1 insitu bean
2479	P-52	Flotacion, Polen #1
2480	P-56	Flotacion, Polen #2
2481	P-52	Flotacion, Polen #3
2482	P-52	Flotacion, Polen #2
2483	P-56	Flotacion, Polen #1
2484	P-56	Flotacion, Polen #3
2485	P-56	Flotacion, Polen #4
2486	P-53	tiesto from TBJ under palm tree hole (1)
2487	P-51	tiestos (2)
2488	P-54	Flotacion, Polen #4
2489	P-54	Flotacion, Polen #2
2490	P-54	Flotacion, Polen #1
2491	P-54	Flotacion, Polen #3
2492	P-52	Flotacion, Polen #4
2493	P-54	directly preserved vine & leaves
2494	P-54	molde de planta
2495	P-54	molde de planta
2496	P-54	tiesto (1)
2497	P-54	molde de planta
2498	P-54	molde de planta
2499	P-54	molde de planta
2500	P-54	molde de planta
2501	P-54	molde de planta
2502	P-54	tiesto (1)
2503	P-54	molde de planta
2504	P-54	tiesto (1)
2505	P-54	tiesto (1)
2506	P-54	molde de planta
2507	P-54	molde de planta
2508	P-54	molde de planta
2509	P-54	molde de planta
2510	P-54	moldes de plantas
2511	P-54	molde de planta
2512	P-54	molde de planta
2513	P-54	molde de planta
2514	P-54	molde de planta
2515	P-54	molde de planta
2516	P-54	molde de planta
2517	P-54	molde de planta
2518	P-54	molde de planta
2519	P-54	molde de planta
2520	P-54	tiesto (1)

2521	P-54	molde de planta
2522	P-54	molde de planta
2523	P-54	molde de planta
2524	P-54	molde de planta
2525	P-54	tiesto (1)
2526		
2527	P-52	tiestos (27)
2528	P-56	molde de planta
2529	P-55	Flotacion, Polen #1
2530	P-55	Flotacion, Polen #2
2531	P-55	Flotacion, Polen #3
2532	P-55	Flotacion, Polen #4
2533	P-51	madera carbonizada
2534	P-53	molde de planta A
2535	P-53	seed A
2536	P-53	molde de planta C
2537	P-53	molde de planta
2538	P-53	tiestos en TBJ (11)
2539	P-53	molde de planta A
2540	P-53	molde de planta C
2541	P-53	molde de planta D
2542	P-53	tiesto (1)
2543	used	
2581	P-55	molde de planta
2582	P-55	molde de planta
2583	P-55	molde de planta
2584	P-51	Flotacion, Polen #1
2585	P-51	Flotacion, Polen #2
2586	P-51	Flotacion, Polen #3
2587	P-51	Flotacion, Polen #4
2588	P-55	molde de planta
2589	P-55	molde de planta
2590	P-51	tiestos (4)
2591	P-55	molde de maguey
2592	19-23N 1-5W	obsidiana (1)
2593	P-55	molde de planta
2594	P-55	molde de maize
2595	P-55	rhizomes direct preservation
2596	P-55	molde de planta
2597	P-55	molde de planta
2598	P-55	molde de planta
2599	P-55	molde de planta
2600	P-55	molde de planta
2601	P-55	molde de planta
2602	P-55	molde de planta
2603	P-55	molde de planta
2604	P-55	molde de planta
2605	P-55	molde de planta
2606	P-55	molde de planta
2607	P-55	molde de planta
2608	P-55	molde de planta
2609	P-55	molde de planta

2610	P-55	molde de planta
2611	3-5N 16-18E	tiestos (19)
2612	3-5N 18-20E	tiestos (37)
2613	1-3N 16-18E	tiestos (59)
2614	1-3N 18-20E	tiestos (19)
2615	P-55	molde de planta
2616	P-55	molde de planta
2617	P-55	molde de planta
2618	P-55	molde de planta
2619	P-55	molde de planta
2620	P-55	molde de planta
2621	P-55	vine, direct preservation
2622	P-55	molde de planta
2623	P-55	molde de planta
2624	P-55	organic, direct preservation
2625	P-55	molde de planta
2626	P-55	molde de planta
2627	P-55	molde de planta
2628	P-55	molde de planta
2629	P-55	molde de rama
2630	P-55	molde de planta
2631	P-55	molde de planta
2632	P-55	molde de planta
2633	P-55	molde de planta
2634	P-55	molde de planta
2635	P-55	molde de planta
2636	3-5N 18-20E	obsidiana (4)
2637	1-3N 18-20E	obsidiana (3)
2638	1-3N 18-20E	obsidiana (3)
2639	P-53	molde de planta
2640	P-53	molde de planta
2641	P-53	molde de planta
2640	P-56	tiesto (1)
2641	P-55	tiesto (1)
2642	P-53	tiestos (25)
2642	P-53	molde de planta
2643	P-53	molde de planta
2644	P-53	molde de planta
2645	P-53	molde de planta
2646	P-53	molde de planta
2647	P-53	molde de planta
2648	used	
2700	P-51	leaf, directly preserved
2701	P-51	leaf, directly preserved
2702	P-51	organic smear
2703	P-51	tiesto (1)
2704	P-51	tiesto (1)
2705	P-51	tiesto (1)
2706	P-51	tiesto (1)
2707	P-51	tiesto (1)
2708	P-51	tiesto (1)
2709	P-51	tiesto (1)

2710	P-51	tiesto (1)
2711	P-51	tiesto (1)
2712	P-51	tiesto (1)
2713	P-51	tiesto (1)
2714	P-51	tiesto (1)
2715	P-51	tiesto (1)
2716	P-51	tiesto (1)
2717	P-51	tiesto (1)
2718	P-51	tiesto (1)
2719	P-51	tiesto (1)
2720	P-51	molde de planta
2721	P-51	molde de planta
2722	P-51	clay fragment
2723	P-51	tiesto (1)
2724	P-51	seed mold
2725	P-51	tiesto (1)
2726	P-51	tiesto (1)
2727	P-51	moldes de plantas
2728	P-51	tiesto (1)
2729	P-51	tiesto (1)
2730	P-51	tiesto (1)
2731	P-51	tiesto (1)
2732	P-51	molde de planta
2733	P-51	molde de planta
2734	P-51	tiesto (1)
2735	P-51	tiesto (1)
2736	P-51	tiesto (1)
2737	P-51	moldes de plantas
2738	P-51	leaves, directly preserved
2739	P-51	tiesto (1)
2740	P-51	tiesto (1)
2741	P-51	tiesto (1)
2742	P-51	tiesto (1)
2743	P-51	tiesto (1)
2744	P-51	tiesto (1)
2745	P-51	tiesto (1)
2746		
2747		
2748		
2749		
2750	P-56	molde de planta
2751	P-56	molde de planta
2752	P-56	molde de planta
2753	P-56	molde de planta
2754	P-56	molde de planta
2755	P-56	molde de planta
2756	P-56	molde de planta
2757	P-56	molde de planta
2758	P-56	molde de planta
2759	P-56	molde de planta
2760	P-56	molde de planta
2761	P-56	molde de planta

2762	P-56	molde de planta
2763	P-56	molde de planta
2764	P-56	molde de planta
2765	P-56	molde de planta
2766	P-56	molde de planta
2767	P-56	molde de planta
2768	P-56	molde de planta
2769	P-56	molde de planta

CHAPTER 5
ARTIFACT CONSERVATION DURING THE 1996 FIELD SEASON

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I. INTRODUCTION

The Cerén Project is a participating project in the archaeological conservation internship program, administered by the Smithsonian Institution's Conservation Analytical Laboratory (CAL) and supported in part by the Samuel H. Kress Foundation. This program provides laboratory staff as part of an advanced training fellowship in archaeological conservation. This year, the fourth in which CAL postgraduate fellows have worked at the site, the laboratory was staffed by Ellen F. Rosenthal from 10 July to 14 August, with Harriet F. Beaubien serving as supervisory conservator at the beginning of the season.

II. CONSERVATION ACTIVITIES ON-SITE

Activities at the outset included organization of the site laboratory and inventory of supplies (both newly brought and remaining from previous seasons). The simple structure, outfitted with wooden shelves and tables but without running water or electricity, accommodated conservation processing and temporary storage, among other activities. For artifacts processed through the laboratory, protective housing was considered as critical a component of their longterm preservation as the stabilization treatments they received. At the close of the season, an inventory of remaining supplies was taken, the lab contents were packed for storage, and the artifacts were transferred to a designated storage room at the Museo Nacional David J. Guzman.

A. Treatments of newly excavated material

The focus of the conservation laboratory during the 1996 season was the treatment of newly excavated material. Most of the artifacts were too fragile to be lifted without damage and required special conservation attention in the field before they could be brought to the laboratory for further cleaning, stabilization and packing for longterm storage. Notable treatments are included in each section which follows.

Impressions and directly preserved plant remains. Because the excavation activity was around the exterior of structures, the majority of the recovered artifacts were agricultural in nature and included impressions of as well as directly preserved plant remains, including vines, roots, seeds, and leaves. Given their rarity in the archaeological record of the sub-tropics and the importance of prompt conservation intervention for their successful recovery, conservation played a key role in the final cleaning, in situ consolidation, and lifting of these fragile artifacts.

The plant remains were examined in situ and cleaned using soft brushes, quills, and wooden sticks. Because the damp plant remains were very soft and lost structural integrity as they dried, consolidation was carried out using ~10-15% Acrysol WS-24 in demineralized water, applied by pipette. They were protected with buckets and geotextile scraps or polyethylene sheets covered with soft dirt, until they could be lifted, usually within hours or on the next day.

Small plant remains. Plant remains, such as discrete roots or leaves, were lifted in their dirt matrix, and carried to the lab on a trowel or on a small platform. To keep the block cohesive, each plant remain and its dirt matrix were liberally consolidated with ~10-15% Acrysol in demineralized water; once dry, ~10-15% Acryloid B-72 in acetone or acetone/ethanol mixtures was applied by pipette or by brush in several applications over several days. To enhance penetration of the consolidant, the blocks were covered with polyethylene sheeting between treatments. Additional support in the form of plaster coated gauze was sometimes applied around the blocks' perimeters and undersides. Several of these later exhibited a whitish "bloom", possibly the result of application of a solvent based resin (Acryloid B-72) onto a damp substrate. For storage, most of the plant blocks were placed directly into individual cardboard boxes, or into Ethafoam sink mounts placed in Continental Airlines polystyrene lidded food containers. The following plant remains or impressions were treated as described above: 295-1-621, 295-7-2493A, 295-7-2493B, 295-7-2624, 295-7-2700, 295-7-2701, 295-7-2702, 295-7-2721, 295-7-2738 and 295-7-2740.

Large plant assemblages. The more complex plant assemblages, such as directly preserved intertwined vines, were block-lifted with P. Cackler's assistance, so that they could be further cleaned and treated in the lab under more controlled conditions. Each of the plant assemblages was isolated on a dirt pedestal which was wrapped with plaster coated gauze; the plant remains themselves were covered by tissue or geotextile covered with soft dirt. Once the plaster was dry (usually overnight) the pedestal was lifted by inserting a trowel or metal plate underneath and transferring it onto a board. To stabilize the underside of the block, plaster and cheese cloth were placed in a Saran Wrap-lined moat formed out of plasticine; the block was set into it and the cheese cloth was worked up the block's sides. Because the plaster appeared to inhibit drying by acting as a moisture reservoir, most of the blocks were damp at the time of lab closure. The plant remains were consolidated with ~10-15% Acrysol in demineralized water, applied by pipette until stable, and none was treated with a biocide. They were packaged into cardboard boxes and are stored in the lab at Cerén. Assemblages treated in this manner were: 295-7-2476, which cracked during the treatment, 295-7-2477, 295-7-2493C and 295-7-2621.

Plaster plant casts. Plant voids were cast by the archaeologists, and a number of the approximately 150 casts were excavated with conservation assistance. Many were fragile and in addition, heavy and quite complex in shape, apparently from the breakage and the entanglements of the stalks that occurred from the force of the eruption.

Conservation assisted in removing many of the larger and more fragile casts from the test pits in Operation 7. These were lifted onto cardboard platforms with custom-cut Ethafoam supports to take the weight off the more fragile areas.

Many of the smaller or fragmented plant casts were brought to the lab in plastic artifacts bags, usually damp and dirt covered. These were removed to allow the casts to dry. Cleaning was usually carried out by the archaeologists. Organic remains uncovered during cleaning were consolidated with ~5-10% Acryloid B-72 in acetone applied by brush.

With the assistance of L. Brown and I. Calvin, the casts were packed for longterm storage. The smaller plant casts were kept in their vented plastic artifact bags and placed into standard cardboard grocery cartons; 1/8" Ethafoam sheet was used as a padding material. Larger plant casts were packed into custom-cut Ethafoam sink mounts and placed into cartons modified to fit, using a hotmelt glue gun. Field specimen numbers were written on mounts or on pieces of flagging tape tied onto stalks or other appendages, and the boxes were also well labeled.

Stalk group [295-7-2727]. A particularly fine example of a grouping of several stems or stalks was block-lifted to maintain its integrity, earmarked for possible museum display. Most of the ash had been removed in preparation for photodocumentation, and the plant stalks had been isolated on a dirt pedestal.

Plaster coated gauze strips were applied around the sides to reinforce the pedestal, and when dry, the whole was lifted onto a platform for transfer to the lab. Once in the lab, more dirt was removed from the base of the stalks and from under the plaster support to reveal the cast roots. Leaving some protective dirt in place, these were covered with plaster gauze bandages to keep the root ball together. This seemed key to maintaining the integrity of the plant grouping. As additional support, wads of aluminum foil were stuffed into the hollow around the root ball. The assemblage was placed in a cardboard box with a side opening to allow easy removal. Further treatment will be necessary to fully stabilize the plant cast assemblage.

Wooden artifacts. Two large wooden artifacts, probably architectural components, were found. Both pieces were charred and broken across the grain into several sections, requiring consolidation and careful lifting for their preservation. The main purpose for their treatment was wood identification by project archaeobotanist D. Lentz, and to that end the largest possible pieces were saved.

Beam [295-2-1316]. This artifact, measuring ~120cm long x 14cm diameter, was found perpendicular to some adobe chunks. One set of these had an indentation, probably the impression of a roof beam and possibly made by the associated charred beam. For comparative purposes, an impression of the indentation was made by applying a single layer of damp tissue paper into the cavity and working it into the interstices of the surface with stencil brushes. This was followed by an application of plaster as a thin shell

strengthened with wooden tongue depressors. After drying, the impression was removed; two longitudinal indented marks were notable but no positive match could be found between these and the beam's surface.

The wooden beam was carefully cleaned using soft brushes, wooden sticks and an air-puffer. It was in six major pieces, many of which exhibited cross-grain cracking. Once documented by the archaeologists, the pieces were lifted with the assistance of B. McKee onto a cardboard platform, and then transferred to a long piece of roof gutter filled with TBJ volcanic ash for support during transport to the lab. There, several of the largest pieces were consolidated using ~10% Acrysol in demineralized water applied by pipette over a several week period, until the wood appeared stable. Slow drying to prevent shrinkage was further encouraged by keeping the pieces partially covered during this process. Once apparently dry, the deeply checked areas were further consolidated with 10-15% Acryloid B-72 in acetone applied by pipette. The largest piece (approximately 20cm long) was selected for structural examination and was packaged in an Ethafoam sink mount within a cardboard box. The consolidation enabled the piece of wood to retain its integrity and to be handled; it is hoped that it will be strong enough to section. By contrast, the untreated pieces gradually fell apart and at the end of season crumbled at the slightest touch.

Plank [295-7-2533]. This plank-like piece of wood measured approximately 50cm x 20cm and was slightly curled up on the edges. The wood was very soft and apparently charred throughout, extensive checking had occurred on the upper surface along with some deep cross-grain cracks, and numerous volcanic rocks were embedded in its underside.

The largest pieces were consolidated in situ with ~10% Acrysol in demineralized water applied by pipette; smaller pieces were left untreated. Several applications were given over the course of two days until the wood seemed stable; the plank was covered with tissue during sessions to keep it clean. Once stable, dirt from around the wood was removed with trowels and the wood pieces were lifted onto a cardboard platform with the assistance of P. Sheets. The wood was brought to the lab and the pieces selected for structural analysis received further consolidation until they were stable. The other smaller untreated pieces were used to perform some informal assessments on consolidants for wood; these results are reported below in a separate section.

Mouse remains [295-1-620]. The animal's remains consisted of bones contained within a cavity in the ash. The loose bones were individually lifted using a camel-hair artist's brush moistened with demineralized water. Examination of the cavity using the proctoscope showed that the skull bones were lodged inside the cavity, and these were left in situ. The cavity was cast using dental plaster in a 1:1 ratio of water to plaster. Once the plaster had dried, the cast was lifted in a block of dirt and brought to the lab. Cleaning, carried out by I. Calvin using soft brushes and wooden tools, revealed the head with skull bones, neck, and the proper left shoulder and leg of a small rodent. A break in the nasal bone was mended with ~5-10% Acryloid B-48N in acetone.

Because the dirt block supported the fragile facial bones, and because the mouse cast was only partial, the dirt block was retained for added stability. It was consolidated first with ~10-15% Acrysol in demineralized water by pipette while still damp. To fortify the edges, cotton gauze dipped in ~40% Acrysol in demineralized water was wound around the block's perimeter. When dry, consolidation continued with ~10-15% Acryloid B-72 until the block was cohesive. At all stages, the block was covered with polyethylene sheeting to promote slow drying and penetration of the consolidant.

The individual bones were cleaned and consolidated with ~1.25-2.5% Acrysol in demineralized water using soft brushes. An accordion-style mount was constructed out of acid-free card, which will allow them to be viewed without being handled. The mount was wrapped in a polyethylene bag and placed with the mouse cast in a polystyrene Continental Airlines lidded food container.

B. Treatments of previously excavated material

Animal skeletal material. During the summer of 1995, the deer skull headdress, turtle shell and other bone artifacts were brought from the Cerén Bodega at the MNDG to the site for study. After a year's storage in the site lab, a number of these were adversely affected by the lack of protection from environmental factors. In addition to some adhesive failure in previous joins, evidence of rodent disturbance was found on many of the artifact bags and mounts.

All the bone artifacts were carefully checked, and the loose fragments were readhered with either Acryloid B-72 in acetone for non-load bearing joins, or with Acryloid B-48N in acetone for more structural

joins. The latter is a stronger polymer with a glass transition temperature (Tg) higher than ambient temperatures, and thus less prone to softening in uncontrolled tropical environments. The mounts for many artifacts were improved to withstand more rigorous handling, in anticipation of future moves of the museum's collections. Most were packed for storage in polyethylene ziplock bags or clear polystyrene boxes, with ample foam padding. Artifacts treated include: 295-1-229, 295-2-244, 295-2-276, 295-2-582, 295-2-714, 295-2-728, 295-3-13, 295-8-188, 295-8-448, and 295-8-524/496.

Deer skull headdress [295-8-34]. The failure of the Acryloid B-72 adhesive along several key joins destabilized the deer skull, and the mount, whose components were somewhat shifted, no longer provided adequate support. Several small fragments of bone on the bottom of the box signaled fresh breaks.

The deer skull was stabilized by rejoining segments with ~20% Acryloid B-48N in acetone applied by brush, and a ~10% solution was used to consolidate loosened joins. Where necessary, the friable edges of the bone fragments were first consolidated using ~10% B-72 in acetone/ethanol. Japanese tissue was applied with ~10% B-48N on the interior of the skull in large strips to reinforce joins; this allowed the smaller Japanese tissue and Cerex strips applied in previous seasons to be removed from the skull exterior. Further interior support was provided to hold together the two fragment groups forming the front halves of the skull with the antlers and the back of the head. Cheese cloth coated with 5% B-48 in acetone was applied while still pliable to the interior; the adhesive was activated with acetone, and the backing was tamped into place with a brush. Where necessary, fills made of small wads of Japanese tissue saturated with ~5-10% B-48N were applied, such as on the front of the face and on the nose pieces.

The remaining fragment groups were packaged for storage in custom cut Ethafoam sink mounts and held in place with 1/8" Ethafoam strips secured to the mount with wooden toothpicks. Further treatment will be necessary to reconstruct the skull and to make it presentable for museum display.

Turtle Shell [295-7-138]. The carapace and plastron, largely reconstructed in 1994, experienced minor damage due most likely to failure of the Acryloid B-72 adhesive and an inadequately supportive storage mount; detached fragments were found on the bottom of the box and some of the joins were loose. Several of these loose fragments were readhered with ~20% Acryloid B-48N in acetone; loosened joins were secured with ~5-10% B-48N in acetone using a small paint brush, reinforced where necessary with Japanese tissue strips applied to the undersides. Excess adhesive and consolidant from previous treatments were reduced by blotting with acetone-wetted tissues.

The loose fragments that could not be rejoined to the shell were bagged separately from the other unattached fragments packaged in past years. The mount was improved to enable the shell to withstand rigorous handling. An Ethafoam sink mount with cotton twill "seat belts" was made for the plastron fragment groups, cushioned on top with crumpled tissues tied with cheesecloth. To lessen the weight on the carapace's edges, the interior pillow support was raised onto an Ethafoam block and four Ethafoam blocks, secured by toothpicks to the mount, were placed around the carapace's perimeter as bumpers.

Plant casts. Two plaster plant casts from 1994 [295-6-646 and 295-6-647] were treated for powdery surfaces by consolidating them with ~5-10% Acryloid B-72 applied by brush.

C. Conservation Tests

Informal experiments in two areas were carried out during the 1996 season with practical application to future work.

Plaster modifications. Dental plaster, used in large quantities at Cerén, represents a significant project expense. When mixed conventionally, it produces a hard dense plaster. At Cerén, dental plaster is currently used in a 1:1 water to plaster ratio for making the plant casts. Such a lean plaster mixture is useful because it pours well into the narrow voids created by the decayed plants, but it produces a weak plaster and is prone to powdering under the conditions of on site storage. Tests were carried to investigate whether substitution could be made in the mixture, using TBJ volcanic ash or glass microcell balloon, to yield a product using less plaster yet with greater durability or lighter weight.

Small batches of modified plaster were prepared, based on a total dry volume of 100ml in the proportions listed below. The mixtures were combined in a 1:1 ratio with demineralized water and then poured into 8cm square polystyrene weighing boats to a thickness of ~3cm.

A: 80:20 Plaster:Ash
B: 20:80 Plaster:Ash
C: 50:50 Plaster:Ash
D: 100 Plaster control
E: 80:20 Plaster:Glass Balloons
F: 50:50 Plaster:Glass Balloons

Informal surface scratch and corner break tests showed that mixtures A, C, and E compared favorably with the control (D), but mixtures B and F were very powdery and weak. The test squares were left in the lab and should be reassessed in 1997.

Wood Consolidants. Six untreated pieces of the plank-like artifact [FS 295-7-2533], each ~10cm x 6cm x 2cm, were chosen to test various wood consolidants available on-site. The consolidants were applied by pipette and brush to one half of the wood piece over several days, until the wood seemed stable. The pieces were evaluated 10 days after treatment for their response to handling and break tests. In all cases, the untreated portions and an untreated control piece exhibited checking and crumbled when touched.

· 10% Polyvinyl Butyral (PVB) in ethanol: produced a cohesive surface, but with a white "bloom"; internally weak and powdery. (Toluene, usually combined with ethanol in PVB consolidation solutions, was not available.)

· 10% Acryloid B-72 in 40:60 acetone:ethanol: produced a sound surface, stronger than the PVB, but with a slight sheen; the surface easily spalled from the rest of the wood.

· 10-15% Acrysol in demineralized water: produced a cohesive piece but weaker than the Acrysol/B-72 combination.

· 10% Acrysol in demineralized water, followed by 10-15% Acryloid B-72 in 40:60 acetone:ethanol after drying: produced the strongest of all the pieces, with a sound surface; difficult to break.

From this informal evaluation, it is clear that all the consolidants made a difference in the cohesiveness and strength of the wood, at least on the surface, and at these dilutions the Acrysol/B-72 combination appeared to give the best results.

III. CONSERVATION ACTIVITIES IN THE MUSEO NACIONAL DAVID J. GUZMAN

In previous seasons, conservators spent considerable time addressing the storage issues of the accumulated collection of Cerén material at the Museo Nacional David J. Guzman. Within the last two years, however, much of the building has been torn down in preparation for rebuilding and the Cerén collection has been moved from its previous location, a segregated part of the main storeroom, to a separate locked room. At the beginning of the 1996 season, the conservators carried out an informal condition review and improved the organization of artifacts to utilize the limited space efficiently and facilitate retrieval of objects for study. Artifacts were generally grouped by material and by operation where practical, and protective supports were provided, such as thin foam shelf liners or foam props for reconstructed ceramics. It is anticipated that the collection will face several more moves before the new building is completed and may require further conservation attention in future seasons.

IV. CONSERVATION ACTIVITIES AT THE SITE MUSEUM

During a photography session at the site museum, the plexiglas bonnets from many of the ceramics cases were removed. This provided an opportunity to examine the vessels, and abrasion from poor mounting techniques was noted. Rings of thin Ethafoam sheeting were placed underneath as protection from the rough surfaces of the cases, and some of the nails supporting the vessels were cushioned with Ethafoam.

V. CONSERVATION EDUCATION AND PUBLIC OUTREACH

Conservation training was provided to archaeological team members throughout the season on an informal basis, in the lab or in the field during collaborative recovery of artifacts. Some of the topics covered included: the appropriate choice of tools, cleaning and lifting techniques, properties of plaster, properties of adhesives and consolidants and their role in conservation, the necessity of protective coverings for exposed artifacts awaiting documentation and lifting, and the importance of proper support for fragile artifacts during transport. Conservation issues and activities were also included in coverage of the site for a

future article in Discovery magazine. In a feature for Salvadoran educational television (Channel 10), conservation staff emphasized the importance of prompt on-site treatment followed by storage under stable conditions for Ceren's artifacts.

VI. CONSERVATION PRIORITIES FOR FUTURE SEASONS

A. Collections care

The artifacts conservation laboratory will continue to place a strong emphasis on collections care, specifically addressing the housing and storage issues of the artifact inventory so that these materials will be available over the long term for research and display. These activities require adequate supplies of packing materials for supportive mounts and containers, stable plastic bags and padding, ample shelving to avoid overcrowding, and attention to security measures, including careful registry and control of the artifact inventory. This responsibility is one which should be shared by the project and Museo Nacional personnel.

Of particular concern is the lack of earthquake-proof measures at the site museum and in the Cerén storeroom at the MNDG. Vulnerable artifacts, such as whole and partially reconstructed ceramics, plaster plant casts, and fragile organic artifacts, should be secured and display cases and storage shelves stabilized.

Several of the display techniques in the site museum also present potential problems, such the use of iron nails to prop ceramics, which may be scratched if the case is jolted. Flecks of paint and apparent scratches on some vessel bases were indicative of abrasion from the rough paint of the case decks. While cushioning was provided during the 1996 season for some artifacts, it is recommended that the other vessels and artifacts on display be given similar protection. A new site museum is planned for the future, and conservation input on display cases and mounting schemes would be a timely and beneficial contribution.

B. Conservation Treatment

The laboratory will continue to respond to the conservation needs of newly excavated material, beginning with in situ stabilization and lifting interventions as needed and continuing in the laboratory. Individualized treatments will be carried out to stabilize the artifacts, to support the research interests of project specialists, and to prepare materials for museum display where appropriate. In addition, materials from previous seasons whose treatment was not completed or whose condition should be checked are also included in lab responsibilities. These are listed below.

Materials from the 1996 season.

· Blocklifted remains. Many were still damp when they were packaged, and should be checked for white bloom or evidence of mold growth. Further cleaning and consolidation should be carried out as needed. Topics to investigate in advance include mold control through application of biocides, and consolidation of dirt blocks as permanent supports for fragile artifacts.

· Plaster plant casts.
295-7-2510: this complex cast should be cleaned and housed with a proper mount.
295-7-2727: in preparation for future display, this cast requires further cleaning and articulation, and a mount fabricated to maintain the integrity of the stalks and roots.
296-7-2737: the stalks and roots of this cast require stabilization so that they may be further articulated.

· Wooden Artifacts, 295-2-1316 and 295-7-2533: the stability of the treated pieces for wood identification should be evaluated.

· Structure 10 wall fragment [no FS#]: found in rubble prior to the season, this chunk (measuring approximately 7cm square) is covered in ash and has a matte red pigment on one surface. Consolidation will probably be necessary before cleaning, as the pigment is extremely powdery and fragile. It was wrapped in plastic, packed into a cardboard box and stored on the shelves in the lab at Cerén.

Materials from earlier seasons.

· Plant casts: if time allows, a full survey of the plant casts stored at the site should be carried out and consolidants applied as needed. Since cardboard boxes often deteriorate from moisture absorption, improved housing in more inert materials should also be provided. Because new museum and storage

facilities are in the planning stages, this would be an ideal time to make recommendations for the plant casts' storage conditions and location.

· Deer skull [295-8-34]. The reconstruction of the skull should continue, if time allows, and it should be noted that a significant amount of time will be necessary to make the headdress suitable for display purposes. In addition, a secure mount, which could be used for both display and storage, must be fabricated.

· Baskets.
295-1-234: the priority for D. Lentz of investigating contents should be checked; this will require removing a portion of the base in addition to adherent adobe floor material. A conforming plaster mount should eventually be made for the base, and the basket returned to its original orientation.
295-4-247: this item should be located and its condition checked.

· Ceramics. The priorities should be reviewed with ceramic specialist M. Beaudry-Corbett for ceramics to be reconstructed and those whose prior improper reconstruction should be redone.

C. Conservation Research

Paint and pigment materials analysis. Artifacts which show evidence of painting or contain colorant materials have been excavated since 1989 and provide a unique opportunity to study pigments available at Cerén. The technical analysis of these materials continues to be carried out at the Conservation Analytical Laboratory.

Plaster modifications. The powdery condition of plant casts may be due to the lean plaster mixture, damp storage conditions, causing partial reaction of the plaster before mixing, as well as the high humidity and elevated temperatures during curing. The strength and water resistance of the plaster may be improved through addition of a consolidant, such as an acrylic or a polyvinyl alcohol or acetate, to the plaster mixture; addition of fillers such as glass microcell balloons or TBJ volcanic ash; or consolidation of the finished plaster casts. Further investigation into methods for producing a resilient plaster, particularly if there is a potential for cost savings, is encouraged.

Wood consolidants. Further investigation into consolidants for charred wood is recommended, and evaluation of treated samples at CAL through sectioning and microscopy should be considered.

D. Conservation Training

With the ongoing development of the laboratory's capabilities, it is expected to continue as a training resource both for conservators from CAL's archaeological conservation internship program, for participating archaeologists and Salvadoran colleagues.

NOTES

Principal conservation materials utilized in treatments

Acryloid B-72 (Rohm & Haas): copolymer of ethylmethacrylate and methylacrylate, dissolved in acetone for consolidation and adhesion; reversible in acetone

Acryloid B-48N (Rohm & Haas): copolymer of methylmethacrylate and butyl acrylate, dissolved in toluene and acetone for adhesion; reversible in acetone

Acrysol WS-24 (Rohm & Haas): an acrylic colloidal dispersion in water; diluted with demineralized water; used for consolidation

Polyvinyl Butyral (unknown source): terpolymer of vinyl acetal, vinyl alcohol, and vinyl acetate monomers, soluble in alcohol, used as a consolidant

Cerex tissue: spunbonded nylon tissue, used for backing

Cheese cloth: open weave cotton fabric

Cotton gauze: open weave cotton fabric

Dental plaster: fine calcium sulfate plus proprietary additives

Ethafoam: polyethylene foam in plank or sheet form
Japanese tissue: fine cellulosic (primarily mulberry) paper, used for backing
Kay-Dry tissues: cellulosic paper laboratory tissues

Records

Conservation Logbooks have been maintained for the 1989, 1990-1, 1992, 1993 and 1996 field seasons, and the 1994 study season at Cerén. The originals are kept on site, with photocopies on file at the Conservation Analytical Laboratory, Smithsonian Institution. Detailed conservation laboratory reports and analytical data are on file at CAL (under CAL#s 5168, 5507 and 5542), with duplicates at the Department of Anthropology, University of Colorado, at CONCULTURA, Department of Education, El Salvador, and on site. Conservation reports have also been included as chapters in the annual site reports issued by the University of Colorado.

CHAPTER 6
ARTIFACT CONSERVATION DURING THE 1994 STUDY SEASON

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I. INTRODUCTION

The Cerén Project is a participating project in the archaeological conservation internship program, administered by the Smithsonian Institution's Conservation Analytical Laboratory (CAL) and supported in part by the Samuel H. Kress Foundation. The internships combine a variety of conservation experiences on-site with analytical opportunities at CAL. Through the program, the 1994 study season at Cerén was the third season of full-time participation of conservators specializing in archaeological materials. Additional support in 1994 was provided by the Smithsonian's Research Opportunity Fund.

Conservation activities were carried out between 5 July and 2 August by Emily Kaplan, recipient of CAL's 1994 postgraduate fellowship, and Harriet F. Beaubien, CAL Objects Conservator and program coordinator. Because a full excavation season was not scheduled for 1994, Kaplan and Beaubien were able to focus their efforts on improvement of the condition of artifacts excavated in previous seasons, housed in the Cerén storeroom of the Museo Nacional David J. Guzman (MNDG). Work included a general inventory, re-organization and condition review of objects in storage; the mounting and rehousing of selected materials; and treatment of selected high priority materials. At the end of the season, laboratory supplies were fully inventoried, repacked and stored in the field laboratory.

These conservation activities provided opportunities for training two project-affiliated colleagues. Their participation is included in the description of the season's work which follows.

II. CONSERVATION ACTIVITIES

A. Training

Kaplan took primary responsibility for training José-Santos Lopez, a staff member in the MNDG's Taller de Restauracion, and Valerie Connor, a long-time Cerén Project volunteer. Lopez and Connor contributed greatly to the productivity of the season. Lopez spent up to five full days per week working with the conservators; Connor worked with the conservators three mornings per week. Storage projects and artifact treatments provided ample opportunity to discuss conservation issues and techniques for longterm preservation. These included: monitoring condition of stored artifacts, properties of conservation materials, combined use of these with locally available and affordable materials, and the importance of providing physical stability such as mounts for longterm preservation.

B. Storage projects

A review was conducted of all reconstructed vessels stored in the Cerén bodega and of those exhibited in the Cerén site museum. The Project Field Specimen (FS) list and the conservation records were used for reference, and location information was verified. In the process, shelf unit labels and flagging tape labels were updated (part of a system to track artifacts removed from the storeroom).

Many of the small finds, stored in degrading materials (such as cardboard and polystyrene boxes, cotton wool, and plastic bags) were rehoused. Specifically, bone, jade, small ceramic, and organic artifacts from Operations 1, 2, 5, and 7 were sorted by material and operation, then rehoused using zip-lock bags, polyethylene foam mounts, and acid-free tissue in polystyrene boxes. Lithic artifacts from Operations 2, 5, 7, and 8 were sorted and rehoused with inventory labels.

The conservators constructed 20 new support mounts for previously reconstructed vessels and a figurine. Many of these were ring mounts, made of polyethylene foam, similar in principle to the "yaguals" (rings made of straw), used locally since prehistoric times to support vessels.
Ring mounts for vessels: 295-1-32, 295-1-35, 295-1-37, 295-1-61, 295-1-65, 295-1-93, 295-1-96, 295-1-254, 295-2-246, 295-2-271, 295-5-11, 295-7-123, 295-8-86, 295-8-138, 295-8-145 and 295-8-479.
Base with 4 buttresses for large jars: 295-1-67 and 295-1-74.
Mount with twill tape: 295-2-66 (incensario) and 295-2-448+ (figurine).

C. Conservation Treatments

Objects were selected for treatment based upon their research importance and conservation priority; several were also appropriate for practical training.

Turtle Shell [295-7-138]

This tortoise or turtle shell (species not identified) was excavated from a test pit for the protective roof foundations by A. Gerstle in 1992. The object consists of an entire carapace and plastron; no bones are evident. The curvature of the shell suggests that the animal was terrestrial rather than aquatic. The Preliminary Report from that year notes that the shell probably fell from the southwest roof or walls of structure 13, which is thought to be a civic building.

The turtle shell was in hundreds of brittle, fragile pieces stored on a makeshift support of cotton wool and toilet paper in a cardboard box in the Cerén bodega. The pieces were arranged in groups, perhaps corresponding to their position prior to excavation. The fragments were covered with a layer of ash, heavier on the side of the fragments corresponding to the outer/top surface of the shell. The other side of the fragments had retained traces of what appeared to be the remains of other organic material, presumably turtle body parts. Examination during conservation treatment revealed some traces of possible red paint or pigment and some lines which may have been incised.

The fragments were cleaned by removing ash and soil with soft brushes, puffed air, and cotton swabs dampened slightly with a solution of 1:1 ethanol:demineralized water as needed. The fragments were then consolidated with a 3-5% solution of Acryloid B-72 in acetone, applied by brush and pipette. Reassembly was accomplished using a 30% B-72 solution in acetone applied by brush to the break edges. Some joins were strengthened by tiny "bandages" of thin Japanese tissue applied with B-72. A storage mount was constructed of polyethylene foam, acid free tissue, and cotton twill tape, with supports of cotton jersey stuffed with polyester batting. Those pieces remaining to be joined were stored in ziplock bags labeled as to presumed location on the object. The work was done by Kaplan (35 hours), Lopez (12 hours) and Connor (12 hours).

The turtle shell provided an opportunity to discuss the degradation and preservation of organic materials and to demonstrate the principles and techniques of cleaning, consolidating, and joining extreme fragile organic objects.

Deer Skull [295-8-34]

This skull was excavated from Structure 10 in 1992 and is thought to be a headdress or mask used for ritual purposes. There are traces of what may be red paint or pigment on the lacrimal bones, and the remains of a carbonized piece of string [295-8-42] on the base of one antler. The skull was in hundreds of pieces, some badly burnt. In particular, the proper right side of the skull was burnt and more fragile than other areas. According to the 1992 Preliminary Report (p.48), the skull "had fallen into the north half of the room near the north door jamb of the dividing wall. It was directly on top of Unit 1 ash with impressions of tabanco poles, and was covered with fragments of clay from the dividing wall and thatch and wood from the roof. Apparently it was resting on the tabanco and came down with it."

In 1992, a portion of the object was consolidated in situ with a dilute solution of Acrysol WS-24 by M. Fenn. After lifting and drying, the bone surfaces were cleaned of ash and dirt with a soft brush, bamboo skewers, and acetone-dampened cotton swabs. Those fragments not consolidated with Acrysol WS-24 were consolidated with dilute Acryloid B-72 in acetone. Fragments were joined with B-72 adhesive. The fragments and some ash were stored in a compartmentalized box with the fragments grouped by general location; another box contained bone bits and surrounding soil/ash matrix collected after lifting. The string clinging to the base of the right antler was consolidated and adhered in place with B-72. In 1993 more pieces were joined by H. Lundberg using Acryloid B-72. Anatomical drawings of skulls were used as guides. Parts of the surface were cleaned with ethanol as needed. The reconstructed antlers were housed in a box with polyethylene foam as support. The rest of the fragments remained in boxes grouped according to general locations.

In 1994 the remaining fragments were cleaned of ash and soil with soft brushes, cotton swabs and ethanol, then consolidated with a dilute solution of Acryloid B-72 in acetone applied by brush. Using a complete deer skull borrowed by P. Sheets from the Denver Museum of Natural History as a model, a large

portion of the remaining fragments were adhered using B-72 in acetone and small strips of Cerex spunbonded nylon as needed for structural stability.

The following portions have been reconstructed: 95% of both antlers; the entire top of the head from the occipital through both frontal, nasal, and premaxilla bones; most of the proper left side including the maxilla, lacrimal and zygomatic bones. The sphenoid, foramen magnum and occipital condyle bones are nearly complete.

A storage mount was constructed of polyethylene foam, polyester batting, cotton jersey and cotton twill tape. The object could be exhibited as it is now with the reassembled portions displayed prominently. Those fragments remaining to be joined were sorted and labeled according to their location and stored in ziplock bags with the reconstructed skull. Samples of the red paint or pigment were taken for analysis at CAL. Work was done by Kaplan (50 hours).

Jar [295-4-263]
Vessel [295-8-583/8-613]

These vessels were partially assembled using a concentrated solution of Acryloid B-72 in acetone as an adhesive. The edges of the sherds were first consolidated with a dilute solution of B-72 in acetone. Work was done by Lopez (15 hours) and Connor (15 hours) under Beaubien and Kaplan's supervision.

Selected from those designated as priorities for study by M. Beaudry-Corbett, these vessels served as excellent examples of some of the challenges encountered in the reassembly of archaeological ceramics including significant stress fractures and missing parts. Using these artifacts as practical examples, the conservators demonstrated the preparation of adhesives, joining strategies and methods, and handling and storage of reconstructed vessels.

Vessel with Organic Remains [295-5-53]

This Guazapa:Miltitlan jar was excavated by M. Beaudry-Corbett from the northwest part of the north room of Structure 12 in 1993. The remains of a woven organic object, similar to a mat in texture, were found lying on a thick layer of ash on three of the sherds. Preliminary removal of ash and consolidation of the woven material with a dilute solution of Acryloid B-72 in acetone was carried out in 1993 by H. Lundberg. In 1994 the remainder of ash obscuring the organic material was removed with ethanol, soft brushes, and wooden picks. The organic material was consolidated with a dilute solution of B-72 in acetone applied by brush and pipette. Samples were taken of the organic material before consolidation for analysis at CAL. The work was done by Kaplan (10 hours).

Paint Patch [295-2-205]
This object, treated in part by Kaplan, was part of the study of painted gourds, described in the section below.

III. RESEARCH ON PAINTED GOURDS

Since 1989, excavations at Cerén have yielded a number of unusual artifacts which were decorated with paint. Because the substrates were organic materials which decomposed with burial, the only evidence recovered was of the decorative paint layers. These were often highly fragmented, very fragile and thus, difficult to remove safely. With few exceptions, interpreting the remains has also been difficult. Because of the time pressures of a normal excavation season, many of these items have not been studied carefully or received conservation treatment which would allow us to understand and appreciate them better. This research was Beaubien's primary focus during the study season, and included investigative treatment, documentation and sampling for analysis of these painted objects.

A. Samples and Procedure

The materials included in this study were 8 artifacts plus 3 associated fragment groups whose paint layers retained much of the original form of the objects; 5 partial paint layers plus 3 associated fragment groups representing segments of the original objects; and 4 groups of disassociated paint fragments. For a better understanding of materials used as paints, 21 items which appear to be pigment materials were also examined. These items are listed in the appendix.

For each artifact, information about the organic material to which the paint was applied, its original form and its original decorative scheme was sought. In order to investigate these features, conservation intervention was sometimes necessary, and consisted of either minor or major treatments. Minor treatments included surface consolidation to stabilize existing paint layers, and joining of paint fragments to form larger pieces for study. The materials used for this were methylcellulose in water and Acryloid B-72 in acetone. Major treatments were carried out on paired paint layers, where one or both layers were previously not investigated. Steps included cleaning, documenting and facing one paint layer, using ethanol and Japanese tissue with methylcellulose; casting a support mount in plaster with a barrier of aluminum foil; inverting the object and exposing the other paint layer, cleaning and consolidating it (as above) for further study.

All activities were recorded in the Laboratory Record Book. Items were photographed, using color slide and black/white film. Scale drawings were made of items retaining their original form, partial paint layers and larger fragment groups.

Pigments and grounds were sampled for analysis from the discrete paint layers of each artifact. Raw pigment materials found stored in various containers in several of the structures were also sampled as comparisons.

B. Preliminary results

The work carried out during the study season supports the identification of these as the remains of painted gourds, the features of which are summarized.

Paint layer characteristics. Each layer of paint, whether preserved as a cohesive layer or in fragments, has two components, a ground or preparation layer well bonded with a pigmented layer. These layers once covered an organic substrate. Although now completely decomposed, its presence at the time of burial is indicated by several features. The most obvious of these is the survival of the fragile paint layers in bowl-like configurations (7 examples), which indicate their attachment to a structurally supportive substrate. Of the 13 examples of partial or relatively complete paint layers, 9 are actually paired layers found with their ground surfaces touching, suggesting application to both sides of the organic substrate. In all of these examples, the texture of the ground surface is found to be smooth on one of the layers and fibrous or pebbly on the other. From the artifacts which retain their original bowl shape it is clear that the smooth surface characterizes the outside paint layer and the textured surface characterizes the inside paint layer. This suggests an organic substrate with a smooth exterior and a fibrous or micro-pitted interior. This characteristic, together with the form and size of the artifacts retaining their original configuration, support the identification of the organic material which these layers once decorated as a gourd (calabash).

Using the examples of paint layers still retaining the configuration of the original artifact, the texture of the ground surface was found to correlate consistently with features of the paint scheme for both inside and outside paint layers. In these examples, the interior layer was monochromatic (with a textured ground surface) and the exterior was polychromatic (with a smooth ground surface). When tested on the partial paint layers of unknown original configuration, this correlation was also found to hold consistently, allowing an attribution of these layers to an inside or outside location.

Decorative approaches. While there are a number of variations in the specific decorative schemes, two basic approaches can be identified, each with its own set of characteristic features beginning with the color of the ground or preparation layer used.

· **Group 1**. All but two of the items studied were painted using a white ground; of these, 5 bowls and 3 patches provide additional information about decoration. On the exterior, the decorative scheme is characterized by registers. Extant rims (6) are accentuated with a red band. The remainder of the form has a green or blue-green field color. On three of the 5 bowls, the base has been painted red, leaving the green as a discrete register; two of these are further decorated with a repeated geometric motif in the green register. On the two bowls with a continuous background color (i.e. without a red base), the repeat motifs suggest registers but without specific demarcations. In one of these, the motifs occur in the zone just below the rim band. The other, once thought to be a "codex," shows the most complex use of registers: it has a repeated figural motif in a broad red register extending to the rim; in the green field below, a geometric repeat motif articulates an intermediate zone, and the base zone is ornamented with a radiating set of motifs.

In this general group, decorative motifs occur on 4 of the 5 bowls and all 3 patches; red (7) and yellow (6) are used for these, with a broader palette appearing on the most complex bowl, including blue, brown, black, white and many pastel hues.

On the interiors which are accessible to study, three of the bowls are painted green, with a narrow lip of red at the rim. One bowl and 3 patches are painted solid red on the interior. This bowl is the one with a repeat motif on a continuous green ground; all the patches (collected near each other) may come from an equivalent position on a similar bowl.

· **Group 2.** The two bowls in this group are painted using a pink ground, and are decorated in a manner unlike the group 1 artifacts. The interiors appear pink and it is not clear at this time whether there is a separate pigmented layer on top of the ground. On the outside, the surface is painted red and ornamented with large elements painted in yellow, brown and white. These decorative elements, while incompletely preserved on both bowls, do not exhibit the same register-like placement nor repeat regularly around the surface. Instead, the bars and coiled shapes arch asymmetrically across the base and near the rim.

The research results clearly show that the paint layers, however fragmentary, retain a great deal of information about the artifacts they once comprised. Taken together, they also provide a great deal of information about a type of artifact that is virtually unknown in the archaeological record. These painted gourds will be the subject of a future publication which will present the details of the analyses, including drawings and photographs. The artifacts will be discussed within their archaeological context, and comparison will be drawn to Cerén's ceramic tradition, whose thorough analysis by Beaudry-Corbett should provide some useful approaches in understanding these unique artifacts.

Principal conservation materials utilized in treatments

Acryloid B-72 (Rohm & Haas): copolymer of ethylmethacrylate and methylacrylate, dissolved in acetone for consolidation and adhesion; reversible in acetone
Methocel A4C methylcellulose (Dow): a cellulose ether, gelled in water, used for temporary adhesion; reversible in water
Cerex tissue: spunbonded nylon tissue, used for backing
Japanese tissue: tengujo mulberry paper, used for backing

Records

Conservation Logbooks have been maintained for the 1989, 1990-1, 1992, 1993 and 1994 seasons at Cerén. The originals are kept on site, with photocopies at the Conservation Analytical Laboratory, Smithsonian Institution. Detailed conservation laboratory reports, as well as CAL treatment documentation and analytical data connected with the painted "morro" [FS 2-51], are on file at CAL. Duplicates are kept at the Department of Anthropology, University of Colorado, at CONCULTURA, Ministry of Education, El Salvador, and on site. Conservation reports have also been included as chapters in the annual site reports issued by the University of Colorado.

APPENDIX: **Items included in the painted gourd study**
(* indicates work previously carried out at CAL)

Paint Layers retaining original form

295-1-237	Str.11	bowl	Photo, drawing
295-1-247	Str.11	bowl	Photo, drawing
295-1-310	Str.11	bowl	Photo, drawing, sample
295-2-51*	Str.2	bowl	Work completed at CAL;
with 2-45		+frags	major treatment et al.

APPENDIX: **Items included in the painted gourd study (continued)**
(* indicates work previously carried out at CAL)

Paint Layers retaining original form

295-4-273	Str.4	lid	Photo, drawing, sample	
with 4-274		+frags		
295-5-49	Str.12	bowl	Major treatment, photo, drawing, sample	
295-8-160	Str.10	bowl	Major treatment, photo, drawing, sample	
with 8-18		+frags	Minor treatment	
295-8-520	Str.10	bowl	Major treatment, photo, drawing, sample	
Partial Paint Layers				
295-2-204	Str.7	patch	Sample	
295-2-205	Str.7	patch	Major treatment, photo, drawing, sample	
295-2-248	Str.7	patch	Minor treatment, photo, drawing, sample	
with 2-252		+frags	Minor treatment	
295-4-317	Str.4	patch +frags	Minor treatment, photo, drawing, sample	with 2-318
295-5-35	Str.12	patch	Photo, sample	
Disassociated Paint Fragments				
295-2-136	Str.7	frags	Minor treatment, sample	
295-2-137	Str.7	frags	Minor treatment, photo, sample	
295-2-211	Str.7	frags	Sample	
295-2-590	Str.9	frags	Minor treatment, photo, sample	

Pigment Materials

295-1-40	Str.11	hematite cylinder	Sample
295-1-41	Str.11	hematite cylinder	Sample
295-1-65/68*	Str.1/6	pigment inside pot	Sample
295-1-142	Str.11	hematite and mica	Sample
295-1-158	Str.11	hematite cylinder	Sample
295-1-228	Str.11	hematite cylinder	Sample
295-1-275	Str.11	hematite and mica	Sample
295-2-213*	Str.7	pigment inside pot	Sample
295-2-214*	Str.7	pigment inside pot	Sample
295-2-215*	Str.7	pigment inside pot	Sample
295-2-221	Str.7	mineral sample	Sample
295-2-222*	Str.7	pigment inside pot	Sample
295-2-230*	Str.7	pigment inside pot	Sample
295-2-234	Str.7	pigment cylinder	Sample
295-2-301	Str.7	hematite cylinder	Sample
295-2-322	Str.7	hematite cylinder	Sample
295-2-329	Str.7	hematite cylinder	Sample
295-4-214	Str.4	hematite cylinder	Sample
295-5-18	Str.12	pigment inside pot	Sample
295-5-23	Str.12	red wall paint	Sample
295-5-47	Str.12	mineral sample	Sample

CHAPTER 7
HOUSEHOLD AND VILLAGE ANIMAL USE AT THE CERÉN SITE

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Introduction

In this chapter I examine household and village animal use at the Cerén site. This research was conducting during the summer of 1995 and included the analysis of the bone, antler, turtle shell, and marine shell artifacts (recovered from cultural contexts) in the Cerén artifact assemblage. The concept of "animal use" is explored from a broad perspective, one which incorporates economic and symbolic components, ethnohistoric accounts, and ethnographic analogies.

Methods

Identification

During the months of June and July 1995, all bone, shell, antler, and turtle shell artifacts were transported from the Museo Nacional to the site laboratory at Cerén for identification and analysis. Initial analysis was conducted at the on-site laboratory on Joya de Cerén, El Salvador. Preliminary field identifications were assigned using a number of osteological books and keyed illustrations (Bass 1987; Driesch 1976; Gilbert 1993; Hillson 1986; Keen 1971; Kent 1992; Olsen 1964, 1968, 1982, 1985; Schid 1972). Salvadoran law prohibits the export of artifacts outside of the country. Thus, one of the primary data collection objectives was the documentation, in scaled photographs and illustrations, of all artifacts containing diagnostic morphology. This allowed for additional taxonomic identification and verification in the United States with aid of comparative faunal collections.

All bone, antler, turtle shell, and marine shell artifacts were identified to the closest possible taxon. In some cases, extensively worked artifacts lacked any diagnostic morphology and were identified only to the level of family, order, or class. Likewise, extremely fragmented or deteriorated bone or shell were often assignable only to their broader taxon.

Animal Size. An attempt was made to assess the relative size of the animal in all specimens lacking enough diagnostic morphology for identification to a specific species or genus. Three categories of size were used (Hamblin 1983):

Small:	Opossums, rabbits, rodents, bats, and small birds.
Medium:	Dog, skunk, large rabbits, fox, raccoon, coatimundis, porcupine, paca, and medium sized birds such as parrots.
Large:	White-tail deer, brocket deer, peccaries, jaguar, large birds including eagles, owls and vultures.

Skeletal Element. The specific skeletal element (such as scapula, tibia, etc.) was recorded for all intact and fragmented elements where possible. However, some skeletal elements were not identifiable due to the extreme fragmentation or deterioration. In these cases, five categories if bone type were utilized modeled after Kent (1993:3) and are defined as the following:

Long bones:	Humeri, radii, ulnae, femurs, tibias, fibulae.
Flat bones:	Scapulae, ribs, cranial portions, mandibles.
Irregular bones:	Phalanxes, metapodia, vertebral parts, carpals, tarsals, and hyoid.
Teeth:	Crowns, roots, and fragments of enamel.
Scrap:	Any bone fragment not recognizable as belonging to the above categories.

Minimum-Number Calculations

Several methods exist for comparing numbers of animal remains from archaeological sites. The two main methods are 1) the number of identified specimens (NISP) and 2) the minimum number of individuals (MNI). Due to the small size of the Cerén faunal sample, both techniques (NISP and MNI) are used for minimum number calculations.

The number of identified specimens preserved (NISP) consists of acquiring a count of the total number of bones, in any given collection, which are identifiable to a particular species. The minimum number of individuals (MNI) consists of calculating the minimum number if individuals, in a given species, that are necessary to account for the number of identifiable bones recovered from a site. MNI counts can be calculated according to two methods; the minimal and maximal method. The minimal method consists of calculating minimal number totals for an entire faunal assemblage as a whole. The maximal method consists of calculating numbers, first, for each structure and then totaling all of these results.

For this project, both minimal and maximal MNI counts were calculated. However, the maximal method was slightly adjusted to better reflect the context of domestic structures at the Cerén site. Households, rather than individuals structures, were used as the primary units for calculating the maximal method. Additionally, extramural activity areas between structures and patios were including in this count.

Results

NISP

A total of 103 turtle shell, marine shell, antler, and bone remains were recovered from cultural contexts at Cerén (Appendix A). Of these, 79 vertebrates and 24 marine shells were recorded. Vertebrate remains included domesticated dog, white-tailed deer, peccary, mud turtle, duck, rodent, artiodactyla (deer or peccary), human, and various unclassifiable bird and mammal specimens. The total number of individual specimens are listed below (Table 6.1). Sixty-two percent of the faunal assemblage was too culturally modified, or fragmented, to allow for identification to the level of genus or species. Therefore, these specimens were assigned to broad taxonomic categories (large, or medium mammals).

Table 6.1 Total Number of Individual Specimens Preserved (NISP) for Vertebrates at the Cerén Site, El Salvador (including unidentified mammal remains).

Taxon	Count	Percent
Anatidae (Duck)*	1	1
Artiodactyla (Deer or Peccary)	3	4
Aves (Birds)	6	8
Canis familiaris (Domesticated Dog)	4	5
Kinosternon sp. (Mud Turtle)	1	1
Mammal (medium-sized)	11	14
Mammal (large-sized)	28	35
Mammal (unknown size)	10	13
Odocoileus virginianus (White-tailed Deer)	9	11
Rodentia	2	3
Tayassu sp. (Peccary)	2	3
Unidentified Scrap Bone	1	1
Total vertebrates	**79**	

* Complete articulated skeleton

To get a better idea of the distribution of the various taxa identifiable beyond the mammalian class, the large, medium and unknown sized mammal taxa were removed. Percentages were, then, recalculated (Table 6.2).

Table 6.2 Total Number of Bones (NISP) at the Cerén Site, El Salvador (unidentified medium and large mammal remains removed).

Taxon	Count	Percent
Artiodactlyla (Deer or Peccary)	3	10
Anatidae (Duck)*	1	7
Aves (Birds)	6	20.5
Canis familiaris (Domesticated Dog)	4	14
Kinosternon sp. (Mud Turtle)	1	3.5
Odocoileus virginianus (White-tailed Deer)	9	31
Rodentia (Large Rodent)	2	7
Tayassu sp. (Peccary)	2	7
Total	**29**	

* Complete articulated skeleton

MNI

A minimum number of 11 animals are represented in the Cerén vertebrate assemblage. Of these, nine are mammals, 1 is an amphibian and one is a bird (Table 6.3). The overwhelming majority of the faunal remains are mammals. Mammals constitute 83 percent of the faunal assemblage (minimal method) representing nine individuals. Various species present include white-tailed deer (*Odocoileus virginianus*), peccary (*Tayassu* sp.), dog (*Canis familiaris*), and a large rodent. The remaining 11 percent of the vertebrate fauna consist of a duck (Anatidae) and a mud turtle (*Kinosternon* sp.).

Table 6.3 Vertebrate Minimum Number of Individual (MNI) at the Cerén site.

	Maximal Method		Minimal Method	
Species	MNI	%	MNI	%
Anatidae (Duck)	1	6	1	6
Canis familiaris (Domesticated Dog)	3	19	1	9
Kinosternon sp. (Mud Turtle)	1	6	1	6
Odocoileus virginianus (White-tailed Deer)	8	50	6	55
Rodentia (Large Rodent)	2	13	1	9
Tayassu sp. (Peccary)	1	6	1	6
Total Vertebrates	**16**		**11**	

Marine Shell

A total number of 24 marine shell artifacts were recovered at the Cerén site (Table 6.4). A minimum of three different shell types are present including a cowry shell (*Cyraea cervinetta*), oliva shells (*Oliva spicata* and *Oliva* sp.) and spondylus shell (*Spondylus calcifer* and *Spondylus* sp.). Shell that was highly modified or in advanced stage of disintegration was only identifiable as bivalve or gastropod. Forty-six percent of the Cerén marine shell was only identifiable to these general levels.

Table 6.4 Identification and Total Number of Marine Shells Recovered from the Cerén Site.

Taxon	Count	Percent
Unidientified Bivalve	9	38
Cypraea cervinetta	1	4
Unidentified Gastropod	2	8
Oliva spicata	5	21
Oliva sp.	1	4
Spondylus calcifer	1	4
Spondylus sp.	5	21
Total Marine Shells	**24**	

Discussion

White-tailed Deer

The most abundant species present at Cerén is white-tailed deer. As at other Mesoamerican sites, the inhabitants of Cerén appeared to have a had a strong preference for deer. According to minimal and maximal methods of MNI counts, the white-tailed deer constituted an overwhelming majority of bones identifiable to the level of genus or species. A minimum of 6 individuals – representing 55 % of the total vertebrate assemblage – were white-tailed deer (minimal method). Calculations according to the maximal method revealed a minimum of 8 individuals – representing 50% of the total vertebrate assemblage. Undoubtedly, some fragmentary specimens and highly modified bone artifacts only identifiable to the taxonomic level of artiodactyla (deer or peccary), and the category large mammal, include additional members of white-tailed deer.

White-tailed deer is the most frequent mammal recovered from many Maya site (Hamblin 1984:138). In fact, white-tailed deer was the most common species recorded at Seibal (Olsen 1978), Zacaleu (Woodbury and Trik 1953), Mayapan (Pollock and Ray 1957), Altar de Sacrificios (Olsen 1972), and Copan (M. Pohl 1995), among others. White-tailed deer populations tend to increase with intensive agriculture, specifically, with the clearing of tropical forests which provides a maximum of forest edge environment and open brushy vegetation which is good for browsing. Therefore, the occurrence of deer at Cerén – an agricultural village – is not surprising. However, the high percentage (50-55%) is unusual.

The elevated Cerén white-tailed deer count is evident when MNI percentages are compared with other Mesoamerican sites. Excavations in the Copan residential zone have produced one the highest MNI percentages of white-tailed deer from published Mesoamerican sites. M. Pohl (1995:446) reported that white-tailed deer composed 36 percent of Coner phase and 29 percent of all Late Classic contexts (both calculated according to minimal method) at Copan.

Another unusual aspect of the white-tailed deer remains at Cerén is the high number if immature individuals. A total of 25 percent (minimal method) to 33 percent (maximal method) of white-tailed deer were not fully mature. The high percentages of white-tailed deer at Cerén may be the inadvertent result of the small sample size. However, various cultural phenomena could account for the high number of deer at Cerén. Cerén residents may have practiced some form of deer management.

One of the deer procurement strategies the Cerén villagers may have utilized is "garden hunting" (Linares 1976). Garden hunting consists of allowing deer to browse in cultivated fields and household gardens where they can be hunted. While some vegetation is lost to browsing, the benefits include easy access to deer when needed.

The ethnohistoric data make many references to the Maya partially taming white-tailed deer. Specifically, historical sources note that it was women who were responsible for taking in, semi-taming, and raising deer. Landa mentioned that women:

> raise other domestic animals and let the deer suck their breasts, by which means they raise them and make them so tame that they never will go into the woods, although they take them and carry them through the woods and raise them there.
>
> Diego de Landa (in Tozzer 1941:127)

Apparently, during historic times, there was a designated place in the woods where women would take deer to browse until they needed them. Ximenez also noted that women semi-tamed deer in the Maya highlands (1967:57). The Motul Dictionary for Spanish-Maya language has an entry "ah may as venadillo pequeno criado en casa" – a little deer raised in the house.

Scholars have argued that Precolumbian women may have raised deer, dogs, peccary, and fowl much like contemporary Maya women raise pigs and fowl for food, trade, and special occasion feasts (M. Pohl and Feldman 1982; M. Pohl 1995). Perhaps the Cerén women raised dog, fowl (a duck was tethered inside the Household 1 bodega), and semi-tamed deer as a contribution to the domestic and ceremonial economy.

Dogs

Dogs are numerically the second most important species (MNI) noted at Cerén. One to three adult dogs, representing 9 (minimal method) to 19 (maximal method) percent of the MNI, were present. All dogs are represented by teeth. A canine tooth, presumably a pendant, had been drilled through the root. An unmodified carnassial tooth was recovered from an elevated context in the Household 2 bodega, perhaps for later perforation. Another unmodified carnassial tooth was recovered from the midden. The fourth dog tooth, an upper premolar, was recovered from the ground close to Household 1.

The Household 1 area, located close to Structure 10, yielded dog, deer, artiodactyla (deer or peccary), and mammal remains. Blood residue analysis conducted on obsidian blades discarded in the vicinity of Household 1 tested positive for Canid antiserum (Newman 1993:184). Two obsidian blades from Household 1 (one from the bodega and one from the kitchen) tested positive to deer antiserum (Newman 1993:183). While a sample of obsidian blades from all contexts were tested for organic residue, thus far Household 1 is the only household to test positive for any type of animal protein. The area around Household 1 yielded a dog tooth as well as discarded bones which, due to the degree of fragmentation, could only be classified as medium-sized mammal. It is possible that some of these bones are dog.

Perforated dog teeth have been found in many Maya sites and seemed to have a special meaning for Precolumbian people. Perforated dog canine teeth have been recovered from Mayapan (Pollock and Ray 1957), Altar de Sacrificios (Olsen 1972), Cerros (Garber 1989), Copan (M. Pohl 1995), among other sites. Large quantities of dog teeth were recovered from the Late Classic site of Actun Polbilche, a cave that may have been used in ceremonies for rain.

Household 1, the Ceremonial Complex, and Animal Use

There is growing evidence that Household 1 may have been involved in a service relationship supporting village ceremonialism (Brown 1996; Sheets 1992; Simmons 1996). Household members may have provided medicinal plants and flowers for ceremonial activities. Additionally, Household 1 members may have provided maize-based food and drink for public feasting (Simmons 1996). Five metates recovered from the household, four of which were in use-contexts, suggest that Household 1 was involved in the large-scale production of maize-based goods (Sheets 1992).

Interestingly, analysis of the faunal material may support an additional connection between Household 1 and the ceremonial complex. Household 1 may have been involved in processing and/or providing animals for public feasts. As mentioned above, the presence of deer and dog skeletal remains and blood residue on obsidian blades in Household 1 suggest that dog and deer were processed here. Ethnohistoric data report that deer and dog were common sacrificial animals and were often consumed in the context of public feasts (Landa in Tozzer 1941; Palacio in Tozzer and Allen 1910)

An examination of both the numbers and types of animal remains (unmodified deer, dog, artiodactyla [deer or peccary], medium and large-sized mammals) recovered from Household 1 are revealing. While not all household have been excavated to the same point, preliminary analysis reveals that Household 1 has a disproportionately high number of unmodified mammal remains recovered from household contexts. A high percentage of unmodified animal remains can indicate and area where animals were butchered and processed.

The high percentage of unmodified mammal remains recovered in Household 1 raises some interesting questions. Ethnohistoric records correlate the consumption of meat, especially large mammal meat, with social status. Diego de Landa (Tozzer 1941) reported that the consumption of meat often occurred in the context of public feasts or private elite rituals and was closely linked to the upper elite class. Recent archaeological investigations at Copan seem to support this association (M. Pohl 1995:459). Pohl noted that the upper classes at Copan had access to more meat and the consumption of meat, in particular the meat of white-tailed deer, was a good indicator of social status. She concluded that the consumption of high status meat was one of the means by which the Maya elite asserted their privileged position.

If we extend this model to Cerén, then we would expect the majority of evidence for household meat consumption (unmodified bone from butchering, burned bone from cooking, deer and dog blood on obsidian blades, etc.) would be seen in association with "wealthier" household compounds. However, faunal evidence form Cerén indicates just the opposite. Both the artifact assemblage and the architecture of Household 1 suggests it may have been the poorest household excavated thus far (Sheets 1992). However, if members of Household 1 were involved in a service relationship with village ceremonialism then this incongruity may be explained. A look at contemporary fiesta systems may be useful here.

The Zinacantecos of Chiapas, Mexico, have an active fiesta system (Vogt 1969). As Vogt has reported, many individuals aspire to participate in this system even though serving in fiesta system positions is quite costly for a family. Fiesta system members initially entering the system must provide all the necessities for public rituals required to ensure the well-being of the community. Specific material items deemed crucial for public ceremonies include; meat, rum, maize, beans, brown sugar, candles, vegetables, eggs, spices, cigarette, and matches. However, the cost of sponsoring the necessary ceremonies us off-set by the increase in prestige for fiesta system members and their families.

As noted above, Household 1 appears to have been involved in some aspect of the large-scale production of various consumable goods – maize, medicinal plants, flowers, and possibly fermented maize-based drinks – which may have been related to public feasting and ceremonies which involved Structure 10. If Household 1 members also were involved in providing and/or processing animals for public consumption, it may have been very costly for the household. While we can only speculate about the possible motives of participating in costly ceremonial activities, it is at least conceivable that one of the benefits could have been social status as defined by prestige, rather than social status as defined by "wealth."

White-tailed Deer and Village Ceremonialism

White-tailed deer are the most common faunal material at Cerén. As mentioned above, there may be a significant link between deer, ceremonialism, and ideology. At Cerén, this link may be found in Structure 10.

Mary Pohl (1981) argues that repetitive scenes of deer sacrifice and deer impostors depicted in Classic Period paintings, sculptures, and described in the ethnohistoric records, document an important ancient deer ceremony which she calls the *cuch* (a Maya word for burden) ceremony. Pohl maintains that the white-tailed deer was (and in some places, such as Santiago Atitlan, still is) the central ritual player, and a deer sacrifice and public feasting were central aspects of the ancient *cuch* ceremony. This ceremony focuses, primarily, on the deer as a metaphor for agricultural fertility, rain, economic prosperity, as well as more abstract concepts concerning themes of death, renewal, and rebirth. The *cuch* ceremony, Pohl argues, was performed at the end of the agricultural year.

Diego de Landa reported a version of a deer ceremony which included a deer sacrifice performed during the month of *Zip*:

> while it [the incense] was burning, each [participant] took an arrow and the skull of a deer, which the Chacs anointed with blue bitumen. And some danced, holding these thus

> anointed in their hands, while others pierced their ears and others their tongues, and passed through the holes seven wide blades of grass called *ac*. This done, the priest first, then the officers of the festival, offered gifts; and so dancing, the wine was poured out, and they got drunk until they were overcome.
>
> Diego de Landa (in Tozzer 1941:155)

A number of striking similarities can be seen when comparing inferred ceremonial activities at Structure 10 with *cuch* ceremonies documented in the ethnohistoric and ethnographic records, particularly with Landa's account of the Yucatan deer ceremony. Landa's report of a deer ceremony contains five basic structural components; 1) anointing a deer skull headdress with blue pigment, 2) dancing with the deer skull headdress and arrow, 3) bloodletting, 4) dancing and drinking, and 5) the sacrifice of a deer. Artifacts possibly representing all five of these ceremonial components are present in the artifact assemblage in Structure 10.

The first two events are indicated by the deer skull headdress. The headdress had been painted red and traces of blue (possibly pigment?) were noted on the distal end of cranial aspect of the right antler. Additional deer costume elements were recovered in this structure which included two large bone beads, a teardrop bone ornament, and a shaped and notched deer scapulae from a juvenile. Bloodletting may be indicated by an obsidian blade containing human protein found in Structure 10. This it the only blade, thus far, to test positive for human blood anti-serum (Newman 1993). While is possible that someone may have inadvertently cut themselves with the blade, Sheets (1993) notes that the context of the blade, stored high in an elevated location in a building for community ritual, as well as the location of the blood on the blade (the distal end of the blade the end which one would presumably be holding away from oneself) make it more probable that the artifact was used in intentional human bloodletting. Another component to the deer ritual is drinking and dancing. Both the high percentage and large size of serving vessels recovered in Structure 10 suggests that large scale food and beverage consumption occurred here. The final component of Landa's *cuch* ceremony consists of the sacrifice of a deer. It is clear from the presence of deer bone and blood residue on obsidian blades that the villagers were butchering deer in this area. It is not clear whether the deer were being killed ritually or not. However, given the overwhelming amount of ethnohistoric, ethnographic, and visual data from Maya paintings and sculpture which documents a ceremony in which a deer deity and deer sacrifice were the central ritual drama (M. Pohl 1981), it is at least conceivable that the deer remains recovered close to the ceremonial complex represent the remains of a deer sacrifice conducted in conjunction with public ceremony and feasting.

Although we do not know the meaning of the ceremonies performed by the Cerén villagers, village ceremonial activities clearly involved the use of white-tailed deer ceremonial paraphernalia, public feasting and drinking, and possible human blood-letting, anointing objects with blue and the consumption, perhaps sacrifice, of deer.

Striking parallels between Landa's 15th century description of a Yucatan *cuch* ceremony and evidence – dating 800 years earlier – of deer ceremonialism at Cerén, suggests that white-tailed deer ceremonialism and the basic structural components of the *cuch* ceremony, may be of great antiquity. The archaeological evidence from Cerén suggests that the *cuch* ceremony may have been part of a wide-spread Mesoamerican ceremonial complex – a complex that was not the exclusive domain of the elites at major Maya urban centers.

The Cerén Ceremonial Complex: Considering the Continuity and the Antiquity of the Fiesta System

A current cultural anthropological debate concerns the antiquity of the Mesoamerican "fiesta system." The fiesta system is a broad inclusive term meant to incorporate what is often confusingly referred to in the literature as cofradias, cargo systems, (which typically, or even exclusively, includes a civil component, [now illegal in Guatemala]) or civil-religious hierarchies (Carlsen 1988). Here, following Carlsen (1988), the term the fiesta system is preferred for all of these organizations (except where formal names are used) thus, avoiding confusion and ambiguity over the pliability of meaning of these terms.

On either sides of the debate are scholars who believe the fiesta system is of great antiquity (Carlsen 1988, 1992, Early 1983) as opposed to scholars who believe the system is discontinuous with the pre-Columbian past and was introduced by the Spanish as a mechanism for the exploitation of indigenous populations (Chance and Tylor 1985, Harris 1964).

Scholars on the continuity side of the debate, argue that pre-Columbian antecedents existed prior to the Conquest. They cite structural continuities in contemporary ethnographic ceremonialism and meaning, pre-Columbian text and iconography, the historic record, and ethnohistoric accounts to support their position. Early (1983) focuses on the historical developments in his argument and notes that certain ritual acts, such as wrapping religious icons in cloth, parading them around town while playing music, display a definite continuity with ceremonies performed today.

On the discontinuity side, scholars cite the exploitative elements of the fiesta system as used by Catholicism to convert and extract tariffs from the indigenous people. Marvin Harris (1964) notes that the primary tool of manipulation used by Spanish elites to exploit the indigenous population was the fiesta system. Harris, while noting the existence of the fiesta system from Mexico to Bolivia, flatly denies that any pre-Columbian derivations of the fiesta system could have existed and such ideas are "clearly out of the question" (1964:25).

Turning to an ethnographic analogy now, in the Cofradia San Juan in Santiago Atitlan, Guatemala, deer ceremonialism is still practiced. The following discussion, except where otherwise noted, is based on the ethnographic research of Robert Carlsen (1988, 1992). Santiago Atitlan, a community of approximately 16,000 Tzutujil Maya inhabitants, is situated at the southern end of Lake Atitlan at the base of the Toliman volcano. The Cofradia San Juan is the earliest documented cofradia dating to 1712 (Early 1983). In the village, various cofradias have very specific functions and the Cofradia San Juan is related to wild animals and midwifery, among other things. But the symbolic relationship actually extends beyond the concept of wild animals to include wild food and, more broadly to the concept of "wildness," in general.

Carlsen notes that in the Tzutujil Maya paradigm, the concept of wildness relates to dryness. However, the Atitecos do not view the dualism between dry and wet, wild and domesticated, as distinct and separate categories but, rather, as points on the same continuum which are constantly transformed into one another – an constant interplay between two poles. This dialectic is given a symbolic form in the guise of the jaguar and deer dance. The jaguar is associated with the dry season and the sacrifice of a white-tailed deer is deemed necessary for the commencement of the wet season. An all night jaguar and deer dance is performed at the Cofradia San Juan, which includes deer impersonators, wearing white-tailed deer skulls and skins, running through the streets of the village all night long. At some point, the jaguar ritually "kills" the deer thus ensuring the return of the wet season and the well-being of the community. This ceremony is performed at the summer solstice in conjunction with several days of music, eating, drinking, and dancing the sacred bundles. The structural underpinning of this contemporary ceremony – deer dance and ceremonial paraphernalia, feasting, drinking, music, and the dancing of the sacred bundles -- bare a striking resemblance to Landa's description of the 15th century *cuch* ceremony.

Returning to the debate concerning the antiquity of the fiesta system, notable here are the types of data used by cultural anthropologists to support their conclusions; the historic records, ethnohistoric accounts, ethnographic analogies, and pre-Columbian text and iconography. The advantage that the Cerén site provides, of course, is that we have actual archaeological evidence. And this evidence supports the idea of an existence of some kind of pre-Columbian antecedent for village ceremonialism, at least at the site of Cerén (Gerstle 1993). As Sheets (1993) notes, the reason the fiesta system may have been so easily adopted by Mesoamerican peoples was that it closely paralleled an indigenous system of great antiquity.

In conclusion, an examination of the spatial relationships, architecture, and artifact assemblage from Household 1 and the ceremonial complex, suggests that members of Household 1 may have had a service relationship with village ceremonialism. Additionally, an examination of the structural components of village ceremonialism, itself, as inferred from the artifact assemblage of Structure 10, closely parallels early ethnohistoric accounts, as well as some contemporary ethnographic practices. These data suggest the existence of some kind of pre-Columbian antecedent which may link, at least in structural features, if not in some meaning content, ceremonialism from present day village fiesta systems and early ethnohistoric accounts, with village ceremonial structure as inferred from the archaeological evidence at the Cerén site.

APPENDIX A:
CONTEXT OF MODIFIED AND UNMODIFIED ANIMAL REMAINS AT THE CERÉN SITE.

DOMESTIC AREAS

HOUSEHOLD 1. Includes four structures; a kitchen (Structure 11), a *bodega* (Structure 6), a domicile (structure 1), and a workshop (Structure 5). Also includes activity areas around these structures and the agricultural areas in direct vicinity of Household 1.

Structure 1 – The Domicile
- Bivalve
  - fragments 3
- Large Mammal
  - long bone
  - fragments 2

Structure 6 – The Bodega
- Anatidae (duck, unidentified species),
  - articulated skeleton, badly burned and crushed, block lifted 1

Structure 11 – The Kitchen
- *Odocoileus virginianus*
  - tibia, L 1
- Large Mammal
  - long bone
  - fragment 1
- Medium Mammal
  - long bone bead fragments 2
- Mammal
- Medium Aves (Bird)
  - long bone beads 3

The Kitchen Garden
- Artiodactyla (deer or peccary)
  - metapodial 1
- Large Mammal
  - rib fragment 1
  - irregular bone fragment 1
- Medium Mammal
  - rib fragment 1
- Unclassifiable Bone 1

Uncultivated Exterior Household Areas
- *Canis familiaris*
  - upper third premolar tooth 1
- Artiodactyla
  - tibia fragment L 1
- Large Mammal 1
- Medium Mammal 1

Young *Milpa* Field
- Medium Mammal
  - rib fragment 1

HOUSEHOLD 2. Includes two structures; a bodega (Structure 7), and a domicile (Structure 2). Also includes the activity areas around these structures and the agricultural areas in direct vicinity of Household 2.

Structure 2 – The Domicile
- *Spondylus calcifer* 1
- Large Mammal
  - long bone
  - *tapiscador* 1
  - rib fragments 2

Structure 7 – The Bodega
- *Canis familiaris*
  - carnassial tooth P^{4} L 1
- *Tayassu* sp.
  - tibia L 1
  - fibula L 1
- Large Mammal
  - long bone
  - fragment 1
  - carved male figurine 1
- *Cypraea cervinetta*
  - bead 1
- *Oliva* sp.
  - bead 1
- *Spondylus* sp.
  - rosette 1
- Bivalve
  - bead 1
  - incised 1
  - unmodified fragment 1
- Gastropod
  - bead 1

Uncultivated Exterior Household Areas
- Mammal
  - long bone needle fragment 1

HOUSEHOLD 4. Includes one structure, a bodega (Structure 4). Also includes the uncultivated exterior household areas and agricultural areas in direct vicinity of Household 4.

Structure 4 – The Bodega
- *Odocoileus virginianus*
  - Antler tool 1
- Large Mammal
  - long bone spatula tool 1
  - long bone needle fragment 1
- Aves (Bird)
  - long bone needle

Uncultivated Exterior Household Area
- *Odocoileus virginianus*
  - humerus L 1

The Agave Garden
- Large Mammal 1

THE CEREMONIAL COMPLEX

Structure 10 – Community Ritual Building
- *Odocoileus virginianus*
  - male cranium
    - headdress 1
  - scapula tools/ornaments
    - adult R 1
    - juvenile L 1
  - antler
    - *tapiscador* 1
- Large Mammal
  - long bone beads 2
  - long bone
  - *tapiscador* 1
  - curved rib tool 1
  - flat bone
    - teardrop
    - ornament 1

Structure 12 – The Shaman's Workshop
- *Odocoileus virginianus*
  - antler drilled L 1
- *Spondylus* sp. fragments 4
- *Oliva spicata* beads 4

CIVIC BUILDINGS

Structure 3 – A Meeting House
- Large Mammal
  - lone bone *tapiscador* 1
- Bivalve Shell 1

Structure 13 – (currently identified through a test pit)
- *Kinosternon* sp. (Mud Turtle)
  - carapace 1
  - plastron 1

MISCELLANEOUS CONTEXTS

The Midden
- *Canis familiaris*
  - molar tooth lower M_1 1
  - canine tooth pendant 1
- Large Rodentia
  - incisor tooth fragment 1
- Aves (Bird)
  - long bone
  - fragment 1
- Large Mammal
  - fibula fragment 1
  - incised long bone 1
  - irregular bone fragment 1
  - unidentified fragment 1

Behind the Stone Seats Outside of the Temescal
- Large Rodentia
  - incisor tooth fragment 1
- Large Mammal 1

Miscellaneous Clay Prepared Surfaces
Encountered in Test pits
- Medium Mammal
  - rib fragments 2
  - rib tool 1
  - long bone fragments 2
- Large Mammal
  - sacrum fragment 1

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