Archaeological Evidence of Marine Resources Used for Subsistence in Coastal Northern Sonora, Mexico

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There are many reasons why people repeatedly made the effort to visit the hyperarid northern coast of Sonora. Foremost was the abundance of and easy access to marine food resources. Here we review the plentiful archaeological and ethnographic evidence for the capture of fish, molluscs, sea turtles, and crab in the Northern Gulf of California.

FISH

Our analysis of fish remains from coastal midden sites near Puerto Peñasco comes from three studies. The earliest was by W. I. Follett (1957), who was Curator of Ichthyology at the California Academy of Sciences. Follett analyzed fish bones recovered from Edward W. Gifford's test excavations around Estero de Morúa (Gifford's Site 3) and Bahía Cholla (Gifford's Site 1) in the late 1940s (see Gifford 1946). Later test excavations by Mabry and Brusca at the Morúa site in 2005 produced fish remains that were analyzed by Phil Hastings, Curator of Fishes at the Scripps Institution of Oceanography in La Jolla, California. Finally, fish otoliths were identified by Kirsten Rowell at the University of Colorado, Boulder, from 2015, 2016, and 2018 test excavations at the Morúa site and other sites around Bahía Adair.

Follet (1957) identified nine species of fishes, in eight families (Table 9.1): Triakidae (houndsharks), Carcharhinidae (requiem sharks), Serranidae (sea basses and groupers), Mugilidae (mullets), Sparidae (sea breams and porgies), Sciaenidae (drums, croakers, weakfish), Girellidae (nibblers), and Balistidae (triggerfish). Two test units excavated at the Morúa site in 2005 yielded additional fish remains (fish bones and one otolith). Mabry and others (2007) report finescale triggerfish (*Balistes polylepis*), opaleye (*Girella* sp.), stingray (*Urobatis* sp.; Urotrygonidae), and shortfin weakfish (*Cynoscion parvipinnis*) (also see Miljour 2008).

The test excavations conducted in 2015, 2016, and 2018 at the Morúa site and others along Bahía Adair yielded fish bones and otoliths. Fish bones are more fragile than otoliths so there may be a preservation bias favoring otoliths. (This situation may account for the total absence of mullets from the collection; the species would have been accessible and nutritious for prehistoric fishermen but has fragile otoliths that are rarely recovered archaeologically). For the new data in this study, species identification was done only on otoliths.

By far the most common fish species identified from otoliths in our study is *Micropogonias megalops*, chano (also known as chano norteño, big eye croaker, gulf croaker). It represents 83 percent of the otoliths that could be identified from the six sites. The next most common fish was *Cynoscion parvipinnis* (shortfin weakfish, shortfin corvina), representing 14 percent of the otoliths. The remaining identified species occurred in very low frequencies. There was some variation by site, for example 88 percent of the otoliths from the Morúa site were shortfin weakfish compared to Otolith Hill and Duna Larga where Gulf croaker represented 95 percent and 96 percent, respectively (Figure 9.1 and Table 9.2). In fact, the Morúa site is the only one in our sample that contained a high percentage of shortfin weakfish. This difference may be a result of that site's location at the mouth of the Río Sonoyta, seasonal occupation patterns of the people, ecological preferences and seasonality or spawning behavior of the fish species, or some other reason. Both of these species spawn in or near the mouths of rivers and inhabit brackish water, so it is most likely that the

Table 9.1. Fish Species Identified from Gifford's 1940s Excavation

Fish Species	*Part Recovered*	*Estimated Size of Living Specimen (cm)*	*Site Where Recovered*
Mustelus lunulatus (?)(Sicklefin smooth-hound shark)	Centra	76	Gifford's Site 3 at Estero Morúa
Rhizoprionodon longurio (Pacific sharpnose shark)	Centrum	41	Near Gifford's Site 1, Bahía Cholla
Mycteroperca Jordani (Gulf grouper/baya)	Vertebra	38	Gifford's Site 3 at Estero de Morúa
Mugil cephalus (Striped mullet)	Vertebra, basioccipital, hyomandibular, hypural	38–51	Near Gifford's Site 1, Bahía Cholla; Gifford's Site 3 at Estero de Morúa
Calamus taurinus (?) (Galapagos porgy). Note that *C. taurinus* is endemic to the Galapagos Islands; more likely this was *C. brachysomus*, the Pacific porgy	Vertebra	38	Near Gifford's Site 1, Bahía Cholla
Cynoscion xanthulus (Orangemouth weakfish)	Vertebra	76+	Near Gifford's Site 1, Bahía Cholla
Totoaba macdonaldi (Totoaba)	Epiotic, quadrate, maxillary, ceratohyal, vertebra, fin ray	51–152	Near Gifford's Site 1, Bahía Cholla; Gifford's Site 3 at Estero de Morúa
Girella simplicidens (Gulf opaleye)	Vertebra	23	Near Gifford's Site 1, Bahía Cholla
Balistes polylepis (Finescale triggerfish)*	Vertebra	25–36	Near Gifford's Site 1, Bahía Cholla

Note: *-Although *Balistes polylepis* is the most common species in the Puerto Peñasco area, there are five species of triggerfish in the Gulf.
Source: Follet 1957.

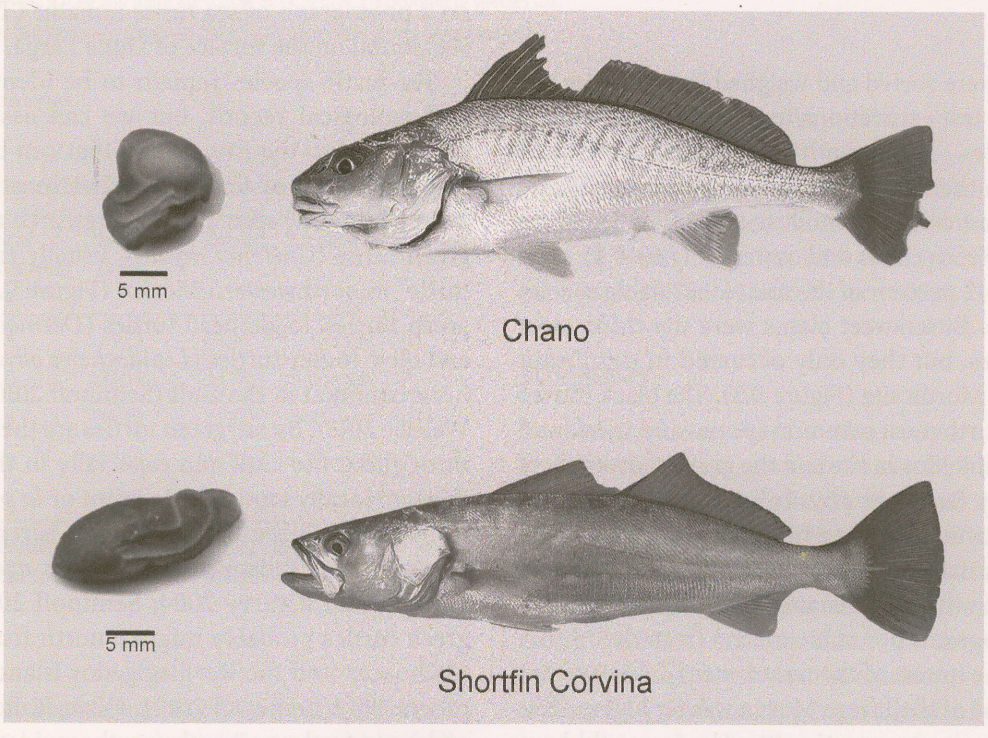

Figure 9.1. Fish and their otoliths. Top, chano or gulf croaker (*Micropogonias megalops*) otolith (left) and fish (right), length to 40 cm. This omnivorous bottom feeder is found from brackish lagoons to the marine coastal shelf. Bottom, shortfin corvina (*Cynoscion parvipinnis*) otolith (left) and fish (right). The total length of the shortfin corvina is commonly 40 cm but can reach to 69 cm; they are secondary predators found from brackish lagoons to the marine coastal shelf. Top photograph courtesy of Luke Ovgard; bottom photograph courtesy of Brad Murakami.

Table 9.2. Fish Species Identified from Otoliths at Six Midden Sites

Species	*SON B:11:1/ Morúa*	*SON B:5:7/ Otolith Hill*	*SON B:5:9/ Los Tábanos*	*SON B:5:10/ Duna Larga*	*SON B:5:11/ Oyster Hill*	*Otolith Hill 2**	*Totals*
Micropogonias megalops (Gulf croaker)	1	571	19	191	23	46	851
Cynoscion xanthulus (Orangemouth weakfish)	4	6	—	—	—	2	12
Cynoscion othonopterus (Gulf weakfish)	1	—	—	—	—	—	1
Cynoscion parvipinnis (Shortfin weakfish)	73	42	3	6	4	10	138
Sciaenidae sp?	1	1	—	1	—	—	3
Totoaba macdonaldi (Totoaba)	3	7	3	1	2	—	16
Otolith fragments	1	25	—	—	—	—	26
Totals	**84**	**652**	**25**	**199**	**29**	**58**	**1,047**

Note: *-Surface collection only.

Data from Mitchell and others 2015: Table 4 and Kirsten Rowell, unpublished data 2018.

variation in species composition of these remains reflects natural variation in catch and taphonomy.

MOLLUSCS

Midden shells were sorted and weighed by type from the five sites where test excavations/units were made during our field studies. The quantities of identifiable shell recovered from the five excavations are shown in Table 9.3. The two most common mollusc types found at these middens were Venus clams and oysters (Figure 9.2), each accounting for 42 percent of the total identifiable species at the five sites. Bittersweet clams were the third most common species, but they only occurred in significant numbers at the Morúa site (Figure 9.3). The black murex snail was the fourth most common species and was found at all five sites. The Morúa site had the greatest diversity of species, possibly due to its physical setting at the mouth of the Río Sonoyta. Sampling may also have biased the species diversity data since some sites were sampled more intensively than others. For example, the amount of shell by volume (kilograms per cubic meter) from the Morúa site is among the lowest of the tested sites (Table 9.4) but the sheer volume of shell from Morúa was far higher than any of the other sites, suggesting sample size could have biased the data toward higher diversity.

SEA TURTLES

Sea turtle remains were recovered from all five of the shell midden sites where test excavations were conducted. No formal analysis of the turtle remains from these excavations has been undertaken, but Jeffrey Seminoff (personal communication 2018) suggested possible identifications based on a photograph of sea turtle remains (Table 9.5, Figure 9.4) found on the surface of Duna Larga.

Sea turtle species remain to be identified from the archaeological record, but we can assume that they correspond to the five species that can be found in the Northern Gulf of California. The most abundant and most commonly seen along the research area coast is the green turtle (*Chelonia mydas*), usually called the "black turtle" in northwestern Mexico (Figure 9.5). Historically, green turtles, loggerhead turtles (*Dermochelys coriacea*), and olive Ridley turtles (*Lepidochelys olivacea*) have been most common in the Gulf (Seminoff 2010; Seminoff and Wallace 2012). By far, green turtles are the most abundant throughout the Gulf and especially in the north where they are locally known as *la negra* or *la prieta*. The black form, found in the Eastern Pacific, is regarded by some as a separate subspecies, *C. mydas agassizii* (Brusca, Findley, and Kimrey 2004; Seminoff 2010). Most Gulf green turtles probably migrate north from rookeries in Michoacán and the Revillagigedos Islands (Nichols and others 1999; Seminoff 2010). Olive Ridley, leatherback, and green turtles nest in the southernmost Gulf. Although occasional claims of olive Ridley, leatherback, and green turtle nesting in the central and Northern Gulf have been reported, these are rare or unconfirmed (Seminoff 2010). Therefore, it is likely that most turtles taken in the Puerto Peñasco-Bahía Adair region by Native Peoples were green turtles.

Table 9.3. Weights (in kgs) and Percentages of Totals for Mollusc Species Identified at Five Sites

Shell Species	*Morúa Site*	*Oyster Hill*	*Otolith Hill*	*Duna Larga*	*Los Tábanos*	*Totals*
Venus clams[a]	67.03[b] (44.53%)[c]	13.54 (15.96%)	10.77 (59.40%)	29.47 (76.29%)	22.55 (45.19%)	143.36 (41.92%)
Oyster (*Ostrea* sp.)	43.76 (29.07%)	67.38 (79.43%)	0.79 (4.35%)	6.55 (16.96%)	24.47 (49.04%)	142.95 (41.80%)
Bittersweet clams (*Glycymeris* sp.)	31.93 (21.21%)	—	—	—	—	31.9 (9.34%)
Black murex (*Hexaplex nigritis*)	2.37 (1.57%)	3.41 (4.00%)	6.56 (36.20%)	2.61 (6.76%)	1.14 (2.28%)	16.09 (4.70%)
Ark shell (*Arca pacifica*)	0.93 (0.62%)	—	—	—	1.01 (2.02%)	1.94 (0.57%)
Dosinia ponderosa	1.45 (0.96%)	—	—	—	—	1.45 (0.42%)
Chama sp.	1.23 (0.82%)	—	—	—	—	1.23 (0.36%)
Cardita affinis	0.76 (0.50%)	—	—	—	—	0.76 (0.22%)
Razor clam	—	—	—	—	0.73 (1.46%)	0.73 (0.21%)
Laevicardium sp.	0.56 (0.37%)	—	—	—	—	0.56 (0.16%)
Melongena patula	0.51 (0.34%)	—	—	—	—	0.51 (0.15%)
White cockle	—	0.50 (0.59%)	—	—	—	0.50 (0.15%)
Totals	**150.53**	**84.83**	**18.12**	**38.63**	**49.90**	**342.01**

Note: Only species totaling 0.5 kg and more are listed. See Chapter 5 for complete species list.

Key: a. Includes *Chione californiensis, Chionista fluctifraga, Chionopsis gnidea*, and *Leukoma grata*;

b. Site total;

c. Percent of all shell recorded.

Table 9.4. Density of Shells at Test Excavations at Five Sites

Site	*Size of Excavation in m³*	*Weight in kgs*	*Kgs/m³*	*Comment*
Otolith Hill	0.4	24.03	60.08	Two test units
Oyster Hill	2.0	102.31	51.16	One test unit
Los Tábanos	1.6	73.30	45.81	One test unit
Morúa	5.0	223.00	44.60	Three test units
Duna Larga	2.4	55.66	23.19	Two test units

Note: The cubic meter calculation is based on test unit's size of 1 m by 2 m and the unit's depth, which varied with each unit and site.

CRABS

Fragments of crab claws were observed on the surface of nearly all the middens recorded by Foster and Mitchell (2000), and they were also recovered from all our study sites. All of the claws are from the Cortez swimming crab (*Callinectes bellicosus*) (Figure 9.6). This crab ranges from the uppermost Gulf of California (and in smaller numbers north to San Diego) south at least to Nicaragua, from the shore to depths of around 20 m. They are especially abundant in bays, esteros, and other saline wetlands along the coast. It is one of the largest shore crabs in North America, with a carapace width up to 18 cm (Brusca, Kimrey, and Moore 2004).

SUMMARY

Coastal marine resources in the study area are abundant and diverse. These resources were exploited by Native Americans over several millennia and appear to have been relatively consistent through time. This situation is directly related to the environmental setting that appears to have been stable following sea level stabilization around 6,000 years ago. Based on the archaeological evidence from this project, the marine resource categories collected by prehistoric people included fish, molluscs, sea turtles, and crabs. The capture of sea turtles may have been more of an opportunistic event compared to the other resources. Fish, molluscs, and crabs were a predictable resource that could be captured with ease, and in bulk. The middens along this part of the coast are dense with shells (Figure 9.7), and some of the sites contain abundant evidence for fish remains (Mitchell and others

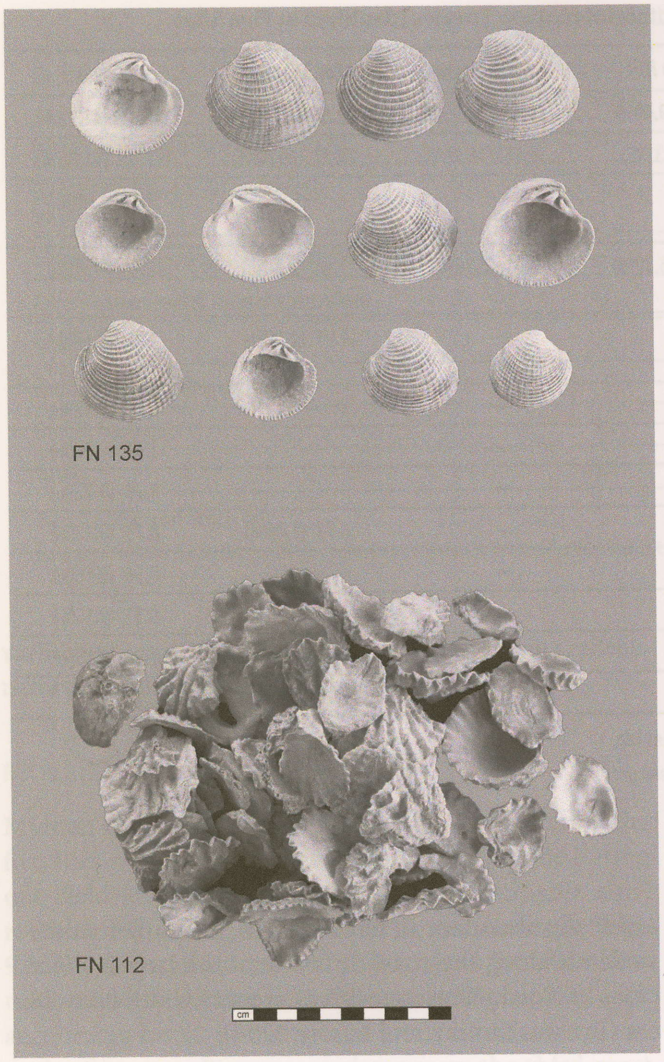

Figure 9.2. Venus clam and oyster shells. Top, *Chione californiensis* (California venus clam; Veneridae). Bottom, *Myrakeena angelica* (*Ostrea angelica*; angel's oyster; Ostreidae) from the Morúa site (Locality 3, Unit 1) (INAH bag nos. 57784A and 57761A). Photograph by Douglas R. Mitchell.

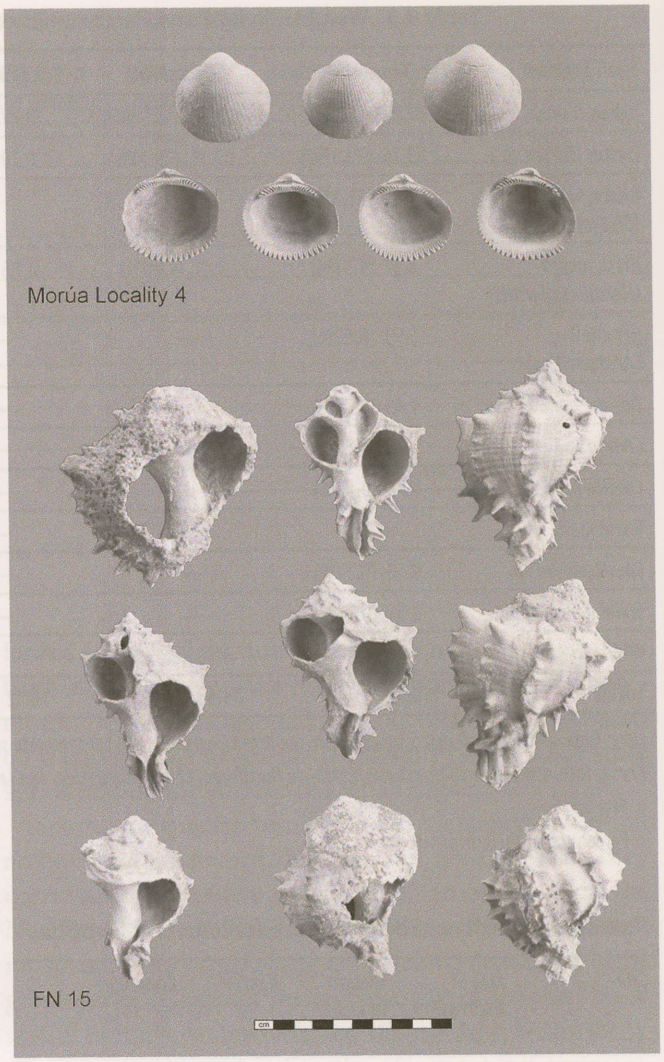

Figure 9.3. Bittersweet clams and pink mouth murex shells: Top, *Glycymeris* sp. (bittersweet clam; *Glycymerididae*) from the Morúa site (Locality 4, Unit 1; INAH bag no. 14020A). Bottom, *Hexaplex erythrostomus* (pink mouth murex; Muricidae) from Otolith Hill (Unit 2; INAH bag no. 13985A). Photograph by Douglas R. Mitchell.

2015). Although most of these middens were created over many generations, the amount of shellfish consumed is still significant. The abundance and environmental stability of these resources is still evident today with local fisheries and *osterias*, although overfishing is a modern concern. In the past, the relatively low numbers of people who probably visited the coast likely precluded overexploitation of these resources.

Finally, it should be mentioned that when Gifford made surface collections and conducted test excavations in the area in the 1940s, he collected other faunal remains. In notes from his excavations, he mentions bones from sea lion and possibly whale. There is no ethnographic evidence for exploitation of those resources on the coast of northern Sonora, so it is most likely that use of these larger marine animals was accidental and related to beach collection.

Table 9.5. Jeffrey Seminoff's Observations on Sea Turtle Fragments from Duna Larga

Number (see Figure 9.4)	*Identification*
1	**Peripheral bone** (edge of carapace), most likely from the lateral portion of the shell.
2	**Peripheral bone**, likely that directly adjacent to nuchal area (anterior portion of carapace).
3	Unidentified
4	Unidentified
5	Phalange?
6	Fragment from pelvic girdle or shoulder region?
7	**Rib**, obvious from the serpentine like suture border at the top of the photo.
8	Unidentified
9	Unidentified
10	Unidentified
11	Phalange?
12	Phalange?
13	Likely a rib bone, but hard to tell based on fragment.
14	Phalange?
15	Unidentified
16	Possible parietal skull bone
17	Possible phalange but seems a bit too robust. Marine mammal?

Note: Numbers correspond to image in Figure 9.4 (words in **bold** are bones where the identification is of relatively high confidence).

Figure 9.4. Sea turtle bones from the surface of Duna Larga (INAH bag no. 74995A).

Figure 9.5. Green sea turtle. Image from https://www.fisheries.noaa.gov/species/green-turtle, accessed 7-8-20.

Figure 9.6. Callinectes bellicosus, the Cortez swimming crab. Photograph by Richard Brusca.

Figure 9.7. Dense midden deposits on dune surface, SON B:5:11 (Oyster Hill), foreground, Estero Las Lisas, background. View to east. Photograph by Gary Huckleberry.

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Coastal Foragers of the Gran Desierto

Investigations of Prehistoric Shell Middens along the Northern Sonoran Coast

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