

# Archaeological Shell Middens in the Colorado Delta: An Option for the Use of the Biosphere Reserve of the Upper Gulf of California

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## Abstract

Shell middens are the most common archaeological feature within the Biosphere Reserve of the Upper Gulf of California and the Colorado River Delta, on the coasts of Baja California and Sonora. Although they have been little studied, they provide the oldest evidence of a human presence and a key to understanding the process of colonization and modification of the natural environment. This paper describes and compares the mollusk composition at middens located at La Ciénega de El Doctor on the Sonora coast and at Campo Cristina on the coast of Baja California. Rocky coast bivalves were exploited at Campo Cristina, while species associated with soft substrates were found at La Ciénega de El Doctor. Although unspectacular, archaeological shell middens are a cultural resource with a great potential for ecotourism and educational purposes, particularly in the Biosphere Reserve, where because of restrictions on the exploitation of the natural resources they may constitute an additional source of income for the inhabitants and thus contribute to the conservation efforts.

## Introduction

The coastal areas of Baja California, both on the Pacific coast and in the Gulf of California, are characterized by a great abundance of archaeological shell midden sites. These consist of mounds formed by mollusk shells and associated with other cultural materials such as lithic and ceramic artifacts. In most cases, the archaeological deposits are not associated with structures, and only in a few cases with rock shelters containing pictographs or petroglyphs. As a result

of the sites' unspectacular character, despite their frequency, they have been little studied (Bendímez, Téllez, and Serrano 1993; DuShane 1981; Killingley 1980, 1981; Téllez 1987). Nonetheless, there are a good number of radiocarbon dates (Hubbs and Bien 1967; Hubbs, Bien, and Suess 1960, 1962, 1965), which in some cases attest to an antiquity of about 9,000 years (Gruhn and Bryan 2001) and probably as much as 40,000 years (Fujita 2002).

In addition to the great age of the shell middens, their importance lies in the information they offer for understanding the customs of the ancient inhabitants and how they exploited the natural resources, and the ecological characteristics of the environment when these human groups were present. This information is also extremely valuable for understanding the historical development and impacts to which the natural environments have been subjected.

The location of the shell middens primarily in areas accessible to the coastal zone has made them vulnerable to destruction. This zone attracts urban development, seasonal fishing camps, and tourism. In particular, the lack of control over tourism has resulted in serious damage to many shell midden sites through the

activity of off-road vehicles. However, tourism also represents one of the options for sustainable use of the coastal zone, and for that end basic studies are needed at these sites to understand how people have coexisted with their environment and to promote its conservation and use. Above all, this represents an alternative source of income for the coastal communities.

The delta of the Colorado River is a very attractive area economically because of the abundance of its fishing resources and the natural landscapes. Many endemic species inhabit the area, some of them in grave danger of extinction, including the Gulf of California harbor porpoise, totuava, and Colorado delta clam. These unusual characteristics have resulted in the designation of the delta as a Biosphere Reserve. The archaeological shell middens within the limits of the reserve as well as outside of it constitute another asset to be considered in the reserve's management plan. The present study discusses several relatively intact sites along the northern Gulf of California, the present state of investigations of them, and proposed options for their use in ecotourism, in order to educate and to promote their conservation.

### Shell Middens of the Biosphere Reserve and Nearby Areas

Two areas of shell middens are located on the Sonora coast to the north of the community of Golfo de Santa Clara (Fig. 1). The shell deposits are very shallow (Fig. 2), and they are dispersed as patches in small areas at the foot of the cliffs of the Mesa de Sonora, indicating that they were regional travel camps. This contrasts with shell middens located both to the south of Golfo de Santa Clara and on the Gulf and Pacific coasts of Baja California, where extensive and dense accumulations may reach several meters in thickness, implying that the settlements those areas were more stable, even lasting several millennia.

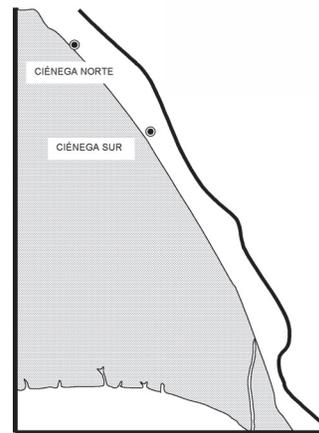
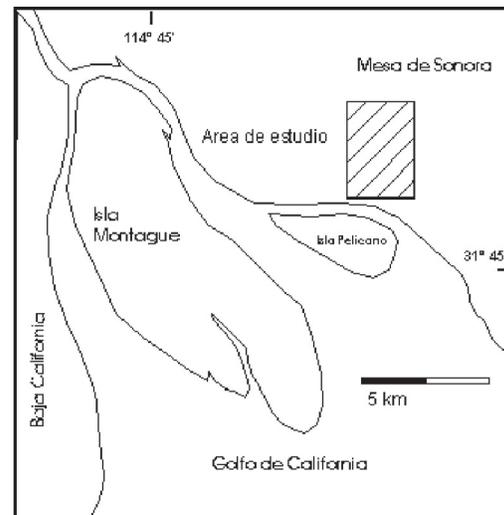


Fig. 1. Location of the shell middens in the Colorado delta north of the Golfo de Santa Clara, Sonora.

Table 1 lists counts for the shellfish species observed within 1 m<sup>2</sup> surface areas at two of the middens located at La Ciénega de El Doctor, known as Ciénega Norte and Ciénega Sur, as well as the relative abundance of each species. At both locations the most abundant species was *Chione cortezi*. Its predominance (making up 99% and 64% of the shell, respectively) implies that there was a marked preference for this bivalve as a food source, in the same way that it is presently exploited commercially in the area of the Colorado delta. In large part this is explained by its

Table 1. List of species and their frequency in a surface area of one square meter at the localities of La Ciénega de El Doctor.

Species	Ciénega Norte		Ciénega Sur	
	count	percent	count	percent
<i>Chione cortezi</i>	207	99.0	157	64.3
<i>Pholas chiloensis</i>	-	-	47	19.3
crab claws	-	-	18	7.4
<i>Ostrea</i> sp.	1	0.5	10	4.1
unidentified gastropod	-	-	6	2.5
<i>Balanus</i> sp.	-	-	3	1.2
<i>Mulinia coloradoensis</i>	1	0.5	1	0.4
<i>Trachycardium</i> sp.	-	-	1	0.4
<i>Polinices</i> sp.	-	-	1	0.4
Total	209		244	



Fig. 2. Shallow shell midden at the foot of the coastal cliffs of La Ciénega de El Doctor. Note the dispersion of the shells.

agreeable taste and by the fact that it will last several days out of water, making it suitable to be transported over considerable distances while still fresh. The same pattern has been observed at sites such as Cañón Las Cuevitas, approximately 28 km west of San Felipe, where small shell middens are associated with narrow shelters in sedimentary rock and where *Chione* is similarly predominant.

The remaining species are very scarce in the middens, indicating either that their dietary importance was minor or that they were used for other purposes. The single exception is *Pholas chiloensis* at Ciénega Sur,

accounting for 19% of the shell. There are no precedents for the use of this burrowing bivalve species for food. Its presence is somewhat rare, inasmuch as it is associated with hard substrates (Keen 1971) that are not found in the vicinity. However, based on personal observations of the lower intertidal zone in muddy substrates north of San Felipe, where dead specimens have been seen in their life positions, this species is capable of growing on soft substrates and therefore was available to be collected. It is not possible to determine the use to which it was put by the native people, because of the fragmented condition of the shells.

A *Chione cortezi* shell provided a radiocarbon date of  $975 \pm 40$  BP, corrected for the reservoir effect, which indicates that coastal marine resources have been exploited in the delta area at least since that period. Because this species is abundant under normal marine conditions, its collection evidently occurred within parts of the delta where there was not much influence from the fresh water of the river.

The scarcity of *Mulinia coloradoensis* in the archaeological deposits is notable; only a single specimen was found. This species is endemic to the Colorado delta and was extremely abundant in the past, as is indicated by the cheniers or shell bars that are abundant on Baja California's delta coast, as well as the shallow, less spectacular deposits on the Sonora coast. The species is now very rare and is headed toward extinction. Its absence from the middens suggests that, despite its former abundance, it was never used for food or other purposes.

The natural deposits of *M. coloradoensis* for their part reflect a dramatic change in the ecology of the delta area. Shells in their life positions dated to 500 years ago in deposits about 70 km from the mouth of the river (Télez, Ávila, and Flessa 2000, 2001) indicate that before damming of the river's waters, estuarine conditions extended as far south as the vicinity of the port of San Felipe. On the other hand, in the direction of the Sonora coast, the scarcity of *Mulinia* shell deposits provides evidence that the river's water flowed primarily toward the Baja California side.

On the surface of the Golfo de Santa Clara shell middens are found pale gray potsherds, lightly polished and with interior depressions. These indentations are typical of the use of the hammer-and-anvil technique. Taken together with the age of the shell middens, we may assign the sherds to the Hakataya culture (Schroeder 1960, 1979), and more specifically to its Patayan division (Schroeder 1988), which was restricted to the northernmost part of Baja California, southern Califor-

nia, and western Arizona. Another characteristic of the shell middens is that they are found in narrow patches along the foot of the cliffs, which suggests a seasonally mobile lifeway, also considered typical of the Hakataya culture.

The limited distribution of archaeological evidence for this group farther south in the state of Baja California is indicated by comparing another shell midden which was studied at Campo Cristina (Fig. 3), outside of the delta area and about 60 km south of San Felipe. The species present are different from those of the La Ciénega de El Doctor sites, in that they pertain to rocky substrates. The predominant bivalve species was *Cardita affinis* (58-68%), followed by *Protothaca grata* (6.5-10.3%), and among the gastropods, *Tegula rugosa* (10.3-21%). Table 2 lists the species that were present. These species are common on the rocky coast adjacent to the archaeological site, and they were evidently collected at the same location.

Dating the Campo Cristina shells gave an age of  $1269 \pm 45$  BP, indicating a greater antiquity than that for the shell middens of Santa Clara. No pottery fragments were observed, very probably because of a difference in cultural affiliation.

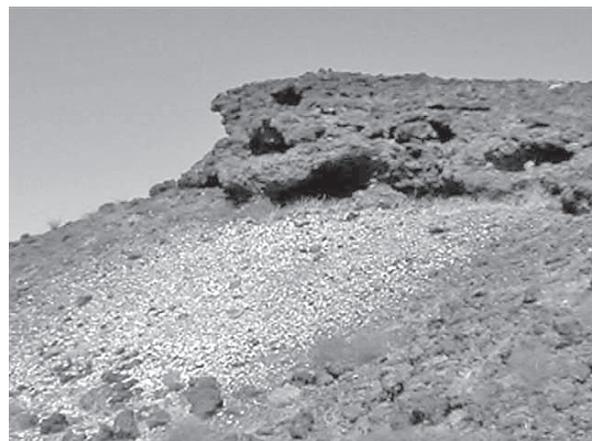


Fig. 3. Shell midden at Campo Cristina, Baja California.

Table 2. Faunal list of mollusks present in the Campo Cristina shell midden.

Species	Quadrat 1		Quadrat 2	
	count	percent	count	percent
<i>Cardita affinis</i>	36	58.1	66	68.0
<i>Tegula rugosa</i>	13	21.0	10	10.3
<i>Protothaca grata</i>	4	6.5	10	10.3
<i>Turbo fluctuosus</i>	5	8.1	4	4.1
<i>Pteria sterna</i>	2	3.2	6	6.2
unidentified Muricidae	1	1.6	1	1.0
<i>Laevicardium elatum</i>	1	1.6	-	-
<i>Vermetes contortus</i>	-	-	(present)	
Total	62		97	

The results presented here testify to the importance of the shell middens as a source of environmental, ecological, and historical information. Given that most of Baja California has still preserved its pristine landscapes and that the scarcity of water limits development, the potential role for much of its territory lies in conservation and ecological tourism. The shell middens in the Colorado delta, together with its biological resources and natural scenery, provide an opportunity for sustainable use through ecotourism. In the delta area it is possible to observe the impact of changes in an ecosystem resulting from both human and natural causes. With adequate training of the local residents in Golfo de Santa Clara and nearby areas, as well as extensive publicity, ecotourism provides an option for economic use for the core area of the Upper Gulf of California and the Colorado River Delta's Biosphere Reserve, within which the laws do not permit the exploitation of fishing resources. In this way, preservation of the shell midden sites can be promoted as part of this alternative use among the local inhabitants and in adjacent areas where similar archaeological sites exist. This will depend upon an adequate program to stimulate the inhabitants' awareness and to give them basic instruction in archaeology and natural history. It will contribute to a higher valuation of our natural and archaeological patrimony, before increasing population growth, the lack of control over tourism in

the territory, and above all the indiscriminate use of recreational off-road vehicles can continue their slow but steady destruction of both archaeological sites and the natural landscape.

### Conclusions

In the area of La Ciénega de El Doctor, Sonora, the surface characteristics of the archaeological shell middens suggest that they belonged to the Hakataya culture, and more specifically its Patayan branch. Another shell midden, located at Campo Cristina south of San Felipe in Baja California, showed characteristics of a different cultural affiliation, in that no ceramics were seen.

The age of 975 BP for the Santa Clara shell middens establishes that at least since that period coastal mollusks have been exploited within the limits of the Colorado delta. Particularly exploited was *Chione cortezi*, a species with no important populations outside of the delta, and which therefore must have been collected within its limits. These middens are about 300 years more recent than the one at Campo Cristina in Baja California, dated to 1269 BP.

The near absence of *Mulinia coloradoensis* in archaeological deposits shows that this species was never used for food, despite its abundance in the past.

The delta area possesses many attractive features for ecotourism, both historical and natural. With an adequate training program, ecotourism would provide a potential economic use of the Biosphere Reserve's core zone for the communities of riverine fishermen, as well as for other neighboring areas.

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