A REPORT ON THE HUNTER-ROBINSON AND SARDINAL SITES

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ABSTRACT

Excavations in 1973 at two small Late Polychrome "inland" shell middens near the Bay of Culebra provided important information about the seasonality of site occupation and marine resource exploitation.

RESUMEN

En 1973 se excavó en dos concheros pequeños del período Policromo Tardío, ubicados a poca distancia de la costa, en la zona de Bahía Culebra. La excavación reveló importante información respecto a la variabilidad estacional de las ocupaciones de los sitios y la explotación de recursos marinos.

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Introduction

THIS paper reports on 1973 excavations at two small "inland" shell middens in the Bay of Culebra region. As detailed elsewhere (Moreau 1979), these "inland" sites are without doubt an integral part of broader coastal systems [see Accola (1977) for an example of this cultural system in the same zone but for another time period, and Voorhies (1978) for a general discussion of coastal systems]. These sites are located within a day's walk from the coast (Lange 1978a: 105-111).

It should be stressed that there are more significant differences between these "inland" sites and those located farther inland (for example in the central Costa Rican *cordillera)* than between these "inland" occupations and nearby coastal sites.

The Hunter-Robinson (3047I-305-1) and Sardinal (3047I-432-1) sites are located in the vicinity of the town of Sardinal (Fig. 1). The difference in geographical location of each "inland" site is also shown in Fig. 1, and there is a marked contrast in both distance from the coast and ease of access to the coast between the two. Hunter-Robinson is located about 1.5 km from the coast, and is accessible via a trail on a slope averaging 30°; the Sardinal site is located some 7 km inland, and the road leading to it from the coast does not cross slopes over 15°.

Site Descriptions and Testing Procedures

The Hunter-Robinson and Sardinal sites present the same general physical patterns of small, discontinuous shell middens with scatters of potsherds and some lithics between. At the Hunter-Robinson site, four middens were located to the east of the then dirt road leading to Playa Hermosa and Playa Panama (Fig.2); there was also evidence for occupation west of the road, but this area was destroyed during paving of the road in spring, 1978 (Fig.3). No freshwater sources are apparent close to the site, and modern inhabitants draw water from wells.

The Sardinal site is located near the course of the Sardinal River, which may have provided a pathway to the coast, and also would have been an at least seasonally reliable fresh water source.

The two sites were tested with different objectives in mind. At Hunter-Robinson, where Mounds II and III were under cultivation, and Mound IV had previously been cut by the dirt road, we decided to test extensively in the Mound I area (Figs. 2, 4). At the Sardinal site, the

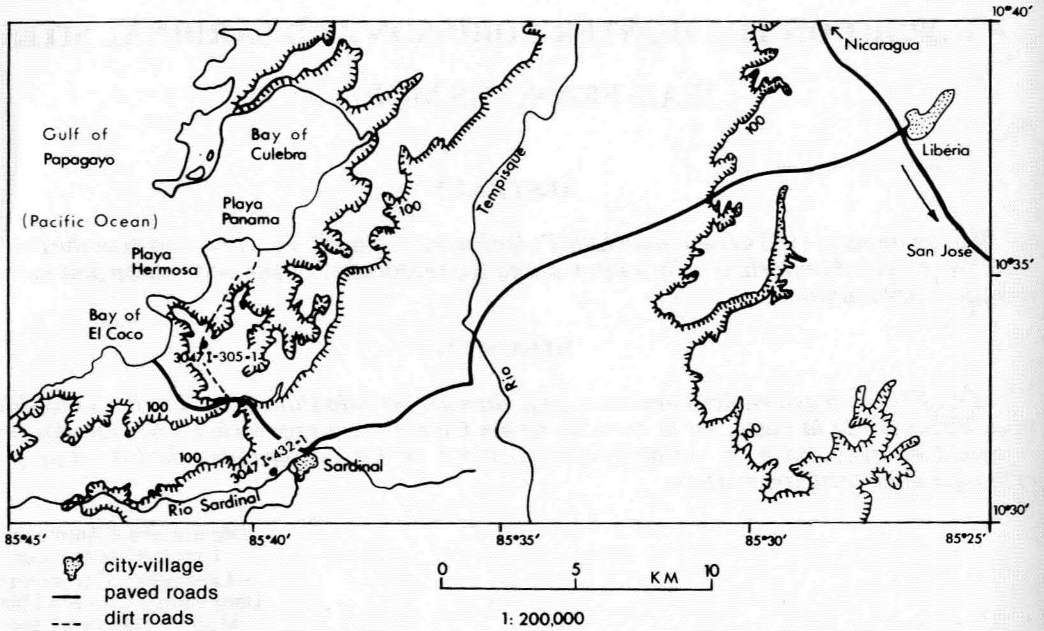


Fig. 1. The Bay of Culebra area, showing Hunter-Robinson (3047I-305-1) and Sardinal (3047I-432-1) site locations.

road-cut revealed Mounds 1 and 2 (Fig. 6). We rapidly tested these two mounds to gather ceramic and mollusc samples to compare with more extensive collections from excavations in Mound I at Hunter-Robinson.

As seen in the figures, the dimensions of the two mounds at Sardinal and the various mounds and scatters at Hunter-Robinson were small, roughly 10 m in diameter and, in the case of the mounds, about 75 cm in height. In all mounds, the accumulation of shells was concentrated in the center of the mound, and tapered toward the edges. The total volume of Mound I (Hunter-Robinson) was estimated at 25 m^3, and about 20% was excavated (Fig. 5).

Chronological Placement of the Sites

No radiocarbon dates were obtained from either the Hunter-Robinson or Sardinal sites, but ceramic cross-dating suggests that both sites were occupied during the Ruiz phase of the Late Polychrome Period (see Lange, this volume). The most frequent ceramic type represented was Murrillo Applique (Baudez 1967: 165-167; Lange 1971a:185-194), and second in frequency were white-slipped sherds, including a number of La Madeira (Las Marias) polychrome sherds (Lange 1971a:173). Types such as Mombacho and Vallejo Polychrome (Baudez 1967:160, 167) with distinct Mesoamerican motifs seem to occur less frequently, but may be present in greater quantities than specifically identified, among the numbers of badly eroded white-slipped bodysherds recovered from excavation. Ceramics representing the preceding Middle Polychrome Period (see Accola 1978c; Accola and Ryder, this volume; Accola and Wallace, this volume) occurred only rarely. For example, only a very few sherds of Mora Polychrome, the hallmark of the period (Accola 1978 a, c), were found.

The Prehistoric Occupation of the Hunter-Robinson and Sardinal Sites

Artifact Assemblage: Most analysis of material excavated from these two sites has thus far been devoted to molluscan studies (Moreau 1975, 1977, 1978); bones from fish and terrestrial animals are currently being analyzed as well. Interpretation of the prehistoric occupation of these two sites is therefore still tentative, and should be considered provisional until evaluation

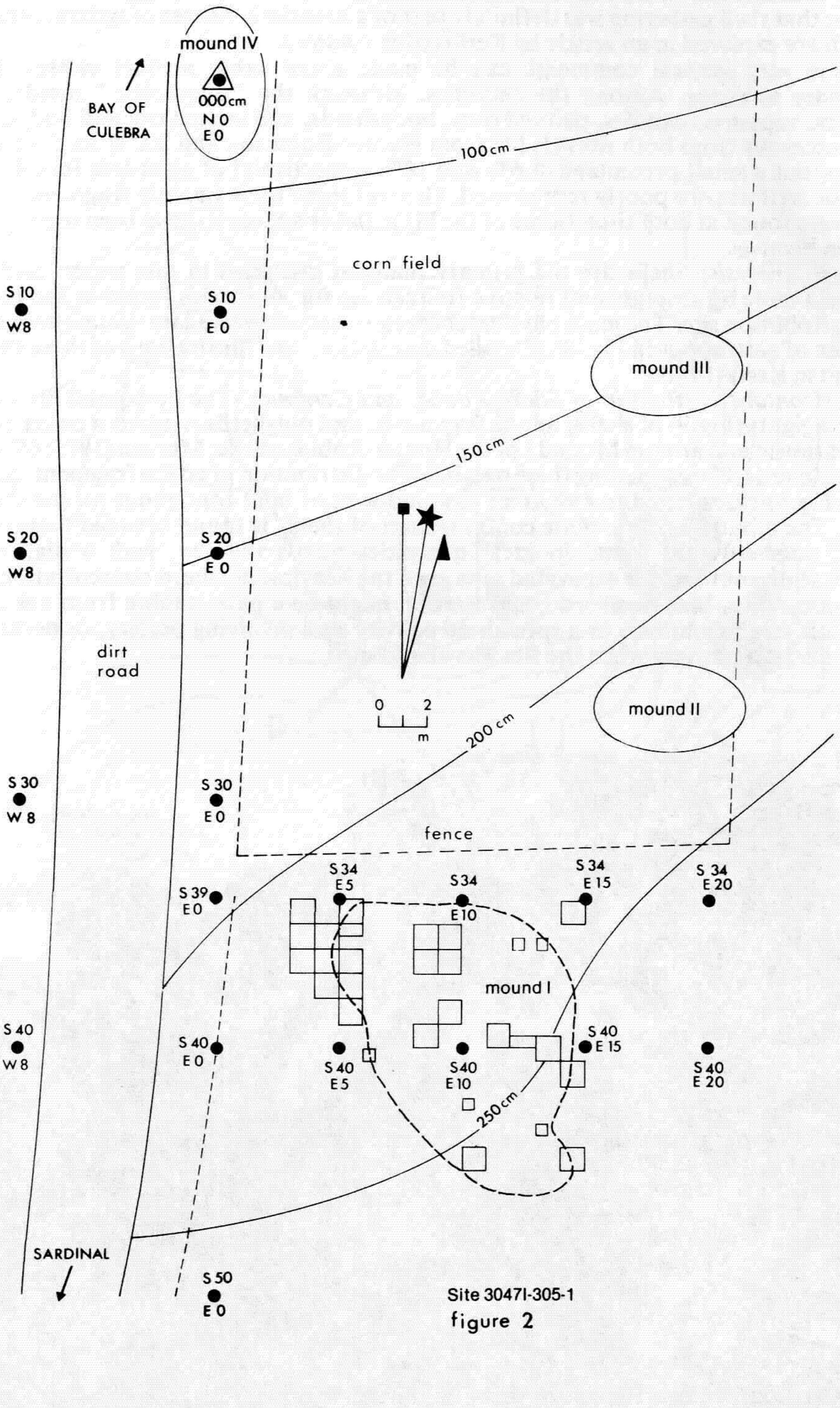


Fig. 2. Distribution of shell-mounds at 3047I-305-1.

of other artifacts can be utilized to confirm, alter, or deny the model suggested here. However, it is clear that shell gathering was definitely part of a broader subsistence system, other aspects of which are explored in an article by Kerbis (this volume).

Some very general comments can be made about other artifact classes, based on preliminary analyses. Among the ceramics, although the "diagnostic" sherds, meaning shoulders, supports, handles, painted rims, bodysherds, and incised rim and bodysherds, are fairly numerous from both sites (1,326 from Hunter-Robinson and 202 from Sardinal), they represent but a small percentage (6.6% and 18% respectively) of all sherds found. All other classes of artifacts are poorly represented. Ground stone tools (mainly fragments) and lithic flakes were found at both sites. Some of the lithic flakes appear to have been used as knives to pry open bivalves.

Shell Analysis: Shells are the primary material discussed in this paper, and Figure 7 provides a table of absolute and relative frequencies for all species found in Mound I at the Hunter-Robinson site. The main physical characteristics of bivalves are summarized in Fig. 8a, and those of gastropods in Fig. 8b. Detailed descriptions and illustrations of these shells are to be found in Keen (1971).

Horizontal Distribution of Shell, Adobe, and Ceramics: The horizontal distribution of relative weights (Fig.9) of shells, adobe fragments, and potsherds suggests a pattern of spatial organization in and around Mound I of the Hunter-Robinson site; Moreau (1975: 68) described the technique used in estimating these weights. The distribution of adobe fragments (horizontal lines in Fig.9) is restricted to two areas east and west of, and contiguous to, the shellmound proper. The mound itself, a dense concentration of shells, is found between these two areas. Finally, potsherds are found in great quantities across the site, with a high degree of concentration south of the excavated area, and the heaviest potsherd concentration joins the two adobe zones. This potsherd concentration might be a path leading from one presumed habitation area to another, or a specialized activity area involving pottery, or perhaps even a dump of broken pottery when the site was abandoned.

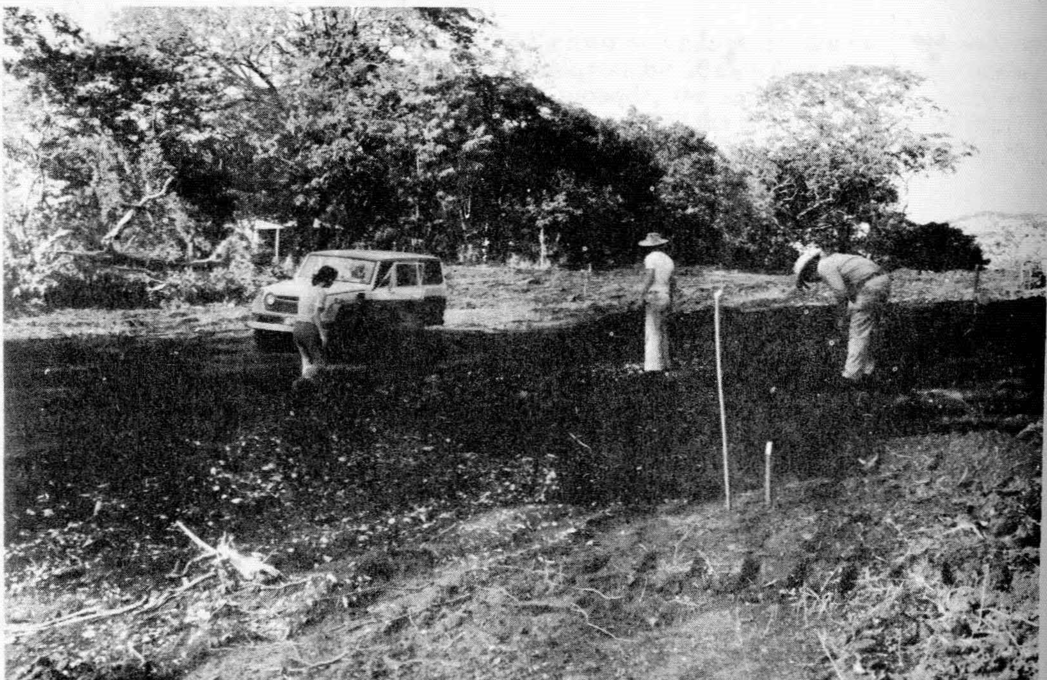


Fig.3. Site 3047I-305-1 after destruction by road construction.

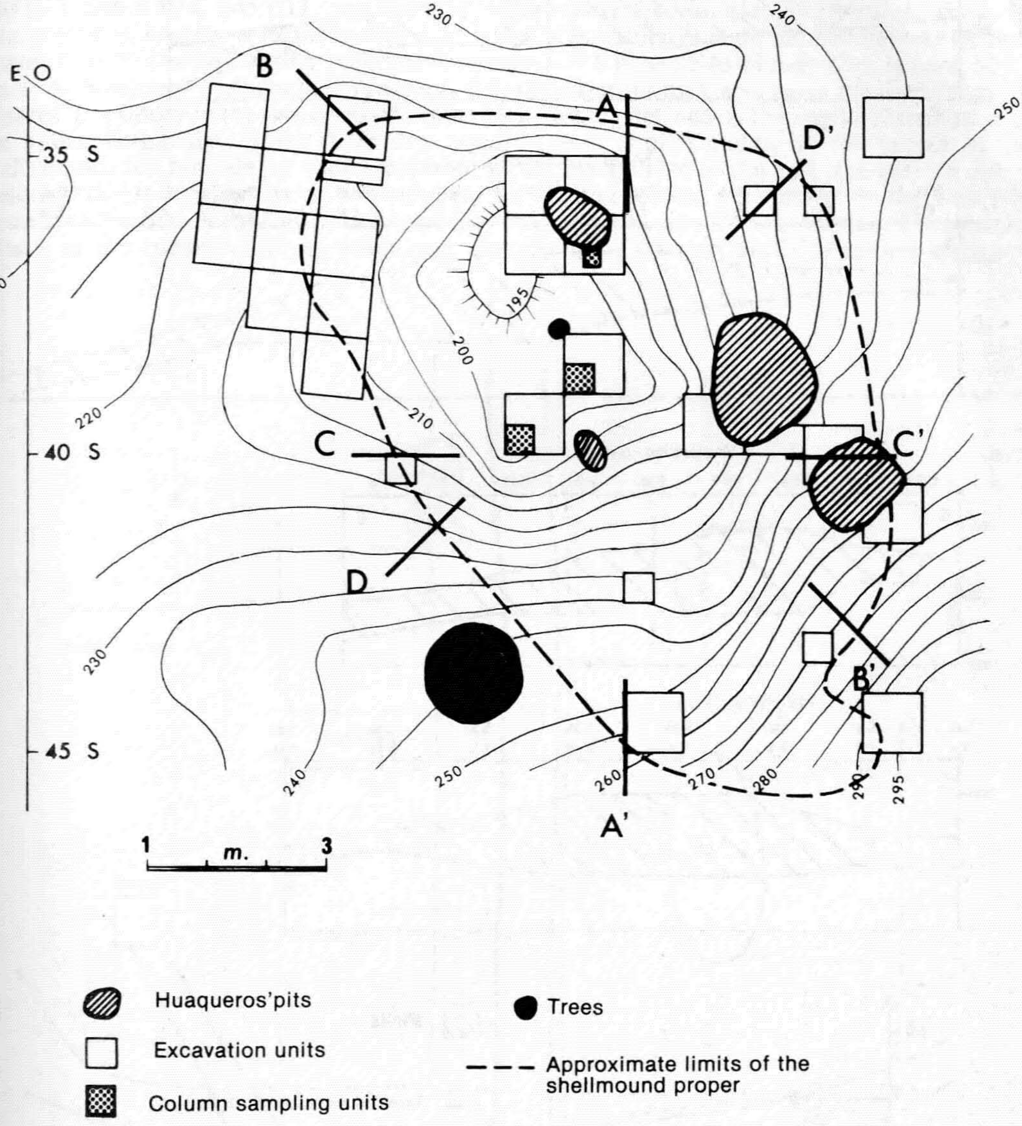


Fig. 4. Site 3047I-305-1, Mound I; limits and areas of excavation. The transects (A-A', B-B', C-C', and D-D') represent the vertical sections shown in Fig.5.

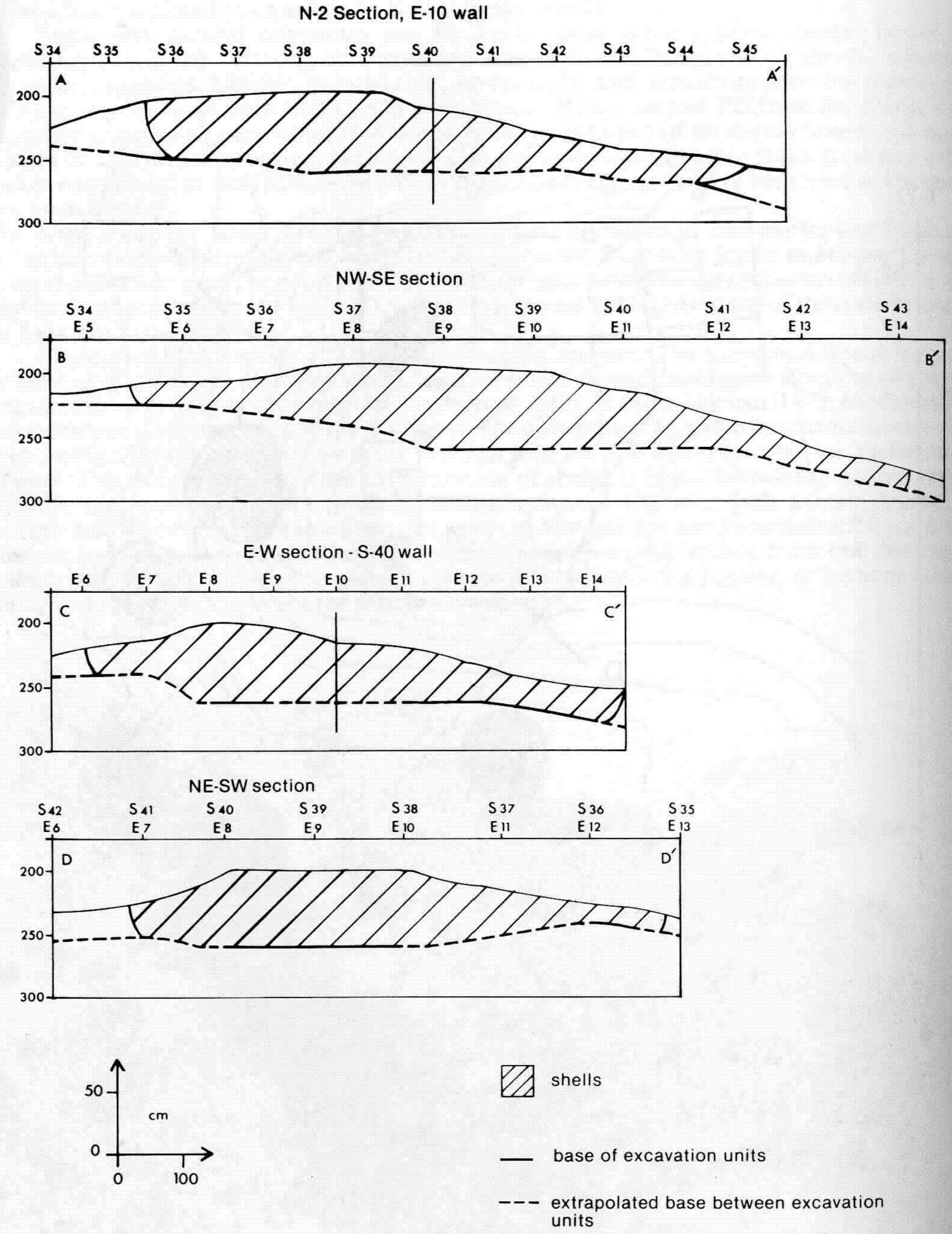


Fig.5. Vertical sections, Site 30471-305-1.

The first hypothesis is the least likely, in view of the interpretation of the microchronological record presented in the following pages. These data suggest that the midden accumulated continuously for about nine months, formed by shells and other refuse from two different habitation zones, one to the east and the other to the west of the shellmound.

The vertical distribution of the weight of the shells, adobe, and undecorated sherds (Fig.10) is generally unimodal, that is, a one peak distribution which can be considered as one line of evidence for a continuous occupation of the site. In excavated squares S36 E4, S36 E10, S40 E12, S40.5 E14, S45 E11, and S45 E15, where there are bimodal distributions, these are interpreted as *huaquero* disturbances since all of these squares were located around or near *huaquero* pits. The bimodality observed in squares S39 E10 and S40 E9 may also, in part, be the result of *huaquero* disturbance; however, this distribution may also have resulted from the squares' proximity to the two areas of occupation already defined by the spatial distribution of the adobe fragments. Since these two squares were approximately in the center of the shellmound, the bimodality could represent a first occupation to the east (the eastern adobe concentration), overlain by an immediately succeeding second occupation to the west (the western adobe concentration). The bimodality may also be a clue to the existence of two microphases in the continous occupation near the mound. Seriation and Chi-square statistical

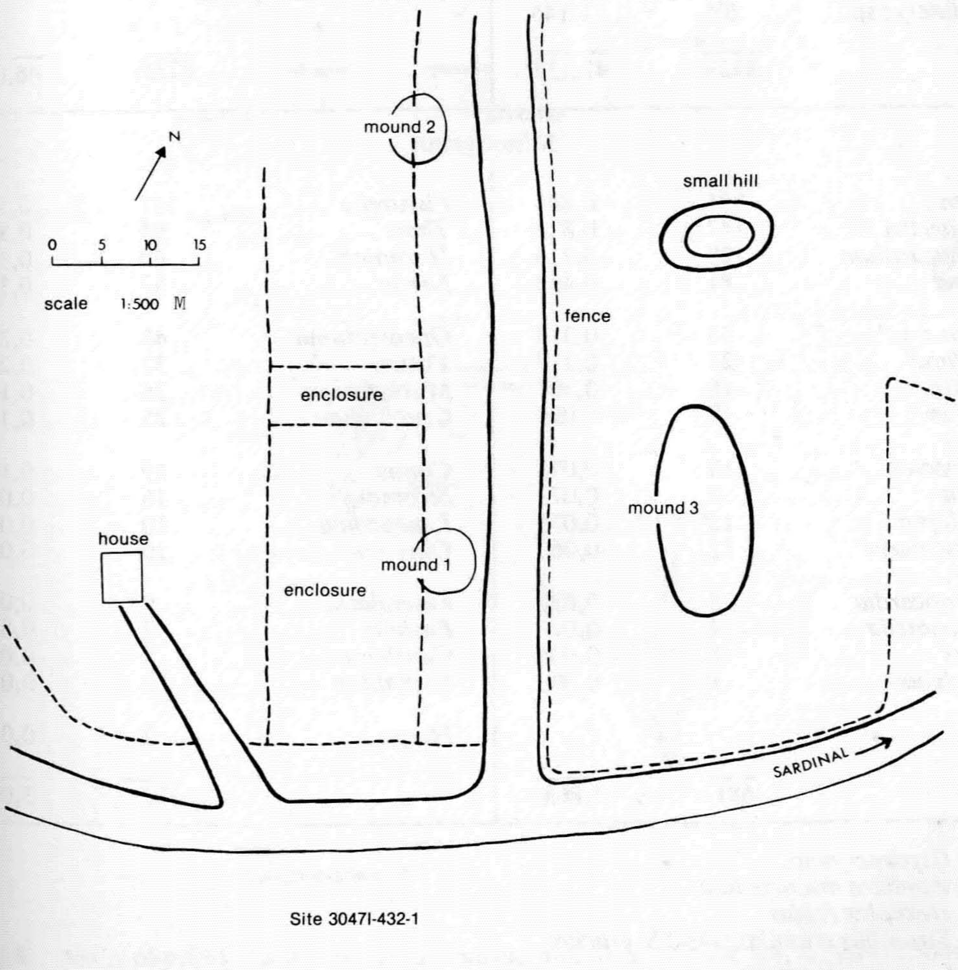


Fig.6. Distribution of shell-mounds at Site 3047I-432-1.

analysis of the shell frequencies have demonstrated that the two phase model is plausible (Moreau 1975: chapter VI).

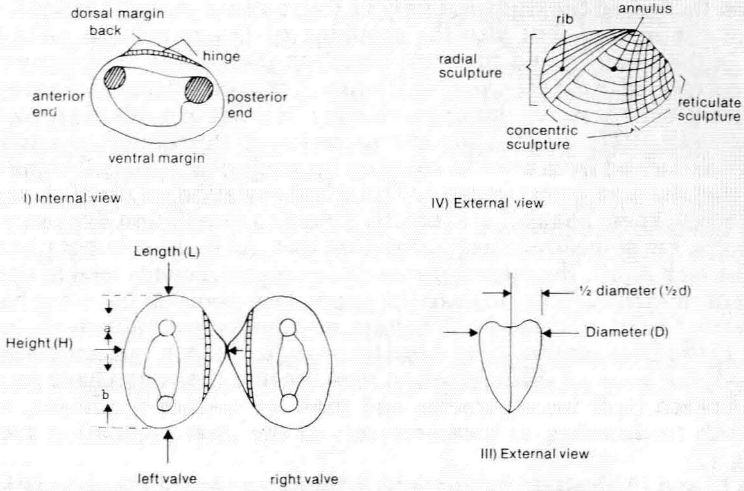
Analysis of Shell Frequencies: The study of the variation in shell frequencies also permits seriation of excavation units to delineate fluctuations in shellfish exploitation during the occupation of Mound I (Fig. 11). Counts of *shell frequencies* differ from counts of *mollusc frequencies,* in that shell frequencies *do not* take into account the fragmentation of shells, nor the separation of bivalves into two halves. Mollusc frequencies do take both of these phenomena into account (see Moreau 1975, 1978 for methodological details). Whether considering either shell or mollusc frequencies, Fig. 11 does suggest that three different groups

Bivalves	f	%	Gastropods	f	%
		Major species			
Chione sp.	3778	21,128	*Strombus granulatus*	6142	34,348
Anadara multicostata	2260	12,639	*Strombus gracilor*	1873	10,474
Mactra isthmica	1292	7,225	*Hexaplex regius*	220	1,230
Mactra velata	632	3,534			
Arca pacifica	262	1,465			
Glycimerys sp.	205	1,146			
	8429	47,137		8235	46,052
		Minor genus			
Pecten	151	0,843	*Fissurella*	107	0,599
Argopecten	147	0,822	*Thais*	93	0,521
Trachycardium	128	0,716	*Hexaples*[c]	69	0,386
Chama	81	0,453	*Nerita*	57	0,319
Glycimerys[a]	56	0,313	*Opeostotoma*	43	0,240
Anadara[b]	21	0,117	*Vasum*	37	0,207
Cardita	18	0,101	*Muricanthus*	26	0,145
Dosinia	17	0,095	*Crucibulum*	25	0,140
Lyropecten	14	0,078	*Conus*	19	0,106
Ostrea	13	0,073	*Strombus*[d]	16	0,089
Periglypta	13	0,073	*Leucozonia*	10	0,056
Ventricolaria	11	0,062	*Oliva*	10	0,056
Trigonocardia	5	0,028	*Fasciolaria*	9	0,050
Eucrassatella	4	0,022	*Fusinus*	7	0,039
Donax	1	0,006	*Cantharus*	5	0,028
Spondylus	1	0,006	*Cymatium*	2	0,011
			Harpa	2	0,011
	681	3,808		537	3,003

a-exc. *Glycimerys* sp.
b-exc. *Anadara multicostata*
c-exc. *Hexaplex regius*
d-exc. *Strombus granulatus* and *S. gracilor*

Fig. 7. Shell species represented in Mound I, Site 3047I-305-1.

THE MAIN PHYSICAL CHARACTERISTICS OF MARINE MOLLUSCA



BIVALVES

figure 8a

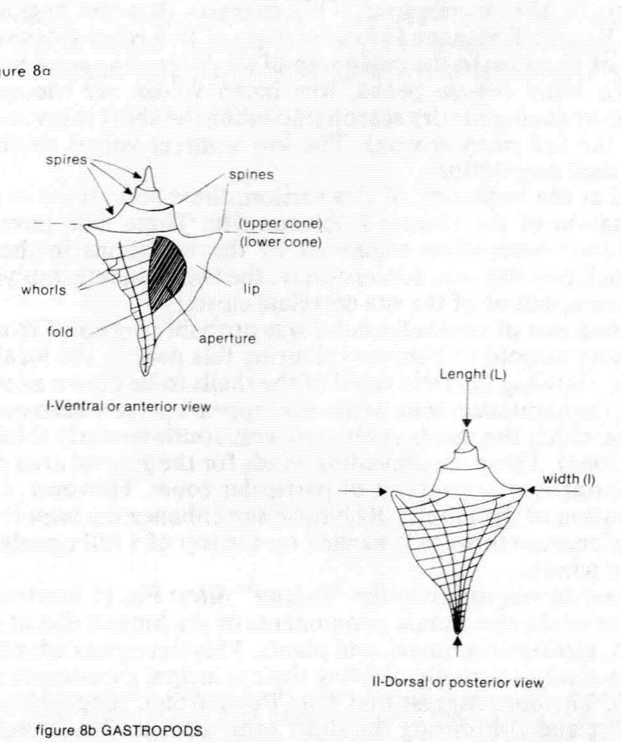


figure 8b GASTROPODS

Fig.8. Main physical characteristics of marine mollusca: a) bivalves, b) gastropods. The measurements "a" and "b" allow determination of left and right segments, through anterior and posterior examination.

of shells were important in human nutrition at the Hunter-Robinson site: 1) major components in the diet were *Chiones* and *Strombus granulatus;* 2) *Anadara multicostata* and *Strombus gracilior* were complementary, increasing in frequency relative to low availability of major species; 3) other species which were clearly minor are *Arca pacifica,* the *Mactras, Hexaplex,* and *Glycymeris,* as well as two categories of miscellaneous bivalves and gastropods.

Seriation facilitated the study not only of fluctuations in shell species frequencies during formation of the mound, but also the grouping of the excavation units for the study of fluctuation in the mean ($\bar{x}$) and standard deviation (Sx). These statistics were computed for the species represented in the shell sample from each excavation unit. Two previous papers have dealt extensively with these calculations and their interpretative value in greater detail (Moreau 1975: chapter VII; 1977). Briefly, the interpretation of fluctuation of $\bar{x}$ and Sx for different shell species was derived from a model based on the study of actual shell populations. Biologists have shown that the parameters (mean and standard deviation) of shellfish populations change through the year. These changes are directly linked to population dynamics peculiar to each shellfish species, but some broad generalizations emerge: in the summer (the dry season) from December through April, the *means* of population measurements tend to decrease because of the addition of immature individuals to the population pool; on the other hand, the *standard deviation* tends to rise because both mature and immature individuals are present in the population. In the rainy season, from April through November, but especially in the latter part of that period, the *mean* of the population rises because the young have grown, reducing the difference between their measurements and those of mature specimens, and the *standard deviation* tends to decrease, as measurements of the total population are smaller than in summer (Fig.12).

Figures 13 and 14 illustrate fluctuations in the mean and standard deviations for the major shell species excavated in Mound I of the Hunter-Robinson site. Generally, we are dealing with bimodal (two peak) curves, with the maximum mean values generally occurring at the beginning and end of the distribution. This suggests that the beginning and end of the occupation of the Hunter-Robinson site cover parts of two rainy seasons, from the end of the long rainy season of one year to the beginning of the long rainy season in the following year. Between these two rainy season peaks, low mean values are thought to represent shell populations exploited during the dry season (including the short rainy and dry season episodes prior to onset of the full rainy season). The low summer values result from the immature individuals in the shell populations.

As was noted at the beginning of this section, there seem to be two micro-phases in the continuous occupation of the Hunter-Robinson site. These data have implications for the seasonal, nine month occupation suggested by the variations in the mean and standard deviation of the shell populations. Interestingly, the two data sets implying both seasonal and spatially discrete occupations of the site correlate closely.

The area located east of the shellmound was probably occupied from late November (the end of the long rainy season) to February. During this period, the local prevailing winds are east-northeasterly, allowing the fetid smell of the shells to be blown away from the habitation zone. Conversely, the habitation zone to the west appears to have been occupied from March to September, during which the winds reverse to west-south-westerly (Hubbs and Roden 1964: 146; Vivó Escoto 1964). These are prevailing winds for the general area of northwestern Costa Rica, and not necessarily characteristic of particular zones. However, the peculiarities of the physiographic location of the Hunter-Robinson site enhance the importance of consideration of wind directions because this site is located on the top of a hill openly exposed to both off-shore and off-land winds.

Subsistence and Demography of the "Inland" Sites: Fig.15 illustrates the fluctuations in relative frequencies of the three main components of the human diet at the Hunter-Robinson site: molluscs, fish, terrestrial animals, and plants. This figure was adapted from ethnographic analogies with populations actually deriving their principal subsistence from the sea (Moreau 1975: chapter IX). The data suggest that Late Polychrome peoples had to rely on resources other than molluscs and fish during the short rainy season. The presence of grinding stone fragments, as well as animal bones, in the shellmound at Hunter-Robinson gives clues to the other resources that were exploited. During the long rainy season, people perhaps lived along the Tempisque River farther inland, or they may have returned to coastal midden areas. The large dimensions of the coastal middens indicate people living and gathering shellfish on the coast proper during the rainy season.

In a recent paper, I suggested that only multiple explanations will allow a better understanding of why coastally-oriented peoples settled "inland" as well as immediately adjacent to coastal resources (Moreau 1979). "Inland" occupation may well have been directed toward exploitation of, or access to, resources not available on the coast. Such sites would have interacted not only with coastal sites, but also with sites in the Tempisque and Sardinal valleys, where broader expanses of agricultural land were available. The seasonal movement of some peoples to "inland" settings may have resulted from: 1) over-exploitation of naturally fluctuating marine resources; 2) demographic pressures in the coastal zone; or 3) some combination of these two reasons. It can also be argued the inland sites were direct links in trade networks, perhaps functioning as "nodes" through which goods were exchanged between coastal peoples and others. Moreau (1979) assessed these generalizations from the standpoint of the Hunter-Robinson and Sardinal sites.

Whatever the reasons for the inland settlement, the small dimensions, as well as the short period of occupation of the Hunter-Robinson site, imply a population of about 10 persons. Such a figure is suggested by the calculation of shell weights, using a method similar to that described by Ascher (1959). The usual habitats of the shell species found in the shell middens, and statistical analysis of their measurements, suggest that the shells were probably individually collected by hand rather than collectively by netting or dredging. The breakage pattern of the shells, as well as their excellent preservation, support an intepretation that they were eaten either raw (especially some species of bivalves) or boiled (especially the gastropods).

Conclusion

Most of the data upon which this paper was based were excavated from one mound at the Hunter-Robinson site, but study of the samples gathered from two mounds at the Sardinal site resulted in similar broad conclusions concerning the "inland" occupation of northwestern coastal Guanacaste (Moreau 1975: chapter VIII). Lange (1978b and this volume) has reported the same general characteristics for the Ruiz site, another inland occupation. The results of these studies indicate that inland sites are integral parts of coastal cultural systems.

ACKNOWLEDGEMENTS

This report would not have been possible without Fred Lange's faithful support in the field in both 1973 and 1977, as well as many long, friendly discussions. In Costa Rica, Michael Snarskis and Suzanne Abel-Vidor provided insights that helped improve the text. Ian Badgley, and the editors, helped to improve the English. My thanks also go to the people who efficiently excavated the various shellmiddens. My dearest thanks are finally directed to my wife, Jocelyne, who graciously accepted the hours not spent with her and our child, but with the work performed on the materials from these shellmiddens.

Editors' note: Although not dealt with in this paper, Moreau (1978) has also raised the important issue of the possible impact of deposition of volcanic ash in coastal areas on marine resources. This topic will be expanded in a Ph.D dissertation to be submitted soon by Moreau.

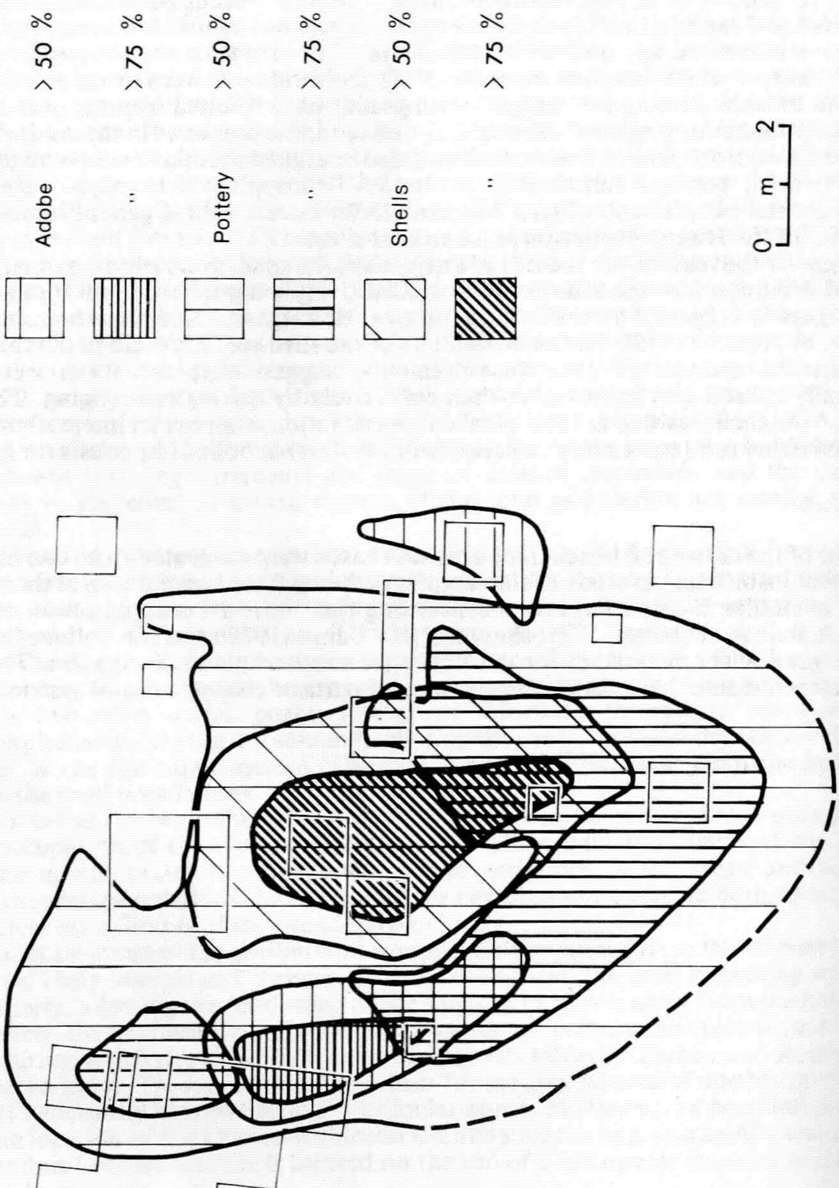


Fig. 9. Site 3047I-305-1, horizontal distribution of adobe, undecorated bodysherds, and shells. The percentage frequencies of weight are shown relative to the heaviest density of any of the three data classes in any excavation square (see Moreau 1975: 69 for details). The bodysherds were the only ceramics considered in the distributional weighting. They are the majority of ceramics excavated (over 90% of the total ceramics from the sites).

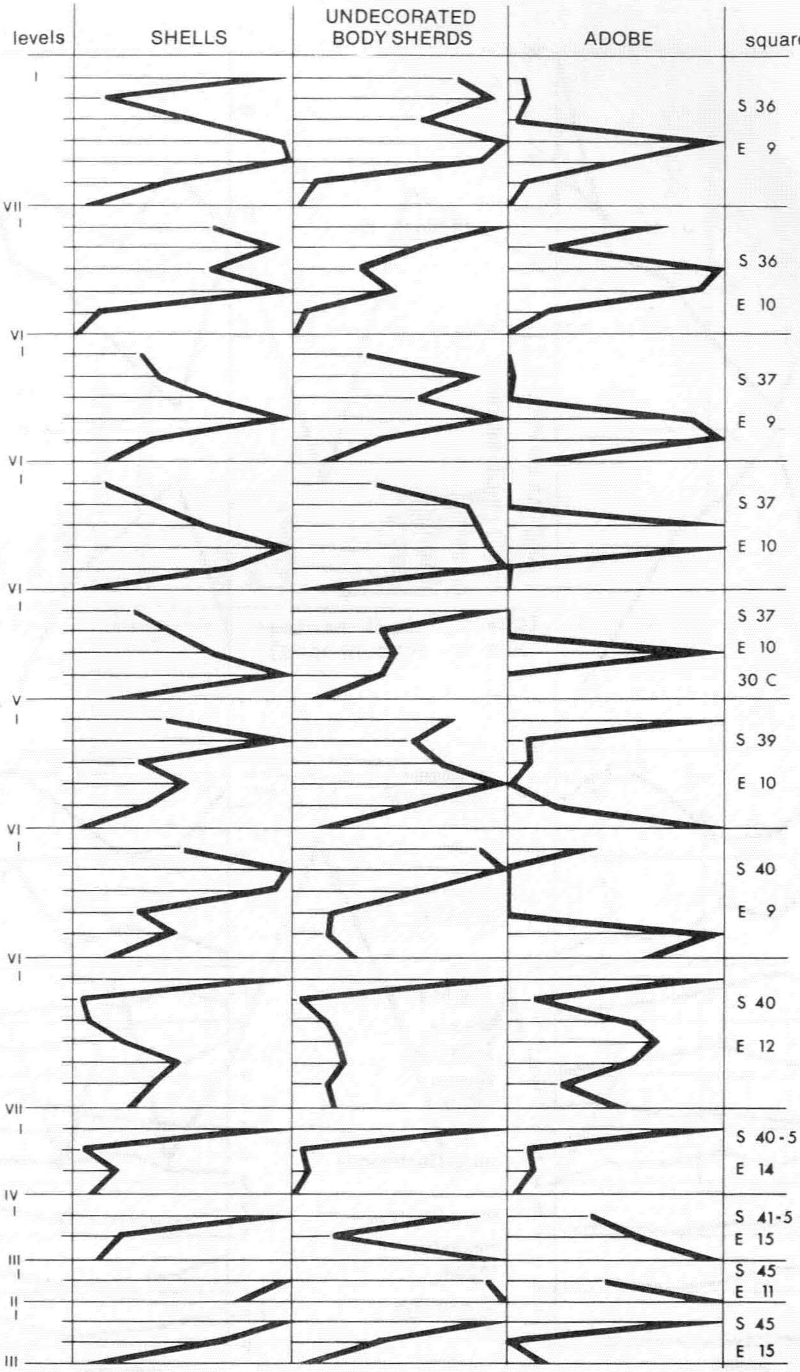


Fig. 10. Site 3047I-305-1, vertical distributions of abode, shell, and undecorated bodysherds. The levels (ex: I-V) on the left of the figure are from the squares shown to the right of the figure. The fluctuations in the graphs are variations in absolute weight. The scales for the three artifacts classes are not comparable in this figure.

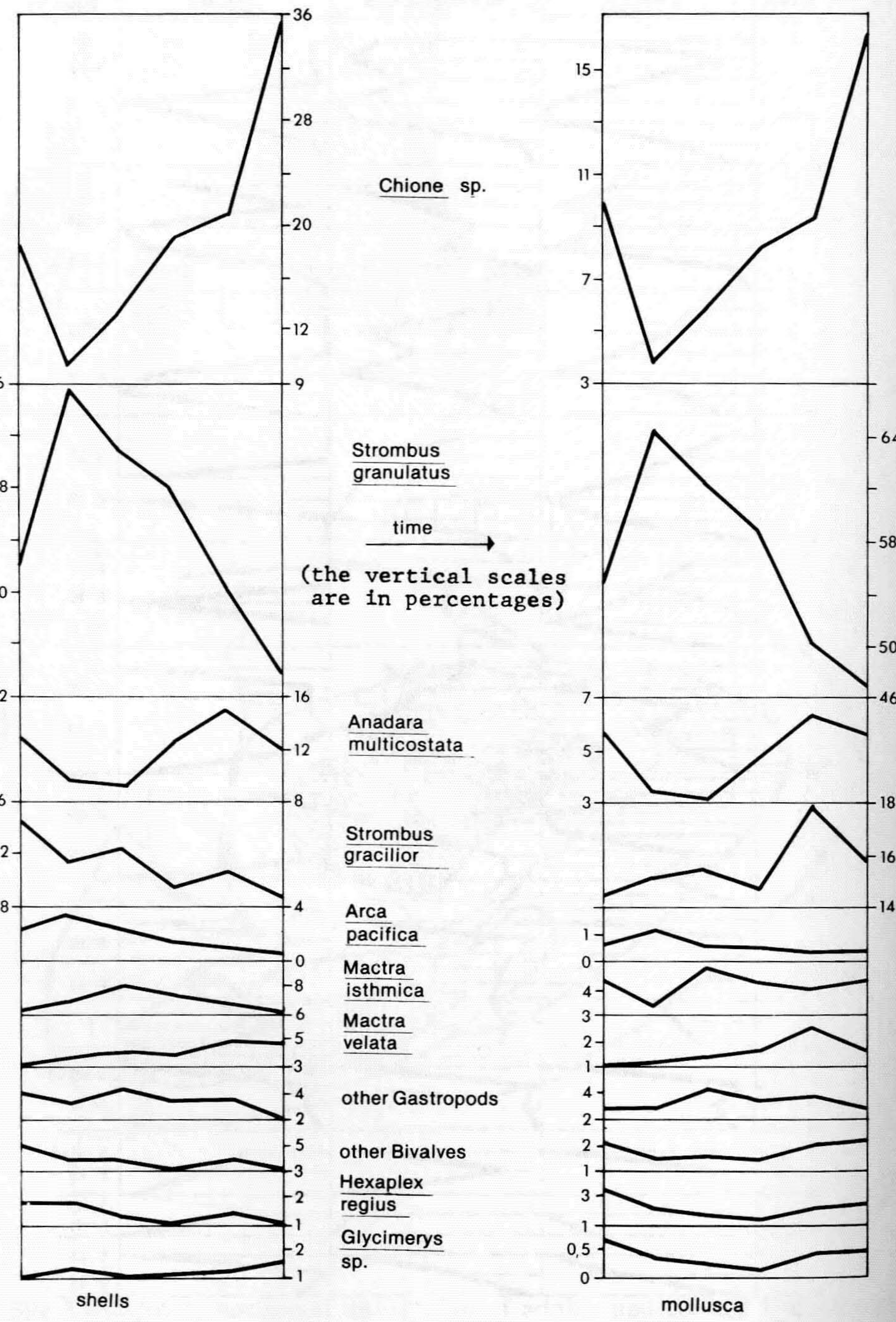


Fig. 11. Site 3047I-305-1, shell and mollusc frequencies during occupation of the site. The time arrow points toward the end of the occupation.

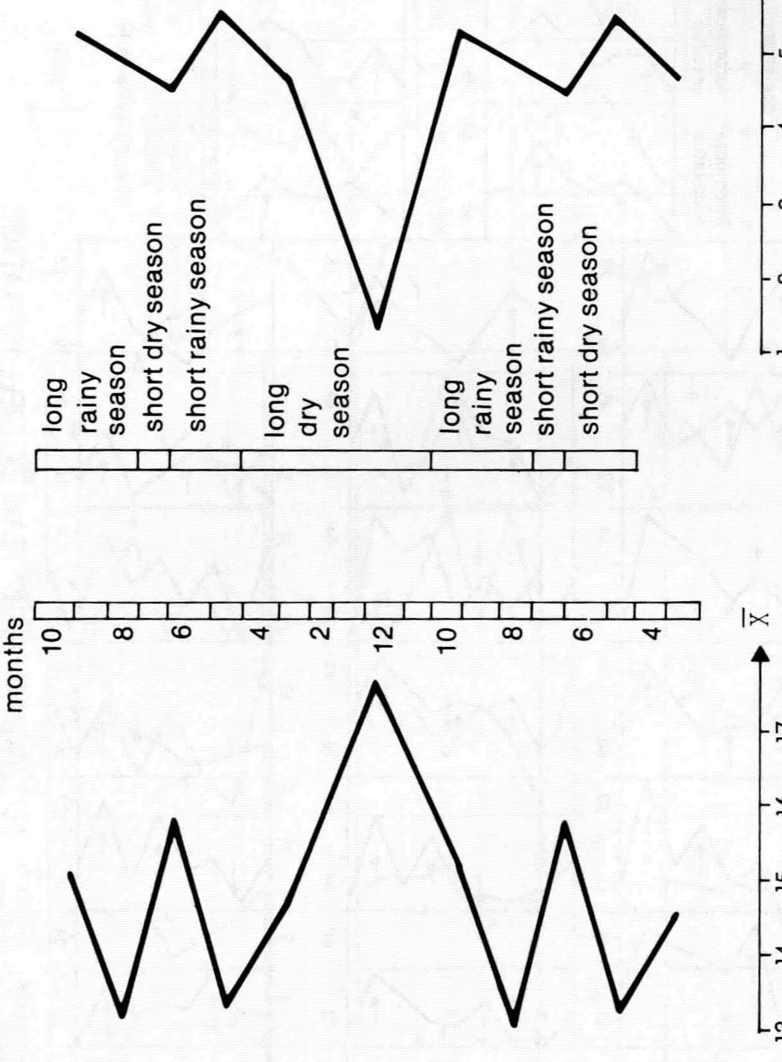
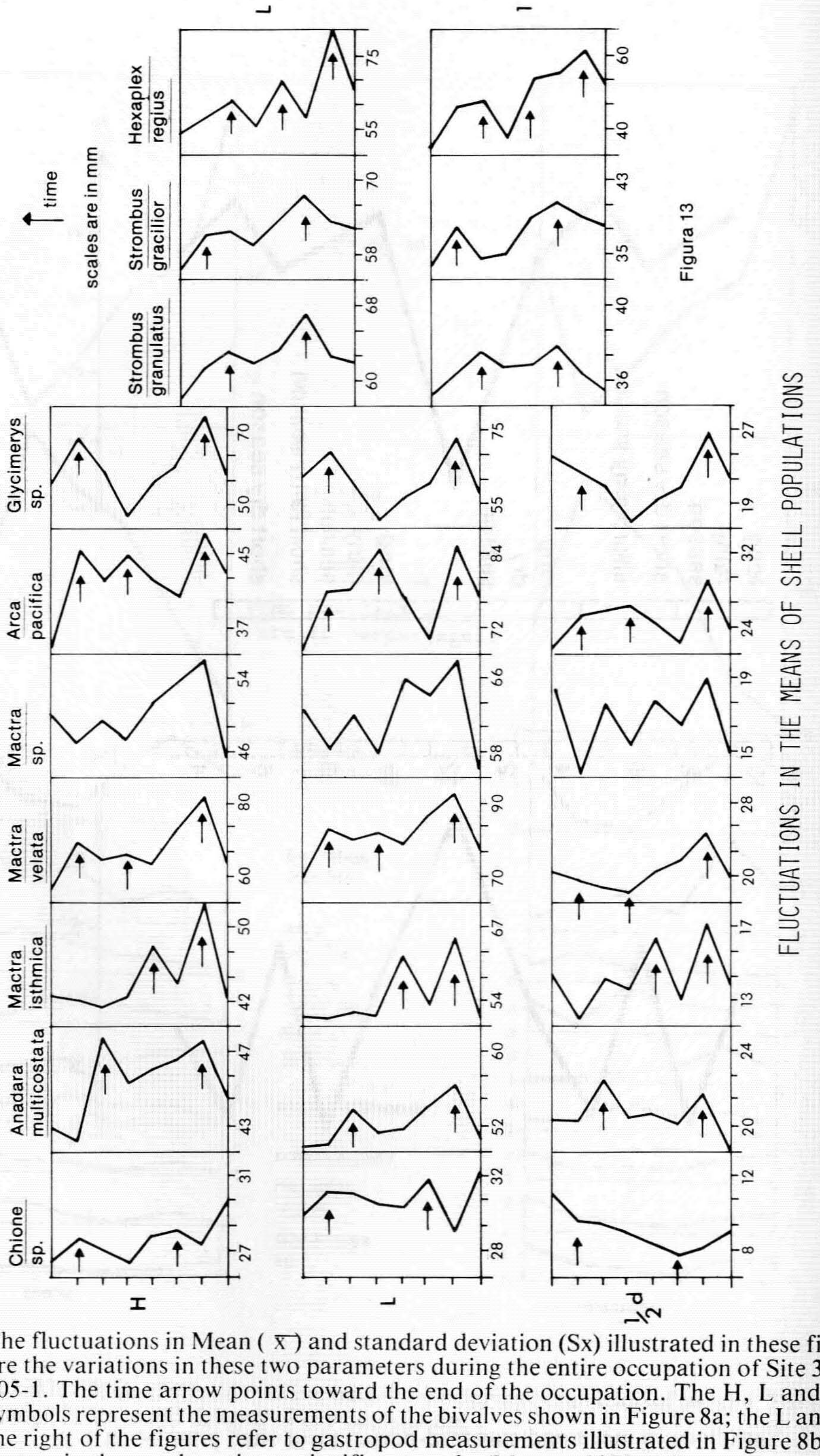


Fig. 12. Variations in mean and standard-deviation of shell population.



Figs. 13, 14. The fluctuations in Mean ($\overline{x}$) and standard deviation (Sx) illustrated in these figures are the variations in these two parameters during the entire occupation of Site 3047I-305-1. The time arrow points toward the end of the occupation. The H, L and 1/2d symbols represent the measurements of the bivalves shown in Figure 8a; the L and l to the right of the figures refer to gastropod measurements illustrated in Figure 8b. The arrows in the graphs point to significant peaks (Moreau 1975:110).

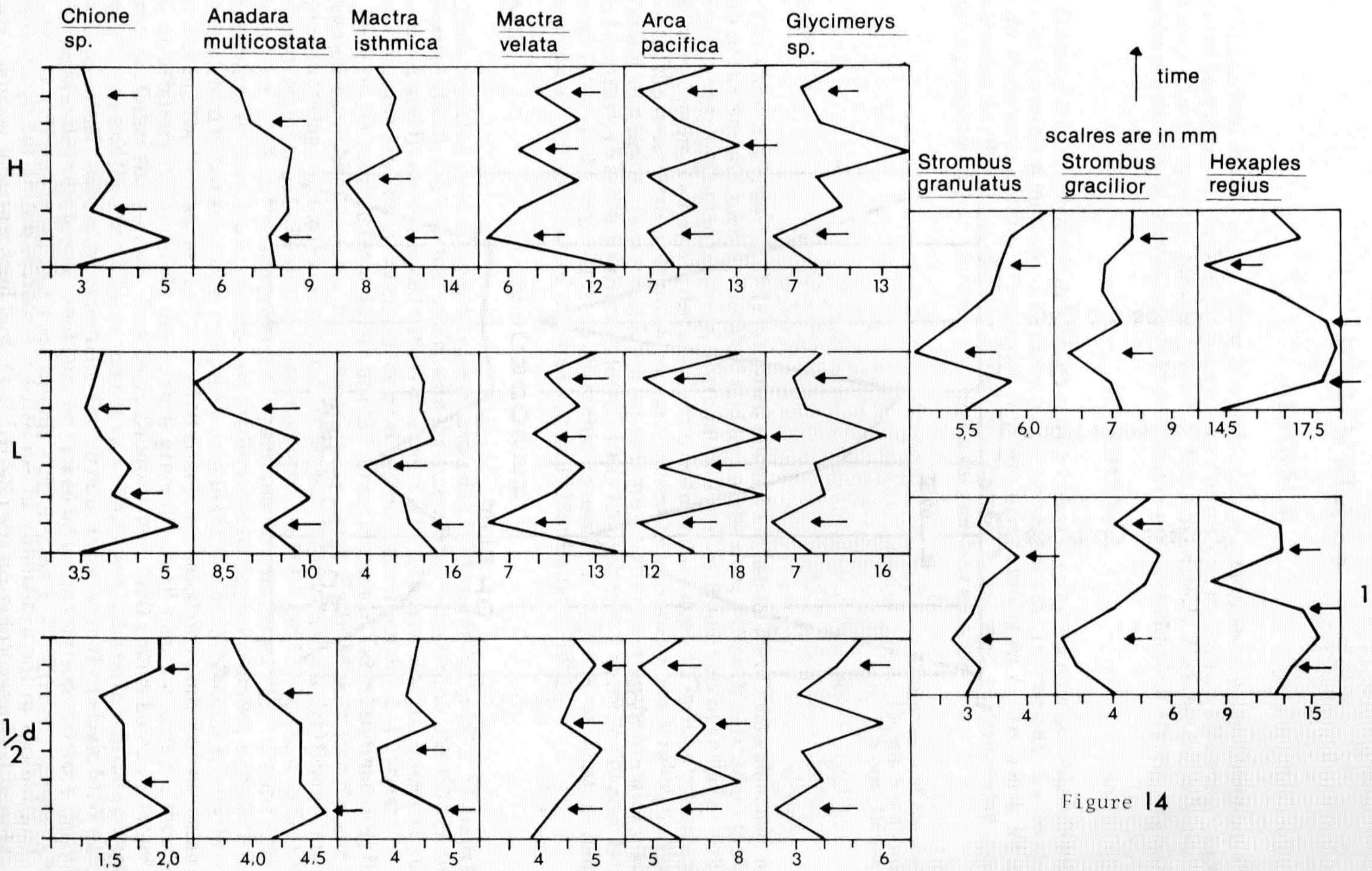


Figure 14

FLUCTUATIONS IN STANDARD DEVIATION OF SHELL POPULATIONS

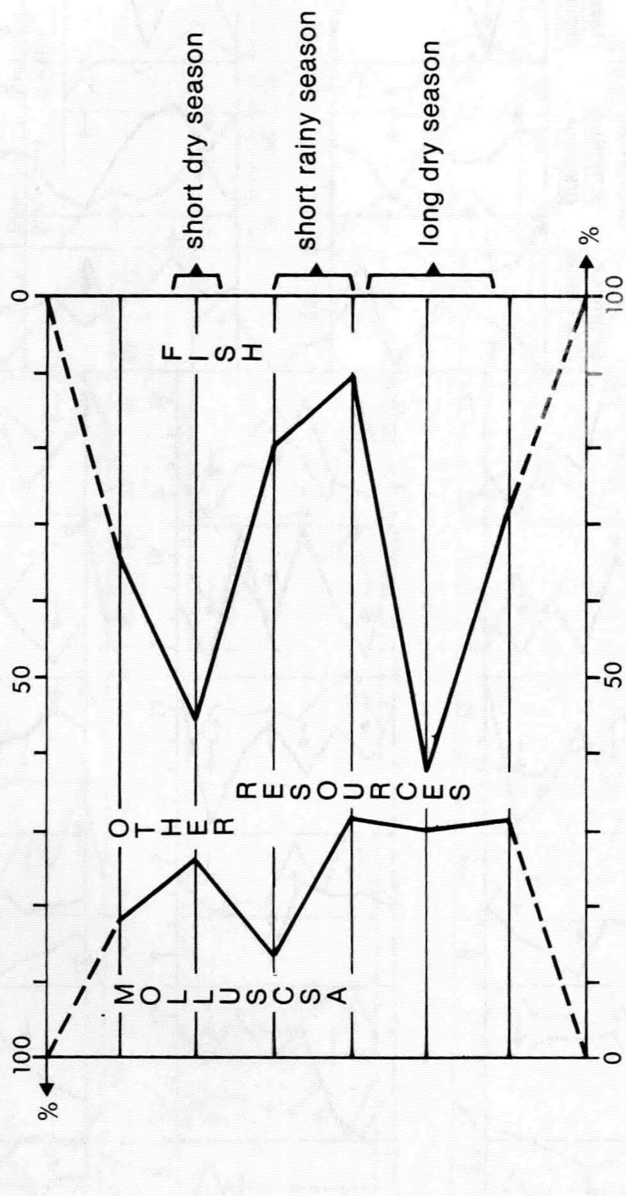


Fig. 15. Fluctuations in the availability of subsistence resources during the occupation of Mound I, Hunter-Robinson site (30471-305-1). Full lines represent occupied part of the year, dashed lines represent the unoccupied part of the year.