7

The Prehistoric Fishery of San Clemente Island

Roy A. Salls

Introduction

San Clemente Island is the southernmost of the California Channel Islands and has been divided into six topographic or geomorphic zones (Yatsko Chapter 3). Two of these zones were selected for ichthyofaunal analysis due to the abundance of fish elements and fishing artifacts observed during the surface surveys and preliminary testing. The analyzed sites are located on the Coastal Terrace and the Plateau.

The Eel Point Sites SCLI-43B and C, although situated on the Coastal Terrace, are within a sand dune. Big Dog Cave (SCLI-119) is located on the Coastal Terrace but within a quarter km from a sandy beach and accompanying dune area. The Columbus Site (SCLI-1492) is located on the northern section of the island's Upland Plateau and the Nursery Site (SCLI-1215) is at the head of a fault valley which provides easy access to the well-protected landing at Wilson Cove on the northeast shore (Figure 7.1).

The objective of this study is to develop an interpretive framework for the reconstruction of prehistoric fisheries on San Clemente Island. This model includes the biological and physical conditions of the marine environment which impose adaptive constraints on fishing cultures. No attempt is made to reconstruct the prehistoric diet of the island's marine-adapted population. This survey of aboriginal fishing regimen investigates the native fisheries through site marine habitat analysis and, based upon the empirical identification of the piscine remains, proposes the probable fishing technologies which were employed. The methodology of this research incorporates the many selective processes responsible for these fishing methods and provides a view of local restrictions for the fishery.

In developing an interpretive framework based on the ecofact, artifact, and habitat analysis, the proverbial argument "what is a sufficient sample?" must be addressed. Archaeology itself is a sampling procedure and a complete recovery of any cultural or biological sample from the past is impossible. In part, this debate stems from the fact that a fossil fauna assemblage passes through several stages before it reaches the analyst (Klein and Cruz-Uribe 1984:3):

1) *The life assemblage:* the community of live animals in their "natural proportions."
2) *The death assemblage:* the carcasses that are available for collection by people, carnivores, or any other agent of bone accumulation.
3) *The deposited assemblage:* the carcasses or portions of carcasses that come to rest at a site.
4) *The fossil assemblage:* the animal parts that survive in a site until excavation or collection.
5) *The sample assemblage:* the part of the fossil assemblage that is excavated or collected.

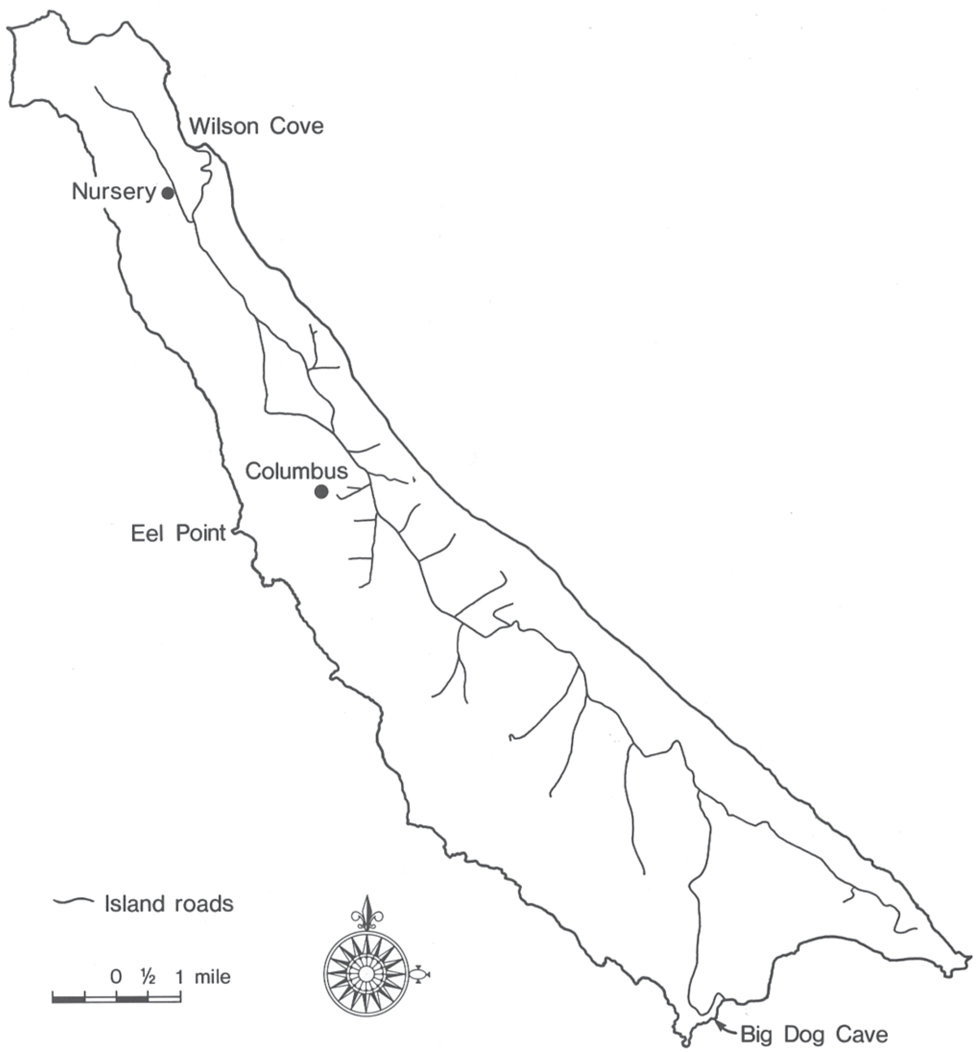

Fig. 7.1 San Clemente island.

The faunal sample from each of the five sites varied in relation to the total volume of the excavation. Large fish faunal assemblages, such as Eel Point (with over a million elements) and the Nursery Site, were analyzed through a randomly selected, reduced sample. The faunal collections from the smaller excavation volume sites, such as Columbus and Big Dog Cave, were analyzed from the total midden volume excavated, thereby processing the complete ichthyofaunal assemblage. Column samples (15x15 cm) were taken from the sidewalls of each unit analyzed for ichthyofauna. These column samples were processed through a series of U. S. Standard Laboratory screens in an effort to recover the elements of the smaller species such as sardines (*Sardinops sagax*) and anchovies (*Engralus mordax*). The column samples yielded the same species that had been recovered by standard screening to 1/8 inch.

The bones were analyzed, whenever possible, by using a comparative collection of fish skeletons which had been acquired from the offshore area adjacent to the site being investigated. The comparative collection was procured by underwater spearfishing, trawl nets, seine nets, and rod-and-reel fishing. This reference collection was obtained during different seasons of the year in order to provide osteological seasonality information for the site species. Additional comparative material was borrowed from the Ichthyology Section of the Natural History Museum of Los Angeles County.

The archaeological skeletal remains were compared to the osteological characteristics displayed by contemporary related genera and species. If a specimen's bony attributes, characteristic of a taxonomic family, could not be identified to the level of species, it was catalogued to a family. An unidentified surfperch element, for example, was recorded taxonomically to its family Embiotocidae only after all available comparative species of surfperches had been eliminated. If an unknown element failed to match any species within the total comparative collection, or if the element was so poorly preserved as to preclude any type of order or genera classification, it was then catalogued as an unknown Osteichthyes (bony fish) or unknown Elasmobranchi (shark or ray). Unusual elements or specimens from anomalous species were identified with the assistance of ichthyologists at the Natural History Museum of Los Angeles County.

Table 7.1. Ichthyofaunal abundance by resource area habitat.

Site	Resource Area	Total Elements	Elements per cubic meter
Columbus (SClI-1492)	KB/SRRF	789	229
Nursery (SCII-1215)	KB/SRRF	1273	77.1
Big Dog Cave (SClI-119)	KB/SRRF	874	364
Eel Point B (SClI-43B)	KB/SRRF	1577	203
Eel Point C (SClI-43C	KB/SRRF/ RRF	20679	1087.7
		Total: 25192	Avg: 392.2

Island Resource Zones

Ichthyofaunal communities (life assemblages) require certain types of habitats (Allen 1985). Allen's habitat types are grouped under two major categories based on their fish assemblages: those zones associated with soft substrate and those associated with rocky substrate. These defined habitats have been employed for this study and include the rocky substrate habitats of: Kelp Bed (KB); Shallow Rocky Reef (SRRF); Deep Rocky Reef (RRF) and Intertidal (IT). The soft substrate habitats include: Bay and Estuary (BE); Open Coast Sandy Beach (OC); Harbor/ Nearshore Soft Bottom (H/NSB); Nearshore Midwater (MW); and Offshore Soft Bottom (SB) (Figure 7.2).

Allen has plotted the ten most numerous species, or life assemblages, for each type of southern California nearshore habitat. "The resultant curves served to illustrate relative dominance and equitability within the ichthyofauna of the various habitat types" (Allen 1985:136). The nearshore environment has been divided into nine major habitats (above) which are occupied by 17 piscine groups or life assemblages. These assemblages are derived through cluster analysis utilizing the Bray-Curtis index of dissimilarity (Allen 1985, Fig. 4). The presence of particular life assemblages of ichthyofauna within an archaeological site matrix reflects the past fish communities, as well as their habitats.

The ecological resource zones of San Clemente Island available to the occupants of the sites analyzed for this report apparently did not change to any great degree as the species cluster index is almost identical from Eel Point B, dated at 9775 ±165 BP, to the historic occupation at Big Dog Cave (Table 7.1). There was, however, an expansion into different nearshore marine habitats at the end of Eel Point B time. These changes

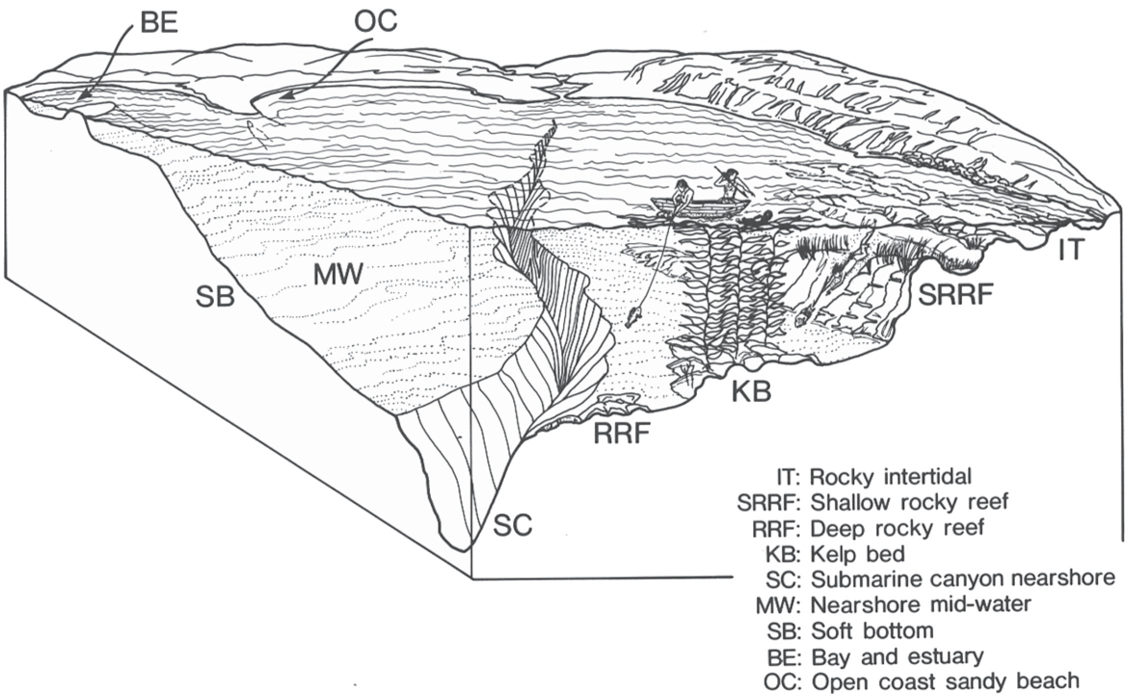

Fig. 7.2. Nearshore marine habitats of Southern California.

correspond to the appearance of the single-piece shell fishhook and the exploitation of deeper water (RRF) environments for rockfish (*Sebastes sp.*).

The determination of the resource zone for each site required the consideration of several factors. First, the underwater habitats within the site resource zone were investigated. The resource zone was delineated by using Vita-Finzi and Higgs' (1970) method for scaling zones within the zone in terms of their relative importance. The value of a habitat is weighed in relation to its distance from the site. For example, a reef located within one kilometer of the site may have a weight of 100 per cent, whereas a reef ranging 15 km away may have a weight of only 10 per cent. Associated factors involving the richness of underwater habitats, canoe speeds, and wind and water currents were combined to establish a marine resource zone for each site. Fish specimens were captured, when possible, from each site's resource area, as reference species for comparison studies. The archaeological samples were then analyzed and the prehistoric habitats were defined (cf. Allen 1985:137). Habitat changes between the contemporary site resource zones and those indicated by the archaeological sample were recorded. The final determination of the prehistoric site resource area was refined from the total evidence provided by the ichthyofaunal sample as well as other artifactual, ecological, and geological data from the site.

Factors In Aboriginal Fishing

The analysis of a site's environmental resources is an essential aspect to be considered in the study of aboriginal fishing adaptations. A resource area incorporates the dynamics of distance and energy expenditure and usually represents the resource zone situated within reasonable walking or canoe time, rather than distance from the site (Flannery 1976:92; Vita-Finzi and Higgs 1970). This definition of site resource zone rests on the assumption that with all things being equal:

> The further the area is from the site, the less it is likely to be exploited, and the less rewarding is its exploitation (unless it is peculiarly productive) since the energy consumed in movement to and from the site will tend to cancel out that derived from the resource. Beyond a certain distance the area is unlikely to be exploited from that site at all: in terms of technology available at the time, its exploitation becomes uneconomic. (Vita-Finzi and Higgs 1970:7)

The concept of site catchments (resource zones) provides a model for understanding the thermodynamics of human utilization of resources and "the close relationship between the ability of a human population to exploit a resource profitably and the expenditure of energy necessary for its exploitation" (Jarman 1972:706).

Chisholm (1968) found that the distance from the home base regulated the amount of profit realized in an agricultural community. Distance (time and energy) appears to be a primary factor affecting most marine fisheries. Generally, the farther away from home port a fishing locality lies, the more difficult it becomes to organize the optimal sequences of fishing events (Cordell 1980:53). Time and energy is measured in terms of wind patterns, currents, climatic variations, upwellings, seasonal, and other oceanic influences. The size of a resource zone may also vary in different targeted fish species in response to the "energy gain relative to energy costs in travel, processing, preservation and eventual transport" (Styles 1981:23).

Fishing is a distinguishable subsystem within an overall hunting and gathering subsistence endeavor. It is often directed towards the procurement of one or more primary species, with other fish comprising only the incidental and opportunistic components of the catch. To interpret this subsystem properly, it is important to understand that specific fishing methods are determined on the basis of resource characteristics as well as cultural restrictions and preferences. Archaeologically, cultural restrictions and preferences can be determined only under exceptional circumstances and by their very nature are usually drawn by analogy from historic and ethnographic accounts (Salls 1988b:70).

Ethnographic research has shown that fishermen try to maximize their catch by exploiting various underwater environments. They also possess a knowledge of the species' distributions and their associated habitats (Marcus 1987:395; Morrill 1980:3). "The location of the fishing grounds by visual triangulation and the knowledge of the distribution of fish within them in a given season are transmitted over generations" (Forman 1980:15).

Numerous studies of fishing peoples have indicated that the most important influences for the determination of fish production are ecological. The general characteristics of a fishery—seasonality, distribution, density, biological structure, and behavior—are major determinants in the required social organization involved for such an undertaking. A cultural system, therefore, requires a "mapping" of the ecological dimensions shaping a marine resource in order to develop an effective procurement method. Buckley (1968:491) describes this mapping process for complex adaptive systems, as the one in which "an adaptive system acquires features that permit it to discriminate, act upon, and respond to aspects of the environmental variety and its constraints."

Although species and habitat information is important to fishing peoples, many other factors enter into successful maritime adaptation. For the canoe fishermen inhabiting the Valencia Delta of Brazil, determining where to fish is largely a matter of synchronizing information concerning tides, winds, capture techniques, and fishing areas in an effort to increase their chance of locating a school of fish (Cordell 1980:29). This awareness of the overall environmental dynamics required to enhance chances of fishing success is not exclusive to the Brazilian Indians. It also applied to the aborigines using the resources off San Clemente Island.

San Clemente Island Fisheries

The maritime adaptations of the five sites analyzed on San Clemente Island were typified by the exploitation of nearshore marine habitats of Kelp Bed (KB), Shallow Rock Reef (SRRF) and Deep Rock Reef (RRF) (Allen 1985:133).

Columbus Site (SCLI-1492)

The ichthyofaunal sample from the Columbus Site was obtained from eight 1 by 1 m test pits. The total volume excavated equaled 4.5 cubic meter. Two units were set in sterile clay, and the adjusted volume, therefore, may be reduced to 3.8 cubic meter. The midden was passed through one-eighth inch screen which provided a piscine sample of 787 elements. The number of elements identified to species (NISP) was 270 with the minimum number of individuals (MNI) being 80. This represents 210 piscine elements per cubic meter, or 71 identified elements per cubic meter. In total there were 16 fish species identified to 13 taxonomic families (Table 7.2).

Resource Zone. The Columbus Site is located near the center of the island with access to both east and west shores. The most accessible of these is toward Eel Point on the west shore. The nearshore marine habitats exploited, based on Allen's (1985) cluster analysis, were Kelp Bed (KB) and probably Shallow Rocky Reef (SRRF). These habitats represent 87 per cent of the fish faunal remains. The Midwater (MW) and Open Coast Sandy Beach (OC) environments provided 6 per cent of the elements respectively (a single element from each).

Fishing Adaptation. From the species as well as the smaller size of the recovered fish remains, it appears that most of the fishing was from the shore. The sheephead, as with all San Clemente sites, was the most abundant specie at 73 per cent of the total identified sample.

Seasonality. It is very difficult to determine seasonality for the Columbus Site because most of the fish are year-round residents. There were two yellowtail (*Seriola lalandi*) elements present which signifies summer/fall exploitation. Yellowtail, however, are often present throughout the year during certain warmer annual cycles (Salls 1990b).

The Nursery Site (SCLI-1215)

The unit of analysis at the Nursery Site was obtained from the 1984 excavation of the house pit. The excavation grid was divided into eight 2 by 2 m units which exposed most of the house floor and some of the immediate area surrounding the house. The piscine elements appear to be refuse from the occupation of the structure and were treated as a single aggregate.

A total of 16.5 cubic meter of site matrix was excavated from the house pit and processed through one-eighth inch screen to provide a sample of 1,280 elements (Table 7.2). This represents 77 elements per cubic meter excavated with a NISP of 681 and a MNI of 114. There were 41 identified species per cubic meter and 24 identified species representing 13 taxonomic families.

The Nursery Site is an example of the activity-area model suggested by Schiffer (1972). The site was probably occupied by an extended family group and approximately four house pits have been discovered by a combination of augering and test pits. One house

Table 7.2. Number of Fish Elements by Site.

Species	San Clemente Island site number SCLI-					
	1492	1215	119	43B	43C	Total
Elasmobranchi (Sharks and Rays)						
Order Heterodontiformes						
Heterodontus francisci (Horn Shark)		7				7
Order Laminformes						
Isurus oxyrinchus (Shortfin Mako)	1					1
Order Carcharhiniformes						
Triakis semifasciata (Leopard Shark)	2	3	1		6	12
Prionace glauca (Blue Shark)				1		1
Order Rajiformes						
Rhinobatos productus (Shovelnose Guitarfish)					2	2
Myliobatis californica (Bat Ray)	1					1
Osteichthyes (Bony Fishes)						
Order Anguilliformes						
Gymnothorax mordax (California Moray)	6	14	12	1	44	77
Order Clupeiformes						
Sardinops sagax (Pacific Sardine)	3					3
Order Scorpaeniformes						
Scorpaena guttata (California Scorpionfish)	4	4		9		17
Sebastes atrovirens (Kelp Rockfish)	1		1	265	24	291
Sebastes auriculatus (Brown Rockfish)			2			2
Sebastes carnatus (Gopher Rockfish)		3		4	19	26
Sebastes caurinus (Copper Rockfish)					6	6
Sebastes chrysomelas (Black & Yellow Rockfish)			3		8	11
Sebastes flavidus (Yellowtail Rockfish)				5	24	29
Sebastes goodei (Chilipepper)				7	70	77
Sebastes melanops (Black Rockfish)				1	21	22
Sebastes miniatus (Vermillion Rockfish)		13	24		102	139
Sebastes mystinus (Blue Rockfish)					6	6
Sebastes paucispinis (Bocaccio)		15	24	4	198	241
Sebastes pinniger (Canary Rockfish)					3	3
Sebastes rastrelliger (Grass Rockfish)	5	21	36	20	862	944
Sebastes rosenblatti (Greenblotched Rockfish)			1			1
Sebastes rufus (Bank Rockfish)			1		29	30
Sebastes serranoides (Olive Rockfish)					7	7
Sebastes serriceps (Treefish)		2	1	7	53	63
Sebastes sp. (Unk. Rockfish)	5	38	21	21	457	542
Ophiodon elongatus (Lingcod)			2		5	7
Leptocottus armatus (Pacific Staghorn Sculpin)					1	1

Table 7.2, cont. Number of Fish Elements by Site.

Species	San Clemente Island site number SCLI-					
	1492	1215	119	43B	43C	Total
Unk. Cottid (Unk. Sculpin)			1			1
Scorpaenichthys marmoratus (Cabezon)		1	5		23	29
Order Perciformes						
Stereolepis gigas (Giant Sea Bass)			5			5
Paralabrax clathratus (Kelp Bass)	5	18	14	80	289	406
Paralabrax maculatofasciatus (Spotted Sand Bass)				1	4	5
Paralabrax nebulifer (Barred Sand Bass)					11	11
Paralabrax sp. (Unk. Bass)				1	2	3
Caulolatilus princeps (Ocean Whitefish)		8	80	7	56	151
Seriola lalandi (Yellowtail)	2	5		2	4	13
Trachurus symmetricus (Jackmackerel)	5	26		11		42
Atractoscion nobilis (White Sea Bass)		7	1			8
Roncador stearnsi (Spotfin Croaker)				1		1
Umbrina roncador (Yellowfin Croaker)					1	1
Girella nigricans (Opaleye)	4		1		5	10
Medialuna californiensis (Halfmoon)					2	2
Amphistichus argenteus (Barred Surfperch)					17	17
Embiotoca jacksoni (Black Surfperch)	5	1	1		2	9
Embiotoca lateralis (Striped Surfperch)				1	4	5
Hypsurus caryi (Rainbow Surfperch)					2	2
Rhacochilus toxotes (Rubberlip Surfperch)		1		1	4	6
Rhacochilus vacca (Pile Perch)				2		2
Embiotocidae (Unk. Surfperch)		1			3	4
Chromis punctipinnis (Blacksmith)		1				1
Hypsypops rubicundus (Garibaldi)		2				2
Sphyraena argentea (Pacific Barracuda)	20	4		8	5	37
Semicossyphus pulcher (Sheephead)	198	474	460	780	3,594	5,506
Heterostichus rostratus (Giant Kelpfish)		1				1
Euthynnus pelamis (Skipjack Tuna)				1		1
Sarda chiliensis (Pacific Bonito)		2			1	3
Scomber japonicus (Pacific Mackerel)		6	1	23	10	40
Thunnus alalunga (Albacore)		9		4	1	14
Thunnus sp. (Unk. Tuna)		1			1	2
Order Pleuronectiformes						
Paralichthys californicus (California Halibut)	1			24		25
Unidentified Osteichthyes (Unk. Fish)	519	592	172	533	14,438	16,254
Total	788	1,279	870	1,826	20,425	25,188

pit has been excavated. Specialized activity areas have been identified in terms of butchering locations, food storage pits, a cemetery, and a garbage midden. Primary refuse is suggested by the storage of foodstuffs in shallow pits outside the walls of the house. Although these "cache pits" were used to store several types of material from foods to artifacts, many contained a single collection of one species of fauna. Pits containing only land snails (3,449 specimens, catalog number 864), the marine mollusk *Tegula* sp. (72 specimens, catalog number 3451), or fish were present. Other primary refuse areas were identified by the abundance of single-specie elements within a small area. A processing area for birds was discovered during the 1987 test excavations. This area, measuring 1 x 0.5 m, contained 2,715 elements—mostly wings and lower leg bones (catalog number 3451).

The garbage midden was located downwind (south) of the last housepit. This garbage midden is a typical shellmound containing high concentrations of local marine shells and sea-mammal bones. The occupants of this site appear to have been exploiting sea mammals to a greater degree than has been observed at other San Clemente Island sites. Sea mammal remains, some from large whales, are abundant at the site. The very large bones, such as ribs and vertebrae, were probably brought to the site for house construction and other utilitarian requirements as evidenced by remaining whale ribs in some of the housepit postholes.

Resource Zone. The presence of white sea bass (*Atractoscion nobilis*), ocean whitefish (*Caulolatilus princeps*), leopard shark (*Triakis semifasciata*), and barracuda (*Sphyraena argentea*) indicates considerable fishing off the north end of San Clemente Island, where numerous schools of most of these species were observed during the 1984-1986 underwater surveys. The leopard shark has been observed along the various sandy bays on the north end of the island as a solitary species.

The resource zone revealed by the piscine sample indicates that KB/SRRF fishing provided 85 per cent of the fish. MW habitats yielded 9 per cent with all other habitats presenting 5 per cent of the fish utilized. All of these habitats are within close canoe distance from Wilson Cove. Much of the fishing area is protected from the strong northwesterly winds by being located within the lee of the island.

Fishing Adaptation. The Nursery Site, although inland from the coast, is just a short walk from Wilson Cove. The abundance of piscine, sea mammal, and sea bird elements indicates a strong marine focus. The presence of single-piece shell fishhooks, bone gorges, and composite barbs (Bleitz-Sanburg and Salls 1988) provides considerable insight into the fishing methods at the site. Nets were used for the smaller fish, while hook-and-line was used to exploit the Kelp Bed, Shallow Rocky Reef and Deep Rocky Reef habitats. The presence of large, white seabass otoliths, which were very common on the surface of the site, indicates some spearing was probably practiced. As with all the San Clemente Island sites, the sheephead was the most important species comprising 44 per cent of the piscine sample (Table 7.2).

The Nursery Site is in a direct line with the Little Harbor Site on Santa Catalina Island. These sites share the warm waters of the Catalina Gyre. A total of 28 species of fishes were recovered from the two sites. Fourteen species were present at both sites. Eleven Nursery Site species were absent at Little Harbor while three Little Harbor species—mostly large pelagic fishes—were absent at Nursery. An argument against deep-water, mid-channel fishing is advanced by the lack of abundant albacore (*Thunnus alalunga*) and the total absence of the skipjack (*Euthynnus pelamis*) and blue shark (*Prionace glauca*) at Nursery. These species are abundant at Little Harbor. Little Harbor, in contrast to Wilson Cove, has access to the very deep waters of the Catalina Submarine Canyon (Salls 1988:194-203).

Seasonality. The presence of albacore (*Thunnus alaunga*), yellowtail (*Seriola lalandi*), and bonito (*Sarda chiliensis*) suggests summer/fall occupation. Two white seabass (*Atractoscion nobilis*) otoliths recovered from the Nursery Site were examined for seasonality by Scientific Research Systems. Both fishes had been taken in the summer—one in the early summer and the other in late summer. The preponderance of year round fish species in the Nursery Site midden makes a definite season of occupation difficult to determine on fish bones alone; however, the abundance of house pits with storage facilities indicates a substantial village of some permanence.

Big Dog Cave (SCLI-119)

Since the 1939 excavations, much of the original face of the Big Dog cave midden has been lost due to wave action from the severe storms of 1982-83. The test units sampling the remaining midden consisted of three 1 by 1 m units, evenly spaced across the cave floor in areas which appeared to be outside the original 1939 excavations. A total of 2.4 cubic meters of cave floor was screened. The site yielded an ichthyofaunal sample of 870 elements or 364 elements per cubic meter. A total of 704 elements were identified (NISP) and the MNI was 105. The stratigraphy of the cave indicated that each unit was stratigraphically independent from the others. Due to the small sample and site disturbance, however, the MNI was calculated as a single aggregate (Grayson 1984:28).

Resource Zone. The resource zone at Big Dog Cave consisted of three nearshore marine habitats: Shallow Rocky Reef (SRRF), as indicated by the presence of black surfperch (*Embiotoca jacksoni*), cabezon (*Scorpaenichthys marmoratus*), and the grass rockfish (*Sebastes rastrelliger*); Kelp Bed (KB), as evidenced by sheephead (*Semicossyphus pulcher*), kelpfish (*Heterostichus rostratus*), and kelp rockfish (*Sebastes atrovirens*); and Deep Rocky Reefs (RRF), as shown by the presence of bocaccio (*Sebastes paucispinis*) and vermillion rockfish (*Sebastes miniatus*) (cf. Allen 1985, Figure 3). The major nearshore habitats exploited, based on the identified species, were: KB/SRRF 80 per cent, MW 12 per cent, RRF 3 per cent, and Soft Bottom (SB) 4 per cent—represented by the Boccaccio (*Sebastes paucispinis*).

Open Coast Sandy Beach (OC) habitats exist at nearby Horse Beach and Pyramid Cove. The faunal analysis does not support an exploitation of these areas. All these resource zones exist within one hour's paddling time from the mouth of the cave (cf. Squire and Smith 1977: Chart B). The northwesterly winds are very severe in the vicinity of the cave and probably inhibited traveling by canoe towards the sandy beaches to the southeast; however, they are easily reached by foot from the cave.

Fishing Adaptation. On March 17, 1769, the Spanish caravel *San Antonia* anchored between Pyramid Head and China Point, just east of Big Dog Cave (Vizcaino 1959:31). Two plank canoes came out from shore to meet the vessel. The occupants presented the Spanish with fish which had been harpooned. The Spanish remained for approximately three days and were provided with "red fish," possibly sheephead or the vermillion rockfish, both of which were present in the Big Dog Cave material.

Single-piece shell (*Haliotis*) fishhooks and fish line recovered from the cave indicate hook-and-line fishing. Nets were recovered in 1939 as well as a harpoon foreshaft (Bennyhoff 1950:304).

Seasonality. The cave is located in a narrow defile carved between two projecting fingers of land. It therefore provides excellent year-round protection except for rare southwesterly storms. Almost all the fish species recovered from the cave can be caught throughout the year at the island. The Pacific mackerel (*Scomber japonicus*) and the white seabass

(*Atractoscion nobilis*) are usually more abundant in the summer and fall months.

Eel Point B (SCLI-43B)

Six randomly scattered 1 by 2 m test units were excavated during the 1984 UCLA Field School resulting in 14.4 cubic meters of site matrix being screened for fish elements. A 30 per cent sample of the site excavations was obtained by the use of a table of random numbers. This sample (7.97 cubic meters) represents almost half the entire cubic volume excavated. A total of 1,825 fish elements were analyzed. This represents 203 piscine elements per cubic meter excavated. The NISP was 1082 with a MNI of 192 and the NISP per cubic meter was 136. The site was excavated by arbitrary levels within each stratigraphic layer. The MNI was determined from piscine aggregates within these cultural levels (Grayson 1984:28; White 1953).

Resource Zone. The present marine environment at Eel Point consists of extensive KB, RRF, SRRF, and MW habitats. The coastline exhibits sheer, 16 m (50 ft) cliffs immediately north of the site, and a cobble beach (Eel Cove) to the south. There may have been a sandy beach at Eel Cove in prehistoric times. This is suggested by two observations: first, underwater surveys in the immediate area of Eel Cove disclose large sandy areas just offshore, and second, the dune midden has been dissected by wave action and forms part of the Eel Cove cliff which extends down to the cobble beach. Finally, the cobble beach appears to be an erosional, interface feature between the dune and the sandy cove substrate.

The piscine sample exhibits most of the same fish species which are present in the area today. Although some general topographic features of the coastline have changed, the underwater habitats and fish species have apparently remained stable for at least 10,000 years. The nearshore underwater habitats exploited at Eel Point B were calculated by the number of identified elements recovered from the site. Ninety-one per cent of the identified sample were SRRF/KB species with the MW and OC habitats representing 4 per cent each. The remaining habitats were indicated by 1 per cent of the sample.

The marine habitats remain very similar for many kilometers north and south of the site and make it difficult to determine the resource boundaries. The presence of OC fish, such as the spotfin croaker (*Roncador stearnsi*) and some of the surfperch (Embiotocidae), indicate some fishing on a sandy beach. A sandy beach may have been present in Eel Cove, as suggested, or some fishing was conducted at beaches to the north or south of the site. The latter model does not seem likely, however, due to the distance involved. The few midwater fishes present indicate some procurement outside the kelp-bed habitat which currently extends on some reefs to approximately 1 km offshore. It is possible to catch yellowtail, albacore, and barracuda in the outer kelp, as they were observed in this environment during an underwater survey of the area.

Seasonality. Most of the fish remains recovered from Eel Point B are currently present in the site's resource zone throughout the year. The few albacore (*Thunnus alalunga*) found in this assemblage indicate a late summer/early fall occupation. The abundance of rockfish (*Sebastes* sp.) signifies a winter occupation, since many of these species are adapted for cold water and are found closer inshore during periods of cooling. They are also present, however, throughout the year in deeper waters.

Eel Point C (SCLI-43C)

The fish faunal assemblage was obtained from a random sample of the 1984 test pits. The excavation unit was 8 x 12 square meters. Such large areas were required for crew safety due to the potential slumping of the dune material and the great depth of the midden. The large unit was divided into 24, 2 x 2 m test pits. This area of Eel Point C overlies only the very upper layers of Eel Point B.

After the removal of 1.5 m of sterile overburden (wind blown dune sand), the test units were excavated by arbitrary 15 cm levels within each strata. The piscine sample was analyzed by cultural level. A total of 100 cubic meters of site matrix was screened through one-eighth inch mesh screens. A 30 per cent random sample of the site excavation was selected by using a random table of numbers. This sample of 19 cubic meters of site midden provided a total of 20,426 piscine elements and represents 1,088 elements per cubic meter. The NISP was 6,227 with a MNI of 926 and represents 328 identified elements per cubic meter.

Resource Zone. This zone was the same as at Area B of Eel Point.

Fishing Adaptation. This site appears to be an example of the decreasing correspondence between primary use and discard locations resulting from the increasing intensity of site occupation (Gifford 1980:98). The faunal remains indicate considerable differences between the occupation of this site and those of the Nursery and Little Harbor sites. Where the latter sites were highly diversified in terms of use areas, Eel Point C functioned as a specialized fishing camp. The collection of shellfish at Eel Point C also differed in that the smaller intertidal species, such as black abalone (*Haliotis cracherodii*), turbans (*Tegula* sp.), and limpets (Acmaeidae), were exploited instead of the larger species of *Haliotis* and *Mytilus* so prevalent at Eel Point B, Nursery, and the Little Harbor sites. There is considerable evidence that this change in the shellfish harvest was the result of over exploitation of the intertidal zone (see Raab 1989a, Salls 1986b, 1988). With the reduction in large mollusks fishing increased dramatically with a specialized exploitation of the California sheephead (*Semicossyphus pulcher*) (Fig. 7.3)

The preponderance of elements consisted of syncranium (head) bones—the atlas, second, and third vertebrae, and the penultimate, ultimate, and hypural bones of the caudal (tail) area. The absence of central body vertebrae suggests that this was a location of specialized processing. The processing activity also used great quantities of wood, inferred from the extensive ash and charcoal layers of the site. Very few burned elements were discovered in spite of the copiousness of the ash. The abundance of ash, paucity of burned bones, and the absence of "fish bodies" suggests the processing of fish for off-site consumption. Preliminary investigation at two additional sand-dune sites, known as the Gar and Flasher Sites on San Clemente Island, has disclosed similar processing activities.

The size of most of the fish elements suggests hook-and-line or spear fishing or both. Gorges, bone barbs, and several types of single-piece shell fishhooks are

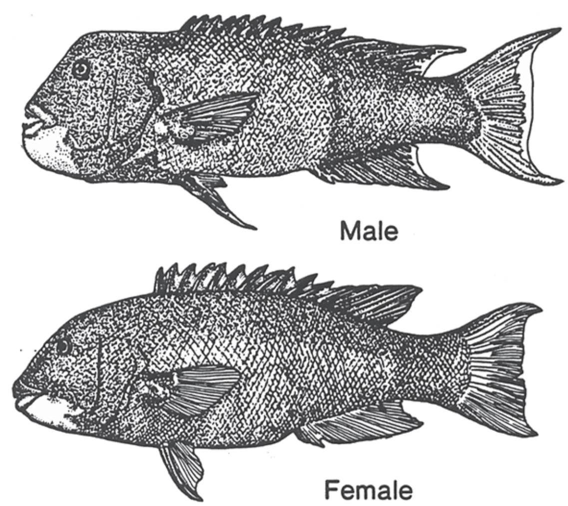

Fig. 7.3. California sheephead.

present within the midden. The similarity with Eel Point B can be observed in the same percentage for KB/SRRF fish, of 91 per cent. There was minor exploitation of Deep Rocky Reefs (RRF) and Soft Bottom habitats (SB) indicated by deep water rockfish (*Sebastes* sp.), totaling 7 per cent of the sample (Allen 1985: Fig. 4). MW and OC habitats are represented by 1.0 per cent and 0.8 per cent respectively. The sheephead (*Semicossyphus pulcher*) make up 58 per cent of the site's identified fish. This is interesting because sheephead, usually solitary, are often attracted by the feeding activity of schooling fish (Feder, Turner, and Limbaugh 1974:65). One would logically expect that the schooling fish would be more numerous around the bait of fishermen and therefore make up the greater percentage of the overall catch.

This solitary behavior would appear to eliminate the possibility of catching large numbers in nets. Further, sheephead inhabit KB, SRRF, and RRF habitats which are not conducive for gill or other large nets; however, a large gill net broke from its moorings and drifted into a kelp bed in 1987. When it was finally recovered, numerous large male sheephead were found to be entangled (Camm C. Swift, personal communication 1987).

The greatest support for underwater spearfishing, as described by the early explorers (Eisen 1905:9), is the profusion of sheephead elements. Sheephead consistently ranked at or near the top of the underwater, spearfishing catch for modern divers (Ames 1972). Assuming catch per unit of fishing effort to be the best indicator of relative abundance of sheephead, Ames compared the effort (days of fishing per person) between underwater spearfishing and hook-and-line angling.

The result of this comparison indicates that a party-boat angler, using hook-and-line, will catch a sheephead every 129.6 hours or one every 16.2, eight-hour days. A diver will obtain a fish every 22.7 hours of effort or one fish every 2.8, eight-hour diving days. Finally, a competitive diver will spear a sheephead every 4.8 hours or one fish per 0.6 of an eight-hour day. Competitive divers obtain more sheephead because they search for and target the largest fish, which are most often sheephead. Diving for fish with hand nets cannot be ruled out, however, as a method of capture since it was a common practice of the Southern Valley Yokuts, who were in close contact with the coastal people during historic times (Wallace 1978:450).

It could be argued that traps were used. This may have been the case as sheephead often enter lobster traps. I have observed, however, over the years, that almost every KB species will enter lobster traps. It is interesting to note that the California spiny lobster (*Panulirus interruptus*) is absent from the island faunal sample. If traps were used, it would seem logical that some evidence of lobsters would be present.

Seasonality Based on Otolith Analysis. A total of 40 otoliths were recovered by excavation and column sample analysis. This sample was submitted to Scientific Research Systems for identification and seasonality determination. Through careful examination, it was determined that fishing was a year-round activity at Eel Point C (Salls 1988:Figure 17).

A Generalized Ichthyofaunal Taxonomy

Faunal remains provide the means for reconstructing past environments as well as comprising the basic data used to explain certain dimensions of cultural change, especially with regard to hunter-gatherer societies. Different variations within the faunal assemblage may be related to the differences in the history of the site, the types of habitats available to the site, or to cultural distinctions between various occupants of the site. "To slight such material, or to study it with less care than is accorded potsherds, is to ignore or to misinterpret the evidence for an important segment of culture" (Daly 1969:147).

> It may be time, after a good number of years, to permit the dictum "*American Archaeology is Anthropology or it is nothing* " (Willey and Phillips 1958:2) to quietly retreat and to allow room for a more expanded view of the subject where zoological or ecological questions might be given at least equal footing with other, more esoteric, questions, such as the identification of ramages in archaeological remains. (Casteel 1976:6)

The generalized taxonomy accounts herein presented list the species from the archaeological context of San Clemente Island by family only (for a more in depth discussion of the individual fish species recovered from archaeological sites on San Clemente Island, the reader is referred to Salls 1988). The categories of fishes are arranged systematically based on the taxonomical classifications of Elasmobranchi by Compagno (1984a; 1984b) and Osteichthyes by Nelson (1984). "Considerable disagreement exists concerning the spelling of many family names" (Robins et al. 1980). There is also some confusion over the proper taxonomic classification of some fishes resulting in a species being recognized under different genera. In general, the genus and species nomenclature follows *The List of Common and Scientific Names of Fishes From the United States and Canada*, *4th edition* (Robins et al. 1980).

The Cartilaginous Fishes

Class Chrondrichthyes

Subclass Elasmobranchi (Sharks And Rays)

As the name implies, cartilaginous fishes have skeletons of cartilage which are usually calcified, but not true bone. These fishes are divided into two groups: sharks and rays (subclass Elasmobranchi) and the chimaeras (subclass Holocephali). Fertilization is internal. Oviparous species lay eggs in leathery cases while ovoviviparous species keep the eggs in the oviduct until the young hatch. A third type is similar to a placental animal giving live birth.

Order Heterodontiformes

These sharks are also known as bullhead sharks. They are circumpacific in distribution with an additional population off South Africa. There is only one family in this order (Heterodontidae) with eight known species. The only Southern California species is the Horn shark (*Heterodontus francisci*). Horn sharks prefer KB, SRRF and RRF habitats. The large dorsal spines are often found in archaeological sites and are sometimes mistaken for bird talons or animal teeth.

Order Laminformes

This order is comprised of large sharks with streamlined bodies which are the swiftest and most voracious of all the sharks. The family Lamnidae, or mackerel sharks are found worldwide in many habitats. Three members of this family are found in Southern California with only one species recovered at Eel Point C: the shortfin mako or Bonito shark (*Isurus oxyrinchus*). The shortfin mako is epipelagic but often comes close to shore. It is very common in the prehistoric sites of Southern California.

Order Carcharhiniformes

This order is comprised of small to moderately large sharks. This group includes approximately 60 per cent of all Elasmobranchi species.

Family Triakididae

The family Triakidae, or smoothhound sharks, are mainly inshore species which frequent shallow bays.

There are 45 species in this family with five found along the Pacific Coast (Eschmeyer, Herald, and Hammann 1983:34). The Triakididae were represented in most of the island sample, except Eel Point B, by the Leopard shark (*Triakis semifasciata*). This species is very common in Eel Cove, Wilson Cove and other sandy areas near KB habitats of the nearshore areas of San Clemente Island.

Family Carcharhinidae

The Carcharhinidae (Requiem sharks) are differentiated from their smoothhound relatives (Triakididae) by several anatomical differences. There are 32 species with four found along the California Coast. The most common is the Blue shark (*Prionace glauca*) which often patrols the edge of the kelp forests. They are also very easy to spear as they laze along the surface.

Order Rajiformes

This order consists of the familiar skates and rays which have adapted to benthic living (living in contact with the substrate [bottom] in bays, lagoons, Open Coast Sandy Beach (OC) habitats and in deep offshore waters). Rays have small denticles (thorns) on their dorsal surface. The denticles have been modified in some species into caudal stingers that have been recovered from San Clemente archaeological sites with asphaltum adhering to the proximal end indicating hafting.

Family Rhinobatidae

The guitarfishes (family Rhinobatidae) are shaped like their namesake; skate-like and flattened. There are two species in Southern California with the shovelnose guitarfish (*Rhinobatos productus*) being the most common. The shovelnose guitarfish frequents OC and Bay and Estuary (BE) habitats. This species is easy to obtain with hook-and-line, baskets, spears or by hand in the surf of sandy beaches. Its presence only during early Eel Point C time supports the sandy beach hypothesis for that period.

Family Myliobatidae

Another family within the Order Rajiformes is the Myliobatidae (eagle rays). One species of this family is native to Southern California waters, the bat ray (*Myliobatis californica*). The mouth plates and the caudal stingers of this species are very common in prehistoric Southern California archaeological sites located near BE habitats. Bat rays are also very common at San Clemente Island with over 150 mating couples observed in a single day. This species was caught by hook-and-line and by spearing during the ichthyofaunal surveys of the Island from 1984-1988.

Class Osteichthyes

This classification includes all the bony fishes except for the jawless types. The species recovered from the prehistoric Indian middens of San Clemente Island are all members of the taxonomic subdivision Teleostei. The teleosts are the most diversified and abundant group of vertebrates known, consisting of approximately 35 orders, 409 families and 20,812 identified species (Nelson 1984:87).

Order Anguilliformes

The anguilliformes make up a large order of fishes commonly called eels. They have elongated snake-like bodies that lack ventral fins. There are about 19 families and 597 species (Nelson 1984:102). The family Muraenidae is made up of the common rocky substrate and reef eels. There is only one species of Muraenidae in Southern California; the California Moray (*Gymnothorax mordax*). This common SRRF dweller is found in the rocks and crevices of the reefs of San Clemente Island. It must have been common for the last 10,000 years as it is found in every site midden investigated. Since morays are not found in cold waters, their range is below Point Conception. As a nearshore, warm water adapted species, its presence for such a long period of time indicates stable water temperatures similar to the present. Morays are taken on hook-and-line using cut bait such as abalone or fish.

Order Clupeiformes

This order includes the herrings, anchovies, and shads. They are small schooling fishes, compressed and generally silver in color. Their habitat is usually inshore and in shallow bays. There are four to seven families in this order with three occurring in Southern California (Eschmeyer, Herald, and Hammann 1983:70).

Family Clupeidae

This family includes the herrings, shads, and sardines. The Pacific sardine (*Sardinops sagax*) is a pelagic schooling fish found nearshore and around the outer edge of the kelp beds. It is occasionally taken on small hooks but nets are the preferred method of capture. During the Anza Expedition in 1775, the Spanish indicated that sardines were very abundant at several Chumash villages. Although column samples from each San Clemente Island site were analyzed for small elements, such as sardines, they were only recovered from the Columbus site. Therefore, they do not appear to be important in the overall catch of the sites investigated, and the possibility that they arrived on the site as stomach contents of a larger predator cannot be ruled out.

Order Scorpaeniformes

This order, which includes the scorpionfishes and rockfishes, is the largest marine family in California waters. Most members of this order have spines on the head and a suborbital ridge under the cheek. The fin spines are venomous in most species.

Family Scorpaenidae

There are 90 species of the family Scorpaenidae (rockfishes and scorpionfishes) in North American waters with the greatest diversity on the Pacific Coast (Table 7.3). They are the most abundant fishes in the

Table 7.3 Rockfish Recovered from San Clemente Island Sites

Common Name	Scientific Name	Preferred Habitat
California Scorpionfish	*Scorpaena guttata*	KB/SRRF/RRF/BE
Kelp Rockfish	*Sebastes atrovirens*	KB/SRRF
Brown Rockfish	*Sebastes auriculatus*	SRRF/SB
Gopher Rockfish	*Sebastes carnatus*	KB/SRRF/RRF
Copper Rockfish	*Sebastes caurinus*	KB/ SRRF/RRF
Black & Yellow Rockfish	*Sebastes chrysomelas*	IT/SRRF/RRF/KB
Yellowtail Rockfish	*Sebastes flavidus*	RRF/MW (schooling)
Chilipepper	*Sebastes goodei*	(all habitats)
Black Rockfish	*Sebastes melanops*	SRRF/RRF/MW/
Vermilion Rockfish	*Sebastes miniatus*	SRRF/RRF
Blue Rockfish	*Sebastes mystinus*	RRF (schooling)
Bocaccio	*Sebastes paucispinis*	RRF/SB/MW
Canary Rockfish	*Sebastes pinniger*	RRF/SB
Grass Rockfish	*Sebastes rastrelliger*	IT/SRRF/KB
Greenblotched Rockfish	*Sebastes rosenblati*	RRF
Bank Rockfish	*Sebastes rufus*	SB
Olive Rockfish	*Sebastes serranoides*	SRRF/KB/SB/RRF
Treefish	*Sebastes serriceps*	KB/SRRF/RRF

San Clemente Island middens after the sheephead. Rockfishes can be caught by the use of hook-and-line but some are presently caught with nets.

Family Hexagrammidae

The greenlings and lingcod (Hexagrammidae) comprise a small family of marine fishes related to the sculpins and rockfish but lack headspines. The lingcod (*Ophiodon elongatus*) was recovered from Big Dog Cave and Eel Point C. This species is abundant in shallow, colder waters north of Point Conception and is sometimes found in deeper waters of Southern California. The small sample of this species as well as the black rockfish indicate RRF fishing.

Family Cottidae

The family Cottidae represents the sculpin species within the order Scorpaeniformes. Most are very small tidepool (IT) species and are difficult to identify. One of the larger species is the Pacific staghorn sculpin (*Leptocottus armatus*), of which a single element was recovered from Eel Point C. This species prefers BE environments and often enters brackish waters as well as the lower reaches of coastal streams. As a major prey species of herons, fishes, and marine mammals, this single element may have reached the site as stomach contents of a larger species.

The second Cottid recovered was the Cabezon (*Scorpaenichthys marmoratus*). This species is a very common IT, KB, and SRRF species at San Clemente Island. Their habit of nesting in tide pools exposed them to the collecting activities of early man. The male guards the nest and can often be caught by hand (Feder, Turner, and Limbaugh 1974:91).

Order Perciformes

The largest order of vertebrates on earth, the Perciformes, is composed of approximately 7,500 known species. This order includes all the typical spiny-rayed fishes.

Family Percichthyidae

These are the temperate basses; bass-like fishes which have been recently separated from the true basses (Serranidae) by anatomical differences. During aboriginal times only two species of temperate basses were found in Southern California waters. One inhabits midwater depths within the open sea and was probably unknown to the Native Americans. The other represents the largest member of the order Perciformes found in local waters. This large fish, known as the giant sea bass, is rare in aboriginal sites. It is usually caught by hook-and-line from RRF, SRRF, and KB habitats (Salls 1988:560).

Family Serranidae

The family Serranidae contains the familiar bass-shaped fishes such as groupers and basses. Most are hermaphroditic with some being both male and female at the same time. Three members of this family were present in the faunal assemblages. The kelp bass (*Paralabrax clathratus*) was the most abundant and is presently common along the entire coast of the Island. The spotted sand bass (*P. maculatofasciatus*) and the barred sand bass (*P. nebulifer*) prefer the eel grass habitat near sandy areas (Feder, Turner, and Limbaugh 1974:32). All three were caught from the shore during marine surveys of San Clemente Island.

Family Malacanthidae

The Malacanthidae or tilefishes are found in temperate and tropical waters of the world. There are 31 species in the family with one or possibly two on the Pacific Coast. The ocean whitefish (*Caulolatilus princeps*) is the only common member along our coast. Although rare in most Southern California prehistoric middens, this species is common at San Clemente, both in the middens and presently along the west side of the island (Squire and Smith 1977:21). It is usually taken by hook-and-line or by commercial netting.

Family Carangidae

The Carangidae include the fast-swimming jacks, amberjacks, and pompanos. Schooling fishes, usually pelagic, with 12 species occurring along the Pacific Coast. The yellowtail (*Seriola lalandi*) is a common summer visitor in Southern California. During warm water years they may be found farther north and often linger the entire year. Their schooling behavior makes them easy prey for nets. In early historic times they could be caught from the shore with hook-and-line (Salls 1988:570-571).

The jackmackerel (*Trachurus symmetricus*) is a shoaling pelagic species ranging from the surface to 183 m (600 ft). The young are often found under the kelp canopy.

Family Sciaenidae

This family includes the drums and croakers which are known for the sounds they make. There are about 210 known species. The largest croaker along the Southern California Bight is the white sea bass (*Atractoscion nobilis*). This species is common in the Nursery Site midden. Young white sea bass are found along open coasts-sandy beach (OC) habitats but the adults are most often observed along the outer edge of the kelp beds. They can be speared from the surface but are usually taken by hook-and-line.

Two smaller relatives of the white sea bass, usually found in OC and BE habitats, are the spotfin croaker (*Roncador stearnsi*) and the yellowfin croaker (*Umbrina roncador*). Only a single element of each was recovered at Eel Point. This may indicate some change in the shoreline at the point, or the elements may have been brought to the sites in some sea mammal.

Family Kyphosidae

The Kyphosidae, known as the sea chubs, are made up of three subfamilies: the nibblers (Girellinae), the halfmoons (Scorpidinae), and the rudderfish (Kyphosinae). The very common Opaleye (*Girella nigricans*) is a Girellinae. It feeds on small microorganisms living on various algae and will not take animal bait. Although abundant in tide pools and areas of surf grass, it is seldom found in archaeological sites.

The halfmoon is another abundant fish very seldom found in aboriginal sites. It is a common schooling fish around kelp beds and shallow reefs. The commercial catch is made with nets. Halfmoon did not make up much of a resource on San Clemente as only two elements were recovered (Eel Point B).

Family Embiotocidae

The Embiotocidae (surfperches) elements are frequent within Southern California coastal sites. There are 13 genera with 22 species confined to the North Pacific Ocean and 20 living in the Eastern Pacific waters (Nelson 1984:18; Robins et al. 1980:47). Six species of Embiotocidae were recovered from San Clemente faunal assemblages. The KB, IT, and SRRF species were represented by the black perch (*Embiotoca jacksoni*), striped seaperch (*Embiotoca lateralis*), rainbow seaperch (*Hypsurus caryi*), rubberlip seaperch (*Rhacochilus toxotes*), and the pile perch (*Rhacochilus vacca*). A single OC species, the barred surfperch (*Amphistichus argenteus*), was present only at Eel Point C. The presence of this fish indicates that some OC fishing was practiced, probably before the coastline changed from sandy beach to cobble beach. All of the surfperch can be obtained with nets or by hook-and-line.

Family Pomacentridae

The damselfishes are usually shallow water tropical marine species with a few found in subtropical regions. These colorful fishes comprise 235 species with two occurring in Southern California waters including the largest known damselfish—the Garibaldi (*Hypsypops rubicundus*). The Garibaldi is rare in archaeological sites although it is very good to eat and easy to catch. It is found in rocky areas and KB and SRRF habitats. Currently it is very common at Santa Catalina Island and in that island's Ripper's Cove Site (SCaI-26) (Salls 1988b:593).

The blacksmith (*Chromis punctipinnis*) is the other damselfish present in California waters. It is a schooling fish found in KB, SRRF and RRF habitats. It is rare in prehistoric middens; a single element from the Nursery Site is the only representative from San Clemente Island.

Family Sphyraenidae

The sphyraenids include about 18 species of barracuda including a single species from Southern California - the Pacific Barracuda (*Sphyraena argentea*). This barracuda is a surface schooling fish found near shore and around kelp beds to about 18 m (60 ft.) and is usually caught by hook-and-line or nets. There is ethnographic evidence that coastal Native Americans used special harpoons to obtain barracuda (Hudson and Blackburn 1979:182).

Family Labridae

Known as wrasses, this is a large family of marine tropical fishes with 57 genera and 500 species (Nelson 1984:327). Some species live their juvenile and early adult phase as females and, as they grow older, change into males (*Protogynous hermaphrodite*). There are three species of wrasses in Southern California. The sheephead (*Semicossyphus pulcher*) is the most common species as well as the most abundant fish recovered from the archaeological remains on San Clemente Island. Sheephead are found in IT, KB, SRRF, and RRF habitats. They can be caught by hook-and-line from shore or watercraft and are easy to spear by underwater spearfishing.

Family Clinidae

This family includes the kelpfishes and fringeheads. The species recovered from Big Dog Cave (single element) was of the giant kelpfish (*Heterostichus rostratus*). This species resembles a kelp frond and it lives in the kelp canopy, adjusting its color to match its surroundings. It is not common in middens but is easy to spear from the surface.

Family Scombridae

The family of tunas and mackerels are fast-moving schooling pelagic fish, usually found in the summer and fall along the California Coast. There were four members of this family recovered, mostly from Eel Point and Nursery. Tuna can be caught in nets or by hook-and-line using live bait or lures.

Order Pleuronectiformes

This order, commonly known as flatfishes because of their unique flattened morphology and eyes on the same side of the body, is divided into 6 families, 117 genera, and 538 known species (Nelson 1984:373).

Family Bothidae

This family usually has a left-sided orientation of the eyes. The left side is usually pigmented while the right or "blind" side is white. The California halibut (*Paralichthys californicus*) is the only member of Bothidae recovered from the archaeological assemblages. Most of the elements were found at Eel Point

B—which again points to an environmental change of the coastline from OC to IT. Halibut are usually taken on hook-and-line.

Summary

By the very end of the Pleistocene Epoch people had reached and exploited the rich marine resources of San Miguel and San Clemente Islands. Because San Clemente Island is some distance from the nearest landfall (over 21 miles from Santa Catalina Island), and was never connected to the California coast, watercraft were required to reach it. Its occupation provides the earliest evidence of watercraft in North America and brings to light the innovation and adaptability of the first Americans (Meighan 1990).

The Kelp Bed (KB), Shallow Rock Reef (SRRF), and Deep Rock Reef (RRF) nearshore habitats of San Clemente Island provided a major fishery for the island inhabitants for ten millennia. Although the preponderance of fish species recovered from the island middens were from these habitats, the fishermen appeared to have specialized throughout this long time period in fishing for the California Sheephead. This specialization is evidenced in the ichthyofaunal sample in which sheephead make up 62 per cent of the entire sample from all four sites analyzed in this report. Preliminary analysis of five additional San Clemente sites (Old Airport [SCLI-1487], Ledge [SCLI-126], North End Shelter [SCLI-1178], Flasher [SCLI-16E], and Gar [SCLI-16S]), indicates a similar specialization.

The island preference for sheephead began very early at Eel Point (SCLI-43B) within strata radiocarbon dated at 9775 YBP and continued into the historic Mission Period, as evidenced at Big Dog Cave (SCLI-119) and the Columbus Site (SCLI-1492). Fishing for sheephead in the kelp forests continued despite changes in fishhook technology from the gorge to the shell hook and from composite bone hooks and harpoons to those made of Spanish metal.

Experiments during the UCLA field schools from 1983-1986 disclosed that shore fishing can account for most of the fish species present during the early period at Eel Point B. This shore based fishery appears in conjunction with the exploitation of intertidal abalone. Watercraft were present but the abundance of deeper water species, especially the rockfish (*Sebastes sp.*) does not appear until the late levels of Eel Point B (Salls 1988: Table 43).

The marine adapted Canaliño Indians developed their unique traditions from a maritime heritage of longer duration than has previously been considered. They affected their environment by constant exploitation of diverse marine resources—resources which declined in availability.

Acknowledgments

I wish to express my appreciation to the many people who assisted in the research and preparation of this paper. First, I would like to recognize Jan Larsen and Andy Yatsko of the Natural Resources Office, North Island Naval Air Station, San Diego; the San Clemente Island staff under the direction of Commander Patton; and the UCLA field crews supervised by Dr. Clement Meighan, for their valuable field assistance over a five year period. A special thanks goes to Camm Swift and Jeffrey A. Seigel, ichthyologists, of the Los Angeles County Museum of Natural History for providing comparative collections and assisting in the difficult fish bone identification, and to Dr. Rainer Berger and Millie Bendat of the UCLA Radiocarbon Laboratory for the radiocarbon dating and analysis. The San Clemente Island map was drawn by Jean Sells of the Earth and Space Sciences Department at UCLA and the nearshore marine habitats and sheephead fish by Dana Bleitz.