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Results of the Puritan-American Museum of Natural History Expedition to Western Mexico

12. Shell Middens of San José Island

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INTRODUCTION

The present paper records extraordinarily large deposits of Recent shells from the vicinity of Amortajada Bay, San José Island, Baja California. The island was briefly visited on April 28 and 29, 1957.² Observations made in the field and a study of the composition of these shell heaps indicate that the deposits are aboriginal midden sites. Although shell middens are known elsewhere from numerous places in the region of the Gulf of California, none of the previously reported sites approaches the large size of these deposits. The apparent uniqueness of the shell middens of San José Island, therefore, merits special recognition. This paper is intended only to describe the middens and to record the molluscan elements of the deposits. Formal archeological studies of the sites must await exploration of the island by anthropologists.

I am indebted to several people for kindly providing assistance in the completion of this study. Captain Henry Angelsen of the "Puritan" aided in the field work. Dr. Leo G. Hertlein of the California Academy of Sciences, Dr. William C. Massey of the University of Florida, and

¹ The American Museum of Natural History.

² For the itinerary of the expedition, see Emerson (1958).

Drs. Gordon F. Ekholm and Brian H. Mason of the American Museum of Natural History provided information of various kinds. Dr. Wallace S. Broecker of the Lamont Geological Observatory of Columbia University analyzed a shell from one of the middens for a C-14/C-16 age determination.

REVIEW OF THE LITERATURE

Although brief mention has been made by several authors of the presence of kitchen middens along both coasts of Baja California, these accounts have been largely incidental to other studies. Beal (1948,

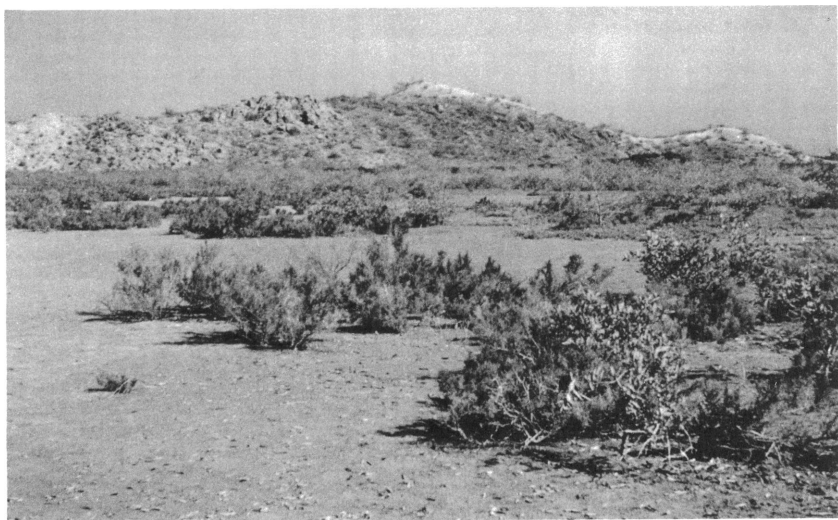


FIG. 1. Shell heaps capping the volcanic flow viewed from the salt marsh (foreground); midden of approximately 20 feet in thickness at the summit of the flow (center) and midden approximately 10 feet in thickness near the seaward end of the flow (right).

p. 28) reported shells of "Quaternary" age to be widely scattered over areas of the peninsula to elevations of about 1800 feet. In addition to his own observations, Beal also cited the common occurrence of Recent or "subfossil" marine shells at elevations of from 100 to 2300 feet reported by Angermann (1904), Böse and Wittich (1913), and Wittich (1920). Significantly, shells from elevations above 1000 feet were not found by Beal to be associated with Pleistocene terraces. Beal believed, however, that the surface deposits of loose shells were too extensive and too widespread to have been of aboriginal origin, but did not rule

out such a possibility. Unfortunately, some geologists and zoogeographers have accepted Beal's report as indicating major marine inundations of the peninsula during the Pleistocene. Actually, the available evidence strongly suggests that the accumulations of shells of Quaternary age at elevations greater than 1200 feet are not Pleistocene marine deposits, but more probably are scattered shells from kitchen middens. This controversy could easily be resolved by having the shell deposits dated by the radiocarbon method (cf. Squires, 1959, p. 400).

The common molluscan constituents of middens overlying late Pleistocene terrace deposits along the northwestern coast of Baja California



FIG. 2. Lower midden of figure 1 viewed from the summit of the flow, with the 2-foot thick midden at the seaward base of the flow terminating at the edge of the mangrove swamp (right).

have been briefly noted by Emerson (1956), Valentine (1957), and Addicott and Emerson (1959); a total of 11 species has been recorded from these sites. In a report on archeological investigations of Baja California, Massey (1947) mentioned the occurrence of numerous shell middens, including some attaining depths of 15 feet or more, but did not identify the species of mollusks.

In the Gulf of California area, shell middens are known to occur commonly from near sea level to inland areas with elevations greater than 1000 feet. Gifford (1946) records 19 species of mollusks from

three midden sites near the head of the Gulf, in the region of Punta Peñasco, Sonora. Hanna and Hertlein (1927) report "enormous numbers of shells of living species of mollusks" overlying fossiliferous beds of Pliocene age at Punta Santa Antonita, Baja California, and suggest that the shells are of kitchen-midden origin. They also record midden material, listing five species of mollusks, from Puerto Balandra, Carmen Island, Baja California. Hertlein (1957) cites four species of mollusks and the vertebrae of fish from a probable midden at Buena Vista, Baja California, at an elevation of 200 feet. Massey reports (*in litt.*) shell middens from sites along the southeastern coast of Baja California, in the region of La Paz and southward, but states that extensive deposits of middens in this region are rare.

A number of archeological samples from western North American sites have been dated by the radiocarbon method. Most pertinent to this discussion are age determinations of samples assembled by Carl L. Hubbs from sites along the coast of northwestern Baja California. Samples from five different sites reveal extremes of 300 ± 160 years B.P. for a thin, surface midden on a sand dune at San Antonio del Mar to 4030 ± 200 years B.P. for a subsurface midden overlying a marine terrace at Punta Baja (Suess, 1954).

LOCALITY DESCRIPTION

San José Island is the largest of the group of islands adjacent to the southeastern coast of Baja California. Of volcanic origin, the island is about 17 miles long and 2 to 6 miles wide. The mountainous central region attains a maximum elevation of approximately 2000 feet. The shell middens are located on the edge of Amortajada Bay (latitude $24^{\circ} 53' N.$, longitude $110^{\circ} 35' W.$), a shallow embayment on the southwestern end of the island. The inner portion of this bay is fringed by a dense growth of mangrove trees that form extensive swamps and salt flats.

The middens occur locally on the surface of a low ridge, 5 to 60 feet in elevation, composed of volcanic rocks that are apparently referable to the Comondú formation of supposedly Miocene age. The prominent rock types of the flows are a reddish rhyolite and a dark gray, hornblende andesite. Viewed from a distance (fig. 1), the ridge appears to be capped with light-colored sediments. A closer inspection, however, shows (figs. 2-4) the crest and the upper slopes of the seaward end of the ridge to be covered with a deposit composed largely of loosely compacted shells of mollusks, with a sparse amount of soil. The covering deposit locally has a maximum thickness of about 20 feet at the

peak of this part of the flow and attains a maximum thickness of 10 feet at the seaward end of the flow. A deposit of about 2 feet of shells occurs at the base of the flow, near the edge of the present mangrove swamp (fig. 2).

The soil was found to be colored locally a dark gray by volcanic ash and by small particles of charcoal. Clam shells from the lowest site retain color pigments and internal gloss. Many shells from the higher elevations were poorly preserved; some specimens, especially the pectens, on the surface of this part of the deposit were found to be badly

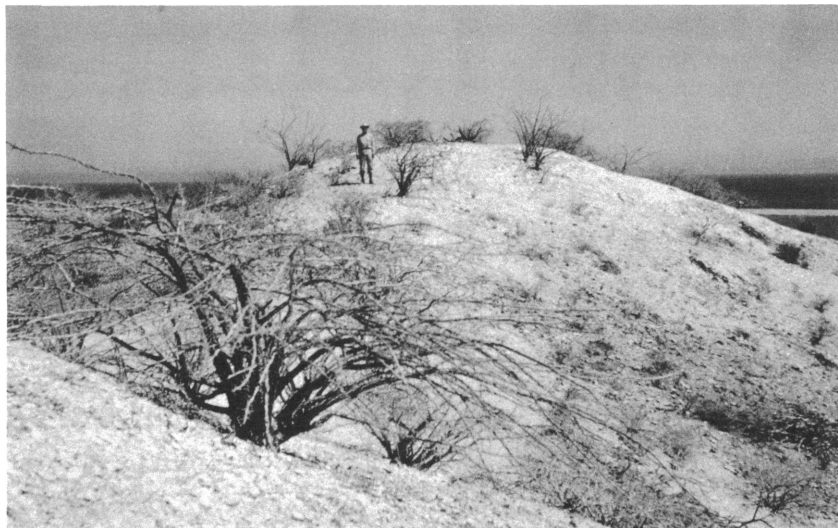


FIG. 3. Crest (background) of the 10-foot thick midden, showing the irregular surface that characterizes the shell heaps.

weathered. Small pieces of volcanic rock were rare in the surface of the middens, and none of these was recognized as an artifact.

MOLLUSCAN CONSTITUENTS OF THE MIDDENS

A total of 35 species of mollusks was collected from the middens. These include 22 species of pelecypods and 13 species of gastropods (see annotated list below). Small colonies of a stony coral, *Porites californica* Verrill, 1870,¹ were found attached to the valves of several of the large pelecypods. The mollusks and the coral are extant species that are living in the Gulf of California region at the present time.

¹ Identification courtesy of Dr. D. F. Squires.

No vertebrae of fish or other animals were noted in the deposits.

Large clam shells, especially *Ostrea fisheri*, *Lyropecten subnodosus*, *Pecten vogdesi*, *Spondylus princeps*, *Chama frondosa*, and *Pinctada mazatlanica*, appeared to be the most common constituents of the middens. Smaller pelecypods, such as *Aequipecten circularis*, *Ostrea angelica*, and *Chione californiensis*, were also noted to be very abundant. On the other hand, large gastropods were found to be extremely rare, although a special effort was made to recover them. Both of the *Strombus* shells that were found are broken, a circumstance suggesting that the soft parts had been removed. Some of the smaller snails probably were attached to the large clam shells and were incidentally carried to the midden sites by the Indians. The opercula of small-sized *Turbo* shells are common in the collection, and many of the *Turbo* shells have been broken open.

In summary, the collection is characterized by generally well-preserved specimens of locally extant species, with large clams predominating, small mollusks uncommon, and snail shells commonly broken. The nature of the collection, therefore, serves to substantiate the conclusion, based largely on observations made in the field, that these deposits were of aboriginal origin.

PELECYPODA

- Barbatia* (*Cucullaearca*) *reeveana* (d'Orbigny, 1846), common
Anadara (*Anadara*) *formosa* (Sowerby, 1833), uncommon
Glycymeris (*Glycymeris*) *gigantea* (Reeve, 1843), uncommon
Glycymeris (*Glycymeris*) *maculata* (Broderip, 1832), uncommon
Glycymeris (*Glycymeris*) *multicostata* (Sowerby, 1833), common
Modiolus capax (Conrad, 1837), rare
Pinctada mazatlanica (Hanley, 1856), very common
Ostrea angelica Rochebrune, 1895, very common
Ostrea fisheri Dall, 1914, very common
Pecten vogdesi Arnold, 1906, very common
Aequipecten (*Plagioctenium*) *circularis* (Sowerby, 1835), very common
Lyropecten (*Lyropecten*) *subnodosus* (Sowerby, 1835), very common
Spondylus princeps Broderip, 1833, very common
Anomia peruviana d'Orbigny, 1846, rare
Cardita affinis californica Deshayes, 1854, rare
Chama frondosa Broderip, 1835, very common
Trachycardium (*Trachycardium*) *consors* (Sowerby, 1833), common
Trigoniocardia (*Americardia*) *biangulata* (Broderip and Sowerby, 1829), rare
Periglypta multicostata (Sowerby, 1835), rare
Megapitaria squalida (Sowerby, 1835), common
Chione (*Chione*) *californiensis* (Broderip, 1835), very common
Chione (*Chione*) *undatella* (Sowerby, 1835), common

GASTROPODA

Diodora inaequalis (Sowerby, 1835), rare
Tegula (*Agathistoma*) *mariana* Dall, 1919, common
Turbo squamiger Reeve, 1843, common
Cerithium maculosum Kiener, 1841, rare
Cerithium stercusmuscarum Valenciennes, 1833, rare
Crepidula cf. *C. onyx* Sowerby, 1824, rare
Crucibulum spinosum (Sowerby, 1824), rare
Cypraea (*Zonaria*) *annettae* Dall, 1909, rare
Strombus galeatus Swainson, 1823, rare



FIG. 4. Portion of the surface of the largest shell heap, showing loose shells and occasional small rocks.

Strombus granulatus Swainson, 1822, rare
Muricanthus sp. indet., one fragment of a large muricid gastropod
Anachis coronata (Sowerby, 1832), rare
Conus (*Conus*) *princeps* Linné, 1758, rare

AGE OF THE MIDDENS

The large size of the middens indicates a use of the sites over a considerable period of time. The common presence of many species of mollusks that do not live in mangrove swamps suggests that either the mangroves have formed a barrier to the open sea since the midden sites were occupied, or that the Indians used canoes or some other means to reach the open water of the bay. At the present time, the

mangrove swamp extends to the base of the site of the lowest midden (fig. 2).

A specimen of *Lyropecten* from the surface of one of the higher middens was submitted to Dr. Wallace S. Broecker of the Lamont Geological Observatory to be analyzed by the radiocarbon method. This sample (L-561) was determined to be 1000 ± 80 years B.P. The better-preserved condition of specimens from the lowest site, however, suggests that it is younger than the other sites and apparently was the last one occupied. The dated sample, therefore, apparently is representative only of the period of terminal occupation of the higher sites.

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