Settlement Patterns on Espíritu Santo Island, Baja California Sur

Harumi Fujita and Gema Poyatos de Paz

Abstract

Systematic survey of the coastal fringe of Espíritu Santo and La Partida islands in Baja California Sur reveals the presence of 127 archaeological sites, consisting of habitational caves and rock shelters, habitational open sites, shell middens, funeral caves, and rock painting sites. Analysis of the composition of shell remains at each site permits us to discuss variations in shellfish gathering strategies and settlement patterns through time. We find that the La Ballena Complex functioned as a socio-economic and ideological center in the late period, possibly reflecting the "Las Palmas Culture."

Abstracto

La encuesta sistemática de la franja costera de las islas de Espíritu Santo y de la Partida en Baja California Sur revela la presencia de 127 sitios arqueológicos, consistiendo en cuevas de habitación y abrigos de la roca, sitios abiertos de la habitación, unos escoriales de concha, unas cuevas fúnebres, y los sitios de la pintura sobre la roca. Sigue habiendo el análisis de la composición de concha en cada sitio nos permite a discutir las variaciones en los crustáceos que recolectan estrategias y modelos del establecimiento con tiempo. Encontramos que el complejo de la Ballena funcionó como un centro socioeconómico e ideológico en el último período, reflejando posiblemente la "cultura de Las Palmas."

Introduction

Espíritu Santo Island, located 30 kilometers (km) north of La Paz, is separated from the Baja California peninsula by the six-kilometer wide San Lorenzo Channel. Smaller La Partida Island is separated from the northern tip of Espíritu Santo Island by a small channel. Together, the 99 square kilometer islands are 19 km long and have an average width of 5.5 km (Fig. 1). Their maximum elevation is 595 m above sea level. Numerous cliffs mark the island's eastern coast, in contrast to the western littoral, along which numerous small bays form protected beaches. Some bays include estuaries surrounded by mangroves. The island probably originated through tectonic elevation; its surface is principally composed of volcanic rocks of the Miocene superior and marine sediments of the Pleistocene. Different strata of diverse colors display the history of the island's geology (Secretaría de Gobernación y UNAM 1988:245).

In 1535, Hernán Cortés named this island, Isla de Las Perlas (Island of the Pearls) after the rich pearl oyster beds in the western littoral. Later the island was baptized Espíritu Santo by Francisco de Ortega in 1632. During the 17th century many expeditions attempted to harvest

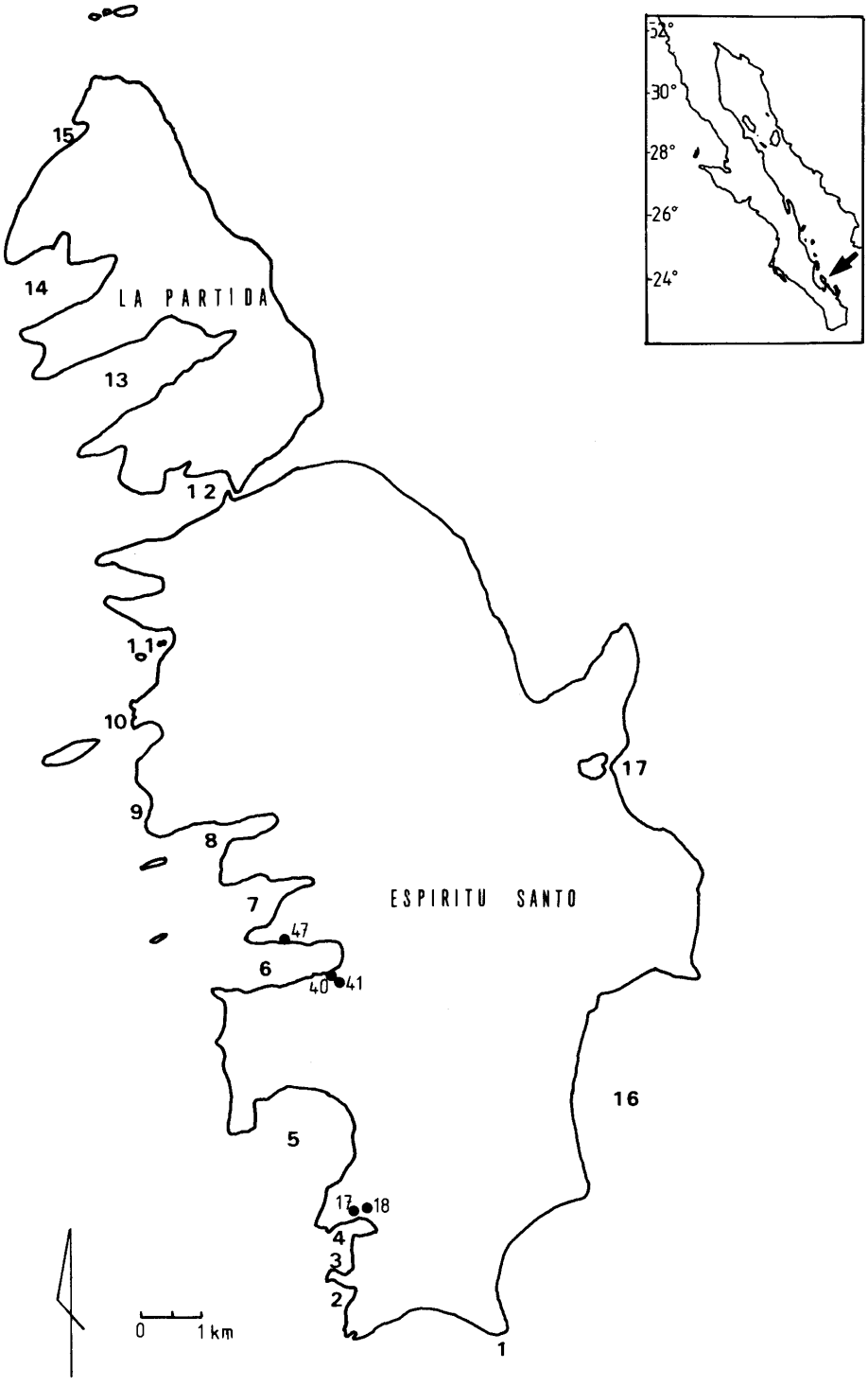

Fig. 1. Espíritu Santo and La Partida islands.

the wealth of littoral Baja California, but all failed. On the other hand, the fortune-hunters left important geographic and ethnographic descriptions of the island (Mathes 1970; 1974).

Archaeological study of Baja California began with ten Kate's exploration of Espíritu Santo's funerary caves in 1883, followed by the work of Leon Diguet. The curious burial system and skull morphology were of special interest to these men, who concluded that the dolichocephalic and hipsistenocephalic forms were the most outstanding characteristics of the native Californians inhabiting the southern region and the nearby islands, similar to Melanesians of the South Pacific and the population of Lagoa Santa in Brazil (ten Kate 1883; Diguet 1905).

After a long hiatus of archaeological investigations on Espíritu Santo, a group of archaeologists of the Instituto Nacional de Antropología e Historia (Mexico) headed by Baudelina García-Uranga and Jesús Mora conducted a 1981 survey of the bay of La Ballena and its surroundings. Various classes of sites were found: habitational caves, rock shelters, open camp sites, shell middens, funerary caves, rock painting sites, and trails (García-Uranga and Mora 1981). Fujita directed recent investigations in 1994 and 1996 (Fujita 1995a and 1997).

Characteristics of Site Classes

Systematic survey revealed the presence of 127 coastal sites (Appendix Table 1). In addition, six test pits (0.5 m x 0.5 m) were excavated at five sites (Fig. 1), two in cave sites of La Dispensa II Bay (J-17 and J-18). J-17 is the largest rock shelter in the bay and it contains numerous shell remains. J-18 is a small cave about 100 m northeast of J-17. It contains less shell than J-17. Four other test pits were located in La Gallina Bay (J-40 pits #1 and #2, J-41, and J-47). J-41 and J-47 are cave sites and J-40 is a shell midden. Sites J-40 and J-41 are on the end of the bay, while J-47 is closer to the mouth of the bay. Test pits in caves or rock shelters were placed at the center of the drip line. The shell midden test pits were excavated in two different areas where shell composition was observed to be different. Screen was used to collect the small materials and remains. Although the main object of the test pits was to obtain shell samples for radiocarbon dating, enough data was obtained to establish some hypotheses on changes in shell gathering strategy in the late period. The site classes are described below.

Habitational Caves and Rock Shelters

The most frequent site type is the habitational cave or rock shelter (Fig. 2). The west coast of the island is marked by rows of hills in an east-west direction, forming protected bays. Numerous caves are found in these hills. Those caves which were occupied by humans have the following characteristics: In general, much of the floor is flat and clean, although some caves experienced ceiling collapse after occupation. Shell remains, lithic debitage, ash, and charcoal are usually present in the exterior and on the talus. In many cases, grinding stones, such as metates, were found near the drip line, although some were observed in the interior or on the

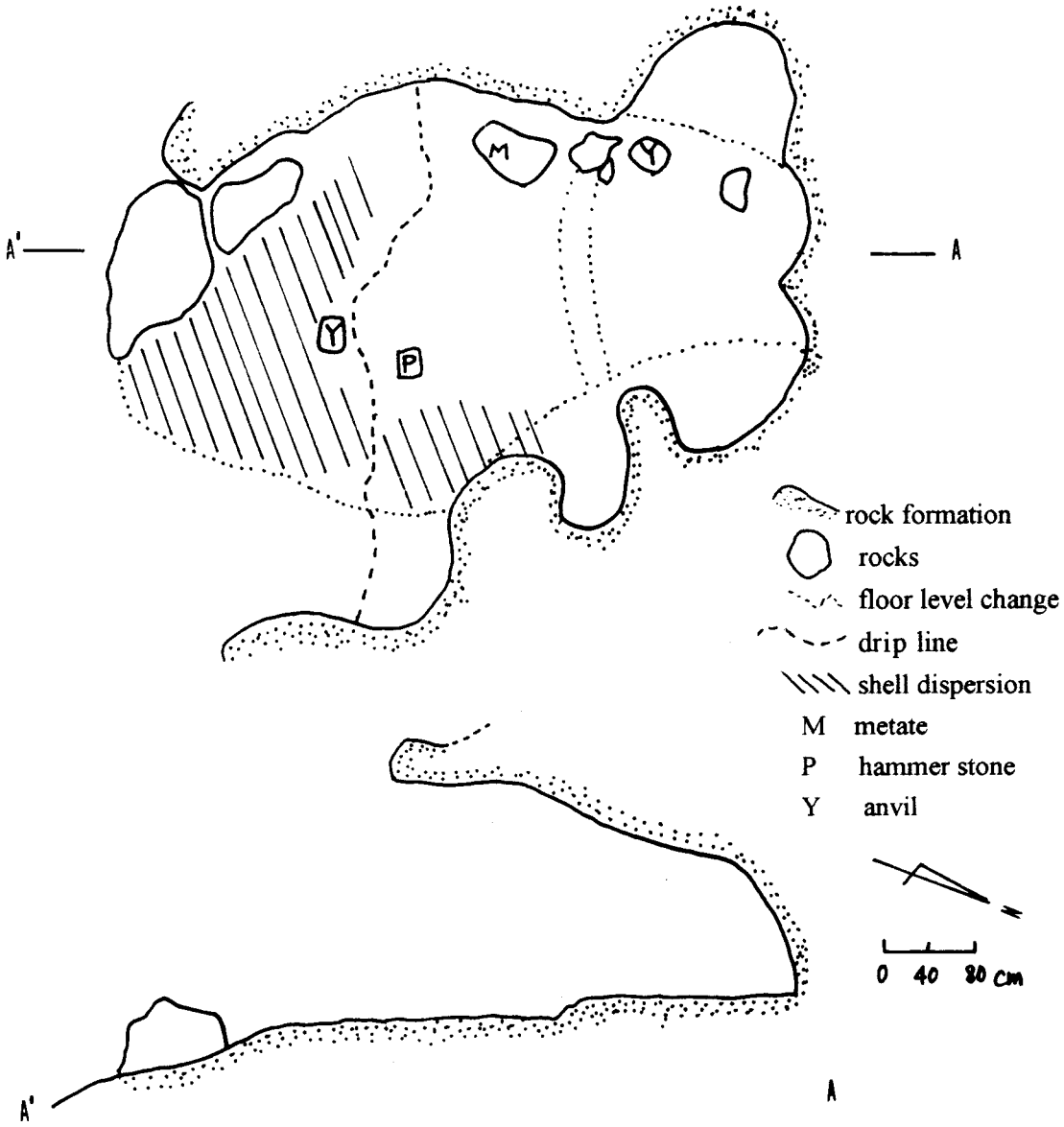

Fig. 2. Habitational cave (J-70 Las Calaveritas 1).

Fig. 3. Rock rings in J-67 La Ballena 1.

talus. Thus, sleeping areas could be distinguished from food processing and lithic manufacturing areas. The mouths of some caves have walls made of piled rocks.

Open Camp Sites

Habitational open camp sites are characterized by vestiges of daily living, such as rock rings and/or clear zones generally associated with other activities (Fig. 3-4). Metates, mortars, manos, and mano/hammers indicate the grinding of red pigments and seeds of mesquite (*Prosopis articulata*), pitahaya dulce (*Stenocereus thurberi*), pitahaya agria (*Stenocereus gummosus*), cardon (*Pachycereus pringlei*), wild fig (*Ficus palmeri*), wild plum (*Cyrtocarpa edulis*), etc. (Fig. 5). Shell remains mark the food preparation and consumption areas (Fig. 6). Hearths and burnt shell and bone are evidence of fire making. Cores, flakes, hammerstones, and debitage denote the manufacture and resharpening of lithic tools. Faunal remains, grinding stones, and diverse other artifacts reflect consumption of terrestrial and marine foods. Each habitational site is located near a water source, such as an estuary, *tinaja* (natural water catchment), stream, or coastal salt lake. Some are situated on sandy or rocky ground; others are on elevated, rocky ground with trails that connect strategic spots.

According to the 17th-century visitors to this island, the native inhabitants slept in the open air, except in the rainy season when they occupied caves. A beach dwelling consisted of a hut

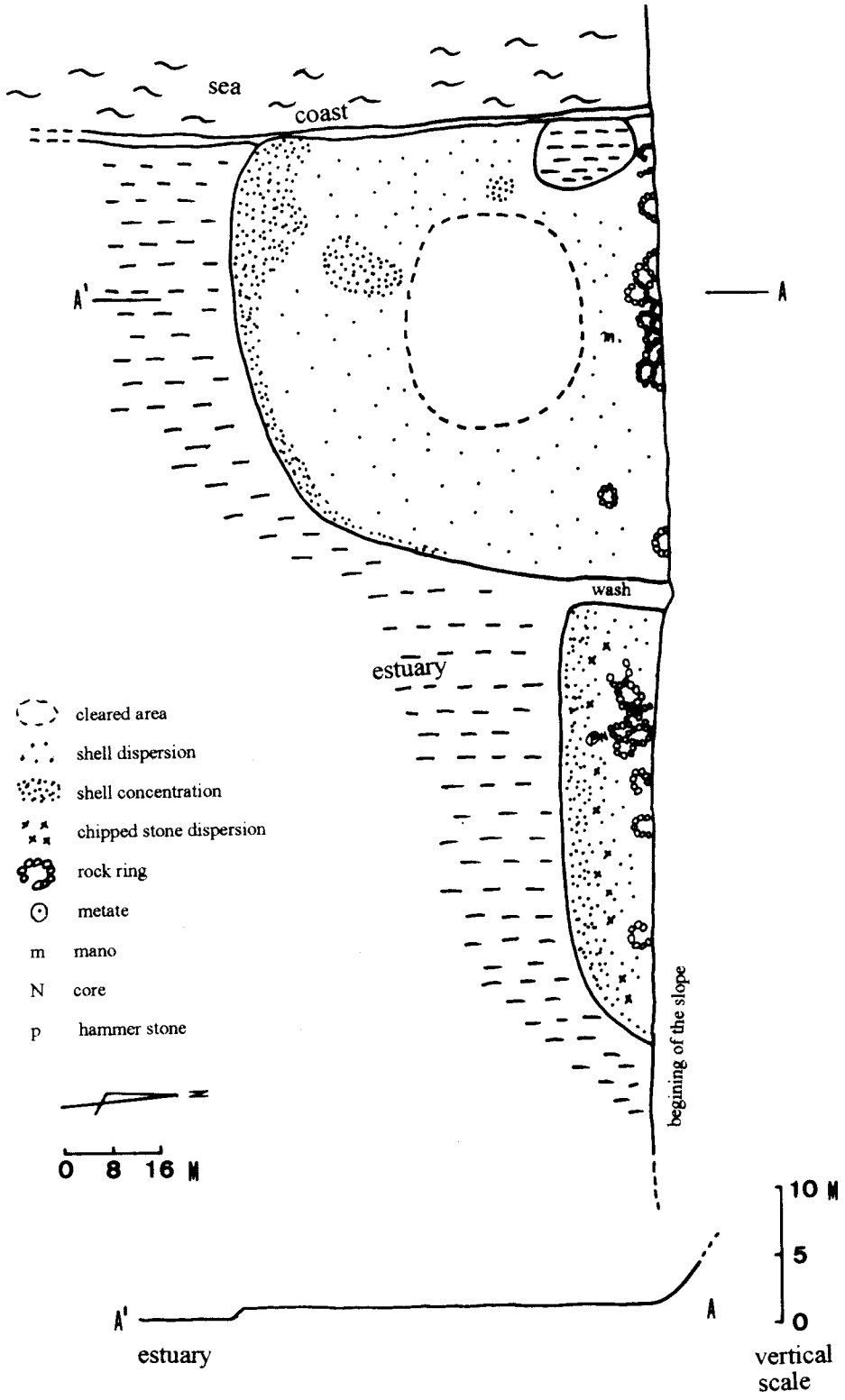

Fig. 4. Habitational open camp site (J-67 La Ballena 1, Section E and F).

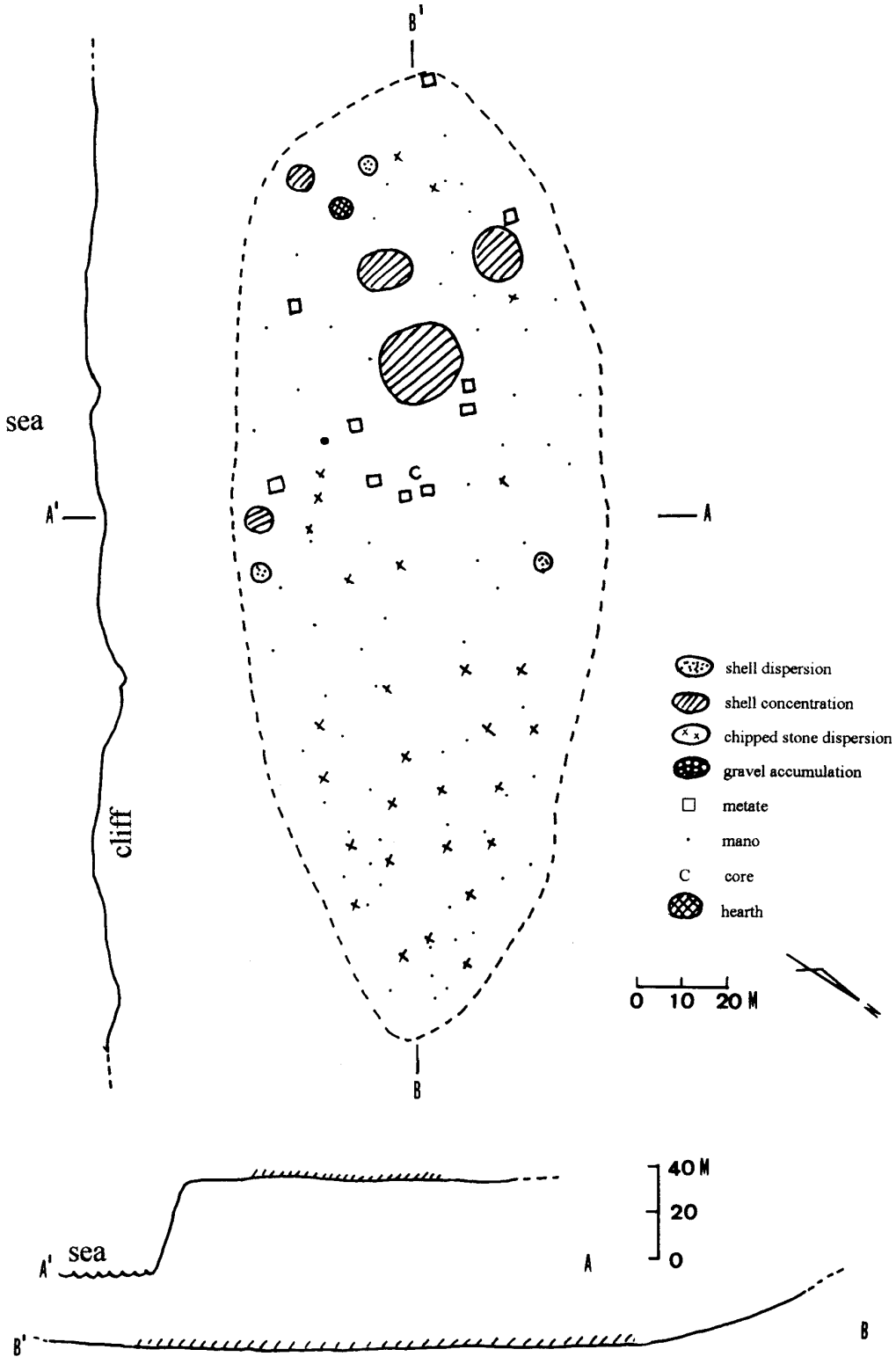

Fig. 5. Habitational open camp site (J-94 El Gallo III-1, Section A).

Fig. 6. Large shell accumulation in J-67 La Ballena 1.

made with branches. A settlement of 300 people was reported on the western side of the island (Mathes 1970: document 37). Presence of the people was described during an extremely dry season of 1632 (June and July) by Francisco de Ortega and in July and August of 1683 by Isidro Otondo y Antillón as well as in autumn, during the rainy season of 1633 (September and October) by Esteban Carbonel de Valenzuela and Francisco de Ortega (Mathes 1970, 1974).

Shell Middens

Shell middens are located near sandy or rocky beaches; on dunes; or on marine, fluvial or lake terraces with nearby water sources. There are two types of shell middens: habitational and presumed non-habitational. The middens contain shells from various marine environments: intertidal and intralittoral zones or sandy and rocky bottoms (Fig. 7). A total of 40 species of bivalves and 33 gastropods was identified. However, only a few species constitute most of the shell middens. Most remarkable is the predominance of the large rock oyster (*Ostrea fisheri*), pearl oyster (*Pinctada mazatlanica*), and *Chama frondosa* in most of the coastal zones (Fujita 1995b). Smaller clams (*Chione californiensis*) and oysters (*Ostrea conchaphila*) are frequent, especially in the riverine end of the estuaries and near the salt coastal lake situated in the

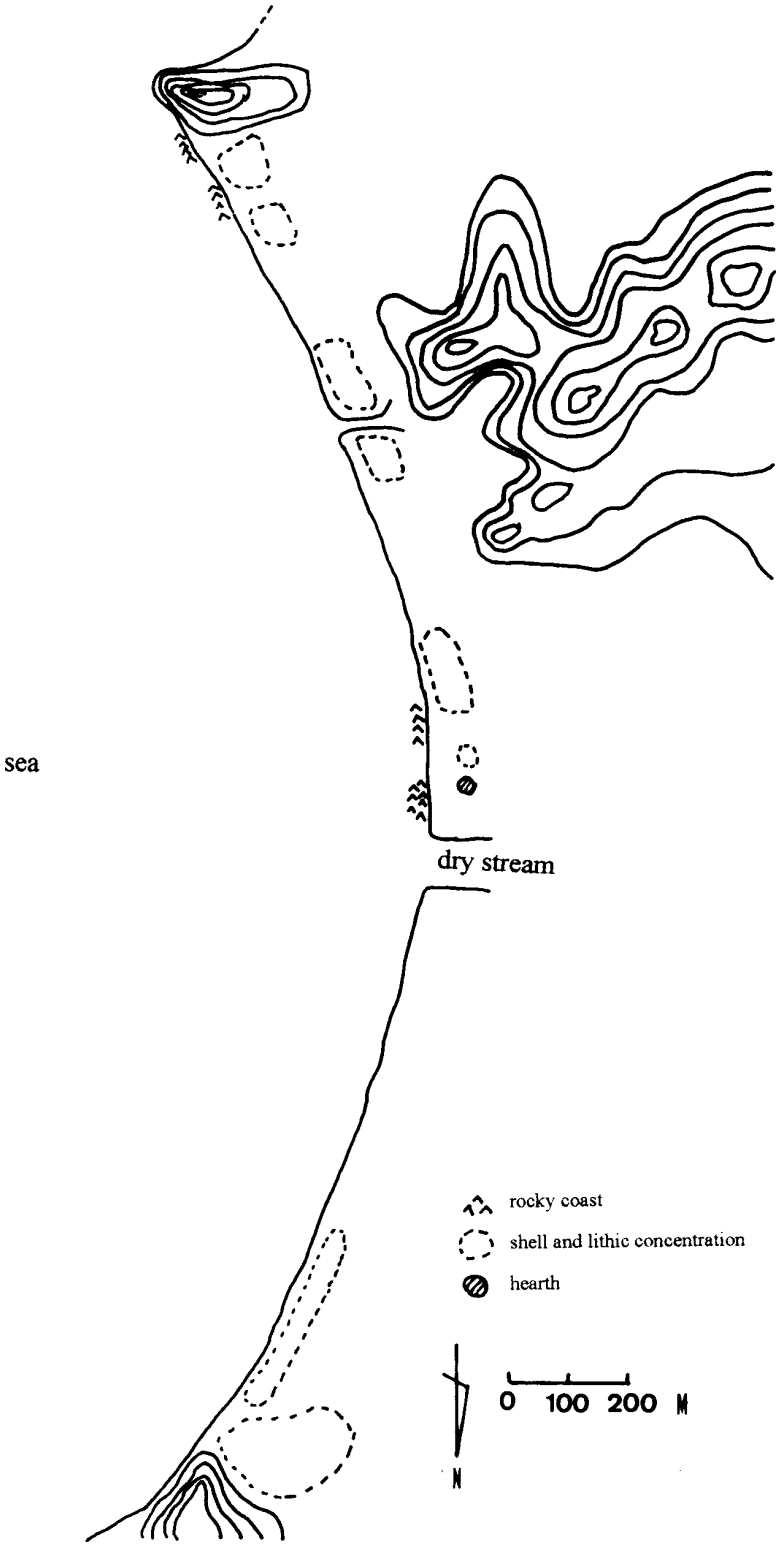

Fig. 7. Shell midden (J-121 La Bonanza Norte).

northwest littoral of the island. Among the gastropods, the large marine snail (*Strombus galeatus*) and medium marine snail (*Strombus granulatus*) are most common. It appears that large shells and snails were preferred in the late period. However, medium and small species were preferred in the earlier periods, based on data from the six test pits. The middens also contain ash deposits or hearths, usually with basalt and rhyolite flakes and debitage scattered around them. Finer lithics, such as end and side scrapers, choppers, metates, and manos, are found with less frequency. Bone is less abundant than shell; however, historical documents report that the principal food resource of the people was fish (Mathes 1970: document 38). Therefore, we assume that the shortage of bone is due to lack of large scale excavations using fine screen size, poor preservation, or disposal of faunal garbage elsewhere.

Funerary Caves

Four funerary caves were recorded (J-73, J-74, J-78 and J-88). Unfortunately, all had been disturbed (Fig. 8-11). In two caves (J-78 and J-88), red painted human bone remains were observed. Associated objects recovered in J-78 included two fragmented twigs (apparently worked), and a fragmented sea lion bone. Artifacts found in cave J-88 included three bone awls, a pelican bone whistle, a probable deer rib with cut marks and a polished surface on one face, six worked twigs, and a figurine in worked pearl oyster shell (Fig. 12). Also evident were diverse remains from dolphins, sea lions, turtles, deer, hare, reptiles, fish, and birds.

The characteristics of these caves—low hidden entrances, red-ochre-painted human bone remains, and associated artifacts—argue that the funeral custom known as the Las Palmas Culture that prevailed throughout the Cape region between A.D. 1200-1700 (Massey 1955; Carmean and Molto 1991; Molto and Fujita 1995) was practiced here.

The only adult male cranium recovered from the funerary caves is classified as dolichocephalic, which is common among the population in the Cape region (Fig. 13). The human dental remains show a high rate of attrition and a normal amount of caries (Leticia Sánchez, personal communication). If the human diet had emphasized marine resources, caries would not be so evident; so we can assume some consumption of fruit and seed in addition to marine resources. The high dental attrition rate is principally caused by the use of teeth as instruments to make cords or to tan leather and from grit in the diet. In general, the bones are strong without signs of disease. Stable isotopic analysis revealed that the nitrogen isotope value for the human bone sample from Espíritu Santo Island is +19.8 and the carbon isotope value is –9.7, indicating the occupants consumed marine vertebrate flesh complemented by cacti (Molto and Kennedy 1991:47-59).

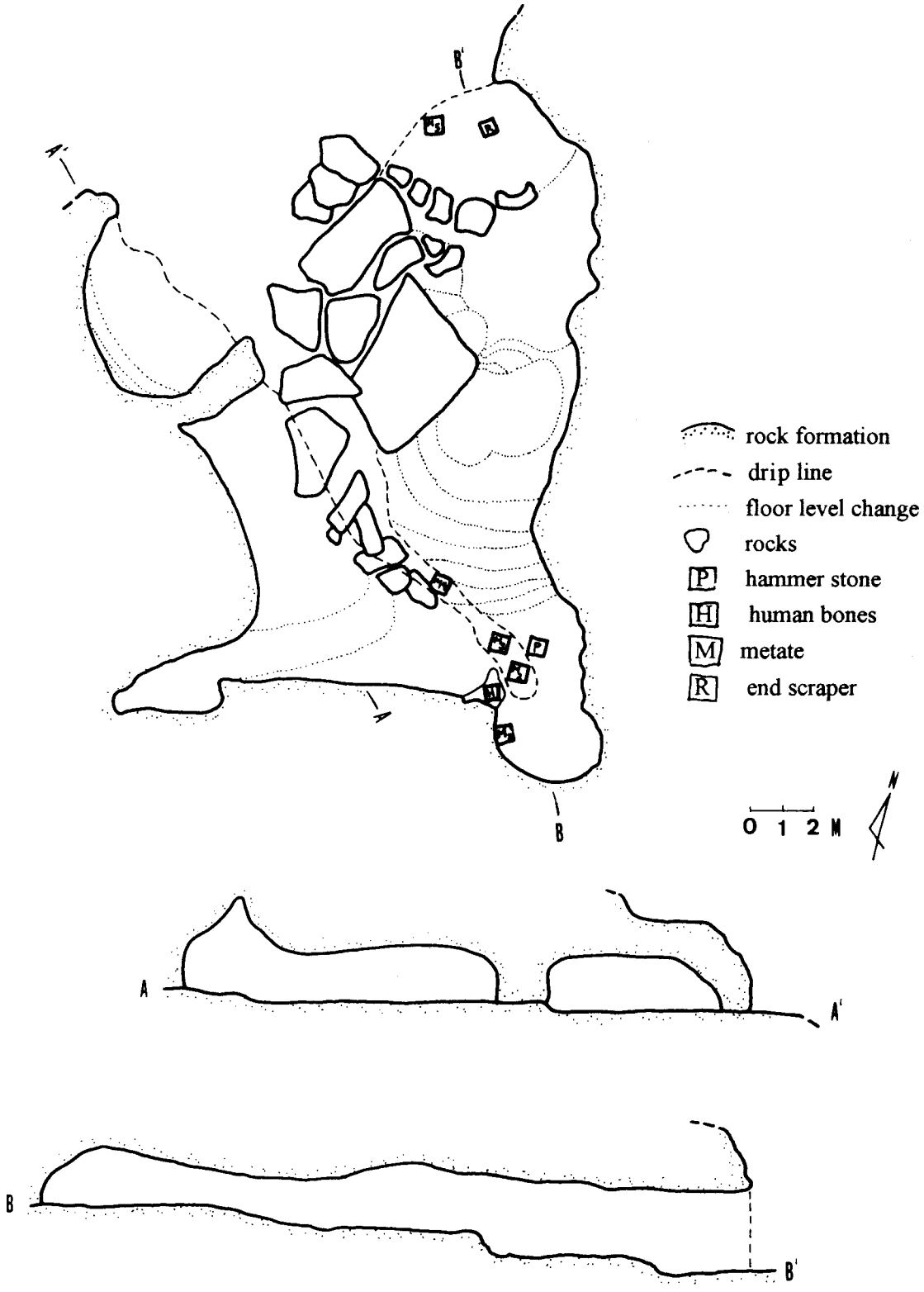

Fig. 8. Funeral cave (J-73 Las Calaveritas 4).

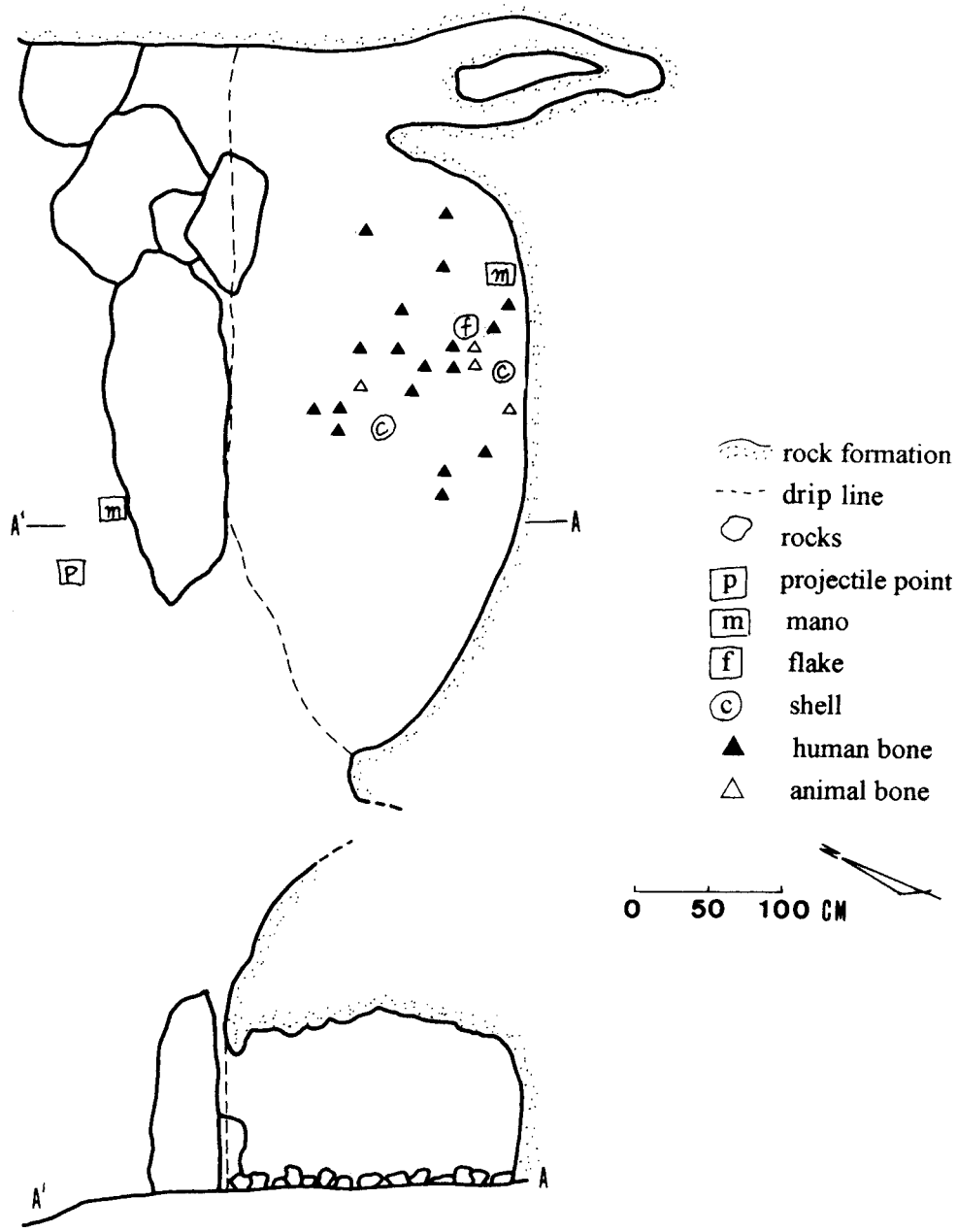

Fig. 9. Funeral cave (J-74 Las Calaveritas 5).

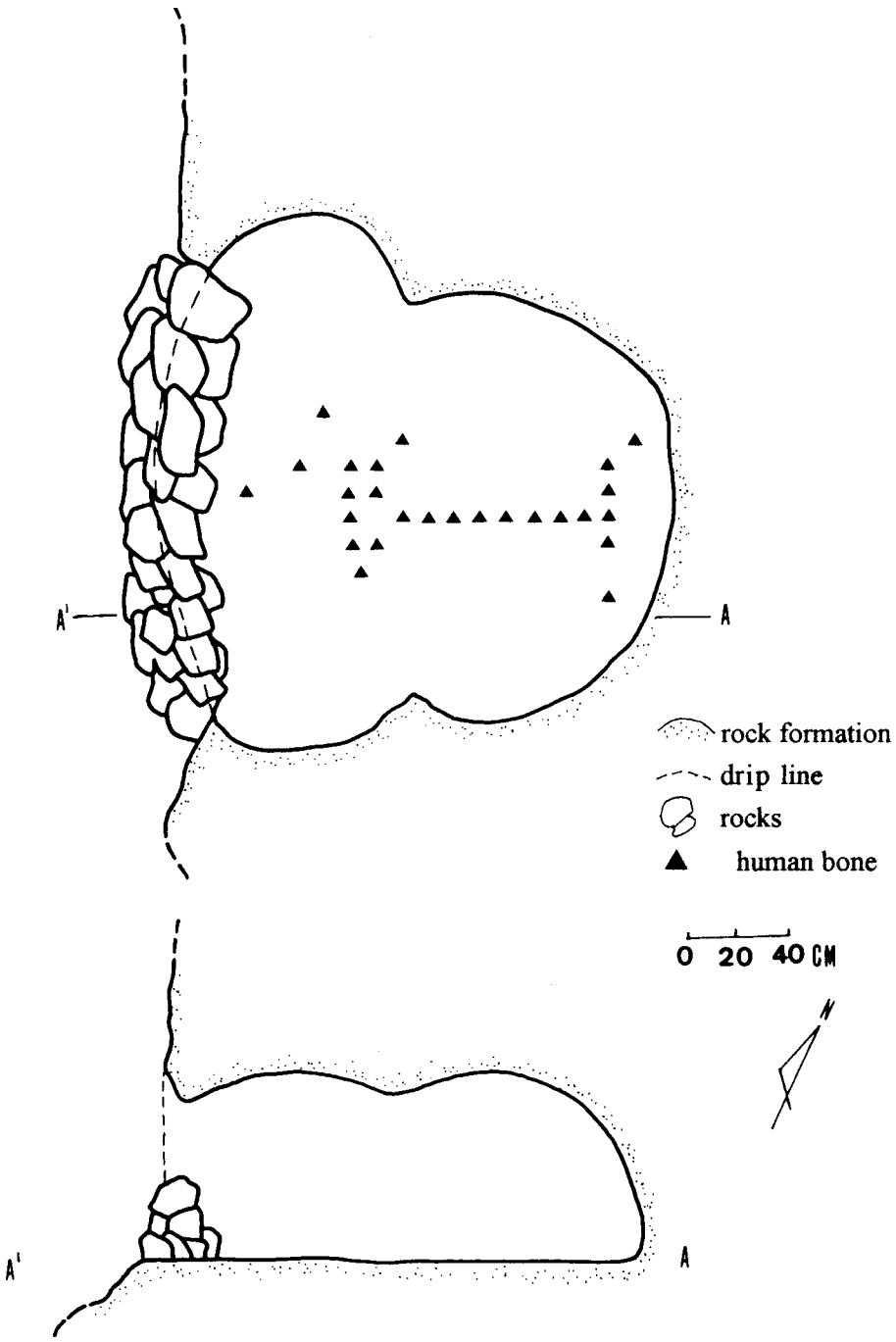

Fig. 10. Funeral cave (J-78 Las Calaveritas 9).

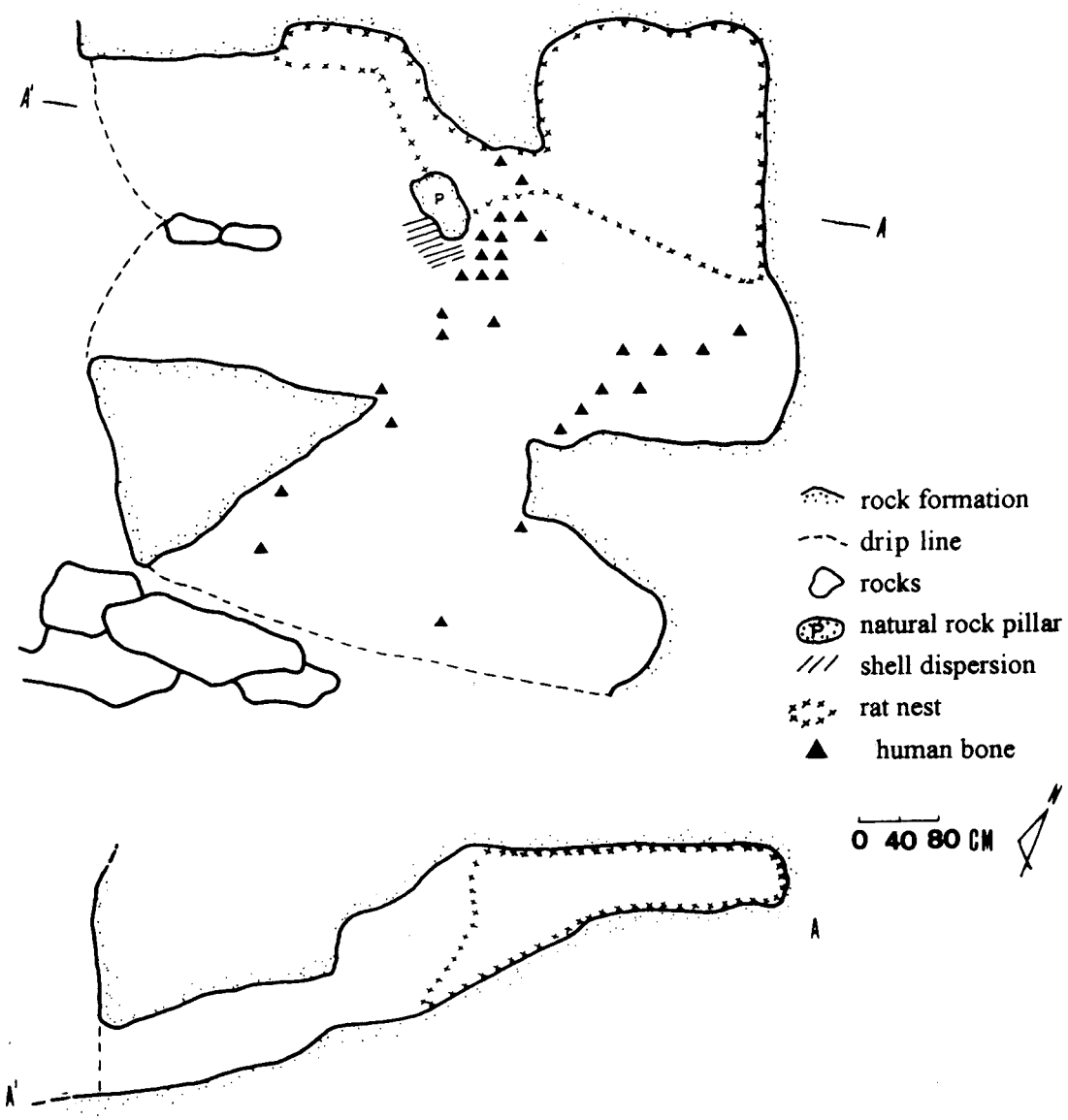

Fig. 11. Funeral cave (J-88 El Puertecito 7).

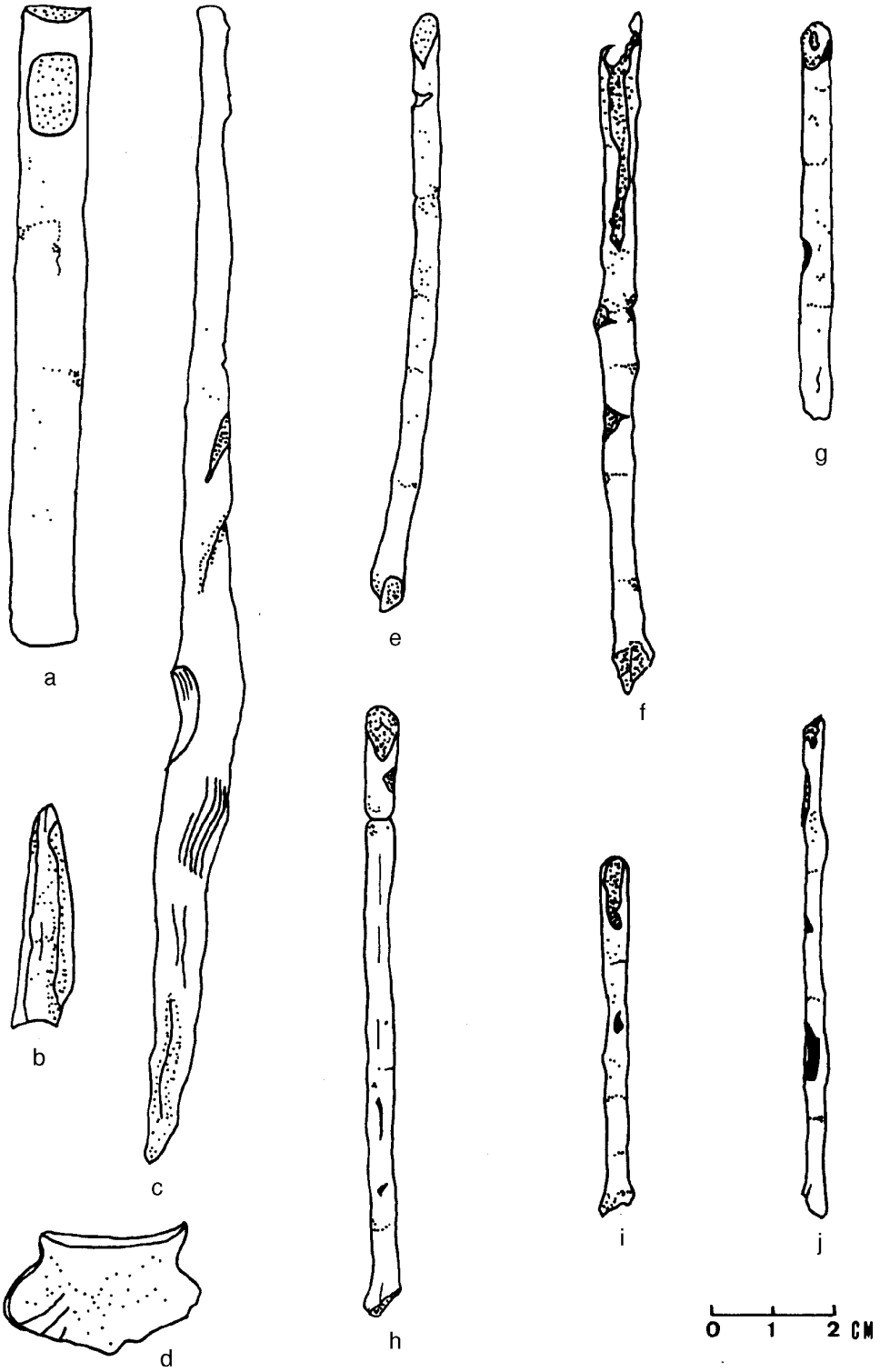

Fig. 12. Worked bone, twigs, and shell (J-88 El Puertecito 7). *a*: pelican bone whistle, *b*: awl, *c*: worked deer rib bone, *d*: pearl oyster figurine, *e-j*: worked twigs

Fig. 13. Adult male cranium (J-88 El Puertecito 7).

Rock Painting Sites

Two rock painting sites were discovered (J-68 and J-85). These contain geometric figures composed of various straight and curved, vertically and diagonally intersecting lines. The red-painted figures are on the exterior wall of J-68 and on the interior wall in J-85 (Fig. 14-16). Both sites have evidence of human occupation. The significance of the paintings may relate to the location, as well as to ideological factors.

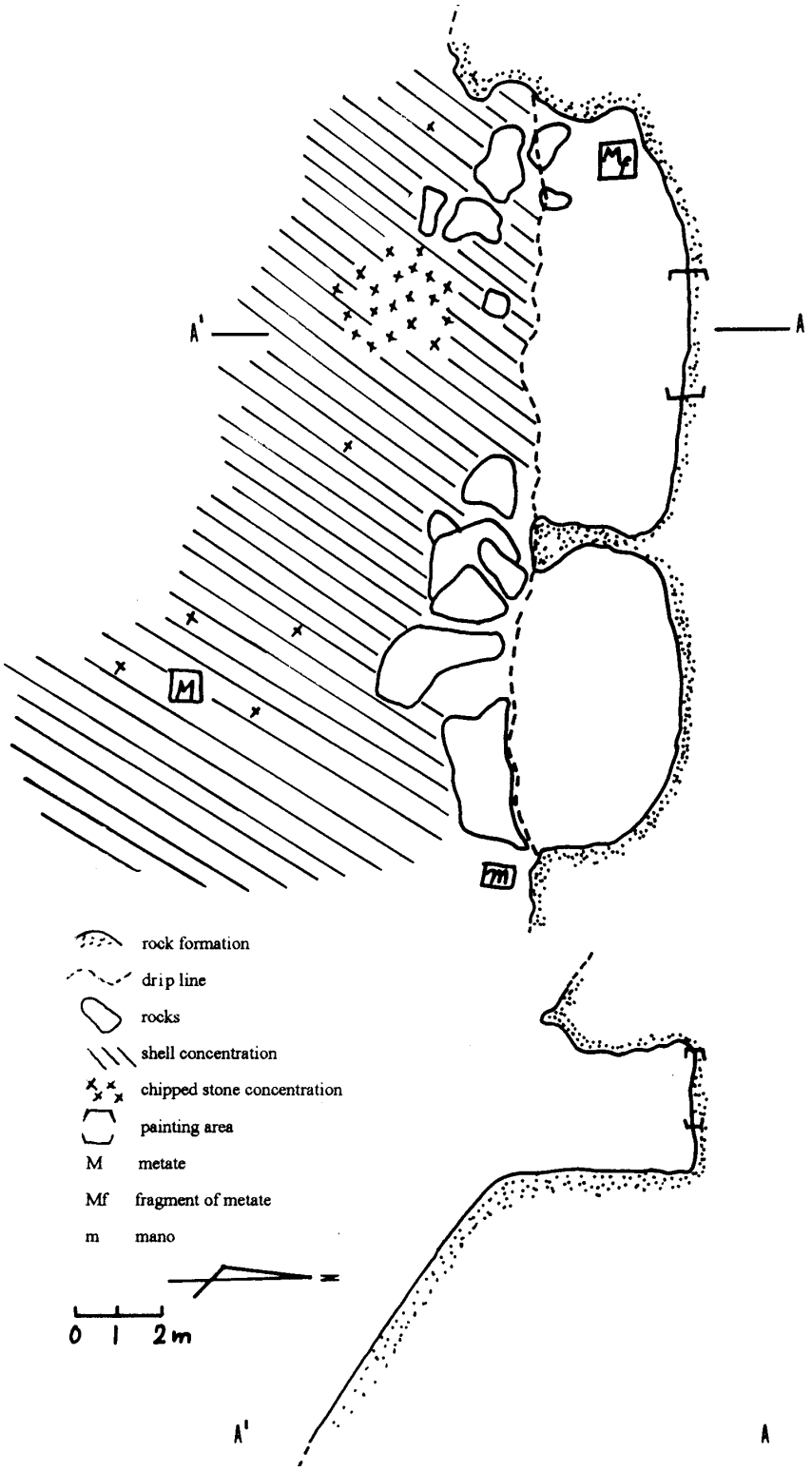

Fig. 14. Rock painting shelter (J-85 El Puertecito 4).

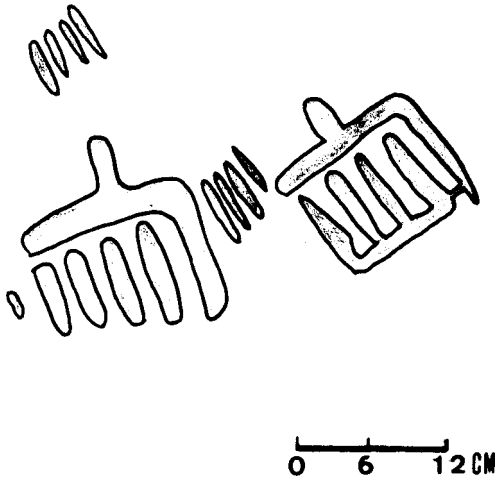

Fig. 15. Rock painting (J-68 La Ballena 2).

Fig. 16. Rock painting (J-85 El Puertecito 4).

Trails

The extraordinary network of trails is apparently unique in the Cape region. It connects the campsites with other strategic spots: tinajas, beaches, the estuary, habitational and funeral caves, rock painting sites, land food resources, and the mountain which was the probable source of basalt and rhyolite. One trail is straight and about 500 m long with a maximum width of 8.9 m, suggesting that many people may have walked together. Father Miguel del Barco reported that it could have functioned as a race track:

> Juntabanse en un lugar determinado las rancherias confinantes y allí formaban de ramas de árboles y matorrales una casita o choza redonda, desde la cual desembarazaban la tierra por un trecho proporsionado formando camino ancho y llano para las carreras (Barco 1973:187).
>
> (The neighboring settlements gathered in a specific place to form a round hut made of tree branches and bushes, from which the ground was cleared away to a certain distance, forming a flat and wide trail for races.)

Socio-economic and Ideological Center: La Ballena Complex

A high concentration of different types of sites is found between La Ballena Bay and El Puertecito Bay, facing a small islet and connected by various trails. In this area, 19 sites were recorded, including the funerary caves and rock painting sites mentioned above. This area also contains the second largest and the most complex site in the whole Cape region. Catalogued as J-69 La Ballena #3, this site is located on an elevated long peninsula (Fig. 17-18).

Seven campsites are found in an area of about 1 km^2 (2 km by 0.5 km), all connected by a complex network of trails (Figs. 19A and 19B). These campsites vary between 900 and 4200 square meters. La Ballena #3 contains various features and materials defining different activity areas on the rocky surface. Seventeen circular, oval and rectangular rock rings were noted in five campsites: seven in Campsite A, three in B, two in C, four in G, and one adjacent to D. In some cases bedrock is integrated into the rock rings. Frequently two to four rock rings overlap, forming compound rock rings. We also noted a rectangular rock ring adjacent to Campsite D in an area full of rock clusters. The circular rings vary in internal diameter from 2.5 m to 5.25 m with a mean of 4.29 m. The major axes of the two oval rings are 3.2 m and 3.3 m. The five rectangular rock features range between 2.86 m and 5.34 m in length, with an average of 4.13 m.

Compared with the rock rings in the Bahía Concepción area reported by Ritter (1981) and based on the description of the early missionaries in Baja California (Venegas, 1943; Barco, 1973), the rock rings found in J-69 La Ballena #3 seem to have served as foundations for single-family dwellings rather than ceremonial structures or storage features. However, a rock

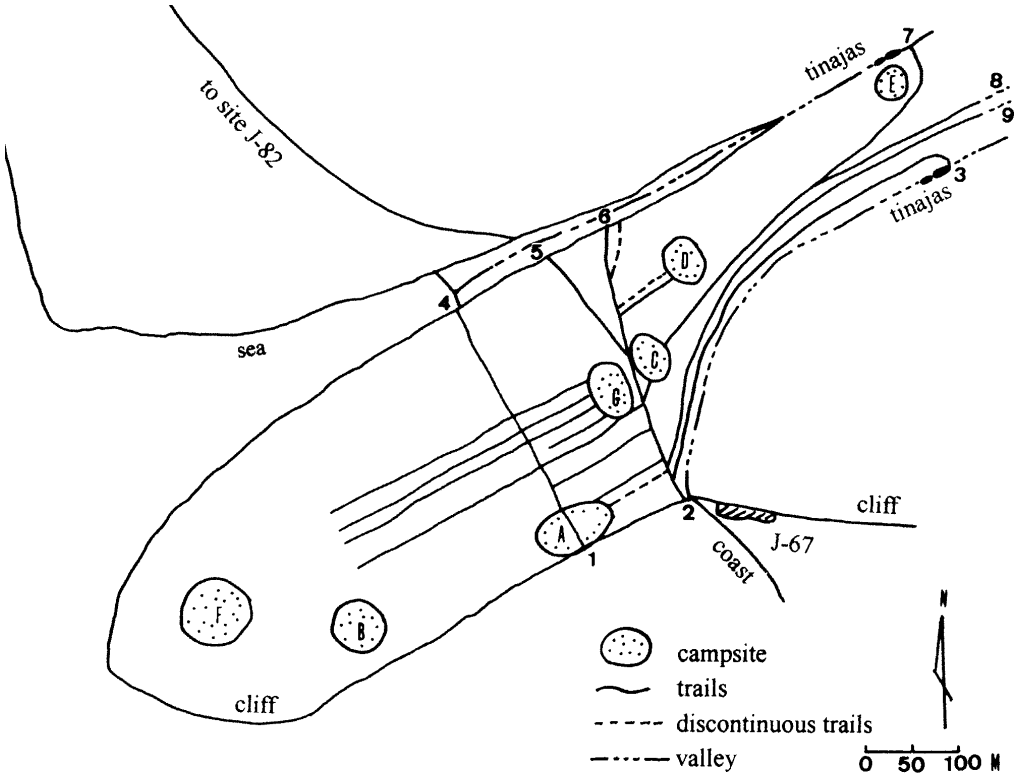

Fig. 17. J-69 La Ballena 3. Destinations of trails, 1: rock shelters without archaeological evidence; 2: J-68 La Ballena 2, habitational cave with rock painting and the coast of the La Ballena Bay; 3: tinajas; 4: rock shelters without archaeological evidence; 5: habitational caves and rock shelters; 6: funeral caves J-73 & J-74 and tinajas; 7: tinajas; 8 and 9: hills.

Fig. 18. J-69 La Ballena 3 site. looking north.

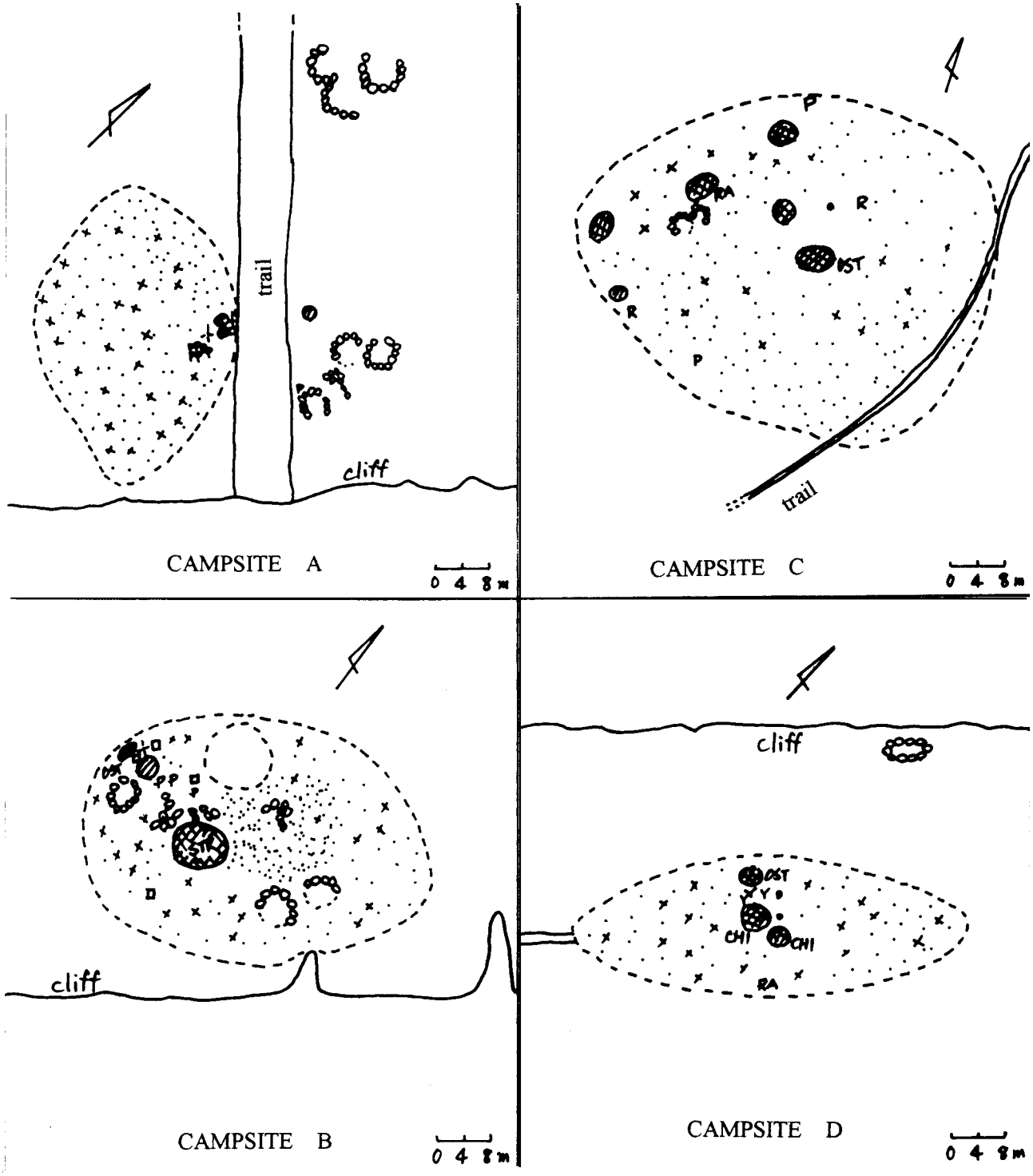

Fig. 19A. Campsites a-d, J-69 (symbols shown in the Figure 19B).

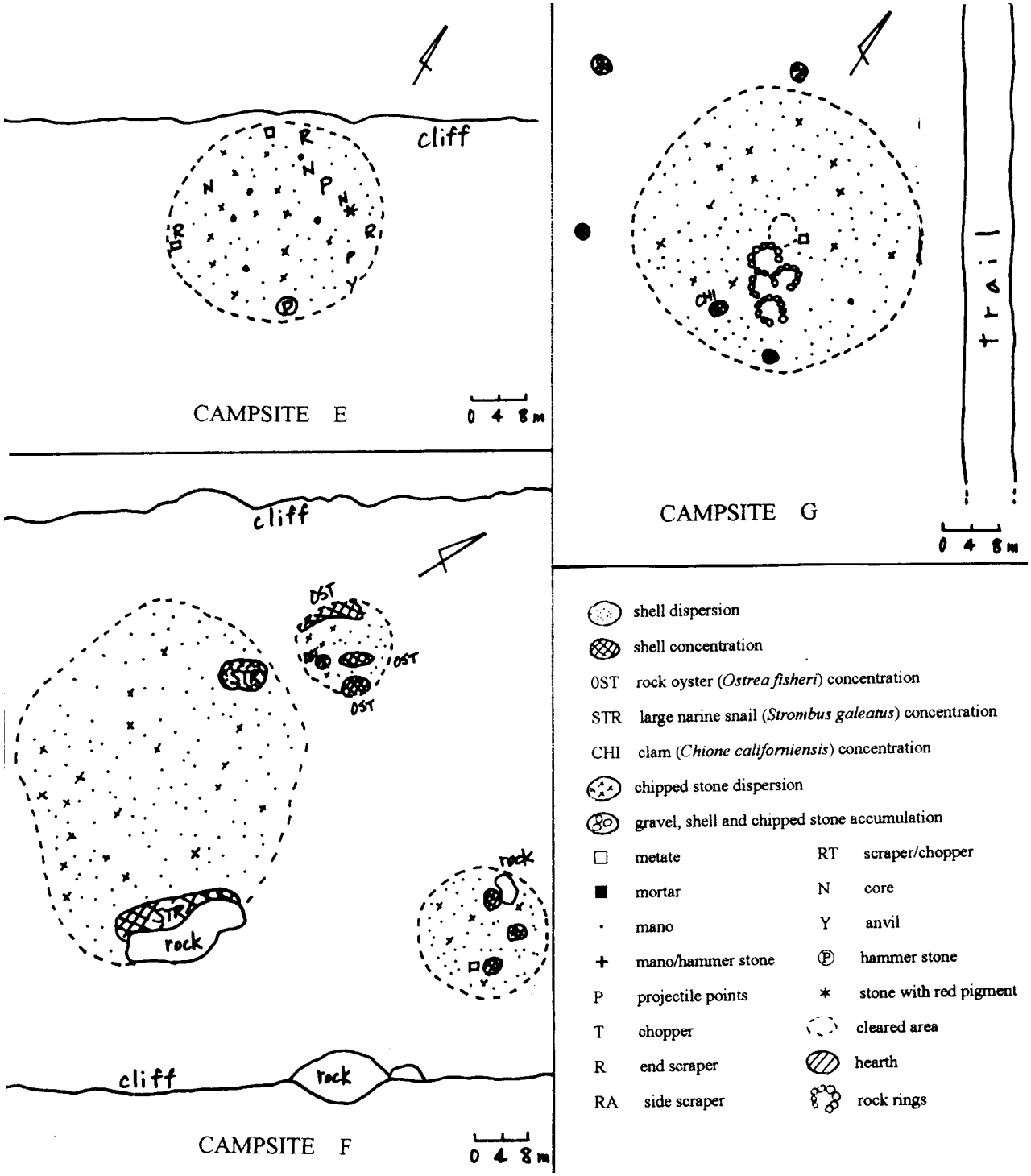

Fig. 19B. Campsites e-g, J-69.

feature found adjacent to campsite D, near the edge of the slope, could have had a different function since this feature was made by clearing rocks forming a rectangular hole, rather than by arranging rocks in a cleared area. This single rock feature might have a function similar to rock rings in the Bahía Concepción reported by Ritter (1981:39). Ritter proposed that this type of rock ring was used as a hunting blind.

Numerous basaltic grinding stones were observed in J-69: 14 metates, 5 mortars, 13 manos, and 3 mano/hammerstones. Four mortars were part of the rocky surface of Campsite A (Fig. 20). This site contains more than 50 per cent of all manos and mano/hammerstones. Of the chipped stone lithics, the 20 projectile points (most fragmented and one preform) recovered here constitute 80 per cent of all found. Also present were other instruments such as choppers, end and side scrapers, and lithics related to manufacture debris. Shell remains were dispersed in each campsite; concentrations of certain species also were found. In Campsite A, concentrations of rock oyster (*Ostrea fisheri*), *Chama frondosa*, and large and medium marine snail (*Hexaplex erythrostomus*) are present. In Campsite D, two concentrations of clams (*Chione californiensis*) and rock oyster were found. In Campsite F, the large marine snails are concentrated.

Fig. 20. Double mortar found in campsite A, J-69.

Fig. 21. Underwater stone alignments in La Ballena Bay.

Moreover, submarine stone alignments detected in La Ballena Bay probably served to trap fish (Fig. 21). All these factors could have favored establishment of a socio-economic and ideological center in which the people, materials, technology, and diverse kinds of information were concentrated in the prehispanic era. This site may correspond to a settlement with 300 people reported by Esteban Carbonel de Valenzuela, a crew member of Captain Francisco de Ortega in September, 1633 (Mathes1970: document 37).

The discovery of non-local deer remains, evidence of foreign manufacturing technique on some projectile points (two serrated points characteristic of Comondú Culture and an elongated La Paz point were recovered), the rock painting methods, and the burial preparation which probably started on the peninsula suggest possible interchange with mainland groups. However, as Yesner (1982:42) points out, an island has an advantage for joining all kinds of marine fauna and fowl, since the mixture of deep, nutrient-rich cold waters with surface warm water is the ideal habitat for a multitude of fish species. This process is greatest where the water passes between islands or through a channel. This applies well to the western side of the island which contains various small islets. Therefore, it is certain that the inhabitants of Espíritu Santo and La Partida islands enjoyed marine resources complemented by terrestrial ones, plus drinkable water year-round.

Discussion

Although we are awaiting radiocarbon dating on shell samples to give chronological context to these sites, our analysis of the predominant shell species and quantities in each site and in six test pits from five different sites permits us to classify most of the sites by shell type and hypothesize occupation periods and site stability as follows.

Group 1 Sites and Shell Composition

Shell remains in Group 1 sites consist primarily of large and heavy shells (principally more than 10 cm long) that inhabit a rocky deep sea bottom, such as rock oyster, pearl oyster, *Chama frondosa* and/or large marine snail. *Spondylus princeps, Spondylus calcifer* and/or *Lyropecten subnodosus* are also found in some Group 1 sites located in the central and northwestern parts of the islands. The amount of these shell remains is remarkable in many Group 1 sites, especially on the western coast. Of the 95 sites in which predominant species were detected, 49 sites are Group 1 (51.6 per cent). Pearl oyster remains were more abundant in the southwestern bays, while rock oyster remains were more frequent in the central and northwestern parts. These deposits seem to reflect the typical subsistence strategy in the late period in spite of the massive pearl exploitation of the 17th century. The test pit excavated in rock shelter J-47 shows intensive exploitation of pearl oysters from the surface through the lowest level VI. This species represents 70-100 per cent of the bivalves found in each level. However, these shells were found in ashy sand, and basalt flakes were present in almost every level, suggesting the use of fire and lithics to open the shells. We feel these shells were used primarily for food and secondarily for pearls. The native people fluted pearls so they could be tied, along with seeds, nuts and shells, on necklaces. For the Europeans, however, brilliant well- shaped pearls were the main goal and they opened shells with metal knives. The smoked and fluted pearls were not prized by them. Moreover, there are many sites in which pearl oyster remains are found along with other large food shells. It seems that in the majority of the sites these large shell deposits cover those of the earlier periods. This evidence was detected in three test pits (rock shelters J-17 and J-18 and shell midden J-40 pit #2).

Group 2 Sites and Shell Composition

Group 2 sites are composed of smaller shells and snails that inhabit a shallow sandy sea bed in the estuary areas or a coastal lake with mangroves. Generally they are characterized by clams (*Chione californiensis* and/or *Chione undatella*), mangrove oyster (*Ostrea palmula* and/or *Ostrea conchaphila*) and snails (*Strombus granulatus* and/or *Strombus gracilior*). Other frequent species with the same habitat in some sites are *Megapitaria aurantiaca*, *Megapitaria squalida, Glycymeris gigantea, Glycymeris maculata*, *Argopecten circularis*, *Modiolus capax*, *Anadara multicostata* and *Turbo fluctuosus*. These shells are found in large quantities at the riverine ends of the estuaries and also in an open site located in the *meseta* (elevated flat land) near the ridge of the cliffs. In Campsites D and E of J-69, *Chione californiensis* is the most

common species. This species is also predominant in Campsite A, and a concentration of *Strombus granulatus* is exposed on the rocky bed in Campsite B of J-94. Fifteen sites contain shells corresponding to this group (15.8 per cent). This value is relatively high considering that most of the deposits of this period were found beneath those of the late period. Four test pits (J-17, J-18, test pit #2 of J-40, and J-41) show evidence of the earlier deposits. Test pit #1 in J-40 and J-41 reveals a predominance of these shell remains in all levels. We assume that the sites which contain shells of this group belong to the earlier period. However, the J-17 test pit indicates different shell composition below the shell layer of Group 2 in the lowest levels, which consists of the large bivalves *Anadara multicostata, Glycymeris gigantea* and *Dosinia ponderosa*. These species also inhabit the shallow sandy sea bed in estuary areas. These shells are larger than contemporary ones and seem to be related to the earliest occupation on the island. In some sites, a small snail (*Nerita scabricostata*) was observed. This snail attaches to rocks in the intertidal zone.

Group 3 Sites and Shell Composition

In Group 3 sites, shell remains consist of a combination of Groups 1 and 2; however, in some cases, other shells also were observed. Thirty-one sites were classified as this group (32.6 per cent). Evidence suggests that this group:

a) May reflect shellfish gathering from various habitats in the late period.
b) May indicate seasonality in the late period.
c) May reflect shellfish gathering from various occupation periods.

At J-67 the shell remains found on the surface could be a result of a) and b). At J-69 and J-94 the shell remains found on the rocky surface and the campsites are located separately. Some of them show Group 2 shell composition that may indicate c). The two test pits in J-40 reveal that some portions of the site retain the deposits of the earlier periods, while in other portions late period deposits cover earlier ones. The test pit in J-41 revealed the predominance of Group 2 shells in the subsoil, although the Group 1 shells were observed to a certain degree. This may indicate brief occupation in this cave site in the late period.

Thirty sites contain few shell remains and may have been used for short occupations of various caves or rock shelters in the higher slopes or further from the coast. In general the amount of Group 1 shells is high in many sites, as well as in the upper layers of the J-17 and J-18 test pits and J-40 (pit #2). The amount of pearl oyster shells was extremely high in test pit J-47 showing the intensive exploitation of this species in the late period. Shell composition change was clearly observed in J-17, J-18, and J-40 (pit #2) test pits and slightly in the J-41 test pit. Large quantities of Group 2 shells were found below Group 1 shell layers in test pits in J-17, J-18 and J-40 (pit #2). However, the J-17 test pit gave evidence of an earlier period with different shell composition. The quantity of Group 2 shells observed in the test pits was as high as that of the Group 1 shells in the upper levels of the test pits. However, Group 1 sites are more numerous in the western side of the island. Thus, it is likely that these differences in

shell composition reflect shellfish gathering strategies rather than seasonality. In short, the principal shellfish collected in the earlier periods were those which inhabit the shallow sandy seabed in the estuary zone. They would have been collected easily by women and children. In other estuary areas in the peninsula, shell species belonging to Group 2 were recorded in extraordinary amounts in the sites located in Bahía de las Ánimas (Ritter et al. 1994:1-23) and in El Conchalito in La Paz (Fujita and Rosales 1997).

In Espíritu Santo and La Partida islands, the principal shellfish exploited on a large scale in the late period were those which inhabit the deep rocky seabed outside the bays. These shellfish contain much more edible flesh than the Group 2 shells, although it is more difficult to extract. To exploit these shells intensively, we assume that groups of highly skilled divers were formed and that technology related to the manufacture of rafts and tools to extract the shellfish occurred. This strategy might have been developed as a result of an increase in population and/or an influence from the peninsular groups. There may have been an exchange system for some foods and other resources. These hypotheses can be made on the basis of cultural comparisons with coastal sites on the peninsula and with ethnohistorical documents (Mathes 1970, 1974; Fujita 1985, 1998). The La Ballena Complex probably functioned as a socio-economic and ideological center to organize both subsistence activities and ceremonial affairs related to religion, funerals, and festivities in the late period. The rock rings found in the open sites and shell middens located near the coast were probably principal habitation areas in the late period. The caves were used during rainy or windy days and some also served as a place to process shellfish and plant foods. Special small hidden caves were selected for funeral purposes. The elaborate rock paintings in J-85 seem to reflect the ideology of the group in the late period. In addition, the network of trails connecting various sites supports the importance of this complex.

We now face some contradictions between the ethnographic descriptions and archaeological evidence with respect to the pearl oyster exploitation season. According to historical sources, pearl oysters were mainly gathered in July, August, and September when sea water was warm enough for the divers (Barco 1973:137-139). Feldman (1969:167), citing Malkin, estimates that *Pinctada mazatlanica, Ostrea fisheri, Spondylus princeps, Lyropecten subnodosus*, etc., were collected in the summer, while *Ostrea palmula, Cardita affinis, Arca pacífica, Modiolus capax, Strombus gracilior, Polinices recluzianus, Hexaplex erythrostomus, Turbo fluctuosus*, etc., were collected in the winter. On the other hand, Drover (1974) analyzed growth lines of *Chione undatella* and *Chione fluctifraga* from a shell midden at Newport Bay in southern California, and concluded that these shellfish were gathered principally in the winter. In Espíritu Santo, the archaeological evidence shows no seasonality pattern. On the contrary, our evidence seems to indicate shellfish gathering differences over time. Fishing and sea mammal hunting should have played an important role according to the historical sources and the results of the stable isotopic analysis. Lithic tool and raft manufacture should have been well organized in the late period as well as exchange systems between the peninsular groups. These aspects were not resolved in this survey. There are many issues yet to be clarified.

Survey in the mountain area, large scale excavations, analysis of faunal remains, radiocarbon dating, and analysis of growth-line of shells are necessary to know more about the archaeology of Espíritu Santo and La Partida islands.

According to historical sources, Pericu Isleño was the historic group that inhabited the island. Thus, it is probable that the Pericues developed the Las Palmas Culture in the late period. The stratigraphy of the J-17 test pit shows three different shellfish exploitation strategies, suggesting the presence of earlier adaptations. However, we can now define other previously unclear aspects of the Las Palmas Culture. The socio-economic and ideological center La Ballena Complex headed by J-69 La Ballena #3 site and the group of sites located between La Ballena Bay and El Puertecito Bay is a model for deciphering activities related to both subsistence and ideology of the Las Palmas Culture.

Conclusion

A systematic survey and test excavations at various sites permit us to assume several settlement patterns on the island. Although we don't know much about the earliest human occupation, we found a layer of large shell (*Anadara multicostata*, *Glycymeris gigantea* and *Dosinia ponderosa*) in the lowest levels in the J-17 cave test pit. These shells were much larger than the same species in later periods. In this early period, the human population might have been very small.

The next period is characterized by smaller shells (*Chione californiensis* and/or *Chione undatella*), mangrove oyster (*Ostrea conchaphila* and/or *Ostrea palmula*), and/or snails (*Strombus granulatus* and/or *Strombus gracilior*). These shells could have been collected easily by women and children. It seems that there was a gradual increase in population reflected in the number of the sites spread over the littoral fringe, mainly in the estuary area and in the caves or rock shelters and even in some open sites on mesetas. Grinding stones (metates, mortars, and manos) seem to have appeared in this stage. The subsistence and consumption unit might have been each bay, using the caves and rock shelters for preparation, consumption, and sleeping. It seems that shell middens near the mangrove coast were collection sites for small shellfish. One unit might have moved to another bay after having gathered the food resources to a certain extent in order to expect the resources for the next seasons. This movement could be circulative among the bays. Most of the deposits from this period are covered by those corresponding to the late period, The shell composition change during the earlier periods could be caused by natural factors, such as climatic fluctuation or sea level change, although more studies are necessary to determine the natural and human factors.

The late period, which probably started ca. A.D. 1200, is characterized by the intensive exploitation of large shells that inhabit a deep rocky seabed. The principal prey are rock oyster (*Ostrea fisheri*), pearl oyster (*Pinctada mazatlanica*), *Chama frondosa* and/or large marine snails (*Strombus galeatus*). It seems that this shell composition change was caused principally

by human factors. It appears that a massive exploitation was necessary to support an increased population. The settlement patterns might have become more centralized and the major subsistence strategy in the islands might have been determined in the La Ballena Complex. As historical documents describe (Mathes 1974: document 38), teams of divers using rafts would have formed and technology related to the manufacture of rafts and tools to extract those shells might have flourished. Also, ideological expressions would have developed to unite the group, as shown in the funeral caves corresponding to the Las Palmas Culture, rock paintings, and the trail network clearly observed in La Ballena Complex.

Finally, we emphasize to the public and the authorities the necessity to conserve the archaeological sites of these islands. These sites permit us to understand the evolution of the maritime adaptation and settlement patterns of these early peoples to compare with other cultural manifestations of the Cape region. However, this rich cultural legacy is in danger. We hope that all citizens are proud of this archaeological legacy and raise consciousness to conserve these islands as an archaeological reserve.

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Appendix Table 1. Site characteristics.

Site	Site name	Site type	Site size (m2)	Geomorphic situation	Water source	Archaeological elements	Mollusc distribution	Dominant molluscs	Lithic distribution
J-1	Punta Lupona	shell middens	800	dune	estuary	S L B(a) A C	regular	ARG.c PIN.m	few
J-2	Las Navajas 1	habitational open camp sites	760	plain	estuary	S H RL W	regular	CHA.f PIN.m	absent
J-3	Las Navajas 3	habitational caves or rock shelters	11.5	slope	estuary	S W	few		absent
J-4	Las Navajas 3	habitational caves or rock shelters	9	slope	estuary	S L	few	PIN.m	few
J-5	Las Navajas 4	habitational caves or rock shelters	7.5	slope	estuary	S L W	few	CHA.f PIN.m	few
J-6	La Dispensa I-1	habitational caves or rock shelters	10	slope	estuary	S	few		absent
J-7	La Dispensa I-2	habitational caves or rock shelters	34	slope	estuary	S L	few	PIN.m	regular
J-8	La Dispensa I-3	habitational caves or rock shelters	14	slope	estuary	S B(a)	few		absent
J-9	La Dispensa I-4	habitational caves or rock shelters	42	slope	estuary	S L	few	CHA.f PIN.m	few
J-10	La Dispensa I-5	habitational caves or rock shelters	9.5	slope	estuary	S	few		absent
J-11	La Dispensa II-1	habitational caves or rock shelters	5	slope	none within 100 m	S L M	few		few
J-12	La Dispensa II-2	habitational caves or rock shelters	6	slope	none within 100 m	S	few	CHA.f PIN.m	absent
J-13	La Dispensa II-3	habitational caves or rock shelters	21	slope	none within 100 m	S L M	few	CHA.f OST.c PIN.m	few
J-14	La Dispensa II-4	habitational open camp sites	800	beach	none within 100 m	S RL CA	regular	CHA.f CHI.u PIN.m	absent
J-15	La Dispensa II-5	habitational caves or rock shelters	10	slope	none within 100 m	S L M	few	CHI.c	few
J-16	La Dispensa II-6	habitational caves or rock shelters	7	slope	none within 100 m	S	few		absent
J-17	La Dispensa II-7	habitational caves or rock shelters	29	slope	none within 100 m	S L	very abundant	CHA.f PIN.m	regular
J-18	La Dispensa II-8	habitational caves or rock shelters	8.5	slope	none within 100 m	S L	regular	CHA.f PIN.m	few
J-19	La Dispensa II-9	habitational caves or rock shelters	13	slope	none within 100 m	S L	few		few

Appendix Table 1. Site characteristics, continued.

Site	Site name	Site type	Site size (m2)	Geomorphic situation	Water source	Archaeological elements	Mollusc distribution	Dominant molluscs	Lithic distribution
J-20	La Dispensa II-10	habitational caves or rock shelters	30	slope	none within 100 m	S L M	few	PIN.m	few
J-21	San Gabriel 1	habitational caves or rock shelters	23	slope	estuary	S	few		absent
J-22	San Gabriel 2	habitational caves or rock shelters	21.5	slope	estuary	S B(h,a)	few	CHI.c PIN.m	absent
J-23	San Gabriel 3	habitational caves or rock shelters	22	slope	estuary	S	few	PIN.m	absent
J-24	San Gabriel 4	habitational caves or rock shelters	36.5	slope	estuary	S L M	few	OST.c PIN.m	few
J-25	San Gabriel 5	shell middens	350	dune	estuary	S L A	very abundant	CHA.f CHI.c PIN.m	regular
J-26	San Gabriel 6	shell middens	750	beach	estuary	S L	very abundant	CHA.f PIN.m ST.ga	few
J-27	San Gabriel 7	habitational caves or rock shelters	11	slope	estuary	S L	few	PIN.m	few
J-28	San Gabriel 8	habitational caves or rock shelters	21.5	slope	estuary	S L	regular	PIN.m	regular
J-29	San Gabriel 9	habitational caves or rock shelters	40	slope	estuary	S L B(a) M	regular	CHI.c PIN.m	few
J-30	San Gabriel 10	habitational caves or rock shelters	24.5	slope	estuary	S L B(h,a) C	regular	PIN.m	few
J-31	San Gabriel 11	habitational caves or rock shelters	61	slope	estuary	S L B(a)	few	CHI.c PIN.m	few
J-32	San Gabriel 12	habitational caves or rock shelters	34.5	slope	estuary	S L	few		few
J-33	San Gabriel 13	habitational caves or rock shelters	51.5	slope	estuary	S L SA	abundant	PIN.m	few
J-34	San Gabriel 14	habitational caves or rock shelters	17.5	slope	estuary	S	regular	PIN.m	absent
J-35	San Gabriel 15	habitational caves or rock shelters	26.5	slope	estuary	S L	regular	PIN. m	few
J-36	San Gabriel 16	habitational caves or rock shelters	39	slope	estuary	S	regular		absent
J-37	San Gabriel 17	habitational caves or rock shelters	37	slope	estuary	S	regular	PIN.m	absent
J-38	San Gabriel 18	shell middens	100	beach	estuary	S A	very abundant	PIN.m ST.ga	absent

Appendix Table 1. Site characteristics, continued.

Site	Site name	Site type	Site size (m2)	Geomorphic situation	Water source	Archaeological elements	Mollusc distribution	Dominant molluscs	Lithic distribution
J-39	La Gallina 1	shell middens	3900	beach	estuary	S L M Pp H	abundant	CHA.f OST.c PIN.m ST.ga	regular
J-40	La Gallina 2	shell middens	1500	beach	estuary	S L	abundant	PIN.m	few
J-41	La Gallina 3	habitational caves or rock shelters	20	slope	estuary	S L B(a) M	regular	OST.c PIN.m	few
J-42	La Gallina 4	habitational caves or rock shelters	45.5	slope	estuary	S L M	regular	OST.c PIN.m	regular
J-43	La Gallina 5	habitational caves or rock shelters	37	slope	estuary	S L M	regular	PIN.m	few
J-44	La Gallina 6	habitational caves or rock shelters	24	slope	estuary	S L M	abundant	PIN.m	few
J-45	La Gallina 7	habitational caves or rock shelters	18	slope	estuary	S L M	regular	CHA.f PIN.m	few
J-46	La Gallina 8	habitational caves or rock shelters	145.5	slope	estuary	S L Cc	regular		few
J-47	La Gallina 9	habitational caves or rock shelters	33.5	slope	estuary	S B(a)	very abundant	PIN.m	absent
J-48	La Gallina 10	shell middens	34	slope	estuary	S	abundant	PIN.m	absent
J-49	La Gallina 11	shell middens	160	slope	none within 100 m	S	regular		absent
J-50	El Gallo I-1	shell middens	360	beach	none within 100 m	S	regular		absent
J-51	El Gallo I-2	habitational caves or rock shelters	25.5	slope	none within 100 m	S	few		absent
J-52	El Gallo I-3	shell middens	200	slope	none within 100 m	S	few	ST.gn	absent
J-53	El Gallo I-4	habitational caves or rock shelters	15	slope	none within 100 m	S L	few		few
J-54	El Gallo I-5	shell middens	5600	plain	none within 100 m	S	abundant	PIN.m CHI.c	few
J-55	El Gallo I-6	habitational caves or rock shelters	24.5	slope	none within 100 m	S L	regular	MEG.a TUR.f	few
J-56	El Gallo I-7	habitational caves or rock shelters	12	slope	none within 100 m	S L	regular		few
J-57	El Gallo I-8	habitational caves or rock shelters	34	slope	none within 100 m	S L	regular		few

Appendix Table 1. Site characteristics, continued.

Site	Site name	Site type	Site size (m2)	Geomorphic situation	Water source	Archaeological elements	Mollusc distribution	Dominant molluscs	Lithic distribution
J-58	El Gallo I-9	shell middens	420	beach	none within 100 m	S	regular		absent
J-59	El Gallo I-10	habitational caves or rock shelters	17.5	slope	none within 100 m	S L	very abundant		few
J-60	El Gallo I-11	habitational caves or rock shelters	20.5	slope	none within 100 m	S	regular	CHI.c GL.gi OST.c	absent
J-61	El Gallo I-12	habitational caves or rock shelters	35	slope	none within 100 m	S L C A	regular		few
J-62	El Gallo I-13	habitational caves or rock shelters	9	slope	none within 100 m	S	regular	MEG.s OST.c	absent
J-63	El Gallo I-14	shell middens	2900	beach	none within 100 m	S	regular		absent
J-64	El Gallo II-1	shell middens	6700	beach	none within 100 m	S	regular	CHA.f SPO.p OST.f ST.ga	absent
J-65	El Gallo II-2	habitational caves or rock shelters	37.5	slope	none within 100 m	S L M C	regular	CHI.u OST.c	abundant
J-66	El Gallo II-3	shell middens	2500	beach	none within 100 m	S	regular	PIN.m CHI.c. ST.gn	absent
J-67	Ballena 1	habitational open camp sites	66000	beach & foot of hill or a mt.	estuary	S L M B(t)RL CA	very abundant	CHI.c OST.f PIN.m SPO.p	abundant
J-68	Ballena 2	habitational caves or rock shelters with paintings	120	slope	estuary	S L M P(g)	regular	CHI.c	few
J-69	Ballena 3	habitational open camp sites with trails	1000000	meseta	tinaja	S L M Pp Prp H RL CA T	abundant	CHA.f CHI.c GL.gi MEG.a OST.f PIN.m ST.ga	abundant
J-70	Las Calaveritas 1	habitational caves or rock shelters	20	slope	tinaja	S L M	few	CHI.c	regular
J-71	Las Calaveritas 2	habitational caves or rock shelters	22	slope	tinaja	S L M	few	CHI.c OST.f	few
J-72	Las Calaveritas 3	habitational caves or rock shelters	17	slope	tinaja	S L M	few	CHI.c	regular
J-73	Las Calaveritas 4	habitational caves or rock shelters with burials	200	slope	tinaja	L M B(h)	none		very few

Appendix Table 1. Site characteristics, continued.

Site	Site name	Site type	Site size (m2)	Geomorphic situation	Water source	Archaeological elements	Mollusc distribution	Dominant molluscs	Lithic distribution
J-74	Las Calaveritas 5	exclusively funerary caves	11	slope	tinaja	S L M Pp B(h, b, f, a)	few		few
J-75	Las Calaveritas 6	habitational caves or rock shelters	40	slope	tinaja	S L M	few		regular
J-76	Las Calaveritas 7	habitational caves or rock shelters	12	slope	tinaja	S L M	few	OST.f PIN.m	abundant
J-77	Las Calaveritas 8	habitational caves or rock shelters	25	slope	tinaja	S L M	few	PIN.m	very few
J-78	Las Calaveritas 9	exclusively funerary caves	3	slope	tinaja	B(h,a) W	none		very few
J-79	Las Calaveritas 10	habitational caves or rock shelters	60	slope	tinaja	S L	regular	GL.gi OST.f PIN.m NER.s	regular
J-80	Las Calaveritas 11	habitational caves or rock shelters	25	slope	tinaja	S L	few		very few
J-81	Las Calaveritas 12	habitational caves or rock shelters	30	slope	tinaja	S L	regular	CHA.f OST.f PIN.m	very few
J-82	El Puertecito 1	habitational open camp sites with trails	6500	meseta	tinaja	S L M CA	regular	CHI.c OST.f ST.ga	very abundant
J-83	El Puertecito 2	habitational caves or rock shelters	55	slope	tinaja	S L	few	OST.f	regular
J-84	El Puertecito 3	shell middens	1200	marine terrace	tinaja	S L	abundant	CHA.f OST.f PIN.m SPO.c	regular
J-85	El Puertecito 4	habitational caves or rock shelters with paintings	180	slope	tinaja	S L M P(g)	regular	OST.f PIN.m	regular
J-86	El Puertecito 5	habitational caves or rock shelters	125	slope	tinaja	S L M	regular	CHI.c CHI.u LYR.s OST.f PIN.m SPO.c SPO.p	regular
J-87	El Puertecito 6	habitational caves or rock shelters	26	slope	tinaja	S L M	few	OST.f PIN.m	few
J-88	El Puertecito 7	exclusively funerary caves	32	slope	tinaja	S B(h,a)	few		few

Appendix Table 1. Site characteristics, continued.

Site	Site name	Site type	Site size (m2)	Geomorphic situation	Water source	Archaeological elements	Mollusc distribution	Dominant molluscs	Lithic distribution
J-89	El Candelero Sur 1	habitational open camp sites	14000	beach	estuary	S L RL CA	abundant	CHA.f OST.f PIN.m SPO.c SPO.p	abundant
J-90	El Candelero Sur 2	habitational caves or rock shelters	42	slope	estuary	S L	regular	OST.f PIN.m SPO.s SPO.p	few
J-91	El Candelero Sur 3	habitational caves or rock shelters	168	slope	estuary	S L Cc H M	regular	OST.f PIN.m	few
J-92	El Candelero Sur 4	habitational caves or rock shelters	120	slope	estuary	S L B(a) H	regular	PIN.m SPO.c	regular
J-93	El Candelero Norte	shell middens	6000	beach	estuary & spring	S L Pp	abundant	CHI.c OST.f PIN.m	regular
J-94	El Gallo III-1	habitational open camp sites with trails	147000	meseta	wash	S L M H T	abundant	CHI.c CHI.u OST.f SPO.p ST.ga ST.gn	regular
J-95	El Gallo III-2	shell middens with trails	5300	meseta	wash	S L H CA T	regular		few
J-96	El Gallo III-3	habitational caves or rock shelters	30	slope	wash	S L W	regular	OST.f PIN.m	few
J-97	El Gallo III-4	habitational caves or rock shelters	140	slope	wash	S L M	regular	OST.f PIN.m	abundant
J-98	El Gallo III-5	habitational caves or rock shelters	60	slope	wash	S L M	few	OST.f PIN.m	few
J-99	El Gallo III-6	habitational caves or rock shelters	32	slope	wash	S L	few		very few
J-100	Ensenada de la Partida 1	habitational open camp sites	5400	beach & foot of hill or a mt.	none within 100 m	S L M B(f,d,a) H RL	abundant	ANA.m	regular
J-101	Ensenada de la Partida 2	habitational caves or rock shelters	6	slope	none within 100 m	S L	regular	OST.f	few
J-102	Ensenada de la Partida 3	habitational caves or rock shelters	40	slope	none within 100 m	S L	regular	OST.f	few
J-103	Ensenada de la Partida 4	habitational caves or rock shelters	78	slope	none within 100 m	S L M	regular	OST.f	few
J-104	El Cardonal 1	shell middens	1000	slope	estuary	S	regular	NER.s ST.gn	absent

Appendix Table 1. Site characteristics, continued.

Site	Site name	Site type	Site size (m2)	Geomorphic situation	Water source	Archaeological elements	Mollusc distribution	Dominant molluscs	Lithic distribution
J-105	El Cardonal 2	shell middens	1500	plain	estuary	S L M H B(a)	regular	PIN.m CHA.f OST.f MOD.c ST.gn	abundant
J-106	El Cardonal 3	shell middens	30000	dune	wash	S L	abundant	PIN.m ST.ga	few
J-107	El Cardonal 4	habitational caves or rock shelters	23	slope	wash	S L M	abundant	PIN.m ST.gn	very few
J-108	Ensenada Grande 1	habitational caves or rock shelters	15	slope	tinaja	S L	few	ST.ga ST.gc	very few
J-109	Ensenada Grande 2	habitational caves or rock shelters	32	slope	tinaja	S L B(t, f, b)	regular	OST.f PIN.m ST.ga ST.gc	very few
J-110	Ensenada Grande 3	habitational caves or rock shelters	20	slope	tinaja	S L	regular	OST.f PIN.m ST.ga ST.gc	very few
J-111	Ensenada Grande 4	habitational caves or rock shelters	42.4	slope	tinaja	S L	regular	OST.f PIN.m ST.ga ST.gc	few
J-112	Ensenada Grande 5	habitational caves or rock shelters	18	slope	tinaja	S L M	few	OST.f PIN.m ST.ga ST.gc	few
J-113	Ensenada Grande 6	habitational caves or rock shelters	168	slope	tinaja	S L M	regular	OST.f PIN.m ST.ga ST.gc	few
J-114	Ensenada Grande 7	shell middens	3000	dune	estuary	S L	abundant	CHI.c OST.f PIN.m	regular
J-115	Ensenada Grande 8	habitational caves or rock shelters	50	slope	none within 100 m	S L	regular	OST.f SPO.c	regular
J-116	Ensenada Grande 9	shell middens	1000	dune	estuary	S L	few		few
J-117	Ensenada Grande 10	habitational caves or rock shelters	70	slope	estuary	S L M	abundant	OST.f	regular
J-118	Embudo	shell middens	50	slope	none within 100 m	S	regular	OST.f	absent
J-119	Punta Lupona 2	shell middens	800	dune	none within 100 m	S Cc	regular		absent
J-120	La Bonanza	shell middens	18000	dune & fluvial terrace	intermittent stream	S L M H	abundant	GL.gi GL.ma OST.f PIN.m	regular
J-121	La Bonanza Norte	shell middens	62000	dune & plain	spring & estuary	S L M Mrp H	abundant	CHA.f OST.f PIN.m	abundant

Appendix Table 1. Site characteristics, continued.

Site	Site name	Site type	Site size (m2)	Geomorphic situation	Water source	Archaeological elements	Mollusc distribution	Dominant molluscs	Lithic distribution
J-122	Faro la Bonanza	shell middens	77000	dune & plain	intermittent stream	S L Pp	regular	GL.gi	regular
J-123	La Lagunita 1	shell middens	1700	lacustrine terrace	coastal lake	S L M CA	regular	CHI.u	regular
J-124	La Lagunita 2	shell middens	1400	lacustrine terrace	coastal lake	S L	few		few
J-125	La Lagunita 3	shell middens	1000	fluvial terrace	coastal lake	S L	regular	CHI.u OST.c	few
J-126	La Lagunita 4	habitational caves or rock shelters	1200	lacustrine terrace	coastal lake	S L M	abundant	CHA.f CHI.u OST.c OST.f	few
J-127	La Lagunita 5	shell middens	2.5	slope	coastal lake	S	regular	ANA.m CHI.c CHI.u HEX.e	absent

Key for archaeological elements

A	ash
B(a)	animal bone
B(b)	bird bone
B(d)	dolphin bone
B(f)	fish bone
B(h)	human bone
B(t)	turtle bone
C	charcoal
CA	cleared areas
Cc	ceramics
H	hearth
L	lithics
M	metates, mortars, and/or manos
Mrp	metate with red pigment
P(g)	rock painting (geometric figures)
Pp	projectile points
RL	rock rings
S	shell remains
SA	submarine stone alignments
Srp	stone with red pigment
T	trails
W	rock walls

Key for dominant molluscs

bivalves:

ANA. m	*Anadara multicostata*
ARG. c	*Argopecten circularis*
CHA. f	*Chama frondosa*
CHI. c	*Chione californiensis*
CHI. u	*Chione undatella*
GL. gi	*Glycymeris gigantea*
GL ma	*Glycymeris maculata*
LYR. s	*Lyropecten subnodosus*
MEG. a	*Megapiraria aurantiaca*
MEG. s	*Megapitaria squalida*
MOD. c	*Modiolus capax*
OST. c	*Ostrea conchaphila*
OST. f	*Ostrea fisheri*
PIN. m	*Pinctada mazatlanica*
SPO. c	*Spondylus calcifer*
SPO. p	*Spondylus princeps*

gasteropods:

HEX. e	*Hexaplex erythrosromus*
NER. s	*Nerita scabricostata*
ST. ga	*Strombus galeatus*
ST. gn	*Strombus gracilior*
TUR. f	*Turbo fluctuosus*