PAPERS
of the
NEW WORLD ARCHAEOLOGICAL FOUNDATION

NUMBER FORTY-ONE

The Chantuto People: An Archaic Period Society of the Chiapas Littoral, Mexico

by

BARBARA VOORHIES

(With Spanish Translation
of Concluding Section)

NEW WORLD ARCHAEOLOGICAL FOUNDATION
BRIGHAM YOUNG UNIVERSITY
PROVO, UTAH
1976

PAPERS
of the
NEW WORLD ARCHAEOLOGICAL FOUNDATION

NUMBER FORTY-ONE

The Chantuto People: An Archaic Period Society of the Chiapas Littoral, Mexico

by

BARBARA VOORHIES

(With Spanish Translation
of Concluding Section)

NEW WORLD ARCHAEOLOGICAL FOUNDATION
BRIGHAM YOUNG UNIVERSITY
PROVO, UTAH
1976

GARETH W. LOWE

Director

SUSANNA M. EKHOLM

Series Editor

STEPHANIE BIRD

Volume Editor

Printed by
Brigham Young University Printing Service
Provo, Utah

"In shallow salt Water, these impenetrable Woods of Mangroves are frequented by great Numbers of Alligators, which being too big to enter the closest Recesses of these Thickets, the smaller Ones find a secure Retreat from the Jaws of their voracious Parents. These watery Woods are also plentifully stored with ravenous Fish, Turtles and other Animals which prey continually one upon the other, and the Alligator on them all; so that in no Place have I ever seen such remarkable Scenes of Devastation as amongst these Mangroves . . . where the Carcasses of half devoured Animals are usually floating in the Water. They grow in most parts of the Earth under the Torrid Zone and are found but little north or south of the Tropicks."

M. Catesby 1731: 63
quoted in Bowman 1917: 603

ACKNOWLEDGMENTS

I have received generous assistance from many people and organizations throughout this study.

The excavations were carried out under an archaeological concession (No. 10/69) issued by the Instituto Nacional de Antropología e Historia to the New World Archaeological Foundation, Brigham Young University. Financial support during my reconnaissance trip of 1971 was provided by a General Research Grant from the University of California, Santa Barbara. The research was funded by a National Science Foundation grant issued to the regents of the University of California.

Some of the archaeological and other remains were examined by people whose contributions I deeply appreciate. James J. Childress performed the nutritional analysis of clams; Matsuo Tsukada studied the midden samples for possible pollen; Elizabeth S. Wing and Kathie Johnson analyzed the vertebrate faunal remains; Joseph E. P. Morrison, Joseph Rosewater, and Allyn Smith examined shells; Phillip L. Walker studied the human remains; and Larry R. Wilcoxon studied the obsidian collection.

The majority of data processing was performed in Santa Barbara where I was assisted by several people: Jane Divinski, Anabel Ford, George Gregg, Paul Heuston, Martin Jacobson, Ronald Jeffries, and Michael Pérez. In Chiapas I received assistance from various staff members of the New World Archaeological Foundation. Jorge Acuña N. made a preliminary identification of the ceramic material, Ramiro Jiménez P. drew the illustrations, and Mario Vega R. photographed the artifacts. Elisabeth Brown thoughtfully and carefully typed the manuscript.

Some additional people not only contributed their professional expertise, but also personally involved themselves in the project. I am doubly grateful to these individuals. Cynthia Hutzel shared with me the first experiences in the field area during the summer of 1971. I am grateful for her unwavering good spirits which were a tremendous asset, especially during some potentially frustrating experiences. Christopher Dunn, Wayne Olts and Gilberto Utrilla assisted during the excavations. Their contributions were vital to the project's success and I highly value our shared times together. Without their help I would have accomplished very little.

I derived much personal pleasure from the tremendous hospitality extended to us outsiders by the people of La Palma. I am particularly indebted to Eduardo Coutiño, Don Martín de los Santos, Miguel Ochoa, Elías Ochoa, and Arnulfo Vera. These men formed the core of our excavation crew and also became our friends during our brief but intense stay in their village.

I benefitted also from stimulating discussions with Albert C. Spaulding, Barbara L. Stark, Elizabeth S. Wing, and Phillip L. Walker. Phillip L. Walker has been particularly helpful in this regard. José Luis Castro-Aguirre and A. Starker Leopold were kind enough to write long informative letters in answer to my queries regarding aspects of their areas of speciality.

The manuscript was read in part or completely by Stephanie Bird, Susanna M. Ekholm, Gareth W. Lowe, Albert C. Spaulding, Phillip S. Walker, and Elizabeth S. Wing. I am very grateful for their helpful suggestions.

When I was first considering this project, Carlos Navarrete shared with me much unpublished information on the Soconusco. His generous attitude and the specific information he provided me about sites and logistics gave tremendous impetus to the project's realization. Eduardo Martínez E. has provided me with considerable assistance throughout this study. He has been consistently eager to offer the kind of help that makes the difference between a difficult or a smooth progression of a project. He also surveyed two of the sites.

Gareth W. Lowe has supported the project in many tangible and intangible ways difficult to detail. He has offered every form of professional assistance from the time of my first inquiries about the feasibility of this project until its conclusion. I am exceptionally grateful for his munificence.

The collections have been deposited with the New World Archaeological Foundation, then at Tuxtla Gutiérrez, Chiapas, Mexico, and since moved to Comitan.

Barbara Voorhies
University of California
Santa Barbara, California
March 1976

CONTENTS

ACKNOWLEDGMENTS vii
INTRODUCTION 1
Background and Objectives 1
Cultural Backdrop of Study 4
Coeval Occupations 5
Cultural History of the Soconusco 7
Prehistoric Coastal Dwellers 9
Residence Patterns 11
Subsistence Patterns 13
Exchange Systems 15

PRESENT-DAY ENVIRONMENT 17
Introduction 17
Resource Community Zones 18
Shallow Water Marine 20
Beach Sand and Low Beach Scrub 20
Mangrove Forest 20
Herbaceous Swamp 20
Madresalar 21
Tropical Savanna 21
Forest and Field Systems 22
Marine Estuary and Lagoon System 22
Community Periodicities 23
Reptiles 23
Crustacea 25
Birds 25
Fish 26
People 26
Summary 28
Limiting Factors 28
Ecological Analysis 29

RECONSTRUCTION OF PREHISTORIC SOCIAL SYSTEMS:
EXCAVATIONS AND DATING 33
Excavations 33
Methods 33
Stratigraphy 34
Zapotillo, Cs-8 34
Tlacuachero, Cs-7 36
Campón, Cs-6 39
Depositional History 39
Stage 1 39
Stage 2 41
Stage 3 41

Dating the Occupations 41
Methods 41
Results 42
N8W1 and N1E9 at Cs-6 42
N3E3 at Cs-8 42
0E2 at Cs-7 43
Conclusions 43

RECONSTRUCTIO OF PALEOENVIRONMENTS
AND EFFECTIVE ECOSYSTEMS 45
Fauna 45
Invertebrate Remains 45
Mollusks other than Marsh Clams and Barnacles 45
Marsh Clams 48
Shrimp 52
Summary 53
Vertebrate Remains 54
Methods 54
Results 55
Conclusions 55
Flora 63
Methods 64
Results 64
Interpretations 64
Conclusions 66
Human Remains 67
Postclassic Period 67
Archaic Period 67
Coastal History 69
Summary 70

RECONSTRUCTION OF PREHISTORIC
SOCIAL SYSTEMS: MATERIAL CULTURE 71
Introduction 71
Stone Artifacts: Non-obsidian 71
Stone grinding tools 71
Hemispherical mortars or bowls 71
Metates with concave grinding surfaces 72
Metates with planar grinding surfaces 73
Ovoid manos 76
Oblong mano 77
Probable mano fragments 77
Fragments of grinding tools 78
Simple silhouette stone bowl, unrestricted 79
Stone sphere 79
Pebble choppers 80
Hammerstones 81
Possible abrader saws 81

Bifacial flake tool 82
Possible end-scrapers 82
Thin flake, one edge possibly utilized 82
Crude blade 83
Pumice fragments 83
Polishing stones 83
Flat ovoid small boulders 84
Unworked waterworn pebble and cobble fragments 84
Unworked waterworn pebbles and cobbles 84
Shell artifacts 84
Pigment containers 84
Perforated shells 84
Bone Artifacts 85
Antler point 85
Bone cylinder 85
Stone Artifacts: Obsidian (from a study by Larry R. Wilcoxon) 85
Introduction 85
Description of Artifact Classes 86
Prismatic Blades 86
Flake Tools 86
Cores 87
Waste Flakes 87
Utilized Whole Flakes 87
Utilized Flake Fragments 88
Non-Utilized Whole Flakes 88
Non-Utilized Flake Fragments 88
Shatter Chunks 89
Distribution 89
Functional Analysis of Obsidian Artifacts 89
Discussion 93
Structural Remains 93
Summary of the Material Culture of the Chantuto People 94

RECONSTRUCTION OF PREHISTORIC SOCIAL SYSTEMS:
DISCUSSION AND CONCLUSIONS 97
The Ecology of the Chantuto People 97
The Chantuto Phase in Time and Space 97
Subsistence 97
Demographic Structure 98
Residence Pattern 98
Exchange Networks 100

RECONSTRUCCIÓN DE SISTEMAS SOCIALES
PREHISTORICOS: DISCUSIÓN Y CONCLUSIONES
(A Spanish Translation of preceding section) 102
La Ecologia de La Gente de Chantuto 102
La Fase Chantuto en tiempo y espacio 102
Subsistencia 102
Demografia 103

Patrones residenciales 104
Redes de intercambio 105

APPENDIX I: CERAMIC STUDY 109
Sherd Classification 109
Early Preclassic Period Material: Barra Phase 109
Cotán Grooved Red 109
Monte Incised 109
Modeled Red-Rimmed 109
Smoothed Punctate 109
Late Preclassic Period Material 109
Santa Rosa Polished Orange 109
Zoned Bichrome 112
Brown Ware 112
Black over Brown Ware 114
Polished Orange II 114
Black and Red Ware 114
Early Classic Material 116
Dull Red Ware 116
Brown and Black Bichrome 120
Black Ware I 120
Black Ware II 120
Carved Red Ware I 121
Carved Red Ware II 124
Monkey-Vessel Ware 124
Plain Ware: Fine Paste 124
Plain Ware: Coarse Paste 126
Polychrome 131
Bichrome I 132
Bichrome II 132
Stuccoed Sherds 132
Postclassic Period Material 132
Plumbate 132
Ceramic Non-Vessel Artifacts 134
Clay Earplug and Earspool 134
Solid earplug 134
Flared tube earspool 134
Clay Figurines 134
Standing figurine 134
Torsos 134
Head 136
Legs and Feet 136
Arm and Hand 136
Discussion 136

APPENDIX II: ANALYSIS OF MARSH CLAMS 139
Clam Weights and Dimensions 139
Nutritional Content 141

REFERENCES 143

FIGURES

1. The state of Chiapas, Mexico, with study area indicated 1
2. Map of study area with shell midden sites and biotypes indicated 2
3. Archaeological map of southern Mesoamerica 5
4. Map of study area showing archaeological sites mentioned in the text .. 18
5. Waterfront scene at the village of La Palma 19
6. A homogeneous stand of red mangroves (*Rhizophora mangle*) 21
7. A stand of white mangroves (*Laguncularia racemosa*) 21
8. Graph of community periodicities in the Chantuto study area that are discussed in the text 24
9. A temporary shrimper's camp located at the mouth of Lagoon Pansacola 27
10. Schematic section of stratigraphic units at N3E3, Cs-8 34
11. Contour map of Site Cs-8 35
12. Transverse section of Site Cs-8 36
13. Contour map of Site Cs-7 37
14. Area of clay stratum exposed at Cs-7 38
15. Contour map of Site Cs-6 40
16. Reconstructed mound surface at Cs-6 at approximately 2460 B.C. 43
17. *Neocyrena ordinaria* prime shells 47
18. Weight of marsh clam shell per cubic meter of excavated material at N0E2, Cs-7 50
19. Weight of marsh clam shell per cubic meter of excavated material at N3E3, Cs-8 51
20. Confidence interval for the clam size mean of the population sampled by depth at N0E2, Cs-7 52
21. Confidence interval for the clam size mean of the population sampled by depth at N1E9, Cs-6 52
22. Confidence interval for the clam size mean of the population sampled by depth at N8W1, Cs-6 53
23. Confidence interval for the clam size mean of the population sampled by depth at N3E3, Cs-8 53
24. Percent of animal-derived portion of people's diet during the Archaic Period contributed by aquatic, terrestrial, and unidentified organisms 60
25. Percent of animal-derived portion of people's diet during the Early Classic Period contributed by aquatic, terrestrial, and unidentified organisms 61
26. Concentration indices of bone by minimum number of individuals derived from five classes of animals compared for Early Classic and Archaic period deposits 62
27. Concentration indices, by weight, of bone derived from five classes of animals compared for Early Classic and Archaic period deposits 63

28. Percent water content and percent loss on ignition for three burnings of soil samples from N3E3, Cs-8 65
29. Hemispherical mortars or bowls 72
30. Metates with concave grinding surfaces 73
31. Metates with planar grinding surfaces 73
32. Metates with planar grinding surfaces 74
33. Ovoid manos 76
34. Oblong mano 77
35. Probable mano fragments 77
36. Simple silhouette stone bowl, unrestricted 79
37. Stone sphere 80
38. Pebble choppers 81
39. Hammerstones 81
40. Possible abrader saw 82
41. Bifacial flake tool 82
42. Possible end-scrapers 82
43. Thin flake, one edge possibly utilized 82
44. Crude blade 83
45. Polishing stone 83
46. Flat ovoid small boulder 84
47. Shell pigment container 84
48. Perforated *Agaronia propatula* shells 85
49. Worked antler point 85
50. Bone cylinder 85
51. Prismatic blade fragments 86
52. Flake tools 87
53. Cores 87
54. Utilized flakes 87
55. Non-utilized flakes 88
56. Shatter chunks 89
57. Preclassic Period sherds 108
58. Santa Rosa polished orange 110
59. Zoned Bichrome 112
60. Brown ware 113
61. Black over brown ware 115
62. Polished orange II 116
63. Black and red ware 117
64. Dull red ware 118–19
65. Black ware I 121
66. Black ware II 122
67. Black ware II 123
68. Carved red ware I, form 1 124
69. Carved red ware II 125
70. Monkey-vessel ware 126
71. Plain ware: fine paste 127
72. Plain ware: fine paste 128–29
73. Plain ware: fine paste, form 5 129
74. Plain ware: coarse paste 130

75. Plain ware: coarse paste 131
76. Miscellaneous ceramics 133
77. Clay earplug and earspool 134
78. Clay figurines 135
79. Weights of shells and drained meat of living specimens of *Neocyrena ordinaria* prime 140
80. Maximum widths of clam shells and weights of meat of two samples of living specimens of *Neocyrena ordinaria* prime 141

TABLES

1. Coastal sites mentioned in text 10
2. Identifications of fish specimens caught in the estuary near La Palma January-March 1973 23
3. Approximate schedules of migratory waterfowl along the Chiapas Coast 26
4. Radiocarbon age determinations of analyzed samples 42
5. Distribution and frequency of molluscan shells, excepting marsh clam shells, from grids N0E2 and S16W1, Site Cs-7 46
6. Distribution and frequency of molluscan shells, excepting marsh clam shells, from grids N8W1, N1E9, and S1W11, Site Cs-6 46
7. Distribution and frequency of molluscan shells, excepting marsh clam shells, from grid N3E3, Site Cs-8 48
8. Habitats of mollusks and barnacle recovered from excavations 49
9. Distribution of faunal remains recovered from Archaic Period deposits at sites Cs-6 and Cs-7 56–57
10. Distribution of faunal remains recovered from Early Classic Period deposits at sites Cs-6 and Cs-7 58–59
11. Description of human burials from the upper stratigraphic unit at grid N3E3, Site Cs-8 68
12. Frequency and distribution of artifacts from test pits N0E2 and S16W1, at Site Cs-7 72
13. Frequency and distribution of artifacts from test pit N3E3 at Site Cs-8 74
14. Frequency and distribution of artifacts from test pits N1E9, N8W1, and S1W11 at Site Cs-6 ..... *facing* 74
15. Frequency and distribution of obsidian artifacts in two test pits (N1E9 and S1W11) at Site Cs-6 75
16. Frequency and distribution of obsidian artifacts in test pit N8W1 at Site Cs-6 76
17. Frequency and distribution of obsidian artifacts in two test pits (N0E2 and S16W1) at Site Cs-7 78
18. Frequency and distribution of obsidian artifacts in test pit N3E3 at Site Cs-8 79
19. Modified Wentworth Grade Scale 80
20. Frequency and distribution of wear patterns on utilized flakes and utilized flake fragments from two test pits (N0E2 and S16W1) at Site Cs-7 91

21. Frequency and distribution of wear patterns on utilized flakes and utilized flake fragments from two test pits (N8W1 and N1E9) at Site Cs-6 92
22. Frequency and distribution of wear patterns on utilized flakes and utilized flake fragments from test pit N3E3 at Site Cs-8 92
23. Frequency and distribution of wear patterns on utilized blade fragments from test pit S16W1 at Site Cs-7 93
24. Distribution and frequency of pottery types from grids S16W1 and N0E2 at Site Cs-7 . . . . *facing* 110
25. Presence-absence chart of cultural affiliations of potsherds from six test pits 111
26. Percent of average meat weights to average shell weights for four samples of *Neocyrena ordinaria* Prime 141
27. Nutritional analysis of some shellfish 142

INTRODUCTION

BACKGROUND AND OBJECTIVES

The present study concerns an archaeological investigation of a prehistoric society that flourished during the third millenium before Christ on the coast of the present-day state of Chiapas, Mexico (Fig. 1). I conducted the archaeological investigation of this society from the perspective of prehistoric anthropology; the ultimate goal of my research is to reconstruct, insofar as possible, the sociocultural system of this prehistoric society.

I refer to this sociocultural system as the Chantuto society (Voorhies 1975). This name is derived from the archaeological site that was first recognized by Philip Drucker (1948) as demonstrating the society's former existence. Drucker identified and tested the Chantuto site (Fig. 2, Cs-3) during an archaeological survey of the Chiapas Coast.

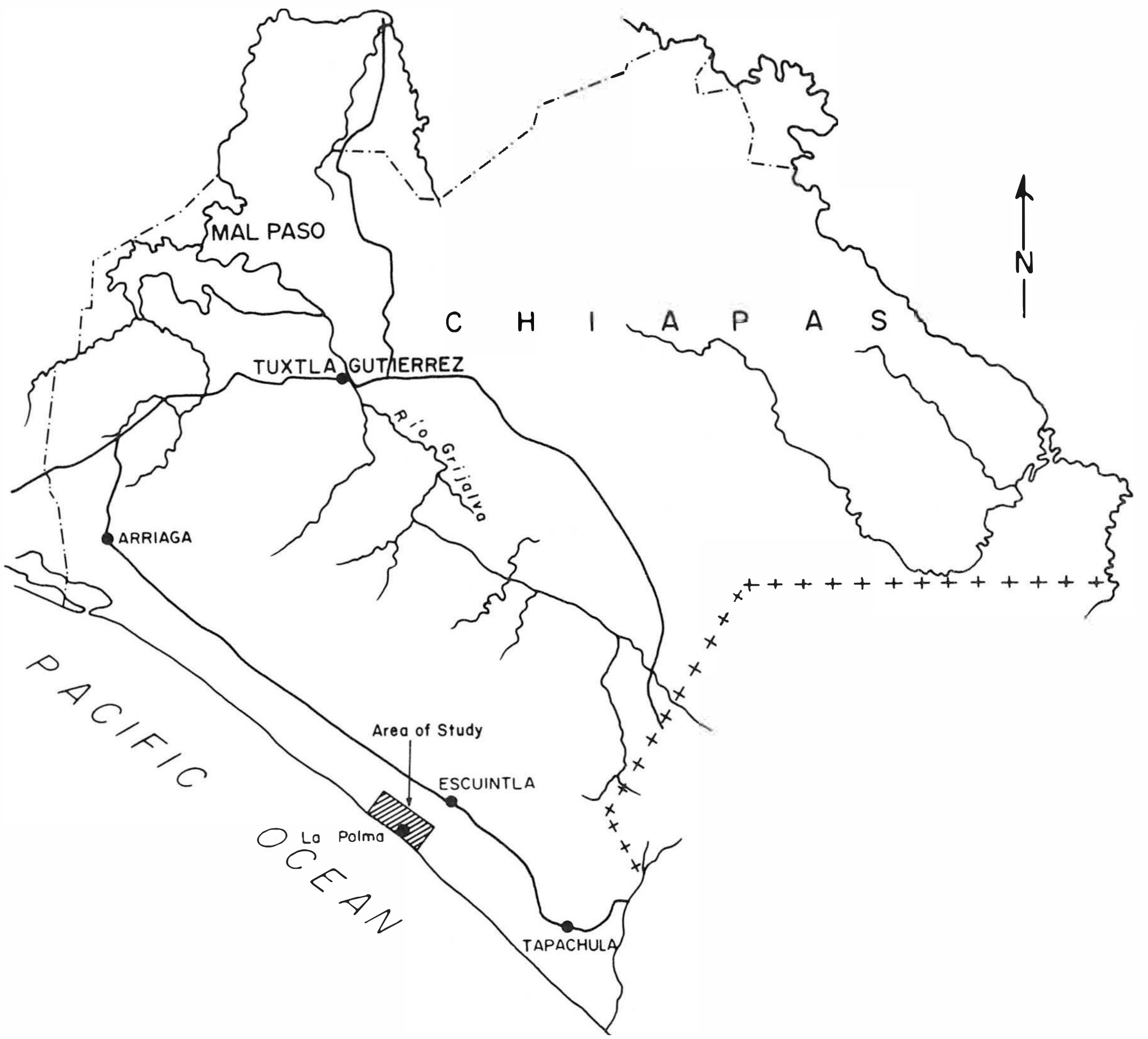


Figure 1. The State of Chiapas, Mexico, with Study Area Indicated

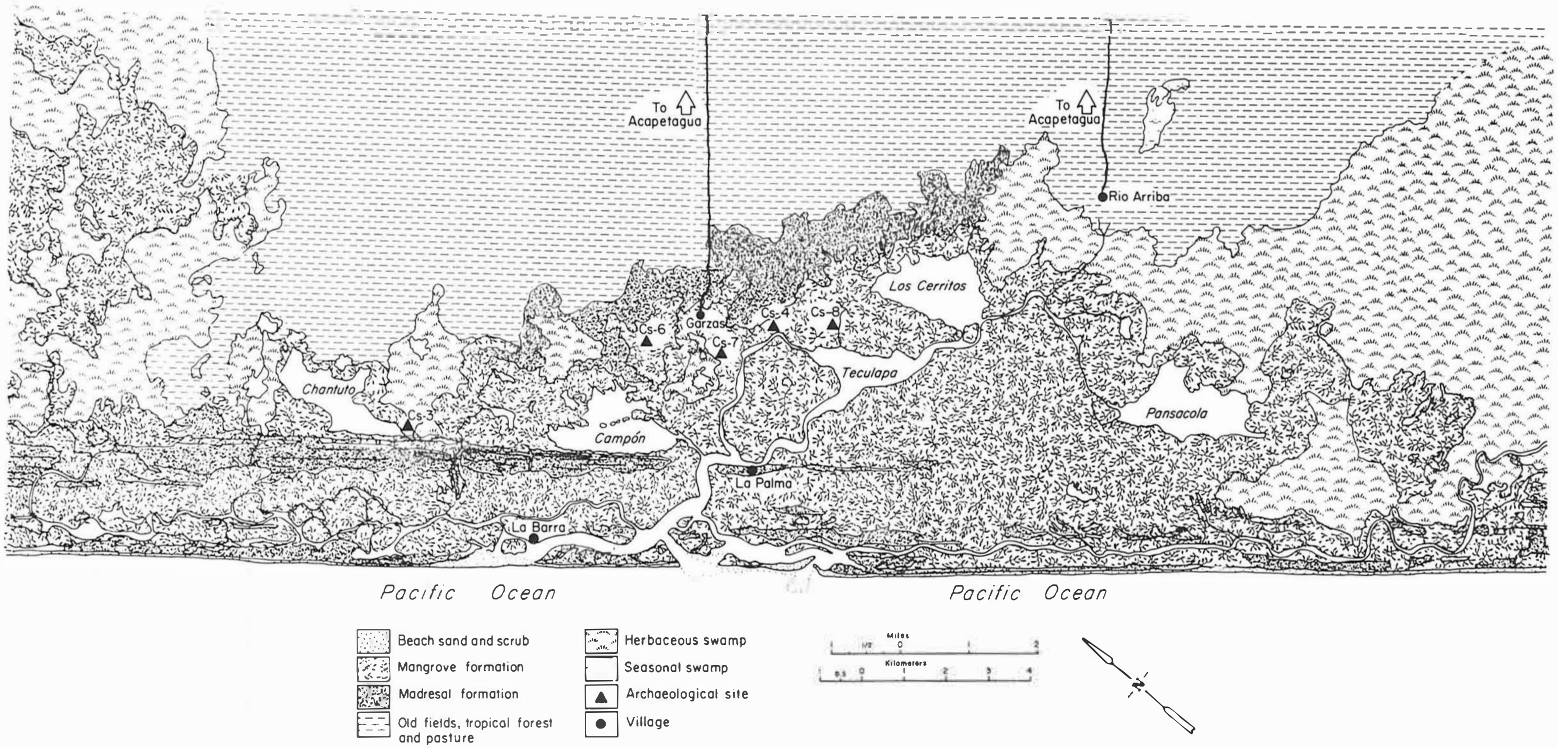


Figure 2. Map of Study Area with Shell Midden Sites and Community Zones Indicated

His 2.5-m-deep test pit into the Chantuto site revealed two stratigraphic units: an upper stratum that contained ceramic fragments as inclusions, and a lower stratum without ceramics. Drucker did not systematically study the Chantuto site, but he considered its aceramic stratum to be the most significant discovery of the field season.

> Islona de Chantuto is a very important site. So far as I know, this and Longyear's non-pottery layer at Copan are the only Mesoamerican sites where non-pottery middens underlie sherd-yielding strata. From one of these two sites may come the first light on the postulated pre-ceramic and early ceramic horizons of Middle America [Drucker 1948: 166].

Drucker also noted that local informants described other features, apparently middens, in the vicinity of Chantuto.

Drucker's assessment of the importance of his discovery was not followed up by other investigators until 1953, when José L. Lorenzo (1955) visited the site. Lorenzo mapped the Chantuto midden as well as a second midden (Fig. 2, Cs-6) that he had discovered. He also tentatively located the positions of other possible middens reported to be present in the Chantuto Zone. Lorenzo dug a test pit in the southeast quadrant of the Chantuto midden. His findings were essentially in agreement with those of Drucker, who had placed his earlier pit in the southwest quadrant near the mound's topographic center (Lorenzo 1955: site map). The 3.5-meter-deep pit dug by Lorenzo contained pottery inclusions in the upper 2.25 meters. Below this level stone tools and flakes, animal bones, charcoal, shell valves, and other materials were found, but pottery was conspicuously lacking.

A third investigator, Carlos Navarrete (n.d.), visited the field area in 1969. While there he discovered two previously unknown middens (Cs-4 and Cs-7), one of which (Cs-4) he tested and mapped. Navarrete dug three pits at Cs-4 but reported them in summary form as a single generalized section. He discovered sherds (mainly from the Postclassic Period with some Early Formative Period ones) in the upper 0.9 meters of the deposits. The remaining deposits to depths of 2.0–2.5 meters had no ceramics but were unambiguously deposited by humans. Thus Navarrete's work also revealed a major aceramic component and extended the known areal extent of the Chantuto culture to a second site.

I made my first trip to the field area in August 1971. At that time I visited the four previously reported middens and found a fifth site (Cs-8).

Thus in January 1973, at the beginning of my field study, the archaeological component pertaining to the Chantuto culture had been identified. The corresponding stratigraphic unit had been exposed in five test pits which had been dug into two midden sites (Cs-3 and Cs-4). These sites are situated approximately 9 km from each other. Three apparently similar sites had also been identified but not tested.

The prior studies gave some insight into the economy of the Chantuto people. The abundance of clam shells demonstrated that shellfish gathering was a significant aspect of food getting. Animal bones indicated that other food-procuring activities were also employed, but since the bones had not been identified, it was not possible to specify these other activities. Some stone tools had been recovered but were undescribed. The absence of ceramic remains gave rise to the speculation that the Chantuto people did not farm. The deposits were not dated so that neither the time of the Chantuto occupation nor its duration could be established.

The identification of archaeological sites with stratigraphic sections containing deposits that were aceramic in content elicited immediate interest. Particularly after the appearance of Lorenzo's widely read article, various authors began to tentatively assign the deposits to the Archaic Period (Coe 1967: 61; Johnson and MacNeish 1972, Fig. 4; Piña Chan 1960: 44; Stone 1972: 22). This assignment was based solely on stratigraphic considerations. The present publication is the first report that compares the Chantuto artifact assemblage with those from other Mesoamerican sites.

My broad research goal has been to reconstruct the entire sociocultural system of the Chantuto people. The nature of archaeological research makes such an ambitious goal rarely completely attainable. In order to partially focus my research objectives, I have been particularly concerned with reconstructing that part of the cultural system that relates directly to the biophysical environment; that is, with the cultural core of the system as defined by Steward (1955). This decision was based in part on my endorsement of Steward's view concerning the prime importance of core traits, and in part on practical considerations.

Steward defines core features as the principal means by which a human society adapts to a biophysical environment. He infers that these traits have primacy because they are most closely associated with the means of energy capture and utilization. The energy input of a system sets an ultimate limit on the demographic and organizational social attributes of that system. Although Steward's schema can be criticized in that it overlooks the value of noncore cultural traits in determining a relationship to biophysical environment and ignores the effect of the social environment on a society's utilization of biophysical resources, it provides a convenient starting point for archaeological research.

The study objectives can be more precisely defined in terms of concrete and limited research goals. Some of the major study objectives are presented here; other objectives are discussed in their appropriate contexts within the report.

A first objective was to determine the comparability of the aceramic strata at the five sites. At the beginning of the field project, I hypothesized that these strata were deposited under similar cultural conditions and that they were correlative in time. The hypothesis was based on the similarity of appearance of the mounds, their proximity to each other, and data available from previous studies. One goal of the project was to test this hypothesis.

A second objective was to determine the Chantuto people's food preferences throughout the yearly cycle, and whether they practiced a mixed economy (for example, combining foraging with fishing) or an unmixed one. My hypothesis was that the Chantuto people were practicing an unmixed economy.

A third objective was to reconstruct the demographic structure of the Chantuto population. I hypothesized that the Chantuto people constituted a small community, had a low population density, and had near demographic parity between the sexes.

A fourth objective was to determine the nature of population mobility. My hypothesis was that these people formed a stable, localized population that subsisted on spatially fixed, rather than shifting, resources.

A fifth objective concerned the nature of possible relationships between the Chantuto people and their contemporaries in significantly different habitats, as for example in the highlands or the more immediate environs of the mainland Chiapas Coast. One hypothesis was that the study population was integrated into an exchange network involving highlanders.

My study has been successful in fulfilling most, but not all, of these objectives. The results are summarized in the final chapter of this report.

CULTURAL BACKDROP OF STUDY

The significance of the Chantuto occupation can be appreciated only in terms of its position within the spectrum of Mesoamerican cultural history. Although final comparisons between the Chantuto Phase and other Mesoamerican phases will be presented in the concluding chapter, I believe that a brief introductory discussion of relevant Mesoamerican prehistoric occupations will aid the nonspecialist reader in assessing the present study. This discussion is presented in three sections. First, I review the current knowledge concerning Mesoamerican occupations that were coeval with the Chantuto occupation. In this section the time factor is the significant criterion of comparison. Second, I review the currently available information concerning occupations at sites located in the vicinity of the study area. These are restricted to the Soconusco region of the Pacific coastal plain. In this section the spatial factor is the diagnostic criterion of comparison. Third, I review the currently available information concerning prehistoric peoples who, like the Chantuto people, participated in aquatic ecosystems. In this section ecological relationships are the crucial criteria of comparison.

Coeval Occupations

At the present time occupations that are coeval with the Chantuto population are known from only two locations in southern Mesoamerica. They are the Tehuacan Valley, a high altitude valley in the state of Puebla, and Puerto Marqués, coastal Guerrero (Fig. 3).

Of these two regions, the archaeological material is more complete for the Tehuacan Valley. Two phases, overlapping in time with the Chantuto occupation, have been identified (Johnson and MacNeish 1972). The Abejas Phase occupation (3400–2300 B.C.) partially predates the apparent emergence of the Chantuto population, whereas the Purron Phase occupation (2300–1500 B.C.) partially postdates it. The chronological placement of these two relevant phases from Tehuacan is based on seven radiocarbon dates and typological comparisons with the dated sequence at Puerto Marqués (Johnson and MacNeish 1972: 41). Although the investigators consider the dating of the two phases to be approximate, the contemporaneity of these occupations with that of Chantuto is well supported.

The Abejas people were basically plant collectors who made important supplements to their diet by hunting, trapping, and farming. Agriculture contributed more than 20 percent (MacNeish 1967a, Fig. 186) to the diet; the crops included corn, beans, and squashes (MacNeish 1967a: 293–94). Some of the Abejas Phase occupants of the valley may

Figure 3. ARCHAEOLOGICAL MAP OF SOUTHERN MESOAMERICA
The locations of archaeological sites and study areas mentioned in the text are indicated.

have been permanently living in villages of pit houses (*see also* Flannery 1972). Others maintained the ancestral pattern of seasonal flux in population size and campsite location (MacNeish, Peterson, and Neely 1972: 378–81). The early part of the Purron Phase occupation (that is, the portion of the occupation coeval with the Chantuto occupation) is poorly known but apparently is similar to the Abejas occupation except for the important addition of pottery. By implication, the use of pottery by the Purron people suggests greater sedentarism than that of the Abejas people.

The time equivalent to the Chantuto Phase at Puerto Marqués is called the Ostiones Phase (Brush 1969: 23). The phase is dated by means of two radiocarbon analyses performed on shell samples. Level 38, the deepest of the Ostiones formation, yielded a date of 2950 B.C. ± 130 years; Level 35, which is 20 cm below the upper contact of the formation, yielded a date of 2250 B.C. ±135 years. However, since Level 33 from the overlying Pox formation yielded a date of 2450 B.C. ±140 years, the best estimate for the ending date of the Ostiones Phase is the mean of these two dates, or 2350 B.C. The Ostiones Phase occupation thus falls approximately between 3000 B.C. and 2300 B.C. This duration is similar to that of the Chantuto occupation.

It is disappointing that the early deposits of the Ostiones Phase yielded scant archaeological information. The one-meter-deep deposits contained many shells as inclusions; these were weighed but species identifications are not reported. Only a few artifacts were recovered. Brush (1969; Fig. 20) illustrates five lithic artifacts from the Ostiones Phase deposits. Four of these are flake tools and one is a pebble mano. Circular striations on the mano led the author to conclude that it was used with a rotary motion (Brush 1969: 96).

Brush cautiously concludes that the Ostiones Phase deposits were laid down by villagers in permanent residence rather than by periodic occupants of the site. He bases this conclusion on the stratigraphic evidence of a non-bedded formation that also lacks sterile layers. This suggests to him continuous rather than intermittent depositional conditions.

> Available evidence therefore, points toward a preceramic village at Puerto Marqués which lasted for approximately 500 years [Brush discards the 2250 B.C. date without explanation] before the introduction or invention of pottery there [Brush 1969: 97].

Readers who are acquainted with the present status of Mesoamerican archaeological research may wonder about possible third-millenium occupations in two other areas known for their long and well-studied chronologies. These areas are the Central Depression of Chiapas and the Valley of Oaxaca. Each of these chronologies has a hiatus that coincides with the time of the Chantuto occupation.

The hiatus in the known chronology of the Grijalva Basin of Chiapas spans the time period between 4000 B.C. and 1500 B.C. Known occupations that predate the Chantuto occupation have been recognized at Santa Marta cave (MacNeish and Peterson 1962). These occupations (Early Santa Marta Phase and Late Santa Marta Phase) were of foraging peoples who apparently inhabited the cave on a seasonal basis. The end of the hiatus is signaled by the Cotorra Phase occupation that has been identified at Santa Marta cave as well as at the site of Chiapa de Corzo. The Cotorra archaeological component is the earliest known from Chiapas that includes pottery remains. The slim but consistent evidence from typological comparisons and radiocarbon dates suggests that the Santa Marta Cotorra occupation may be slightly earlier than that of Chiapa de Corzo (MacNeish and Peterson 1962: 18; Johnson and MacNeish 1972, Fig. 4), but neither occupation overlapped in time with that of Chantuto.

The long chronology from the Valley of Oaxaca also has a hiatus that includes the third millenium B.C. This hiatus follows the Yuzuna Phase (3500 B.C.–?2900 B.C.) and is terminated by the San José Mogote Phase (approximately 1150 B.C.–850 B.C.) (Johnson and MacNeish 1972, Table 9, Fig. 4). The hiatus falls between an occupation of people with a mixed foraging and farming economy, and an occupation of people who were full-time farmers.

Coeval occupations with the Chantuto occupation are known from northern Mesoamerica in Nuevo Leon and Tamaulipas (Johnson and MacNeish 1972, Fig. 4). These occupations are part of a cultural tradition that is distinct from that of the south and appear to have no great significance for the interpretation of the Chantuto material.

Cultural History of the Soconusco

The study area is located within a region that in Aztec times was the province of Soconusco (Xoconochco). This province was located at the southeasternmost limits of the empire (Coe 1961: 15). The province covered that section of the coastal peneplain that today lies within southeastern Chiapas and northwestern Guatemala. The geographical unit of the Soconusco has apparently had a single uniform cultural development throughout prehistoric time. It can thus be considered a minimal unit in the cultural area sense, and a review of its cultural history is essential to the interpretation of the significance of the present study.

Lowe and Mason (1965) summarize what was known in 1960 about the prehistory of the Soconusco. In the present discussion I reiterate the major events of that history and bring it up to date on the basis of data that have become available since the writing of the 1965 article.

The Soconusco, although rich in archaeological sites, has not been well studied (Lowe and Mason 1965: 197). The most thorough investigations have been made at Altamira (Green and Lowe 1967, Lowe 1967a) and Izapa (S. Ekholm 1969; Lowe, Lee and Martínez 1976) in Chiapas, and Salinas la Blanca (Coe and Flannery 1967) and La Victoria (Coe 1961) in adjacent Guatemala (Fig. 3). Izapa is a major ceremonial center, but the community patterns of Altamira and the Guatemalan sites studied never developed beyond the level of rural villages.

The earliest known occupation of the Soconusco is the Archaic Period settlement reported here; no Paleoamerican Period deposits are known to occur. Occupations are known from the Early Preclassic and all subsequent periods. Oddly enough, the information is more complete for the Preclassic occupations than for any later ones.

The earliest known occupation that postdates the Chantuto Phase is the Barra Phase defined by Lowe (1967b; 1975b) for Altamira. Equivalent material was subsequently encountered at Paso de la Amada (Ceja T. 1974), located approximately three miles north of Altamira, and at Tlacuachero (Cs-7). All of these sites are located near lagoons. At Altamira a single household is indicated but the more extensive deposits at Paso de la Amada indicate at least several households. The Barra Phase occupation at the type site of Altamira is dated by its stratigraphic position underlying Ocós Phase deposits. The estimated beginning date for the Barra Phase at Altamira is before 1600 B.C., and its estimated ending date is 1500 B.C. (Lowe 1971: 57; 1975b: 29).

The generally similar but later occupation represented by the Ocós Phase deposits was first identified at La Victoria (Coe 1961). Coe estimates that the Ocós Phase at La Victoria began in 1500 B.C. and lasted until 1000 B.C. (Coe 1961: 121). Ocós-related ceramic complexes are also known from several other Guatemalan border sites and approximately twenty sites in southern Chiapas (Lowe 1975a; 1975b, Fig 1). These are concentrated within the Soconusco and along the upper Río Grijalva at the eastern end of the Chiapas Central Depression. Related material has been found in southern Veracruz at San Lorenzo; in Alta Verapaz, Guatemala; at Juchitan, Oaxaca; and less surely from several surface sites in Central Tabasco (Lowe 1975a).

The ceramics from the Barra and Ocós phases form components of a single tradition of *tecomates* that apparently was influenced by the neckless gourd. Stylistic similarities are closest to material recovered from sites in northern South America (Lowe 1971: 220; 1975b). Some of these similarities are so close that Coe (1960) has suggested that sea-borne migrations occurred between the two areas. Recently Ocós-related ceramics have been located in Tabasco (Sisson 1970), raising the possibility that the route of contact may have been via the Gulf Coast (Lowe 1971: 221). Although the exact nature of the Soconusco-South America relationship is not presently known, it is certain that in Barra-Ocós times the Soconusco formed part of a cultural area that extended southward to South America (Lowe 1971; 1975b).

The Barra and Ocós peoples practiced a highly diversified system of food procurement. At estuarine sites they collected estuarine resources, hunted some land animals, and fished. It is generally believed that they also had some form of agriculture, particularly at the inland sites, although the evidence for this is inferential. Lowe (1967b: 65–71) has hypothesized that these peoples first cultivated root crops and that the introduction or intensification of maize-growing ways coincided with the termination of the Ocós occupations and their replacement by Olmec-related peoples.

The majority of Ocós sites appear to have been the locations of single or a very small number of households (*see* Lowe 1975a). Paso de la Amada and Aquiles Serdán appear to have been higher-order places during Ocós times. At Aquiles Serdán (Navarrete in preparation) this inference is based only on the presence of deep and extensive deposits. At Paso de la Amada a three-meter-high central mound is enclosed by a quadrangular arrangement of low platforms covering several acres (Ceja T. 1974).

The cultural development of the Soconusco subsequent to the Ocós Phase is typified by close relationships with the Olmec heartland. The Ocós people themselves were in part contemporaries of the Ojochi and Chicharras people (1500–1150 B.C.) at San Lorenzo in Veracruz (Coe 1969). The Chicharras people are considered proto-Olmec because they were making major topographical modifications, sculpting stone monuments, and engaging in other activities indicative of a high order of social organization. Exactly what impact this precocious cultural development had on the Soconusco is still unclear.

The Olmec presence in the Soconusco area was felt in immediate post-Ocós times although its exact nature is also unclear. This Olmec influence was the dominant influence over the entire "Greater Isthmus Area" (Lowe 1971: 222) which includes southern Veracruz, western Tabasco, southeastern Oaxaca, and southern (and perhaps central) Chiapas. The ceramic manifestation in the Soconusco was first discovered at Salinas La Blanca and has been called the Cuadros Phase (Coe and Flannery 1967). Reconstructed life at this site during the Cuadros and subsequent brief Jocotal occupations is that of a small hamlet continuously occupied throughout the yearly cycle (Coe and Flannery 1967: 101). The people subsisted on crops grown along the alluvial banks of the estuary and on products collected from it. This mixed economy may have supported a minimum population of 25 persons according to the investigators.

Coe and Flannery (1967: 68) note ceramic similarities between Cuadros material at Salinas La Blanca and that of the Cotorra Phase in the Chiapas highlands. Closer affiliations are found with Altamira (Green and Lowe 1967) and Izapa (Coe and Flannery 1967: 68; S. Ekholm 1969). Lowe (1967b: 65) interprets the Altamira-Cuadros Phase as a rural expression of the Early Olmec civilization of the Gulf Coast area. This phase is known from ceramic material only, and little can be said about the lives of these people, although there may be similarities to the Cuadros people at Salinas La Blanca. At Izapa, the Cuadros-related phase is well represented in the ceramic assemblage (S. Ekholm 1969: 98); there is no evidence for ceremonial construction at this early time.

The brief Jocotal phase that follows the Cuadros phase at Altamira, Salinas La Blanca, and Izapa seems to show closer ceramic similarities with La Venta than with San Lorenzo (S. Ekholm 1969). This change in relationship is undoubtedly connected with the rise of La Venta as the major center within the

Gulf Coast area. Both Altamira and Salinas La Blanca were temporarily abandoned in approximately 700 B.C., at the end of the Jocotal occupation. This marks the close of the Soconusco's historical role as a rural part of the Olmec sphere. La Victoria was abandoned much before this time but was resettled later by the Conchas people (Coe 1961). The Conchas occupation shows ceramic ties with both South America and the Gulf Coast (Coe 1961; Lowe 1971) but is more regional in nature than the preceding phases. Coe (1961: 116–19) reconstructs the Conchas settlement as consisting of approximately ten houses. The villagers practiced a mixed economy whose food procurement depended on hunting, fishing, foraging, and farming.

Izapa, like La Victoria, was occupied by Conchas people, but little more can be said about this occupation (S. Ekholm 1969: 97). It preceded the development of platform mound building during the Duende Phase (750–500 B.C.), when Izapa became a major ceremonial site. Apparently the decline of the Olmec influence was the necessary stimulus for the rise of ceremonial sites and the Izapan style within the Soconusco.

The rise of ceremonialism at Izapa marks a change in the amount of archaeological detail available for the prehistory of the Soconusco. Izapa is the only well-excavated site with occupations that postdate the Late Preclassic Period. The published report on this material is not yet available (*but see* Lee 1973).

The regional importance of Izapa continued for many centuries. The major sculptures (Norman 1973) were manufactured during Late Preclassic and Protoclassic times (300 B.C.–A.D. 250). This tradition of monument carving stylistically relates the earlier Olmec carvings with those of the later Maya. Izapa continued to function as a major ceremonial center during both Early and Late Classic times (S. Ekholm 1969: 4), with some occupation continuing during the Early Postclassic Period (Lee 1973).

With the exception of Izapa, there is very little information available for the Early Classic Period in the Soconusco (Lowe and Mason 1965: 212). This void is probably the result of insufficient research rather than prehistoric depopulation. Late Classic Period developments in the Soconusco are only slightly better published than those of the Early Classic Period. The horizon marker of San Juan plumbate has been recovered from several Pacific Coast sites (cited in Lowe and Mason 1965) and has been carefully studied for Izapa (Lee 1973, and in preparation). Coe and Flannery (1967: 93–97) report 22 sites with major Late Classic occupations in the Suchiate area alone.

Postclassic developments in the Soconusco are similar in their poor documentation despite the known existence of several sites from this time period. Plumbate occurs at Izapa (Lee 1973) and in the Cintalapa and Suchiate drainages (Lowe and Mason 1965: 204) but little other meaningful information is available.

Prehistoric Coastal Dwellers

In this section my principal objective is to identify Middle American prehistoric coastal peoples whose niches are homologous to the niche of the Chantuto people. In order to meet this objective I have reviewed the archaeological reports on a number of Middle American coastal sites. The sites and reports that I have consulted are presented in Table 1. These reports do not exhaust the available literature on the subject but represent the material that I was able to obtain in the time available for this research. I believe, however, that the sample is representative of both the variety of adaptations practiced by prehistoric coastal peoples, and the range of methods practiced by archaeologists working with coastal sites in Middle America. For a detailed discussion of methods used in shell midden excavation, consult Shenkel (1971).

The consulted site reports vary greatly in the amount of recorded data. Some sites have not been scientifically excavated, while others have been the focus of intensive research. Consequently, it is not possible to make precise comparisons among the reconstructed ecologies of the study populations. Despite this limitation I will discuss the available data with this ideal objective in mind.

Table 1. Coastal Sites Mentioned in Text.

Site or Regional Names	Occupational Phases	Dates	Locations	Sources
Pacific Coast				
Marismas Nacionales	Related to those of Chametla and Amapa	A.D. 700–750 to 1300	Southern Sinaloa and northern Nayarit	Scott 1974; Shenkel 1971, 1974
San Blas 4	Matanchén	Minimum age: 1570 B.C. (Mountjoy 1972) 1760 B.C. (Mountjoy 1974)	San Blas, Nayarit	Mountjoy 1971, 1972, 1974
Barra de Navidad	—	A.D. 600 to Contact	Barra de Navidad, Jalisco	Nicholson and Meighan 1974; Long and Wire 1966
Puerto Marques	Ostiones	2950 B.C. to 2450 B.C. (Brush)	Puerto Marqués, Guerrero	Brush 1965, 1969
Ocós Area				
La Victoria	Ocós Conchas 1–2	1300–1100 B.C. (?) 800–300 B.C.	Ocós Area, Guatemala	Coe 1961
Salinas La Blanca	Cuadros Jocotal	1000–850 B.C. 850–800 B.C. (?)		Coe and Flannery 1967
IS-3, IS-7, IS-11	Chiriquí	A.D. 1100 to A.D. 1500	Gulf of Chiriquí, Panama	Linares de Sapir 1968
Cerro Mangote	—	4858 B.C. ± 100 years (Stone 1972: 21)	Cerro Mangote, Panama	McGimsey 1956
Atlantic Coast				
Cancun Midden	—	250 B.C.	Isla Cancun, Quintana Roo	Andrews 1965, 1969; Wing 1975
Patarata 52	Camerón 1–3 Limón	A.D. 250 to A.D. 550 A.D. 600 to A.D. 900	Lower Papaloapan drainage, Veracruz	Stark 1974
Not reported	Viejón	Undated	Central Veracruz	MacNeish 1967b
Isla de Pithaya		Formative ?	Near Colonia de las Flores, Tampico	Ekholm 1944; Cook 1946

It is my impression that no coastal population has ever depended exclusively on an aquatic environment for the provision of its basic economic needs. If this is true, then every coastal population must have some means of procuring terrestrial resources. It is useful to conceptualize two diametrically opposed solutions to this problem. One solution is for the population to move regularly through a series of habitats, of which the coastal location would be one. This system of transhumance would facilitate human utilization of dispersed and stationary resources. A second solution would be for the resources to be moved among stationary populations. Most empirical societies exhibit both of these behaviors in varying degrees. Nevertheless, there has been an overall trend in culture history for resources to become circulated more, and consuming populations to circulate less. It is also apparent that transhumance is a viable solution when a regional population has a low density. A high density regional population facilitates the development of an exchange system.

Prehistoric coastal populations of Middle America can be arrayed in their relative positions along a theoretical continuum with the two ideal situations as end points. According to the general trend mentioned above, I would expect that the earlier the coastal population, the more likely it is that it will move among different resource zones. Conversely, the later the occupation, the more likely it is that resources will be circulated among stationary populations. This prediction requires testing with empirical data.

In order to arrange societies along the continuum it is essential to have information available concerning the entire range of ecologic interactions practiced by each study population. Without this complete information serious distortions could mar the archaeological reconstructions. For example, coastal deposits left by nomadic foragers may strongly resemble those deposited by a subpopulation of sedentary inland people who seasonally collected shellfish. The two situations may not be distinguishable on the basis of the data from the waterside populations alone. Separation of these two contrasting situations necessarily depends on archaeological research carried out on proximate inland sites. This requirement has seldom been met in Middle American studies.

As an initial attempt to classify Middle American coastal populations according to their ecological niches it is necessary to reconstruct the following three aspects of each prehistoric society:

1. The duration of the population's presence in the waterside habitat. The range of theoretical extremes varies from brief periodic visits to full-time residence within the habitat.
2. The degree of dependence on aquatic resources. The theoretical extremes are near-exclusive dependence to minimal reliance on biota derived from aquatic habitats.
3. The degree of reliance on interpopulational exchange systems for critical resources. This could vary from relative self-sufficiency on the part of the waterside population to extreme dependence on an exchange network.

I will now discuss the societies given in Table 1 according to the headings Residence Patterns, Subsistence Patterns, and Exchange Patterns.

Residence Patterns. I am not familiar with any coastal middens that have been interpreted as deposits left by nomadic foragers. The unexcavated material from Central Veracruz, referred to as the Viejón complex (MacNeish 1967b: 311), may ultimately be interpreted in this manner. My reason for this conjecture is that projectile points, cross dated to the Coxcatlan Phase (5000–3400 B.C.) in the Tehuacan Valley, have been reported there. The residence pattern of the Coxcatlan people in the Tehuacan Valley has been reconstructed as nomadic (MacNeish, Peterson, and Neely 1972: 372–75).

Data deficiencies prevent the reconstruction of settlement patterns for Isla de Pithaya, Cancun, and the Gulf of Chiriquí sites. The inferred presence of regional agriculture and demonstrated former use of ceramic vessels implies permanent rather than transitory occupations. Andrews (1965: 44) considers the Cancun midden as either resulting from a small, temporary village or a campsite of hunters.

Several of the investigated coastal sites have been interpreted as deposits left by food extraction activities carried out on an intermittent basis by people whose permanent residence was located elsewhere. These sites include Barra de Navidad, the Matanchén deposits from San Blas 4, and the strandline sites in the Marismas Nacionales.

The researchers (Long and Wire 1966: 43) at Barra de Navidad appear to favor a reconstruction of periodic occupations, although they stress that they have been unable to reach a final conclusion concerning the residence pattern at that site. They consider the lack of burial grave goods, paucity of artifacts, and bedded stratigraphy as evidence of intermittent occupation by seasonal collectors of shellfish and salt. They note, in contrast, that the volume of the midden material might be interpreted as evidence for a permanent village. This latter suggestion appears to be unwarranted as it is based on a subjective impression concerning different rates of deposition between periodic and continuous occupations.

Mountjoy (1971, 1972, 1974) discusses a shell midden site (San Blas 4) near San Blas, Nayarit. The site was not excavated but a stratigraphic cut, made by a road construction crew, was examined and samples were collected. This work allowed Mountjoy to define the Matanchén complex. Mountjoy believes that the human agents of deposition did not reside at San Blas 4. His conclusion is based on the following considerations: 1) good shell preservation which suggests the absence of pedestrian traffic, 2) lack of evidence for food preparation activities, and 3) a simple tool kit that appeared to have been exclusively designed for food extraction activities.

In the Marismas Nacionales study, Shenkel (1971) identified and mapped 627 shell accumulations. These were classified into four types based on shell and artifact contents. Two types of middens, each of which is located along the strandline, consist of a single dominant species of mollusk, and contain almost no cultural material. These sites are interpreted by Shenkel as former collecting stations that were visited periodically by people who lived some distance farther inland at sites in the supratidal zone. Some of these sites were also investigated by Shenkel. They differed from the strandline sites not only by location but also by the presence of cultural material. Shenkel concluded that they were habitation sites.

Other coastal deposits are interpreted by their investigators as the remains left by small groups of sedentary people who lived in hamlets or villages. This is true of the supratidal sites in the Marismas Nacionales, and at Cerro Mangote, Moho Cay, Puerto Marqués, La Victoria, Salinas La Blanca, and Patarata Island 52.

The evidence for habitation at the supratidal sites in the Marismas Nacionales is associational, and has been summarized above. At Cerro Mangote no evidence of permanent structures was found, but the high frequencies of stone tools, human burials, and food remains led McGimsey (1956: 160) to reconstruct the community as a "fairly permanently situated small group, almost certainly larger than a single extended family."

At Moho Cay the presence of burials and the apparently domestic nature of surface-collected cultural remains led Craig (1966: 20) to infer that it had been a permanent residence. Brush (1969) reached the same conclusion for the Ostiones Phase deposits at Puerto Marqués. He based this conclusion on the non-bedded nature of the deposits and the absence of sterile layers. Brush's interpretation of continuous deposition appears consistent with the available evidence, but I believe that his reconstruction of a village (Brush 1969: 97) was not supported by the evidence that was available to him.

At La Victoria, Coe (1961: 144) reports permanent occupation based on wattle and daub remains in Ocós Phase deposits. A clay platform, floors, and daub fragments support the same reconstruction for the Conchas Phase deposits. Coe and Flannery (1967: 101) reconstruct the settlement at Salinas La Blanca during the Cuadros and Jocotal occupations as a hamlet consisting of a few families. They use ethnographic comparisons in reaching this conclusion. The occupation is interpreted as continuous because all seasons are represented by the recovered biotic remains.

Permanent residence has been reconstructed for the occupation at Patarata Island 52 by Stark (1974: 377–78). She has multiple reasons for this conclusion. They include ethnographic analogy, remains of substantial structures (wattle and daub walls and floors constructed of clay and shell), high frequency of burials, utilitarian pottery, and a wide range of tools that are typically associated with domestic activities. In addition, the faunal remains suggest to Stark that both wet and dry season collecting activities were practiced.

In summary, most studied coastal sites have been interpreted as continuously deposited by human agents resulting from their permanent residence at the sites. Some sites, in contrast, are believed to have been intermittently deposited by humans who periodically visited the locations for brief and limited collecting activities. The evidence used to support these conclusions is varied, as has been previously indicated. The strongest arguments are those based on multiple considerations, as in Stark's study at Patarata 52. The weakest evidence is based on assumptions about rates of deposition when these assumptions are not founded on adequate ethnographic studies. Such studies could contribute valuable information relevant to the interpretation of archaeological remains.

Subsistence Patterns. Ideally I would like to determine the relative percentage contributed by terrestrial and aquatic biota to the diets of each studied prehistoric population. Unfortunately only a few Middle American coastal middens have been carefully analyzed for food remains. All of these sites have yielded well-preserved animal remains but plant remains are either scarce or were not recovered. This situation is generally believed to be the result of differential preservation factors. Although widely acknowledged by archaeologists, differential preservation is sometimes not fully taken into account. As a result, the reconstructed subsistence patterns of coastal human populations may be poor reflections of the prehistoric reality. Despite such serious limitations I will now summarize the available information.

The reconstruction of subsistence patterns is presently not possible for Matanchén, Ostiones, and Viejón phases or for the deposits at Isla de Pithaya. This is due to inadequate data stemming from the fact that none of these sites was scientifically excavated.

Molluscan remains (Andrews 1969: 57) and vertebrate faunal remains (Wing 1975: 186–88) from Cancun have been quantified. Andrews (1965: 44) reconstructs the prehistoric diet as derived from turtles, mollusks, and fish supplemented by hunted animals. Andrews does not consider the possibility of plant foods and his suggestion of terrestrial hunting is not substantiated by the faunal analysis which reports only aquatic species with the exception of one bird. All of the aquatic forms are inshore species probably caught with nets, hooks, and harpoons (Wing 1975: 187–88).

The reconstructed subsistence patterns at both Cerro Mangote and Barra de Navidad are believed by the respective investigators to be based principally on shellfish gathering. At Cerro Mangote the shellfish diet was supplemented by terrestrial animals and plants. The latter were inferred from the presence of grinding tools. There was no positive indication of agriculture. At Barra de Navidad the shellfish gathering was supplemented by deer, small terrestrial vertebrates, birds, and fish. The importance of plants could not be assessed by the investigators.

Stark (1974) concludes that the subsistence pattern at Patarata 52 favored aquatic resources. Her study reports recovered food remains in detail with appendixes devoted respectively to plant (Cutler 1974) and animal (Wing 1974) remains. Stark acknowledges the relative difficulties in reconstructing the floral and faunal components of prehistoric diets. Despite these difficulties she finds evidence for greater emphasis on animal foods compared to plant foods. The animals were probably procured in the adjacent estuary. Stark also suggests a possible subsistence change indicated by an increase over time in dry season foods.

The subsistence economies at both Ocós region sites are interpreted as mixed, but with a primary emphasis on agriculture. Coe (1961: 114–17) reports the subsistence patterns for Ocós and Conchas phases at La Victoria. Preservation of vertebrate and plant remains was poor; nevertheless, Coe determined that the prehistoric occupants fished, collected shellfish and hunted land animals in addition to farming. Coe and Flannery (1967) reconstruct full-time farming for the Cuadros and Jocotal phases at Salinas La Blanca. This was supplemented by fishing and the collection of shellfish, including considerable emphasis on crabs. Small vertebrates and deer remains were also represented.

Two of the consulted studies, in the Marismas Nacionales and the Chiriquí Gulf region, are unique in that they report subsistence patterns for multiple sites in a region rather than for only a single, isolated site. As a result it is possible to reconstruct a regional subsistence pattern that necessarily has more validity than any pattern based on a single location.

Shenkel's (1971: 127) study of the sites in Marismas Nacionales concentrated on the molluscan remains. Other faunal remains, reported as scattered and deteriorated, were not quantitatively reported. The two types of supratidal midden sites contain artifacts that suggest reliance on well-developed agriculture (Shenkel 1971: 135). The actual extent of this reliance on agricultural products was impossible to determine. The shoreline sites represent shellfish collecting as an almost exclusive activity. This observation is best interpreted as representing only a small portion of the dietary intake of the human consumers. The consumers were either local or interior people with a wide dietary range including foods from cultivated crops. In light of the uncertainty concerning the location of consumers, Shenkel uses several different models for calculating population size from shell data. One of these models assumes local consumption of all shellfish represented by the studied middens, whereas another model assumes that the shellfish represented by strandline deposits were all exported as processed commodities.

The Chiriquí phase subsistence pattern reconstructed by Linares de Sapir (1968: 72–73) is particularly interesting because it is based on studies of three sites each from a population practicing a different resource strategy. Each site is located on an island within the Gulf of Chiriquí, Panama. One island lies within an estuary, a second island lies offshore at the mouth of the same estuary, and the third island lies 24 km off the mainland in the open sea. Linares de Sapir identified the recovered fauna (excluding fish which are only reported as present). Farming activities were inferred from the tool assemblages. She tentatively reconstructs the following subsistence pattern.

Inhabitants of the island closest to the mainland were primarily farmers who supplemented their diet by fishing, hunting deer, and gathering mollusks. Their neighbors on the island at the mouth of the estuary were also farmers who collected shellfish but apparently neither fished nor hunted. The offshore islanders relied heavily on shellfish, fishing, and hunting. They apparently also cultivated.

In summary, this review of some studies of Middle American prehistoric coastal populations has allowed me to make two significant generalizations about the current research. First, none of the investigators has devised a way to reconstruct utilized plant and animal resources using the same criteria for each of these biotic components. Procurement of plants usually is inferred from tool assemblages whereas the animal procurement patterns are more often inferred from remains of the organisms themselves. This method has probably resulted in an emphasis on animals rather than plants in the reconstructed subsistence patterns. Such an emphasis may well have had major effects on explanations about the relative roles of inland and coastal dwelling populations. I am thinking specifically about proposals concerning the possible priority of settled life in coastal regions. These proposals seem based on notions of population economic self-sufficiency which in turn are based on distorted data. I am not able to pursue these interesting ideas in this study but will reserve this project for a future publication.

A second generalization is that all of the studied coastal populations indicate at least a partial participation in terrestrial as well as aquatic ecosystems. The relative balance between consumed organisms derived from each of these systems has been shown to vary widely. This generalization can be made despite the fact that directly comparable, quantified data are not available for all the sites. In most of the studied sites the presence of agriculture is indicated for the regional if not the local population. For example, although no direct evidence for agriculture was available at Barra de Navidad, the lateness of the occupation makes it reasonable to assume the population consumed agricultural products. The Ostiones, Viejón and Cerro Mangote occupations may be exceptions, but these have not been studied sufficiently well to permit conclusive statements. Accordingly, although it is reasonable to assume that Middle American foraging populations once regularly entered coastal zones in their migratory schedules, and while there subsisted primarily on aquatic resources, only slight positive evidence for this adaptation is currently available.

Exchange Systems. In this section I investigate the possible participation of various prehistoric Middle American coastal populations in networks of exchange also serving interior populations. Several of the coastal populations have not yet been adequately studied and at the present time no information is available regarding their possible roles in regional resource circulation. These poorly known groups are represented by the Ostiones and Viejón phases, and the site of Isla Pithaya.

At Cancun and San Blas 4 the investigators were only able to reach very tentative conclusions because of data limitations. Andrews (1969: 57) speculates that the shell accumulations at Cancun indicate either that shellfish meat was consumed locally or that meat was traded to and consumed in the interior. He feels his data do not allow differentiation between these two possible interpretations. Andrews notes that the interior site of Dzibilchaltun has coeval deposits with the remains of three genera of mollusks believed by him to have been imported for their meat. He also mentions the possibility of importation of shell for raw material in the production of ornaments and other items.

The Matanchén deposits at San Blas 4 are viewed by Mountjoy as remains of a food extraction station. Mountjoy (1971: 56) suggests that food preparation and consumption may have occurred elsewhere. Due to the absence of regional sampling there is no evidence for these possible locations.

The only studied site for which the absence of exchange has been suggested is that of Cerro Mangote. McGimsey (1956: 155) notes that all of the items in the tool assemblage and all food remains could have been obtained locally. From this he concludes that the prehistoric population was self-sufficient rather than participating in a regional exchange system. He further suggests that the significance of the presence of pottery in the subsequent regional Monagrillo Phase may be its indication of the development of communication networks.

The majority of studied coastal populations are believed by their investigators to have been dependent on exchange for at least some of their critical resources. Shenkel (1974: 60–61), working in the Marismas Nacionales, concludes that the region may have exported smoked molluscan meat. His reasons for this conclusion are that the strandline middens have no domestic refuse, that the habitation sites in the immediate vicinity are neither large nor numerous, that a huge quantity of consumed shellfish is indicated, and that the midden material contains fragments of charcoal. This reconstructed export pattern is believed by Shenkel (1971) to have originated approximately A.D. 700 and lasted until A.D. 1300. The importers of the dried mollusks may have been the Chametla and Amapa populations from whom the Marismas peoples imported ceramics.

Ceramics indicate an exchange between the island populations of the Gulf of Chiriquí and the Coclé people of the Parita Bay region (Linares de Sapir 1968). There is no evidence for exchange of food items, and possible movement of raw materials is not discussed.

At Barra de Navidad contact with the interior is indicated by the presence of pottery, and tools of granite and obsidian. The items of export may have been fish, salt and shellfish, but the authors (Long and Wire 1966: 47) emphasize the speculative nature of this conclusion.

Coe (1960, 1961) believes long-distance trade had been established as early as Ocós times at La Victoria. His evidence for this is derived from a number of specific ceramic traits linking this Guatemalan site with sites in coastal Ecuador. To him the evidence suggests direct sea trade because of the apparent absence of relevant traits at sites located in the intervening area.

At Salinas La Blanca, the pottery, although showing affinities with pottery from inland sites, does not seem to be imported (Coe and Flannery 1967: 102). Most of the stone tools are reported as manufactured from igneous rocks but the authors do not report which, if any, of these materials could not be obtained within the study area. I suspect that obsidian and dacite may have been two imported items.

Stark's (1974: 385–92) work at Patarata 52 leads her to conclude that the ancient inhabitants were participating in a complex exchange network involving inland peoples. Particularly close connections with people in Central Veracruz are indicated by the presence of tools made from obsidian and other igneous rocks derived from that region. The ceramic items at Patarata were not made locally and show closest trait similarities with the Central Veracruz region. Stark speculates that the Patarata people may have also imported agricultural products, such as food items and cotton. Stark found no direct evidence concerning the commodities which may have been exported from the mangrove zone. She mentions shell, shell artifacts, asphalt, mollusks, shellfish, turtle, and bone and wood items as suitable commodities. Another strong possibility is that the inhabitants provided services rather than commodities. Stark suggests that the inhabitants of Patarata 52 may have provided transshipment services for a vigorous trading system extant during Early Classic times. Navarrete (pers. comm.) has suggested the same role for mangrove swamp dwellers in the Chantuto Zone, especially during the Postclassic occupations.

In summary, most of the studied coastal sites reviewed here yield definite evidence for participation in regional exchange systems. The evidence of the former exchange systems is commonly derived from the presence of items imported to the coastal regions. It is probable, but not proved, that the coastal sites each exported a suite of perishable commodities to inland sites. The Ocós sites and Patarata 52 may have contributed transportation services in addition to exporting some items. The one studied population that may have been relatively self-sufficient is that of Cerro Mangote. Similar adaptations may be indicated by the Ostiones and Viejón occupations which have not yet been thoroughly studied.

In the concluding section of this work I will briefly discuss the relevance of these prior studies to the present study of the Chantuto people.

PRESENT-DAY ENVIRONMENT

INTRODUCTION

In this section I discuss the present-day biophysical environment of the Chantuto study area. The reconstructed paleoenvironment of the Chantuto people and the evidence for this reconstruction will be presented in a later section. At present it is sufficient to note that the paleoenvironment appears to have been broadly similar to that of the area today.

The study area is located within the geographic region known since Aztec times as the Soconusco. This is the flat, low-lying, NW-SE-trending plain of the Pacific Coast which lies between the Isthmus of Tehuantepec and the Mexican-Guatemalan border. The Chiapas portion of this coastal plain is more than 300 km long and varies in width from 10 km at the northwestern end, to 35 km in the southeast (García Soto 1969). The plain is flanked on its landward side by the steep-sided escarpment of the Sierra Madre Occidental. The land rises very abruptly from the sea level plain to peaks between 2,500 and 2,900 m above sea level. The highest peak which is visible from the field area is that of the volcano Tacaná (4030 m). The difference in elevation between the mountains and plain is accentuated by the near absence of a piedmont formation. This situation contrasts with that of the well-developed piedmont of the Boca Costa in adjacent Guatemala.

The climate of the Soconusco is classified in the Köeppen system as tropical wet-and-dry (Aw) (Vivó Escoto 1964). This means that the rainfall is moderate or greater and occurs in definite wet and dry seasons. García Soto (1969) reports that Escuintla, a town located near the study area, has an annual rainfall record of 3,839 mm. This amount fell in 149 days. Vivó Escoto (1964, Fig. 10), in contrast, describes the Pacific lowlands of the Chiapas Coast as receiving 2,000–3,000 mm of rain annually. The rainy season generally occurs during the warmer months of the year when moist air from the Pacific Ocean is forced to rise over the high escarpment. Average yearly temperatures are between 25 and 30° C. (Vivó Escoto 1964: 198), and do not show a striking range in seasonal variation.

The climax vegetation of the Soconusco is tropical rainforest which gives way to seasonal forests and savannas toward the coast (*see* Miranda 1952; Wagner 1964). It is probable that the long regional history of human interference with the climax ecosystem is a primary factor controlling the distribution of these formations (Wagner 1964: 245). Today most of the coastal plain is maintained in pasture for cattle grazing or is cleared for farming.

Coastal swamps occur along much of the seaward margin of the Soconusco. These swamps typically consist of mangrove vegetation associated with lagoons and tidal channels which are hemmed in by barrier beaches and old beach ridges (West 1964: 379). The study area is located (Fig. 1) within this coastal formation, southwest of Escuintla (92° 50′W. Long.; 15° 10′N. Lat).

The study focuses on five shell middens that occur within the broad strip of mangrove forest that parallels the shoreline (Fig. 4). The forest is threaded with innumerable small canals and a major waterway which forms the lower reaches of several converging rivers that drain the Sierra Madre Occidental. The major drainage channel of this estuary is interrupted in places by large, shallow lagoons. These are locally called *pampas*. The water regime of the estuary is affected by both tidal action and the volume of fresh water which is carried into it by the river systems. Technically speaking, the mangrove forest formation is within the littoral zone, that is, between the extreme limits of high and low tides. The inundated nature of this region has considerable implications for the local biotic community.

Two types of geomorphic features—beaches and prehistoric middens—provide dry land within the littoral zone. The active

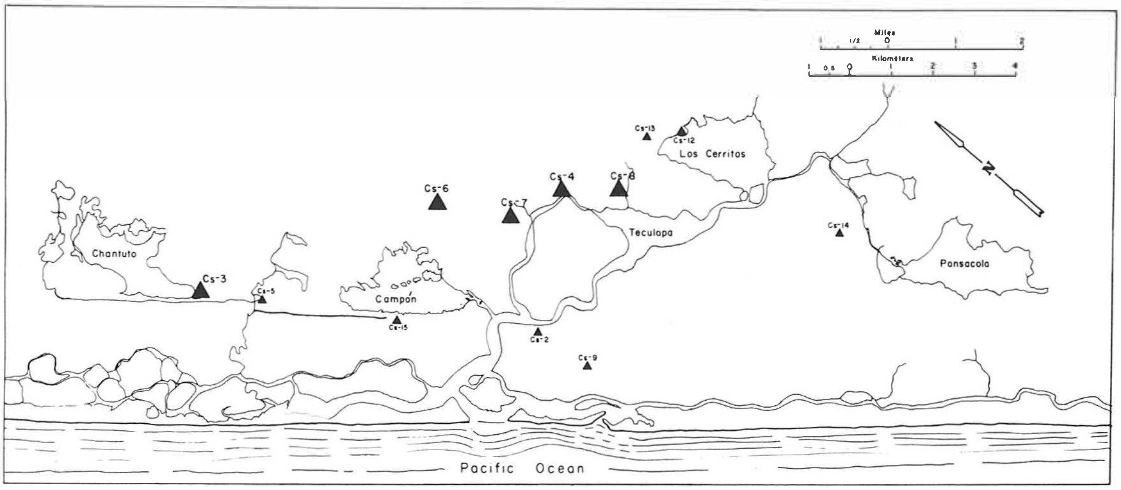


Figure 4. Map of Study Area Showing Archaeological Sites Mentioned in Text
The large triangles indicate shell midden sites with Archaic Period deposits. Other archaeological sites are indicated by small triangles. The modern village of La Palma is located at Site Cs-2.

beach is a narrow strip of unconsolidated sand located at the outermost edge of the shoreline. The landward side of the sandy beach has been invaded by scrub vegetation, which in turn intergrades with mangrove. Remnants of formerly active beaches can be discerned on aerial photographs. These now support scrub and ***madresal*** trees rather than the mangrove vegetation that occurs on less well-drained terrain. The old beaches all lie inland from and parallel to the NW-SE-trending coastline. The most inland of these old beaches is also the most prominent one. It is located approximately 2.75 km inland from the present-day shoreline. This ancient beach provides the dry land upon which the village of La Palma is located (Fig. 5). The few agricultural plots which are farmed by the La Palmans are also located northwest of the village on this same beach ridge.

Prehistoric midden deposits also provide well-drained terrain which is colonized by terrestrial biota. Some of the archaeological sites in the study area are located on one of the ancient beach ridges and are not surrounded by mangrove vegetation. Other sites, including the five shell middens which are studied here, lie inland from the series of ancient beaches. The local people refer to all of these sites as *islonas* and believe that most of them are natural features rather than human artifacts. Some of the mounds are used today as house sites or campsites.

RESOURCE COMMUNITY ZONES

The geographic region which has been described briefly can be more precisely characterized by identifying its component biotic communities and their distributions. Biotic communities are assemblages of populations that live in a prescribed area or physical habitat (Odum 1959: 245). One implication of the fact that each community is defined as having a unique assemblage of species is that each must have a unique food potential for human consumers.

Coe and Flannery (1967), in a previous study of a prehistoric population of the Pacific Coast, have demonstrated the archaeological productivity that results from considering community zones. Many of the zones described by them for the Ocós region are also present in the Chantuto region. In the following discussion of individual communities I rely heavily on this published material. It should be noted that Coe and Flannery use the term *microenvironment* to refer to the same concept that I designate *community zone*. I prefer to avoid using *microenviron-*

ment in this sense because its meaning is not consistent with that established within ecology. In the ecological literature the term *microenvironment* refers to certain environmental variations that occur within a single community (Odum 1959: 139–43). Ecologists, for example, distinguish microenvironmental variations in temperature, humidity and other factors, which correlate with height above soil surface, or degree of exposure to the sun's radiation.

It is important to recognize that the community associations distinguished here are merely convenient categories designed to convey to the reader the diversity of Chantuto resources. Boundaries between adjoining zones are often hard to recognize because of their intergraded nature. Nevertheless, the zones consist of actual biotic associations that are distinguishable from one another. They are defined principally on the basis of floristic composition and potential for human utilization.

The distribution of zones within the study area forms a mosaic pattern (Fig. 2). This distribution, however, is not completely random; it tends toward a regular series of geographic belts from the sea landward. Zonation of communities is a common feature of many, but not all, mangrove swamps (*see* Bowman 1917; Thom 1967; West 1956). In the Chantuto area the zonation is neither simple nor regular. The pattern that emerges (Fig. 2) from the sea landward is

1. a shallow water marine zone,
2. a series of discontinuous sand beaches interrupted by inlets and estuaries,
3. a mangrove forest interrupted by large expanses of cattail swamps,
4. a *madresalar* formation (a type of mangrove), and
5. a mixed tropical-seasonal forest which is interrupted by tropical savanna and old-field formations.

I will now discuss these communities.

Figure 5. Waterfront Scene at the Village of La Palma
The village has been built on an inactive beach ridge.

Shallow Water Marine

This zone comprises that part of the neritic (nearshore) zone which lies between the low tide line and the continental shelf (*see* Odum 1959: 334–35 for a discussion of zonation in the sea). It is the zone of shallow water overlying the continental shelf that can be optimally utilized by fishermen working from small boats. I made few direct observations of this zone, because, among other reasons, village life at La Palma is focused on the estuary rather than the marine environment. The study area falls within the Central American Oceanic region (Hubbs and Roden 1964: 161–65). This oceanic belt is greatly influenced by winds blowing from both the Pacific and the Atlantic. The strong offshore winds from the Atlantic have the most influence during the dry season. Mean tidal range for this section of the Central American Oceanic region is approximately 1.9 m (Hubbs and Roden 1964: 166). The shore that lies within the study area is exposed and usually lashed by heavy surf; sea surface is generally rough.

The marine life of the Middle American Pacific Coast is classed as Panamanian. The Panamanian biota extends from northern South America to southern Mexico (Hubbs and Roden 1964: 175). This tropical biota is fairly uniform throughout the region except that the rocky shore fauna are discontinuous due to a long section of the coastline where this habitat is absent. The study area is within this section of depositional shoreline and therefore lacks the component of the Panamanian fauna which requires rocky shores.

Beach Sand and Low Beach Scrub

The beach forms a narrow ridge that is directly exposed to the pounding surf at its outer edge. The beach sand is unconsolidated and shifting along the strand. The most important food items for humans are invertebrates that live burrowed in the sand, and eggs of the green sea turtle. The invertebrates include crabs, perhaps the same ones that are found in the Ocós area (Spanish: *chichimeco*, *nazereno*), sand dabs (Spanish: *chiquirines*), snails, and clams. All of these invertebrates are collected by La Palmans during their occasional visits to the beach; they are boiled together to make a tasty but sandy shellfish stew. The chiquirines and sea turtle eggs are collected in large quantities as a specialized activity and are exported to the mainland.

The beach ridge is vegetated by scrub on its inland side. This strand formation consists of plants that are adapted for edaphic aridity. The community also includes animals noted for the Ocós area including the locally named *iguana rayada* (*Ctenosaura similis*), armadillo (*Dasypus novecinctus*), and the green sea turtle (*Chelonia mydas*) (Coe and Flannery 1967: 11).

Mangrove Forest

A mangrove forest formation occurs in a linear zone which is parallel to the coastline. A similar forest has been described by Thom (1967); Rützler (1969) describes the ecology of a mangrove community. The zone attains a maximum width of approximately 8 km within the study area. This distribution is critically determined by the limits of tidal action.

Two species of trees dominate this biotic community. Both are called mangroves because of their ability to tolerate inundated and saline soils. The stilt-rooted red mangrove (*Rhizophora mangle*) occurs as the major species in large single-species stands (Fig. 6). The white mangrove (*Laguncularia racemosa*), which has pneumatophores rather than stilts, occurs particularly at the edges of channels and mixed with red mangroves (Fig. 7).

All of the fauna described for the Ocós mangrove forests are believed to also occur in the Chantuto Zone. Termites, crabs, raccoons, anteaters, and porcupines are all present, but I did not make positive species identifications of any of these animals.

Herbaceous Swamp

This zone occurs close to and often surrounded by mangrove forest formations. It consists of a single major plant species — the cattail. Cattails thrive in shallow, still water. They sometimes occur around the edges of the

Figure 6. A Homogeneous Stand of Red Mangroves (*Rhizophora mangle*)

open-water pampas. Some of the areas of cattail swamp appear to have been lagoons in the recent past. It is possible that the cattail is the first stage in the succession from open water to mangrove formation.

Herbaceous swamps are not described for the Ocós region. In the Chantuto area they provide food for many of the migrant and resident bird species. In addition, a kind of turtle, locally called *casquito*, lives among the rushes.

Madresalar

This formation tends to occur in the study area wherever the soil is relatively well drained and highly saline. Such areas are found on the low-lying old beaches and in a broad zone located inland from the previously described mangrove formation and seaward of the tropical forest-cleared field zone. The vegetation is almost a pure stand of black mangroves known locally as *madresal* (*Avicennia nitida*). Madresal cannot tolerate continuously flooded soils as do the white and red mangroves. Instead its limits are determined by the presence of seasonal floods. In the dry season it is possible to walk freely through this forest formation, as it lacks dense undergrowth.

Coe and Flannery (1967: 13-14) mention crabs, whitetail deer (*Odocoileus virginianus*), the black ground-iguana (*Ctenosaura similis*), jaguarundi (*Felis yagouaroundi*), and mice as present in this community.

Tropical Savanna

This zone is similar to that described by Coe and Flannery (1967: 15-16). It is a seasonal swamp formation dominated by coarse grass and isolated palms (Spanish: *marachan*). In the study area tropical savanna formations

Figure 7. A Stand of White Mangroves (*Laguncularia racemosa*)

are found between madresalar and the mixed tropical forest formations.

Coe and Flannery (1967: 15) mention that this formation is a favored habitat for many water birds, rabbits, and rodents. Cottontail rabbit (*Sylvilagus floridanus*), gray fox (*Urocyon cinereoargenteus*), and coati (*Nasua narica*) are typically found here. Peccary, tapir, and cayman may have formerly inhabited this region before they were hunted to extinction.

Forest and Field Systems

The madresal formation intergrades on its landward side with a deciduous forest formation. This formation has two stories and reaches a height of approximately 12 m (Wagner 1964: 249). It is replaced by a three-storied semideciduous formation characterized by *Ceiba* and guanacaste (*Enterolobium cyclocarpum*) wherever soils are deep. Deep soils are frequently found along rivers in the Pacific coastal zone. The floristic compositions of these formations are described by Miranda (1952) and Wagner (1964).

Seasonal forest formations ring the lower slopes of the prehistoric shell middens. They are prevented from invading the summits of the middens by frequent burning of the vegetation by the local people. *Manaca* palms are selectively maintained because their leaves are valued for thatch.

Many animals typically inhabit the seasonal forest habitat. Coe and Flannery (1967) mention the kinkajou (*Potos flavus*), tepescuintli (*Cuniculus paca*), jaguar (*Felis onca*), termites, and mosquitoes. In the Chantuto area we observed jaguar tracks, iguanas, various insects, and crabs in the semiforested habitat of the middens.

Much of the forest formation has been removed by humans who use the land for agricultural and other purposes. Agricultural plots are typically abandoned after a short period of farming so that the regional landscape presents a mosaic of plots in all stages including cleared fields, old fields, and tropical forest formations. These communities can be considered as an intergraded series because species have overlapping habitats and boundaries are often difficult to define. The pocket gopher, *tuza* (*Orthogeomys grandis*), seeks out cornfields as a favored habitat.

In the Ocós area a beginning date of 1500 B.C. is suggested (Coe and Flannery 1967: 15) for these environments caused by human activity. This date is a reasonable minimal estimated time for the beginning of agriculture in the Chantuto area.

Marine Estuary and Lagoon System

This zone includes the brackish water portion of the estuarine system that extends inland from the active beach for a seasonally variable distance. The maximum distance occurs in the dry season when the inland boundary coincides with that of the madresalar formation. During the wet season the zone contracts in extent as the inland boundary shifts seaward.

The fauna of this community is similar to that of the Ocós region (Coe and Flannery 1967: 11). The fish that inhabit the estuary-lagoon system are relatively varied and abundant. Unfortunately the faunal assemblage was not systematically studied during this research project. I did secure specimens of some fishes to aid in the identification of the archaeological fish remains. These fish were caught with hook and handline by a boy who was fishing from a canoe in the canal in front of the village. The specimens were prepared in the field either by drying the whole fish or by skeletinizing them. The prepared fish specimens were identified by Elizabeth S. Wing (Table 2) and subsequently used for identification of the excavated faunal remains.

I observed four types of mollusks: oyster, mussel, snail, and marsh clam, in the estuary. Oysters (*Ostrea columbiensis*) and mussels (*Mytella falcata*) were found attached to mangrove roots in a zone near the active beach. The snail (*Cerithidea* sp.) occupies mudflats that occur along the middle reaches of the estuary, whereas the marsh clam (*Neocyrena ordinaria*) lives in the mud in shallow water lagoons (*see* Appendix II).

The casquito turtle (*Kinosternon cruentatum*) is often seen in the water; crocodiles were reportedly present in the recent past.

Table 2. IDENTIFICATIONS OF FISH SPECIME S CAUGHT IN THE ESTUARY NEAR LA PALMA JANUARY-MARCH 1973

Specimens were Caught with a Hook and Line by a Boy Fishing from a Dugout Canoe. Identifications were Made by Elizabeth S. Wing.

Local Name	Scientific Name
Armado	*Lepisosteus* sp.
Bagre	Ariidae
Chopa	*Anisotremus* sp.
Dentón	*Lutjanus* sp.
Huitle	*Centropomus* sp.
Jurel	*Caranx*, cf. *C. marginatus*
Liseta	*Muqil*, cf. *M. setosus*
Mapache	*Haemulon* sp.
María juela	*Centropomus* sp.
Meche	*Lutjanus* sp.
Mojarra	*Cichlasoma* sp.
	Eugerres sp.
Pargo	*Lutjanus* sp.
Peji caite	*Paralichthys* sp.
Pes aquja	*Strongylura* sp.
Piuela	*Gobiomorus* sp.
Ratón	*Micropogon* cf. *M. altipinnis*
Robalo	*Centropomus* sp.
Sambuco	Eleotridae
Sapatera	*Chaetodipterus zonatus*
Sierra	cf. Scombridae
Vieja	Eleotridae

Some shrimp can always be found in the estuary system; they reach a peak in frequency from December through May. The life history of shrimp and its effect on village life is discussed in the following section.

COMMUNITY PERIODICITIES

The mangrove-estuarine community is subject to seasonal periodicities. These cyclic events could have had major effects on the habits of the Chantuto people. In addition it is possible that a knowledge of periodicities in the present-day ecosystem will aid in the reconstruction of the ecology of prehistoric people. For these reasons I will sketch the major community periodicities in the present-day environment.

Odum (1959: 277) has pointed out that an understanding of community periodicity requires understanding of the periodicities of each plant and animal as well as the factors controlling them. This goal will not be attainable in the present report, but a significant start can be made by outlining the major periodic events in the abiotic and biotic components of the environment. Detailed studies of control mechanisms have not been made in the present investigation.

Considering only the abiotic component of the ecosystem, the most pronounced periodicity is that of the water regime. The Chantuto Zone is located within the tropics where a regular seasonal difference in rainfall is common. The wet and dry seasons in the Chantuto Zone are distinct. Rain falls almost daily during the mid-March to mid-October rainy season (Fig. 8), whereas almost no rain occurs during the dry season. The second major seasonal periodicity is related to the first — the seasonal variation in salinity within the estuary. Salinity changes also occur in daily and monthly cycles but the seasonal changes are the most extreme and enduring ones. During the rainy season the freshwater influx increases, thus lowering the salinity throughout the estuary system. In the dry season the salinity increases. Probably the salinity of the estuary remains near that of adjacent marine waters because the estuary communicates freely with the sea.

Periodicities in the physical features of the environment affect those of populations. There are many kinds of periodicities within the Chantuto ecosystem, but this discussion is restricted to seasonal periodicities that either 1) directly affect the food supply of the La Palmans, or 2) significantly alter the food-chain pattern and volume of biomass in the zone (and thus have the potential of affecting the food supply of a resident human population). The periodicities are diagrammatically shown in Figure 8. The periodicities of populations will be discussed by groups.

Reptiles

Two kinds of reptiles — turtles and iguanas — are collected for food by inhabitants of the Chantuto Zone. Most of these animals continuously inhabit the zone, but their availability and desirability for food is seasonal.

Local informants mention four distinct types of turtles regularly found in the Chan-

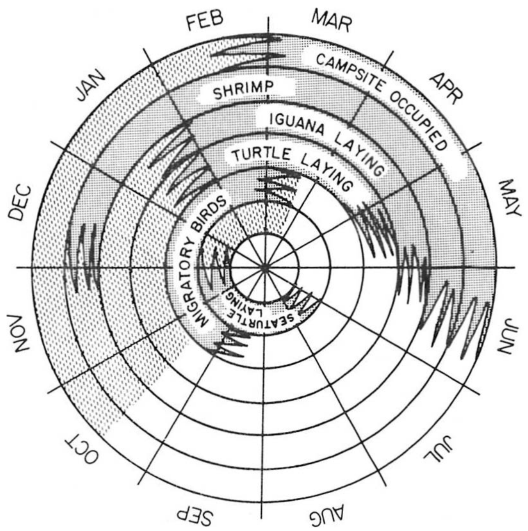


Figure 8. GRAPH OF COMMUNITY PERIODICITIES IN THE CHANTUTO STUDY AREA THAT ARE DISCUSSED IN THE TEXT
These are the times when migratory birds and shrimp are abundant in the study areas, three types of reptiles are nesting, and people occupy temporary campsites. The dry season period is indicated by broken-line stippling.

tuto Zone. The turtle locally called *casquito* is probably *Kinosternon cruentatum*, whose habitat includes the brackish water swamps (Alvarez del Toro 1972: 18). The turtle locally known as *cruzalluchi* is *Staurotypus salvinii*, whose habitat includes swamps and fresh water (Alvarez del Toro 1972: 23). The *tortuga de río* is probably *Chrysemys grayi*, a species that lives in lakes and freshwater rivers with slow currents (Alvarez del Toro 1972: 25). *Tortuga de campo* is probably *Rhinoclemys pulcherrima*, a terrestrial species whose distribution includes the Chiapas Coast (Alvarez del Toro 1972: 27). The first three turtles mentioned are definitely preyed on by humans, and the last may also be a food item.

The two kinds of turtles that are most energetically collected in the zone are the *casquito* and *tortuga de río*. *Casquito* usually lives in the water and the cattail reeds where lack of visibility makes it relatively safe from human predators. During the laying season the females move out of the safe regions and onto well-drained land. In the field area laying occurs during March and April (Alvarez del Toro 1972: 20; pers. obs.). At this time La Palmans burn the nesting sites (which are often found on prehistoric mounds) in order to find turtles as well as their eggs. This procurement pattern may have considerable time depth in the study area (*see* section entitled "Reconstruction of Prehistoric Social Systems: Excavations and Dating"). The *tortuga de río* can also be gathered at any time of the year, but it is most easily collected during the nesting season. This occurs between February and April (Alvarez del Toro 1972: 25).

Cruzalluchi and *tortuga de campo* play a lesser role in the present-day economy of La Palmans than do the two turtles just discussed. Their laying periods are unknown to me.

The sea turtle, locally called *parlama (Chelone mydas)*, is a rare visitor to the Chantuto Zone. Populations of this species have been seriously reduced during historic times (Ehrenfeld 1974) so that the *parlama* may have been a greater potential food item for prehistoric residents of the Chantuto Zone compared with the present-day situation. Usually this turtle inhabits the near-shore marine zone in grazing areas often far from breeding sites. During its laying season it seeks beaches above the high-tide strandline. Laying occurs between July and December, but most takes place from August to October (Alvarez del Toro 1972: 13; pers. obs.). Both the eggs and the meat of this animal are highly prized as food.

The collection of iguanas is also seasonal in frequency. The green iguana (*Iguana iguana*; the male is called *garrobo*) usually inhabits trees or water where its capture is difficult. The eggs are highly valued by humans as food and this animal is hunted relentlessly during the laying season between February and May (Alvarez del Toro 1972: 61; pers. obs.). *Ctenosaura similis* is also valued for its meat and eggs, but I do not know when laying occurs in the Chantuto area.

In summary, present-day inhabitants of the Chantuto Zone collect local reptiles more frequently during February through April than at other times of the year. This period coincides with the end of the dry season and the onset of the wet season. If, on the other hand, the sea turtle were of economic significance at any time in the prehistoric past, the period of collection would have occurred at the end of the wet season and the beginning of the dry season.

Crustacea

Any visitor to La Palma quickly discovers that periodicities in the life history of shrimp have a profound influence on village life. Periodically schools of shrimp come into the estuarine-lagoon system and by their presence greatly increase the volume of biomass in that ecosystem. The economy of the La Palma villagers is closely tied to this event. Details of the life history of these shrimp are difficult to obtain, however, because most accessible literature on shrimp biology deals only with Gulf Coast populations, particularly the commercial species *Penaeus setiferus*. Fortunately, shrimp species of the Pacific tend to be the same as those of the Atlantic and in general all peneids have similar life histories (Lindner and Anderson 1954: 457).

A female shrimp emits her eggs directly into the sea. In the process of emission the eggs are fertilized. When the eggs hatch, the young are in their first larval stage, which is followed by several other larval stages. Either at the last larval stage or shortly thereafter the young shrimp move into the estuaries. They remain in these nursery grounds for several months while they feed and grow rapidly. Gradually they move back to the sea where they finish their life cycles as adults.

The major shrimp migration begins in the Chantuto Zone in early December. It continues until approximately the end of June. Some shrimp are found in the estuarine waters at all times of the year, but the quantity dramatically increases during the period mentioned. I do not know whether several different species are involved in this cycle.

Birds

The avifauna of the study area are incredibly varied and abundant. These birds exhibit many types of periodicities, some of which may be important to humans. I restrict the present discussion to the most striking periodic event of the area's avifauna — the seasonal presence of migratory waterfowl (Anseriformes).

The seasonal presence of the anseriformes in a community can have potentially great impact on a resident human population because humans can prey on these birds. If a human population actually consumes migratory birds, their seasonal presence can provide a large input of energy into the human population. Binford (1968) emphasized the potential of this source of food as a precondition for the social evolution which resulted in the Archaic Period of the New World and the Mesolithic Period of the Old World.

The study area is located within the westernmost of four flyways which have been recognized for migratory waterfowl in North America (Leopold 1959). Flyways are the routes that connect the breeding grounds in the northern part of North America with the wintering grounds in the southern part of the continent. The westernmost flyway follows the coastline of the Pacific. Wintering grounds along this route occur in lagoons from northern California to northern Nicaragua. The southernmost wintering ground, which includes the study area, is a continuous strip along the coast from the Gulf of Tehuantepec to the Gulf of Fonseca.

The numbers of migratory waterfowl in the wintering grounds are remarkably large. Even in modern times, when game birds are rigorously hunted and suffer from habitat loss, the flocks are impressive in size. The 1952 waterfowl survey, for example, counted 27,040 migratory ducks in the Chiapas Coast from Pijijiapan to the Guatemalan border (Leopold 1959: 137).

The migration schedules are not well known for any migrant species that reaches the Chiapas Coast, nor has any detailed study of waterfowl migrations been made in the area of investigation. A general outline of migrations emerges from Leopold's (1959) work. Alvarez del Toro (1971) contributes much useful information on migratory waterfowl in Chiapas but does not discuss schedules. Eight species are listed by both authors as seasonal

Table 3. APPROXIMATE SCHEDULES OF MIGRATORY WATERFOWL ALONG THE CHIAPAS COAST Derived from Leopold (1959).

Earlier Arrivals	Later Arrivals
Blue-winged teal (*Anas discors*)	Gadwall (*Anas strepera*)
Cinnamon teal (*Anas cyanoptera*)	Baldpate (*Mareca americana*)
Shoveler (*Spatula clypeata*)	Green-winged teal (*Anas carolinensis*)
Pintail (*Anas acuta*)	Lesser scaup (*Aythya affinis*)

inhabitants of the Chiapas Coast. In general these birds are locally present from late September through February. Apparently, however, some species arrive earlier than others in most parts of Mexico (Table 3), perhaps including the study area.

The blue-winged and cinnamon teals, the pintail, and the shoveler possibly reach the Chiapas Coast as early as September/October. Somewhat later, perhaps in October/November, the green-winged teal, gadwall, pintail, and baldpate arrive. All of these ducks are in the Chiapas coastal area from December through January. Departures are less well studied than arrivals, but most migrants have departed the Chantuto Zone by March (pers. obs.).

Alvarez del Toro mentions three additional species of migrant waterfowl on the Chiapas Coast which are not discussed by Leopold. These are ruddy duck (*Oxyura jamaicencis*), masked duck (*O. dominica*), and ringnecked duck (*Aythya collaris*). Alvarez del Toro gives no specific information on the migration schedules of these species.

In summary, migrant game birds are seasonally present in the study area for approximately six months of the year, from September to March. All migrants are probably coresident during December and January.

Fish

Seasonal periodicities presumably occur within the fish populations but they have been little studied. Perhaps the most significant changes are variations in fish distributions controlled by seasonal changes in salinity within the estuary. As described earlier, the salinity gradient of the estuary fluctuates in such a way that the inland limit of marine conditions shifts seaward during the wet season and landward during the dry season. Fishes with narrow limits of tolerance for salinity content would also tend to shift their ranges in a corresponding manner.

Most fishes found in the lagoons and estuary are probably marine forms that can tolerate relatively wide salinity conditions (euryhaline). José Luis Castro-Aguirre (pers. comm.) mentions *Caranx*, *Centropomus*, *Diapterus*, *Encinostomus*, *Eugerres*, and *Gerres*, as well as "several gobies, sleepers and flatfishes" as euryhaline forms. These fishes are probably found in the estuary throughout the year and their individual ranges may not be greatly affected by annual salinity changes. Marine stenohaline forms (which tolerate a relatively narrow salinity range) probably move seaward during the rainy season so that the position of their maximum landward limits will vary throughout the annual cycle. Some of these forms may move out of the estuary entirely during the rainy season. Marine stenohaline fishes include *Anisotremus*, *Cetengraulis*, *Chaetodipterus*, *Opisthonema*, and some species of *Anchoa* and *Lutjanus*.

Some secondary freshwater fishes also inhabit the estuary. Among these are *Astyanax*, *Cichlasoma*, *Poecilia*, and *Poeciliopsis*. Although the maximum seaward limits of these fishes may vary in conjunction with seasonal salinity changes, this does not mean that these fishes actually migrate out of the estuary.

In summary, the periodicities of the fish component of the ecosystem apparently involve annual shifts of ranges within the littoral zone. Dramatic periodicities that might be reflected in the stratigraphic sections have not been identified.

People

The inhabitants of La Palma exhibit a seasonal periodicity in residence location and patterns of subsistence procurement that is in phase with the presence of young shrimp in the estuary-lagoon system. Shrimp are the single most important species of the region for the economy of La Palma, and their yearly arrival in the inland waters triggers a prompt response by their human predators. At first men switch from fishing to shrimping. The men operate in two-man partnerships. Each set of partners must have a throw net, a pole, a paddle, and a dugout canoe. During the shrimp season the crews leave the village in the predawn or even earlier when the moon is full. When they reach the desired area the bowman poles or paddles the canoe, stern foremost. His partner stands on a platform at the stern and casts a circular draw net into the water. The captured shrimp are dumped from the net into the closest section of the compartmented canoe. The day's catch is often immediately bought by women entrepreneurs who boil the shrimp on the village beach. The cooked shrimp are drained, packed in large baskets, and promptly shipped inland.

As the shrimp season progresses the animals become larger and bring a higher price in the market. Between March and May many villagers, especially the men, occupy campsites that are near one of the shrimp-rich lagoons. Most people from La Palma camp at the mouth of Chantuto on the prehistoric midden Cs-3. Another large camp is located at the mouth of lagoon Pansacola, but most occupants come from villages other than La Palma (Fig. 9). The people at Chantuto seasonally rebuild the temporary shelters that remain from the previous season. These are simply thatched roofs supported by poles. Pole benches and sleeping platforms serve as the necessary furniture. Clay platforms raised on pole supports serve as hearths (fogóns). Drinking water is secured from a nearby spring.

The shrimpers work the Chantuto lagoon in their usual fashion. The catch, however, is more thoroughly dried after boiling than is usual at the village. The shrimp are spread on straw mats and dried in the sun before packing. They are also winnowed to remove their antennae and other fragile appendages. The more thorough drying is required because of

Figure 9. A Temporary Shrimper's Camp at the Mouth of Lagoon Pansacola

the increased length of time between harvest and arrival at inland markets.

Not all encampments in the area are bases for the collection of shrimp. I observed two separate camps which were built by people who were dependent on fishing rather than shrimping. Both camps were constructed in the mangrove forest on soggy ground which became completely flooded during the rainy season. One of these camps consisted of a single structure inhabited by a nuclear family for approximately two months (February-March). This family worked as an economically independent unit and were not members of the village fishing cooperative. The second camp had several flimsy structures and seemed to be occupied by men only. This camp was located along the "banks" of Río Arriba, above the inland limit of noticeable brackish water but within the mangrove biotope. I suspect that this location is optimal for securing gar pike (*Lepisosteus*). The fishing camps are utilized only during the dry season. My observations, furthermore, suggest that they may be occupied prior to the occupation of shrimp camps. The fishermen seem to switch to the collection of shrimp when rising prices make that a more economical occupation.

Periodicities in the seasonal cycle of the village of La Palma involve a major population shift from the village site to encampments. The major shift involves a large proportion of the total population and takes place between March and May when people relocate at the mouth of the Chantuto lagoon. Small groups of people may regularly move out of the village to campsites some months prior to the shrimp season in order to be closer to the fishing grounds. These moves coincide with the latter part of the dry season and the first part of the wet season.

Summary

The periodicities in the effective environment of the Chantuto Zone have been described. A significant observation is that although each species has an individual timetable of biomass fluctuation, there appears to be a tendency for all to peak during the latter part of the dry season and the early part of the wet season. Thus, if the Chantuto people were seasonal occupants of the zone, the period of time coinciding with the end of the dry season and the onset of the wet season might be the most auspicious period of the annual cycle for their presence within the swamp.

It is important to recognize that this tropical ecosystem does not undergo the radical seasonal alterations found in many temperate ecosystems. In higher latitudes a periodic shift occurs between a season characterized by activity in autotrophic organisms and a season characterized by active heterotrophic organisms. The seasons are markedly different, and the periodicities of species are simultaneously in phase. In the mangrove estuary system many organisms do not undergo major seasonal periodicities and those that do may not be as strictly in phase with one another as in other types of ecosystems. These circumstances pose problems in interpreting the archeological data.

LIMITING FACTORS

It is sometimes possible to isolate a few ecological factors that critically limit the size (or density) of a biotic population. That is, even though many factors combine to determine population size, only a few may be particularly important in this regard.

In the Chantuto Zone two such limiting factors for humans are apparent. The first is water. This is paradoxical for such a water-rich environment, yet the fact remains that water for consumption is a scarce resource throughout the year.

The villagers at La Palma need water for consumption and for washing. Water for washing clothes and for bathing is obtained in the dry season from shallow (1-2 m) wells. The wells are located behind the houses (which usually face the canal) where they have been dug into the sand of the old beach upon which the village is situated. A single household may exclusively use one well but it is common to find several households with kinship ties sharing a single well. The wells are not shored up and tend to collapse readily.

It is my impression that new wells are dug every dry season after the wet season interim of disuse.

The water obtained from the wells is slightly brackish and considered unfit to drink. The wells, nevertheless, serve an important function. Almost every morning women take the laundry to the wells and hand scrub it on raised wooden trays. In the afternoon people bathe modestly in thatched enclosures near the wells.

In the wet season the village canal becomes less saline than in the dry season. Washing is then done on the beach. The inexhaustible supply of water makes laundry a less arduous task than in the dry season. All the villagers bathe in the canal at this time of year.

Drinking water is never obtained from the estuary but always from freshwater rivers at the inland edge of the mangrove forest. This water is brought by canoe to the village. A few households have access to an outboard motor and steel drum containers but most households do not have these items. Those without must paddle an ordinary compartmented dugout to the water source, fill the low compartment with the water, and paddle back again to the village. One village man sells his services for this task. The relatively high cost of water probably contributes to the high consumption of bottled soft drinks and beer.

Scarcity of agricultural lands is a second limiting factor on the human population. Most residents of La Palma fish and shrimp rather than farm. The seafood catch is exported to inland markets, and agricultural products are imported to the zone. Beans, rice, and maize are imported in bulk. Tomatoes, potatoes, onions, cabbage, and a few other vegetables are brought into the village in small quantities and are eaten as side dishes. Fruit is generally scarce but mango, coconut, and avocado trees grow in the village.

There are few vegetable gardens near the houses, although flowers and sometimes herbs are grown. Some agricultural plots are present on the ancient beach ridge east of the village and also south of Lagoon Campón. Sugar cane, corn, and rice are the major crops.

One wet season milpa that I visited in September of 1974 had squash, watermelon, sesame and cucumber plants intermixed with the maize. The maize was partially harvested. Two crops are grown annually: *el temporal* from the May planting to beginning of the harvest in August, and *el segundo* from the September planting to the beginning of harvest in November.

There is some land along the beach ridge that has not been farmed in recent memory and appears suitable for this purpose. That is, the farming niche has not been fully exploited in the Chantuto area. Nevertheless, the potentially farmable land is scarce in the littoral zone. This factor effectively limits population size to that supportable by the fishing industry.

ECOLOGICAL ANALYSIS

The mangrove-estuary environment, despite much bad press (for example, Catesby 1731 cited in Bowman 1917) can best be considered as a potentially favorable habitat for humans. There are several reasons for this. These reasons involve particular characteristic features of the ecological community such as 1) the species structure, 2) the density of component populations, and 3) the effect of faunal migrations.

The characteristic species structure and population densities of the mangrove-estuary community indicate that this is an example of an ecotone (*see* Odum 1959: 278), that is, it is a transitional community located between adjoining communities. Communities described as ecotones often contain organisms present in adjoining communities as well as organisms characteristic of the ecotone. The number of species and some population densities are often greater in an ecotone than in the adjoining communities. Increased species diversity and density have an effect on the total community and thus, of course, on most component populations. Humans can potentially benefit from ecotonal environments.

In the mangrove-estuarine environment many typically terrestrial biota are interlinked in the food web with typically marine biota. This community forms a narrow belt located between marine and terrestrial communities. The marine species intergrade with terrestrial ones in a vertical as well as in a horizontal direction. In fact, a regular zonation of biota occurs in both directions. If the community is viewed in a horizontal section normal to the coastline, a regular series of organisms occurs with marine biota at the seaward end and terrestrial biota at the landward end. A vertical section through the community also reveals zonation in the biota with the treetops supporting fully terrestrial species and the tree bases supporting medio-littoral species (Rützler 1969: 533).

In addition to its unusual combination of species, the mangrove-estuarine community is distinguished by exceptionally high population densities in some organisms. Dense populations are possible because this ecosystem as a whole has a higher primary productivity than most other ecosystems. Primary productivity refers to the rate at which energy is stored in the form of organic substances (Odum 1959: 68). Usually the faster that green plants can store energy, the more energy will be available for circulation through the community. Lagoons tend generally to be more productive than either marine water or fresh water (Odum 1959: 75). Accordingly the high primary productivity of estuarine lagoons permits a high population density of herbivores and the organisms that are supported by them.

Another characteristic feature of estuarine environments is the occurrence of faunal migrations. The importance for humans of the faunal movements to and from tropical estuaries has often been overlooked despite the fact that other faunal migrations have been the focus of much interest. Archaeologists in particular have been impressed by the fact that some saltwater fishes go to fresh water to spawn. This is particularly true of some temperate species. This type of life cycle is called anadromous (*see* Myers 1949 for a discussion of terms for fish migrations). Binford (1968) has proposed that human sedentary life leading to domestication may have been facilitated by changes in the environments in the northern latitudes at the end of the Pleistocene Epoch. These changes increased the extent of habitats for anadromous fishes and migratory waterfowl compared with the size of the same habitats during the Pleistocene Epoch. In Binford's view the humans who were linked in the food web to these animals were consequently enabled to develop a localized, sedentary residence pattern. This development may in turn have facilitated the human tendency to aggregate other organisms that eventually became true domesticates, although Binford himself proposes a different mechanism leading to plant domestication.

In the tropics where anadromous species are lacking, many estuarine species go to the sea to spawn. This life cycle is referred to as pseudocatadromous. This cyclical phenomenon has important implications for organisms, including humans, in the mangrove-estuarine ecosystem. Periodically there is an influx of young animals which remain in the community until they are mature enough to return to the coastal waters. Their presence in the littoral environment significantly increases the biomass of the ecosystem and affects the direction as well as the volume of flow of energy throughout the system.

I propose that the role of pseudocatadromous species in the tropics is similar to that proposed by Binford for anadromous species in temperate areas. That is, expansion of habitats for pseudocatadromous species may have permitted increased human sedentarism. This in turn may have favored modification of human procurement systems in a way that ultimately led to the domestication of certain other species. The postulated expansion of habitats would have occurred at the end of the Pleistocene Epoch when sea level began to transgress from its former stabilized position, marked by the edge of the continental shelf, to a landward direction over the shelf. The transgression would have increased the aerial extent of estuarine habitats and thus the habitats for species such as shrimp that require quiet waters with low salinities during their life cycles, as well as for other species such as migratory waterfowl.

Whether this proposed environmental change had the postulated effect on human groups remains untested at the present time.

RECONSTRUCTION OF PREHISTORIC SOCIAL SYSTEMS: EXCAVATIONS AND DATING

EXCAVATIONS

Methods

The field research portion of this project was carried out during the first three months of 1973. I also returned briefly to the field area in August 1973 in order to enlarge one of the previously excavated test pits. The results of this work are discussed under the section entitled Tlacuachero, Cs-7. My initial research design was to determine as quickly as possible whether each of three previously untested middens had an aceramic component as had been reported for two additional middens. I planned to accomplish this by arranging for three crews simultaneously to dig control pits at each site, but transportation problems rendered this plan impractical. Accordingly, it was necessary for the entire crew to work together at each of the sites. The goal was to maximize both the utilization of personnel and the area dug without jeopardizing the accuracy of data collection.

At the end of the field season we had tested each of the three previously untested sites. One square pit, 3 m on a side, penetrated Cs-8. Two square pits, each 2 m on a side, penetrated Cs-7, and three pits, each 2 m on a side, penetrated Cs-6.

The variations in pit size and number resulted from practical considerations in the field. The number of pits dug at sites Cs-7 and Cs-6 was determined by the number of project personnel available to oversee the excavations. At the beginning of the project, only two of us had had previous field experience so the first site excavated, Cs-7, was limited to two test pits. The second site studied, Cs-6, was penetrated by three pits because one project member had gained sufficient experience to direct his own excavations. Cs-8 was the last site studied and was the highest mound of the three. Time limitations were a crucial factor in my decision to concentrate on only one test excavation at this site. I also enlarged the standard pit size to 3 m on a side because I anticipated that the excavation would be unusually deep.

The test pits at Cs-6 and Cs-7 were selected in the following manner. A sampling grid of 2 m squares was generated for each site. The grid was quartered by bisecting the mound with axes oriented to the cardinal directions. Three grid units were randomly selected from each quadrant. In this manner 12 possible locations were selected for each site.

These possible pit locations were then field checked. Usually, the first selected grid unit for each quadrant was retained unless it proved to be located in a spot that made excavation difficult or impossible. This occurred, for example, when one selected grid unit was located under a large tree that had been felled in preparation for the manufacture of a dugout canoe. When the first chosen grid unit had to be rejected, the second grid location was considered, and so on. This method generated four possible pits per site. The final pits were arbitrarily chosen from the four randomly selected ones.

The above procedure for selecting pits was not carried out for Cs-8. Instead, a pit was placed on the highest portion of the site, 9 m east of the datum point.

The grids were numbered according to the position of the northeast corner in relation to the site coordinates. Units along the coordinates were numbered consecutively starting from zero. For example, pit N0E2 was located zero grid units north and two grid units east of the datum point. This means that the NE stake of the pit was located on the east axis, 4 m (1 grid unit = 2 m on a side) from the datum point.

All pits were excavated in arbitrary levels of 20 cm measured vertically from the ground level at the NE stake. In a few cases digging by arbitrary levels was temporarily suspended and natural levels were dug in order to solve specific problems generated by the stratigraphy. All excavated material was screened through a 0.5 cm square mesh. This procedure resulted in the recovery of many bones and artifacts which would otherwise have been missed. For one pit at each site the marsh clam shell retained by the screens was subsequently weighed. These data can be used to compute clam biomass.

At the end of each pit excavation the field crew collected a series of midden deposit samples from a vertical section along one wall. These samples were blocks each measuring 10.0 cm on a side. Each sample was taken from the lower half of one of the 20-cm artificial levels of the test pit. Consecutive levels were sampled in all pits excepting N3E3, where alternate levels were sampled. The material to be sampled was blocked out with a 10-cm hand scale and was scooped into a bucket with a knife or trowel. The extracted sample was then hauled to the surface and immediately bagged. These samples were used for studies of pollen and shell sizes. The results of these studies are valuable for the reconstruction of prehistoric diet (*see* section entitled "Reconstruction of Paleoenvironments and Effective Ecosystems").

Stratigraphy

The vertical sections were similar in all pits. Two stratigraphic units separated by an erosional contact comprised the major features of each section. In the following discussion I will briefly describe the stratigraphy of each of the five test pits. Figure 10 shows a schematic version of a generalized section based on the measurements at Zapotillo (Cs-8).

Zapotillo, Cs-8. Zapotillo was the last site that was excavated during the 1973 field season. This site was first located and named by me in 1971. It is situated along a canal north of Lagoon Teculapa (Fig. 2). The midden measures 135 × 110 × 11 m (Fig. 11). In plan it is approximately the same size as Tlacuachero but it is 4 m higher.

The single pit at this site, N3E3, was the deepest excavation of the entire season. It reached a depth of 11.6 m before water prevented further digging (Fig. 12). The pit was located on the highest part of the mound slightly northeast of the datum point. The uppermost stratigraphic unit consisted of an unstratified dark brown soil. It contained inclusions of potsherds, shells, obsidian flakes and blades, grinding stone fragments, and a few other objects of human manufacture. Ceramic inclusions were predominately Early Classic Period in age but a possible Early Preclassic fragment and two possible Late Classic fragments were also recovered. The lower contact of this unit varies from 1.3 to 1.9 m below the surface.

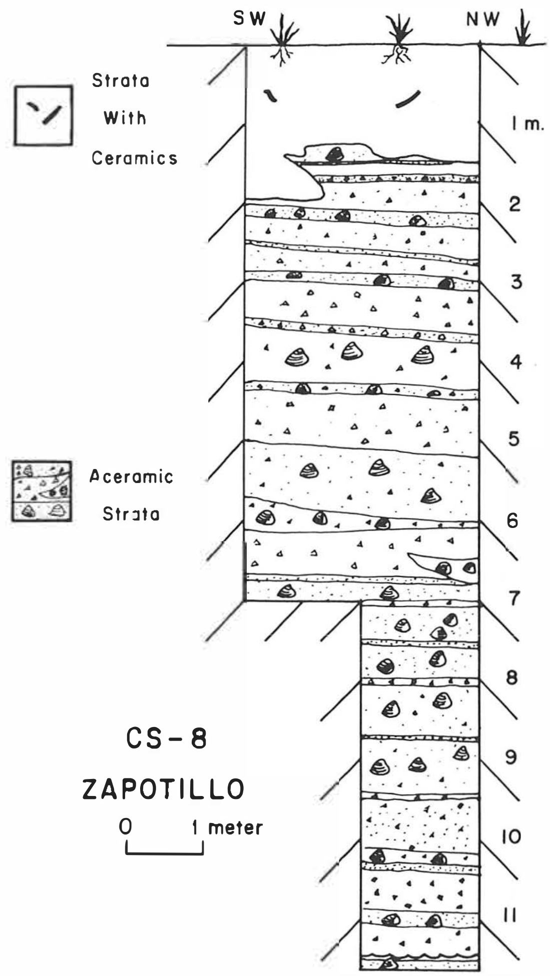


Figure 10. Schematic Section of Stratigraphic Units at N3E3, Cs-8
The strata with ceramics are primarily Early Classic Period deposits. The aceramic strata are dated from the Archaic Period.

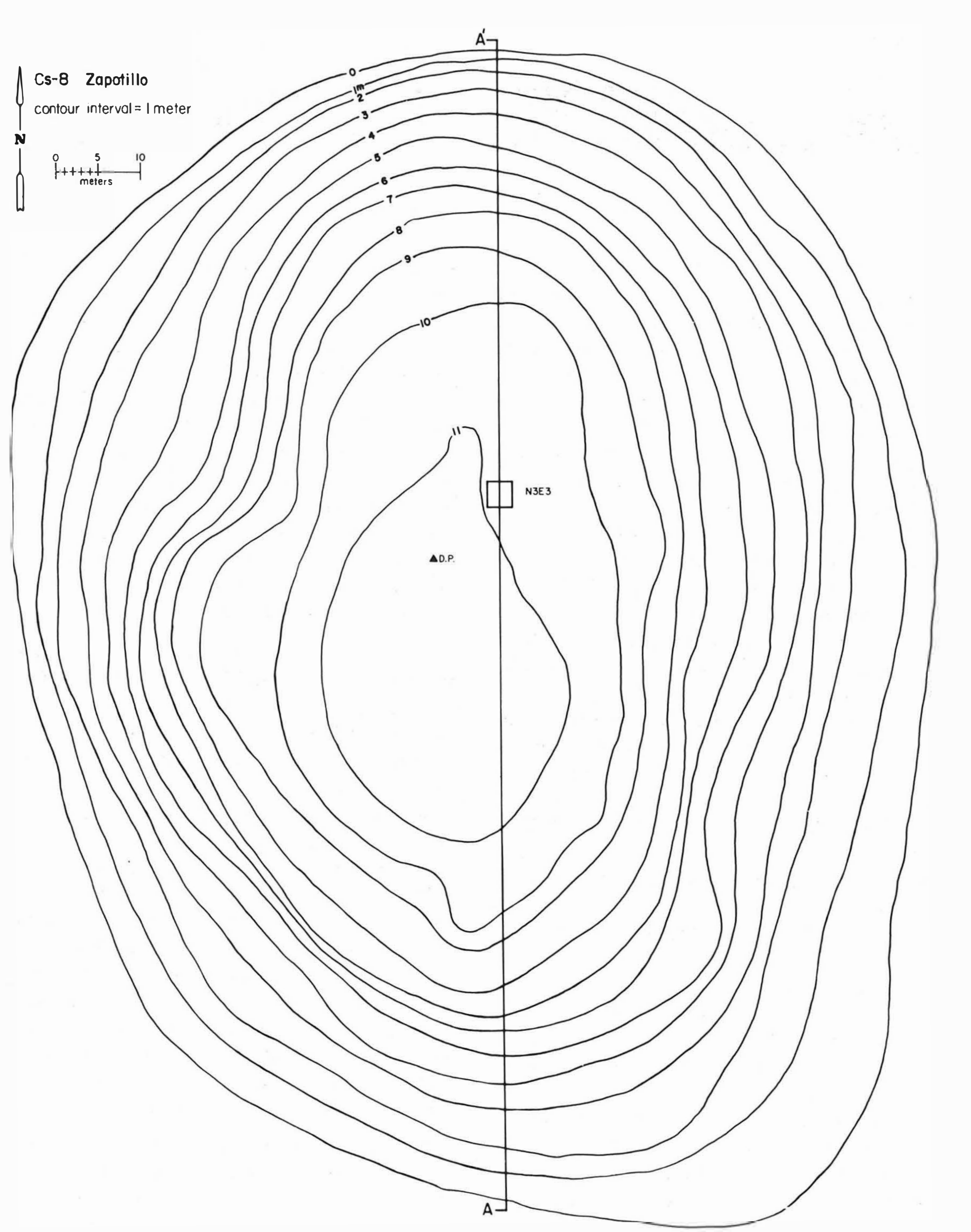


Figure 11. CONTOUR MAP OF SITE Cs-8
The location of test pit N3E3 is indicated. Survey by Eduardo Martínez E.

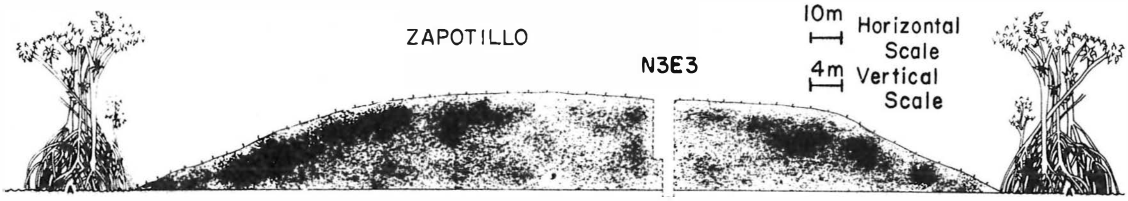


Figure 12. TRANSVERSE SECTION OF SITE Cs-8
The relationship of excavation to height of the mound is shown.

Several human burials were found within this upper stratigraphic unit. Some of these extended to just above the lower contact of this stratum. Three burials were fragmentary and disturbed but may have been secondary burials at the time of deposition. A fourth burial was articulated. The body had been placed in a fetal position with the legs doubled against the chest, and hands drawn behind the ankles. A small zoomorphic pot with plumbate glaze was found inverted over the lower mandible. This pot indicates that the burial was deposited during the Postclassic Period or later.

The lower stratigraphic unit extends from a maximum upper level of 1.3 m below the surface to the bottom of the 11.6 m pit. Its upper contact is an unconformity which was caused by erosion prior to deposition of the uppermost deposits. The lower contact was not exposed. The lower stratigraphic unit is well bedded. It consists of lenses of shell gravel and whole marsh clam shells both mixed with some sand and charcoal fragments. Bedding varies from very thin (1-3 cm) to medium (10–30 cm) (*see* Dunbar and Rodgers 1957: 97). This deposit was largely derived from clam shells.

Very few artifacts were encountered in this formation. Most striking was the absence of ceramic material. Obsidian flakes extended to at least 6.6 m below the surface. There were no special features encountered within the aceramic deposits with the exception of a former pit in the northern portion of the excavation. This feature was between the 6.2 and 6.8 m levels.

Tlacuachero, Cs-7. Tlacuachero was the first site excavated during the 1973 field season. The name was given to the site by Carlos Navarrete, although locally it is referred to as Pechón. It is located inland from La Palma between lagoons Campón and Teculapa. The dimensions of the site are 140 × 128 × 7.0 m (Fig. 13). This site proved to be the most inaccessible of all those excavated during the season. We approached the site from the west, passing first through the Lagoon Campón. It was then necessary to travel through canals and a small, shallow lagoon which contained so little water during low tides that the entire crew had to disembark in order to push the canoe through the mud. Travel time averaged three hours per day.

Two test pit excavations were made into this site during the field season. One, N0E2, was located at the highest part of the site; the other, S16W1, was located in the southwest quadrant in a topographical depression. Both pits were dug to the water table level. We unsuccessfully tried digging S16W1 below the water level with the aid of a water pump that never operated properly. The final depth of S16W1 was 3.40 m below the mound surface, whereas N0E2 was dug to a depth of 7.40 m below the surface. The two excavated areas had similar stratigraphic sections. In both pits a dark brown unstratified soil comprised the upper stratigraphic unit. Subtle color changes and orientation of included shell material indicated that the deposition of the dark brown soil was in part periodic.

The lower contact of the upper stratum varied in N0E2 between 1.00 and 2.10 m below the surface at the NE stake. The underlying unit was eroded prior to deposition of the younger unit. In pit S16W1, the lower contact of the upper stratum lies between 1.25 and 1.95 m below the surface at the NE stake.

This contact is also an unconformity and represents intrusion of overlying strata.

The upper strata in both pits contained a higher frequency of artifacts than the underlying ones. These included potsherds and other artifacts similar to those found within the analogous stratum at Cs-8. Dated sherds from N0E2 included material from the Early Preclassic to Postclassic periods, but sherds from the lower levels (−1.0 to −1.60 m) of S16W1 were exclusively from the Early Classic Period and sherds from the upper levels (−0.2 to −1.0 m) (Appendix I) were from both the Early Classic Period and the Late Classic Period. The underlying stratigraphic unit in both pits was a bedded deposit similar to

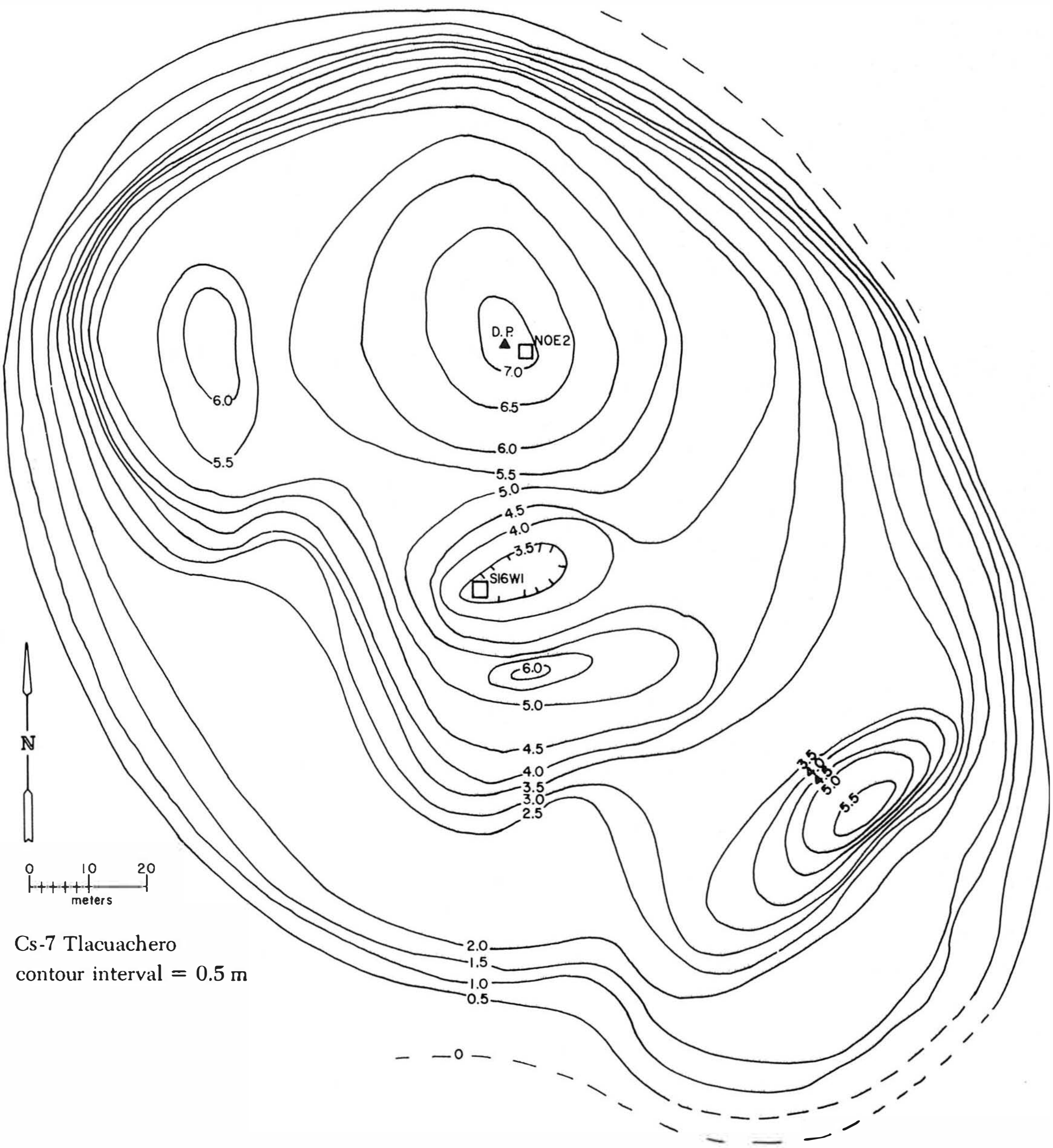


Figure 13. Contour Map of Site Cs-7
The locations of test pits N0E2 and S16W1 are indicated.

that of Cs-8. The lower contact of this unit was not exposed in either pit. Very few artifacts were encountered in this formation as was the case in the equivalent deposit at Cs-8. Ceramic inclusions did not occur. Obsidian flakes were encountered throughout the upper 5.6 m of the excavation at N0E2.

A yellow-orange clay stratum was encountered at 4.5 m below the NE stake. This unique stratum extended over the entire area of the excavation and was 20 cm in thickness. The clay contained minute bone fragments that indicated its primary deposition as canal bottom muck. It was apparently redeposited at the site by human agents. A fragmentary human skeleton was found within this stratum (*see* section entitled "Reconstruction of Paleoenvironments and Effective Ecosystems").

The discovery of the clay stratum led me to hypothesize that it represented a living floor of a house with all the implications of settled village life during an Archaic occupation. During August 1973, I returned to the site with the intention of enlarging the original test pit in order to locate the boundaries of this possible house floor and to seek evidence that tested the hypothesis (no artifacts had yet been found associated with the excavated stratum). The fieldwork took place, however, during the rainy season when the instability of the deposits made my research goal impossible to achieve. I originally planned to excavate two trenches, one due east and one due south of the test pit (Fig. 14). These trenches were to be dug to the upper surface of the clay stratum. The east trench had to be abandoned at approximately 1.80 m because of a major cave-in. Serious cave-ins also occurred in the south trench; despite these hazards digging was continued.

The clay stratum was finally exposed in a N-S strip that extended 4 m south of test pit N0E2. The strip was approximately 80 cm wide although the width was not precisely controlled. The upper surface of the stratum was level and free of artifacts. The layer was 20 cm thick and unstratified. It contained inclusions of molluscan valves and one obsidian flake. The valves were sometimes scorched but more often unburned. Whole valves were frequently oriented with their flat surfaces parallel to the upper surface of the layer. This was particularly true of valves located near the top of the stratum.

Two circular holes were found in the layer at S2E2. They were 20 cm and 24 cm in diameter; the sides of the holes were straight. These features probably mark the former locations of posts that supported either a roof or furniture. No direct evidence of posts was found as the holes contained only midden material which was deposited at the same time as the overlying stratum.

I consider this stratum to be a living floor. The evidence for this conclusion is circumstantial but consistent. There are three primary reasons for this interpretation. First, the stratum is the result of human rather than non-human activity. Second, it strongly resembles contemporary clay floors in the area.

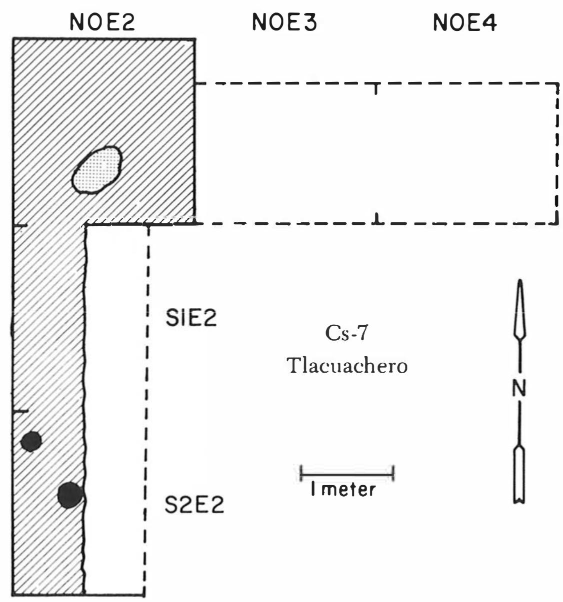


Figure 14. Area of Clay Stratum Exposed at Cs-7
Stratum is indicated by hatched lines. Dark circles represent locations of depressions and stippled area indicates the location of a burial.

Third, a Mesoamerican custom with considerable proven time depth is the placement of burials within a house floor (cf. Tozzer 1941).

As evidence against this interpretation it should be noted that the upper surface of the stratum lacked any debris that might have resulted from the collapse of a former roof.

It has not been possible to fully test the hypothesis that the clay stratum represents a house floor. Further research is required and should be underway by the time this report is published.

In S16W1 several soil color changes suggest the former presence of stakes at depths of 2.0–2.5 m. Obsidian flakes were found to a minimum level of 2.4 m; a hammerstone was discovered at 2.6 m.

Campón, Cs-6. Campón was the second site investigated. This site was visited and mapped by Lorenzo (1955) and his two students in 1953. It was not until the end of the field season that it was possible to reconfirm that the site we had been calling El Castaño, as it is referred to by local inhabitants, was actually that visited by Lorenzo. The confirmation is based on a conversation with an individual who guided Lorenzo to the site. The site is located inland from Campón lagoon and was easily reached by a navigable canal which curves around its base. The site's dimensions are 70 × 80 × 6 m (Fig. 15).

Three pits, 2 m on a side, were excavated. One of these, S1W11, was located on the steep western slope of the site. This pit was dug to a depth of 4.60 m. S1W11 was unusual in that it was located in material apparently dumped in large quantities over the western edge of the mound. The thick bedded strata dipped sharply to the west and contained almost no cultural material. Ceramics were uncovered to −2.2 m. All datable sherds with one exception are Early Classic Period. The exceptional sherd is Early Preclassic Period.

Pit N8W1 was located in the northwest quadrant, near the northern edge of the mound's relatively flat top. It was dug to 6.8 m, that is, below the apparent basal level of the mound. Like all other pits in the present study, the cultural material at N8W1 continued below the lowest level of excavation. Two major stratigraphic units were present in this pit, similar to those described for Zapotillo and Tlacuachero. The upper stratum, which contained ceramics, reached a maximum level of 3.3 m below the surface. Dated sherds were exclusively Early Classic Period. The lower contact was very irregular and indicates much intrusion of the upper stratum into the underlying aceramic unit. Obsidian flakes occurred at least to the 4.6 m level.

Pit N1E9 was located on a small promontory that overlooks the steep eastern slope of the site. It was dug to 6.6 m below the surface. The upper unit, similar to those already described, reached a maximum depth of 3.9 m. Recovered sherds were predominately Early Classic Period. Sherds dated as Early Preclassic, Late Preclassic, and Late Classic were found at various levels in the upper unit. The stratigraphic positions of the sherds reversed the chronological rank order of their cultural affiliations. The lower contact of this unit rests on an erosional surface of the lower deposits. The lower stratigraphic unit resembles those found in all other pits. Obsidian was found to 5.0 m below the surface.

Depositional History

The stratigraphic sections exposed in all three sampled middens (Cs-6, Cs-7, and Cs-8) are similar. This evidence supports the hypothesis that the studied midden sites were deposited under similar conditions. Partial evidence available for Cs-3 and Cs-4 also agrees with this hypothesis. The depositional history of the mounds excavated by me will be discussed in the present section.

Stage 1. According to available evidence, the Chantuto people were the first group to occupy the southern portion of the Chiapas coastal plain. Their living habits resulted in the gradual accretion of five midden deposits composed largely of shells from marsh clams. I was unable to determine what conditions fostered initial occupation at each of the midden sites; no excavation pit in the Chantuto middens reached sterile deposits. In fact, some of the test pits made during the present

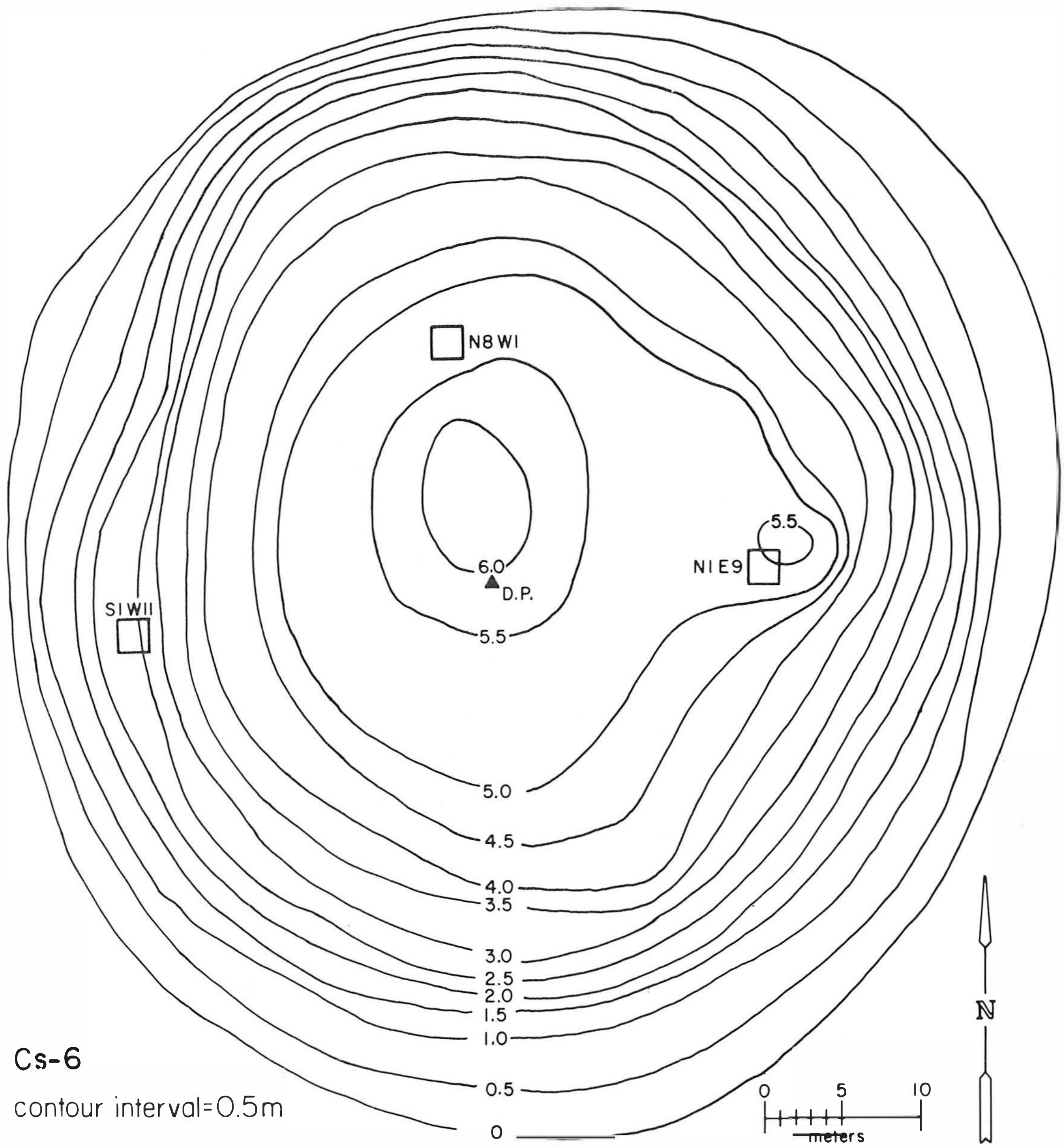


Figure 15. CONTOUR MAP OF SITE Cs-6
Locations of test pits S1W11, N8W1, and N1E9 are indicated. Survey by Eduardo Martínez E.

study continued beneath the apparent basal levels of the mounds without penetrating non-cultural material. In other words, the lower contact of the Chantuto component was never located and extends an unknown depth below the present-day water level.

In view of this lack of evidence I can only consider possible alternatives in the conditions which might have attracted people to the locations that subsequently became middens. Probably these particular locations were chosen because the land was slightly higher than in surrounding areas. This is the critical factor determining the locations of present-day campsites established by fishermen along the banks of canals or lagoons. Coe and Flannery (1967: 20) conclude that the Cuadros people (1000–850 B.C.) of Salinas La Blanca followed the same practice in their similar environment. The Cuadros people appear to have intentionally dumped clay fill on their site in order to enhance drainage. Evidence of fill was uncovered in the Chantuto study only at the location of S1W11, Cs-6, although it is possible such evidence also underlies the sampled deposits. The twentieth century fishing camps are not systematically improved by adding fill. Instead, the inhabitants build shelters that have platform floors of poles which are raised slightly above the soggy soil. The small postholes of S16W1 (Cs-7) could be locations of vertical supports of this type of shelter. According to this line of reasoning the Chantuto people could have initially occupied only slightly raised land which bordered a canal or lagoon and which subsequently became higher through gradual deposition of midden deposits.

The deposits left by the Chantuto people are deep sediments of marsh clam shell mixed with very little other material. The impressive depth of deposits and their regular bedded nature indicates a long and unchanging depositional history. The beds are lenses which must have been formed by superposition of successive shell heaps. The shell gravel is the result of postdepositional crushing probably due to pedestrian traffic.

A single clay stratum was encountered at Cs-7. This was constructed from mud that was probably collected from the bottom of a nearby lagoon. The stratum was carefully leveled and contained a human burial. These meager clues suggest that I discovered a house floor built during the Archaic Period. This possibility has not been fully explored.

Stage 2. This stage consists of a hiatus in time for which no deposition is recorded. Stratigraphically this stage is represented by an erosional surface which forms the upper contact of the Stage 1 deposits. The duration of this period of erosion has not been precisely fixed and presumably differs at each pit location. Its minimum bracketing dates are from the end of the Chantuto Phase (2,000 B.C.) to the beginning of the Barra Phase (estimated at 1600 B.C.).

Stage 3. Except for a small quantity of potsherds dating from earlier phases (*see* Appendix I), the ceramic evidence from the upper strata indicates a significant reoccupation of the sites during Early Classic times. The sediment deposited during this occupation differs significantly from that of the earlier occupation. The non-bedded nature of the uppermost deposits indicates a uniform and continuous mode of deposition. Shell inclusions are much less frequent than in the underlying deposits. The bulk of the upper strata consists of well-sorted fine grain silt. Much of this is probably wind deposited, although other natural and human agents also contributed to the deposition. Chunks of adobe sometimes containing molds of straw were probably once chinking between wall poles of houses.

DATING THE OCCUPATIONS

Methods

Sixteen radiocarbon dates (Table 4) were calculated from samples recovered from the excavations and submitted for analysis. All dates, with one exception, were calculated from analyses of carbonized wood. The exception is a single date run on a shell sample; the same level was also dated by analyzing wood. All of the dated material was from organic inclusions (wood or shell) that were in stratified contexts with associated cultural material. No sample was from a specifically cultural item.

Fifteen of the dated samples were collected from the deposits pertaining to the Chantuto Phase. A single dated sample was collected from the deposits pertaining to the local phase correlate of the Early Classic Period. The submitted samples derive from four test pits representing all three excavated sites.

The radiocarbon analyses were made by two laboratories. The Institute of Physical and Chemical Research (Rikagaku Kenkyusho), Japan, analyzed 13 samples, and the Institute of Geophysics and Planetary Physics, University of California, Los Angeles, analyzed three samples. The UCLA laboratory used the conventional Libby half-life of 5568 years in the calculation of radiocarbon ages. The radiocarbon dates were subsequently converted by me to the 5730-year half-life. The Japanese laboratory presented the dates according to both values for the half-life.

The corrected dates and their ranges were calculated following the procedure advocated by Damon and his coworkers (1974). The correction procedure is necessary to offset errors in accuracy of radiocarbon dates that are due to past variations in the atmospheric inventory of particular elements.

There are three objectives to my interpretation of available dates: 1) to determine the bracketing dates of the Chantuto occupation of the study area, 2) to place the three Chantuto site occupations on the same chronological scale, and 3) to calculate rates of deposition for the Chantuto age deposits in the sampled vertical sections. In order to carry out these objectives it is first necessary to evaluate separately the sequence of dates from each site and pit. The final results of this interpretation are presented in the subsection entitled "Conclusions."

Results

N8W1 and N1E9 at Cs-6. Three dates are available for the Chantuto deposits at Cs-6 (Table 4). The dates agree well with each other; the two dates from N1E9 conform in chronological and stratigraphical rank order and the single date from N8W1 is consistent with them.

The mean dates suggest that the period of occupation at this site was approximately 2650–2490 B.C. A range in sedimentation rates can be calculated for N1E9 using the measured interval between dated samples (2 m) and the differences between mean dates (160 years). The result is that one meter of material was deposited during a time interval of 80 years.

The spatial locations of the pits, the pattern of dates, and the stratigraphic positions of the samples provide some evidence for the topography of the mound at some time in the prehistoric past (Fig. 16). According to these data the NE quadrant of the mound was built up earlier than the NW quadrant of the mound. This result is consistent with the results of an excavation in the SW quadrant of the site (S1W11) where stratigraphic evidence indicates prehistoric dumping of waste material along the western slope of the mound.

N3E3 at Cs-8. Four levels of this vertical section were dated. One level was dated twice, using charcoal once and shell once for the analyses. Analysis of variance (Long and Rippeteau 1974) shows that the five dates are significantly different in age. The two dates from the same level do not agree with each other; the date from the charcoal sample reverses stratigraphic rank order and is dis-

Table 4. Radiocarbon Age Determinations of Analyzed Samples
Dates are presented by stratigraphic rank order per stratigraphic sections.

Sample Number	Provenience		Cultural Association	C^{14} Years B.P. (5730 = T 1/2)	Corrected Date (after Damon et al. 1974)	Corrected Range in years B.C.
N-1601	Cs-6, N8W1,	6.6–6.8	Chantuto Phase	4010 ± 90	4410 ± 130	2330–2590
N-1600	Cs-6, N1E9,	3.4–3.6	Chantuto Phase	4100 ± 90	4530 ± 130	2450–2710
N-1599		5.4–5.6	Chantuto Phase	4170 ± 90	4610 ± 140	2520–2800
1866-A	Cs-8, N3E3,	1.2–1.4	Chantuto Phase	4017 ± 80	4420 ± 120	2350–2590
N-1891-1		8.4–8.6	Chantuto Phase	4080 ± 95	4500 ± 130	2420–2680
N-1891-2 (shell)		8.4–8.6	Chantuto Phase	3820 ± 95	4170 ± 150	2070–2370
N-1594		9.8–10.0	Chantuto Phase	3880 ± 90	4250 ± 130	2170–2430
1866-B		11.0–11.2	Chantuto Phase	4038 ± 80	4450 ± 120	2380–2620
N-1595	Cs-7, N0E2,	1.0–1.2	Early Classic Period	1960 ± 100	1910 ± 110	70 B.C.–A.D. 150
N-1597		2.40–2.45	Chantuto Phase	4140 ± 85	4580 ± 130	2500–2760
N-1598		2.48–2.60	Chantuto Phase	4050 ± 75	4460 ± 120	2390–2630
N-1596		4.6–4.7	Chantuto Phase (clay floor)	4730 ± 75	5300 ± 120	3230–3470
N-1887		5.4–5.6	Chantuto Phase	4480 ± 95	4500 ± 150	2400–2700
N-1888		5.8–6.0	Chantuto Phase	4580 ± 95	5120 ± 150	3020–3320
N-1889		6.4–6.6	Chantuto Phase	4440 ± 95	4950 ± 150	2850–3150
1866-D		6.6–6.8	Chantuto Phase	4326 ± 80	4810 ± 130	2730–2990

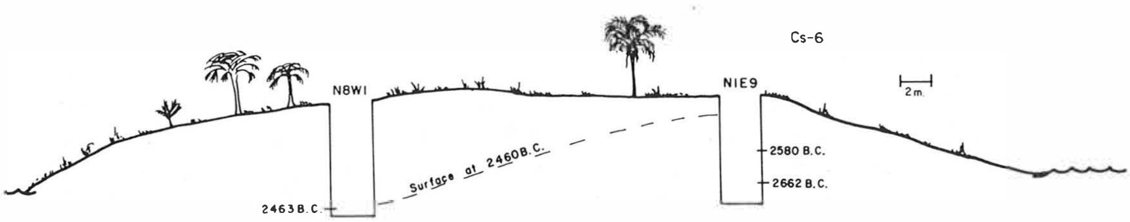


Figure 16. Reconstructed Mound Surface at Cs-6 at Approximately 2460 B.C.
The reconstruction is based on radiocarbon dates available from two test pits.

carded. Stratigraphic rank order is also reversed by the date from the uppermost sample analyzed and it will also be discarded.

The mean dates of the remaining highest and lowest samples of the sequence suggest that the period of occupation at this site was approximately 2500–2220 B.C. These mean dates may not be good estimates of the duration of occupation but they are the best ones available. The rate of sedimentation is calculated from the measured interval between dated samples (2.6 m) and the differences between the means of these dates (280 years). The result is that 1 m of material was deposited in an interval of 108 years.

N0E2 at Cs-7. There are seven radiocarbon dates for the Chantuto Phase sequence at N0E2, Cs-7. Two dates are for two levels above a clay floor, one date is for the clay floor, and four dates are for four levels below the clay floor. The date for the clay floor is earlier than any date for the levels underlying it, and I suspect that old wood from the lagoon bottom was taken up with the clay when the material was obtained for the floor. This date has not been included in the analysis of the radiocarbon dates.

The remaining dates pertain to one or the other of two more or less continuous depositional units separated by the clay floor. In both cases analysis of variance (Long and Rippeteau 1974) as well as stratigraphic rank order reversals (Table 4) indicate that the radiocarbon measuring instrument is too coarse to make reliable distinctions within the depositional units with so small a sample of dates. Accordingly I figured a mean for the two dates for the levels overlying the floor, resulting in 4520 ± 90 years before 1950 as the best estimate for a date within these two levels. For the four dates that underlie the floor (between 5.4 and 6.8 m) figuring the mean yields 4810 ± 130 years before 1950 (using Chauvenet's correction) as a best estimate for a date somewhere within these levels. The best estimate for the time required for the deposition of the sequence is the difference between these dates (290 years) plus an unknown amount representing the difference between my dating of mean points within the lower and upper units and the unknown dates of the extremes of the sequence.

The minimal estimate of the time of occupation of this site is thus 2860–2570 B.C.

Using this best estimate of time of deposition in conjunction with the measured thickness of the dated section (4.2 m) I have calculated the rate of deposition at 69 years per meter of deposits.

Conclusions

The major result of the radiocarbon age determinations from the Chantuto shell middens is that they securely fix the Chantuto occupation within the Archaic Period (7000–1500 B.C.). The occupation occurred during the late Archaic Period, from 3000 B.C. to 2000 B.C. At present these are the earliest dates available for a Mesoamerican coastal dwelling population that has been relatively well studied. This dating places the Chantuto occupation as coeval with known occupations on the Guerrero coast and in the highlands in Puebla, Tamaulipas, and Nuevo Leon (*see* Introduction). The cultural data available for the known highland occupations when taken in combination with data for the lowland population at Chantuto provide a slim but sound basis for the reconstruction of the Mesoamerican social system during the third millenium before Christ (*see* section "Reconstruction of Prehistoric Social Systems: Discussion and Conclusions").

The second set of results permits an evaluation of the contemporaneity of occupations at the three studied sites. On the basis of the available information, Cs-7 with its estimated minimal 2860 B.C. initial date was the first of the three sites to be occupied. Approximately two hundred years later (2650 B.C.) Cs-6 was occupied. Last, Cs-8 was occupied in 2500 B.C., 150 years after the initial occupation of Cs-6 and 360 years after that of Cs-7. At approximately this time Cs-6 was abandoned; Cs-7 had already been abandoned for 70 years. The three sites were thus occupied and subsequently abandoned in the following order from early to late: Cs-7, Cs-6, Cs-8.

The third set of results permits a comparison of rates of sedimentation at the three sites. According to my results the rates of deposition become slower the younger the site occupied. This may relate to a progressive decrease in the importance of the littoral environment for the Chantuto people over time.

The final result concerns the single range of dates (70 B.C.–A.D. 150) available for the Early Classic Period deposits. This result places the occupation earlier than would have been predicted on the basis of cross-site typological comparisons of artifacts. The severely limited evidence concerning the age of the Early Classic occupation in the Chantuto Zone should not be accepted as necessarily accurate.

RECONSTRUCTION OF PALEOENVIRONMENTS AND EFFECTIVE ECOSYSTEMS

In this section I reconstruct the environments and effective ecosystems of the two groups of prehistoric people who occupied the shell midden sites. Thus I am concerned in part with describing the habitats of these two groups of people and in part with their relationships to ecological communities. The discussion deals separately with the faunal and floral components of the ecosystems and with the geomorphology of the region.

FAUNA

The excavation techniques were designed to recover all faunal remains other than those of marsh clams (which were sampled only). Some faunal remains were collected directly from the test pits, whereas small bones and shells were recovered during screening. The collection was sorted in the laboratory into two groups: remains of vertebrate animals and remains of invertebrate animals. The vertebrate remains were subsequently identified by Elizabeth S. Wing and her assistant, Kathie Johnson.[1] Joseph P. E. Morrison,[2] Joseph Rosewater,[3] and Allyn G. Smith[4] each identified some invertebrate shells. In this chapter I will discuss the results of my interpretations of the faunal remains. These results are separately analyzed according to the original two groupings.

Invertebrate Remains

The invertebrate remains that were deposited in the shell middens consist of an astronomical number of shells of marsh clams (*Neocyrena ordinaria* Prime) (Fig. 17) and an extremely small quantity of remains from other species (Tables 5–7). The large volume of the marsh clam shells leaves no doubt that they are the remains of animals that were consumed by the prehistoric peoples. I discuss particular aspects of the predator-prey relationship between humans and clams in the section entitled Marsh Clams.

The small number of shells from non-marsh clam species requires a different approach. It is first necessary to consider whether each type of mollusk actually contributed to the diet of the prehistoric people, served some other function, or was not utilized. After considering this, the reconstructed dietary patterns of molluscan foods can be compared for the two human occupations.

Mollusks other than Marsh Clams and Barnacles. Mollusks and barnacles recovered from the excavations represent three broadly defined habitats (Table 8). The majority of the shellfish types comes from the estuary, but marine and terrestrial species also occur in the middens. None of the marine species has a deep-water habitat requiring special collection skills. Only some of the shellfish types listed are probable food sources. I consider *Orthalicus, Euglandia,* worm tube, barnacle, *Neritina,* and *Sanguinolaria* as doubtful food items.

I consider *Orthalicus* and *Euglandia* doubtful food items because of the ease with which they could have become incorporated in midden deposits without humans as agents of deposition. Both of these snails have a terrestrial habitat. The few *Euglandia* specimens are restricted to the upper 40 cm of the deposits; all *Orthalicus* specimens are from the Early Classic Period or mixed deposits. Hatula Moholy-Nagy (pers. comm.) reports that workmen at Tikal consider this snail to be inedible.

Worm tubes, barnacles, and *Neritina* I consider doubtful food items because of their

1. The Florida State Museum, Department of Natural Sciences.
2. Department of Invertebrate Zoology, National Museum of Natural History, Smithsonian Institution.
3. *See* footnote number 2.
4. Department of Geology, California Academy of Sciences.

Table 5. DISTRIBUTION AND FREQUENCY OF MOLLUSCAN SHELLS, EXCEPTING MARSH CLAM SHELLS, FROM GRIDS N0E2 AND S16W1, SITE Cs-7.

MOLLUSK / LEVEL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	24	25	26	27	28	29	30	31	32	33	34	
Cs-7, N0E2																											
Orthalicus princeps	1	3	4	1	3																						
Cerithidea sp.					1																						
Anadara sp.																											
Agaronia propatula									1																		
Unidentified barnacle																1	3										
Neritina sp.																				1					3	1	
	EARLY CLASSIC PERIOD						"MIXED"					ARCHAIC PERIOD															

MOLLUSK / LEVEL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Cs-7, S16W1															
Anadara sp.		1	2	1											
Cerithidea sp.				1											
Orthalicus princeps			23	6	2	1									
Agaronia propatula		3	8	5	27	9	1	1							
Neritina sp.											8	1	3		
Unidentified barnacle														1	
Unidentified		1					1							1	
	EARLY CLASSIC PERIOD						"MIXED"				ARCHAIC PERIOD				

Table 6. DISTRIBUTION AND FREQUENCY OF MOLLUSCAN SHELLS, EXCEPTING MARSH CLAM SHELLS, FROM GRIDS N8W1, N1E9, AND S1W11, SITE Cs-6.

MOLLUSK / LEVEL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Cs-6, N8W1																											
Cerithidea sp.				1																							
Ostrea columbiensis				2																							
Anadara sp.					1																						
	EARLY CLASSIC PERIOD							"MIXED"										ARCHAIC PERIOD									
Cs-6, N1E9																											
Ostrea columbiensis				1																							
Cerithidea sp.											1																
	EARLY CLASSIC PERIOD													"MIXED"										ARCHAIC PERIOD			
Cs-6, S1W11																											
Euglandina sp.		1																									
Orthalicus princeps		2	1																								
	EARLY CLASSIC PERIOD						"MIXED"					ARCHAIC PERIOD															

small amounts of edible meat and the probability that they were accidentally collected along with other mollusks. Worm tubes attach themselves to oyster shells. The association of worm tubes with *Ostrea* in the archaeological deposits makes it very likely they were introduced into the midden by this means. Barnacles also attach themselves to oysters and clams. They may have been introduced to the deposits along with those shellfish. *Neritina* specimens are small and were found in both stratigraphic units. Empty *Neritina* are common in the mud bottoms of shallow lagoons, and for this reason I believe that most specimens were accidentally collected with marsh clams. This does not explain the high frequency of shells in the Early Classic Period deposits at N3E3, because of the relatively low frequency of marsh clams associated with the same stratum. Perhaps some *Neritina* were eaten in Early Classic times.

Sanguinolaria is probably an edible bivalve, but because only one specimen was recovered it was probably an unimportant contributor to the ancient diet. If not eaten, perhaps the delicate pink shell attracted the eye of some prehistoric beachcomber who brought it back to the midden site.

The remainder of mollusks probably were utilized for food. At least one, *Agaronia propatula*, may have had a double use because fifteen specimens, all from Early Classic deposits, are perforated. These shells apparently were used for ornaments. The *Anadara* specimens may have been used as smoothers as in the Ocós area (Coe and Flannery 1967: 80) but this possibility was not checked. All *Anadara* specimens were from the Early Classic deposits.

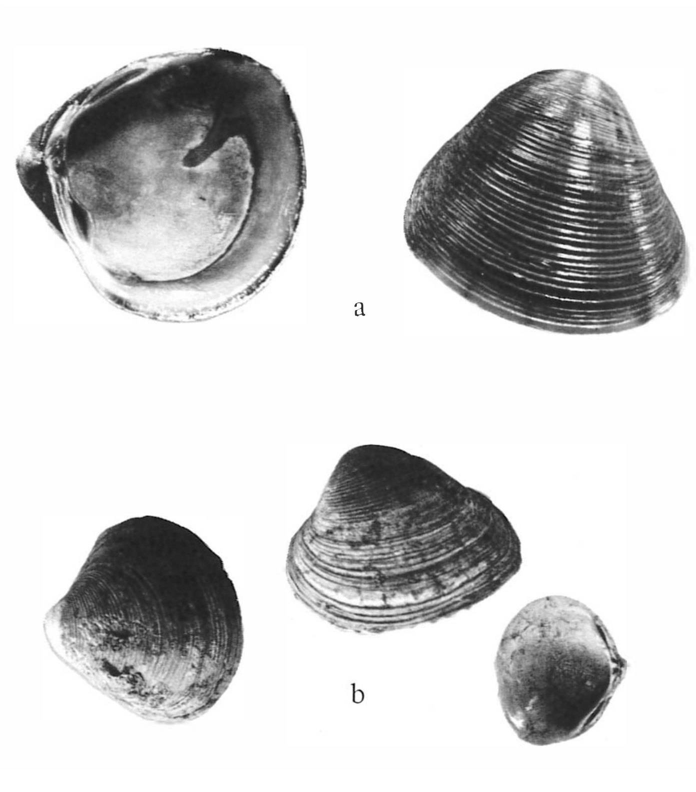


Figure 17. *Neocyrena ordinaria* PRIME SHELLS
a: modern specimens; *b*: archaeological specimens
(natural size)

Table 7. Distribution and Frequency of Molluscan Shells excepting Marsh Clam Shells, from Grid N3E3, Site Cs-8

MOLLUSK Cs-8, N3E3 \ LEVEL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Euglandina sp.	3	3																											
Agaronia propatula	27		46																										
Anadara sp.	1	3	1	2																									
Sanquinolaria bertini			1																										
Natica chemnitzii		5	7	3	4																								
Cerithidea sp.	12	8	40	10	2	6																							
Ostrea columbiensis	14	82	115		48	12	3																						
Orthalicus princeps	5	4	2	1		3	2		1											1									
Unidentified "worm tube"	3	5	8	4	1		1																						
Neritina sp.		50		18	20	38	22	31	33	7	7		1	1	4	3	2	2	21	5	3	2	1	10	2	3	3	7	5
Unidentified barnacle	1	1	3	2	8	2	7	2	2				1			2	1				1	1				1	1	1	
	EARLY CLASSIC PERIOD						"MIXED"			ARCHAIC PERIOD																			

MOLLUSK \ LEVEL	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58
Euglandina sp.																													
Agaronia propatula																													
Andara sp.																													
Sanquinolaria bertini																													
Natica chemnitzii																													
Cerithidea sp.																													
Ostrea columbiensis										1																			
Orthalicus princeps																													
Unidentified "worm tube"							1																						
Nerithina sp.	1	2		3	5	6		2	14	6	8	4	16	1	2	9		6	3	1		3	2			3	2	1	3
Unidentified barnacle				1		2	5	5	1						1					1	1	1							
	ARCHAIC PERIOD																												

The patterns of shellfish utilization for mollusks other than marsh clams and *Crustacea* are significantly different for the Early Classic and Archaic period peoples.

Archaic Period deposits yielded four types of shellfish in addition to marsh clams. None of the four represents a significant food resource. I consider Barnacle, *Neritina*, and *Orthalicus* to be doubtful food sources. *Ostrea* may have been eaten but is represented by only a single specimen. Obviously oysters were not a significant part of the diet of the Chantuto people; instead these people effectively concentrated on a single mollusk — the marsh clam.

The Early Classic people utilized a greater diversity of mollusks from a wider variety of habitats than did the Chantuto people. *Anadara, Cerithidae, Natica, Ostrea,* and possibly *Neritina* were collected from their estuarine habitats. *Agaronia* was dug out of the beach sand. *Orthalicus* may have been collected from trees, although this was not established.

Marsh Clams. The ecological relationship between humans and marsh clams can be reconstructed on the basis of analyses of deposited clam shells. Specifically, three aspects of this relationship are studied here. These are the relative quantity of clam shells deposited over time, the size of individual clams collected over time, and the time of collection during the annual cycle. These aspects of the human-marsh clam relationship permit a partial test of Binford's (1968) hypothesis (described in the section entitled "Present-Day Environment") concerning the forces that triggered the switch by many societies from foraging to horticultural subsistence strategies. Binford's hypothesis predicts that the estuarine-oriented foragers overreached the support capacity of their environment and were thus under pressure to establish a new equilibrium between population needs and available resources. In the present study the test of this hypothesis must be restricted to only one ecological relationship — between the human predator population and the marsh clam prey population — out of the total web of relationships known to have existed between the human population and its environment. This limitation is imposed by the lack of precise data concerning long-term relationships between humans and other populations in the ecological community.

I predict two test implications will be confirmed if disequilibrium occurred in the ecological relationship between humans and marsh clams.

1. Disequilibrium would be indicated by a decline in the amount of human predation on clams. This would occur either because of (a) a decline in available biomass in the clam population, or (b) an alteration of human food preferences. The hypothesis of increasing ecological stress would be supported by evidence for decline in predation on clams toward the end of the Chantuto occupation.
2. Disequilibrium would be indicated by an alteration in the size of clams collected. If the clam population were becoming extinct, the age structure of the population would reflect this change. The hypothesis of increasing ecological stress would be confirmed by evidence for a change in the size of clams collected toward the end of the Chantuto occupation compared with

Table 8. Habitats of Mollusks and Barnacle Recovered from Excavations

	Estuarine Habitats
Anadara tuberculosa	A bivalve that is abundant in mangrove swamps and is an important food mollusk (Keen 1971:44).
Unidentified barnacle	A brackish water barnacle that adheres to hard substrates such as rocks or shells.
Cerithidea sp.	A snail that is common on the mudflats along the edges of estuaries (pers. obs.).
Natica chemnitzii	A moon snail that is found intertidally on mudflats (Keen 1971:473).
Neocyrena ordinaria	A marsh clam found on the bottoms of shallow lagoons (pers. obs.).
Neritina sp. cf. N. (*Theodoxus*) *luteofasciatus*	A snail that is found on the margins of mangrove swamps or on mudflats (Keen 1971: 360). Shells are commonly present in lagoon bottom mud (pers. obs.).
Ostrea columbiensis	An oyster that adheres to rocks and mangroves; common in mangrove swamps (Keen 1971: 82). Found only on mangroves in study area (pers. obs.).
Unidentified worm tube	A worm tube probably from the gastropod family *Vermetidae*. These worms attach themselves to hard substrates. In the study area oyster shells are commonly used for this purpose (pers. obs.).
	Marine Habitats
Agaronia propatula	A gastropod that occurs intertidally in sand (pers. obs.).
Sanguinolaria bertini	A common intertidal bivalve (Keen 1971: 244). Shells can be collected from beach (pers. obs.).
	Terrestrial Habitats
Euglandia sp.	A terrestrial snail (Joseph Rosewater pers. comm.; pers. obs.).
Orthalicus princeps	An arboreal snail (Allyn G. Smith pers. comm.).

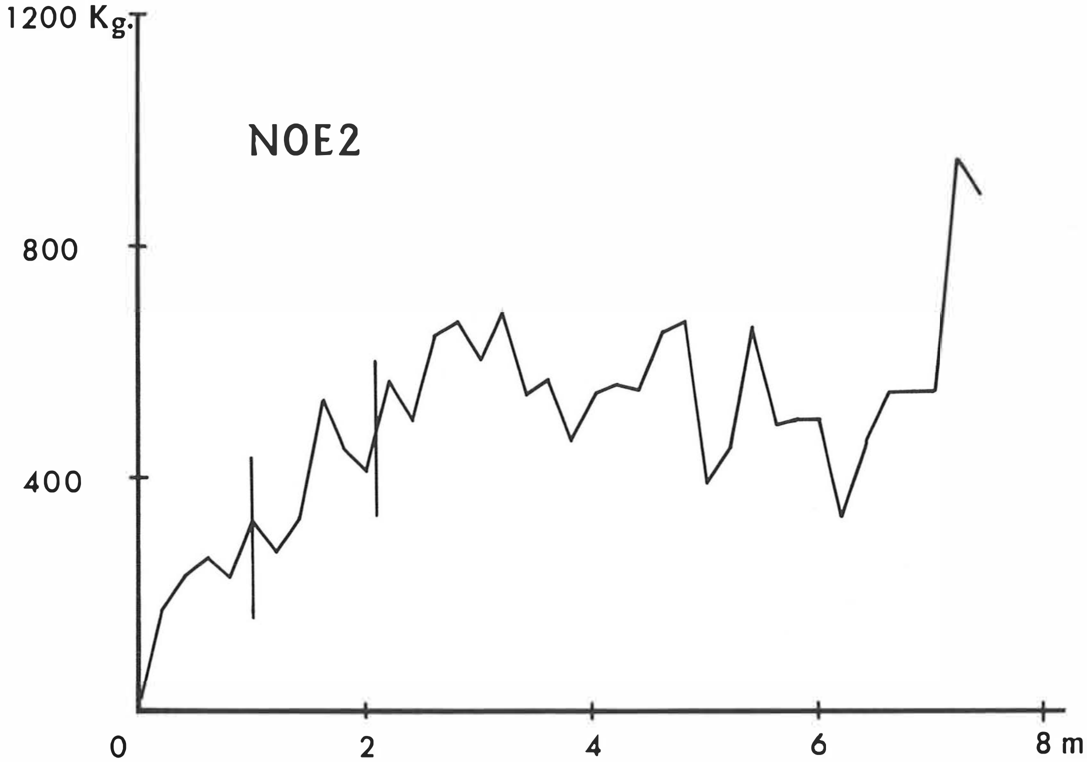


Figure 18. WEIGHT OF MARSH CLAM SHELL PER CUBIC METER OF EXCAVATED MATERIAL AT N0E2, Cs-7
Weighed shell was retained by a screen with a 0.5 sq. cm mesh. Archaic Period deposits occur below the 2.2 m excavation level; Early Classic Period deposits occur above the 1.0 m level.

the size of clams collected at the beginning of the occupation.

As one test of this prediction I have determined the quantity of clam shells in the deposits of three pits each representing a midden site. Shell retained by a screen with a 0.5 sq. cm mesh was weighed for each level. These data were converted to weight of clam shell per cubic meter of excavated material. One of the studied pits, N1E9, Cs-6 is not reported here because the sampled section of Archaic Period deposits is too short to be informative. The remaining pits studied, N0E2 (Fig. 18) and N3E3 (Fig. 19) are reported. In these figures the relevant Archaic deposits are plotted to the right of the right-hand vertical line on each graph. In both graphs the weights of clam shell fluctuate over time. At N0E2 the heaviest weights occur in the two lowermost levels. These measurements are wet weights and are not directly comparable to the remaining measurements. Excluding the wet-weight measurements at N0E2, a regular fluctuating pattern of shell weight emerges with depth. The weight of shell does not decrease significantly in the upper compared with lower levels of the Archaic Period deposits. At pit N3E3 the heaviest weights of shell are recorded for several levels occurring in the upper portion of the stratigraphic section. At the present time I am unable to adequately explain these exceptionally heavy levels but it is significant that the lightest shell weights of the upper section are not significantly lighter than those of the lower section.

The two graphs of shell weights per depth show no decrease in amount of marsh clam deposits toward the top compared with the bottom of marsh clam deposits. Thus the available data do not confirm Binford's hypothesis. The lack of confirmation should not be taken as evidence of disproof of the hypothesis for several reasons. First, the postulated growth of forager populations may have occurred but may not have affected the human-marsh clam connection because of (a) human outmigration from the study area, (b) human substitution of some other food for clam meat, or (c) the clam population's ability to support heavy predation by humans. Second, human predation may have disrupted the marsh clam population but this may not be apparent because of loss of evidence through erosion; the upper contact of the Archaic deposits is erosional. The amount of removed material cannot be determined although indirect evidence such as lack of surface features suggests that it was not great.

As a second test of the prediction I have determined the size of clam shell inclusions sampled in vertical sections at five test pits. The analyzed shells were obtained by the sampling method described in the third section. The whole shell valves were separated from other classes of midden material and the maximum width of each valve was measured to the nearest half centimeter grade size. The data on clam widths and sampled excavation levels were analyzed by George Gregg and Ronald Jeffries[5] who determined the 95 percent confidence interval for the clam size mean of the clam population that was sampled at each level. In the series of graphs (Figs. 20–23) the lines connect the points that are the upper and lower bounds of this confidence interval. The vertical lines separate the Archaic Period deposits which are represented on the right from the Early Classic Period deposits which are represented on the left. According to the prediction, mean clam size will decrease in the upper compared with the lower levels of each section of Archaic deposits. Although regular fluctuations in mean clam size are apparent over time, there is no trend toward decreasing clam size toward the top of the section of Archaic Period deposits. Accordingly the available data do not confirm Binford's hy-

5. Department of Computer Science, University of California, Santa Barbara.

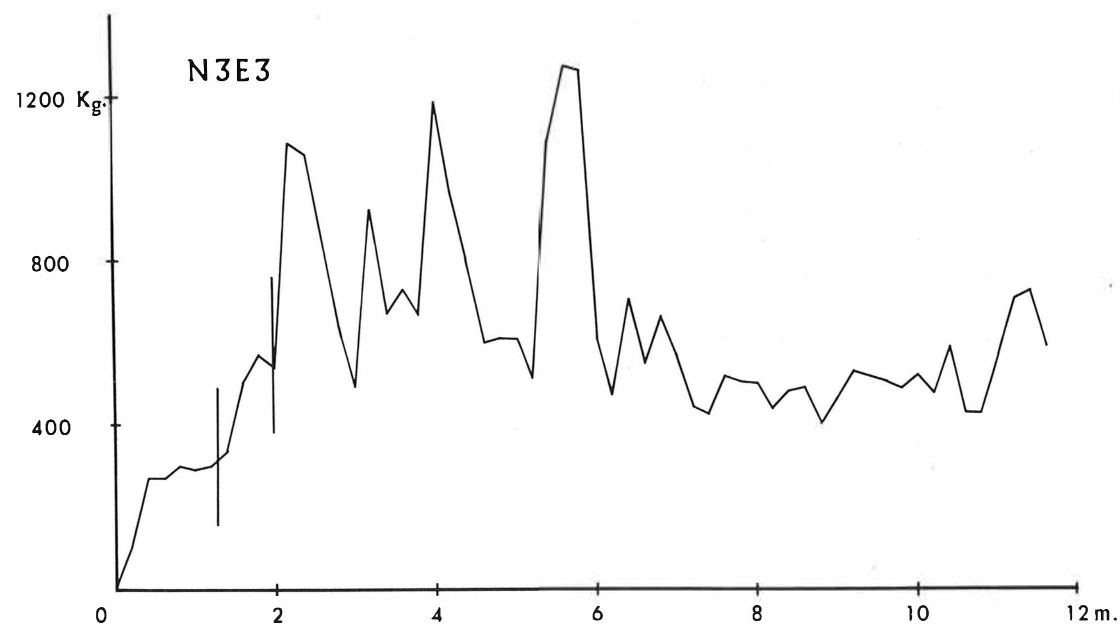


Figure 19. Weight of Marsh Clam Shell per Cubic Meter of Excavated Material at N3E3, Cs-8
Weighed shell was retained by a screen with a 0.5 sq. cm mesh. Archaic Period deposits occur below the 2.0 m excavation level; Early Classic Period deposits occur above the 1.4 m. level.

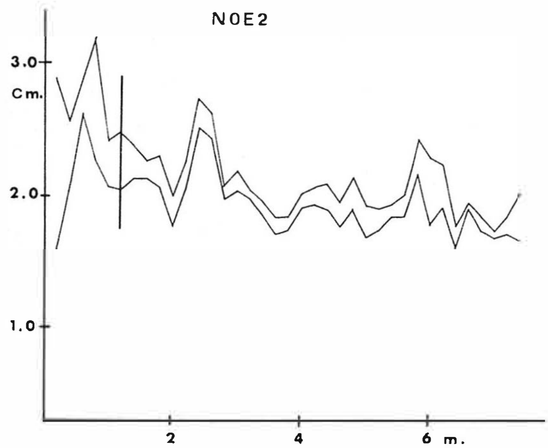


Figure 20. CONFIDENCE INTERVAL FOR THE CLAM SIZE MEAN OF THE POPULATION SAMPLED BY DEPTH AT N0E2, Cs-7

Samples from Early Classic Period deposits are indicated to the left of the vertical line; samples from Archaic Period deposits are indicated to the right of the line.

pothesis. This lack of confirmation does not disprove Binford's hypothesis for the same reasons discussed in reference to shell weight data.

The small number of whole shell valves recovered from the Early Classic Period deposits prevents any meaningful comparison of mean clam shell sizes in the upper levels of the sampled stratigraphic sections.

Shrimp. The economy of the La Palma villagers is substantially based on the collection and exportation of shrimp. In addition, shrimp fishing was a major coastal activity in 1574 according to the incumbent governor of the Soconusco Province, Luis Ponce de León (1961: 138). The ethnographical and historical situations raise the possibility of a similar situation in the prehistoric past. Shrimp remains would not appear to preserve readily in a lowland tropical environment so that the examination of this possibility is difficult. I have tried several methods in an attempt to determine whether the prehistoric people engaged in shrimping.

One method was to examine the biological literature on shrimp in order to determine whether it has readily preservable parts. I discovered that, in fact, some Crustacea maintain their sense of balance by means of small organs called statocysts. These are cavities lined with sensory hairs that contain stone-like structures that move freely within them. The contents of statocysts are called statoliths. Unfortunately, the statoliths of shrimp are not concretions formed by the animal and hence potentially observable in archaeological deposits but instead are sand grains that are incorporated into the body at molting (MacGinitie and MacGinitie 1968: 58).

A second method was to examine soil samples for any particles of shrimp that might have endured. I was particularly looking for rostra, the portions of the exoskeleton that project from the thoracic carapace over the heads of the shrimp. I reasoned that the rostrum might be a particularly durable part of the shrimp because it appeared thicker than some other portions of the exoskeleton. In addition, its characteristic serrated edges would make it distinctive if discovered in the samples. Thirty-six samples from test pit N0E2 were examined without any shrimp remains being recovered.

I was thus unable to discover direct evidence for shrimp harvesting by prehistoric people in the study area. This may be the

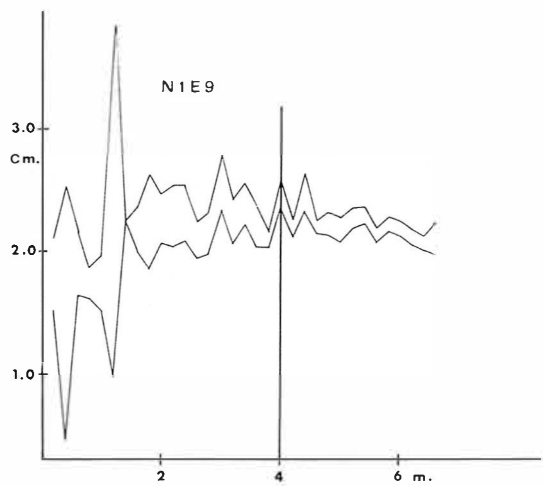


Figure 21. CONFIDENCE INTERVAL FOR THE CLAM SIZE MEAN OF THE POPULATION SAMPLED BY DEPTH AT N1E9, Cs-6

Samples from Early Classic Period deposits are indicated to the left of the vertical line; samples from Archaic Period deposits are indicated to the right of the line.

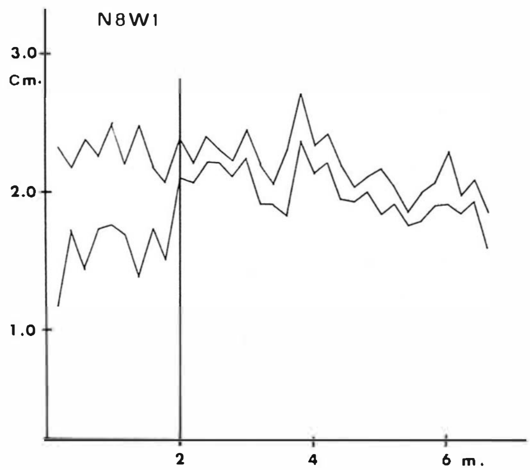


Figure 22. CONFIDENCE INTERVAL FOR THE CLAM SIZE MEAN OF THE POPULATION SAMPLED BY DEPTH AT N8W1, Cs-6
Samples from Early Classic Period deposits are indicated to the left of the vertical line; samples from Archaic Period deposits are indicated to the right of the line.

result of the absence of evidence due to conditions of poor preservation or it may result from the fact that the activity was not practiced. Available indirect evidence suggests to me that this activity was, in fact, practiced. Several lines of reasoning, to be discussed throughout this section, suggest that the primary occupation of the Chantuto people was in the late dry season/early wet season time period and that these people focused their collection activities on the marine estuary and lagoon system. This time and focus coincides with the presence of shrimp in the study area and enhances the possibility that shrimp were also an important food item during the Archaic Period.

Summary. The analysis of invertebrate remains has produced evidence concerning the general nature of effective ecosystems of the two occupations that I am reconstructing from archaeological remains.

The Chantuto people consumed large quantities of marsh clams which they collected from shallow water lagoons. I suggest that they may also have been collecting shrimp from this same zone. The available evidence has been examined to determine whether overexploitation of the clam population developed at the end of the Archaic Period but no evidence supporting this was found.

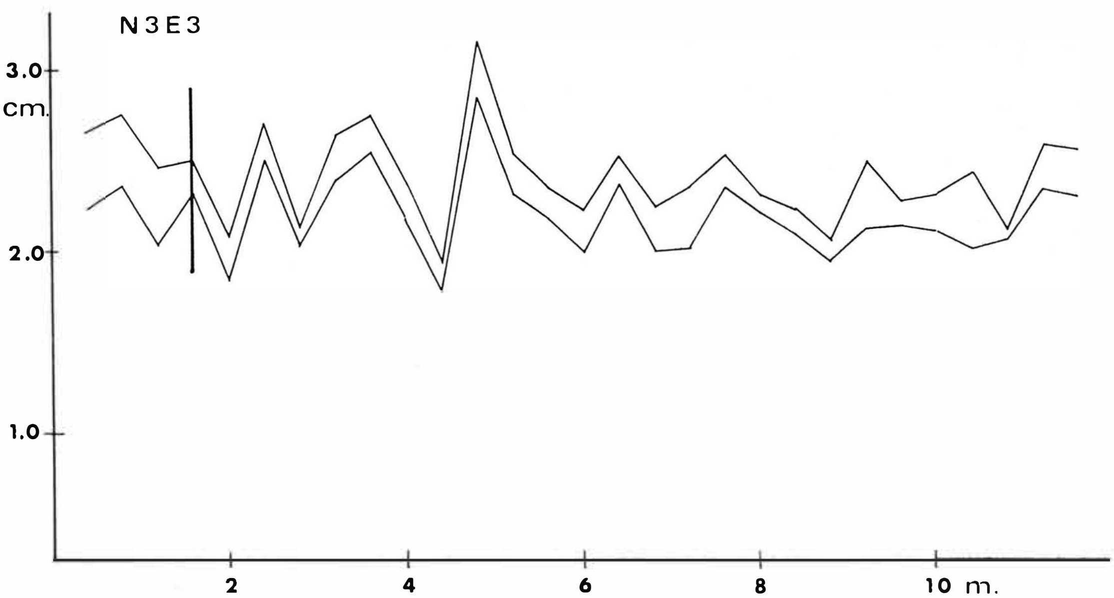


Figure 23. CONFIDENCE INTERVAL FOR THE CLAM SIZE MEAN OF THE POPULATION SAMPLED BY DEPTH AT N3E3, Cs-8
Samples from Early Classic Period deposits are indicated to the left of the vertical line; samples from Archaic Period depsoits are indicated to the right of the line.

The Early Classic Period people consumed a relatively smaller amount of marsh clams than did the Chantuto people. The later people also harvested a few other types of mollusks; although their scarce remains indicate that they were not an important component of the diet in terms of the biomass contributed. Their presence suggests merely that the people were collecting food from a wider variety of biotopes than was indicated by the molluscan remains deposited by the Chantuto people.

Vertebrate Remains

In the present study all non-human bone recovered from the excavated pits is assumed by me to be the residue of food once consumed by the prehistoric human occupants of the sites (*see* Ziegler 1973). This material is reported (Tables 9, 10) for five test pits each located at one of two sites, Cs-6 or Cs-7. The bone recovered from N3E3 at Cs-8 has not yet been studied. Despite this the available evidence permits the reconstruction of part of the prehistoric human subsistence patterns for each of the two occupations at the midden sites. The methods and results used in this reconstruction are discussed below.

Methods. Each bone element was examined by Wing or her assistant Johnson and identified as precisely as possible to the lowest taxon. Some material was completely identified as to genus and species. Other material could be identified only at the family level (e.g. Eleotridae), or to a general class of animals such as "bird." In addition, some material could not be identified in any manner and is reported as unidentified bone.

The amount of faunal material of each animal type is reported for *each component* by Minimum Number of Individuals (MNI) and Weight (Wt.). The percents contributed by each animal type to the totals of MNI and Wt. in each component are also shown. In addition, the Concentration Index (CI), which shows the amount of material per cubic meter of midden, is given for each major habitat group per component. This index corrects for differences in volume of excavated material in compared units (Ziegler 1973: 132–33).

The assignment of animals to habitat groups follows that proposed by Wing (1974; pers. comm.). It is based on an animal's most common, but not necessarily its only, habitat. The habitats are not exactly equivalent to the zones discussed earlier for the field area. The relationship between these two series deserves clarification.

Three of the habitats proposed for the archaeologically known fauna are aquatic. These are fresh water, peripheral and marine. In the present-day environment I have distinguished two aquatic zones: shallow water marine, and marine estuary and lagoon system. As I have already discussed, these zones interconnect with each other and with the freshwater river systems. The aquatic environment thus consists of a medium that grades from greater to lesser concentrations of salt. The position of the marine, peripheral, and freshwater facies relative to the more fixed locations of terrestrial zones fluctuates on a regular, seasonal basis. Accordingly, organisms classed here as freshwater forms would be typically found in the upper reaches of the estuary where fresh water rather than salt water is characteristic. These same forms may be found in the lower reaches of the estuary during the rainy season when freshwater conditions prevail. Peripheral forms are those that are characteristically found in brackish waters and thus are present in some part of the estuary at all times of the year. Marine forms are characteristic of the offshore zone and during the dry season in the lower reaches of the estuary when similar conditions occur there. Thus, if the food remains of a group of prehistoric humans in the study area were to have a preponderance of either freshwater or marine animals, this might indicate either utilization of a particular zone or a seasonal utilization at a specific part of the estuary.

The terrestrial habitat is the fourth one used to categorize the animals whose former presence is reconstructed from archaeological remains. The term is used here inclusively to include a variety of forms such as birds (Accipitridae and Anatidae), dog (*Canis familiaris*), toad (*Bufo* sp.), agouti (*Dasyprocta* *punctata*), snake (*Drymarchon corais* and Viperidae), green iguana (*Iguana iguana*), deer (*Odocoileus virginianus*), and raccoon (*Procyon lotor*). Each of these animals can be found in more than one zone (*see* section entitled "Present-Day Environment" and Coe and Flannery 1967). Some animals, for example Anatidae and toad, are found in aquatic habitats as well as terrestrial ones. Dogs are coresident with humans and generally occur in all habitats in which humans are also found. Raccoons are found in mangrove forests and madresalars. Deer and agouti are species that are restricted to forest and field systems, tropical savannas, and madresalars. The *ratonera* snake (*Drymarchon corais*) is typically found in pine forest habitats (Wing, pers. comm.).

Thus many of the animals classed as terrestrial should not be taken to be indicators of human subsistence procurement in a strictly mainland environment because they can and do enter the swamp. Of the recovered fauna, the best available indicators for a mainland orientation are the *ratonera* snake, deer, and agouti. It is worth noting that other typically mainland species, such as jaguar, peccary, and kinkajou (*see* Coe and Flannery 1967: 13), are not represented in the archaeological remains from the Chantuto sites.

Results. Results of the analysis of faunal remains are presented by habitat in a detailed format (Tables 9, 10) and in summary form (Figs. 24–27). The significance of these results is limited by the small size of the excavations compared with the sizes of mounds, the small sample size, and by the relatively large amount of bone that could not be identified. Despite these limitations, the patterns of food procurement that emerge for each of two components in excavations at the same or different sites are similar. This finding suggests to me that the reported results reflect patterns of actual human food procurement and are not random phenomena.

One set of results compares the relative reliance of Archaic Period (Fig. 24) and Early Classic Period (Fig. 25) peoples on animal food sources obtained from different habitats. Both peoples relied more extensively on freshwater animals than on animals from other habitat groups. That is, freshwater forms are first in rank order of habitats for each of the two studied components. The Chantuto people, however, relied relatively more extensively on freshwater forms than did the Early Classic people, as evidenced by percent of MNI (ave. 62.3% compared with 41.6%) and Wt. (ave. 47.4% compared with 46.0%) of freshwater forms in the total array of material from each component.

The habitats that are second in rank order differ for the two occupations under study. During the Chantuto occupation the second most important habitat group was peripheral aquatic as indicated by both MNI (ave. 26.9%) and Wt. (ave. 13.1%). Thus, the most important zone for procurement of vertebrate food sources during the Archaic Period was the marine estuary and lagoon system where both freshwater and peripheral aquatic forms occur. In contrast, the terrestrial habitat is second in rank order for Early Classic people as indicated by MNI (ave. 32.4%) and Wt. (ave. 21.0%). The reliance on terrestrial forms by Early Classic peoples is almost as great as their reliance on freshwater forms. This shows that mainland savanna, forest and field systems were almost as important as the marine estuary and lagoon system for the procurement of vertebrate food sources during the Early Classic Period.

The terrestrial habitat is third in rank order for the Archaic Period deposits as indicated by MNI (ave. 3.9%) and Wt. (ave. 3.6%). Accordingly, the terrestrial zone was not a highly favored area for food procurement during the Chantuto peoples' occupation of the sites. The peripheral aquatic habitat is third in rank order for the Early Classic Period deposits, as indicated by MNI (ave. 23.6%) and Wt. (ave. 6.3%). The marine habitat ranks fourth in both components as evidenced by MNI (Archaic Period ave. 0.6%; Early Classic Period ave. 1.5%) and Wt. (Archaic Period ave. 0.1%; Early Classic Period ave. 0.5%). The marine zone thus had very minor significance in the food procurement pattern for both peoples under discussion.

Conclusions. The study of remains from

Table 9. DISTRIBUTION OF FAUNAL REMAINS RECOVERED FROM ARCHAIC PERIOD DEPOSITS AT SITES Cs-6 AND Cs-7*

Archaic Component, Cs-6

	N8W1						S1W11						N1E9					
	MNI			Wt.			MNI			Wt.			MNI			Wt.		
	#	%	CI	gms	%	CI	#	%	CI	gms	%	CI	#	%	CI	gms	%	CI
FRESHWATER																		
Chrysemys sp.	1	4		2.3	3.6		—			—			1	2.2		17.5	10.0	
Cichlasoma sp.	3	12		0.5 (1.2)	0.7 (1.8)		—			—			12	26.1		1.8 (0.4)	1.0 (0.2)	
Eleotridae	7	28		4.0	6.2		1	12.5		0.2	0.8		16	34.8		2.1	1.2	
Eleotris sp.	—			—			—			—			—			—		
Gobiomorus sp.	—			—			—			—			1	2.2		0.1	0.1	
Kinosternon sp.	3	12		10.9 (5.3)	17.1 (8.3)		1	12.5		7.9	30.3		3	6.5		29.9 (5.4)	17.1 (3.1)	
Lepisosteus sp.	3	12		3.8	6.0		3	37.5		0.8	2.9		2	4.3		18.7	10.7	
Staurotypus sp.	1	4		0.1	0.2		—			—			1	2.2		1.7 (4.3)	1.0 (2.5)	
Total	18	72	0.9	28.1	43.9	1.6	5	62.5	0.4	8.9	34.0	0.8	36	78.3	3.5	82.0	46.9	7.9
PERIPHERAL																		
Ariidae	3	12		1.0 (1.1)	1.6 (1.7)		—			—			2	4.3		4.4 (1.0)	2.5 (0.6)	
Carcharhinidae	—			—			—			—			—			—		
Centropomus sp.	2	8		2.2 (1.5)	3.5 (2.4)		2	25.0		6.1	23.5		2	4.3		5.0 (1.1)	2.9 (0.8)	
Crocodylus sp.	—			—			—			—			1	2.2		4.1 (0.8)	2.4 (0.5)	
Cynoscion sp.	—			—			1	12.5		0.5	1.9		1	2.2		0.3	0.2	
Eugerres sp.	1	4		0.3	0.5		—			—			—			—		
Lutjanus sp.	—			—			—			—			—			—		
Mugil sp.	—			—			—			—			—			—		
Pristis sp.	—			—			—			—			—			—		
Total	6	24	0.5	6.1	9.7	0.3	3	37.5	0.3	6.6	25.4	0.6	6	13.0	0.6	17.0	9.9	1.6
MARINE																		
Anisotremus sp.	—			—			—			—			—			—		
Caranx sp.	—			—			—			—			—			—		
Chelonia sp.	—			—			—			—			1	2.2		0.2	0.1	
Sphyraena sp.	—			—			—			—			—			—		
Total	0			0.0			0			0			1	2.2	0.1	0.2	0.1	0.0
TERRESTRIAL																		
Accipitridae	—			—			—			—			1	2.2		1.8	1.0	
Anatidae	—			—			—			—			—			—		
Bufo sp.	—			—			—			—			—			—		
Canis sp.	—			—			—			—			—			—		
Dasyprocta sp.	—			—			—			—			—			—		
Didelphis sp.	—			—			—			—			—			—		
Drymarchon sp.	—			—			—			—			—			—		
Iguanidae	—			—			—			—			1	2.2		0.8	0.5	
Odocoileus sp.	—			—			—			—			—			—		
Procyon sp.	—			—			—			—			—			—		
Viperidae	—			—			—			—			—			—		
Total	0			0			0			0			2	4.4	0.2	2.6	1.5	0.3
UNIDENTIFIED																		
fish	—			22.7	35.6		—			6.1	23.3		—			51.2	29.3	
mammal	—			—			—			—			—			—		
reptile	—			—			—			—			—			—		
snake	—			—			—			—			—			—		
turtle	—			6.0	9.4		—			1.6	6.2		—			12.4	7.1	
rodent	1	4		0.1	0.2		—			—			1	2.2		0.2	0.1	
bird	—			—			—			—			—			—		
bone	—			0.7	1.1		—			2.9	11.2		—			9.3	5.4	
Total	1	4	0.1	29.5	46.3	1.7	0			10.6	40.7	0.9	1	2.2	0.1	73.1	41.8	7.0
Grand Total	25	100.0	1.5	63.7	99.9	3.6	8	100.0	0.7	26.1	100.1	2.3	46	100.1	4.5	171.9	100.2	16.8

Table 9. Continued.

Archaic Component, Cs-7

	N0E2						S16W1						Average for 5 pits					
	MNI			Wt.			MNI			Wt.			MNI			Wt.		
	#	%	CI	gms	%	CI	#	%	CI	gms	%	CI	#	%	CI	gms	%	CI
FRESHWATER																		
Chrysemys sp.	2	1.7		26.8 (5-1.8)	2.5 (5.2)		1	4.1		20.5 (2.4)	8.8 (1.0)							
Cichlasoma sp.	10	8.5		3.5	0.3		1	4.1		0.1	0.0							
Eleotridae	34	29.1		7.4 (0.6)	0.7 (0.1)		4	16.7		0.3 (0.1)	0.1 (0.0)							
Eleotris sp.	—			—			—			—								
Gobiomorus sp.	—			—			—			—								
Kinosternon sp.	4	3.4		104.8 (6.2)	9.9 (0.6)		4	16.7		60.3 (2.3)	26.0 (1.0)							
Lepisosteus sp.	5	4.3		249.7	23.5		2	8.3		73.9	31.9							
Staurotypus sp.	2	1.7		3.1 (2.7)	0.3 (0.3)		—			—								
Total	57	48.7	4.0	459.6	43.4	31.9	12	49.9	2.1	159.9	68.8	28.6		62.3			47.1	
PERIPHERAL																		
Ariidae	19	16.2		11.3 (1.7)	1.1 (0.2)		3	12.5		2.4 (1.0)	1.0 (0.4)							
Carcharhinidae	3	2.6		0.5	0.0		1	4.1		0.6	0.3							
Centropomus sp.	9	7.7		99.2 (12.0)	9.3 (1.1)		1	4.1		1.7	0.7							
Crocodylus sp.	3	2.6		6.8	0.6		—			—								
Cynoscion sp.	7	6.0		4.1 (1.7)	0.4 (0.2)		—			—								
Eugerres sp.	—			—			—			—								
Lutjanus sp.	2	1.7		7.2 (9.3)	0.7 (0.9)		—			—								
Mugil sp.	3	2.6		3.1	0.3		—			—								
Pristis sp.	—			—			—			—								
Total	46	39.4	3.2	189.9	17.9	13.2	5	20.7	0.9	5.7	2.4	1.0		26.9			13.1	
MARINE																		
Anisotremus sp.	—			—			—			—								
Caranx sp.	1	0.9		4.5 (1.9)	0.4 (0.2)		—			—								
Chelonia sp.	—			—			—			—								
Sphyraena sp.	—			0.2	0.0		—			—								
Total	1	0.9	0.1	6.6	0.6	0.5	0			0.0				0.6			0.1	
TERRESTRIAL																		
Accipitridae	—			—			—			—								
Anatidae	—			—			—			—								
Bufo sp	—			—			—			—								
Canis sp.	—			—			—			—								
Dasyprocta sp.	1	0.9		0.7	0.1		—			—								
Didelphis sp.	—			—			—			—								
Drymarchon sp.	—			—			—			—								
Iguanidae	7	6.0		14.0 (0.3)	1.3 (0.0)		—			—								
Odocoileus sp.	4	3.4		69.0 (3.6)	6.5 (0.3)		1	4.1		13.8 (5.4)	5.9 (2.3)							
Procyon sp.	—			1.3	0.1		—			—								
Viperidae	1	0.9		0.2 (0.2)	0.0 0.0		—			—								
Total	13	11.2	0.9	89.3	8.3	6.2	1	4.1	0.2	19.2	8.2	3.4		3.9			3.6	
UNIDENTIFIED																		
fish	—			187.1	17.6		—			13.8	5.9							
mammal	—			5.4	0.5		—			—								
reptile	—			1.1	0.1		—			2.8	1.2							
snake	—			—			—			—								
turtle	—			16.4	1.5		—			7.3	3.1							
rodent	—			—			1	4.1		0.5	0.2							
bird	—			0.3	0.0		5	20.8		0.0	0.0							
bone	—			106.0	10.0		—			22.8	9.8							
Total	0			316.2	29.7	22.0	6	24.9	1.1	47.2	20.2	8.4		6.2			15.7	
Grand Total	117	100.2	8.2	1061.6	99.9	74.8	24	99.6	4.3	232.0	99.6	41.4		99.9			99.9	

*Minimum Number of Individuals (MNI) reported by number of bone elements (#), percent of bone totals from site (%), and Concentration Index (CI). Weight (Wt.) reported in grams (gms), percent of bone totals from site (%), and Concentration Index (CI). Numbers enclosed in parentheses refer to uncertain identifications.

Table 10. DISTRIBUTION OF FAUNAL REMAINS RECOVERED FROM EARLY CLASSIC PERIOD DEPOSITS AT SITES Cs-6 AND Cs-7 *

Early Classic Component, Cs-6

	N8W1						S1W11						N1E9					
	MNI			Wt.			MNI			Wt.			MNI			Wt.		
	#	%	CI	gms	%	CI	#	%	CI	gms	%	CI	#	%	CI	gms	%	CI
FRESH WATER																		
Chrysemys sp.	1	7.7		5.4	8.1		1	14.3		61.0 (2.6)	33.4 (1.4)		1	5.3		0.1	0.1	
Cichlasoma sp.	—			—			—			—			—			—		
Eleotridae	—			—			—			—			1	5.3		0.1	0.1	
Eleotris sp.	—			—			—			—			—			—		
Gobiomorus sp.	—			—			—			—			—			—		
Kinosternon sp.	2	15.4		10.1 (3.3)	15.1 (4.9)		1	14.3		86.1	47.2		4	21.1		27.1 (5.7)	25.0 (5.3)	
Lepisosteus sp.	3	23.1		2.2	3.3		—			—			2	10.5		5.5	5.1	
Staurotypus sp.	—			—			—			4.0	2.2		1	5.3		6.2	5.7	
Total	6	46.2	0.6	21.0	31.4	2.2	2	28.6	0.3	153.7	84.2	21.3	9	47.5	0.6	44.7	41.3	3.1
PERIPHERAL																		
Ariidae	1	7.7		0.8	1.2		—			—			2	10.5		1.0 (0.5)	0.9 (0.5)	
Carcharhinidae	1	7.7		0.1	0.1		—			—			1	5.3		0.4	0.4	
Centropomus sp.	1	7.7		0.7	1.0		—			—			2	10.5		0.6 (0.7)	0.6 (0.6)	
Crocodylus sp.	1	7.7		3.2 (0.9)	4.8 (1.3)		1	14.3		1.2	0.7		1	5.3		7.7	7.1	
Cynoscion sp.	—			—			—			—			1	5.3		1.3	1.2	
Eugerres sp.	—			—			—			—			—			—		
Lutjanus sp.	—			—			—			—			—			—		
Mugil sp.	—			—			—			—			—			—		
Pristis sp.	—			—			—			—			—			—		
Total	4	30.8	0.4	5.7	8.4	0.6	1	14.3	0.1	1.2	0.7	1.7	7	36.9	0.5	12.1	11.2	0.8
MARINE																		
Anisotremus sp.	—			—			—			—			—			—		
Caranx sp.	—			—			—			—			—			—		
Chelonia sp.	1	7.7		1.7	2.5		—			—			—			—		
Sphyraena sp.	—			—			—			—			—			—		
Total	1	7.7	0.1	1.7	2.5	0.2	0			0.0			0			0.0		
TERRESTRIAL																		
Accipitridae	—			—			1	14.3		0.8	0.4		—			—		
Anatidae	—			—			—			—			1	5.3		1.3	1.2	
Bufo sp.	—			—			—			—			—			—		
Canis sp.	—			—			—			—			1	5.3		0.3	0.3	
Dasyprocta sp.	—			—			—			—			—			—		
Didelphis sp.	—			—			—			—			—			—		
Drymarchon sp.	—			—			1	14.3		2.8	1.5		—			—		
Iguanidae	1	7.7		1.1 (0.8)	1.6 (1.2)		1	14.3		4.7 (0.8)	2.6 (0.4)		—			—		
Odocoileus sp.	1	7.7		7.2 (4.0)	10.7 (6.0)		1	14.3		11.4	6.2		—			—		
Procyon sp.	—			—			—			—			—			—		
Viperidae	—			—			—			—			—			—		
Total	2	15.4	0.2	13.1	19.5	1.4	4	57.2	0.6	20.5	11.1	2.8	2	10.6	0.1	1.6	1.5	0.1
UNIDENTIFIED																		
fish	—			4.5	6.7		—			0.1	0.1		—			11.1	10.2	
mammal	—			3.7	5.5		—			—			—			6.2	5.7	
reptile	—			—			—			—			—			—		
snake	—			—			—			0.5	0.3		1	5.3		0.9	0.8	
turtle	—			4.9	7.3		—			3.1	1.7		—			10.3	9.5	
rodent	—			—			—			—			—			—		
bird	—			—			—			—			—			—		
bone	—			12.1	18.5		—			3.4	1.9		—			21.1	19.8	
Total	0			25.5	38.0	2.7	0			7.1	4.0	1.0	1	5.3	0.1	19.9	16.0	1.5
Grand Total	13	100.1	1.3	67.0	99.8	7.1	7	100.1	1.0	182.5	100.0	26.8	19	100.3	1.4	108.3	100.0	7.5

Table 10. CONTINUED.

Early Clsssic Component, Cs-7

	N0E2						S16W1						Average for 5 pits					
	MNI			Wt.			MNI			Wt.			MNI			Wt.		
	#	%	CI	gms	%	CI	#	%	CI	gms	%	CI	#	%	CI	gms	%	CI
FRESHWATER																		
Chrysemys sp.	2	18.2		60.2	32.4		1	6.7		94.5 (14.7)	18.4 (2.9)							
Cichlasoma sp.	—			—			—			—								
Eleotridae	—			—			—			—								
Eleotris sp.	—			—			—			—								
Gobiomorus sp.	—			—			—			—								
Kinosternon sp.	2	18.2		13.0	7.0		3	20.0		44.9 (6.8)	8.7 (1.1)							
Lepisosteus sp.	1	9.1		0.3	0.2		1	6.7		9.5	1.8							
Staurotypus sp.	—			—			1	6.7		3.5 (1.8)	0.7 (0.3)							
Total	5	45.5	0.8	73.5	39.6	11.5	6	40.1	0.9	175.5	34.1	27.4		41.6			16.0	
PERIPHERAL																		
Ariidae	—			—			1	6.7		(0.4)	0.1							
Carcharhinidae	—			—			—			—								
Centropomus sp.	—			—			1	6.7		3.6	0.7							
Crocodylus sp.	—			—			1	6.7		3.4	0.7							
Cynoscion sp.	—			—			—			—								
Eugerres sp.	—			—			—			—								
Lutjanus sp.	—			—			1	6.7		0.1 (1.4)	0.0 (0.3)							
Mugil sp.	—			—			—			—								
Pristis sp.	1	9.1		17.8	9.6		—			—								
Total	1	9.1	0.2	17.8	9.6	2.8	4	26.8	0.6	8.9	1.8	1.4		23.6			6.3	
MARINE																		
Anisotremus sp.	—			—			—			—								
Caranx sp.	—			—			—			—								
Chelonia sp.	—			—			—			—								
Sphyraena sp.	—			—			—			—								
Total	0			0.0			0			0.0				1.5			0.5	
TERRESTRIAL																		
Accipitidae	—			—			—			—								
Anatidae	—			—			—			—								
Bufo sp.	—			—			—			—								
Canis sp.	2	18.2		13.5	7.3		1	6.7		13.3 (8.2)	2.6 (1.6)							
Dasyprocta sp.	—			—			—			—								
Didelphis sp.	—			—			1	6.7		0.2	0.0							
Drymarchon sp.	—			—			—			—								
Iguanidae	—			—			1	6.7		2.0	0.4							
Odocoileus sp.	1	9.1		8.0	4.3		1	6.7		89.2 (13.1)	17.3 (2.5)							
Procyon sp.	2	18.2		11.9 (12.9)	17.2 (6.9)		1	6.7		62.9 (1.7)	12.2 (0.3)							
Viperidae	—			—			—			—								
Total	5	45.5	0.8	66.3	35.7	10.4	5	33.5	0.8	190.6	36.9	29.8		32.4			21.0	
UNIDENTIFIED																		
fish	—			—			—			2.6	0.5							
mammal	—			—			—			23.3	4.5							
reptile	—			—			—			26.0	5.1							
snake	—			—			—			—								
turtle	—			—			—			2.4	0.5							
rodent	—			—			—			—								
bird				—			—			—								
bone				28.1	15.1		—			85.0	16.5							
Total	0			28.1	15.1	4.4	0			139.3	27.1	21.8		1.0			26.0	
Grand Total	11	100.1	1.8	185.7	100.0	29.1	15	100.4	2.3	511.3	99.9	80.4		100.1			99.8	

*Minimum Number of Individuals (MNI) reported by number of bone elements (#), percent of bone totals from site (%), and Concentration Index (CI). Weight (Wt.) reported in grams (gms), percent of bone totals from site (%), and Concentration Index (CI). Numbers enclosed in parentheses refer to uncertain identifications.

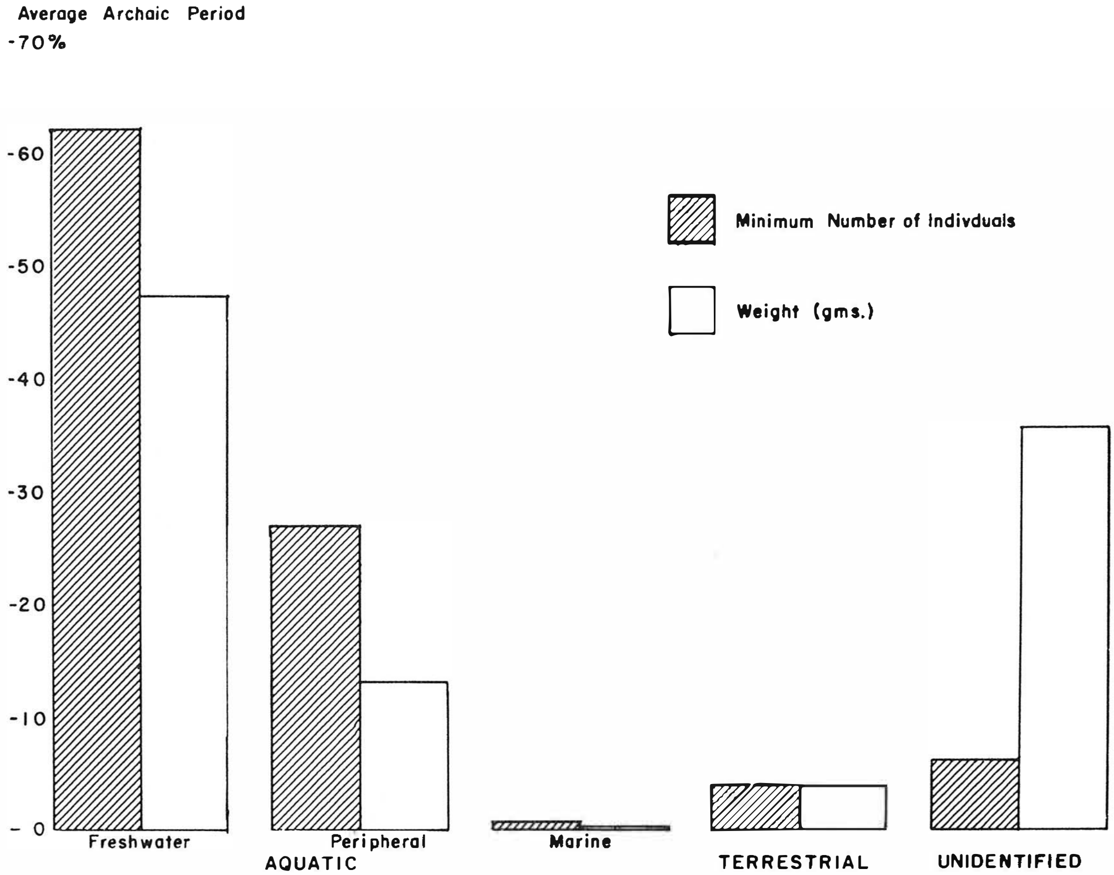


Figure 24. PERCENT OF ANIMAL-DERIVED PORTION OF PEOPLE'S DIET DURING THE ARCHAIC PERIOD CONTRIBUTED BY AQUATIC, TERRESTRIAL, AND UNIDENTIFIED ORGANISMS
Results are the averages of bone, analyzed by minimum number of individuals, and by weight, recovered from five test pits at sites Cs-6 and Cs-7.

vertebrate fauna at two shell midden sites permits the reconstruction of food-getting strategies for two human occupations. These conclusions are presented below, first by discussing separately each of the two occupations, and second by comparing them with each other.

The Chantuto people who lived at these sites during the latter part of the Archaic Period relied heavily for food on the fish and reptiles found in the marine estuary and lagoon system. In the recovered remains, freshwater forms predominate over both peripheral and marine forms, thus indicating either a seasonal or a spatial orientation toward the freshwater facies of the estuary. Accordingly, the Chantuto people may have been occupying the sites during the height of the rainy season (when the distribution of freshwater organisms extends farthest downstream) or they may have done most collecting in the upstream freshwater zone. The data on vertebrate fauna remains considered alone are insufficient to determine which of these possibilities is most correct.

The terrestrial organisms are present in small quantities in Archaic Period deposits. Most of these forms are commonly found in the environment seaward of the swamp/mainland interface. Deer (*Odocoileus*), agouti (*Dasyprocta*), and *ratonera* snake (*Drymarchon*) are typical of mainland terrestrial conditions and may be scarce even in the well-drained areas within the swamp. The presence of deer and agouti remains in Archaic Period deposits suggests that some food was brought to the sites from the mainland, although this practice was apparently limited in scope. It is also noteworthy that these indicators of a mainland subsistence focus were recovered from Cs-7 but not from Cs-6. This suggests some differences between occupations at the two sites. These possible differences will be discussed further in the final section.

All types of marine organisms that are represented in the deposits can be collected from the marine estuary and lagoon system (particularly during the dry season) or from the beach. Accordingly, the presence of these forms does not necessarily indicate that humans were procuring food from the offshore environment during the Archaic Period. Two additional factors combined with this observation suggest to me that the offshore marine environment was not utilized by the Chantuto people. One of these factors is that marine forms have a low representation in the recovered bone material from the Archaic Period deposits. Another factor is that present-day inhabitants of La Palma avoid the offshore zone, as the heavy surf cannot be negotiated with traditional dugout canoes.

During the Early Classic Period occupation, aquatic organisms (as indicated by M I and Wt.) contributed slightly more to the human procurement system than did terrestrial organisms. Freshwater species are the aquatic

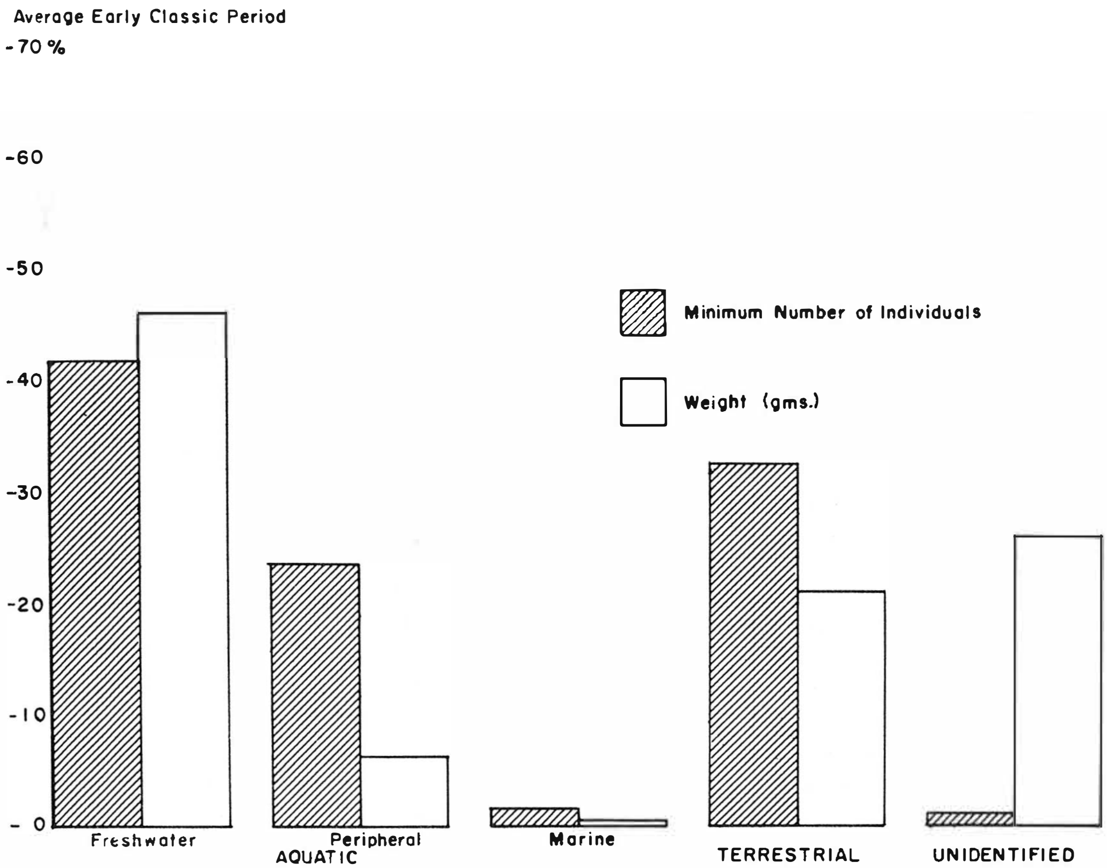


Figure 25. Percent of Animal-Derived Portion of People's Diet During the Early Classic Period Contributed by Aquatic, Terrestrial, and Unidentified Organisms
Results are the averages of bone, analyzed by minimum number of individuals, and by weight, recovered from five test pits at sites Cs-6 and Cs-7.

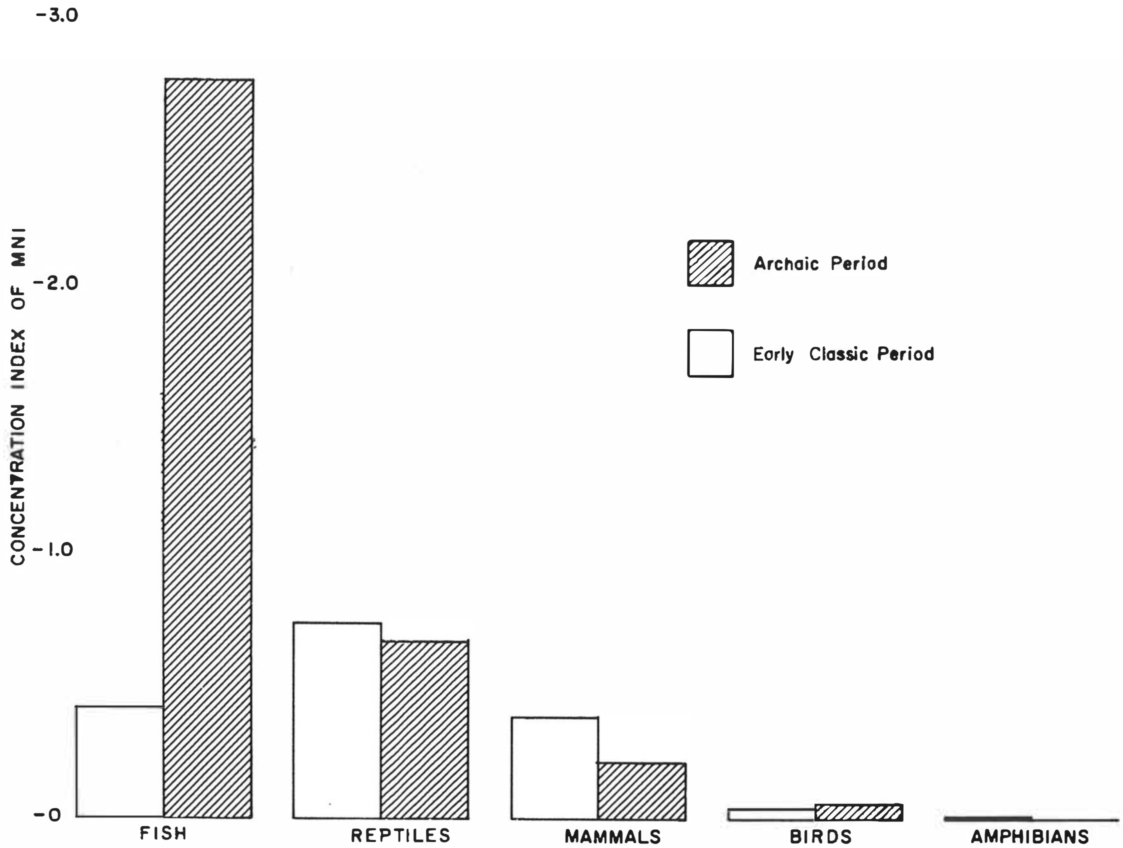


Figure 26. CONCENTRATION INDICES OF BONE BY MINIMUM NUMBER OF INDIVIDUALS, DERIVED FROM FIVE CLASSES OF ANIMALS COMPARED FOR EARLY CLASSIC AND ARCHAIC PERIOD DEPOSITS
Results are the averages for comparable strata at five test pits in Cs-6 and Cs-7.

organisms represented in greatest quantities, but peripheral species are also substantially represented. Marine species are relatively insignificant and, as in the Archaic Period deposits, do not indicate that people were actually working the offshore zone. It seems to me to be more likely that the marine forms were collected from other zones.

The most important terrestrial forms are deer, iguana, and raccoon. Of these only the deer is a strong indicator of food procurement on the mainland because iguana and raccoon are also present within the swamp.

Certain differences and similarities of the food-getting patterns practiced by Archaic Period and Early Classic Period peoples can be more sharply drawn by considering the life forms, and, by implication, modes of collection, of the animals represented in the archaeological deposits (Figs. 26–27). The organisms are classed either as fish, reptiles, mammals, birds or amphibians. Fish remains are more abundant in the Archaic Period deposits than in the Early Classic Period deposits, as indicated by concentration indices (CI) of MNI (ave. 2.76% compared with 0.42%) and CI of Wt. (ave. 14.52 compared with 1.56). This demonstrates that fishing was a more vigorously pursued activity in Archaic Period times than in Early Classic Period times. Reptiles were collected somewhat more frequently by Early Classic Period peoples than by Archaic Period peoples as indicated by CI of MNI (ave. 0.74 compared with 0.67) and CI of Wt. (ave. 14.6 compared with 8.6). The rate of mammal collection apparently was greater during the Early Classic Period occupation than during the Archaic Period as indicated by CI of MNI (ave. 0.38 compared with 0.22) and CI of Wt. (ave. 9.63 compared with 4.42). The collection of birds was of minor significance during both occupations and the collection of amphibians was equally insignificant for both occupations.

This analysis shows that the major difference between the food-procurement systems of the Archaic Period and Early Classic Period occupants of the sites is that the former group placed a relatively great emphasis on fish whereas the latter group placed a relatively great emphasis on mammals. Both groups relied to a moderate extent on the collection of reptiles and to a minor extent on birds and amphibians.

FLORA

A general research objective was to reconstruct the vegetational component of the ecosystem of the prehistoric people under study. One specific goal was to reconstruct the climax vegetation of the zone.

I hypothesized that the climax vegetation of the zone in the prehistoric past was mangrove forest as it is today. If the mangrove forest formation in the study area could be shown to have been occupied by prehistoric humans, then by implication much of the world's tropical coastline may have been similarly occupied. At the present time, at least, large stretches of tropical coastline are fringed by this formation (Chapman 1970).

Chapman has pointed out the unusual dis-

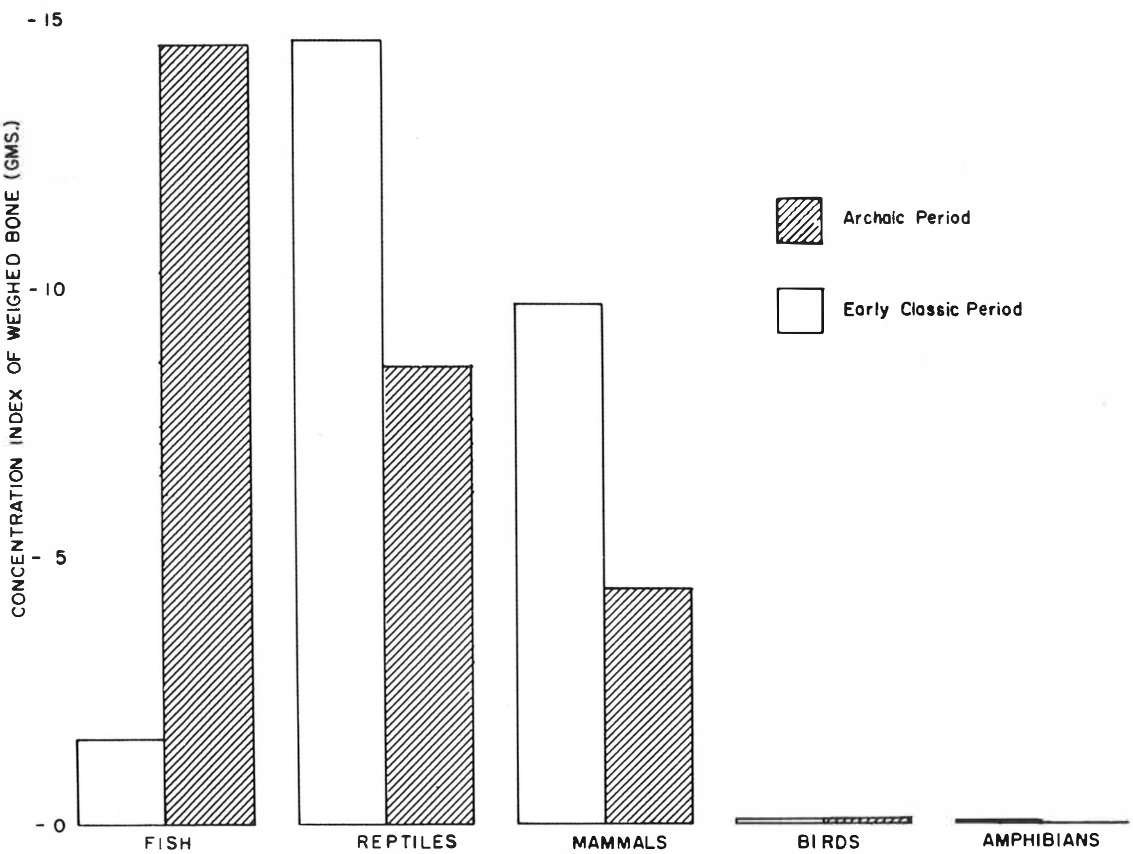


Figure 27. CONCENTRATION INDICES, BY WEIGHT, OF BONE DERIVED FROM FIVE CLASSES OF ANIMALS COMPARED FOR EARLY CLASSIC AND ARCHAIC PERIOD DEPOSITS
Results are averages for comparable strata at five test pits in Cs-6 and Cs-7.

continuous distribution of *Rhizophora mangle*, a mangrove species present in th study area. This species is not only found within the tropics of the Americas and West Africa but also in Fiji, Tonga, and New Caledonia. Islands that are located between Melanesia and the Pacific Coast of the Americas lack *R. mangle* in their mangrove formations. Chapman (1970: 1) suggests that a possible explanation for this striking distribution is that *R. mangle* was dispersed by human agents. Thus a botanist has suggested a long, significant relationship between a mangrove species and humans. It is possible that archaeological data could contribute to the solution of this interesting problem.

A second objective of this project was to determine whether the prehistoric people of the study area were practicing agriculture. Although today the study area is primarily a swamp it may not have been as extensively inundated in prehistoric times. It is thus possible that more arable land existed in the past. Furthermore, even today arable land occurs within the mangrove formation on raised, inactive beaches. The shell middens themselves are sometimes farmed which indicates that farming may also have been practiced in ancient times.

An additional question involving possible early agriculture on the Pacific Coast concerns the crop assemblage. Lowe (1967b) has proposed that a vegecultural assemblage predated seed culture in the Soconusco. One of my research objectives was to provide information related to this issue.

Methods

In order to meet the objectives concerning the paleobotany of the study area, soil samples for palynological study were submitted by me to Matsuo Tsukada.[6] Although samples were collected from all excavations, only the series from N3E3, Cs-8, was submitted for analysis. This series consists of 29 samples taken at 40 cm intervals from a vertical section along the west wall of the excavation.

6. Quaternary Research Center, University of Washington.

Tsukada examined the extracts for fossilized pollen and determined the percent of water content and loss on ignition when samples were burned at various temperatures and for different lengths of time (Fig. 28).

Results

The results of the examined extracts are extremely disappointing because no identifiable pollen was discovered (Tsukada pers. comm.) Other results of the study are presented in Figure 28. Graph A shows percent of water content of each sample. Graph B shows loss on ignition when samples were burned for 12 hours at 450° C. Tsukada (pers. comm.) concludes that this loss is primarily due to the removal of carbonized plant fragments, since these are visible in the samples and in prepared extracts. High content of carbonized fragments is represented by levels 1, 5, 9, 14, 15, 16, 17, 24, and 26.

Graphs C and D show additional loss on ignition when samples were burned at 700° C for 1 and 7 hours respectively. The high value peaks indicate the removal of a high content of $CaCO_3$, which is present in the form of shells. High $CaCO_3$ content is indicated for levels 1–4, 6–9, 11–14, 17–19, 21–23, 25–27, and 29.

Interpretations

The simplest conclusion that can be drawn from the absence of fossil pollen is that virtually all pollen grains were oxidized rather than becoming fossilized and preserved. Accordingly, this absence should not be used to infer the absence of entomophilous plants but rather to indicate unfavorable conditions of preservation (Tsukada pers. comm.). This finding, therefore, provides no information concerning ancient vegetation, either cultivated or wild. Pollen may be preserved in lagoon sediments but this possibility has not been field checked.

The fluctuations in amounts of $CaCO_3$ (Fig. 28, graphs C and D) can be interpreted as indicative of relative intensities of human occupation. Peaks of $CaCO_3$ should represent relatively intense human occupations because first, the greater the human occupation, the faster the accumulation of shellfish remains, and second, the greater the human population, the faster the rate of shell breakdown due to pedestrian traffic. Accordingly, relatively heavy site occupations should result in strata with high shell content both because of the rapidity of shell deposition compared with rates of deposition of other materials and because of the small grain size and hence greater compaction of the shell material.

Calcium carbonate content is a function not only of depositional conditions but also erosional conditions. If leaching were strictly a function of length of time since original deposition, then I would expect greater peaks to occur in the more recently deposited portion of the section since that portion has had the shortest time for erosion. Alternatively, if leached $CaCO_3$ from the upper levels of the section were secondarily deposited at lower levels, I would expect greater $CaCO_3$ peaks to occur at the lower compared with the upper levels. The pattern of fluctuations shows neither a progressive increase nor decrease in the amounts of $CaCO_3$ from top to bottom of the section. This suggests that the observed fluctuations are not due to postdepositional factors. Thus I conclude that the best explanation for fluctuations in $CaCO_3$ is that they reflect periodicities in human occupations.

Ethnographic analogy (*see* section entitled "Present-day Environment") suggests that the indicated fluctuations in occupations may have been seasonal in the prehistoric past. The observed fluctuations in the graphs of $CaCO_3$ content do not seem to me to represent expected annual seasonal fluctuations because they are not consistent with the annual rates of deposition presented in the sec-

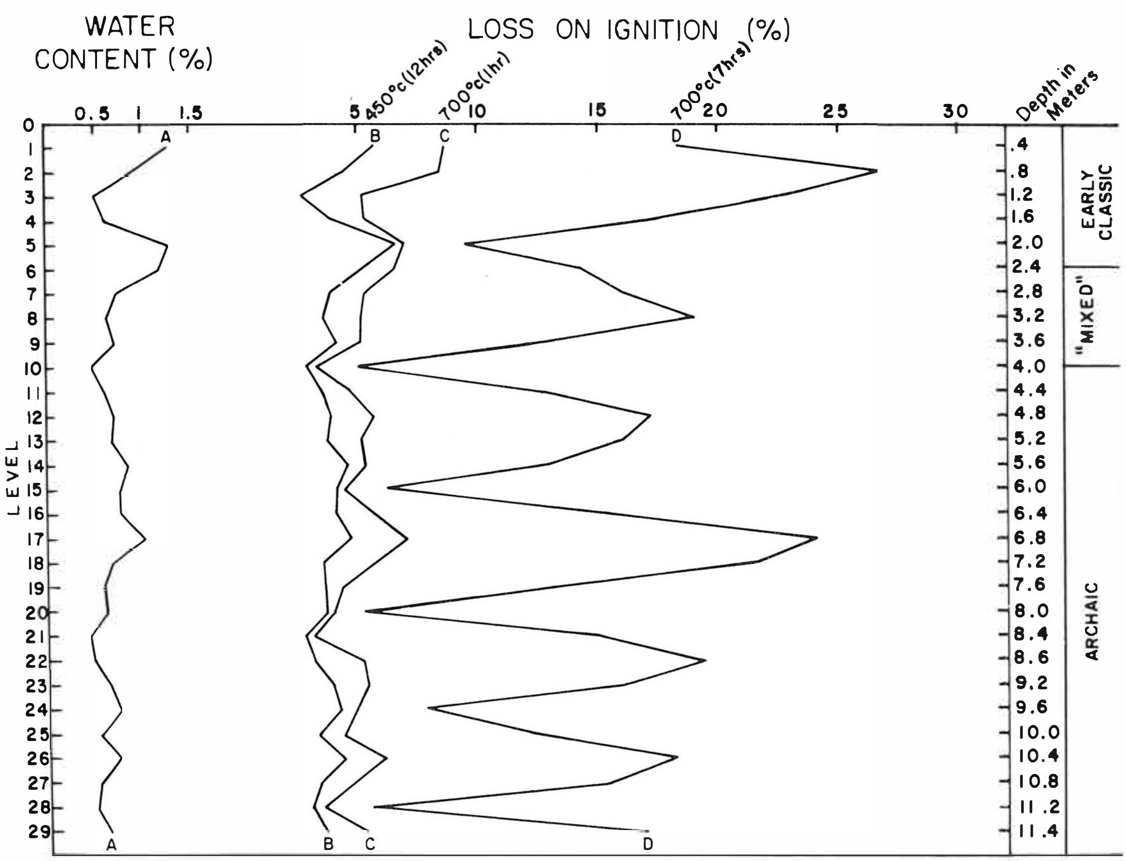


Figure 28. Percent Water Content (Graph A) and Percent Loss on Ignition for Three Burnings (Graphs B, C, and D) of Soil Samples from N3E3, Cs-8

tion entitled "Reconstruction of Prehistoric Social Systems: Excavations and Dating." It is possible that the fluctuations are due to seasonal occupations that are not annually represented at the site from which the samples were taken. This could be due to the fact that populations visited the sites at greater than one-year intervals, or that yearly increments were uniformly deposited but are obscured by the procedures of data collecting and processing, or that annual visits to the sites did not result in annual increments of sediments over the entire surface of the mound. Visual examination of the stratigraphy at the sites shows that beds lense out. This supports the third explanation.

The carbonized plant fragments probably derive from intentional burning of vegetation by prehistoric occupants of the study area. This assumption is based on the long record of repeated burnings, and on ethnographic analogy. The question then arises as to the purpose of such burning. Mesoamericanists are usually safe in assuming that evidence of burning indicates that the prehistoric people practiced a swidden system of agriculture. In this particular case such an interpretation seems to me to be incorrect because the faunal data indicate that during the Archaic Period the paleoenvironment was a mangrove swamp zone as it is today. Accordingly, land for farming could have been even more scarce than it is at the present time if one accepts that fewer inactive beach ridges were present in the past (*see* Coastal History subsection following). In addition the faunal data indicates that turtles formed an important part of the subsistence for the Chantuto people. On the basis of this evidence I favor the interpretation that prehistoric burning indicated by carbonized fragments resulted from a foraging rather than a farming procurement activity. It should be emphasized that this is the best possible interpretation but that farming has not been disproved.

Fluctuations in amounts of preserved carbonized fragments are not great (Fig. 28, graph B). Many periodic events, both cultural and climatic, may have interacted in determining the amount of carbonized fragments that were eventually preserved in the sediments. These factors are frequency of burning, distance between burning site and site of deposition, and intensity of erosional factors.

Frequency of burning should correlate with intensity of human occupation so that I would expect the curves of the graphs of $CaCO_3$ and carbonized fragments to be synchronous. Observation of the graphs of these two items does not show clear-cut synchrony between them. I do not feel that this lack of synchrony is conclusive evidence against this view because of the many differences in possible preservation factors between burned plant fragments and marsh clam shells. The carbonized fragments are small sized and lightweight so that they could be expected to be eroded much more easily than the shell material. It is also possible that carbonized fragments and clam shells were deposited during the same season (for example at the end of the dry season) but peaks occurred at time intervals of different lengths. This could be a type of long-term alternation of resources as the human population responded to possible fluctuations in the biomasses of collected animals.

Conclusions

Fluctuations demonstrate variations in the amount of shell deposited over time and in the amount of carbonized fragments deposited over time or in postdepositional vagaries in their preservation. I conclude that these fluctuations are best explained by the ethnographic analogy of seasonal procurement. The record of these periodic events does not, however, demonstrate their annual nature. This may be due either to the absence of the complete stratigraphic record for the entire site, lack of precision in data recovery and analysis, or to non-annual but seasonal procurement activities by the prehistoric people.

Observation of the graph (Fig. 28) does not indicate to me any significant variations in $CaCO_3$ and carbonized fragments between the Early Classic Period and the Archaic Period deposits. The similarity in $CaCO_3$ between the two stratigraphic units seems initially odd because the frequency of shell inclusions is strikingly different in them. Perhaps erosional factors explain this. The similarity in deposits of carbonized fragments is consistent with the similar Concentration Indices of reptile remains in the two stratigraphic units.

HUMAN REMAINS

Postclassic Period

Three human burials were intruded into the upper stratigraphic unit at N3E3, Cs-8. In all three burials the skeletal remains were disarticulated, disturbed, and only partially complete. The burial that was found at the north side of the grid (Burial 1) and the burial that occurred near the grid center (Burial 2) were so disturbed that the orientation of the remains could not be determined. The skeleton which lay within the southeast quadrant of the grid (Burial 3) was more deeply buried than the other two skeletons and as a result of this the bones were relatively less disturbed. Apparently the body of this individual was buried in a flexed, seated position facing northwards. The forearms had been crossed behind the lower legs near the ankles. The head was found facing to the right where it had fallen forward into the chest cavity. A small plumbate pot may have been originally placed on the individual's head. When recovered it was in an inverted position over the mandible.

The plumbate vessel indicates that Burial 3 dates from the Postclassic Period or later. It is probable that all three burials belong to the same prehistoric occupation, although this conclusion could not be verified for lack of other datable grave goods. The skeletal material was examined by Phillip L. Walker.[7] The results of this study are presented in Table 11.

Archaic Period

A single burial dating from the Chantuto Phase was uncovered in N0E2, Cs-7. The burial had been deposited within a layer of yellow-orange clay considered by me to be a house floor (*see* section entitled "Reconstruction of Prehistoric Social Systems: Excavations and Dating").

The burial was included in the clay matrix which showed no signs of the former cavity which had been dug to receive the body. The skeleton was incomplete, partially articulated, and badly fragmented by the heavy overburden it had been supporting. In addition, the man who was digging at the time of its discovery partially cut into the burial with the mattock he had been using to break up the hardened clay. As a result of these factors the burial was in poor condition at the time of recovery.

The position of the body, however, was determined. The burial was placed in a flexed, supine position with the head to the east. Disarticulated hand bones were found under the pieces of badly smashed skull as though at the time of burial the hands had been placed under the deceased's head. The spine and foot bones were disarticulated and scattered, but long bones were in place.

No grave goods were associated with the burial. There was no indication of the former presence of a coffin, clothing, or a shroud.

Phillip L. Walker examined some parts of the skull and submitted the following comments:

> Parts of the skull examined consisted of highly fragmented pieces of frontal, maxilla and mandible. These bones along with 12 teeth were imbedded in a calcareous matrix which was partially removed using dilute acetic acid.
>
> Several features suggest the individual represented by these bones was a male: (1) the mandible is robust, particularly in the area of the mental eminence, (2) the supra-orbital margin of the frontal bone is blunt, and (3) distinct temporal lines are present.
>
> The molars are of particular interest since they are severely worn and give evidence of heavy use. Two of the four molars present (probably maxillary and mandibular first molars) are worn past the level of the cementoenamel junction

7. Department of Anthropology, University of California, Santa Barbara.

Table 11. DESCRIPTION OF HUMAN BURIALS FROM THE UPPER STRATIGRAPHIC UNIT AT GRID N3E3, SITE Cs-8
Analysis by Phillip L. Walker.

BURIAL 1

Sex: Female

The illium has a relatively obtuse sciatic notch and the supraorbital margins of the frontal bone are sharp. The mastoid process is moderately large and the zygomatic arch gracile. The long bones are gracile and lack distinct muscle attachment scars.

Age: Approximately 30 years.

All epiphyses are fused and distinct arachnoid granulations are present on the pariental bones. The sagittal and lambdoidal sutures are partially fused. The first maxillary molar has dentine exposures on two cusp tips.

Measurements: (Maximum length)

Humerus: 28.6 cm
Ulna: 22.8 cm
Radius: 21.4 cm

Anomalies and Pathologies:

This individual appears to have been fairly healthy prior to death. There is no sign of osteoarthritis. The tympanic plate of the right temporal bone has a small (2.4 mm) dehiscence.

BURIAL 2

Sex: Female

The skull of this individual has sharp supraorbital margins, a slightly bulging frontal bone and a relatively small mental eminence. The mastoid process is small. All long bones are extremely gracile.

Age: 15-16 years

All epiphyses that are present are fused with the exception of the epiphysis on the sternal end of the clavicle. The mandibular and maxillary third molars have not erupted and possess incomplete roots. None of the teeth present have dentine exposures.

Anomalies and Pathologies:

This individual has bilateral cribra orbitalia. The maxillary incisors are moderately shoveled. The right tympanic plate is dehiscent.

BURIAL 3

Sex: Male

The skull of this individual has rounded supraorbital margins and a well-developed mental eminence. The mastoid process is moderate in size.

Age: Probably older than 40 years but no good age indicators are present. The squamous suture is not fused. The presence of osteoarthritis and the edentulous condition of the mandible suggest a mature individual.

Anomalies and Pathologies:

The mandible is completely edentulous and has marked alveolar resorption. The horizontal ramus of the mandible measures 13.8 mm in the area of the incisors. The first metatarsus is partially fused to the first cuneiform allowing little or no movement at this joint. The right tympanic plate is dehiscent.

along all but a small portion of their circumference where a remnant of enamel, a few millimeters long, is still present. The plane of wear of these teeth is steeply sloping at an angle of about 45° to a plane passing through the long axis of the roots. Approximately one-fifth of the mandibular molar of this pair was sheared away from the rest of the crown during the life of the individual. The intact portion of the tooth was subsequently subjected to wear, which gives the surface of the old fracture a rounded, polished appearance. The two remaining molars (probably a mandibular third and maxillary second molar) still retain a portion of their enamel and have U-shaped dentine exposures covering only about one-third of their occlusal surfaces. The difference in the degree of attrition of these two sets of molars may indicate a high rate of attrition since the first molars appear to have been subjected to considerable wear before the second and third molars erupted. It is impossible to estimate an individual's age from the amount of tooth wear due to the fact that the abrasive quality of diets differ among populations. If, for example, this individual were a member of the Canaliño population, an aboriginal group of foragers with high rates of tooth wear, he would have been a minimum of 40 years of age at time of death. Additional evidence for an age of greater than 40 years is indicated by the loss of at least three premolars from the mandible. That this loss was premortem is evidenced by resorption of the alveolar bone around the sockets of these missing teeth.

The maxillary third molar shows slight hypoplastic pittings on its buccal side which is an indication of development disturbance during tooth formation.

In summary, the evidence of the physical characteristics of the Chantuto people is severely limited to fragments of a single individual. This individual appears to have been an adult male who possibly suffered slight physiologic stress in his early years and whose diet was highly abrasive producing rapid dental attrition.

Comparative material for coeval populations in Mesoamerica is nearly non-existent. Anderson (1967:97) reports one burial and one find of inclusions of lower limb and pelvic bone fragments from Abejas Phase deposits at Tehuacan. The burial is not reported and the broken bones only indicated that the individual represented had reached adulthood. Anderson found heavy dental wear in remains dating from the Ajuereado to Coxcatlan phases. Evidence for tooth wear is lacking for the Abejas Phase. The Chantuto specimen indicates that the exceptionally high rate of tooth wear was perhaps typical of coastal populations during the late Archaic Period.

The co-occurrence of the clay stratum and a human burial are evidence for an occupation of some duration of the site at one time during the Archaic Period. If the stratum was built as a house floor then it is evidence for permanent rather than seasonal occupation of the site by at least one residential social group. No evidence is currently available concerning the existence of additional floors for the same time period, so that it is impossible to determine whether the presumed structure was unique or part of a village.

COASTAL HISTORY

The Chantuto people who occupied the Chiapas Coast during the latter part of the Archaic Period lived in an environment that was similar to that found in the area today. This has been demonstrated by the vertebrate and invertebrate faunal remains recovered from the Archaic Period deposits. It has also been shown that a significant part of the prehistoric people's adaptation to the area included the harvesting of clams, and perhaps shrimp, from shallow lagoons. Binford's 1968 hypothesis, discussed earlier, regarding the relationship between post-Pleistocene geomorphologic changes and human adaptation to littoral environments, raises the question of possible synchrony between such changes in the Chantuto area and the arrival of the Chantuto people.

The present-day geomorphology is discussed in the introduction. The strand plain barrier on the seaward side of the lagoon system consists of several parallel ridges that were formed by depositional regression. The date of formation of these ridges is of interest because it must mark the time of development of the lagoon system. World-wide geomorphic studies suggest this occurred no earlier than 7,000 years ago (5,000 years B.C.) when the rate of sea-level rise became significantly slower than the rate of oceanic transgression from 20,000 to 7,000 years ago (Curray, Emmet, and Crampton 1969: 64).

The beginning date of coastal progradation in the study area has not been determined. Farther north on the coast of Nayarit, Curray and his associates found that regression began approximately 4,500 years ago (2450 B.C.). This date is obviously inapplicable for the Chiapas Coast because the Archaic Period occupation has a minimum beginning date of 3000 B.C.

In summary, it is not possible to fully test Binford's hypothesis due to the crucial lack of a date for the beginning of coastal progradation. Binford's hypothesis that post-Pleistocene geomorphologic changes fostered adaptation by foragers to littoral environments is possibly supported by and not disproved by the meager evidence available in the Chantuto area. The hypothesis needs further testing in the study area and elsewhere.

SUMMARY

The salient points that have been made in this chapter are reiterated below.

1. The human habitat of the Chantuto Zone had its present-day manifestation as early as 3000 B.C., the time of the earliest known occupation of the zone. The habitat has undergone no major changes during the ensuing 5,000 year period to the present time.

2. It has not been possible to date the initial formation of the mangrove estuary environment, consequently no correlation can be made between this event and the time of initial occupation by humans.

3. The Early Classic people
   a. had a subsistence economy with emphasis on both estuarine and mainland resources.
   b. practiced burning of herbaceous swamp for the collection of turtles. This probably occurred at the end of the dry season. The middens may have been especially important as reptile collecting stations during this occupation.
   c. may have practiced agriculture in the zone but no recovered evidence supports this interpretation.

4. The Chantuto people
   a. had a subsistence economy with a major emphasis (as far as can be determined) on resources available in the marine estuary and lagoon system. A few mainland species were also recovered.
   b. procured a large biomass of clam meat as indicated by the phenomenal amounts of shell deposits.
   c. probably scheduled the collection of clams on a periodic basis.
   d. did not overexploit the clam population as far as the evidence indicates.
   e. practiced the burning of herbaceous swamps for the collection of turtles. This probably occurred at the end of the dry season.
   f. probably harvested shrimp at the end of the dry season/beginning of the wet season interface.
   g. probably built substantial houses. This inference is based on the occurrence of a single clay stratum, interpreted as a house floor. It is not obvious to me whether the putative house was one of many in a village or a single, isolated homestead.
   h. are members of a poorly known biological population. Remains of a single individual are reported here.

RECONSTRUCTION OF PREHISTORIC SOCIAL SYSTEMS: MATERIAL CULTURE

INTRODUCTION

The non-vessel artifact assemblage is not large considering the volume of midden deposits that was excavated. There seem to be two explanations for this finding, one applicable to each major occupation. The small assemblage from the Archaic Period deposits is explained by the limited technological needs of the foragers who were participating in the estuarine ecosystem and their probable brief visits to the sites. Similar findings have been made elsewhere for prehistoric groups with homologous ecologies, as I discussed in the introduction. It must also be remembered that the material culture of the Chantuto people was not as simple as it now appears after the removal of all biodegradable materials.

The small assemblage from the deposits that contain ceramics is not adequately explained by assuming a limited technology for the group or groups responsible for deposition. Instead, the available evidence suggests to me that these groups utilized the mounds for milpa sites, burial sites, and only rarely as living sites. The possible farming activity on the middens (indicated by the presence of a soil matrix) explains the paucity of artifacts as well as the stratigraphic disturbance. The practice of using the middens as burial sites also contributes to stratigraphic disturbance. This practice may have originated during the Late Classic Period and was definitely carried out during the Postclassic Period. Survey evidence for the coast of Chiapas, including the study area, shows that late period settlements are typically seaward of earlier ones. Several of these late settlements are known from the study area itself, where they are all located on the ancient beach ridges that are seaward of the lagoons (Navarrete, pers. comm.). Apparently it was not automatic for these people to bury their dead with grave goods. Only one pot offering was found.

The Early Classic Period people may have sometimes lived at the sites. No direct evidence for house structures was found, but much indirect evidence is available. The deposits contained chunks of adobe that bore impressions of sticks. Although these could have been derived from clay hearths, their abundance in some pits suggests the remains of a larger construction such as a building. Also, the presence of grinding tools suggests nearness to home-based activities.

The descriptions of recovered artifacts are presented below. Artifacts are described by types, and specimens from the two components are combined if they appear to be examples of a single type. The frequencies and distributions of artifacts are shown in Tables 12–18. Dimensions are given either in centimeters or in grade names derived from the Wentworth grade scale (Table 19).

STONE ARTIFACTS: NON-OBSIDIAN

Stone Grinding Tools

Hemispherical mortars or bowls (Fig. 29)
Sample: 5 specimens.
Dimensions in cm: thickness (T), 4.0, 4.5, 2.0 (broken), 5.0, 3.2.
Material: andesite (4) and granite (1).

All recovered specimens are fragmentary but three retain rim surfaces. Both the interior and exterior surfaces of these vessels are worked and are mutually parallel. The interior surfaces are smoother than the exterior surfaces, probably as a result of abrasion during use. The interior of the granite vessel has a high luster. Two of the andesite specimens have interior striations that are parallel to the rims. These indicate rotary grinding.

Compare: Hemispherical mortars from the Tehuacan Valley (MacNeish et al. 1967:

Table 12. FREQUENCY AND DISTRIBUTION OF ARTIFACTS FROM TEST PITS N0E2 AND S16W1, AT SITE Cs-7

Cs-7, N0E2

EXCAVATION LEVEL / ARTIFACT TYPES	1	2	3	4	5	6	7	8	9	10	11	12	13	19	20	21	27	28	29	30	31	32	33
Mortars/bowls			1																				
Concave metates																							
Planar metates	1															1							
Ovoid manos				1																			
Oblong mano												1											
Probable manos			1	1					1														
Grinding tool fragments	1			2	2											1							
Stone bowl		1																					
Stone sphere							1																
Pebble choppers																							
Hammerstones			1																				1
Abrader saws?																							
Bifacial flake tools					1																		
End scrapers?																							
Utilized thin flake																					1		
Crude blade														1									
Pumice fragments			1	1		1																	
Polishing stones													1										
Flat, ovoid boulders							1																
Waterworn stones						1											1						
Waterworn stone fragments	1	2	1				1			2								1					
Shell container								1		1													
Perforated shells	2	4			2	1	2	1		1													
Antler point																							
Bone cylinder					1																		
Earplug					1																		
Earspools				1																			
Figure fragments	1		1		2	1	1			1													
	1	2	3	4	5	6	7	8	9	10	11	12	13	19	20	21	27	28	29	30	31	32	33

Cs-7, S16W1

EXCAVATION LEVEL / ARTIFACT TYPES	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Mortars/bowls			1	1	1									
Concave metates				1										
Planar metates			1										1	1
Ovoid manos													1	
Oblong mano														
Probable manos			1	1	3	1								
Grinding tool fragments			1	2	2									
Stone bowl														
Stone sphere														
Pebble choppers														
Hammerstones														
Abrader saws?														
Bifacial flake tools														
End scrapers?						1								
Utilized thin flake														
Crude blade														
Pumice fragments					1									
Polishing stones														
Flat, ovoid boulders														
Waterworn stones			2			1							1	
Waterworn stone fragments		1	1	1	2									
Shell container														
Perforated shells		1			1									
Antler point			1											
Bone cylinder														
Earplug														
Earspools		1												
Figure fragments				2	1									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14

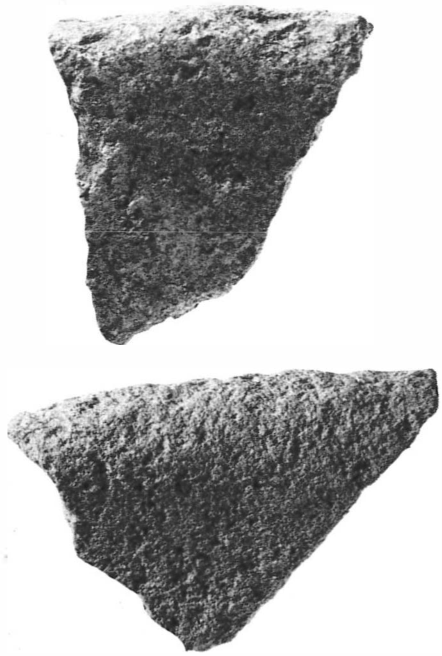


Figure 29. HEMISPHERICAL MORTARS OR BOWLS (scale ½)

116). This type has been found in the El Riego and Coxcatlan phase deposits only. Also the stone bowls from Altamira resemble the artifacts reported here. The excavators consider that some bowls were from the Barra Phase deposits (Green and Lowe 1967: 130). Stone bowls or mortars were recovered from the site of La Victoria in deposits of the Ocós and Conchas phases (Coe 1961: 101–2, 106).
Early Classic: 2 specimens.
Early Classic or Late Classic: 3 specimens.

Metates with concave grinding surfaces (Fig. 30)
Sample: 7 specimens.
Dimensions in cm: maximum thickness (Max. T.), 8.0, 7.0, 6.0, 11.0, 6.0, 7.5, 6.0.
Materials: granite (3), gabbro, (1), basalt (1), thin-bedded gneiss (1), and unidentified (1).

These metates had flat bases and convex sides judging from the shapes of the three largest specimens. When complete the metates had either round or oval plan views.

Figure 30. METATES WITH CONCAVE GRINDING SURFACES
(scale ½)

These forms were obtained by pecking and/or grinding the raw material. Two specimens retain characteristics of unworked rock on their lateral and basal surfaces. One specimen has striations on its interior surface. These parallel its side but it is difficult to determine whether they are due to usage because they also parallel the grain of laminae.

Compare: Chiapa de Corzo, Limited trough and Basin metates (Lee 1969: 117–18). The Limited Trough Metates are found in Cotorra Phase as well as Jiquipilas and earlier. In the Tehuacan Valley comparative materials are Boulder metate — milling stones (El Riego Phase to historic times), Boulder trough metates (El Riego to Ajalpan times), and Basin metates (Ajalpan Phase and later) (MacNeish et al. 1967: 118–20). Boulder metates were recovered from Santa Marta Cave (Santa Marta Phase) (MacNeish and Peterson 1962: 28). Similar metates were also found at Altamira in undifferentiated fill (Green and Lowe 1967: 28–29). Metates with concave grinding surfaces appeared in the Conchas Phase assemblage at La Victoria (Coe 1961: 106), and at Salinas La Blanca (Coe and Flannery 1967: 63). In summary, similar metates have been dated in the highlands from the beginning of the Archaic Period to historic times. In the lowlands this type occurs in the Archaic Period deposits at least until Late Preclassic times.
Archaic: 2 specimens.
Early Classic: 3 specimens.
Early Classic or Late Classic: 2 specimens.

Metates with planar grinding surfaces (Fig. 31; Fig. 32)
Sample: 6 specimens.
Dimensions in cm: T., 7.0, 6.0, 4.0, 6.0, 3.0 (incomplete), 7.0.
Material: granite (2), andesite (3), and thin-banded gneiss (1).

One large fragment has a quadrilateral outline with rounded corners, a flat, water-

Figure 31. METATES WITH PLANAR GRINDING SURFACES
(scale ½)

Table 13. FREQUENCY AND DISTRIBUTION OF ARTIFACTS FROM TEST PIT N3E3 AT SITE CS-8

Cs-8, N3E3 / ARTIFACT TYPES — EXCAVATION LEVEL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	48
Mortars/bowls																																	
Concave metates							1																										1
Planar metates																																	
Ovoid manos																1																	
Oblong mano																																	
Probable manos																																	
Grinding tool fragments	1		2																												1	1	
Stone bowl																																	
Stone sphere																																	
Pebble choppers																																	
Hammerstones																																	
Abrader saws?																																	
Bifacial flake tools																																	
End scrapers?																												1					
Utilized thin flake																																	
Crude blade																																	
Pumice fragments																																	
Polishing stones																																	
Flat, ovoid boulders																																	
Waterworn stones					1											2																	
Waterworn stone fragments		2	2	1	1		1	1									1				1												
Shell container																																	
Perforated shells																																	
Antler point																																	
Bone cylinder																																	
Earplug																																	
Earspools																																	
Figurine fragments																																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	48

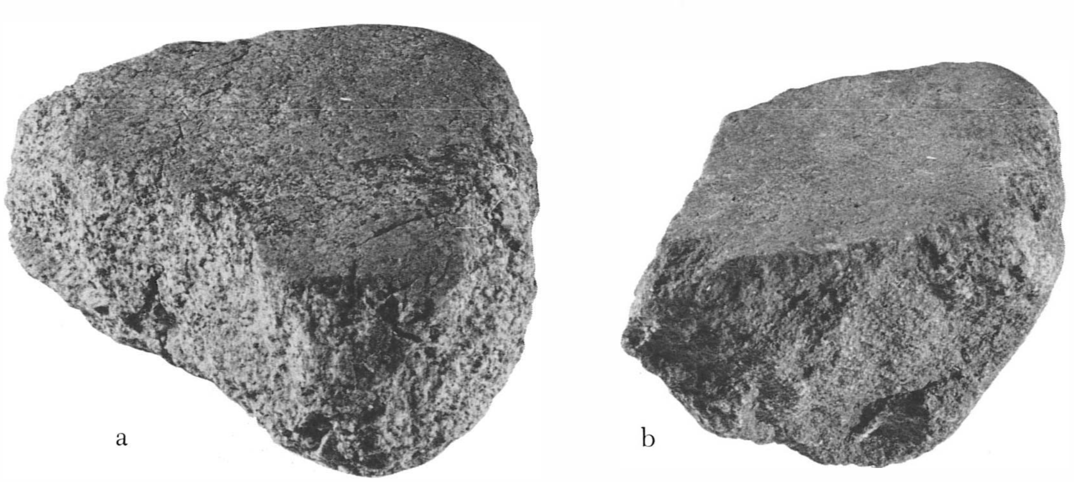


Figure 32. METATES WITH PLANAR GRINDING SURFACES
(*a*:scale ⅓; *b*: natural size.)

Table 14. Frequency and Distribution of Artifacts from Test Pits N1E9, N8W1, and S1W11 at Site Cs-6.

Cs-6, N1E9 — EXCAVATION LEVEL

ARTIFACT TYPES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	31
Mortars/bowls																												
Concave metates							1																	1				
Planar metates					1																							1
Ovoid manos										1												1	1					
Oblong mano																												
Probable manos																												
Grinding tool fragments			1										1							1								
Stone bowl																												
Stone sphere																												
Pebble choppers																						1						
Hammerstones																												
Abrader saws?																												
Bifacial flake tools																												
End scrapers?																												
Utilized thin flake																												
Crude blade																												
Pumice fragments																												
Polishing stones																												
Flat, ovoid boulders																												
Waterworn stones									1			2	1															
Waterworn stone fragments				1				1		1	1			1	2			1									1	
Shell container																												
Perforated shells																												
Antler point																												
Bone cylinder																												
Earplug																												
Earspools																												
Figurine fragments																												
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	31

Cs-6, N8W1 — EXCAVATION LEVEL

ARTIFACT TYPES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Mortars/bowls											1								
Concave metates														1					
Planar metates																			
Ovoid manos																			
Oblong mano																			
Probable manos															1				
Grinding tool fragments			1		1						2								
Stone bowl																			
Stone sphere																			
Pebble choppers							1												
Hammerstones		1					1												1
Abrader saws?		1								1									
Bifacial flake tools																			
End scrapers?																			
Utilized thin flake																			
Crude blade																			
Pumice fragments			1																
Polishing stones										1	1	1							
Flat, ovoid boulders							1			2									
Waterworn stones					1		1							1		1			
Waterworn stone fragments																	1		
Shell container																			
Perforated shells																			
Antler point																			
Bone cylinder																			
Earplug																			
Earspools																			
Figurine fragments																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

Cs-6, S1W11

ARTIFACT TYPES	1	2	3	4	5	6	7	18
Mortars/bowls								
Concave metates					1			
Planar metates								
Ovoid manos								
Oblong mano								
Probable manos								
Grinding tool fragments								
Stone bowl								
Stone sphere								
Pebble choppers								
Hammerstones								
Abrader saws?								
Bifacial flake tools								
End scrapers?								
Utilized thin flake								
Crude blade								
Pumice fragments								
Polishing stones								
Flat, ovoid boulders								
Waterworn stones								2
Waterworn stone fragments								
Shell container								
Perforated shells								
Antler point								
Bone cylinder								
Earplug								
Earspools								
Figurine fragments								
	1	2	3	4	5	6	7	18

worn base and vertical sides that may be worked. The remaining specimens are too small to reconstruct the former vessel shape. One of these has striations parallel to its side. On this meager evidence I postulate that these metates were subjected to a reciprocating grinding motion on their upper surfaces.
Compare: Ovoid plano-convex metates from Tehuacan (Abejas Phase and later) (MacNeish et al. 1967: 119–20). Also Legless slab metates from Chiapa de Corzo (Francesa-Istmo Phases) (Lee 1969: 118). The Chantuto material is similar also to metates from Ocós phase deposits at La Victoria (Coe 1961: 102). Thus, in the highlands this type occurs from the Late Archaic Period onwards.
Archaic: 4 specimens.
Early Classic: 1 specimen.
Early or Late Classic: 1 specimen.

Table 15. FREQUENCY AND DISTRIBUTION OF OBSIDIAN ARTIFACTS IN TEST PITS N1E9 AND S1W11 AT SITE Cs-6

Cs-6, N1E9 — EXCAVATION LEVEL (20 cm)

ARTIFACT TYPES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	TOT
UFF.								1			2	1				1	1			1						7
UF.						1												1								2
NUFF.		1						4	1	2		2	1		2	6		1		1	2	2			1	26
NUF.		1				1	2	5	3	4	2	4	3	2	1	2		5	1	6	4	3	2	2	1	54
UCH.														1												1
NUCH.						1	2	2		1	1			1	1	1		3		6	3	4				26
C.						1							1					1		2						5
UBF.																										—
NUBF.									1																	1
FT.																										—
OTHER																										—
TOTAL		2				4	4	12	5	7	5	7	5	4	4	10	1	11	1	16	9	9	2	2	2	122
	Early Classic Period													Mixed							Archaic Period					

Cs-6, S1W11 — EXCAVATION LEVEL (20 cm)

ARTIFACT TYPES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	TOT
UFF.																										—
UF.																										—
NUFF.																										—
NUF.																										—
UCH.																										—
NUCH.		1	1																							2
C.																										—
UBF.																										—
NUBF.																										—
FT.																										—
OTHER																										—
TOTAL		1	1																							2
	Early Classic Period						Mixed				Archaic Period															

KEY FOR TABLES 15-18, 20-23

- UFF. = Utilized Flake Fragment
- UF. = Utilized Whole Flake
- NUFF. = Non-Utilized Flake Fragment
- NUF. = Non-Utilized Whole Flake
- UCH. = Utilized Shatter Chunk
- NUCH. = Non-Utilized Shatter Chunk
- C. = Core
- UBF. = Utilized Blade Fragment
- NUBF. = Non-Utilized Blade Fragment
- FT. = Flake Tool
- Bi. = Bidirectional Wear
- Uni. = Unidirectional Wear
- Cut. = Cutting or Sawing Wear

Table 16. Frequency and Distribution of Obsidian Artifacts in Test Pit N8W1 at Site Cs-6.

Cs-6, N8W1 — EXCAVATION LEVEL (20 cm.) — ARTIFACT TYPES

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	TOT
UFF.	1		2		1		1	1			1	1	2			1										1	12
UF.	1				1	2		1	1			1															7
NUFF.	1	2	1	5	1	2	3	8	4		5										1						33
NUF.		3		4		6	4	5	3	2	2	1		1		2							2				35
UCH.																											—
NUCH.		3	1	1		6	1	1	1	3				2													19
C.						1			1			1															3
UBF.																											—
NUBF.																											—
FT.	1																										1
OTHER																											—
TOTAL	4	8	4	10	1	17	9	16	10	5	8	4	2	3		3					1		2			1	100
	Early Classic Period						Mixed											Archaic Period									

Ovoid manos (Fig. 33)
Sample: 6 specimens.
Size range: small to large cobbles. Two fragments are very coarse pebbles.
Material: granite (3), andesite porphyry (1), gabbro (2).

These are waterworn stones with one surface smoother than all other surfaces. One specimen with striations parallel to its long axis may have been used in reciprocative grinding. No striations were found on the other tools.

Compare: Ovoid manos from Tehuacan (MacNeish et al. 1967: 108). These were present from El Riego onwards but were especially popular in Coxcatlan, Abejas, and Ajalpan phases. The Chantuto material also resembles Pebble manos from Santa Marta (MacNeish and Peterson 1962: 28), Santa Marta Phase. Ovoid manos were recovered from undifferentiated fill at Altamira (Green and Lowe 1967: 29). The manos or handstones from Ocós and Conchas phases at La Victoria are also similar (Coe 1961: 102, 106).
Archaic: 3 specimens.
Early Classic: 3 specimens.

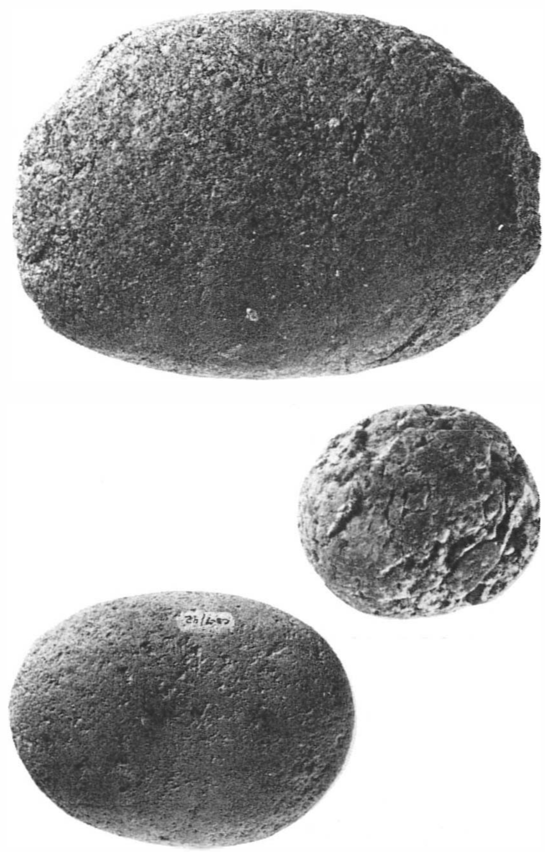


Figure 33. Ovoid Manos
(scale ½)

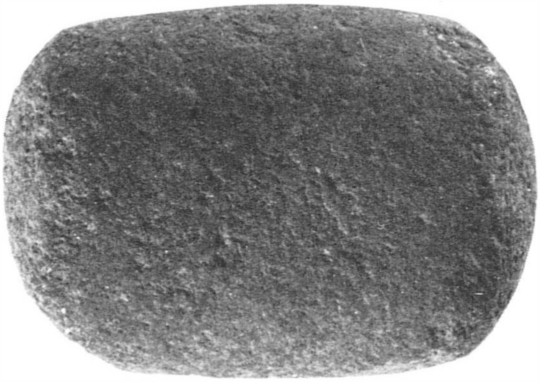


Figure 34. Oblong Mano
(scale ½)

Oblong mano (Fig. 34)
Sample: 1 specimen.
Dimensions in cm: diameter (Dia.), 5.0; length (L.), 7.5; min. dia., 4.0
Material: diorite.

An oblong mano with an oval cross-section. The ends of the tool have peck marks which were probably made during manufacture, but the tool may have been used as a pestle as well as a mano. The mano was probably worked with one hand and was used on both sides. No striations were visible under the microscope.

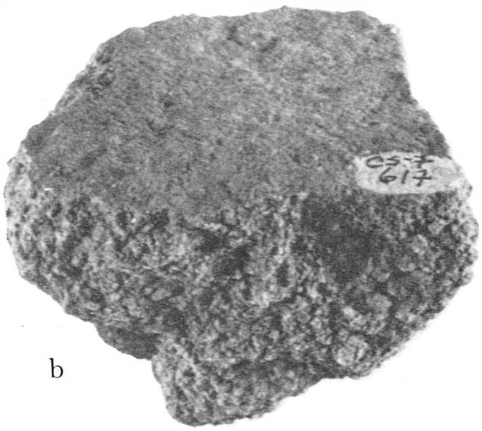
Compare: Oblong manos from Tehuacan (MacNeish et al. 1967: 111) deposits from Coxcatlan Phase to Santa Maria Phase; they reappear in Venta Salada Phase.

Manos with plain end were recovered from Chiapa de Corzo (Lee 1969: 114) deposits of Cotorra, Dili, and Francesa-Istmo phases.
Archaic: 1 specimen.

Probable mano fragments (Fig. 35)
Sample: 10 specimens.
Size range of fragments: very coarse pebbles to small cobbles.
Material: porphyritic andesite (7), thin-banded gneiss (1), and a fine-grained, dark-colored igneous rock (2).

All these fragments have curvatures that resemble those of manos. The cross-sections of these probable manos appear to have been oval. Judging from the evidence of two specimens, the grinding surfaces were restricted to one side. One specimen has an intact end

a


b


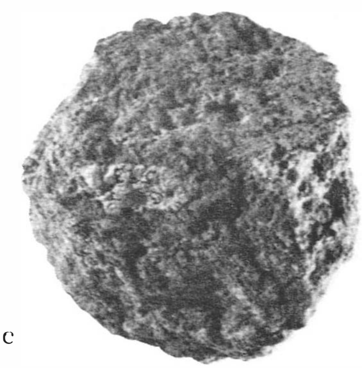
c


Figure 35. Probable Mano Fragments
(*a*: scale ⅓; *b*, *c*: natural size)

Table 17. FREQUENCY AND DISTRIBUTION OF OBSIDIAN ARTIFACTS IN TWO TEST PITS (N0E2 AND S16W1) AT SITE Cs-7.

Cs-7, N0E2 — EXCAVATION LEVEL (20 cm)

ARTIFACT TYPES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	23	24	25	26	27	28	29	30	31	32	33	TOT
UFF.								1																		1
UF.			1																							1
NUFF.			2							1						1				1						5
NUF.										1					1	1				1					1	5
UCH.																										—
NUCH.																										1
C.					1																					—
UBF.																										—
FT.																										
NUBF.																										—
OTHER																										—
TOTAL			3		1			1		2					1	2				2					1	13
	Early Classic Period					Mixed						Archaic Period														

Cs-7, S16W1 — EXCAVATION LEVEL (20 cm)

ARTIFACT TYPES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	TOT
UFF.		1		2	1																					4
UF.	1	4		2	2						1															10
NUFF.				4	1	2		1																		8
NUF.		3	1	14	2			2		1	1	1	1													26
UCH.																										—
NUCH.				2		2		1	1	2			1													9
C.																										—
UBF.				14	1																					15
NUBF.																										—
FT.																										—
OTHER																										—
TOTAL	1	8	1	38	7	4		4	1	3	2	1	2													72
	Early Classic Period								Mixed		Archaic Period															

bearing a pecking scar. Two specimens have striations that follow the curvatures of the worked surfaces suggesting that the tools were used for reciprocative grinding.
Early Classic: 6 specimens.
Early Classic or Late Classic: 4 specimens.

Fragments of grinding tools
Sample: 24 specimens.
Size range: very coarse pebbles to small cobbles.
Materials: granite (22), prophyritic andesite (2).

All specimens are fragmentary but retain one or more worn surfaces that are possibly the result of human activity. It was not possible to confirm this hypothesis even with the aid of a microscope. All fragments are of rock types which are used for the manufacture of grinding tools and which are not available in the study area.

Table 18. Frequency and Distribution of Obsidian Artifacts in Test Pit N3E3 at Site Cs-8.

Cs-8, N3E3 — EXCAVATION LEVEL (20 cm)

ARTIFACT TYPES	1	2	3	4	5	6	7	8	9	10	11	12	23	24	25	26	27	28	29	30	31	32	33	34	35	TOT.
UFF.	3	1	2	1		1	1		1	1									1	1						13
UF.	1		1	1				1												1						5
NUFF.	13	20	22	10	19	10		3	2					4				1		1						105
NUF.	14	19	38	10	12	10	6	1	8	1								1								120
UCH.																										—
NUCH.	4	12	13	4	6	7	4	2	4	2	1	1	1	1									1		2	65
C.	2	1		1	1			1																		6
UBF.																										—
NUBF.				1																						1
FT.		1									1															2
OTHER																										—
TOTAL	37	54	76	28	38	28	11	8	15	4	2	1	1	5				2	1	3			1		2	317
	Early Classic Period						Mixed				Archaic period															

Archaic: 3 specimens.
Early Classic: 12 specimens.
Early Classic or Preclassic: 4 specimens.
Early Classic or Late Classic: 4 specimens.
Early Classic or Postclassic: 1 specimen.

Simple silhouette stone bowl, unrestricted (Fig. 36)
Sample: 1 specimen.

Figure 36. Simple Silhouette Stone Bowl, Unrestricted (natural size)

Dimensions in cm: T., 2.0; Dia. (reconstructed), 14.0
Material: porphyritic andesite.

A ground stone bowl with simple silhouette. The shape of the base is unknown. Vessel exterior has an engraved geometric design.

Early Classic: 1 specimen.

Stone sphere (Fig. 37)
Sample: 1 specimen.
Dimensions in cm: Dia., 8.0.
Material: probably granite.

A single specimen which is in perfect condition. It is manufactured from a coarse-grained igneous rock, which is probably granite. This raw material was pecked in order to form the sphere.

Comparisons: three similar stone balls are reported from surface collections at sites in Tehuacan Valley which were occupied during the Palo Blanco Phase (200 B.C.–700 A.D.) (MacNeish et al. 1967: 137). Stone balls have also been found in Horcones to Jiquipilas (100 B.C.–450 A.D.) phases at Chiapa de Corzo (Lee 1969: 147) and in Ocós Phase material at La Victoria (Coe 1961: 102). Stone spheres are particularly abundant in the

Table 19. Modified Wentworth Grade Scale
Dunbar and Rodgers (1957: 161).

GRAVEL

Grade Name	*Grade Limits (cm)*
	409.6
Very large boulders	
	204.8
Large boulders	
	102.4
Medium boulders	
	51.2
Small boulders	
	25.6
Large cobbles	
	12.8
Small cobbles	
	6.4
Very coarse pebbles	
	3.2
Coarse pebbles	
	1.6
Medium pebbles	
	0.8
Fine pebbles	
	0.4
Very fine pebbles	
	0.2

Diquis Delta, Costa Rica (Lothrop 1963: 15–25, Fig. V). These are usually made from granite and often large sized, ranging from 1–2 m in diameter. Miniature spheres have also been recovered.
Archaic: 1 specimen.

Pebble choppers (Fig. 38)
Sample: 2 specimens.
Dimensions in cm: L., 5.5, 5.0; W., 5.5, 5.5; T., 2.0, 3.0.
Material: quartz (1) and basalt (1).

Each specimen is roughly triangular in outline and retains the waterworn cortex of the original pebble. The quartz specimen shows clear evidence of percussion working. The basalt specimen is less clearly a human artifact. Neither specimen has retouched edges.

Compare: Tehuacan (MacNeish et al. 1967: 88), Pebble choppers. Associated with all phases except Coxcatlan and Abejas.
Archaic: 1 specimen.
Early Classic: 1 specimen.

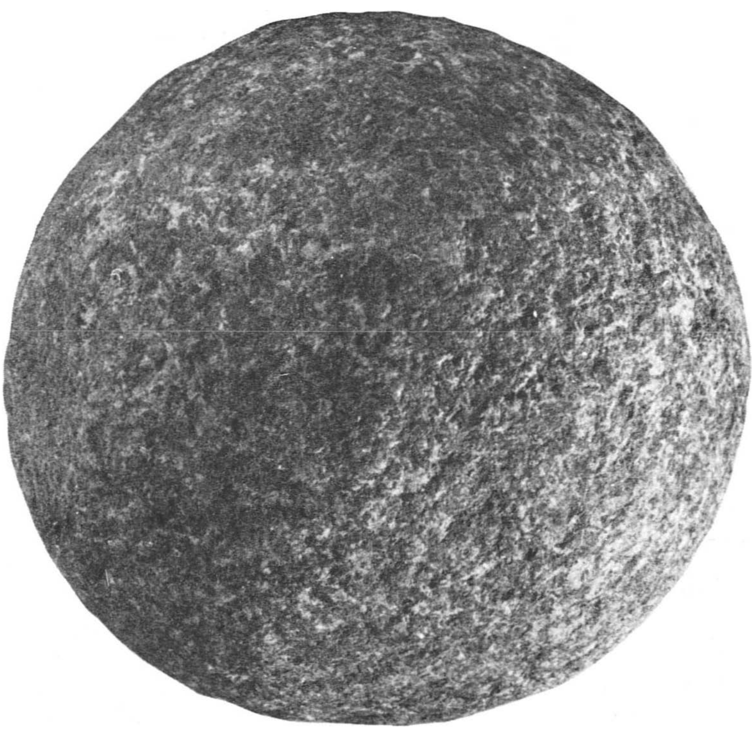


Figure 37. Stone Sphere
(natural size)

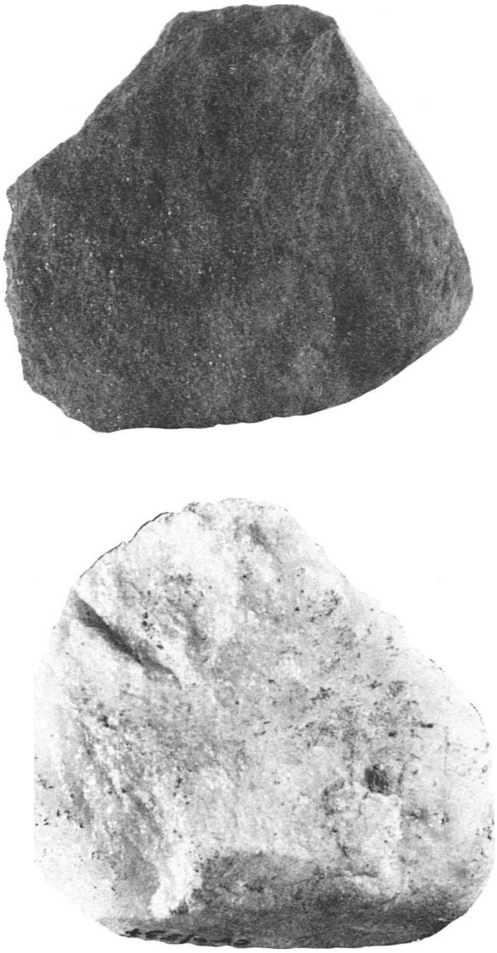


Figure 38. PEBBLE CHOPPERS
(natural size)

Hammerstones (Fig. 39)
Sample: 5 specimens.
Size range: Very coarse pebbles — large cobbles.
Material: granite (4), and gabbrodiorite (1).

Most of these are waterworn cobbles that are battered on one end. They were apparently briefly used as hammerstones. One Early Classic Period specimen has definite signs of human manufacture. It is chipped over the entire surface except for a small area which retains some waterworn cortex.

Compare: Spherical battered pebbles from Tehuacan (MacNeish et al. 1967: 85). This type is found in all phases. Also compare the Pebble hammers from Santa Marta (Level 6) (MacNeish and Peterson 1962: 28). In the lowlands hammerstones were found in Cuadros deposits at Salinas La Blanca (Coe and Flannery 1967: 63), and in the Ocós Phase deposits at La Victoria (Coe 1967: 102).
Archaic: 1 specimen.
Early Classic: 4 specimens.

Possible abrader saws (Fig. 40)
Sample: 2 specimens.
Size: maximum size (Max.), small cobbles.
Material: schist and gneiss.

These specimens may be unworked; however, the schist specimen has one smooth edge which may be due to human utilization. No utilization striations were visible under the microscope.

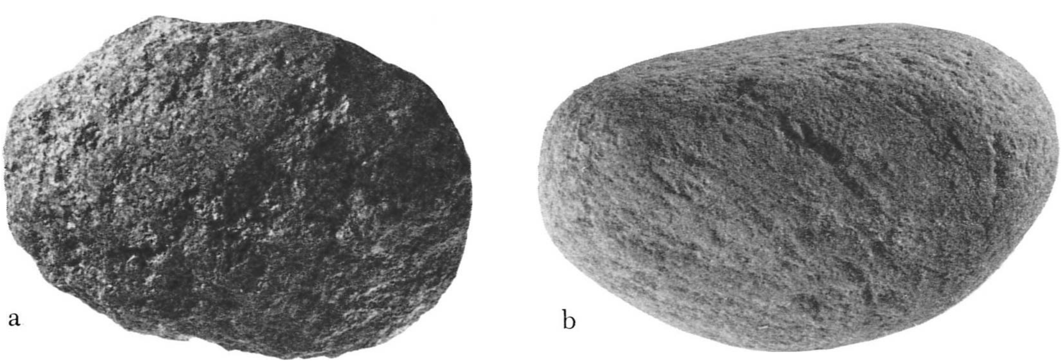


Figure 39. HAMMERSTONES
(*a*; scale 2/5; *b*: scale 4/5)

Compare: Abrader saws from Tehuacan (MacNeish et al. 1967: 125–26). They occur in Ajalpan through Venta Salada phases (1500 B.C.–A.D. 1540).
Early Classic: 2 specimens.

Bifacial flake tool (Fig. 41)
Sample: 1 specimen.
Dimensions in cm: L., 5.0; W., 4.1; T., 1.0.
Material: quartz.

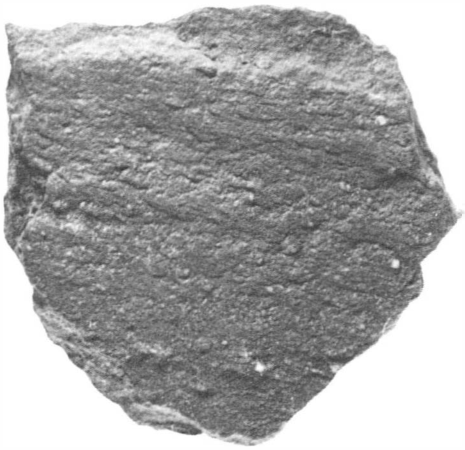


Figure 40. POSSIBLE ABRADER SAW
(natural size)

Figure 41. BIFACIAL FLAKE TOOL
(scale ½)

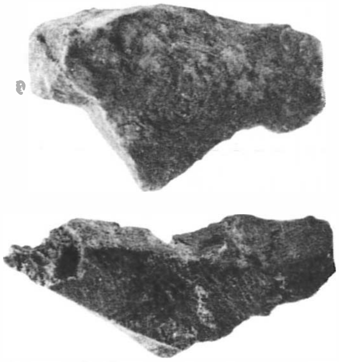


Figure 42. POSSIBLE END-SCRAPERS
(natural size)

A broken ovoid flake which retains a portion of waterworn cortex on its dorsal side. Ventral side is flat; dorsal side is slightly convex. The working end of the tool has been broken off so that its shape cannot be determined.
Archaic: 1 specimen.

Possible end-scrapers (Fig. 42)
Sample: 2 specimens.
Dimensions in cm: L., 4.0, 3.6; W., 1.5, 2.4; T., 1.0, 1.0.
Material: porous obsidian and friable quartzite.

Two flake tools that may have served as end scrapers. The obsidian specimen has a cutting edge perpendicular to its long axis. This edge has been chipped, apparently as a result of utilization. The quartzite specimen is broken so that a possibly similar cutting edge is missing. It may be an unworked rock fragment instead of an artifact.
Archaic: 1 specimen.
Early Classic: 1 specimen.

Thin flake, one edge possibly utilized (Fig. 43)
Sample: 1 specimen.
Dimensions in cm: L., 3.8; W., 2.0; T., 0.6
Material: basalt.

This possible tool has an outline shaped like a right triangle. The mutually perpendicular edges are thick and retain the cortex of the original pebble. The diagonal edge is thin and slightly concave. The specimen is eroded and retains no certain evidence of utilization.

Compare: Thin flakes, one edge utilized from Tehuacan (MacNeish et al. 1967: 49). Found in all phases.
Archaic: 1 specimen.

Figure 43. THIN FLAKE, ONE EDGE POSSIBLY UTILIZED
(natural size)

Figure 44. CRUDE BLADE
(natural size)

Crude blade (Fig. 44)
Sample: 1 specimen.
Dimensions in cm: L., 3.0; W., 1.0; T., 0.5.
Material: quartz.

A rectangular blade which is broken. One lateral edge is thin and has signs of working that are probably due to usage rather than to intentional pressure flaking. The other lateral edge is thick (keeled) as in the back of a knife blade.

Compare: specimens from Tehuacan (MacNeish et al. 1967: Fig. 5) that are labelled Crude blades, pointed striking platforms. This type appears in the El Riego Phase as a minority type but is a majority type in Coxcatlan and Abejas phases.
Archaic: 1 specimen.

Pumice fragments
Sample: 5 specimens.
Grade size: coarse pebbles to very coarse pebbles.

Eroded pumice fragments with no evident signs of usage. Such fragments can be picked up along the beach within the study area. Compare Pumice abraders from Ocós Conchas phase deposits at La Victoria (Coe 1961: 102, 107).
Early Classic: 4 specimens.
Early Classic or Late Classic: 1 specimen.

Polishing stones (Fig. 45)
Sample: 4 specimens.
Grade size: very coarse pebbles to small cobbles; fragments: small cobbles.

These waterworn rocks have a high luster on one side only. The polish is probably due to working some soft material such as clay or leather. Two of the specimens are oval and two are rectangular in shape. One of the rectangular specimens has utilization striations parallel to its long axis. The other specimens

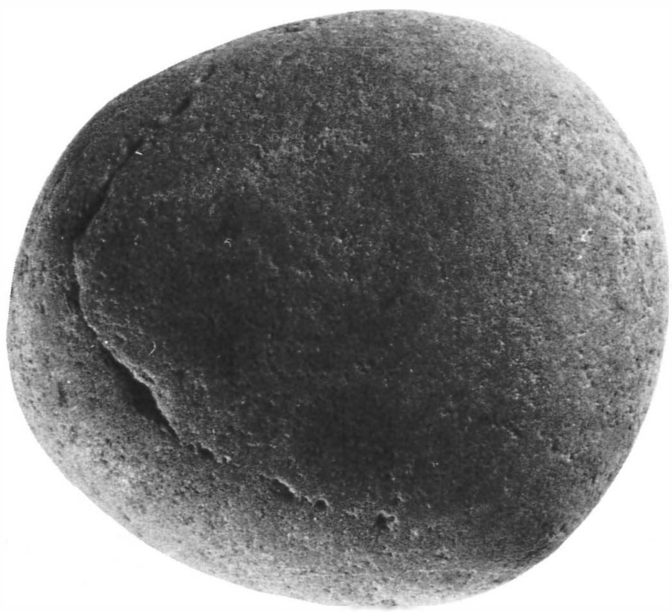


Figure 45. POLISHING STONE
(natural size)

Figure 46. FLAT OVOID SMALL BOULDER (scale ½)

are too finely polished for striations to be detected.

Compare: Polishing pebbles from Tehuacan Valley (MacNeish et al. 1967: 124). They occur from the Abejas Phase onward.
Archaic: 1 specimen.
Early Classic: 3 specimens.

Flat ovoid small boulders (Fig. 46)
Sample: 4 specimens.
Size range: small to large cobbles, actual size.
Material: quartzite (1), schist, (1), granitic (2).

These are waterworn flat boulders. There are no signs of grinding or other human activities even when surfaces are viewed under the microscope. Perhaps these boulders were brought to the sites in order to serve as small work tables for a variety of activities.
Early Classic: 4 specimens.

Unworked waterworn pebble and cobble fragments
Sample: 18 specimens.
Size range: very coarse pebbles to small cobbles.
Materials: coarse-grained igneous rocks.

Fragments of waterworn stones with no signs of human utilization. All are rock types which are locally available in rivers which enter the study area.

Compare: River pebbles in Cuadros Phase deposits at Salinas La Blanca (Coe and Flannery 1967: 64).
Archaic: 5 specimens.
Early Classic or Preclassic: 6 specimens.
Early Classic or Late Classic: 7 specimens.

Unworked waterworn pebbles and cobbles
Sample: 19 specimens.
Size range: coarse pebbles to small cobbles.
Materials: coarse-grained igneous rocks.

Waterworn pebbles and cobbles with no signs of human utilization. Perhaps these were used in cooking. These stones are similar to stones that can be collected in rivers within study area.
Archaic: 6 specimens.
Early Classic or Preclassic: 1 specimen.
Early Classic: 10 specimens.
Early Classic or Late Classic: 2 specimens.

SHELL ARTIFACTS

Pigment containers (Fig. 47)
Sample: 2 specimens.

Two marsh clam shell valves each containing red pigment.
Early Classic: 2 specimens.

Perforated shells (Fig. 48)
Sample: 16 specimens.

Twelve specimens of *Agaronia propatula* each have a single rough-edged perforation that possibly could be due to non-human predation. Three specimens of *A. propatula* each have two perforations with smooth edges caused by drilling. All specimens are from the Early Classic component (one comes from a level mixed with sherds from the Late Classic) at Cs-7. This limited distribution suggests to me that all perforations were in fact caused by human activity.

Compare: Shell tinklers from the Santa Maria Phase of the Tehuacan sequence (MacNeish et al. 1967: 147). Lee (1969: 178)

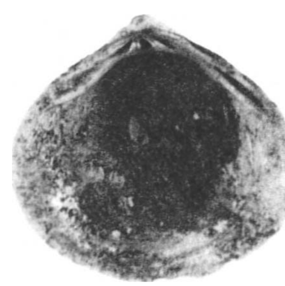


Figure 47. SHELL PIGMENT CONTAINER (scale 2x)

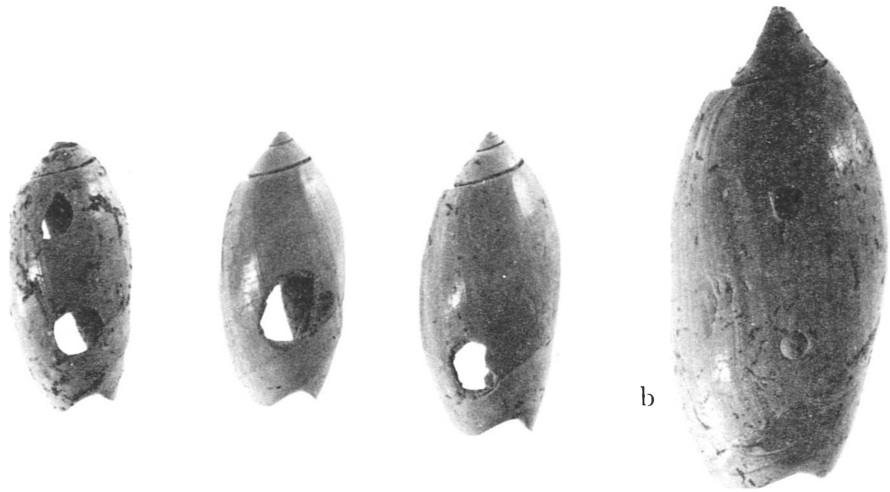
a  b

Figure 48. PERFORATED *Agaronia propatula* SHELLS
(*a*: natural size; *b*: scale 2x)

discusses the distribution of shell tinklers that resemble specimens from Francesa and Istmo phases at Chiapa de Corzo. The remaining specimen is a fragment of the hinge area of a marsh clam shell valve. It bears a single, smooth-edged hole.

BONE ARTIFACTS

Antler point (Fig. 49)
Sample: 1 specimen.
Dimensions in cm: L., 3.2; W., 0.8.

An antler tine has been worked to form a rectangular cross section at the distal end; the proximal end is pointed. A transverse cut has been made at the distal end of the artifact and a longitudinal spall removed from one side.
Early Classic: 1 specimen.

Figure 49. WORKED ANTLER POINT
(natural size)

Bone cylinder (Fig. 50)
Sample: 1 specimen.
Dimensions in cm: L., 2.2; W., 2.0

A hollow bone cylinder with a natural longitudinal groove. This is a piece of metatarsus from *Odocoileus virginianus.* It has been sawed at both ends nearly through to the interior cavity and the last part has been broken off.
Early Classic: 1 specimen.

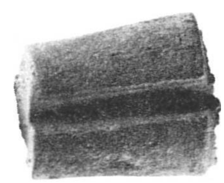


Figure 50. BONE CYLINDER
(natural size)

STONE ARTIFACTS: OBSIDIAN

from a study by Larry R. Wilcoxon

Introduction

In this section we describe and analyze the 636 obsidian artifacts from the excavations. There are three parts to this discussion. In the first part the artifacts are described by classes and their distributions are discussed. The classification system was devised by

Wilcoxon who examined each specimen for form and evidence of utilization.

The second part of this discussion reports a utilization experiment that Wilcoxon performed using non-archaeological obsidian tools. Wilcoxon used these tools on several different substances of different consistencies and also alternated the direction of tool movement. The results allowed Wilcoxon to establish types of wear patterns. A comparison of the archaeological artifacts with the experimental ones permitted the analysis of archaeological material according to the types established by the experiment. This provided some insight into the possible functions of the prehistoric tools.

The final part of this section is a discussion of the results of this study.

Description of Artifact Classes

The artifacts are described according to the categories presented below. The distribution of these artifacts is discussed after the artifact classes have been described.

Prismatic blades (Fig. 51)
17 specimens.
Material: black (16) and green (1) obsidian.

Large, long blades that were struck from prepared conical or cylindrical polyhedral cores with relatively flat striking platforms. The prismatic blades described here are both triangular and trapezoidal in cross section, with the latter shape being most frequent. Of all blades collected, there are no complete specimens. Examination of the working edges reveals no signs of retouch, but the presence of numerous acute flake scars suggests evidence of utilization. All specimens, with one exception, were made from black translucent obsidian. The unique specimen was made from green obsidian. The technique of manufacture was probably indirect percussion, although no polyhedral cores were found in association with the blades.

Flake tools (Fig. 52)
Sample: 3 specimens.
Material: black obsidian.

Flake tools are flakes which have been modified by retouch on one or more edges. All examples of flake tools from this collection have single notches worked into the cutting edge of the flake. Such tools might have served a function similar to that of the ethnographically known spokeshave. All

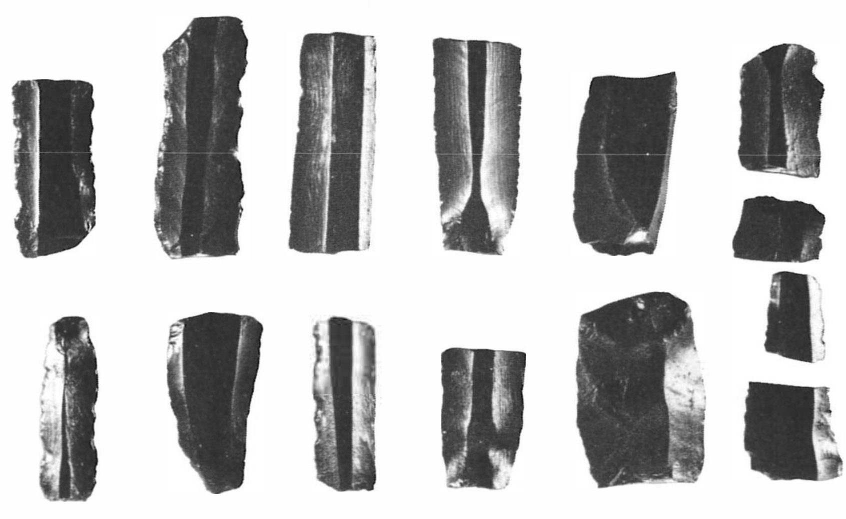


Figure 51. Prismatic Blade Fragments
Prisms up.
(natural size)

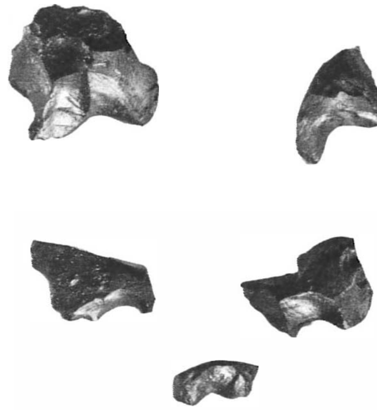


Figure 52. Flake Tools
(natural size)

Figure 53. Cores
(scale ½)

notched tools exhibit small flake scars characteristic of usage.

Cores (Fig. 53)
Sample: 15 specimens.
Material: black obsidian.

All cores described here are small and irregular in shape. Their smallness of size attests to their exhausted state. Such heterogeneity makes it very difficult, if not impossible, to discern regular formal types. No conical or cylindrical cores were observed; and no cores showed evidence of definite platform preparation.

Waste flakes (Figs. 54, 55)

All flakes were classified according to their state of completeness (that is, whole vs. fragmentary) and each class was subdivided on the basis of utilization versus non-utilization. Utilization was determined by the microscopic analysis of each waste flake.

Utilized whole flakes (Fig. 54a)
Sample: 25 specimens.

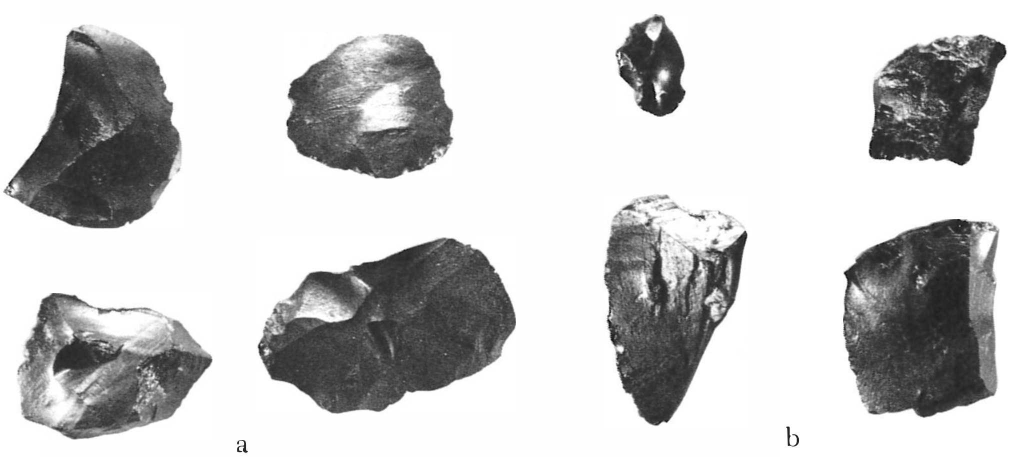


Figure 54. Utilized Flakes
a: whole flakes; *b*: flake fragments
(natural size)

Dimensions in mm: L., 11-32; W., 12-23; T., 2.5-9.
Material: black and gray obsidian (black obsidian most frequent).
Technique of manufacture: soft hammer percussion.

Unformalized flakes, each with one positive bulb of percussion present. Each exhibits evidence of use but not of retouch. All specimens in this category were classified as "utilized" on the basis of the presence of small, acute, flake scars. These scars occurred on one or both sides of the working edge of the flake.

Utilized flake fragments (Fig. 54b)
Sample: 37 specimens.
Dimensions in mm: L., 7-31; W., 10-33; T., 1-8.
Material: black and gray obsidian (black obsidian most frequent).
Technique of manufacture: soft hammer percussion.

Fragments of unformalized flakes, each lacks a positive bulb of percussion, but exhibits evidence of use but not of retouch.

Non-utilized whole flakes (Fig. 55)
Sample: 240 specimens.
Dimensions in mm: Max. L., 5–29; Max. W., 7–30; Max. T., 1–7.
Material: black and gray obsidian (black obsidian most frequent).
Technique of manufacture: soft hammer percussion.

Unformalized flakes, each with one positive bulb of percussion, which exhibit no evidence of retouch or use after removal from cores.

Non-utilized flake fragments (Fig. 55b)
Sample: 177 specimens.
Dimensions in mm: Max. L., 6–30; Max. W., 4–20; Max. T., 1–10.

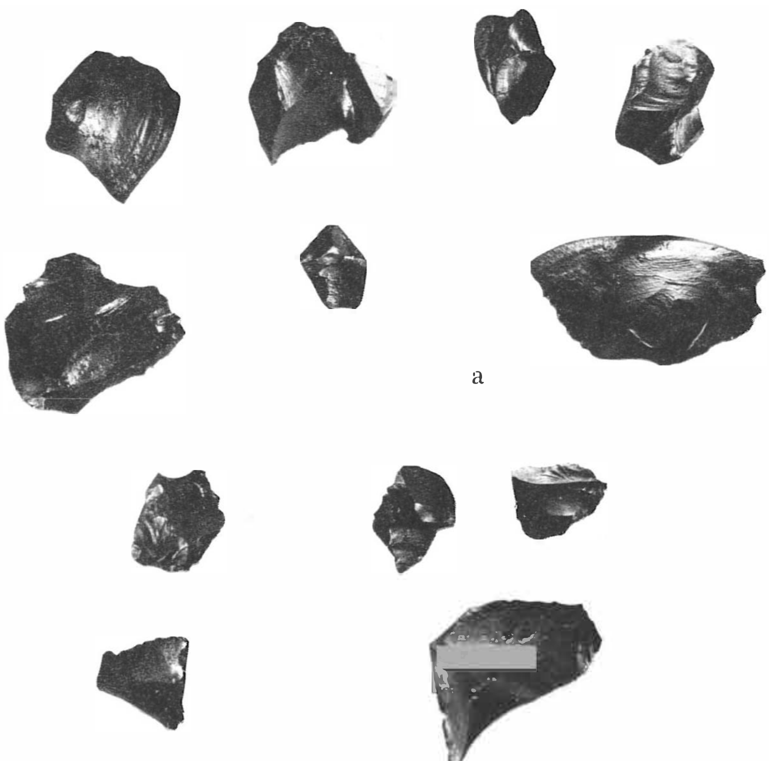


Figure 55. NON-UTILIZED FLAKES
a: whole flakes; *b*: flake fragments.
(natural size)

Material: black and grey obsidian with black being most frequent.
Technique of manufacture: soft hammer percussion.

Fragments of unformalized flakes lacking a positive bulb of percussion. These flake fragments exhibit no evidence of retouch or usage wear.

Shatter chunks (Fig. 56)
Sample: 122 specimens.
Material: black and gray obsidian.

These specimens are amorphous-shaped biprcducts of stone tool manufacture which cannot be confidently assigned to the core or flake fragment classes. Of the 122 total chunks examined, only one exhibited evidence of utilization.

Distribution

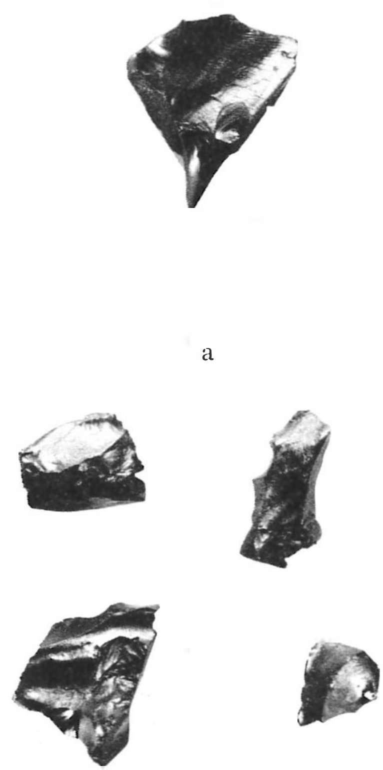
The distribution of the recovered obsidian artifacts is reported in Tables 15–18. The tables display the location of artifacts by excavation grid and level. The levels are combined into the two major depositional periods, the Archaic Period and the Early Classic Period. Because the contact between the two deposits is never horizontal, this display results in the designation of a zone of mixed deposits in each of the grids. These deposits were not stratigraphically mixed but the data retrieval was such that they are best considered in this fashion. For example, a large number of the obsidian artifacts were collected from the screens and it was not possible to securely attribute them to one or the other stratigraphic units occurring in that level.

If we eliminate the specimens from the levels designated as mixed, we can observe that obsidian artifacts occur with greater frequency in Early Classic Period deposits than in Archaic Period deposits. A total of 423 Early Classic Period specimens was recovered at all sites compared with only 57 specimens from combined Archaic Period deposits. Most artifact types were found in both components, but Cores, Utilized blade fragments, and Non-utilized blade fragments were found exclusively in the younger deposits.

Functional Analysis of Obsidian Artifacts

Wear patterns are often quite difficult to discern on artifacts manufactured from hard materials. Fortunately, the siliceous composition of obsidian makes the identification of wear patterns a relatively easy process with the aid of a microscope. Initial examination of the obsidian collection permitted Wilcoxon to sort the sample into utilized and non-utilized artifacts. It was then of interest to try to determine the use or uses to which the tools had been employed. Wilcoxon constructed an experiment with this objective in view.

Wear patterns on artifacts probably result from the interaction of a number of



a

b

Figure 56. SHATTER CHUNKS
a: utilized; *b*: non-utilized.
(natural size)

variables, such as the position of the implement relative to the object being worked, the angle of inclination of the implement's working part, the amount of force applied on the implement during the process of utilization, the hardness of the material from which the tool has been constructed, the direction of the implement movement, and the consistency of the material being worked. In this experiment Wilcoxon tried to hold constant all of these variables except for the direction of implement movement and consistency of worked substances. These were varied in a controlled manner to determine wear patterns.

Wilcoxon was able to distinguish three types of wear patterns that resulted from variations in the direction of implement movement. These are unidirectional wear, bidirectional wear, and cutting and sawing wear.

Unidirectional Wear. This pattern is characterized by the presence of numerous small, ovate-shaped flake scars on a single side of the working edge. The scars produced were, with few exceptions, regular in size and distribution. This pattern was produced experimentally by using the implement as a scraper and moving it in one direction only (for example, toward the user). The direction was always perpendicular to the axis of the working edge. The small flake scars were produced along the edge on the side opposite to the direction of tool movement.

Bidirectional Wear. This pattern is the same as the one described above except that the small ovate flake scars are produced on both sides of the working edge. Bidirectional wear was produced experimentally by using the implement as a scraper and moving it reciprocally in a direction perpendicular to the axis of the working edge.

Cutting or Sawing Wear. This pattern is characterized by the presence of flake scars which vary in size and shape and are distributed in a random manner along the working edge. Occasionally some of the flake scar surfaces demonstrate evidence of having been crushed or shattered during tool usage. This pattern of wear has been produced experimentally by cutting or sawing on various materials with an obsidian implement.

The effect of different substances on the production of wear patterns was examined by noting the differences produced by working on five substances of differing consistency. Four of these substances (bone, antler, wood, and cactus) were chosen because they are commonly believed by archaeologists to have been objects of utilization in the prehistoric past. The fifth substance, potato, was chosen because of its similarity in consistency to manioc, an item not readily available at the time of the experiment. We hoped that the type of wear pattern produced from the utilization of obsidian on this substance would shed some light on the long-debated issue of whether manioc was used as a food staple in Mesoamerica (Bronson 1966; Lowe 1967b, 1975b; Cowgill 1971; Deboer 1975).

Wilcoxon discovered that when the experimental obsidian implements were used on hard substances (antler, bone, and wood) the flake scars that were produced tended to be large in size and easily visible, because of their distinct boundaries. When soft substances (cactus and potato) were utilized, the flake scars that were produced were small in size and difficult to detect without microscopic aid.

The utilized archaeological tools were examined under a microscope and classified according to the three types of wear patterns that resulted from experiments on direction of implement use. All three types of wear patterns were found to occur in each of the two most populous artifact classes, Flakes and Utilized flake fragments. The frequency distributions of wear on these artifacts were plotted by grid level (Tables 20–23) for four test pits at three sites. Grid S1W11 at Site Cs-6 contained no specimens of either of these artifact classes. These distributions reveal no outstanding trends or clusters in the archaeological data. This implies that no significant changes in wear pattern types occurred over time and that the tools were used variously in the directions described above. The extremely small sample size makes the validity of these results questionable.

The flake scars examined on all specimens of Utilized flakes and Utilized flake fragments were more similar to those experimentally produced by soft substances than by hard substances. This finding provides positive, although meager, evidence in support of manioc utilization in Mesoamerica.

The wear pattern analysis of Utilized blade fragments (Table 23) produced another set of interesting results. Of the total of 15 recovered specimens, 8 exhibited evidence of cutting or sawing, whereas 7 specimens showed signs of unidirectional wear. The function of blades often has been inferred to be cutting or sawing but this analysis shows that at least some blades may have been used to scrape unidirectionally.

In conclusion, it is important to recognize that the functional analysis of obsidian from the Chantuto middens is weakened by two significant factors. First, the sample size is small, thus limiting the collection's utility for formulating generalizations; second, as ance (1970: 67-68) has cautioned, great care should be employed when assigning functional categories to archaeological material. This is because no matter how many replicative experiments are performed, a logical argument based on analogy necessarily must be employed. Therefore, it is not possible to state that a tool was definitely used for a specific purpose but only that experimental evidence demonstrates that it might have been so used.

Table 20. Frequency and Distribution of Wear Patterns on Utilized Flakes and Utilized Flake Fragments from Test Pits N0E2 and S16W1 at Site Cs-7

Cs-7, N0E2 — EXCAVATION LEVEL (20 cm)

ARTIFACTS TYPES		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	Tot.
UF.	Bi.			1																							1
	Uni.																										—
	Cut.																										—
UFF.	Bi.																										—
	Uni.								1																		1
	Cut.																										—
	Total			1					1																		2
		Early Classic Period					Mixed						Archaic Period														

Cs-7, S16W1 — EXCAVATION LEVEL (20 cm)

ARTIFACT TYPES		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	Tot.
UF.	Bi.																										—
	Uni.	1	4		2	2						1															10
	Cut.																										—
UFF.	Bi.				1																						1
	Uni.		1			1																					2
	Cut.				1																						1
	Total	1	5		4	3						1															14
		Early Classic Period								Mixed		Archaic Period															

Table 21. FREQUENCY AND DISTRIBUTION OF WEAR PATTERNS ON UTILIZED FLAKES AND UTILIZED FLAKE FRAGMENTS FROM TEST PITS N8W1 AND N1E9 AT SITE Cs-6

Cs-6, N8W1 — EXCAVATION LEVEL (20 cm)

ARTIFACT TYPES		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	26	Tot.
UF.	Bi.	1																									1
UF.	Uni.					1	2		1	1			1														6
UF.	Cut.																										—
UFF.	Bi.							1						1													2
UFF.	Uni.	1		2		1			1			1	1	1			1									1	10
UFF.	Cut.																										—
	Total	2		2		2	2	1	2	1		1	2	2			1									1	19
		Early Classic Period						Mixed											Archaic Period								

Cs-6, N1E9 — EXCAVATION LEVEL (20 cm)

ARTIFACT TYPES		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	Tot.
UF.	Bi.																										—
UF.	Uni.						1												1								2
UF.	Cut.																										—
UFF.	Bi.								1			1	1				1										4
UFF.	Uni.											1						1			1						3
UFF.	Cut.																										—
	Total						1		1			2	1				1	1	1		1						9
		Early Classic Period													Mixed							Archaic Period					

Table 22. FREQUENCY AND DISTRIBUTION OF WEAR PATTERNS ON UTILIZED FLAKES AND UTILIZED FLAKE FRAGMENTS FROM TEST PIT N3E3 AT SITE Cs-8

Cs-8, N3E3 — EXCAVATION LEVEL (20 cm)

ARTIFACT TYPES		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	21	22	23	24	25	26	27	28	29	30	Tot.
UF.	Bi.			1																							1
UF.	Uni.	1			1				1																	1	4
UF.	Cut.																										—
UFF.	Bi.	2						1																		1	4
UFF.	Uni.	1	1	2	1		1			1	1														1		9
UFF.	Cut.																										—
	Total	4	1	3	2		1	1	1	1	1														1	2	18
		Early Classic Period						Mixed				Archaic Period															

Table 23. Frequency and Distribution of Wear Patterns on Utilized Blade Fragments from Test Pit S16W1 at Site Cs-7
All Specimens are from the Early Classic Period Deposits.

Cs-7, S16W1 — EXCAVATION LEVEL (20 cm)

ARTIFACT TYPES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	Tot.
UBF. Bi.																										—
UBF. Uni.				6	1																					7
UBF. Cut.				8																						8
Total				14	1																					15

Discussion

Obsidian flakes have been reported from a significant number of coastal sites (Coe 1961; Coe and Flannery 1967; Green and Lowe 1967; Mountjoy 1971; Stark 1974). The presence of these flakes has aroused interest because, despite the fact that they appear to be wastage from the process of stone tool manufacture, they regularly occur without associated tools. Lowe (1967b) offered the speculation that the flakes may have formed teeth in a grater board. Some support for this has come from the present study, although other equally plausible explanations could account for our findings.

The presence of obsidian in the littoral deposits demonstrates conclusively that the coastal peoples responsible for the two occupations of the Chantuto middens participated in an exchange system that also included highland peoples. Unfortunately, the collection has not been analyzed to determine points of origin for the specimens. The closest primary source to the study area is El Chayal which is located in the Department of Guatemala, Guatemala (compare Pires-Ferreira 1975, Fig. 3). This is significant because Pires-Ferreira's (1975: 26) analysis of a small sample of obsidian from Early Formative Period sites on the Pacific Coast revealed the exclusive presence of El Chayal obsidian. This finding led Pires-Ferreira, following Grove, to suggest that the Pacific lowlanders may have participated in an Early Formative Period exchange route for El Chayal obsidian. Populations in Veracruz, Tabasco, and Oaxaca were also participating in this same system although it is not yet certain that obsidian destined for those consumer populations first passed through the Pacific coastal corridor. Pires-Ferreira speculates that the coastal movement of El Chayal obsidian may have also been accompanied by the exchange of shells moving in the same direction.

It is tempting to view the Chantuto obsidian as evidence for extending the Early Formative Period exchange system 1,000 or more years backward in time to include the late Archaic Period. This pattern has not been demonstrated by the available data which are too limited for testing. The recovered obsidian may have originated at the El Chayal source since its described physical characteristics are similar to those of the Chantuto Zone specimens. The El Chayal obsidian is described as high quality and grey in color (Pires-Ferreira 1975: 26). Some specimens in the present collection are also described as grey but others are described as black in color. In view of the fact that the people who described the materials may have different cognitive color categories and that the degree of blackness of a specimen depends in part on its thickness, which was not held constant, we conclude that it is not possible to determine the source of the archaeological obsidian on the basis of the described physical characteristics of the rock material. The single recovered specimen of green obsidian may have originated at Cerro de Navajas, Hidalgo, Mexico. This is the only source of green obsidian known to us.

STRUCTURAL REMAINS

In the section entitled "Reconstruction of Prehistoric Social Systems: Excavations and Dating" I described a yellow-orange clay stratum that was encountered in pit N0E2, Site Cs-7. The extent of this stratum was not determined, nor were any artifacts found in direct association which might have been used to indicate the reason for its presence. The stratum was definitely constructed by humans and contained one human burial. Indirect evidence suggests to me that the stratum represents the remains of a former house floor. This evidence is based on ethnographic analogy; the stratum resembles contemporary house floors in the study area, and the Mesoamerican practice of burying a deceased individual in the house floor has been well documented both ethnographically (e.g. Tozzer 1941: 130) and archaeologically (e.g. Rathje 1970).

The possibility that the Chantuto people constructed permanent residences is strengthened by the fact that archaeological remains of a permanent residence have been discovered in a coeval site in the Tehuacan Valley. In several other regions settled life is inferred to have begun at this time, although no structures have been located.

In the Tehuacan Valley, an Abejas Phase semisubterranean house has been located near the town of Chilac (MacNeish and García Cook 1972: 156-59). The house floor is oval in plan and originally measured 3.9 × 5.3 m, according to the investigators' reconstruction. The floor was 60 cm below the ground level. The upper part of the house was constructed of a framework of posts that was thatched with brush. The floor was littered with artifacts and contained a hearth at its southern end.

MacNeish, Peterson, and Neely (1972: 378) interpret this house as "secure evidence of a hamlet . . . covering from 500 to 100,000 square meters, with evidence of permanent habitations occupied for all seasons of the year, perhaps for a number of consecutive years, but without evidence of any specialized administrative, economic, or ceremonial centers within the hamlet."

Flannery (1972: 37-38) has criticized this interpretation of an Archaic Period hamlet on the basis of the discovery of a single structure. He also notes that additional test pits (17 pits each measuring 1 sq. m) in the vicinity of the Chilac house revealed no additional structures.

The Chilac house thus provides us with solid evidence that people constructed permanent structures at the time period under consideration. The best interpretation of the Chilac house is that it represents an isolated homestead. No evidence for a settled community is currently available.

In the Central Depression of Chiapas and the Valley of Oaxaca, the late Archaic Period must have been characterized by the beginnings of sedentarism. This is inferred from evidence for nomadic life prior to the period and settled life immediately after it. In both regions a hiatus in the archaeological record prevents meaningful discussion of this transition.

In summary, the clay stratum at Tlacuachero is best interpreted as a portion of a well-constructed house floor, which in turn implies the presence of a permanent structure in the Chiapas littoral during the late Archaic Period. This evidence is admittedly not very solid, and further investigation is required for the testing of my interpretation. Accepting the evidence as indicative of the former presence of a permanent structure, the simplest conclusion is that it was an isolated homestead rather than a part of a hamlet or village. This conclusion is very tenuous and may be proven incorrect in the future.

SUMMARY OF THE MATERIAL CULTURE OF THE CHANTUTO PEOPLE

The Chantuto assemblage consists of a small number of stone artifacts which generally are not distinctive in form. These factors severely limit the utility of the assemblage for the purpose of intersite comparisons. Moreover, the near absence of experimental evidence concerning possible functions of the stone tools renders the collection minimally useful in the reconstruction of the activities of the Chantuto people.

The low frequency of artifacts is itself a significant observation and has been reported for many coastal sites in addition to the Chantuto ones. Although usually stated subjectively rather than quantified, the observed low frequency of artifacts has often been considered by archaeologists as an indicator of transient rather than permanent populations (e.g. Long and Wire 1966; Mountjoy 1971; Shenkel 1971). Conversely, high artifact frequency has been used to indicate permanent residence (e.g. McGimsey 1956; Stark 1974). Most often the reconstructed duration of occupation is supported by several lines of evidence in addition to the observed low frequency of artifacts. When considered in isolation, however, low artifact frequency in coastal deposits may result from one or more of the following factors: (1) population size, (2) duration of occupation, or (3) ecology of the populations.

The first two factors listed are obvious and require no further discussion here. The third factor listed has sometimes been overlooked in the evaluation of artifact frequency. Subsistence economies that have a littoral focus appear to me to require less complex technologies than economies with a greater offshore focus or food-producing terrestrial economies. I concluded that an observed low frequency of artifacts in a particular coastal deposit should be examined as the possible result of each of these three factors. Which factor is judged the most significant will depend on the assessment by the researcher of the various lines of available evidence. In my opinion, when a littoral based subsistence economy is indicated by the faunal remains at the site, the researcher should be cautious in concluding that low artifact frequencies are the result of a temporary occupation when in fact the observation may be reflective of the people's ecology.

Significant conclusions that can be drawn from an analysis of the artifact types in the Chantuto collection are discussed below.

I have identified two morphologically different forms of metates. The types differ significantly in the form of their upper surfaces, but both types bear striations that suggest that the grinding motion paralleled the long axis of the tool. I assume that metates with concave upper surfaces would be especially suitable for grinding dry materials, whereas metates with planar upper surfaces would serve well for grinding wet substances. I was not able to determine the actual functions of the Chantuto metates. The ethnographic literature reports a wide variety of substances that are ground between two stones. These can include pigments, wild or cultivated plant foods and spices, and meat products. Despite this, the pattern of indirect evidence suggests to me that the metates, particularly those with planar surfaces, may have been used to process maize. This suggestion is based on an analogy with the present-day Mesoamerican practice and the documented contemporaneity of maize utilization in the Mesoamerican highlands.

The two types of recovered manos must have been used in conjunction with the metates just discussed. The only striated mano may have been used in a reciprocative motion.

The Chantuto assemblage also included one pebble chopper and one hammerstone. These tools were manufactured from locally occurring waterworn stones and retain areas of the eroded cortex. Both tools were probably used as percussion instruments but the kinds of materials that were worked are not known.

One polishing stone was recovered from the Archaic Period deposits. Archaeologists usually interpret such stones as associated with pottery manufacture. This explanation is unwarranted for the Chantuto specimen due to the absence of associated pottery. Many items of wood, leather, or bark paper could have been smoothed with this tool.

One possible end scraper may have been used to scrape or plane wood or leather objects. Cutting tasks might have been accomplished by the single bifacial flake tool or the thin flake tool with one edge possibly utilized. Conclusive evidence for working was not discovered. The crude blade, which was certainly a tool, may have been used for cutting or scraping.

The two utilized flakes (UF) and three fragments of the same type (UFF) may have been used as scrapers. This possibility is suggested by comparisons between experimental and archaeological artifacts. Unidirectional scraping is indicated more often than bidirectional scraping. The worked material may have been soft rather than hard in consistency. The remaining obsidian artifacts, which are various classes of flakes and chunks, were all non-utilized.

Waterworn stones were carried to the sites for unknown reasons, although they may have been used for cooking purposes.

The most carefully worked artifact recovered from the Archaic Period deposits was the stone sphere. The high quality of granite from which it was made is not locally available so that the sphere, or its raw material, must have been imported into the zone. The unique high quality of the workmanship also raises the question as to whether the sphere may have been intruded at a later time into the older deposits. No stratigraphic evidence of intrusion was noted in the field but significantly the sphere was recovered just below the upper contact of the Archaic Period deposits.

The surviving artifacts of the material culture of the Chantuto people thus indicate a simple tool kit designed for several basic tasks. Unquestionably, the full range of the material culture included many of the perishable items used today in the area. These include canoes, paddles, nets, ropes, poles, and baskets.

RECONSTRUCTION OF PREHISTORIC SOCIAL SYSTEMS: DISCUSSION AND CONCLUSIONS

THE ECOLOGY OF THE CHANTUTO PEOPLE

In the introduction I stated that my primary research objective was to reconstruct the sociocultural system of the Chantuto people with particular emphasis on that part of the cultural system that directly communicated with the biophysical environment. In addition, I set forth five specific objectives of this study. In this concluding section I will summarize and assess the results of the study in separate sections that correspond to the previously established objectives.

The Chantuto Phase in Time and Space

The existence of the prehistoric Chantuto people had been recognized prior to the initiation of the present study. The geographic location of this ancient community had also been identified as a portion of the coast of present-day Chiapas, Mexico.

Five archaeological sites are now positively identified with the Chantuto occupation. Each of these is a shell midden that forms an island within the present-day mangrove swamp. My research has been concerned with three of the five known deposits.

As a result of the research reported here it has been possible to reconstruct the paleoenvironment of the Chantuto people. The evidence indicates that these people lived in an environment generally similar to that of the area today. The shoreline, however, may have been located in a position that is inland compared to its present-day position. I was not able to reconstruct the precise position of the mainland–swamp interface for the time period of the Chantuto occupation. Despite this, I suspect that the archaeological sites were located within the mangrove swamp resource zone during their entire period of occupation by Chantuto people.

The minimal time of occupation, ascertained from a series of radiocarbon age determinations, is during the late Archaic Period, from 3000 B.C. to 2000 B.C. The three studied sites appear to have been occupied in part sequentially, although Cs-7 and Cs-6 were simultaneously occupied for a minimum of approximately 100 years.

The time placement of the Chantuto Phase makes it the earliest identified phase of the Soconusco. It is the partial time equivalent of both Abejas and Purron phase occupations of the Tehuacan Valley. It is also partially contemporaneous with the Ostiones Phase at Puerto Marqués and perhaps with the Matanchén Phase at San Blas 4 and the occupation described for Cerro Mangote, both of which lack bracketing dates.

Subsistence

At the onset of this research an objective of mine was to determine whether the Chantuto people had practiced an unmixed economy based only on wild foods or whether they practiced some form of food production in addition to the procurement of wild foods. My specific hypothesis was that the economy was an unmixed one. In order to fully test this hypothesis it would be necessary to analyze data from both the faunal and floral components of the prehistoric procurement system. In my research, however, analysis was possible only on the faunal remains because no plant remains were recovered. This presents a serious problem in testing my hypothesis in view of the fact that ethnographic analogy suggests that a possible mixed economy would have combined the collection of estuarine fauna with the farming of domesticated plants. The incomplete data available, therefore, prevents testing the hypothesis.

Lacking plant or pollen remains, it is possible to turn to the artifact assemblage for indicators of agriculture. Manos and metates were found in the Chantuto Phase assemblage but I am hesitant to conclude that their presence indicates agriculture when wild plant foods, non-foods, or animal foods could have been processed by grinding. In addition, the obsidian chips found in the deposits could have been associated with the preparation of domesticated plant resources but no conclusive evidence for this has been found.

Considering only the faunal material, it is certain that most resources were procured from the marine estuary and lagoon systems. Important food items were marsh clams, fish, and reptiles. I have also speculated that shrimp may have contributed significantly to the diet. Some animal bones indicate that food was procured from the inland region, although it did not contribute a large proportion of the diet and was significantly present at only one of two studied sites. The apparent relative unimportance of land animals, as shown by the faunal analysis, is reinforced by the absence of projectile points in the tool assemblage. The offshore marine zone was not utilized by the Chantuto people. The primary reason for this conclusion is that offshore species were not present in the faunal material. In addition, hooks which are often associated with deep-water fishing were absent from the tool assemblage. Waterfowl also appear to have been a neglected resource. Nelson (1909) has suggested that the lack of waterfowl bones in Californian midden sites is due to their failure to become deposited since they were eaten by domestic dogs. The absence of dog bones in the Chantuto Phase deposits does not provide support for a similar explanation for the Chantuto material.

Accordingly, the available archaeological evidence for the subsistence pattern of the Chantuto people indicates an unmixed economy based on the procurement of estuarine animal resources. During this study I have become convinced that this procurement focus was permitted by the operation of other mechanisms that provided the consumers with foods from the terrestrial environment. Some of the consumers I believe to have been local people whereas others were possibly from inland populations. The local people may have received terrestrial plant and animal products through trade, whereas the inland groups may have procured their terrestrial foods directly. The need is great for a regional study to clarify these issues.

It is difficult to make accurate comparisons between the Chantuto economy and the economies of the other coastal sites discussed in the introduction. This is due to the fact that only a few studies have been focused on a systematic reconstruction of economic systems. Stark's reconstructed economy for the occupation at Patarata 52 is generally similar to that of the Chantuto people. In both economies a primary emphasis is indicated for estuarine animal species. Plant contributions are hard to evaluate but are believed by both Stark and me to be significantly present, but not dominant.

Demographic Structure

The remains of a single individual were recovered from this component so that the demographic structure of the population cannot be reconstructed at the present time. The individual was a mature adult male, possibly over 40 years of age, who suffered slight physiological stress in early life. The man's diet was distinctly abrasive. An abrasive diet appears to be characteristic of a coastal adaptation as it has been observed for several coastal dwelling human populations (Phillip L. Walker pers. comm.).

Residence Pattern

I have been particularly interested in determining whether the Chantuto people engaged in seasonal population shifts from mainland to littoral habitats or whether they were continuously in residence within the littoral zone. One set of results in this study leads me to conclude occupations were periodic and perhaps seasonal. A second set of results suggests continuous occupation. I will now summarize these two sets of results and discuss my final conclusion regarding the nature of the Chantuto occupation.

The analysis of faunal remains shows that most of the known food resources of the Chantuto people are available in the estuarine ecosystem on a continuous rather than seasonal basis. Some faunal evidence, however, suggests that specific activities were pursued in the period of the late dry season/ early wet season. This period coincides today with the time of maximum shrimp procurement, and on the basis of this ethnographic analogy I believe that shrimping was an important activity in the prehistoric past. This assumption could not be tested due to lack of evidence. The enormous amounts of shell material in the middens attest to a large volume of clam meat which was procured over a 100-year period of time. I do not know whether all of this meat was consumed by local inhabitants or whether some meat was exported to inland communities perhaps in a dried condition. I am beginning to favor the exportation model for reasons discussed below. Analysis of $CaCO_3$ content of the midden material also suggests to me that deposition was periodic rather than continuous. This conclusion is substantiated by visual inspection of the stratigraphic sections of the middens. Difficulty arises in the interpretation of the timing of these periodic events, although they do not appear to have been precisely annual.

The evidence for seasonal occupation of the littoral zone by the Chantuto people is thus derived from faunal analysis, visual inspection of the stratigraphic sections, and analysis of $CaCO_3$ in vertical profiles.

The evidence in favor of permanent residence in the Chantuto Zone is derived from the clay stratum, interpreted as a house floor, which was encountered in a test pit at Cs-7. The presence of the floor provides some proof that permanent residences were constructed in the Chiapas littoral during the late Archaic Period. It is worth mentioning here that the site and test pit (Cs-7, N0E2) in which the house floor was discovered yielded the greatest number of terrestrial animals compared to four other grid samples of Chantuto Phase fauna. This suggests to me that the people residing permanently in the littoral zone imported some meat from the mainland in order to supplement their diet.

What is the best possible model for the human population in the littoral zone during the late Archaic Period in light of the above-mentioned evidence? The simplest explanation appears to me to be one based on ethnographic analogy. At the present time the littoral zone supports a population of permanent inhabitants. Most of these people live in the village of La Palma, but some live in isolated homesteads. In addition, the number of inhabitants in the zone rises dramatically during the shrimp season. At that time mainland village dwellers occupy temporary encampments within the zone.

I reconstruct the residence pattern of the Chantuto people to include some permanent residences within the zone and periodic influxes of mainland dwellers that perhaps occurred on a seasonal basis. It is not certain at the present time whether the littoral dwellers resided in isolated homesteads or in hamlets. This uncertainty is due to lack of research. No specific research has been carried out on the presumed mainland aspect of the Chantuto people's community pattern. The problem of population shifts between the mainland and littoral habitats has not been conclusively solved, although some evidence has been presented in this study. Further research is needed before a final conclusion can be reached. In this regard I recommend four specific approaches. First, a detailed ethnographic study of the human population in the study area would permit a precise comparison between present-day and Archaic Period populations. Second, archaeological research on the mainland might permit the isolation and study of the component that indicates the former presence of the Chantuto people. Third, extensive testing at Tlacuachero would permit the determination of the number of structures that were once present. Fourth, additional work at the site of the clay stratum would permit the location of its boundaries and other possible features which would allow conclusive determination of the stratum's former function.

My reconstruction of the residence pattern of the Chantuto people is partially at variance with reconstructed residence patterns for other Middle American coastal sites. This is because the reconstructions usually favor either periodic or permanent occupations. The periodic deposition is sometimes reconstructed as the result of food extraction activities, as for example at San Blas 4, or as seasonal habitation sites as at Barra de Navidad. Continuous occupation is usually reconstructed as the result of a hamlet or village community organization. An example is Patarata Island 52. I believe that the Chantuto deposits may have accumulated through the activities of both local full-time inhabitants and migrants who came into the littoral on a periodic basis.

Exchange Networks

One of my initial research objectives was to determine the nature of possible exchange relationships between the Chantuto people and coeval populations in habitats other than a littoral one. I have previously discussed the evidence for interaction between littoral dwellers and the presumed dwellers for the adjacent coastal mainland. The evidence suggests to me that reciprocal food sharing and regular population movements occurred between these two habitats. This reconstruction is based only on the evidence garnered from archaeological sites in the littoral zone and requires testing at mainland sites.

One of my initial hypotheses was that the Chantuto people were integrated into an exchange system that included highland groups as well as lowland ones. This hypothesis has been confirmed by the presence of obsidian in the deposits of the Chantuto Phase. The sources of all Mesoamerican obsidian are in the highland region (Pires-Ferreira 1975, Fig. 2), and therefore highland peoples necessarily must have been in some way responsible for the appearance of this resource in the littoral zone. At the present time the obsidian from the excavations has not been analyzed to determine specific points of origin.

Having recognized that obsidian was imported into the littoral zone it is now necessary to consider what items may have been exported in return. No archaeological evidence has come to my attention to solve what first appears to be an imbalance in exchanged commodities. On the basis of ethnographic analogy I hypothesize that estuarine resources, especially shrimp, clams, and fish, might have been sent inland. Some ethnographic parallels make this hypothesis a reasonable one. Cook (1946: 51) contends, without citing his sources, that the coastal dwelling prehistoric California natives exported dried shellfish meat to inland peoples. Closer to the study area, in Nayarit, Mountjoy (1971: 53–54) reports the practice of drying and exporting turtle meat, smoking a small fish called *lisa,* and formerly fire drying the nut meat of oil-nut palms. At La Palma much of the shrimp and fish exported today from the zone is sun dried. Certainly this technique was within the capabilities of the Chantuto people.

My hypothesis, although demonstrably reasonable, requires testing in order to be disproved or confirmed. Shrimp, clams, and fish have different preservation potentials and as a result the success in archaeological reconstruction differs for each of the three commodities. For example, I have not been able to prove that shrimp were taken from the estuary during the Chantuto Phase so, of course, possible export from the zone can only be speculative. Clams and fish, in contrast, were definitely harvested. The shell remains represent a large amount of collected shellfish, whereas the fish remains represent more moderate amounts of food. If some clams were extracted from their shells, dried and exported for inland consumption this situation would not now be apparent from the archaeological record, on the basis of the techniques of analysis that are currently available. Of the three proposed commodities, only fish export can be critically evaluated from the archaeological record. This is true only if the prehistoric people split and sun dried their fish as do coastal people today. This process would result in the absence of archaeological indicators (barring artifacts associated with the fishing activities) at the collecting sites, but would result in the deposition of fish bones at inland locations.

In order to test the hypothesis that fish were exported inland during the Archaic

Period it is necessary for archaeologists to examine relevant deposits for the presence of Pacific estuarine and possibly marine fish remains. To my knowledge, this research has not yet been attempted. For example, at Tehuacan Valley sites fish remains are reported as present but have not yet been identified (Flannery 1967, Table 16), thus preventing the determination of their origins.

If fish export is eventually proved for the Archaic Period peoples, I am in favor of considering this as adequate *indirect* evidence for the inland flow of the other two commodities under consideration as well as evidence for the parallel movement of fish. I am not advocating abandonment of attempts to discover direct evidence for the movement of these commodities but merely admitting that if such evidence fails to materialize, the best interpretation would be the one that treats the three commodities as having similar exchange potentials.

The type of exchange that I envision for the Chantuto people involves the flow of items between pairs of populations that are linked together by these economic, and possibly other forms, of alliances. On a regional basis each of these links would form part of a network of connections integrating a large number of populations over a broad geographical area. This model seems appropriate for the Archaic Period because it does not necessitate the use of commodities for establishing ranked hierarchies within populations, nor the presence of powerful centralized agencies controlling the flow of items into and out of each group. This model is essentially that described by Pires-Ferreira (1975: 4) as "reciprocal exchange of utilitarian commodities (excluding food-stuffs) to which every villager had access." My model differs in that food stuffs are included. The model requires testing against the archaeological evidence.

In my opinion the major significance of this study is that it raises questions that have not been previously considered concerning early Mesoamerican coastal populations and their relationship to the environment. The questions raised greatly exceed the few answers that have been generated. I hope that these questions will provide a useful framework for other individuals who are also interested in the study of coastal adaptations.

RECONSTRUCCION DE SISTEMAS SOCIALES PREHISTORICOS: DISCUSION Y CONCLUSIONES[1]

LA ECOLOGIA DE LA GENTE DE CHANTUTO

En el primer capítulo declaré que mi objetivo principal en esta investigación era la reconstrucción del sistema socio-cultural de las gentes de Chantuto, con énfasis especialmente en esa parte del sistema cultural que los comunicaba con el ambiente bio-físico. Además, expuse cinco objetivos específicos en este estudio. En este capítulo final resumiré y evaluaré los resultados del estudio en secciones separadas que corresponden con los objetivos anteriormente expuestos.

La Fase Chantuto en Tiempo y Espacio

La existencia de la gente prehistórica de Chantuto fué reconocida formalmente antes del presente estudio. La ubicación geográfica de esta comunidad también fué identificada como una porción de la costa del Pacifico en Chiapas, México.

Se identificaron cinco sitios arqueológicos con ocupación de la Fase Chantuto. Actualmente cada sitio es un conchero que forma una isla en la zona pantanosa de los manglares. Mi investigación se concentró en tres de los cinco depósitos conocidos.

Como resultado de la investigación aquí reportada fué posible reconstruir una parte del ambiente paleogeográfico del pueblo de Chantuto. La evidencia indica que esta gente vivía en un ambiento físico en general similar al área de hoy en día. Sin embargo, es posible que la costa haya estado situada tierra adentro, en relación con su posición actual. No fué posible reconstruir la situación exacta del límite entre el pantano y la tierra firme en el período de ocupación de la Fase Chantuto. A pesar de esto, sospecho que los sitios arqueológicos estuvieron situados dentro del manglar durante todo el tiempo de la ocupación de esta gente.

El tiempo mínimo de ocupación, establecido por una serie de análises de radiocarbón, corresponde al Período Arcaico tardío, de 3000 años a. C. hasta 2000 años a. C.

La fase Chantuto es la mas temprana conocida actualmente en el Soconusco. Es en parte contemporánea con las ocupaciones del Valle de Tehuacán en las fases Abejas y Purrón. También es parcialmente contemporanea a la Fase Ostiones en Puerto Marqués, Guerrero, y tal vez a la Fase Matanchén en San Blas 4, Nayarit, tanto como a la ocupación descrita para Cerro Mangote, Panama, aunque esta dos últimas carecen de fechas exactas.

Subsistencia

Al principio de esta investigación, mencioné que uno de mis objetivos era determinar si el pueblo de Chantuto había ejercitado una economía simple, basada solamente en recursos naturales, o si ejercitaban algún método para la producción de alimentos. Mi hipótesis era que la economía fué simple. Para probar esta hipótesis completamente, hubiera sido necesario analizar datos de ambos componentes de la fauna y flora del sistema prehistórico de procuración. En mi investigación, sin embargo, el análisis fué posible solamente sobre restos de fauna, porque no se recobraron restos vegetales. Esto presenta un problema serio al examinar la hipótesis arriba mencionada, en vista del hecho que la analogía etnográfica sugiere una posible economía mixta, combinando la recolección de la fauna del estero con el cultivo de plantas. Por esto los datos disponibles que son incompletos impidieron el probar la hipótesis.

Debido a la falta de restos vegetales o de polen fue necesario recurrir a los artefactos recobrados como indicadores de cultura. Se encontraron manos y metates de la Fase

[1]La traducción de esta resumen fue hecha por Elisabeth Brown y Mari Cruz Paillés H.

Chantuto, pero no podemos concluir que su presencia indica agricultura, ya que tanto las plantas de alimento silvestre, productos no comestibles, o productos animales pudieron haber sido molidos en ellos. Además, los fragmentos de obsidiana hallados en los depósitos pudieron haber sido asociados con la preparación de recursos de plantas domesticadas, pero no se ha encontrado evidencia definitiva para esto.

Si consideramos solamente los restos de fauna, es evidente que la mayor parte de los recursos fueron obtenidos del estero. Importantes alimentos fueron almejas de pantano, pescado, y reptiles. También he especulado que los camarones podrían haber contribuido significativamente al régimen. Algunos huesos de animales indican que alimento fué obtenido tierra adentro. Aunque los animales terrestres no hayan contribuído en gran parte al régimen sus huesos estaban presentes significativamente sólo en uno de los dos sitios en que estos fueron estudiados. La aparente insignificancia de los animales terrestres, mostrada por el análisis de la fauna, es reforzada por la ausencia de puntas de proyectíl en la colección de artefactos.

La zona marina no fué utilizada por la gente de Chantuto. La razón principal para esta conclusión es que las especies marinas no estaban presentes en los restos. Por otra parte, los anzuelos, que frecuentemente se asocian con la pesca en alta mar estan ausentes en la colección de artefactos. Las aves acuáticas también parecen haber sido un recurso olvidado. Nelson (1909) ha sugerido que la escasez de huesos de aves acuáticas en los concheros de California fué debida a que los huesos no fueron depositados, ya que posiblemente fueron consumidos por los perros domésticos. La ausencia de huesos de perros en los depósitos de la Fase Chantuto no permite sostener una explicación similar.

En efecto, la evidencia arqueológica disponible sobre el sistema de subsistencia del pueblo de Chantuto indica una economía sencilla basada únicamente sobre la obtención de recursos de animales del estero. Durante el estudio me convencí de que este sistema de procuracion de alimentos fué permitido por la operación de otros mecanismos que proveían a los costeños con alimentos propios del ambiente terrestre. Supongo que algunos de los consumidores de productos litorales fueron la gente de la localidad, mientras que otros posiblemente fueron gentes de tierra adentro. La gente del litoral pudo haber recibido productos de plantas y animales terrestres por medio de intercambio, mientras que los grupos del interior pudieron haber obtenido directamente sus comestibles terrestres. Existe una gran necesidad de realizar una investigación regional para aclarar estos puntos.

Es difícil hacer comparaciones exactas entre la economía de la gente de Chantuto y las economías de los otros sitios en la costa discutidos en el primer capítulo. Esto es debido al hecho de que solamente algunos estudios fueron enfocados hacia la reconstrucción de sistemas económicos. La reconstrucción económica de la ocupación de Patarata 52, Veracruz, de Stark (1974) es en general similar a la de la gente de Chantuto, aunque corresponden a épocas de ocupación distintas. Ambas economías indican un énfasis fundamental en especies de animales acuáticos del estero. La importancia de las plantas es difícil de evaluar, pero Stark y yo creemos que aunque fueron frecuentemente utilizadas, no constituyeron la parte fundamental de la subsistencia.

Demografía

Se recobraron los restos de un individuo, que corresponden a la Fase Chantuto, de manera que la estructura demográfica de la población no puede ser reconstruída por ahora. Los restos corresponden a un individuo, adulto masculino, posiblemente de más de 40 años de edad, quien sufrió una ligera tensión fisiológica cuando era joven. La dieta del hombre estuvo constituída por substancias abrasivas. Una dieta de substancias abrasivas parece ser característica de una adaptación a la costa, como fué observado en varias poblaciones humanas que habitaron en las costas (Phillip L. Walker comunicación personal).

Patrones Residenciales

Un interés particular era determinar si la gente de Chantuto cambiaba estacionalmente de tierra firme al litoral, o si se quedaban continuamente en residencia dentro de la zona litoral. Una serie de resultados en este estudio me conduce a concluir que las ocupaciones fueron periódicas y tal vez estacionales. Otra serie de resultados sugiere que fué una ocupación continua. Así es que recapitularé estas dos series de resultados y discutiré mi conclusión final en cuanto la constitución de la ocupación de la gente de Chantuto.

El análisis de los restos de fauna nos muestra que la mayor parte de los recursos alimenticios conocidos por la gente de Chantuto estaban disponibles en el ecosistema del estero en forma continua. No obstante, alguna evidencia de la fauna sugiere que ciertas actividades específicas fueron adoptadas durante el período que comprende el fin de la temporada seca y el comienzo de la temporada húmeda. Este período coincide hoy día con la temporada cuando se obtiene la máxima cantidad de camarones, y sobre la base de esta analogía etnográfica supongo que la pesca de camarones fué una actividad importante durante el pasado prehistórico. Esta proposición no pudo ser probada por la falta de evidencia. Las enormes cantidades de restos de moluscos en los concheros confirma el empleo de un gran volumen de carne de almejas, el cual fue obtenido durante un período de 1000 años. No sé si toda esta carne fué consumida por habitantes locales o si parte de la carne fué exportada hacia comunidades del interior posiblemente en forma seca. Empiezo a favorecer el modelo de la exportatión por razones discutidas en la sección siguiente. Análisis del contenido de $CaCO_3$ del material del conchero también me sugiere que el depósito fué periódica, más bien que continua. Esta conclusión fué verificada por una inspección visual de las secciones estratigráficas de los concheros. Ciertas dificultades surgen en la interpretación del registro de estos eventos periódicos, que no necesitaban haber sido precisamente anuales.

De esta manera la evidencia de ocupación estacional por la gente de Chantuto de la zona litoral es derivada del análisis obtenido en la fauna, de la inspección visual de las secciones estratigráficas y el análisis de $CaCO_3$ en las secciones verticales.

La evidencia en favor de residencia permanente en la zona Chantuto fué derivada de una capa de barro, interpretada como el piso de una casa, la cual fué encontrada en un pozo de prueba en Cs-7. La presencia del piso constituye cierta evidencia de que residencias permanentes fueron construídas en la costa de Chiapas durante el Período Arcaico tardío. Vale mencionar aquí que el sitio y el pozo de prueba (Cs-7, N0E2), donde se encontró el piso de la casa, produjo la mayor cantidad de animales terrestres comparado con las demás pozos con fauna de la Fase Chantuto. Esto indica que la gente que residía permanentemente en la zona litoral importaba cierta cantidad de carne del interior para complementar la dieta.

¿Cual es el mejor modelo posible para representar la población humana en la zona litoral durante el Período Arcaico tardío considerando la evidencia arriba mencionada? A mi me parece que la explicación mas parsimoniosa es la que está basada sobre la analogía etnográfica. Hoy en día la zona litoral mantiene una población de habitantes permanentes. La mayor parte de esta gente vive en el pueblo de La Palma, pero algunos viven en casas aisladas. Además, el número de habitantes en esta zona aumenta considerablemente durante la temporada de los camarones. En esta temporada los habitantes de pueblos del interior ocupan campamentos estacionales dentro de la zona.

En base a lo anterior yo reconstruyo el patron residencial de Chantuto, que incluye cierta residencia permanente en la zona, y una afluencia periódica de habitantes de la tierra firme, que probablemente ocurrió en forma estacional y posiblemente anual. Por el momento no se sabe si los habitantes litorales residían en casas aisladas o en pueblos. Esta incertidumbre se debe a la falta de investigaciones sistemáticas. Ninguna investigación específica ha sido conducida sobre los aspectos propuestos en el planteamiento anterior sobre patrones residenciales de la gente de Chantuto. El problema del traslado de la población entre el habitat del interior y el del litoral no se ha sido resuelto concluyentemente, aunque alguna evidencia está presentada en este estudio. Es necesario realizar más investigaciones antes de poder obtener una conclusión final. En vista de lo anterior me permito recomendar cuatro accesos específicos. Primero, un estudio etnográfico detallado sobre la población humana del área que comprende la investigación, lo que permitirá efectuar una comparación precisa entre las poblaciones actuales y las del Período Arcaico. Segundo, realizar investigaciones arqueológicas en la zona interior, podrán servir para identificar el componente que indica la presencia de la gente de Chantuto. Tercero, realizar investigaciones intensivas en Tlacuachero (Cs-7) lo que permitirá determinar la cantidad de estructuras que estaban presentes en un tiempo. Cuarto, un trabajo adicional en el sitio de la capa de barro permitirá la localización de sus límites y otras características las cuales proporcionarán una evidencia concluyente de la función de la capa.

Mi reconstrucción del patrón residencial de la gente de Chantuto varía parcialmente con los modelos de residencias reconstruídas de otros sitios litorales en América Central. Esto es porque las reconstrucciones favorecen por lo regular una ocupacion periódica o una acumulación de tipo permanente. La periódica se reconstruye a veces como el resultado de actividades de extracción de comida, como por ejemplo en San Blas 4, o como sitios de vivienda estacional en Barra de Navidad. La ocupación continua se reconstruye usualmente como el resultado de una organización social comunal de una aldea o de un pueblo. Un ejemplo es la Isla de Patarata 52. Creo que los depósitos de la gente de Chantuto pudieron haber sido acumulados por medio de las actividades cotidianas tanto de sus habitantes locales, como por la gente de paso, quienes venían al litoral periódicamente.

Redes de Intercambio

Uno de mis objetivos iniciales de la investigación era determinar la naturaleza de las posibles conexiones de intercambio entre la gente de Chantuto y las poblaciones contemporaneas de habitats tierra adentro. Previamente he discutido la evidencia de la interacción entre habitantes litorales y los presuntos habitantes de la tierra firme adyacente. La evidencia sugiere que las poblaciones de estos dos habitats compartían su comida y que regularmente ocurrían movimientos en las poblaciones. Esta reconstrucción está basada solamente en la evidencia de sitios arqueológicos en la zona litoral, y requiere investigaciones en sitios sobre tierra firme.

Una de mis hipotésis iniciales era que la gente de Chantuto estaba integrada en un sistema de intercambio que también incluía grupos de la serranía y de la planicie. Esta hipótesis fue confirmada por la presencia de obsidiana en los depósitos de la Fase Chantuto. Los yacimientos de toda la obsidiana del sur de Mesoamérica se encuentran en las regiones montañosas (Pires-Ferreira 1975, Fig. 2), y por lo tanto la gente de estas tierras debe de haber sido responsable de una manera u otra por la aparición de este recurso en la zona litoral. Por el momento no se ha analizado la obsidiana de las excavaciones para así poder determinar los lugares específicos de su origen.

Si reconocemos que la obsidiana fué importada a la zona litoral, es necesario considerar que clase de productos puede haber sido exportado en cambio. Ninguna evidencia arqueológica me llamó la atención para resolver lo que al principio parece ser un desequilibrio en el intercambio de productos. Basado sobre la analogía etnográfica supongo que recursos del estero, especialmente camarones, almejas, y pescados, pueden haber sido enviados hacia el interior. Algunas semejanzas etnográficas sugieren que esta hipótesis es razonable. Cook (1946: 51) sostiene (sin que cite su origen), que los nativos que ocupaban la costa de la California prehistórica exportaban carne seca de mariscos hacia la gente del interior. En

Nayarit, que se encuentra más cerca al sitio de la investigación, Mountjoy (1971: 53–54) relata la práctica de secar y exportar carne de tortuga, el ahumar un pequeño pescado llamado 'lisa', y anteriormente el secar la carne de la nuez de la palma de aceite (oil-nut palm) sobre el fuego. En La Palma gran parte de los camarones y pescados exportados de esa zona hoy día son secados al sol. Sin duda esta técnica estaba al alcance de la gente de Chantuto.

Mi hipótesis, no obstante de ser razonable, requiere ser probada prácticamente a fin de que sea refutada o confirmaba. Camarones, almejas y pescados pueden ser preservados de diferentes modos y debido a esto el hecho en la reconstrucción arqueológica es diferente para cada uno de los productos. Por ejemplo, no se pudo probar que los camarones fueron sacados del estero durante la Fase Chantuto, así, la posible exportación de los camarones fuera de la zona solamente puede ser especulativa. En cambio sabemos que las almejas y los pescados fueron definitivamente recolectados. Los restos de conchas representan una cantidad grande de moluscos recolectados mientras que los restos de pescado representan cantidades mínimas de comida. Si en efecto, las almejas fueron sacadas de sus conchas, secadas y exportadas para ser consumidas tierra adentro, esta situación no sería aparente ahora, por medio del registro arqueológico basado en las técnicas de análisis de que disponemos actualmente. De los tres productos propuestos, solamente la exportación de pescado puede ser evaluado criticamente del registro arqueológico. Esto solamente sería cierto si la gente prehistórica hubiera partido y secado el pescado como lo hace la gente de la costa hoy en día. Este proceso resultaría en la ausencia de indicadores arqueológicos (aparte de los artefactos asociados con las actividades de pesca) en los sitios de acumulación, pero resultaría en el depósito de huesos de pescado en sitios en el interior.

Con el fin de probar la hipótesis de que se exportaba pescado hacia el interior durante el Período Arcaico, se necesita que los arqueólogos examinen depósitos apropiados en busca de pescado de los esteros del Pacífico y posiblemente restos de pescado de mar. A mi saber, tal investigación todavía no se ha intentado. Por ejemplo, en el Valle Tehuacan hay sitios donde restos de pescado fueron reportados como presentes, pero todavía no fueron identificados (Flannery 1967, Table 16), impidiendo así que se determine su origen.

Si finalmente se justifica la exportación de pescado por las gentes del Período Arcaico, estoy de acuerdo en considerar esto como una evidencia *indirecta,* pero adecuada, para el flujo a tierra firme de los otros dos productos (almejas y camarones). No sostengo que se abandonen los esfuerzos para descubrir evidencia directa en cuanto al movimiento de estos productos, pero simplemente admitiendo que si tal evidencia deja de realizarse, la mejor interpretación sería la que trata los tres productos como tal teniendo similares posibilidades de intercambio.

El tipo de intercambio que yo me imagino con relación a la gente de Chantuto incluye el flujo de artículos entre pares de poblaciones que mantienen conexiones a causa de estas alianzas económicas y posiblemente otras formas de uniones.

Sobre una base regional cada una de estas cadenas formaría parte de una red de conexiones integrando a una gran cantidad de poblaciones dentro un área geográfica extensa. Este modelo parece apropiado para el Período Arcaico porque no necesita el uso de productos para establecer jerarquías ordenadas dentro de las poblaciones mismas, ni la presencia de poderosas agencias centralizadas que controlan el movimiento de artículos hacia adentro y hacia afuera de cada grupo. Este modelo es esencialmente el descrito por Pires-Ferreira (1975: 4) como "reciprocal exchange of utilitarian commodities (excluding foodstuffs) to which every villager had access" [cambio mutuo de productos utilitarios (excluyendo comidas) al cual cada aldeano tenía acceso]. Mi plan difiere en que la comida está incluida. Se necesita experimentar con este modelo, con mayor evidencia arqueológica.

En mi opinión la mayor importancia de

este estudio, es que propone preguntas que no se habían considerado anteriormente concernientes a las poblaciones de las costas de Mesoamérica y su relación con el medio ambiente. Las preguntas producidas exceden en gran parte las pocas contestaciones que fueron engendradas. Espero que estas preguntas suministren un molde útil para otros individuos quienes también estén interesados en el estudio sobre las adaptaciones de la costa.

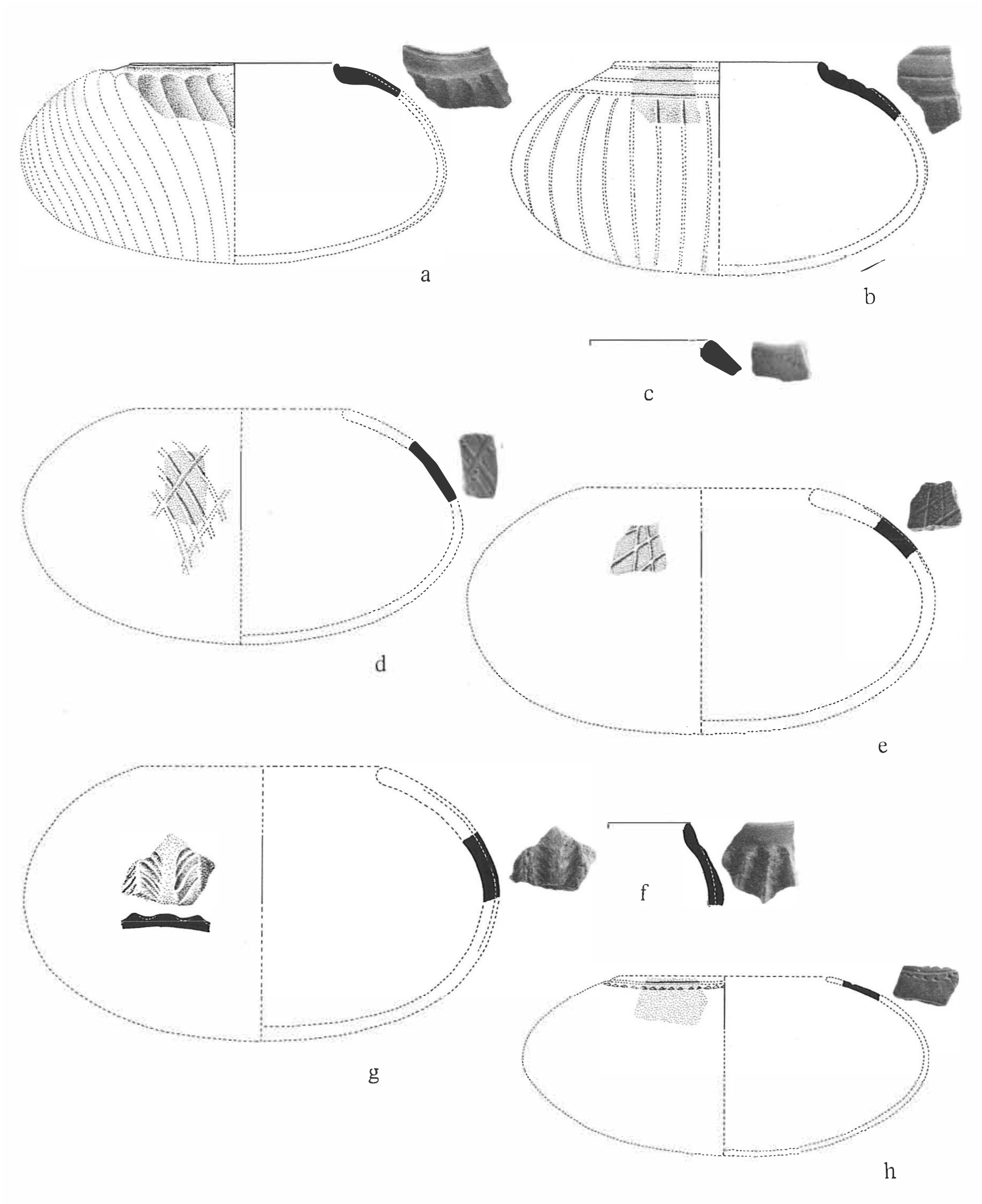


Figure 57. EARLY PRECLASSIC PERIOD SHERDS
a–c: Cotán Grooved Red; *d*, *e*: Monte Incised; *f*, *g*: Modeled Red Rim; *h*: Smoothed Punctate.
(scale ⅓)

APPENDIX I: CERAMIC STUDY

The analysis of the recovered potsherds is supplementary to the primary objectives of the present study. My limited time permitted me to classify fully the sherds from only two of the six pits. These two pits (N0E2, S16W1) had the highest sherd densities of all the excavations. Both are located at Cs-7, Tlacuachero. Even in these pits, the density of sherds (Table 24) is low by Mesoamerican standards.

The remaining collections from four pits at two sites were examined by Jorge Acuña N., who is familiar with the ceramic material from most excavated sites in Chiapas. The results of his tentative identifications are presented in Table 25. This shows the presence or absence of diagnostic sherds for ceramic phases as they were defined at Chiapa de Corzo (*see* Lowe and Mason 1965). Five of these phases were represented in this Chantuto material: Chiapa I (Early Preclassic Period), Chiapa III (Middle Preclassic Period), Chiapa VIII (Early Classic Period), Chiapa X (Late Classic Period), and Chiapa XI (Postclassic Period).

The results of the brief Chantuto ceramic study are summarized in a closing discussion.

SHERD CLASSIFICATION

Early Preclassic Period Material: Barra Phase

Cotán Grooved Red. Three rim sherds that are similar to those found at Altamira (Lowe 1967b: 97–100; 1975b, Fig. 13) were recovered. One sherd is from a tecomate with diagonal, wide grooves below a plain rim (Fig. 57, *a*). A second specimen (Fig. 57, *b*) has three grooves along the rim band, below which are thin, vertical grooves. A third quite variant rim (Fig. 57, *c*) is slipped red on exterior but lacks grooving.

Monte Incised. Two unpolished, unslipped body sherds with cross-hatched incised lines came from S16W1 (Fig. 57, *d*, *e*). These specimens are similar to ones from Altamira (Lowe 1967b: 102–3). Accordingly, they are probably from tecomates or near-tecomates, the only shapes reported for this type at that site showing clear cross-hatching (Lowe 1975b, Fig. 11).

Modeled Red-Rimmed. Two sherds that share features resembling those of the Barra complex at Altamira were recovered from S16W1. The single rim sherd (Fig. 57, *g*) has a slipped and polished red rim. Below the slipped rim are deep, diagonal grooves with sharply raised modeled, intervening ridges. The tool used to produce this unusually deep textured surface may have been a shell. The ridges show that the tool was worked in jabs that produce a herringbone effect (Fig. 57, *f*). The general shape, small size, and grooved decoration of this type conforms to Barra norms, as does the limitation of the corrugations to the exterior; interiors are smoothed and level.

Smoothed Punctate. A single thin, well-smoothed sherd with a horizontal line of triangular punctations was recovered (Fig. 57, *h*). Surface evenness and design conform to the Barra type Petacalapa Black (Lowe 1975b, Fig. 16) but the color here is a dull, brownish red.

Late Preclassic Period Material

Santa Rosa Polished Orange (Fig. 58)

Composition

Inclusions: Very fine granules of sand.

Color: grey (2.5 YR 3/0) with mottled orange (2.5 YR 6/6).

Hardness: 4.0.

Surface

Finish: possibly slipped, and polished.

Color: black (2.5 YR 2.5/0) mottled with orange (2.5 YR 6/8). Mottling occurred during firing as a result of differential reaction of paste to treatment (Fig. 58, *d*, *j*). Orange shadows are frequently found around inclusions and along incisions.

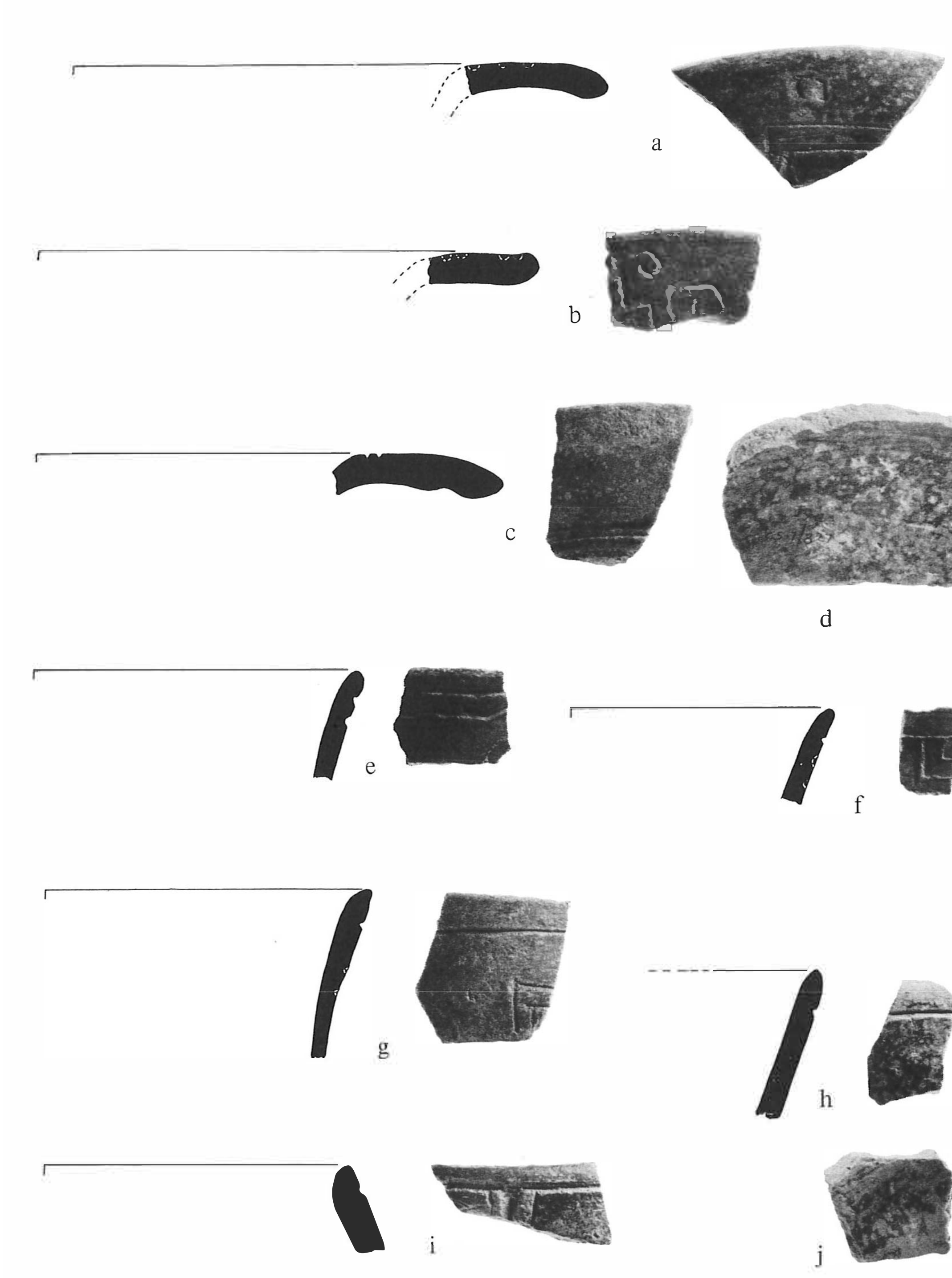


Figure 58. Santa Rosa Polished Orange
a–c: form 1; *d*: body sherd; *e, f*: form 2; *g, h*: form 3; *i*: form 4; *j*: body sherd.
(scale ½)

Table 24. Distribution and Frequency of Pottery Types from Grids S16W1 and N0E2 at Site Cs-7.

POTTERY TYPES

	Cotan Grooved Red	Monte Incised	Modeled Red-Rimmed	Santa Rosa Polished Orange Form 1	Santa Rosa Polished Orange Form 2	Santa Rosa Polished Orange Form 3	Santa Rosa Polished Orange Form 4	Santa Rosa Polished Orange Non-rim sherds	Zoned Bichrome	Brown Ware Form 1	Brown Ware Form 2	Brown Ware Form 3	Brown Ware Form 4	Brown Ware Form 5	Brown Ware Form 6	Brown Ware Form 7	Brown Ware Non-rim sherds
Cs-7, S16W1																	
1 (.00–.20 m.)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2 (.20–.40 m.)	—	—	—	—	—	—	—	1	—	2	—	—	—	—	—	—	—
3 (.40–.60 m.)	1	—	—	5/1	2	1/2	—	7	2	—	2	—	—	—	—	—	—
4 (.60–.80 m.)	—	—	—	—	—	1/—	—	5	—	4	—	—	—	—	—	—	—
5 (.80–1.0 m.)	1	1	1	1	—	—	—	1	—	1	—	—	1	—	—	1	—
6 (1.0–1.2 m.)	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—
7 (1.2–1.4 m.)	1	1	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—
8 (1.4–1.6 m.)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Cs-7, N0E2																	
1 (.00–.20 m.)	—	—	—	—	1	—	—	1	—	1	—	—	—	1	—	—	—
2 (.20–.40 m.)	—	—	—	—	—	1	—	3	—	2	1	—	—	—	—	—	—
3 (.40–.60 m.)	—	—	—	—	1	—	1	2	—	—	1	—	—	—	—	—	—
4 (.60–.80 m.)	—	—	—	2	—	—	—	8	—	1	—	—	—	—	—	—	1
5 (.80–1.0 m.)	—	—	—	3	1	—	—	12	—	4	—	1	—	—	1	—	1
6 (1.0–1.2 m.)	—	—	—	1/1	—	—	—	6	—	2	—	—	—	—	—	—	1
7 (1.2–1.4 m.)	—	—	—	—	—	—	—	6	—	1	—	—	—	—	—	—	—
8 (1.4–1.6 m.)	—	—	—	—	—	1	—	1	—	1	—	—	—	—	—	—	1
9 (1.6–1.8 m.)	—	—	—	—	1	—	—	3	—	—	—	—	—	—	—	—	—
10 (1.8–2.0 m.)	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	1
GRAND TOTAL	3	2	2	14	6	6	1	59	2	19	4	1	1	1	1	1	5

	Black over Brown Ware Form 1	Black over Brown Ware Form 2	Black over Brown Ware Form 3	Black over Brown Ware Form 4	Black over Brown Ware Form 5	Black over Brown Ware Form 6	Black over Brown Ware Form 7	Polished Orange II Form 1	Polished Orange II Form 2	Black and Red Ware Form 1	Black and Red Ware Form 2	Black and Red Ware Form 3	Black and Red Ware Form 4	Black and Red Ware Form 5	Black and Red Ware Non-rim sherds
Cs-7, S16W1															
1 (.00–.20 m.)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2 (.20–.40 m.)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3 (.40–.60 m.)	—	—	—	—	1	—	—	—	—	3	1	1	—	—	7
4 (.60–.80 m.)	—	—	—	—	1	—	—	1	—	—	—	—	—	—	2
5 (.80–1.0 m.)	—	—	—	1	—	—	—	—	—	—	—	—	—	—	2
6 (1.0–1.2 m.)	—	1	—	—	—	—	—	—	—	—	—	—	—	1	2
7 (1.2–1.4 m.)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
8 (1.4–1.6 m.)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Cs-7, N0E2															
1 (.00–.20 m.)	—	—	—	—	—	—	—	1	—	5	1	1	—	1	5
2 (.20–.40 m.)	—	—	—	—	—	—	1	1	—	2	1	1	—	—	8
3 (.40–.60 m.)	1	—	—	—	—	—	—	1	1	1	—	—	—	—	—
4 (.60–.80 m.)	—	—	—	—	—	—	—	—	—	4	1	—	—	—	5
5 (.80–1.0 m.)	1	—	1	—	—	—	—	1	—	3	1	—	1	—	4
6 (1.0–1.2 m.)	—	1	1	—	—	—	—	—	—	—	—	—	—	—	2
7 (1.2–1.4 m.)	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—
8 (1.4–1.6 m.)	—	—	—	—	—	1	—	—	1	—	—	—	—	—	—
9 (1.6–1.8 m.)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
10 (1.8–2.0 m.)	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—
GRAND TOTAL	2	2	2	1	2	1	1	5	3	18	6	3	1	2	38

	Dull Red Ware Form 1	Form 2	Form 3	Form 4	Form 5	Form 6	Form 7	Form 8	Form 9	Form 10	Form 11	Form 12	Form 13	Form 14	Form 15	Form 16	Form, 17	Non-rim sherds
Cs-7, S16W1																		
1 (.00–.20 m.)	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2 (.20–.40 m.)	1	—	—	—	—	—	—	—	—	—	—	1	—	2	1	1	—	—
3 (.40–.60 m.)	2	1	—	—	1	—	—	—	—	—	1	2	1	—	1	—	—	10
4 (.60–.80 m.)	—	—	—	2	—	—	—	—	—	—	—	—	—	—	3	—	—	2
5 (.80–1.0 m.)	3	1	—	—	—	1	1	—	—	—	—	2	—	—	3	—	—	—
6 (1.0–1.2 m.)	—	—	—	—	1	—	—	—	—	—	—	—	1	—	—	—	—	—
7 (1.2–1.4 m.)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
8 (1.4–1.6 m.)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Cs-7, N0E2																		
1 (.00–.20 m.)	3	—	—	—	—	1	—	—	—	4	—	—	—	2	—	—	—	8
2 (.20–.40 m.)	—	1	1	1	2	—	1	1	—	—	—	1	1	2	2	—	—	1
3 (.40–.60 m.)	2	2	2	—	—	1	—	—	—	—	—	—	—	1	—	—	—	1
4 (.60–.80 m.)	1	1	—	1	—	1	—	—	—	—	—	3	1	—	1	—	—	6
5 (.80–1.0 m.)	3	—	—	—	1	—	—	—	1	1	—	1	—	—	1	1	—	2
6 (1.0–1.2 m.)	1	1	—	—	1	1	1	—	—	—	—	1	—	1	—	—	1	—
7 (1.2–1.4 m.)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
8 (1.4–1.6 m.)	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1
9 (1.6–1.8 m.)	1	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	1
10 (1.8–2.0 m.)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
GRAND TOTAL	17	7	4	4	7	6	3	1	1	5	1	12	4	8	12	2	1	32

	Brown and Black Bichrome Form 1	Brown and Black Bichrome Form 2	Brown and Black Bichrome Form 3	Brown and Black Bichrome Non-rim sherds	Black Ware I Form 1	Black Ware I Form 2	Black Ware I Form 3	Black Ware II Form 1	Black Ware II Form 2	Black Ware II Form 3	Black Ware II Form 4	Black Ware II Form 5	Black Ware II Form 6	Black Ware II Form 7	Black Ware II Non-rim sherds
Cs-7, S16W1															
1 (.00–.20 m.)	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—
2 (.20–.40 m.)	—	—	—	—	1	—	—	1	—	—	1/—	3/2	—	—	3
3 (.40–.60 m.)	—	—	1	—	2	—	—	2	1	—	2/—	1/3	—	—	20
4 (.60–.80 m.)	—	—	—	2	2	—	—	2	—	—	—/1	1	—	—	10
5 (.80–1.0 m.)	1	—	—	—	1	—	—	1	—	—	—	2	1	1	8
6 (1.0–1.2 m.)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3
7 (1.2–1.4 m.)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
8 (1.4–1.6 m.)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Cs-7, N0E2															
1 (.00–.20 m.)	1	—	—	1	5	—	—	5	—	—	1/1	1/4	—	—	20
2 (.20–.40 m.)	—	—	—	—	5	—	—	5	—	—	2/4	2	—	—	12
3 (.40–.60 m.)	—	—	—	1	1	—	1	1	—	—	—	1	—	—	12
4 (.60–.80 m.)	—	1	1	—	6	—	—	6	1	1	3/2	2	—	—	20
5 (.80–1.0 m.)	—	—	—	1	2	—	1	2	1	—	1/2	5	—	—	13
6 (1.0–1.2 m.)	—	—	—	1	—	1	—	—	—	1	1/1	—	—	—	8
7 (1.2–1.4 m.)	—	—	—	—	—	—	1	—	—	—	—	1	—	—	8
8 (1.4–1.6 m.)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
9 (1.6–1.8 m.)	—	—	—	—	3	—	—	3	—	—	—	—	—	—	—
10 (1.8–2.0 m.)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3
GRAND TOTAL	2	1	2	6	29	1	3	28	3	2	22	28	1	1	141

	Carved Red Ware I Form 1	Carved Red Ware II Form 1	Carved Red Ware II Form 2	Monkey-Vessel Ware Form 1	Monkey-Vessel Ware Form 2	Monkey-Vessel Ware Non-rim sherds	Plain Ware: Fine Paste Form 1	Plain Ware: Fine Paste Form 2	Plain Ware: Fine Paste Form 3	Plain Ware: Fine Paste Form 4	Plain Ware: Fine Paste Form 5
Cs-7, S16W1											
1 (.00–.20 m.)	—	—	—	—	—	—	—	—	—	—	—
2 (.20–.40 m.)	—	—	—	—	—	1	—	—	—	—	1/1
3 (.40–.60 m.)	1	1	—	6	—	4	4	—	1	2	2/—
4 (.60–.80 m.)	—	—	—	1	—	1	1	—	—	1	2/2
5 (.80–1.0 m.)	—	—	1	2	—	1	5	—	2	—	3/3
6 (1.0–1.2 m.)	—	—	—	—	—	—	—	—	—	1	2/—
7 (1.2–1.4 m.)	—	—	—	—	—	—	—	—	—	—	—
8 (1.4–1.6 m.)	—	—	—	—	—	—	—	—	—	—	—
Cs-7, N0E2											
1 (.00–.20 m.)	—	—	—	5	1	6	14	—	4	3	12/1
2 (.20–.40 m.)	—	1	—	2	—	3	7	1	—	2	7/1
3 (.40–.60 m.)	—	—	—	1	—	1	2	—	1	—	3/1
4 (.60–.80 m.)	—	—	—	3	—	3	4	—	3	—	1/1
5 (.80–1.0 m.)	—	—	—	2	—	2	1	1	2	1	8/1
6 (1.0–1.2 m.)	—	—	—	5	—	2	—	—	2	2	4
7 (1.2–1.4 m.)	—	—	—	3	—	—	—	—	—	—	1/—
8 (1.4–1.6 m.)	—	—	—	—	—	—	—	—	—	3	2/—
9 (1.6–1.8 m.)	—	—	1	1	—	1	—	—	—	—	1/2
10 (1.8–2.0 m.)	—	—	—	—	—	—	—	—	—	—	1/—
GRAND TOTAL	1	2	2	31	1	25	38	2	15	15	63

	Plain Ware: Coarse Paste Form 1	Form 2	Form 3	Form 4	Form 5	Form 6	Form 7	Form 8	Form 9	Form 10	Form 11	Form 12	Form 13
Cs-7, S16W1													
1 (.00–.20 m.)	—	—	—	—	—	—	—	—	—	—	—	—	—
2 (.20–.40 m.)	—	3	1	4	—	—	—	—	—	—	—	1	—
3 (.40–.60 m.)	—	11	1	3	3	—	1	3	1	1	—	1	—
4 (.60–.80 m.)	—	—	1	2	4	—	—	1	—	—	—	1	—
5 (.80–1.0 m.)	—	3	1	2	2	2	—	—	—	—	—	—	2
6 (1.0–1.2 m.)	—	—	—	2	—	—	—	2	—	—	—	—	—
7 (1.2–1.4 m.)	1	—	—	—	—	—	—	—	—	—	—	—	—
8 (1.4–1.6 m.)	—	—	—	—	—	—	—	—	—	—	—	—	—
Cs-7, N0E2													
1 (.00–.20 m.)	—	4	1	2	—	—	1	4	—	—	3	—	1
2 (.20–.40 m.)	—	1	2	3	—	—	—	1	—	1	—	1	—
3 (.40–.60 m.)	—	2	—	3	—	—	1	—	—	—	1	1	—
4 (.60–.80 m.)	—	5	—	5	—	—	—	1	—	1	—	—	1
5 (.80–1.0 m.)	—	3	1	1	2	—	—	1	—	—	1	—	1
6 (1.0–1.2 m.)	2	1	1	1	1	—	—	—	1	1	—	1	1
7 (1.2–1.4 m.)	1	1	—	1	—	—	—	—	—	—	—	1	—
8 (1.4–1.6 m.)	—	1	3	—	—	—	—	—	—	—	—	—	—
9 (1.6–1.8 m.)	1	—	—	—	—	—	—	—	—	—	—	—	—
10 (1.8–2.0 m.)	—	—	—	—	—	—	—	—	—	1	1	—	—
GRAND TOTAL	5	35	12	29	12	2	3	13	2	5	6	7	6

	Plain Ware: Coarse Paste Unidentified Rims	Shoulder Flanges	Basal Flanges	Dimpled Bases	Bases	Nubbin Feet	Incised Sherds	Undecorated Body Sherds (kg)	Polychrome	Bichrome I	Bichrome II	Stuccoed Sherds	Plumbate Form 1	Plumbate Non-rim sherds
Cs-7, S16W1														
1 (.00–.20 m.)	—	—	—	—	—	—	—	0.01	—	—	—	—	—	—
2 (.20–.40 m.)	7	11	—	2	2	—	7	2.0	—	—	—	—	—	1
3 (.40–.60 m.)	25	12	—	2	1	2	8	5.4	—	—	1	—	1	4
4 (.60–.80 m.)	13	2	—	1	3	2	9	2.6	—	—	—	—	—	1
5 (.80–1.0 m.)	3	8	—	—	—	—	21	2.7	—	—	—	—	—	1
6 (1.0–1.2 m.)	1	1	—	—	—	—	5	0.7	—	—	—	—	—	—
7 (1.2–1.4 m.)	—	—	—	—	—	—	—	0.1	—	—	—	—	—	—
8 (1.4–1.6 m.)	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Cs-7, N0E2														
1 (.00–.20 m.)	14	28	3	4	3	—	64	4.9	—	—	—	—	—	—
2 (.20–.40 m.)	1	21	1	5	5	1	34	4.3	1	—	—	—	—	—
3 (.40–.60 m.)	1	8	2	3	2	—	17	1.5	—	—	—	—	—	—
4 (.60–.80 m.)	2	23	1	6	3	—	17	2.7	—	—	—	1	—	—
5 (.80–1.0 m.)	1	14	2	2	6	—	26	3.1	—	—	—	1	—	—
6 (1.0–1.2 m.)	—	2	2	—	4	1	17	1.8	—	—	—	1	—	—
7 (1.2–1.4 m.)	—	2	—	—	—	—	7	1.8	—	—	—	—	—	—
8 (1.4–1.6 m.)	2	—	1	—	—	—	3	0.5	—	—	—	—	—	—
9 (1.6–1.8 m.)	—	—	1	2	—	1	27	0.5	—	—	—	—	—	—
10 (1.8–2.0 m.)	—	—	—	—	1	—	2	0.3	—	1	—	—	—	—
GRAND TOTAL	70	132	13	27	30	7	264	34.9	1	1	1	3	1	7

Texture: smooth with high, glossy luster.

Forms

1. Wide everted rims from plates with outflaring sides (14 sherds) (Fig. 58, *a–c*). Rims often bear concentric incisions on upper surfaces near body. Some rims have ears that are decorated with diagonal incised lines. Rim undersides can be polished black or polished orange. One specimen has red paint in the incisions.

2. Incised, slightly outflaring rims that are possibly from jars with outflaring necks (6 sherds) (Fig. 58, *e, f*). These sherds are equally treated on both sides. T., 0.6 cm.

3. Direct rims with external incisions (6 sherds) (Fig. 58, *g, h*). The vessel shape is not known but was perhaps cylindrical. The

Table 25. PRESENCE-ABSENCE CHART OF CULTURAL AFFILIATIONS OF POTSHERDS FROM FOUR TEST PITS
Identifications by Jorge Acuña N.*

	Cs-8 N3E3					Cs-6 S1W11					Cs-6 N8W1					Cs-6 N1E9				
	I	III	VIII	X	XI	I	III	VIII	X	XI	I	III	VIII	X	XI	I	III	VIII	X	XI
0–.2			X					X					X					X		
.4			X		X			X					X					X		
.6	X?		X					X					X					X		
.8			X					X					X			X?		X		
1.0			X	X				X					X				X?	X		
.2				X				X					X					X	X	
.4			X			X		X					X					X	X	
.6								X					X					X		
.8								X					X					X		
2.0								X					X			X		X		
.2								X					X			X		X		
.4													X					X		
.6													X			X		X		
.8													X					X		
3.0													X					X		
.2													X					X		
.4													X					X		
.6																				
.8																X?				
4.0																				
.2																				
.4																X				

*Roman numerals refer to ceramic phases at Chiapa de Corzo. Their relation to Mesoamerican periods are as follows: I, Early Preclassic; III, Middle Preclassic Period; VIII, Early Classic Period; X, Late Classic Period; XI, Postclassic Period.

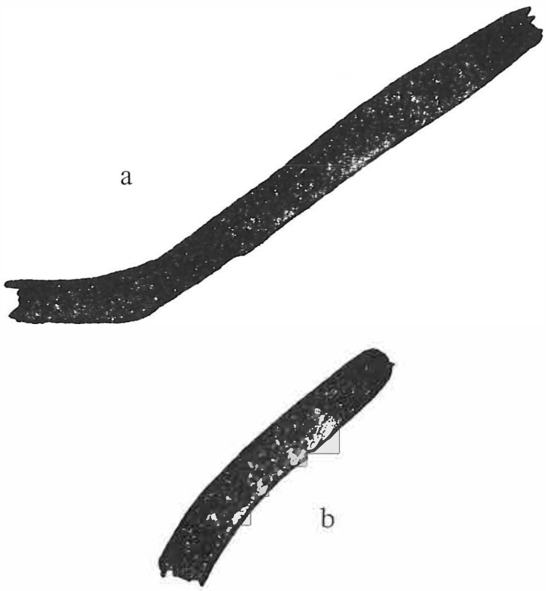


Figure 59. ZONED BICHROME
a: form 1; *b*: form 2.
(natural size)

available specimens are rather small sized. T., 0.7 cm.

4. Tecomate rim with external incisions (1 sherd) (Fig. 58, *i*). T., 1.0 cm.

Comparisons

This type is identical to that described by Brockington (1967: 10–12) for Santa Rosa under the type designation of Polished Orange (*pol O*). Santa Rosa *pol O* first appears in Phase 2, which is dated by Brockington between 600–500 B.C., but it is also present in the succeeding Phase 3 (500–50 B.C.; Brockington 1967: 43–48).

Zoned Bichrome (Fig. 59)

Composition

Inclusions: very fine to medium granules of sand.

Color: varies from grey (7.5 YR 3/0) to light brown (10 YR 6/3).

Hardness: 3.5.

Surface

Finish: rectilinear incised zones.

Color: two tones of red: 10 R 4/6; 2.5 YR 4/6.

Texture: slipped and then incised.

Forms

1. Flat-bottomed dish with out-slanting sides is reconstructed from one basal sherd recovered from surface (Fig. 59, *a*). T., 0.8 cm.

2. High-necked jar is reconstructed from a single rim sherd (Fig. 59, *b*). T., 0.8 cm.

Comparisons

This ceramic class is similar to a type from Perseverancia, a Late Preclassic Period site near present-day Tonala (McElrath in preparation).

Brown Ware (Fig. 60)

Composition

Inclusions: very fine granules of sand.

Color: dark grey (2.5 YR 3/0) with thin edges of yellow-red (5 YR 7/8).

Hardness: 4.5.

Surface

Finish: slipped and polished.

Color: reddish brown (5 YR 5/6).

Texture: smooth with high luster.

Forms

1. Wide everted rims possibly from plates with out-slanting sides (19 sherds) (Fig. 60, *a*, *b*). Most are incised on the upper rim surfaces. Sherds are slipped on both sides. T., 1.0 cm.

2. Direct rims with incised exterior surfaces (4 sherds) (Fig. 60, *c*, *d*). These probably came from simple silhouette bowls. T., 0.7 cm.

3. Direct rim that is possibly from a simple silhouette bowl (1 sherd) (Fig. 60, *e*). Incised line borders rim on interior; exterior has incised geometric design. T., 0.6 cm.

4. Rim sherd with thick labial flange; body shape unknown (1 sherd) (Fig. 60, *f*). T., 0.6 cm.

5. Direct rim from thin-walled vessel with simple silhouette (1 sherd) (Fig. 60, *g*). T., 0.5 cm.

6. Out-flaring rim with horizontal grooves (1 sherd) (Fig. 60, *h*). This sherd is probably part of a former neck of a jar. T., 0.8 cm.

7. Slightly out-flaring wall with direct rim. (1 sherd) (Fig. 60, *i*). A shallow, incised line parallels the rim on vessel exterior. T., 0.5 cm.

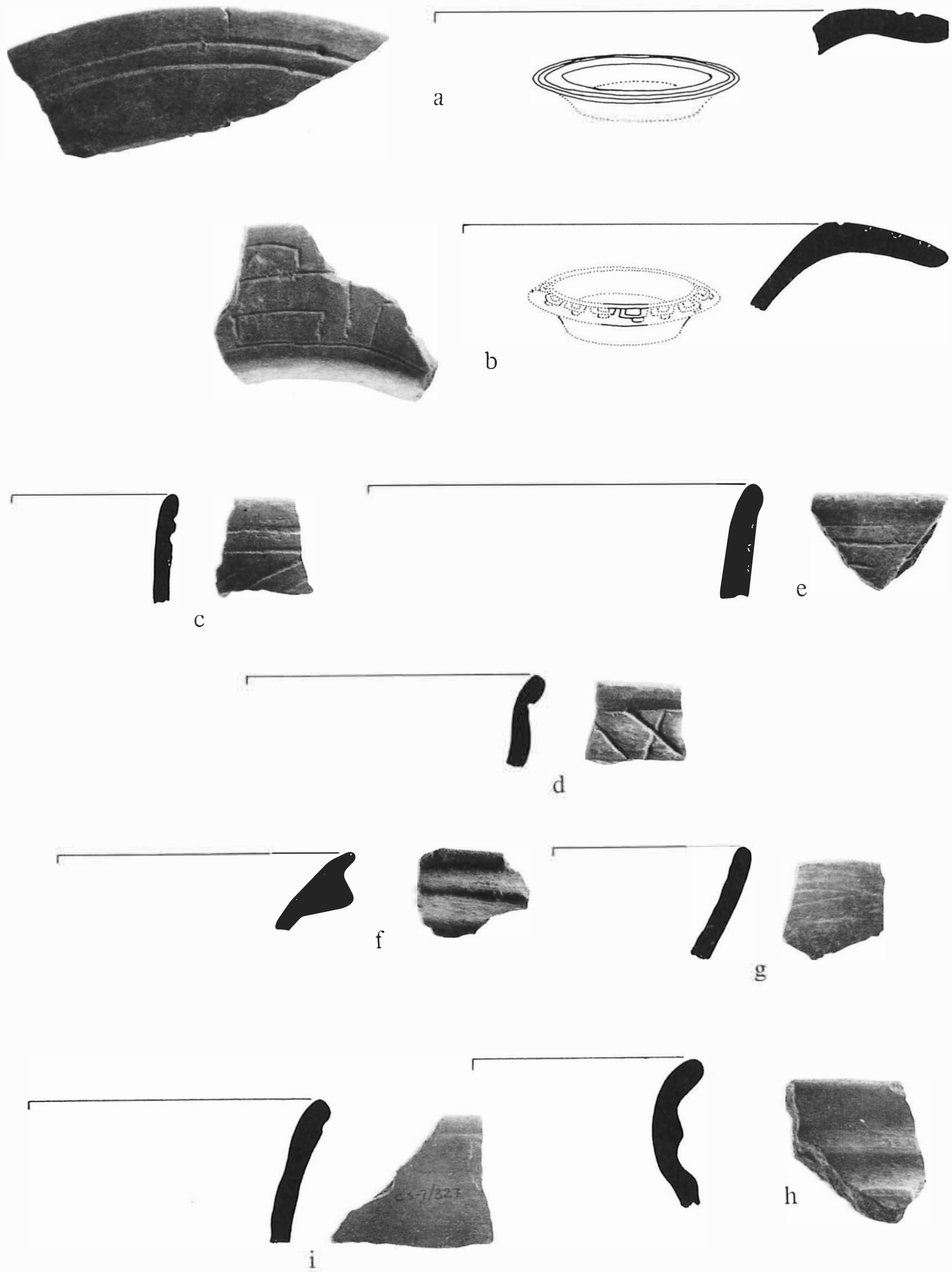


Figure 60. BROWN WARE
a, *b*: form 1 (photographs show upper rim surfaces); *c*, *d*: form 2; *e*: form 3; *f*: form 4; *g*: form 5; *h*: form 6; *i*: form 7.
(scale ½)

Black over Brown Ware (Fig. 61)

Composition

Inclusions: medium granules of sand.

Color: grey to brick red (2.5 YR 5/6).

Hardness: 4.0.

Surface

Finish: slipped and polished.

Color: underslip is various shades of 2.5 YR. These intergrade with black overslip.

Texture: smooth with high luster.

Forms

1. Wide everted rims possibly from plates with out-slanting sides (2 sherds) (Fig. 61, *a, b*). One has diagonal incisions. T., 1.0 cm.
2. Similar to Form 1 but with decked and incised upper rim surface (2 sherds) (Fig. 61, *c, d*). T., 0.9 cm.
3. Direct rims with incised exterior surfaces (2 sherds) (Fig. 61, *e*). Possibly from simple silhouette bowls. T., 0.7 cm.
4. Everted rim possibly from a dish with out-slanting sides (1 sherd) (Fig. 61, *f*). T, 0.8 cm.
5. Direct rims possibly from cylindrical vessels with horizontal grooves (2 sherds) (Fig. 61, *g, h*). T., 0.9 cm.
6. Direct rim possibly from a single silhouette bowl (1 sherd) (Fig. 61, *i*). Incised line borders rim on interior; exterior has incised right triangle motif. T., 0.7 cm.
7. Direct rim with slightly out-turned lip and exterior incision (1 sherd) (Fig. 61, *j*). Possibly from a cylindrical vessel. T., 0.7 cm.

Comparisons

Gareth W. Lowe considers this group of ceramics to be Late Preclassic in age (pers. comm.). The group resembles polished blackish brown from Santa Rosa (Brockington 1967: 8–9).

Polished Orange II (Fig. 62)

Composition

Inclusions: very fine granules of sand.

Color: reddish orange (2.5 YR 5/6).

Hardness: 4.0.

Surface

Finish: slipped and polished.

Color: red-orange (2.5 YR 4/8).

Texture: smooth with high luster.

Forms

1. Rim sherds with everted lips (5 sherds) (Fig. 62, *a–e*). The vessel shape is unknown but possibly is a flat-bottomed plate. The upper rim surfaces bear concentric grooves. T., 0.5–0.9 cm.
2. Sherds with simple silhouettes and slightly everted rims (2 sherds) (Fig. 62, *f–h*). Vessel shape is unknown. T., 0.5–1.0 cm.

Black and Red Ware (Fig. 63)

Composition

Inclusions: very fine granules of sand.

Color: black to grey (2.5 YR 5/0) with outer parts yellow-red (7.5 YR 7/6).

Hardness: 3.0.

Surface

Finish: slipped.

Color: black on interior; red (2.5 YR 5/6) on exterior.

Texture: high luster on black surface; dull luster on red surface.

Forms

1. Direct rim from flat-bottomed dish with out-slanting sides (18 sherds) (Fig. 63, *a–c*). These sherds are polished black on interior and red on exterior. Typically the black slip has been wiped off in a band near the rim. This band now appears unslipped but may have originally been slipped red. T., 0.7 cm.
2. Shallow dish with out-flaring sides and direct rim (6 sherds) (Fig. 63, *d–f*). The interior is polished black; the exterior is red. T., 1.0 cm.
3. Rims with slight-to-pronounced labial flanges (3 sherds) (Fig. 63, *f, h*). Interiors are black; the exteriors are red. T., 0.6 cm.
4. A rim from a vessel with out-flaring sides and a slightly everted lip (1 sherd) (Fig. 63, *i*). The interior is polished black; the exterior is red but retains traces of black overslip. T., 0.8 cm.
5. Simple silhouette bowl with beveled rim (2 sherds) (Fig. 63, *j*). Incisions are on the

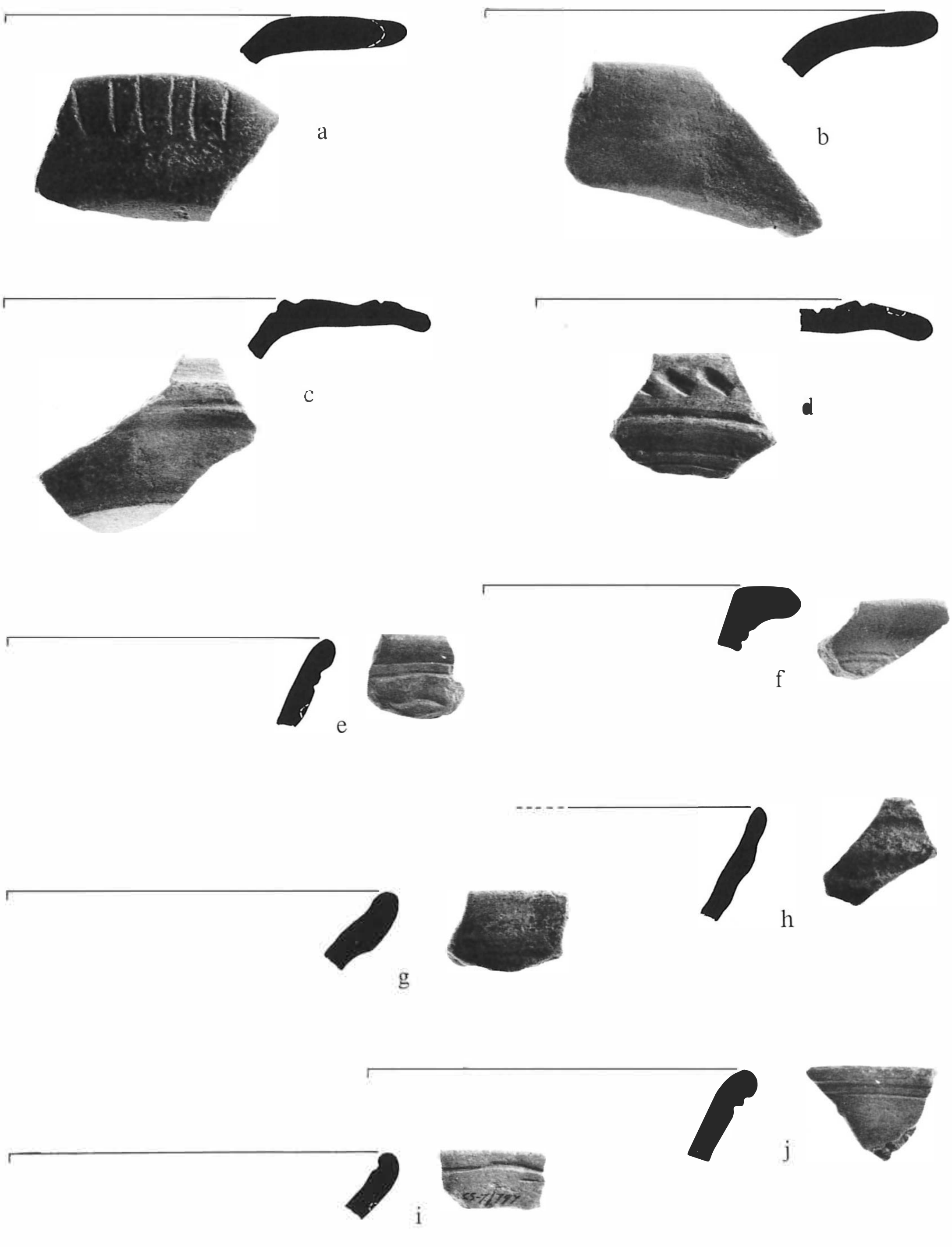


Figure 61. Black Over Brown Ware
a, b: form 1; *c, d*: form 2; *e*: form 3; *f*: form 4; *g, h*: form 5; *i*: form 6; *j*: form 7.
Photographs in *a–d* show upper rim surfaces.
(scale ½)

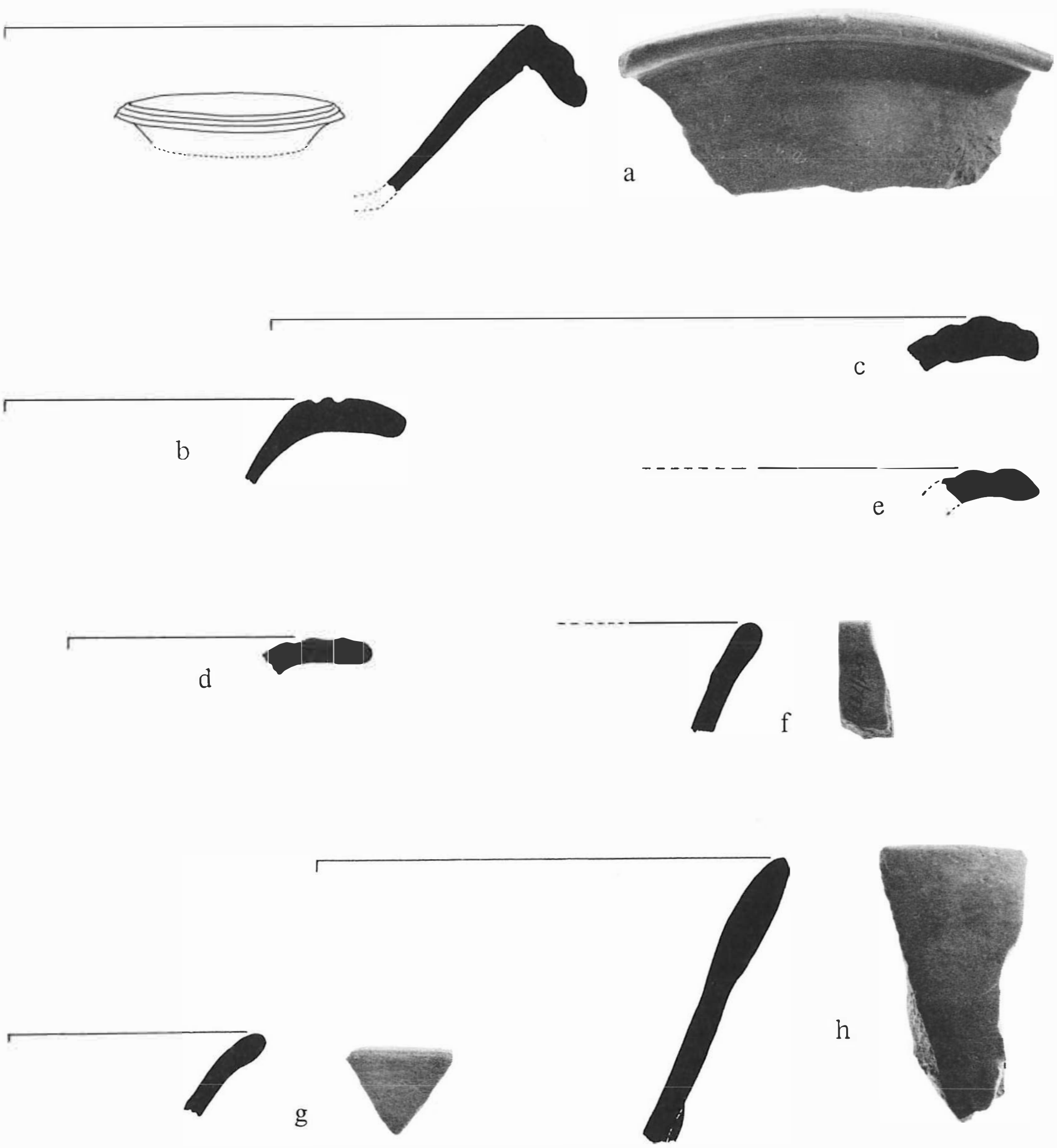


Figure 62. POLISHED ORANGE II
a–e: form 1; *f–h*: form 2.
(scale ½)

exterior red-slipped surface, and on the beveled surface of the vessel's polished black interior. T., 0.6 cm.

Early Classic Period Material

Dull Red Ware (Fig. 64)

Composition
Inclusions: very fine granules of sand.
Color: reddish grey (5 YR 6/4) with darker cores.
Hardness: 4.5.

Surface
Finish: slipped.
Color: reddish brown (10 R 4/6).
Texture: smooth with dull luster.

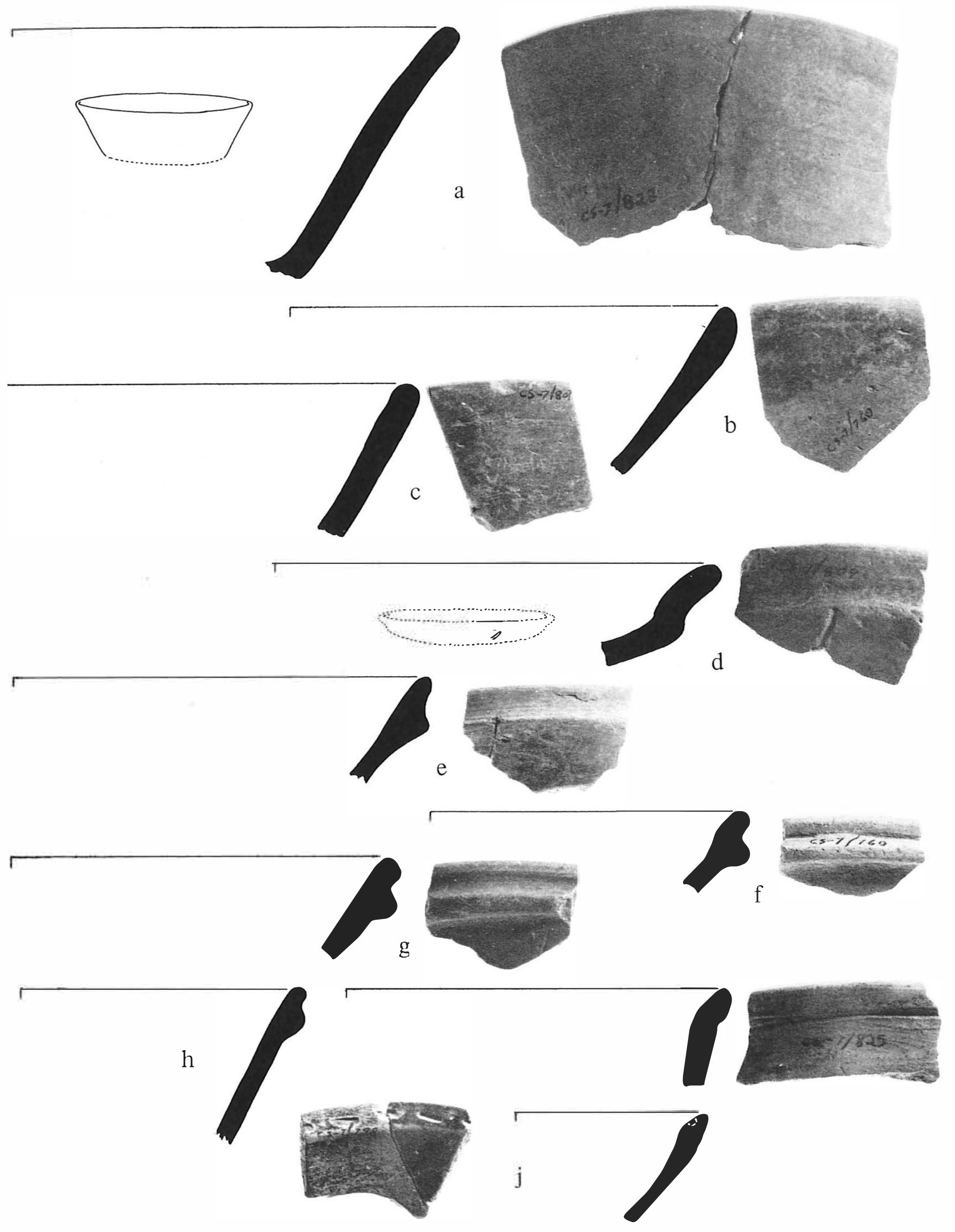


Figure 63. Black and Red Ware
a–c: form 1; *d–f*: form 2; *g*, *h*: form 3; *i*: form 4; *j*: form 5.
(scale ½)

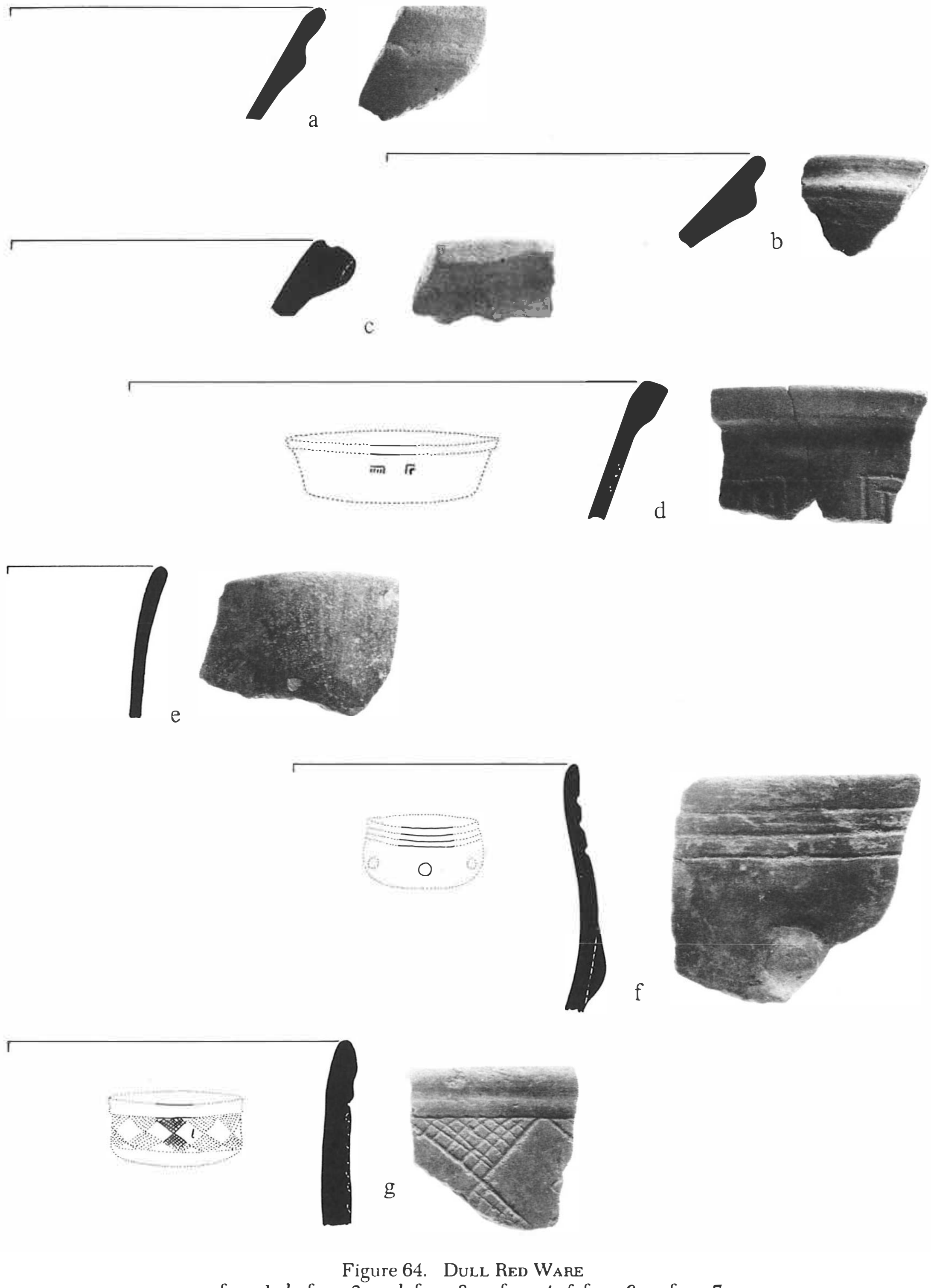


Figure 64. Dull Red Ware
a: form 1; *b*: form 2; *c*, *d*: form 3; *e*: form 4; *f*: form 6; *g*: form 7.
(scale ½)

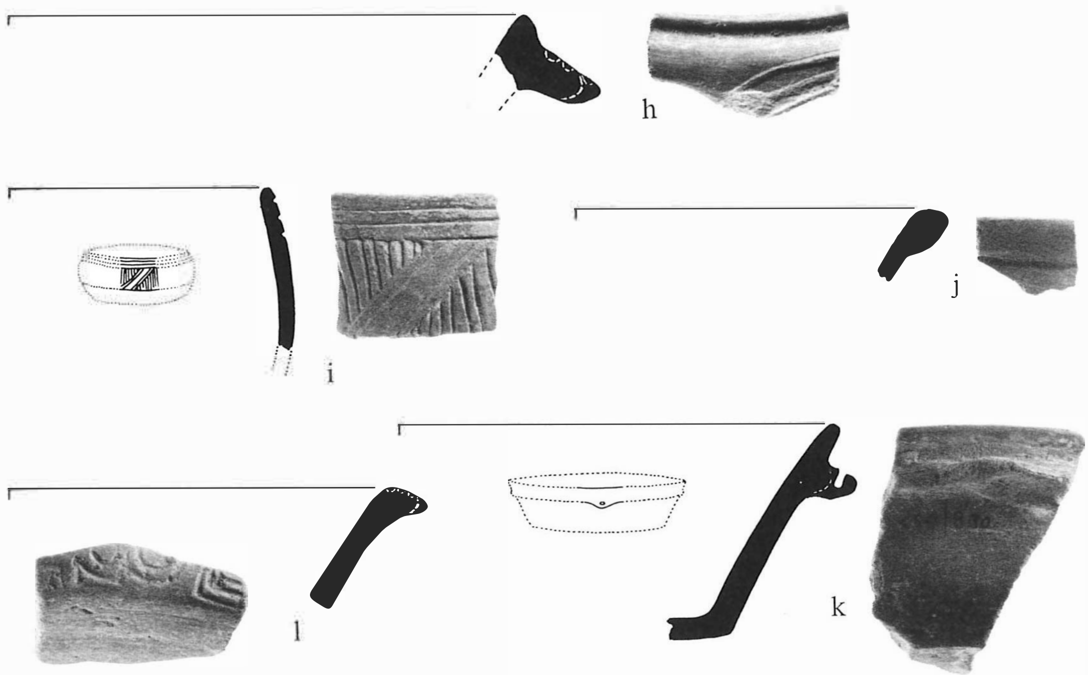


Figure 64. Continued.
h: form 8; *i*: form 10; *j*: form 9; *k*: form 17; *l*: form 14.
(scale ½)

Forms

1. Direct rims that are finger grooved at lip exterior (17 sherds) (Fig. 64, *a*). Some are unslipped on grooved surface. Interior of vessel and exterior below groove is slipped. T., 0.5 cm.

2. Direct rim with slight labial flange (7 sherds) (Fig. 64, *b*). Body shape is unknown. T., 0.5 cm.

3. Thickened lip from vessel with outflaring sides (4 sherds) (Fig. 64, *c*, *d*). Vessel exterior has incised geometric designs. T., 0.7 cm.

4. Rim possibly from cylindrical vessel (4 sherds) (Fig. 64, *e*), with tall neck. T., 0.4 cm.

5. Everted lips from vessels of unknown shapes (7 sherds). Fragments are small in size T., 0.5 cm.

6. Simple silhouette bowl with slightly everted lip (6 sherds) (Fig. 64, *f*). The exterior has three incised lines parallel within the rim. Two specimens have slight protuberances below this decoration. T., 0.5 cm.

7. Simple silhouette vessels with direct rims and incised exteriors (3 sherds) (Fig. 64, g). The designs are cross-hatched triangles in two examples and nested triangles on third example. T., 0.5 cm.

8. Rim with pronounced, incised labial flange (1 sherd) (Fig. 64, *h*). Vessel shape unknown. T., 0.8 cm.

9. Thin-walled vessel with thickened, everted rim (1 sherd) (Fig. 64, *j*). Vessel shape unknown. T., 0.4 cm.

10. Simple silhouette vessels with direct rims and incised exteriors (5 sherds) (Fig. 64, *i*). Two lines are parallel to the rim below which the vessel is decorated with zones of vertical and diagonal lines. T., 0.4 cm.

11. Simple silhouette vessel with incised exterior (1 sherd). Curvilinear designs occur below an incised line that parallels the vessel's lip. T., 0.5 cm.

12. Thick everted lips possibly from large jars (12 sherds). Some retain the remnants of red wash. T., 0.6 cm.

13. Small nubbin feet from flat-bottomed

vessels with out-slanting sides (4 sherds). Two are pierced and hollow; one of these has a clay pellet rattle. Height including thickness of vessel bottom, 2.5–3.0 cm.

14. Slightly everted rims with and without incisions on upper rim surface (8 sherds) (Fig. 64, *l*). T., 0.6 cm.

15. Simple silhouette bowls with direct rims (12 sherds). A few retain patches of red wash. T., 0.7 cm.

16. Slightly everted rims with incisions in form of right triangles located just below rim (2 sherds). Body shape is unknown. T., 0.6 cm.

17. Flat-bottomed dish with out-slanting sides and lateral flange with pierced protuberances (1 sherd) (Fig. 64, *k*). T., 0.6 cm.

Brown and Black Bichrome

Composition

Inclusions: very fine granules of sand.
Color: same as Brown Ware.
Hardness: 4.5.

Surface

Finish: slipped and polished.
Color: black on one surface: brown (5 YR 5/6) on obverse surface.
Texture: smooth with high luster on black surface; medium luster on brown surface.

Forms

1. Wide everted rims possibly from plates with out-slanting sides (2 sherds). Interior and upper rim surfaces are slipped black. T., 0.5 cm.

2. Simple silhouette bowl with direct rim (1 sherd). Exterior is slipped black. T., 0.6 cm.

3. Direct rims with incised exterior surfaces possibly from simple silhouette bowls (2 sherds). One with black on interior; other has reverse coloring. T., 0.5 cm.

Black Ware I (Fig. 65)

Composition

Inclusions: very fine granules of sand.
Color: black (2.5 YR 2.5/0). Streaks black.
Hardness: 5.0.

Surface

Finish: possibly slipped and polished.
Color: black with no brown tones.
Texture: smooth and lustrous with mica particles.

Forms

1. Thin-walled jars (29 sherds) (Fig. 65, *b*). Well-fired, hard, thin-walled jars with short, slightly out-flaring necks and globular bodies. Incised designs are on necks. T., 0.5 cm.

2. A flat-bottomed plate (?) with out-slanting sides (1 sherd) (Fig. 65, *a*). The lip is everted and incised on its upper surface. The vessel was slipped on both sides but the underside of the lip is less carefully worked than upperside. T., 0.9 cm.

3. Direct rims from simple silhouette bowls (3 sherds) (Fig. 65, *c–e*). T., 0.9 cm.

Comparisons

1. Jars from Jaritas Phase, (Type 11-1), Izapa (*see* Lee 1973, Fig. 3). The Chantuto Zone material is highly similar to that from Izapa except that recovered vessel fragments indicate different design motifs.

Black Ware II (Figs. 66 and 67)

Composition

Inclusions: sand (perhaps with calcite) up to medium granule size.
Color: dark grey core (7.5 YR 3/0) but often with pink-red (2.5 YR 5/6) to brick-red (2.5 YR 4/6) edges. Streaks brown to reddish brown.
Hardness: 3.5.

Surface

Color: black with brown overtones when viewed in strong light.
Texture: smooth with lustrous and sometimes soapy finish.

Forms

1. Jars with slightly out-flaring necks and globular bodies (28 sherds) (Fig. 66, *a–c*). Necks are incised. One sherd has a section of body with vertical fluting. T., 0.5–0.8 cm.

2. Direct rims with incised designs; vessel shape unknown (3 sherds) (Fig. 66, *d–f*). Horizontal incised lines are on the exterior of vessels below the rims. One sherd has diagonal incisions. T., 0.8 cm.

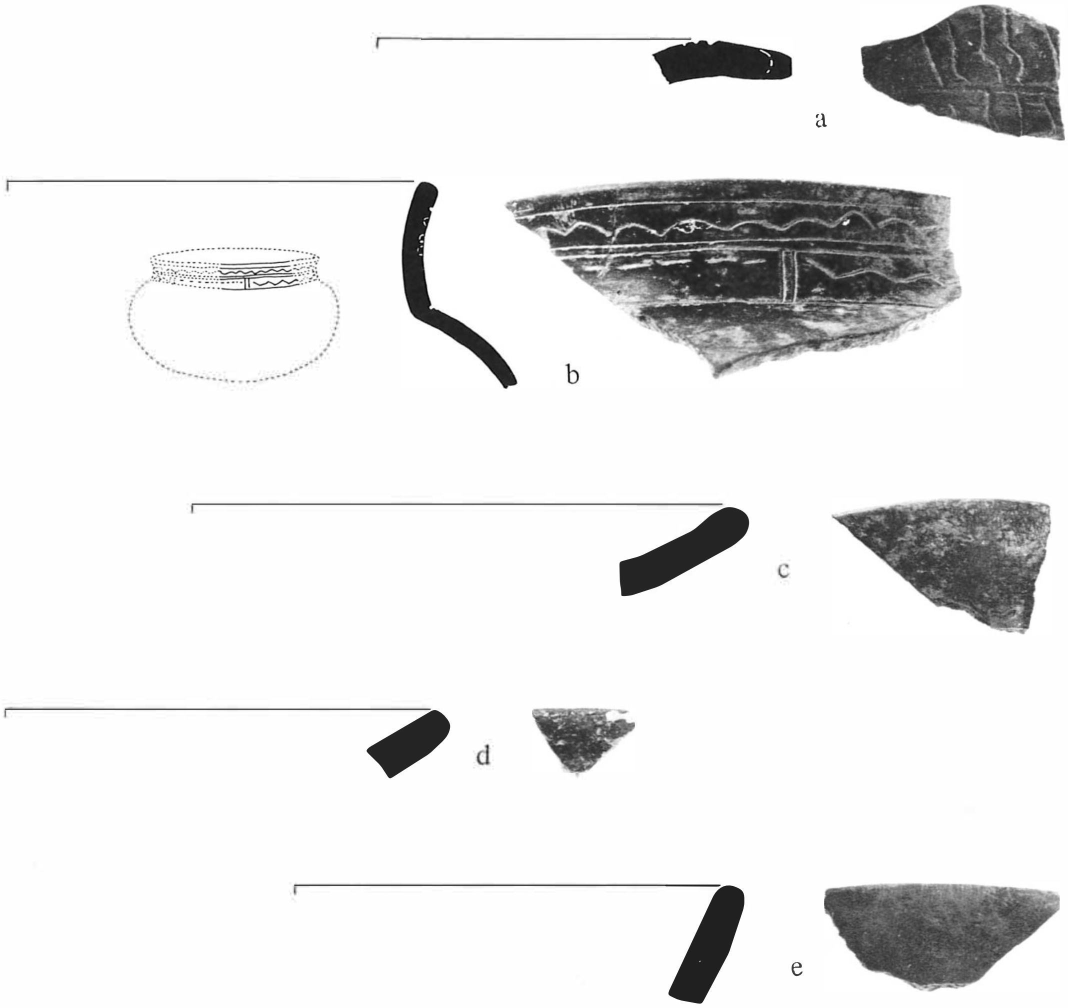


Figure 65. BLACK WARE I
a: form 2; *b*: form 1; *c–e*: form 3.
(scale ½)

3. Sherds with wide, everted rims (2 sherds) (Fig. 66, *g*, *h*). The body shape of vessel is not known but it is probably a jar. Rim exteriors are incised. T., 0.7 cm.

4. Fat-bottomed plates with out-slanting sides and wide, everted rims (22 sherds) (Fig. 67, *a–c*). The black slip is present on the interior surfaces only. Upper surfaces of rims are incised and sometimes the lip has ears. T., 0.5–0.9 cm.

5. Flat-bottomed plates with out-slanting sides and narrow rims (28 sherds) (Fig. 67, *d–f*). The vessels were slipped on the interiors and upper rim surfaces only. Rims have ears that are incised and there is usually a concentric line near the vessel body. T., 0.5 cm.

6. Direct rim sherd from an in-curving walled vessel; base unknown (1 sherd). Slipped on interior only. T., 0.7 cm.

7. A sherd from a vessel with slightly outflaring wall and very slightly everted lip (1 sherd). The exterior only is slipped. T., 0.8 cm.

Carved Red Ware I (Fig. 68)

Composition

Inclusions: very fine granules of sand.

Color: dark-grey cores (2.5 YR 3/0) with

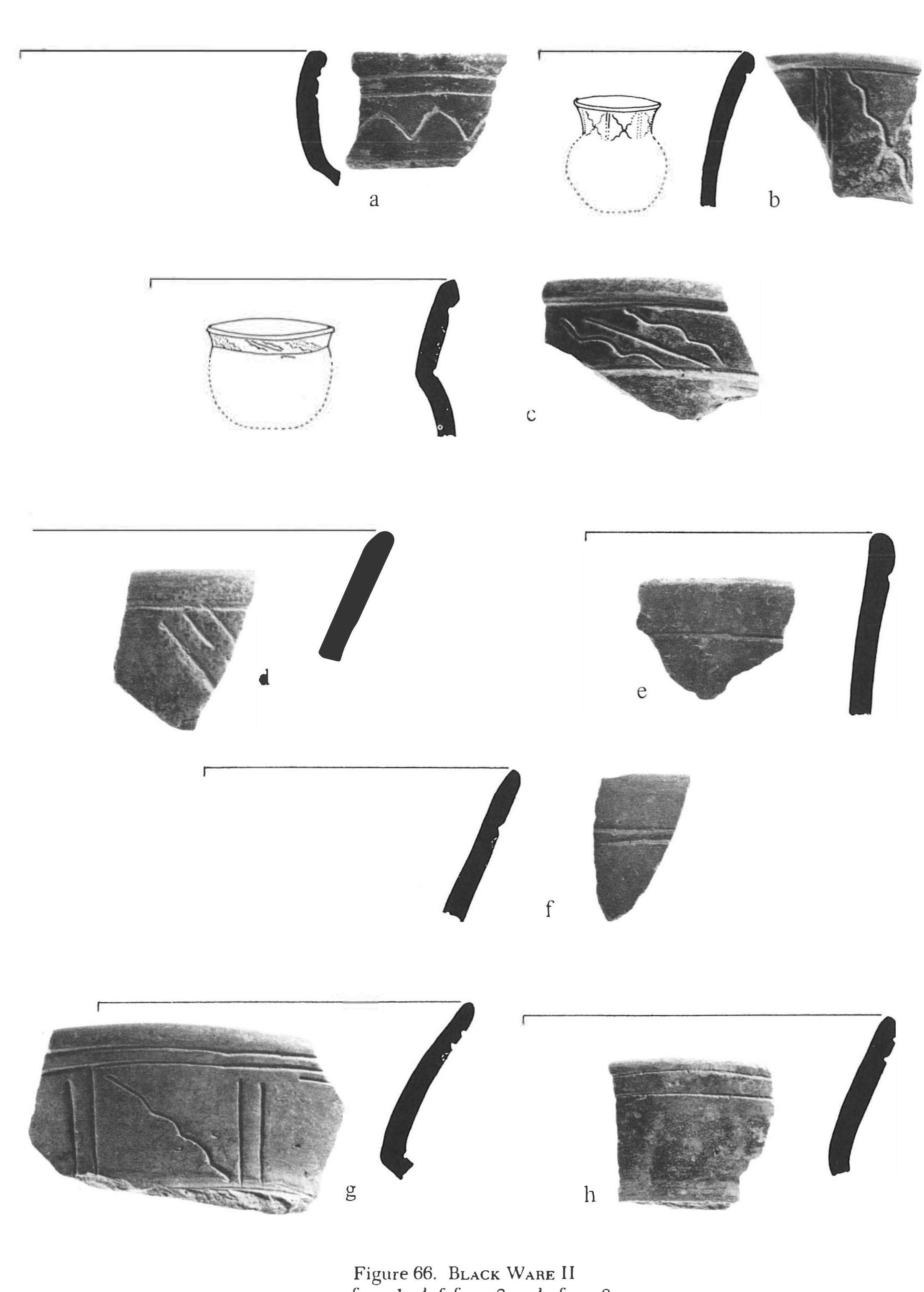


Figure 66. Black Ware II
a–c: form 1; *d–f*: form 2; *g, h*: form 3.
(scale ½)

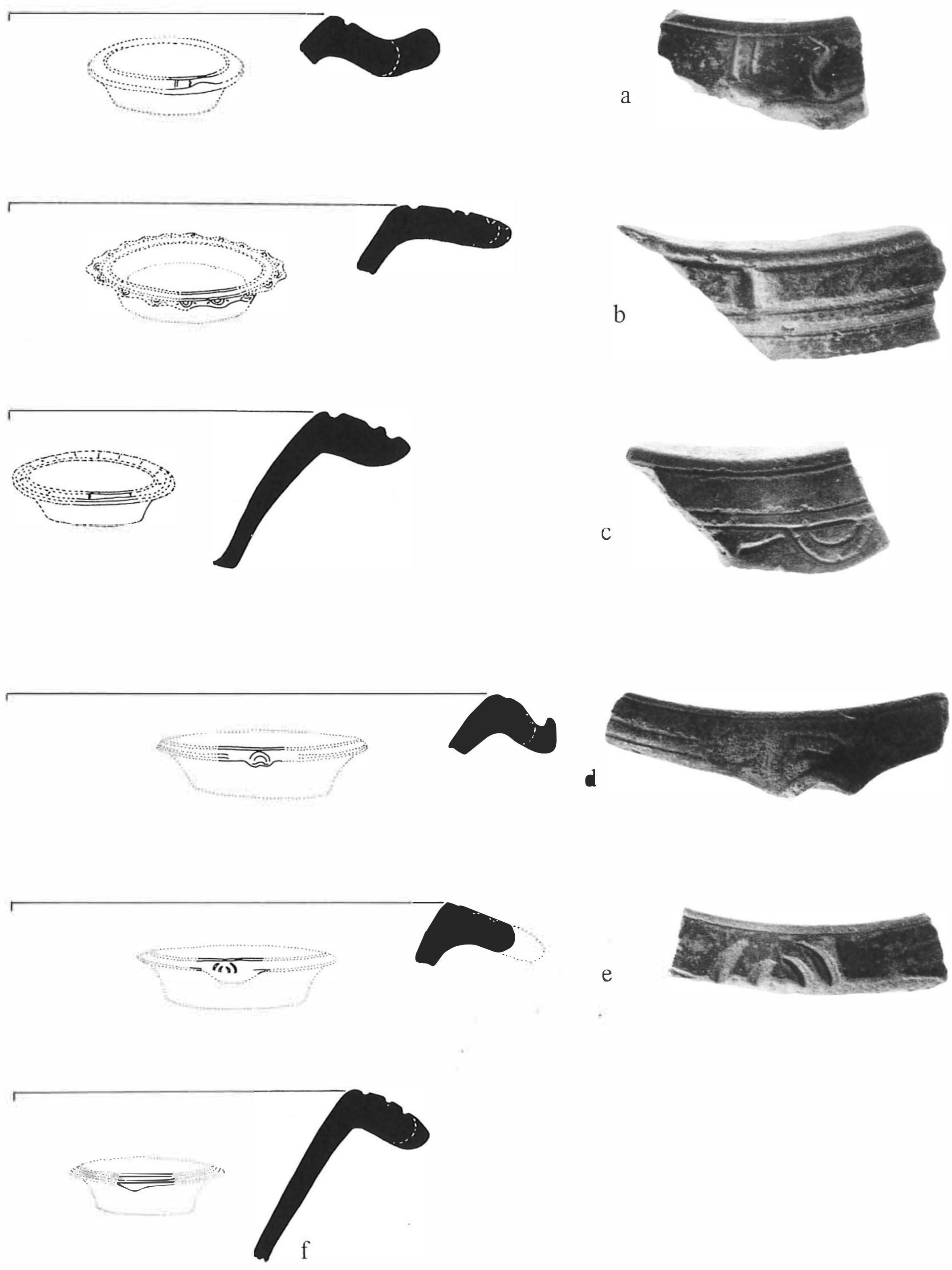


Figure 67. BLACK WARE II
a–c: form 4; *d–f*: form 5. Photographs show upper rim surfaces.
(scale ¼)

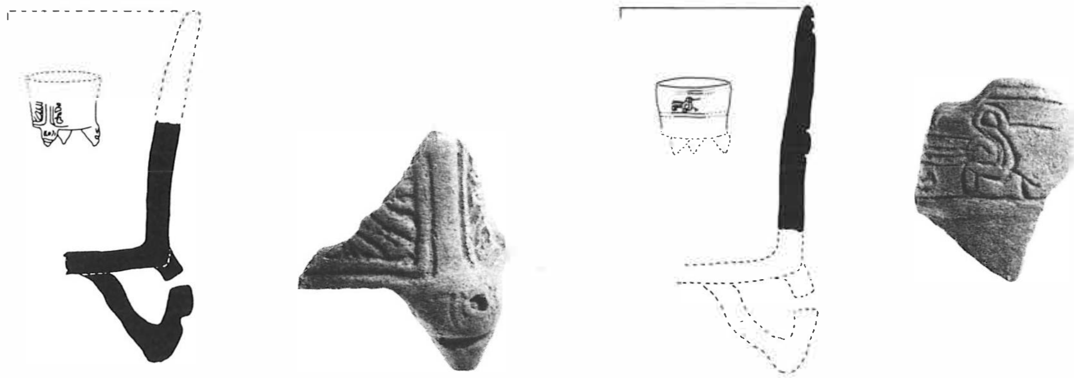


Figure 68. Carved Red Ware I, Form 1
(scale ½)

light grey (10 YR 6/3) edges.
Hardness: 4.5.

Form

1. Vase with slightly out-flaring sides; tripodal, conical feet (1 rim eg.) (Fig. 68). Shape reconstructed from a basal sherd that exactly matches a whole specimen from Izapa (Jaritas Phase, Type 5; *see also* Lee 1973, Fig. 3).

Carved Red Ware II (Fig. 69)

Composition

Inclusions: very fine — medium granule size sand.

Color: brown (10 YR 6/5) with dark core grading to brick red (10 R 5/8–4/6).

Hardness: 4.0.

Surface

Finish: slipped, then carved.
Color: red (10 R 5/6).
Texture: smooth but dull luster.

Forms

1. Shallow dish with S-shaped profile (1 sherd) (Fig. 69, *a*). Geometric incisions and punctation occur on upper lateral facet. T., 0.6 cm.

2. Direct rims from vessels with simple silhouettes (2 sherds) (Fig. 69, *b*, *c*). Exterior incised after application of slip. A mammiform support may be associated with this form. T., 0.5 cm.

Monkey-Vessel Ware (Fig. 70)

Composition

Inclusions: sand grains up to medium granule in size.

Color: yellow-brown (7.5 YR 6/4) with fire-darkened cores.

Hardness: 3.5.

Surface

Finish: red wash.
Color: brownish red (2.5 YR 5/6) wash.
Texture: smooth with dull luster.

Forms

1. Large, wide-mouth jar with small, labial flange (31 sherds) (Fig. 70, *a*, *b*). Incised designs resemble monkeys and are identical to those found at Izapa (Jaritas Phase Type 6-6). Wall thickness at neck, 1.0 cm.

2. Small jar with slightly inturned lip (1 sherd) (Fig. 70, *c*). Design motifs are unknown. Wall thickness, 0.3 cm.

Comparison

General resemblance to material from El Salvador (Longyear 1944), and from Jaritas Phase (A.D. 200–400) at Izapa (pers. obs.; *see also* Lee 1973, Fig. 12, *b*).

Plain Ware: Fine Paste (Figs. 71, 72, 73)

Composition

Inclusions: medium granules of sand.

Color: reddish brown (5 YR 4/4) to brown-black (5 YR 2.5/1).

Hardness: 5.5.

Surface

Finish: surfaces appear unslipped but some retain traces of red wash.

Color: paste surface varies from reddish brown (5 YR 4/4) to grey (10 YR 6/2) or black. Some sherds have fire-darkened clouds.

Texture: smoothed and polished before applying slip or before firing.

Forms

1. Slightly everted rim with slightly flanged recurved upper neck (38 sherds) (Fig. 71, *a*). Body shape unknown but it is believed to be a composite necked jar. Two have small nubbin projections at flange. T., 0.8 cm.

2. Same as Form 1 but with incised scallop design (concave upward) above flange (2 sherds) (Fig. 71, *b*). The necks show traces of incision. T., 0.7 cm.

3. Slightly everted rims that are sometimes nicked, with rounded upper neck and neck flange (15 sherds) (Fig. 71, *c, d*). Scalloped incisions are above an incised line that is parallel to the flange. Traces of incisions appear on neck below flange. T., 0.7–0.8 cm.

4. Slightly everted rims with nicking at regular intervals (15 sherds) (Fig. 72, *a–e*). Flange on upper neck of vessel is also nicked. Vertical or diagonal incised lines are sometimes found between the lip and flange. The lower neck sometimes shows traces of incised designs. T., 0.7 cm.

5. Jar necks and rims with flange near lip (63 sherds) (Fig. 73). Rim is either slightly incurved or slightly everted. No incisions were observed. Eighteen have traces of red wash. T., 0.6–0.8 cm.

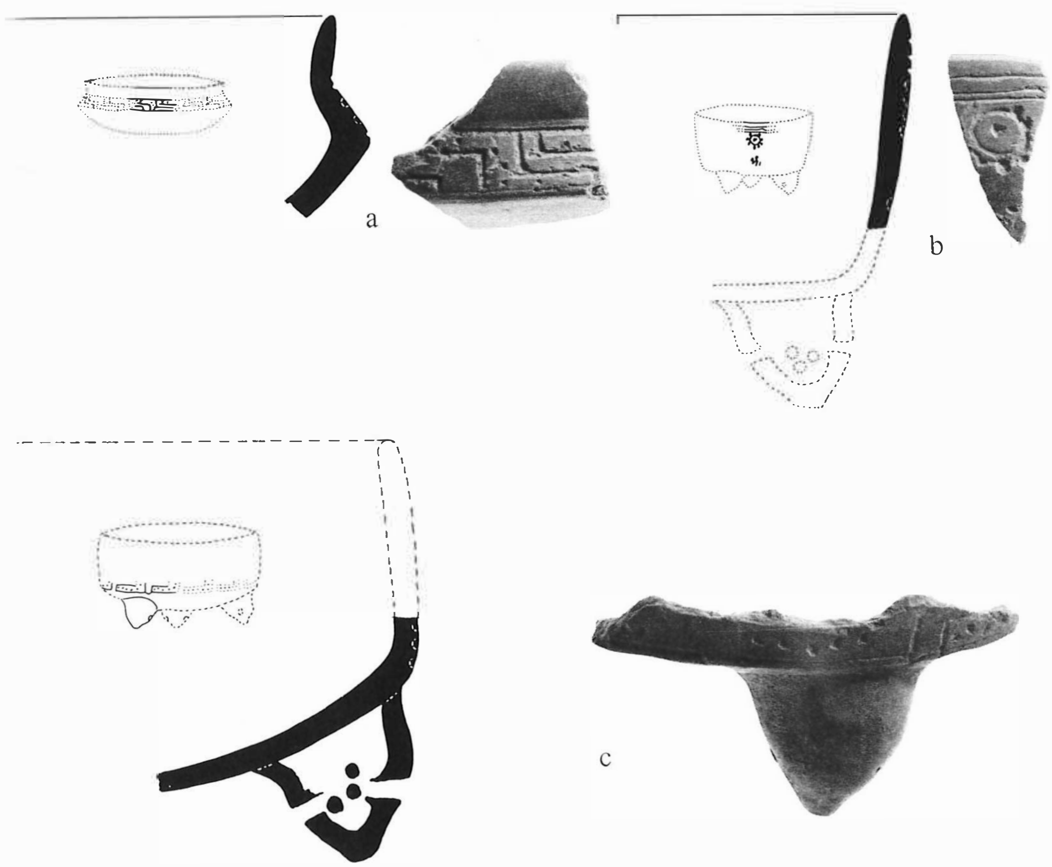


Figure 69. Carved Red Ware II
a: form 1; *b*,*c*: form 2.
(scale ½)

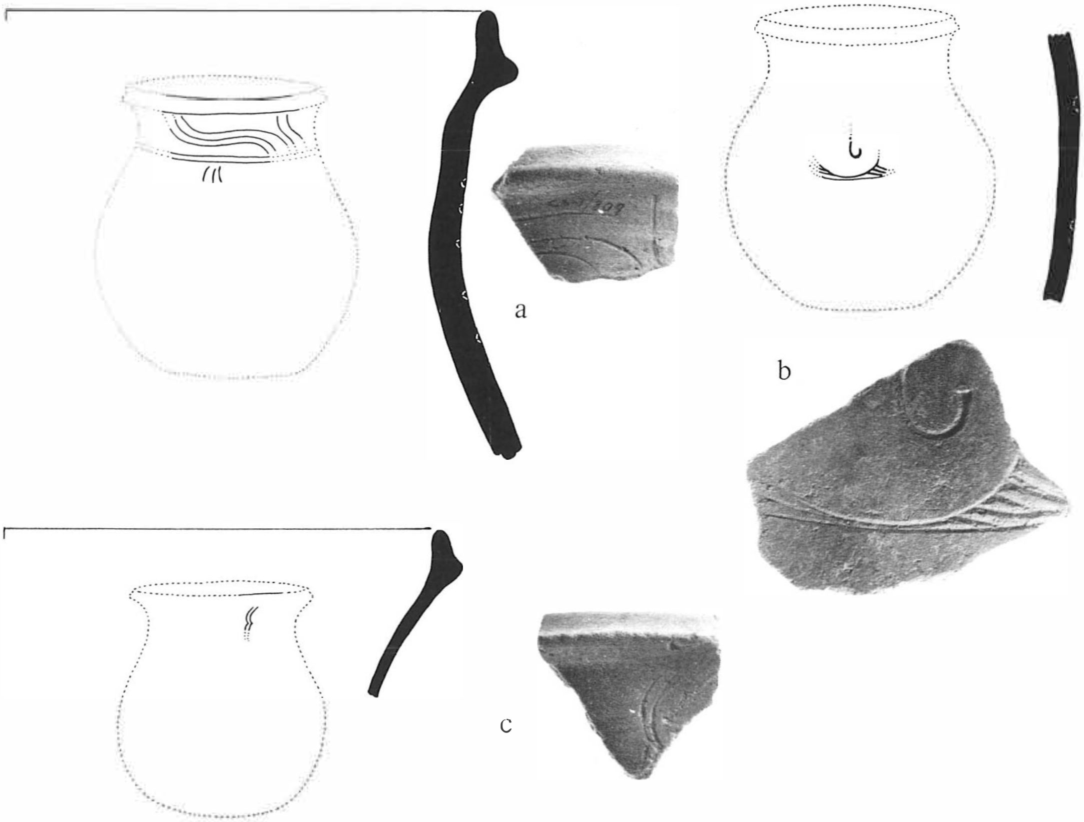


Figure 70. MONKEY-VESSEL WARE
a, b: form 1; *c*: form 2.
(scale ½)

Comparisons

These jars have not been previously described in collections from Chiapas although they are present in Jaritas Phase specimens at Izapa (Lee in preparation). They share similarities in form with cambered rim jars described from Ecuador. Cambered rim jars appear in both Valdivia (approximately 3000–1500 B.C.) and Machalilla (approximately 2000–1500 B.C.) phases (Meggers et al., 1965). Closest resemblances are to Machalilla Embellished Shoulder, Form 4 (Meggers et al., 1965: 126–27).

Plain Ware: Coarse Paste (Figs. 74, 75)

Composition

Inclusions: very fine to medium granules of light-colored sand.

Color: grey (7.5 YR 4/4).

Hardness: 4.5.

Surface

Finish: unslipped.

Color: red (5 YR 5/6) and grey (7.5 YR 6/2).

Texture: sandy to grainy surfaces perhaps as a result of erosion.

Forms

1. Narrow, everted rims with incisions on the upper rim surfaces (5 sherds) (Fig. 74, *a*). Probably from plates with out-slanting sides; base unknown. T., 0.7 cm.

2. Direct rims with labial flanges that are possibly from large jars (35 sherds) (Fig. 74, *b*). These may be merely weathered specimens of the large jars, Dull Red Ware. T., 0.6–1.0 cm.

3. Rim with thickened roll on exterior (12 sherds) (Fig. 74, *c*). Body shape unknown. T., 0.5 cm.

4. Everted lips from jars; base unknown (29 sherds) (Fig. 74, *d*). T., 0.6 cm.

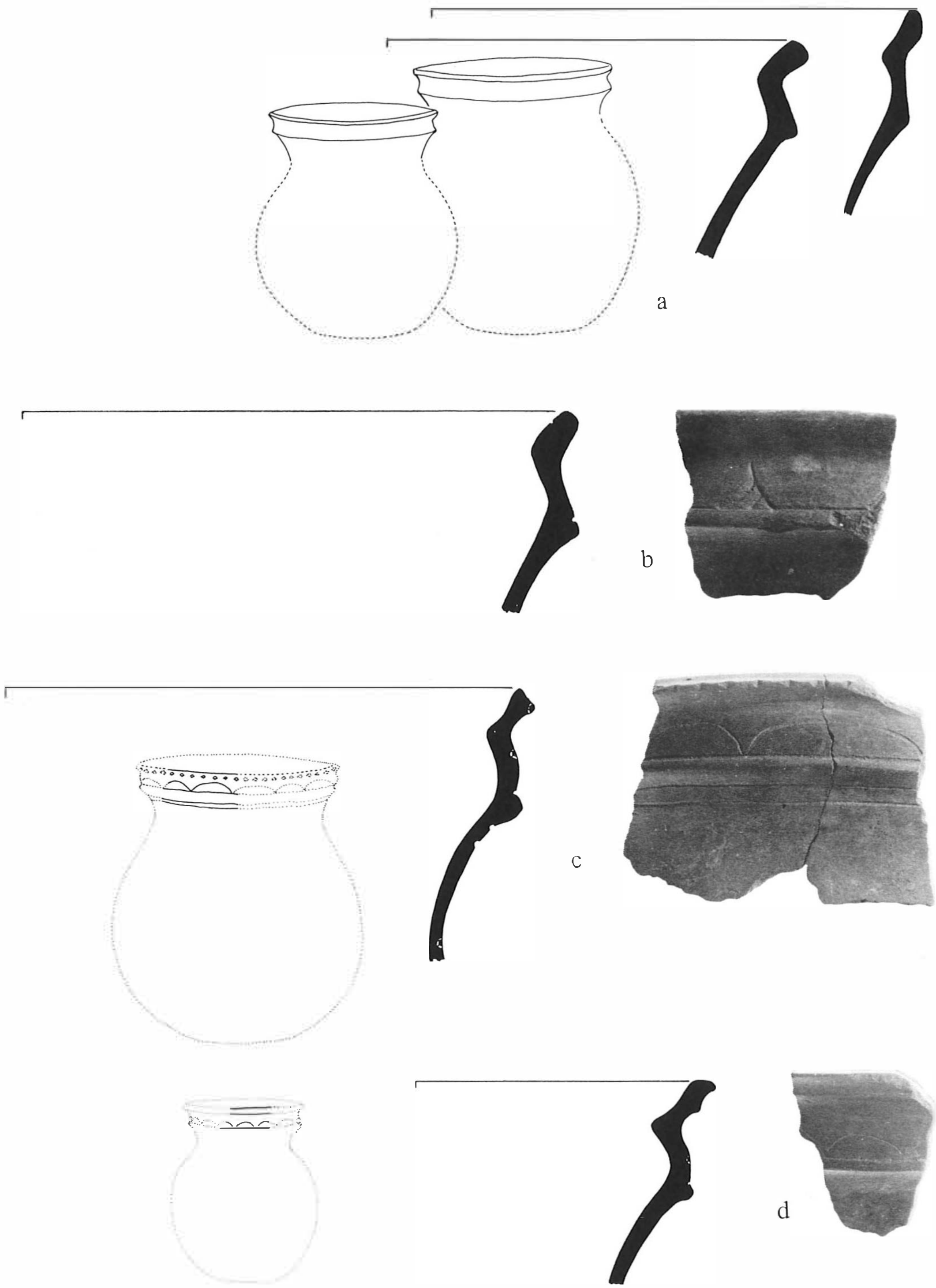


Figure 71. Plain Ware: Fine Paste
a: form 1; *b*: form 2; *c*, *d*: form 3.
(scale ½)

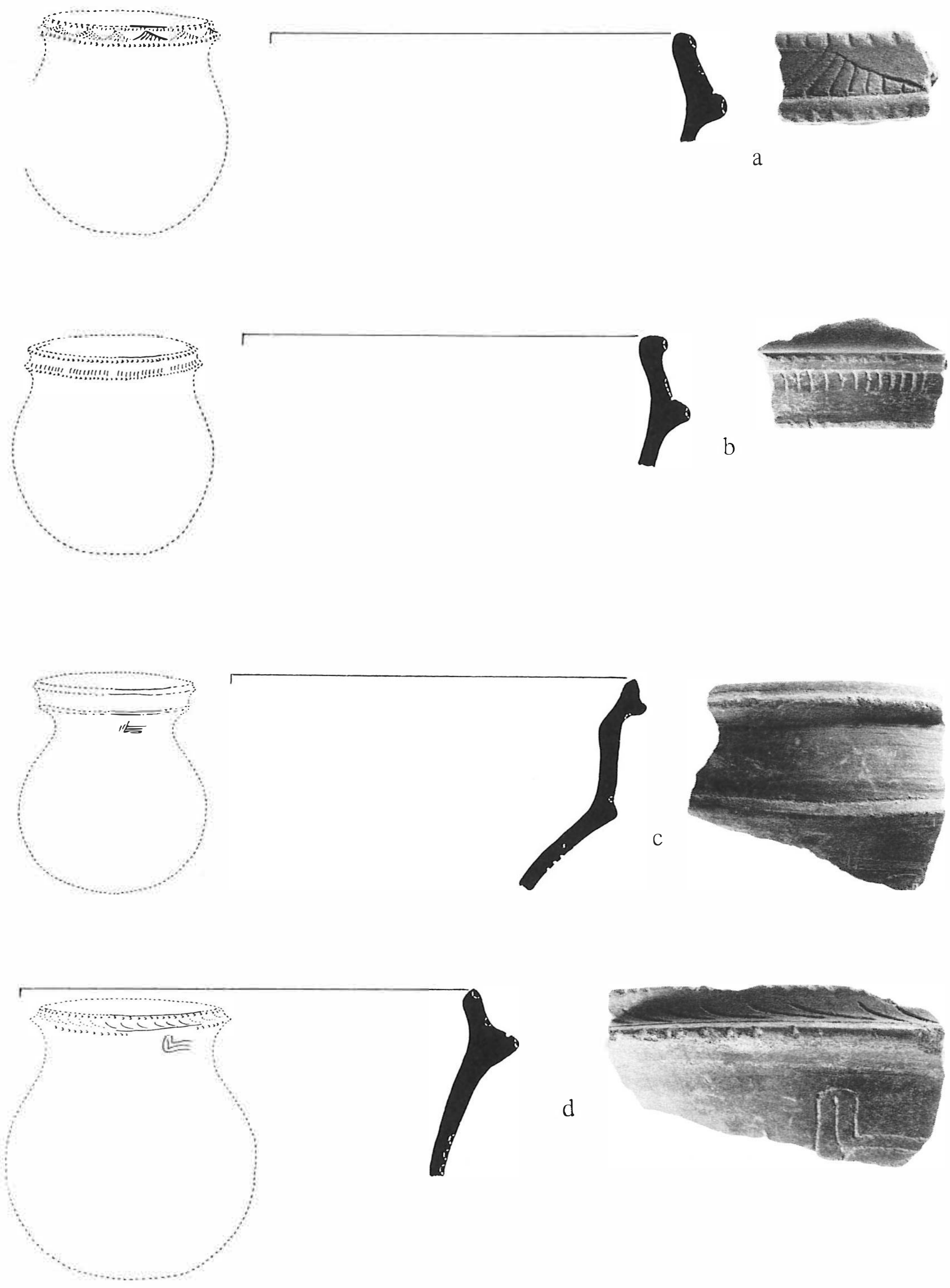


Figure 72. Plain Ware: Fine Paste
a–e: form 4.
(scale ½)

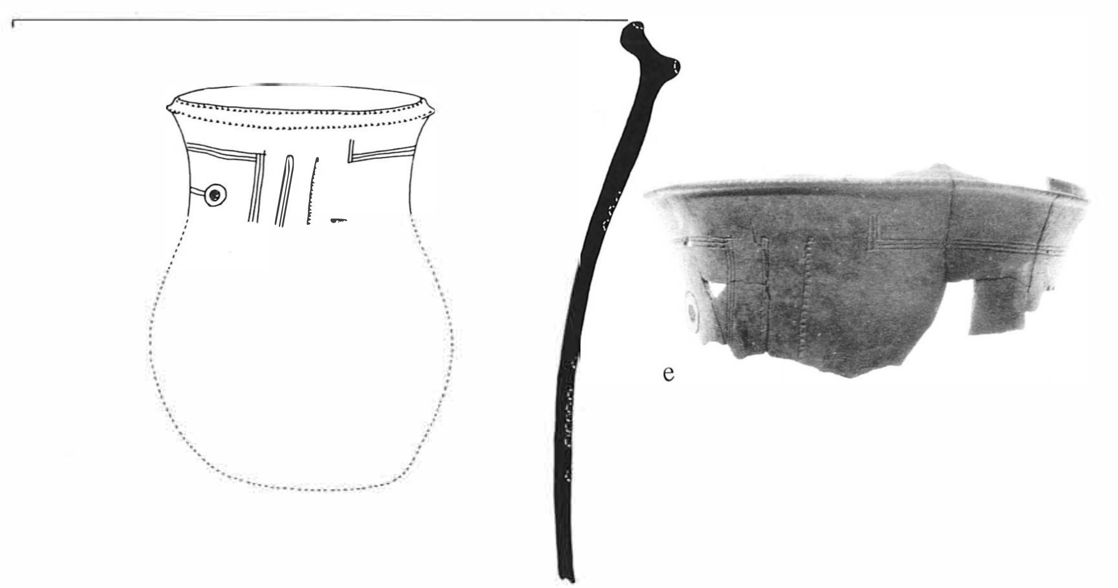


Figure 72. CONTINUED.

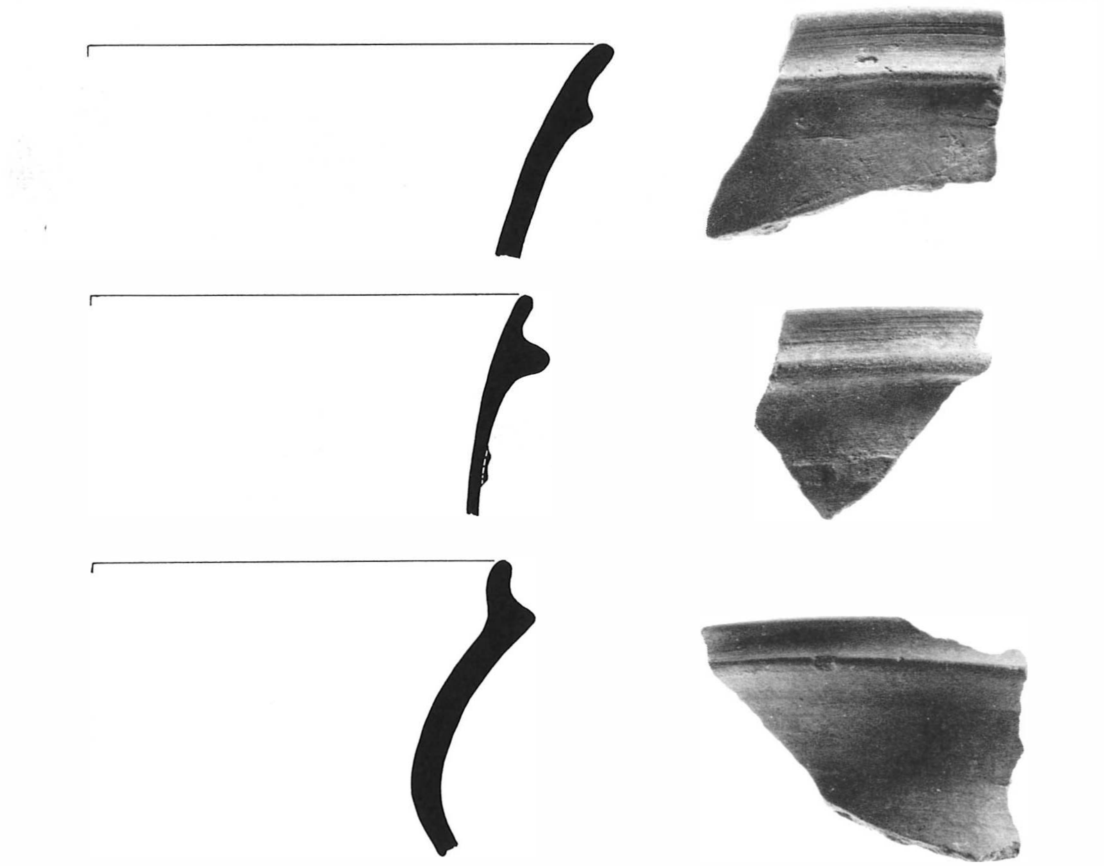


Figure 73. PLAIN WARE: FINE PASTE, FORM 5
(scale ½)

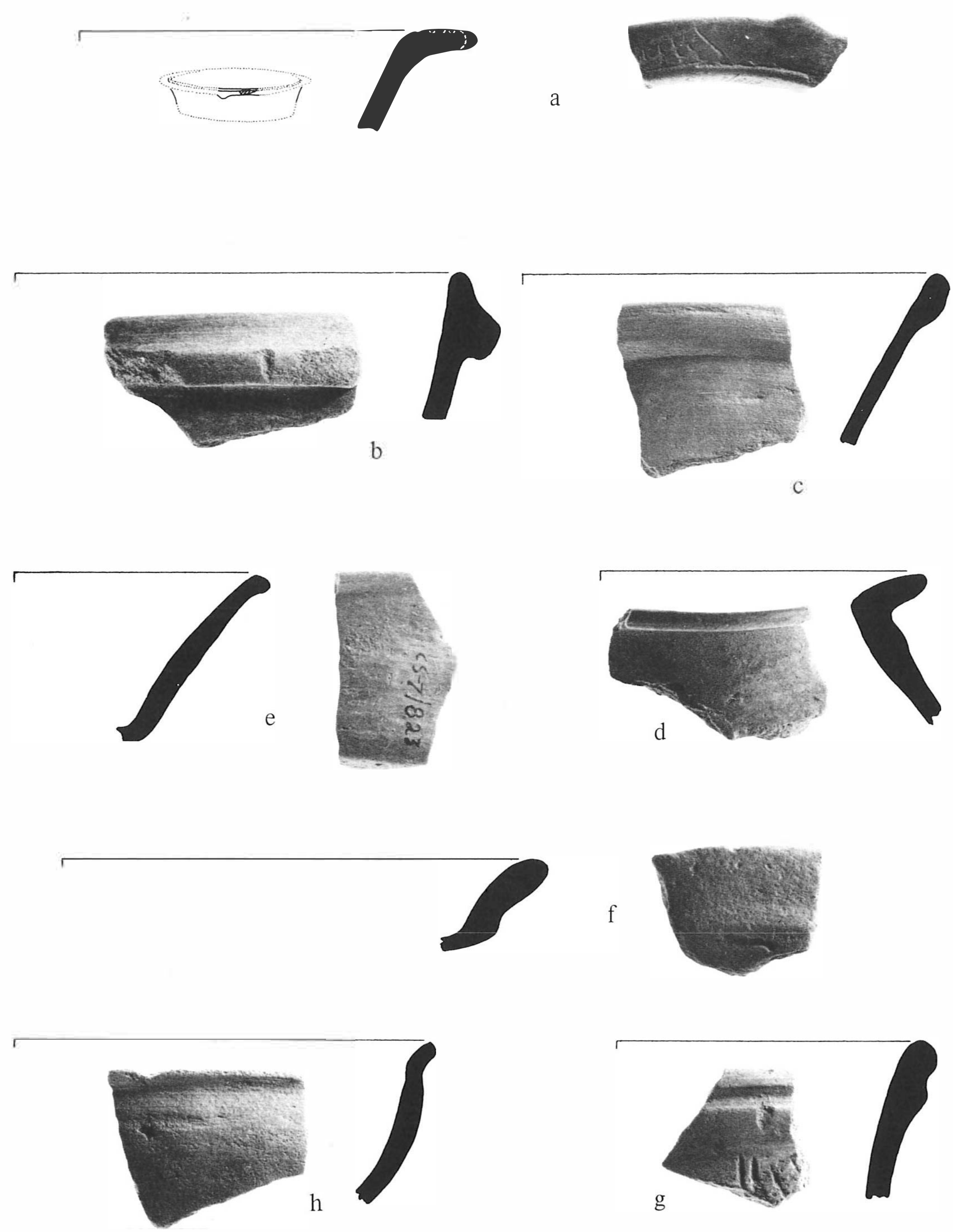


Figure 74. Plain Ware: Coarse Paste
a: form 1; *b*: form 2; *c*: form 3; *d*: form 4; *e*: form 5; *f*: form 6; *g*: form 7; *h*: form 8.
(scale ½)

5. Vessels with direct or slightly everted rims, and relatively straight, out-flaring sides (12 sherds) (Fig. 74, *e*). T., 0.6–1.0 cm.

6. Shallow bowls with out-flaring sides (2 sherds) (Fig. 74, *f*). T., 0.6 cm.

7. Slightly thickened rim sherds with indications of incisions below rims (3 sherds) (Fig. 74, *g*). T., 0.9 cm.

8. Simple silhouette vessels with incurving mouths (Fig. 74, *h*). Rims are direct or slightly everted (13 sherds). T., 0.6–0.8 cm.

9. Incurving bowls with labial flanges (2 sherds) (Fig. 75, *a*). T., 0.9 cm.

10. Out-flaring incised rims that are probably from high-necked jars (5 sherds) (Fig. 75, *c*). T., 0.7 cm.

11. Direct rim sherds that are possibly from potstands (6 sherds) (Fig. 75, *b*). T., 0.8 cm.

12. Slightly everted rim with slightly flanged and recurved upper neck (7 sherds). Vessel shape unknown but believed to be a jar. T., 0.8 cm. Compare Form 1, Plain Ware: Fine Paste.

13. Composite necked jar with slightly everted rim that is nicked at regular intervals (6 sherds). Flange on upper neck of vessel is also nicked. Vertical or diagonal incised lines are sometimes found between lip and flange. Lower neck sometimes has evidence of incised designs. T., 0.8 cm. Compare Form 4, Plain Ware: Fine Paste.

Remarks: This sherd type is a residual category for fragments of all coarse ware that probably served as cooking vessels.

Polychrome (Fig. 76, g)

Composition

Inclusions: very fine to medium granules of sand.

Color: grey core (5 YR 4/1) with orange outer surfaces (5 YR 7/6).

Hardness: 4.5.

Surface

Finish: slipped and painted.

Color: polished black interior; exterior has horizontal stripes of red (10 R 4/6), white (10 YR 8/2) and black (5 YR 3/1) over paste.

Texture: black has high luster; there is a dull luster on polychrome surface.

Form

1. Simple silhouette vessel with direct rim

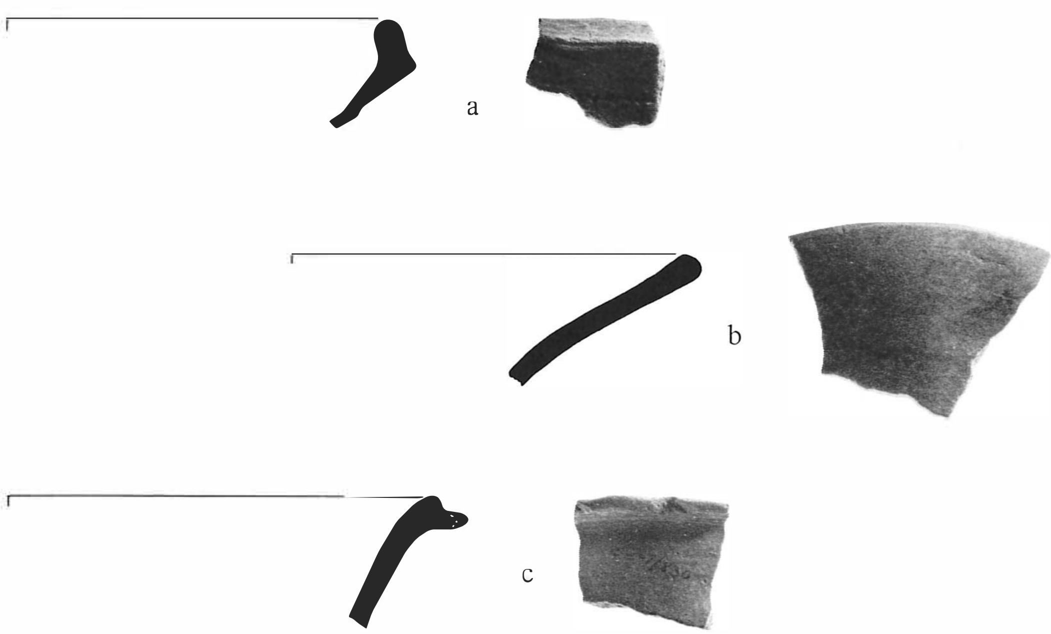


Figure 75. Plain Ware: Coarse Paste
a: form 9; *b*: form 11; *c*: form 10.
(scale ½)

(1 sherd) (Fig. 76, *g*). Shape of base is not known. T., 0.7 cm.

Bichrome I (Fig. 76, *h*)

Composition

Inclusions: very fine granules of sand.

Color: black.

Hardness: 4.0.

Surface

Finish: slipped and painted.

Color: black and specular hematite red (2.5 YR 2.5/4).

Texture: black surface has high luster; red surface has a glittering luster.

Forms

1. A rim sherd with flange and incised line on vessel exterior (1 sherd) (Fig. 76, *h*). The rim is painted with specular hematite below which is a zone of polished black. T., 0.8 cm.

Bichrome II (Fig. 76, *i*)

Composition

Inclusions: very fine granules of dark-colored sand.

Color: yellow-brown (7.5 YR 7/6).

Hardness: 4.5.

Surface

Finish: painted.

Color: white (10 YR 8/1) and red specular hematite (2.5 YR 2.5/4).

Texture: smooth with low luster.

Form

1. Thin-walled, simple silhouette sherd with direct rim (1 sherd) (Fig. 76, *i*). A red band is located along the exterior of the rim. Below this is a white zone. The interior is unpainted but smoothed, T., 0.5 cm.

Comparisons

Probably Late Preclassic Period or Early Classic Period (Gareth W. Lowe pers. comm.).

Stuccoed Sherds (Fig. 76, *e*, *f*)

Composition

Inclusions: very fine granules of sand.

Color: dark grey with light yellow (7.5 YR 7/6) edges.

Hardness: 3.5.

Surfaces

Finish: stuccoed.

Color: pistachio green, pink (7.5 R 6/4) white, and reddish pink (7.5 R 5/6).

Texture: smooth with dull luster.

Form

1. Direct rims from simple silhouette vessels (3 sherds). Two are from thick-walled (1.0 cm.) vessels. One of these, probably a pot stand (Fig. 76, *e*), has a pink-and-green stuccoed design over a smoothed brown exterior surface. The second of these specimens retains slight remnants of pink and white stucco over smoothed paste on the exterior surface. The third specimen is a rim sherd from a cylindrical vessel (Fig. 76, *f*), that has stuccoed decoration on vessel exterior. During the manufacture of this pot a quadrilateral lattice design was cut into the vessel's exterior. This surface was then slipped a reddish brown color. A thick, light-colored pink paint was inlaid into the excised areas. Later, vertical red and white stripes were added, thus obliterating the vertical elements of the lattice. Some remnants of pink stucco adhere to the vessel interior. T., 0.5 cm.

Postclassic Period Material

Plumbate (Fig. 76, *a–d*)

Composition

Inclusions: very fine granules of sand.

Color: grey (10 YR 4/2) with light yellow (10 YR 7/4) near surface.

Hardness: 5.0.

Surface

Finish: glazed.

Color: greys (10 YR 4/1–4/2).

Texture: smooth with medium to high luster.

Forms

1. Jar with out-flaring neck, direct rim (1 sherd) (Fig. 76, *a*, *b*). Has two lines incised on upper body at base of neck. T., 0.6 cm.

2. Avimorphic vessel (Fig. 76, *c*, *d*). A small bowl resembling a bird. Both head and tail project from vessel body and wings are carved on its sides. Stylized feathers and

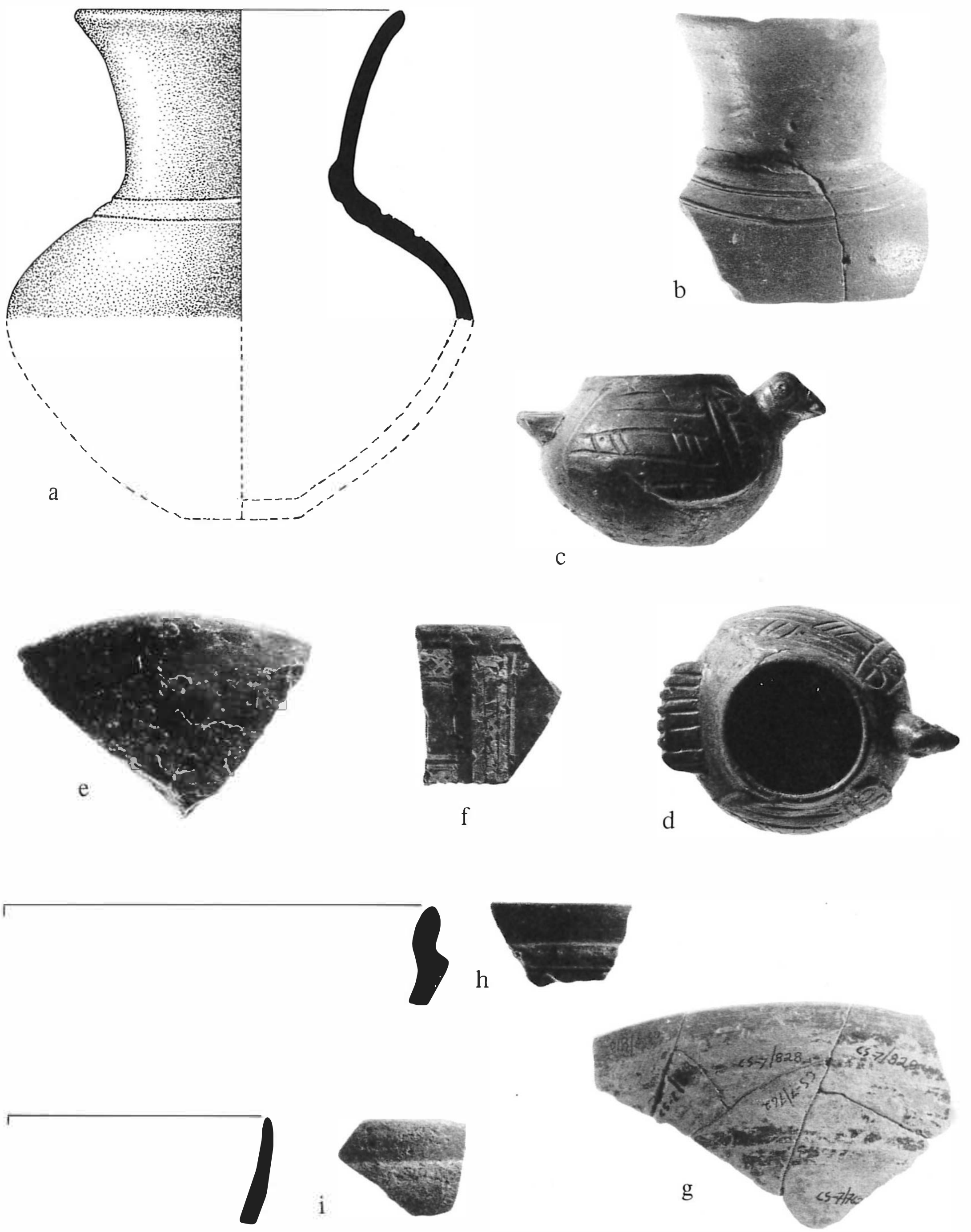


Figure 76. MISCELLANEOUS CERAMICS
a–d: plumbate (*a–b*, drawing and photograph of same vessel; *c–d*, two views of same vessel); *e, f*: stuccoed sherds; *g*: polychrome; *h*: bichrome I; *i*: bichrome II.
(scale ½)

other features are indicated by incised lines. Vessel is glazed with grey plumbate (10 YR 4/1) over a red paste. This vessel was found turned upside down and resting on the jaw of Burial 3. It contained 16 medium to coarse pebble-sized fragments of lime, all of which had been flattened by abrasion on one or more sides. Perhaps this abrasion was due to whitening the body of the deceased during the funeral rites. Dimensions in cm: H., 5.0; Max. dia., 6.5; L., 8.5.

Comparisons

Both specimens are examples of Tohil Plumbate. Form 1 resembles vases from Remanso Phase (A.D. 900–1100) at Izapa (Lee 1973, Fig. 10). Form 2 is an example of miniature bird effigy vessels like those discussed by Shepard (1948, 26). The closest examples (Shepard 1948, Fig. 16, *h, i, j, k*) to the excavated specimen all have a Guatemalan provenance.

CERAMIC NON-VESSEL ARTIFACTS

Clay Earplug and Earspool (Fig. 77)

Solid earplug: 1 specimen (Fig. 77, *a*)

Dimensions in cm: Dia., 2.5; H., 1.3.

A squat, spool-shaped solid earplug without decoration. One end is concave. Compare specimen from Chiapa de Corzo's Francesa Phase (Late Preclassic Period) (Lee 1969, Fig. 47). Solid earplugs have also been recovered from Conchas Phase material at La Victoria (Coe 1961: 104). Early Classic.

Flared tube earspool: 2 specimens (Fig. 77, *b*)

Dimensions in cm: Reconstructed flare dia., 3.4–3.8; T., 0.3, 0.4.

Two broken fragments of earspools which retain portions of rims. One has a dark brown slip (5 YR 3/1) with high luster. One is unslipped and burnished. The wider rim of this specimen is fluted and has an incised groove on the rim surface. Compare pottery earspools from Conchas Phase deposits at La Victoria (Coe 1961: 103). Early Classic.

Clay Figurines (Fig. 78)

Standing figurine: 1 specimen (Fig. 78, *f*)

Dimensions: H., 7.0 cm.

The torso and left leg of standing figurine collected from the surface at Site Cs-14 (El Conchal). Arms are shown against torso. The digits are indicated by deep grooves. Arm bracelets are indicated by incised lines. The umbilicus is suggested by a slight depression; breasts are appliqued bumps. A vertical hole penetrates the figure to a depth of 2 cm below the shoulders. The left foot is splayed, and resembles feet (Fig. 78, *g–k*) described below.

Torsos: 4 specimens (Fig. 78, *a–d*)

One specimen is a seated human figurine with head and legs missing. The stomach is grossly protuberant perhaps as a caricature of pregnancy or representative of some disease. Appliqued breasts have broken off leaving scars. The figurine is wearing a necklace formed by appliqued and punctated strips. Fingers and upper arm bracelets are indicated by incised lines. Two perforations are located below the shoulders; these would have permitted the figurine to have been suspended or fitted with decorative elements. A third perforation on the center of the back of the neck reached the hollow interior which extends through the entire torso. The back of the figurine is flat. It is unslipped and unpainted. Dimensions in cm: 7.0 from buttocks to shoulder.

One specimen consists of a hollow figurine's lower torso. The body cavity was made by inserting a hollow stick through the long axis of the figurine's body. The hands, which are appliqued and incised, are resting on the stomach. The figurine has a large, indented umbilicus and a flat back. The specimen is

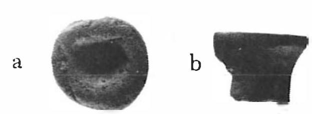


Figure 77. Clay Earplug and Earspool
a: solid earplug; *b*: flared tube earspool.
(scale ½)

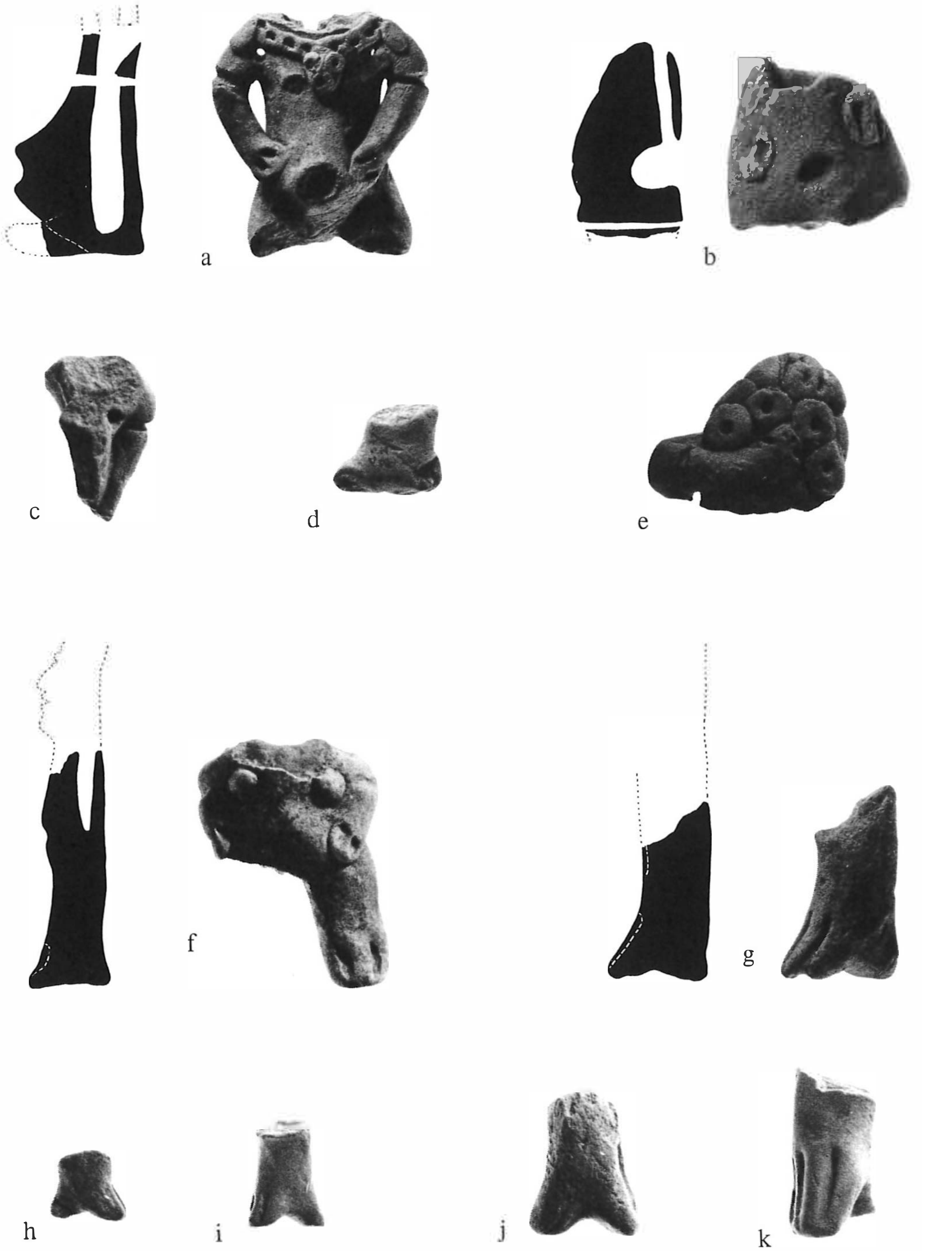


Figure 78. Clay Figurines
a–d: torsos; *e*: head; *f*: standing figurine; *g–k*: legs and feet.
(scale ½)

unslipped and unpainted. Dimensions in cm: H., 5.0; W., 5.5.

One specimen is a broken lower torso of a seated figurine. The individual is seated with legs spread (indicated by the angle of stump). There is no indication of clothing or genitals. The specimen is unslipped and unpainted. Dimensions in cm: H. of fragment, 3.0; W., 3.5.

One specimen is the broken upper torso with the left arm and left side of chest intact. The arm rests along the side of the body. The upper arm is incised to indicate a bracelet. The left breast is punctated but the hole emerges in the center of the back. The figurine has a hollow interior. The specimen is unslipped and unpainted. Dimensions in cm: H., 5.0.

Comparisons

Several types from Chiapa de Corzo.

Head: 1 specimen (Fig. 78, *e*)

Dimensions in cm: W., 6.0; H., 5.5.

A head and right arm of human-like figurine perhaps representing Tlaloc. The arm is raised so the right hand is placed over the mouth. Both the eyes and earspools are indicated by appliqued rings. Hair, fingers, and bracelet are indicated by incised lines. The head is perforated with a vertical slit from the back to an interior hollow. One perforation extends through the body and is located below the arm which is crossed over the upper chest. The artifact is unslipped and unpainted.

Legs and feet: 5 specimens (Fig. 78, *g–k*)

Dimensions in cm: 2.3 to 3.0 for length of foot.

Solid cylindrical objects representing human legs. The feet are arched. Toes are indicated by deep incisions. Usually three incisions are used but one specimen has only two. These lower limb fragments of figurines are unslipped and unpainted.

Arm and hand: 1 specimen

Dimensions in cm: L. from fingers to shoulder, 3.5; W., 1.2.

A fragment from a figurine representing an arm and hand. Fingers and an arm bracelet are indicated by deep, incised lines as has been described for standing figurine and some torsos. This specimen is also unslipped and unpainted. Early Classic.

Comparisons

The figurine fragments recovered from the study area are the same as figurine fragments reported from the nearby mainland region of Escuintla (Kidder 1940; Drucker 1948). Lowe and Mason (1965: 202) discuss the chronological placement of these items and conclude that they are Protoclassic or Classic. The trait of cleft feet links the Chiapas examples with figurines found in El Salvador, where they are particularly well known from the eastern region at the sites of Quelepa and Los Llanitos (Longyear 1944).

DISCUSSION

The strata with ceramic inclusions were not bedded and in some cases showed clear evidence of mixing in the vertical sections of the test pits. The results of the ceramic study by Acuña (Table 25) shows frequent reversals in sherd chronological and stratigraphical rank order. Thus both the stratigraphic and comparative evidence indicate mixed deposits.

This evidence for mixing indicates that the ceramic assemblage should be treated as consisting of ceramic items that were deposited at different times. The time of manufacture and presumed deposition of each item is assumed to be approximately equivalent to that of comparable items in other known sequences. Thus, although the typology of the sherd collection was established by criteria that are internal to the collection, the dating of types was established on the basis of criteria external to it.

The evidence for mixing, the small size of the studied collection, and the limited amount of comparative research, combine to give results that should be considered tentative. In the present discussion I reconstruct the chronology of midden occupation on the basis of available ceramic data. In view of the limitations mentioned, I am able to infer from these data only possible periods of occupation and spheres of ceramic exchange.

The available ceramic material indicates a major significant post-Archaic Period occupation of the middens during the Terminal Preclassic Period/Early Classic Period. That is, from approximately A.D. 100 to A.D. 400. Other less intense occupations are indicated for various periods and they are discussed below.

The three studied middens were apparently all occupied during the Early Preclassic Period. Sherds dating from this time period were found at all sites and in all but one (N8W1) test pit. These sherds were, however, extremely rare. The Early Preclassic Period ceramic inclusions were not exclusively associated with a single stratigraphic unit and in fact come from various stratigraphic levels rather than from the lowermost levels of the ceramic-bearing stratigraphic unit. All Early Preclassic Period sherds were thus intermixed with sherds from later time periods (but note generally lower clustering in Cs-7).

The Early Preclassic sherds that originated from Cs-7, and that were therefore studied, show close resemblances to sherds of the earliest ceramic complex identified in the Early Preclassic chronology of the Soconusco, the Barra Phase, first defined for Altamira (*see* Introduction). This evidence, although meager, permits the inclusion of Tlacuachero within the limited area of known Barra occupation (Lowe 1975a; 1975b). The Early Preclassic material from Tlacuachero shows close affinity to other studied sites of the Soconusco.

The evidence is shaky for occupations of the Chantuto middens for the Middle and Late Preclassic periods. Acuña identified one sherd at Cs-6 that is possibly diagnostic of the Middle Preclassic Period (Chiapa III). Also, the pottery type of Polished Orange, first described for Santa Rosa on the upper Rio Grijalva (Brockington 1967), was found at Tlacuachero. Brockington places the Santa Rosa *pol O* in Phases 2 and 3 which he dates as 600–50 B.C. This placement includes both Middle and Late Preclassic periods. Sometime during this span Tlacuachero and Santa Rosa were part of a single tradition that as Brockington (1967: 12) notes was "widespread over Mesoamerica south of the Isthmus of Tehuantepec." The Zoned Bichrome sherds are also part of a Late Preclassic coastal ceramic sphere.

Thus there is some evidence for a possible Middle–Late Preclassic occupation of the midden. The ceramic comparisons include sites on the upper and middle Rio Grijalva.

The Protoclassic Period is still poorly known for the Soconusco, pending publication of recent studies of Izapa and elsewhere. However, diagnostic sherds of this period from other areas were discovered in the excavations at the midden sites. The figurine fragments also may date from this or the following period (Lowe and Mason 1965: 202). These figurines resemble specimens from El Salvador, where they have been placed later than the Formative Period (discussed by Lowe and Mason 1965). Thus on the eve of the Classic Period the midden occupants shared a figurine tradition with parts of Central America, including El Salvador.

The Early Classic occupation is represented by abundant potsherds. Early Classic material was found throughout the upper stratigraphic units (those that contained ceramic inclusions) in each of the three sites. The chronological placement of my material in the Early Classic Period is based on typologic comparisons with the material from Izapa. Several very close resemblances between whole vessels from Izapa and sherds from Tlacuachero have been identified, although the ceramic study of Izapa materials is not yet completely published (Lee 1973, and in preparation). Many more resemblances will probably be noted when a systematic comparison can be made. In addition, some specific jar forms from Tlacuachero recall jars from El Salvador and from Ecuador. These ceramic cognates indicate a southward orientation in ceramic tradition during the Early Classic Period, like that postulated for the Protoclassic Period. The exact nature of this relationship remains obscure at the present time.

The small number of Late Classic Period sherds that was recognized indicates a light occupation of the middens at that time. The occupation apparently involved all three sites but diagnostic sherds were found in only some test pits.

A Postclassic occupation was identified for Cs-7 and Cs-8 but was not discovered at Cs-6. At Cs-8 an unbroken plumbate pot was associated with a human burial. Apparently during the Postclassic Period the midden served the local inhabitants as a burial site.

APPENDIX II: ANALYSIS OF MARSH CLAMS

The enormous middens of marsh clam shells testify to the importance of this food item in the prehistoric past. It was thus a surprise for me to discover that the present-day inhabitants of La Palma do not collect clams. Several informants actually believed that the local clam population had become extinct approximately five years before the field study. After some searching I eventually discovered clam populations in Cerritos and Teculapa lagoons. In August 1973 I was also informed by my La Palman friends that after my departure from the area a group of villagers from Acapetagua collected large quantities of clams from Lagoon Cerritos. This evidence indicates that in fact the clam population is being utilized today by local inhabitants.

Samples of the clams that I gathered have been identified by Joseph Rosewater[1] as *Neocyrena ordinaria* Prime. This is also the type of marsh clam that was recovered from the excavations.

The living *N. ordinaria* specimens were collected by swimmers working from a canoe. The water in the lagoons varied from approximately 1.0 to 1.5 m in depth in the areas where the clams were gathered. The water was sufficiently deep to necessitate the swimmer remaining underwater while checking the surface of the mud bottom for possible clams. This was most effectively done by keeping the body as close as possible to the bottom while sweeping the arms in wide arcs over the mud. The clams occurred in beds but were regularly spaced at a minimum of one meter intervals. The swimmer accordingly had to keep moving as he or she was collecting. The only equipment necessary to the enterprise was a container for the gathered clams—either a net bag, basket, or a canoe would be suitable for this purpose. We used baskets and the canoe as containers.

After the weighing of the clams was completed, the clam meat was consumed. We discovered that these clams had a strong disagreeable aftertaste when eaten raw. The effect was not dispelled by marinating the raw clams in lemon and spices. Although some people were more repelled by the aftertaste than were others, all eight people who tried the clams experienced the aftertaste. We discovered that cooking completely removed the bitter flavor; the prepared clams were gastronomically equal to commercial varieties.

The analysis consisted of determining the proportion of meat to shell and the nutritional content of meat. Clams were collected on three different occasions (January-February 1973, August 1973, and September 1974) in order to investigate possible variations in meat-shell ratios.

CLAM WEIGHTS AND DIMENSIONS

The freshly collected whole specimens were first weighed on a triple-beam balance. The clams were then opened and the shell valves, combined meat and juice, and drained meat were separately weighed. The results of the weighing of shells and drained meat from specimens collected on three occasions are reported in Figure 79. The graph indicates the nature of population growth of marsh clams. Specimens collected during February 1973 generally fall between 14 and 20 g of shell and 3 to 5.5 g of meat. Some specimens, however, have unusually heavy shells. The specimens from the subsequent collection period, August 1973, have shell weights that also cluster between 14 and 20 g but meat weights cluster between 4 and 8 g. Thus in August the meat-to-shell ratio is increased compared to the specimens analyzed in February. This increase is evidently related to the reproduc-

1. Division of Invertebrate Zoology, Smithsonian Institution, Washington, D.C.

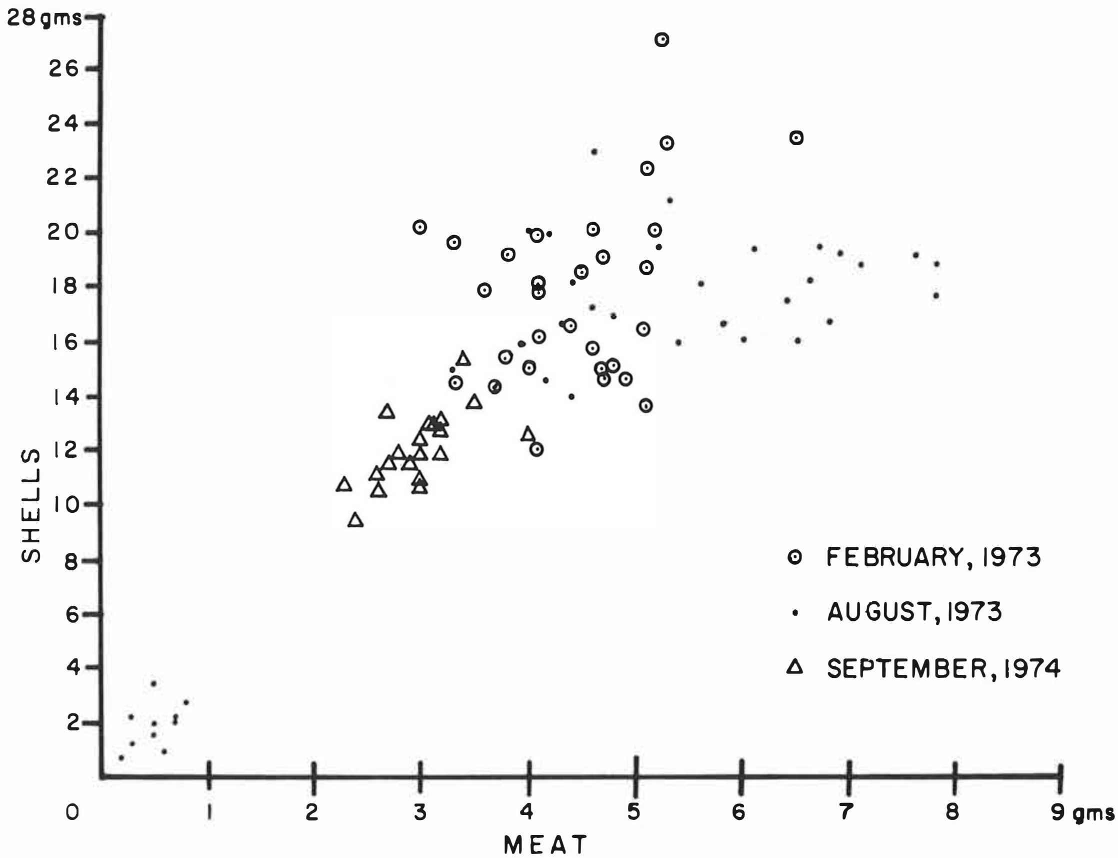


Figure 79. WEIGHTS OF SHELLS AND DRAINED MEAT OF PRESENT-DAY SPECIMENS OF *Neocyrena ordinaria* PRIME
Collected on three occasions from lagoons in the Chantuto study area.

tion cycle of the clams. Some specimens that were recovered during August fall in the lowest ends of both shell and meat weight scales. These small-sized clams are the immature individuals of a new generation. The third sampling took place in September 1974. The clam weights cluster between 9 and 15 g of shell and 2 to 3.5 g of meat. Evidently this sample indicates the amount of growth of the new generation identified in August of the preceding year. The analysis indicates that the reproductive cycle from birth to maturity has a two-year duration.

Figure 79 indicates that the ratio of shell to meat varies throughout the marsh clam reproductive cycle. I have calculated the percent of meat weight to shell weight for samples taken at four intervals (Table 26). The highest average percentage of meat-to-shell weight occurred in August 1973, during reproduction, whereas the lowest occurred in January 1973, when the population was mature but not yet in its reproductive phase.

The maximum widths of shells were also measured for two samples (Fig. 80). These data are plotted against weight of meat (Table 27). The data show that the width of shell is not a good indicator of the amount of meat contained in a clam. For example, shells varying between 4 and 5 cm in width can contain from 3 to 8 g of meat. This observation has importance for archaeological research because it indicates that marsh clam biomass can be more accurately reconstructed from shell weight data than from data on shell sizes.

Table 26. PERCENT OF AVERAGE MEAT WEIGHTS TO AVERAGE SHELL WEIGHTS FOR FOUR SAMPLES OF *Neocyrena ordinaria* PRIME

Date of Collection	Weight of Shells (gm)	Weight of Drained Meat (gm)	Percent of Meat Weight to Shell Weight
January 1973 (N = 50)	873	188	22
February 1973 (N = 32)	560	142	25
August 1973 (N = 43)	541	167	31
September 1974 (N = 21)	254	63	25

NUTRITIONAL CONTENT

Nutritional analyses were performed on five of the clams that were collected in February 1973. These clams were transported alive from the field area to Tuxtla Gutiérrez where they were shucked and the meat frozen. The frozen specimens were then taken to California. Four clams were processed individually from the beginning to the end of the analysis; the meat of a fifth clam was drawn at random from a batch of specimens. The analysis was performed by James Childress[2], who measured the composition in terms of moisture, protein, lipid, and carbohydrate (Table 27). The variations in these items are not large. There is an apparent tendency for

2. Department of Marine Biology, University of California, Santa Barbara.

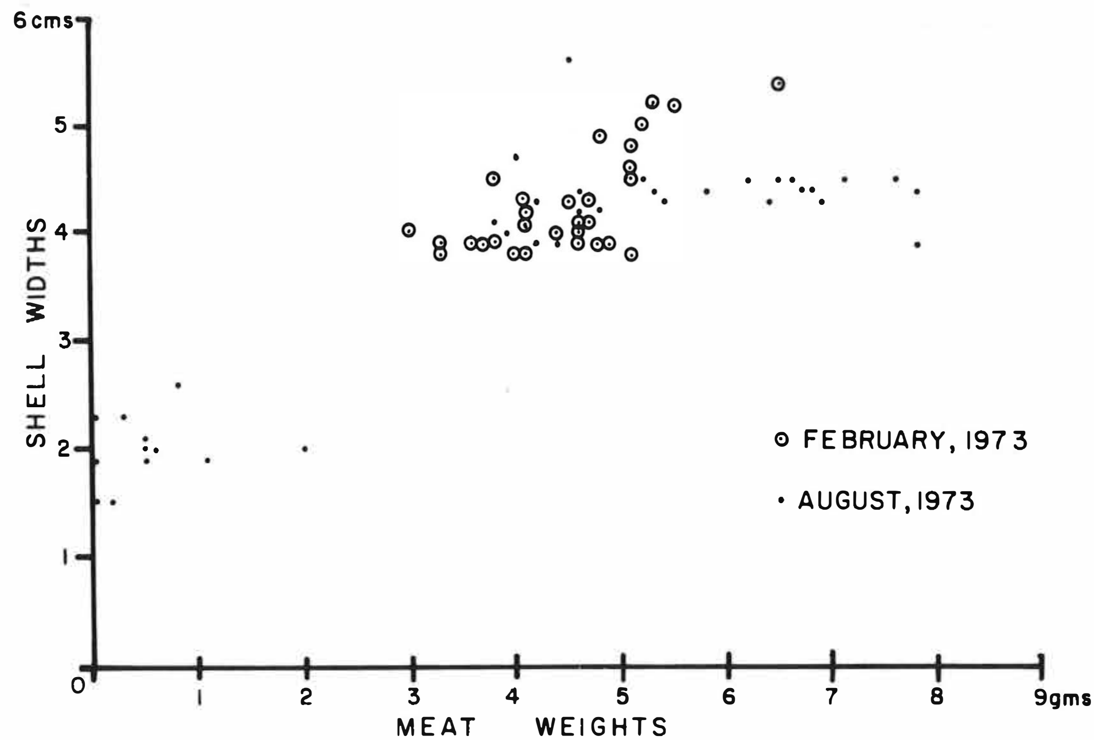


Figure 80. MAXIMUM WIDTHS OF CLAM SHELLS AND WEIGHTS OF MEAT OF TWO SAMPLES OF PRESENT-DAY SPECIMENS OF *Neocyrena ordinaria* PRIME

Table 27. NUTRITIONAL ANALYSIS OF SOME SHELLFISH

Specimen Number	L.; W. (cms)	Weight Whole Clam (gms)	Weight Shells (gms)	Weight Meat (gms) When Shucked	At Laboratory	Percent of wet weight % H_2O	% Protein	% Lipid	% Carbohydrate	Food Energy (Cal.)
#1 Clam	3.9;4.3	33.5	19.8	4.12	2.668	80.6	10.4	2.7	0.9	
#2 Clam	4.2;4.9	27.9	14.9	4.72	2.9273	84.8	8.2	1.7	0.2	
#3 Clam	3.7;3.9	21.3	15.3	3.82	1.9487	86.6	7.2	1.5	0.1	
#4 Clam	3.7;3.8	22.6	13.6	4.94	2.5141	84.3	7.7	2.2	0.2	
#5 Clam from batch	—	—	—	—	3.0591	83.6	6.2	3.4	0.5	
Average	—	—	—	—	—	83.9	7.9	2.3	0.4	
INCAP-ICNND (Wu Leung 1961) 615 Clam		—	—	—	100	81.7	12.6	(fat) 1.6	2.0	76
INCAP-ICNND 650 shrimp (raw)	—	—	—	—	100	78.8	17.3	0.2	2.5	86
INCAP-ICNND 651 shrimp (dried)	—	—	—	—	100	20.4	63.0	2.2	1.0	293

protein to increase with increase in whole clam size. The sample is much too small, however, to permit generalities about this correlation.

Table 27 also includes the composition of clam meat from an unidentified species (Wu Leung 1961: 81). The percentages of water, fat (reported here in the lipid column) and protein are reasonably close to those of the *Neocyrena ordinaria* Prime samples. The carbohydrate content is larger than in the analyzed marsh clam samples. The reported food energy is 76 calories. I have added the nutritional content of shrimp to the table for comparative purposes (Wu Leung 1961: 85). Both raw and dried shrimp were processed. Raw shrimp are higher in protein and food energy than are the analyzed clams. The dried shrimp are even more strikingly nutritious per unit of weight than all other types of food considered here.

REFERENCES

ALVAREZ DEL TORO, MIGUEL
1971 *Las aves de Chiapas.* Gobierno del Estado de Chiapas, Tuxtla Gutiérrez, Mexico.
1972 *Los reptiles de Chiapas.* Gobierno del Estado de Chiapas, Tuxtla Gutiérrez, Mexico.

ANDERSON, JAMES E.
1967 The Human Skeletons. In *The Prehistory of the Tehuacan Valley,* Vol. 1: *Environment and Subsistence,* edited by Douglas S. Byers. University of Texas Press, Austin.

ANDREWS, E. WYLLYS, IV
1965 Excavation of shell midden at Isla Cancun, Quintana Roo. In "Progress Report on the 1960-1964 Field Seasons, National Geographic Society — Tulane University, Dzibilchaltun Program." *Middle American Research Institute, Publication* 31, pp. 42-45. New Orleans.
1969 The Archaeological Use and Distribution of Mollusca in the Maya Lowlands. *Middle American Research Institute, Publication* 34. Tulane University, New Orleans.

BINFORD, LEWIS R.
1968 Post-Pleistocene Adaptations. In *New Perspectives in Archaeology,* edited by Sally R. Binford and Lewis R. Binford, pp. 313-41. Aldine Publishing Company, Chicago.

BOWMAN, H. H. M.
1917 Ecology and Physiology of the Red Mangrove. *Proceedings of the American Philosophical Society,* Vol. 56, No. 7, pp. 589-672. Philadelphia.

BROCKINGTON, DONALD L.
1967 The Ceramic History of Santa Rosa, Chiapas, Mexico. *Papers of the New World Archaeological Foundation,* No. 23. Provo.

BRONSON, B.
1966 Roots and the Subsistence of the Ancient Maya. *Southwestern Journal of Anthropology,* Vol. 22, No. 3, pp. 251-79. Albuquerque.

BRUSH, C. F.
1965 Pox Pottery: Earliest Identified Mexican Ceramic. *Science,* Vol. 149, pp. 194-95. Washington.
1969 A Contribution to the Archaeology of Coastal Guerrero, Mexico. Unpublished doctoral dissertation, Columbia University, New York.

CEJA T., JORGE FAUSTO
1974 Coatán, una provincia preclásica temprana en el Soconusco de Chiapas. Ms. presented at the *XLI Congreso Internacional de Americanistas,* Mexico.

CHAPMAN, V. J.
1970 Mangrove Phytosociology. *Tropical Ecology,* Vol. 11, No. 1, pp. 1-19. Ivaranasi, India.

COE, MICHAEL D.
1960 Archeological linkages with North and South America at La Victoria, Guatemala. *American Anthropologist,* Vol. 62, pp. 363-93. Menasha.
1961 La Victoria. *Papers of the Peabody Museum of Archaeology and Ethnology, Harvard University,* Vol. 53. Cambridge.
1967 Olmec Civilization, Veracruz, Mexico: Dating of the San Lorenzo Phase. *Science,* Vol. 155, pp. 1399-1401. Washington.
1969 The Archaeological Sequence at San Lorenzo Tenochtitlan, Veracruz, Mexico. Paper read at annual meeting of the Society for American Archaeology, Milwaukee, 1 May 1969.

COE, MICHAEL D. AND KENT V. FLANNERY
1967 *Early Cultures and Human* Ecology *in South Coastal Guatemala. Smithsonian Contributions to Anthropology,* Vol. 3, Washington, D.C.

COOK, S. F.
1946 A Reconsideration of Shell Mounds with Respect to Population and Nutrition. *American Antiquity,* Vol. 12, No. 1, pp. 50-51. Salt Lake City.

COWGILL, URSULA M.
1971 Some Comment on Manihot Subsistence and the Ancient Maya. *Southwestern Journal of Anthropology,* Vol. 27, No. 1, pp. 51-63. Albuquerque.

CRAIG, ALAN K.
1966 Geography of Fishing in British Honduras and Adjacent Coastal Waters. *Louisiana State University Studies, Coastal Studies Series* 14. Baton Rouge.

CURRAY, J. R., F. J. EMMEL, AND P. J. CRAMPTON
1969 Holocene History of a Strand Plain Lagoonal Coast, Nayarit, Mexico. In *Lagunas Costeras, Un Simposio,* edited by Augustín Ayala Castanares and Fred B. Phleger, pp. 63-100. Universidad Nacional Autónoma de México, Mexico.

CUTLER, H. C.
1974 Floral Remains from Patarata. In *Patarata Island, Veracruz, Mexico and the Role of Estuarine Mangrove Swamps in Ancient Mesoamerica,* by Barbara L. Stark. Unpublished doctoral dissertation, pp. 449-51, Yale University, New Haven.

DAMON, P. E., C. W. FERGUSON, A. LONG, AND E. I. WALLICK
1974 Dendrochronologic Calibration of the Radiocarbon Time Scale. *American Antiquity*, Vol. 39, No. 2, pp. 350-66. Salt Lake City.

DEBOER, WARREN R.
1975 The Archaeological Evidence for Manioc Cultivation: A Cautionary Note. *American Antiquity*, Vol. 40, No. 4, pp. 419-33. Salt Lake City.

DRUCKER, PHILIP
1948 Preliminary Notes on an Archaeological Survey of the Chiapas Coast. *Middle American Research Records*, Vol. 1, pp. 151-69. New Orleans.

DUNBAR, CARL O., AND JOHN RODGERS
1957 *Principles of Stratigraphy*. John Wiley and Sons, Inc., New York.

EHRENFELD, DAVID W.
1974 Conserving the Edible Sea Turtle: Can Mariculture Help? *American Scientist*, Vol. 62, pp. 23-31. Burlington.

EKHOLM, GORDON F.
1944 Excavations at Tampico and Panuco in the Huasteca, Mexico. *Anthropological Papers of the American Museum of Natural History*, Vol. 38, Part 5. New York.

EKHOLM, SUSANNA M.
1969 Mound 30a and the Early Preclassic Ceramic Sequence of Izapa, Chiapas, Mexico. *Papers of the New World Archaeological Foundation*, No. 25. Provo.

FLANNERY, KENT V.
1967 The Vertebrate Fauna and Hunting Patterns. In *The Prehistory of the Tehuacan Valley*, Vol. I: *Environment and Subsistence*, edited by Douglas S. Byers, pp. 132-77. University of Texas Press, Austin.

1972 The Origins of the Village as a Settlement Type in Mesoamerica and the Near East: A Comparative Study. In *Man, Settlement and Urbanism*, edited by Peter J. Ucko, Ruth Tringham, and G. W. Dimbleby, pp. 1-31. Gerald Duckworth and Co., London.

GARCÍA SOTO, J. MARIO
1969 *Geografía General de Chiapas*. Imprenta Mexicana. México.

GREEN, DEE F., AND GARETH W. LOWE
1967 Altamira and Padre Piedra, Early Preclassic Sites in Chiapas, Mexico. *Papers of the New World Archaeological Foundation*, No. 20. Provo.

HUBBS, CARL L., AND GUNNAR I. RODEN
1964 Oceanography and Marine Life Along the Pacific Coast. In *Handbook of Middle American Indians*, Vol. 1, edited by Robert Wauchope, pp. 143-86. University of Texas Press, Austin.

JOHNSON, FREDERICK, AND RICHARD S. MACNEISH
1972 Chronometric Dating. In *The Prehistory of the Tehuacan Valley*, Vol. 4: *Chronology and Irrigation*, edited by Frederick Johnson, pp. 3-54. University of Texas Press, Austin.

KEEN, MYRA A.
1971 *Seashells of Tropical West America* (revised edition). Stanford University Press, Stanford.

KIDDER, A. V.
1940 Clay Heads from Chiapas, Mexico. *Carnegie Institute of Washington, Notes on Middle American Archaeology and Ethnology*, No. 1. Washington, D.C.

LEE, THOMAS A., JR.
1969 The Artifacts of Chiapa de Corzo, Chiapas, Mexico. *Papers of the New World Archaeological Foundation*, No. 26. Provo.

1973 Secuencia de fases postformativas en Izapa, Chiapas, Mexico. *Estudios de Cultura Maya*, Vol. 9, pp. 75-84. Seminario de Cultura Maya, Universidad Nacional Autónoma de México, Mexico.

LEOPOLD, A. S.
1959 *Wildlife of Mexico: The Game Birds and Mammals*. University of California Press, Berkeley.

LINARES DE SAPIR, OLGA
1968 *Cultural Chronology of the Gulf of Chiriqui, Panama. Smithsonian Contributions to Anthropology*, Vol. 8, Washington, D.C.

LINDER, MILTON J., AND WILLIAM W. ANDERSON
1954 Biology of Commercial Shrimps. In "Gulf of Mexico, its Origin, Waters, and Marine Life." *Fishery Bulletin of the Fish and Wildlife Service*, Vol. 55, *Fish. Bull.* 89, pp. 457-61. Washington, D.C.

LONG, AUSTIN, AND BRUCE RIPPETEAU
1974 Testing Contemporaneity and Averaging Radiocarbon Dates. *American Antiquity*, Vol. 39, No. 2, pp. 205-15. Salt Lake City.

LONG, STANLEY, AND MARCIA V. V. WIRE
1966 Excavations at Barra de Navidad, Jalisco. *Antropológica* 18, pp. 3-81. Caracas.

LONGYEAR, JOHN M., III
1944 Archaeological Investigations in El Salvador. *Memoirs of the Peabody Museum of American Archaeology and Ethnology, Harvard University*, Vol. 9, No. 2. Cambridge.

LORENZO, JOSÉ L.
1955 Los concheros de la costa de Chiapas. *Anales del Instituto Nacional de Antropología e Historia*, Vol. 7, pp. 41-50. Mexico.

LOTHROP, SAMUEL K.
1963 Archaeology of the Diquís Delta, Costa Rica. *Papers of the Peabody Museum of Archaeology and Ethnology, Harvard University,* Vol. 51, Cambridge.

LOWE, GARETH W.
1967a Current Research, Eastern Mesoamerica. *American Antiquity,* Vol. 32, No. 1, pp. 135-41. Salt Lake City.
1967b Discussion in "Altamira and Padre Piedra, Early Preclassic Sites in Chiapas, Mexico," by Dee F. Green and Gareth W. Lowe, pp. 130. *Papers of the New World Archaeological Foundation,* No. 20. Provo.
1971 The Civilizational Consequences of Varying Degrees of Agricultural and Ceramic Dependency within the Basic Ecosystems in Mesoamerica. In "Observations on the Emergence of Civilization in Mesoamerica," edited by Robert F. Heizer and John A. Graham. *Contributions of the University of California Archaeological Research Facility,* No. 11, pp. 212-48. Department of Anthropology, University of California, Berkeley.
1975a The Mixe-Zoque as Ancestors and Competing Neighbors of the Early Lowland Maya. Paper prepared for an Advanced Seminar on Origins of the Maya Civilization, School of American Research, Santa Fe (in press).
1975b The Early Preclassic Barra Phase of Altamira, Chiapas; A Review with New Data. *Papers of the New World Archaeological Foundation,* No. 38. Provo.

LOWE, GARETH W., THOMAS A. LEE, JR., AND EDUARDO MARTÍNEZ E.
1976 Izapa: An Introduction to the Ruins and Monuments. *Papers of the New World Archaeological Foundation,* No. 31. Provo, Utah.

LOWE, GARETH W., AND J. ALDEN MASON
1965 Archaeological Survey of the Chiapas Coast, Highlands and Upper Grijalva Basin. In *Handbook of Middle American Indians,* Vol. 2, edited by Gordon R. Willey, pp. 195-236. University of Texas Press, Austin.

MACGINITIE, G. E., AND NETTIE MACGINITIE
1968 *Natural History of Marine Animals.* McGraw Hill Book Co., New York.

MACNEISH, RICHARD S.
1967a A Summary of the Subsistence. In *The Prehistory of the Tehuacan Valley,* Vol. 1: *Environment and Subsistence,* edited by Douglas S. Byers, pp. 290-309. University of Texas Press, Austin.
1967b Mesoamerican Archaeology. In *Biennial Review of Anthropology,* edited by Bernard Siegel and Alan Beals, pp. 306-31. Stanford University Press, Stanford.

MACNEISH, RICHARD S., AND ANGEL GARCÍA COOK
1972 Excavations in the San Marcos Locality in the Travertine Slopes. In *The Prehistory of the Tehuacan Valley,* Vol. 5: *Excavations and Reconnaissance,* by Richard S. MacNeish and others, pp. 137-60. University of Texas Press, Austin.

MACNEISH, RICHARD S., ANTOINETTE NELKEN-TERNER, AND IRMGARD W. JOHNSON
1967 *The Prehistory of the Tehuacan Valley,* Vol. 2: *Nonceramic Artifacts.* University of Texas Press, Austin.

MACNEISH, RICHARD S., AND FREDRICK A. PETERSON
1962 The Santa Marta Rock Shelter, Ocozocoautla, Chiapas, Mexico. *Papers of the New World Archaeological Foundation,* No. 14. Provo.

MACNEISH, RICHARD S., FREDRICK A. PETERSON, AND JAMES A. NEELY
1972 The Archaeological Reconnaissance. In *The Prehistory of the Tehuacan Valley,* Vol. 5: *Excavations and Reconnaissance,* by Richard S. MacNeish and others, pp. 341-495. University of Texas Press, Austin.

MCGIMSEY, CHARLES R., III
1956 Cerro Mangote: A Preceramic Site in Panama. *American Antiquity,* Vol. 22, pp. 151-61. Salt Lake City.

MEGGERS, BETTY J., CLIFFORD EVANS, AND EMILIO ESTRADA
1965 Early Formative Period of Coastal Ecuador: The Valdivia and Machalilla Phases. *Smithsonian Contributions to Anthropology,* Vol. 1. Washington, D.C.

MIRANDA, F.
1952 *La vegetación de Chiapas.* 2 vols. Gobierno del Estado, Departamento de Prensa y Turismo, Tuxtla Gutiérrez.

MOUNTJOY, JOSEPH B.
1971 Prehispanic Culture History and Cultural Contact on the Southern Coast of Nayarit, Mexico. Unpublished doctoral dissertation. Southern Illinois University, Carbondale.
1972 Matanchén Complex: New Radiocarbon Dates on Early Coastal Adaptation in West Mexico. *Science,* Vol. 175, pp. 1242-43. Washington.
1974 San Blas Complex Ecology. In *The Archaeology of West Mexico,* edited by Betty Bell, pp. 106-19. Sociedad de Estudios Avanzados del Occidente de México, A. C. Ajijic, Jalisco, Mexico.

MYERS, GEORGE S.
1949 Usage of Anadromous, Catadromous and Allied Terms for Migratory Fishes. *Copeia,* Vol. 2, pp. 89-97. Ann Arbor.

NANCE, J. D.
1970 Lithic Analysis: Implications for the Prehistory of Central California. *Archaeological Survey Annual Report* 1970, pp. 66-103. University of California, Los Angeles.

NAVARRETE, CARLOS
n.d. Resumen de las Exploraciones del Reconocimiento Arquelógico de la Costa de Chiapas (Region del Soconusco), en la Temporada de 1969. Ms, New World Archaeological Foundation, Comitan, Mexico.

NELSON, N. C.
1909 Shellmounds of the San Francisco Bay Region. *University of California Publications in American Archaeology and Ethnology*, Vol. 7, No. 4. Berkeley.

NICHOLSON, H. B., AND CLEMENT W. MEIGHAN
1974 The UCLA Department of Anthropology Program in West Mexican Archaeology-Ethnohisotry, 1956-1970. In *The Archaeology of West Mexico*, edited by Betty Bell, pp. 6-18. Sociedad de Estudios Avanzados del Occidente de México, A.C., Ajijic, Jalisco.

NORMAN, V. GARTH
1973 Izapa Sculpture, Part 1: Album. *Papers of the New World Archaeological Foundation*, No. 30, Provo.

ODUM, EUGENE P.
1959 *Fundamentals of Ecology*. W. B. Saunders Co., Philadelphia and London.

PIÑA CHAN, ROMÁN
1960 Mesoamérica. *Anales del Instituto Nacional de Antropología e Historia, Memorias*, No. 6. México.

PIRES-FERREIRA, JANE W.
1975 Formative Mesoamerican Exchange Networks with Special Reference to the Valley of Oaxaca. In *Prehistory and Human Ecology of the Valley of Oaxaca*, edited by Kent V. Flannery. *Memoirs of the Museum of Anthropology, University of Michigan*, No. 7. Ann Arbor.

PONCE DE LEÓN, LUIS
1961 Relación de la Provincia de Soconusco. In *La Victoria*, by Michael D. Coe, *Papers of the Peabody Museum of Archaeology and Ethnology, Harvard University*, Vol. 53. Cambridge.

RATHJE, WILLIAM L.
1970 Socio-political Implications of Lowland Maya Burials: Methodology and Tentative Hypotheses. *World Archaeology*, Vol. 1. (3): 359-74. London.

RÜTZLER, K.
1969 The Mangrove Community, Aspects of Its Structure, Faunistics and Ecology. In *Lagunas Costeras, Un Simposio*, edited by Augustin Ayala Castanares and Fred B. Phleger, pp. 63-100. Universidad Nacional Autónoma de México, Mexico.

SCOTT, STUART D.
1974 Archaeology and Estuary: Researching Prehistory and Paleoecology in the Marismas Nacionales, Sinaloa and Nayarit, Mexico. In *The Archaeology of West Mexico*, edited by Betty Bell, pp. 51-56. Sociedad de Estudios Avanzados del Occidente de México, A.C. Ajijic, Jalisco.

SHENKEL, J. RICHARD
1971 Cultural Adaptation to the Mollusk: a Methodological Survey of Shellmound Archaeology and a Consideration of the Shellmounds of the Marismas Nacionales, West Mexico. Unpublished doctoral dissertation, University of New York, Buffalo.

1974 Quantitative Analysis and Population Estimates of the Shell Mounds of the Marismas Nacionales, West Mexico. In *The Archaeology of West Mexico*, edited by Betty Bell, pp. 57-67. Sociedad de Estudios Avanzados del Occidente de México, A.C. Ajijic, Jalisco.

SHEPARD, ANNA O.
1948 Plumbate: A Mesoamerican Trade Ware. *Carnegie Institution of Washington, Publication* 573. Washington, D.C.

SISSON, EDWARD B.
1970 Settlement Patterns and Land Use in the Northwestern Chontalapa, Tabasco, Mexico: A Progress Report. *Cerámica de Cultura Maya et al.*, No. 6. Temple University, Philadelphia.

STARK, BARBARA LOUISE
1974 Patarata Island, Veracruz, Mexico, and the Role of Estuarine Mangrove Swamps in Ancient Mesoamerica. Unpublished doctoral dissertation, Yale University, New Haven.

STEWARD, J. H.
1955 *Theory of Cultural Change*. University of Illinois Press, Urbana.

STONE, DORIS
1972 *Pre-columbian Man finds Central America: the Archaeological Bridge*. Peabody Museum Press, Cambridge.

THOM, BRUCE G.
1967 Mangrove Ecology and Deltaic Geomorphology, Tabasco, Mexico. *The Journal of Ecology*, Vol. 55, pp. 301-43. Cambridge, England.

TOZZER, ALFRED M.
1941 Landa's Relación de la Cosas de Yucatán: a Translation. *Papers of the Peabody Museum of American Archaeology and Ethnology, Harvard University*, Vol. XVIII, Cambridge.

VIVÓ ESCOTO, JORGE A.
1964 Weather and Climate of Mexico and Central America. In *Handbook of Middle American Indians*, Vol. 1, edited by Robert Wauchope, pp. 187–215. University of Texas Press, Austin.

VOORHIES, BARBARA
1975 Los conchales de la Zona Chantuto, Chiapas, Mexico. *Sociedad Mexicana de Antropología, 13th Mesa Redonda, Arqueología II*, pp. 1–10. Mexico.

WAGNER, PHILIP
1964 Natural Vegetation of Middle America. In *Handbook of Middle American Indians*, Vol. 1, edited by Robert Wauchope, pp. 216–64. University of Texas Press, Austin.

WEST, ROBERT C.
1956 Mangrove Swamps of the Pacific Coast of Colombia. *Annals of the Association of the American Geographers*, Vol. 46, No. 1, pp. 98–121. Lancaster.

1964 Surface Configuration and Associated Geology of Middle America. In *Handbook of Middle American Indians*, Vol. 1, edited by Robert Wauchope, pp. 33–83. University of Texas Press, Austin.

WING, ELIZABETH S.
1974 Subsistence at the Patarata 52 Site, Veracruz, Mexico. In "*Patarata Island, Veracruz, Mexico and the Role of Estuarine Mangrove Swamps in Ancient Mesoamerica*," by Barbara L. Stark. Unpublished doctoral dissertation, pp. 435–48, Yale University, New Haven.

1975 Vertebrate Faunal Remains. In "Archaeological Investigations on the Yucatan Peninsula," *Middle American Research Institute, Tulane University, Publication* 31, pp. 186–88. New Orleans.

WU LEUNG, WOOT-TSEUN
1961 *Food Composition Table for Use in Latin America.* United States Government Printing Office, Bethesda.

ZIEGLER, ALAN C.
1973 Inference from Prehistoric Faunal Remains. *Addison-Wesley Module in Anthropology*, No. 43. Reading, Massachusetts.

(list of NWAF papers continued from back cover)

26. THE ARTIFACTS OF CHIAPA DE CORZO, CHIAPAS, MEXICO, by Thomas A. Lee, Jr. 1969. 231 pages, 149 figures, color frontispiece. $8.00.
27. THE CERAMICS OF AGUACATAL, CAMPECHE, MEXICO, by Ray T. Matheny. 1970. 155 pages, 53 figures. $3.50.
28. MOUND 20, MIRADOR CHIAPAS, MEXICO, by Pierre Agrinier. 1969. 84 pages, 107 figures. Color frontispiece. $2.50.
29. JMETIC LUBTON: SOME MODERN AND PRE-HISPANIC MAYA CEREMONIAL CUSTOMS IN THE HIGHLANDS OF CHIAPAS, MEXICO, by Thomas A. Lee, Jr. 1972. 28 pages, 12 figures. $1.50.

Papers 30, Parts 1 and 2 sold only as a set. $15.00.

30. IZAPA SCULPTURE. Part 1: Album, by V. Garth Norman. 1973. 3 pages introduction, 64 plates.
30. IZAPA SCULPTURE, Part 2: text, by V. Garth Norman. 1976. 360 pages, 245 figures, 26 tables, index.
31. IZAPA: AN INTRODUCTION TO THE RUINS AND MONUMENTS, by Gareth W. Lowe, Thomas A. Lee, Jr., and Eduardo Martínez E. 1976. 100+ pages, 3 maps, 30+ figures. $5.00.
32. THE OLMEC ROCK CARVING AT XOC, CHIAPAS, MEXICO, by Susanna Ekholm-Miller. 1973. 28 pages, 18 figures. $2.00.
33. ARCHAEOLOGICAL INVESTIGATIONS AT DZIBILNOCAC, CAMPECHE, MEXICO, by Fred W. Nelson, Jr. 1973. 142 pages, 107 figures. $5.00.
34. MOUND 4 EXCAVATIONS AT SAN ISIDRO, CHIAPAS, MEXICO, by Thomas A. Lee, Jr. 1974. 88 pages, 58 figures. $4.00.
35. THE OLMEC ROCK CARVINGS AT PIJIJIAPAN, CHIAPAS, MEXICO AND OTHER OLMEC PIECES FROM CHIAPAS AND GUATEMALA by Carlos Navarrete. 1974. 26 pages, 25 figures. $2.00.
36. THE LINGUISTIC, GEOGRAPHIC, AND DEMOGRAPHIC POSITION OF THE ZOQUE OF SOUTHERN MEXICO, by Norman D. Thomas. 1974. 52 pages, 45 figures. $3.00.
37. MOUND 1A, CHIAPA DE CORZO, CHIAPAS, MEXICO, by Pierre Agrinier. 1975. 43 pages, 37 figures. $2.50.
38. THE EARLY PRECLASSIC BARRA PHASE OF ALTAMIRA, CHIAPAS; A REVIEW WITH NEW DATA, by Gareth W. Lowe. 1975. 39 pages, 20 figures. $2.00.
39. MOUNDS 9 AND 10 AT MIRADOR, CHIAPAS, MEXICO, by Pierre Agrinier. 1975. 104 pages, 89 figures. $4.50.
40. MESOAMERICAN COMMUNICATION ROUTES AND CULTURAL CONTACTS, edited by Thomas A. Lee, Jr., and Carlos Navarrete. 1976. 20 symposium papers by various authors, 264 pages, 36 figures, 19 tables. $12.50.
41. THE CHANTUTO PEOPLE: AN ARCHAIC PERIOD SOCIETY OF THE CHIAPAS LITTORAL, MEXICO, by Barbara Voorhies. 1976. 147 pages, 80 figures, 27 tables. $7.50.

Orders for and correspondence regarding the publications of
The New World Archaeological Foundation should be sent to
DIRECTOR OF LIBRARIES, BRIGHAM YOUNG UNIVERSITY, PROVO, UTAH 84602.

PAPERS OF THE NEW WORLD ARCHAEOLOGICAL FOUNDATION

1. THE CHIAPAS PROJECT, 1955-1958, REPORT OF THE FIELD DIRECTOR, by Gareth W. Lowe. 1959. 21 pages, 12 figures.
2. ARCHEOLOGICAL EXPLORATION OF THE UPPER GRIJALVA RIVER, CHIAPAS, MEXICO, by Gareth W. Lowe. 1959. 112 pages, 64 figures.
3. EXPLORATION AT SAN AGUSTIN, CHIAPAS, MEXICO, by Carlos Navarrete. 1959. 16 pages, 10 figures.
4. A BRIEF RECONNAISSANCE IN THE REGION OF TONALÁ, CHIAPAS, MEXICO, by Carlos Navarrete. 1959. 10 pages, 8 figures.

(Papers 1-4 bound together; out of print)

5. CERAMICS FROM TWO PRECLASSIC PERIODS AT CHIAPA DE CORZO, CHIAPAS, MEXICO, by Keith A. Dixon. 1959. 52 pages, 55 figures. (out of print)
6. THE CARVED HUMAN FEMURS FROM TOMB 1, CHIAPA DE CORZO, CHIAPAS, MEXICO, by Pierre Agrinier. 1960. 28 pages, 17 figures. (out of print)
7. ARCHEOLOGICAL EXPLORATIONS IN THE REGION OF THE FRAILESCA, CHIAPAS, MEXICO, by Carlos Navarrete. 1960. 43 pages, 49 figures. (out of print)
8. MOUND 1, CHIAPA DE CORZO, CHIAPAS, MEXICO, by Gareth W. Lowe and Pierre Agrinier. 1960. 105 pages, 67 figures, 39 plates.
9. MOUND 12, CHIAPA DE CORZO, CHIAPAS, MEXICO, by J. Alden Mason. 1960. 44 pages, 23 figures, 12 plates.
10. MOUND 13, CHIAPA DE CORZO, CHIAPAS, MEXICO, by Frederic Hicks and Charles E. Rozaire. 1960. 22 pages, 15 figures, 2 plates.
11. THE TERRACE TO NORTH OF MOUND 13, CHIAPA DE CORZO, CHIAPAS, MEXICO, by J. Alden Mason. 1960. 12 pages, 3 figures, 2 plates.

(Papers 8-11 bound together, not sold separately; $5.00)

12. MOUND 5 AND MINOR EXCAVATIONS, CHIAPA DE CORZO, CHIAPAS, MEXICO, by Gareth W. Lowe. 1962. 114 pages, 46 figures, 34 plates. $2.50.
13. CERAMIC STRATIGRAPHY AT SANTA CRUZ, CHIAPAS, MEXICO, by William T. Sanders. 1961. 81 pages, 60 figures, 11 plates. $2.00.
14. THE SANTA MARTA ROCK SHELTER, OCOZOCOAUTLA, CHIAPAS, MEXICO, by Richard S. MacNeish and Fredrick A. Peterson. 1962. 46 pages, 5 figures, 6 plates. $1.50.
15. SOME CERAMICS FROM MIRADOR, CHIAPAS, MEXICO, by Fredrick A. Peterson. 1963. 126 pages, 183 figures. $3.00.
16. THE ARCHEOLOGICAL BURIALS AT CHIAPA DE CORZO AND THEIR FURNITURE, by Pierre Agrinier (with a conclusion, "Burial Customs at Chiapa de Corzo," by Gareth W. Lowe). 1964. 76 pages, 131 figures. $3.00.
17. EXCAVATIONS AT SANTA ROSA, CHIAPAS, MEXICO, by Agustin Delgado. 1965. 84 pages, 73 figures.
18. ARCHEOLOGICAL RECONNAISSANCE IN THE REGION OF TEHUANTEPEC, OAXACA, MEXICO, by Agustin Delgado. 1965. 35 pages, 27 figures.

(Papers 17-18 bound together, not sold separately; $3.00)

19. THE CERAMIC HISTORY OF THE CENTRAL HIGHLANDS OF CHIAPAS, MEXICO, by T. Patrick Culbert. 1965. 91 pages, 38 figures. $3.00.
20. ALTAMIRA AND PADRE PIEDRA, EARLY PRECLASSIC SITES IN CHIAPAS, MEXICO, by Dee F. Green and Gareth W. Lowe. 1967. 133 pages, 97 figures. $3.00.
21. THE CHIAPANEC, HISTORY AND CULTURE, by Carlos Navarrete. 1966. 111 pages, 102 figures. $3.00.
22. ARCHEOLOGICAL RESEARCH IN THE LOWER GRIJALVA RIVER REGION, TABASCO AND CHIAPAS, by Román Piña Chan and Carlos Navarrete. 1967. 52 pages, 100 figures. $2.00.
23. THE CERAMIC HISTORY OF SANTA ROSA, CHIAPAS, MEXICO, by Donald L. Brockington. 1967. 74 pages, 51 figures. $2.50.
24. EXCAVATIONS AT SAN ANTONIO, CHIAPAS, MEXICO, by Pierre Agrinier. 1969. 63 pages, 96 figures. $2.00.
25. MOUND 30a AND THE EARLY PRECLASSIC CERAMIC SEQUENCE OF IZAPA, CHIAPAS, MEXICO, by Susanna M. Ekholm. 1969. 102 pages, 78 figures. $3.00.

(continued inside cover)