

FISH REMAINS FROM NINE ARCHAEOLOGICAL SITES IN RICHMOND AND SAN PABLO, CONTRA COSTA COUNTY, CALIFORNIA¹

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At least 34 species of fishes are represented among the remains recovered during excavations of nine archaeological sites in Richmond and San Pablo of western Contra Costa County, California. Of the 6,993 elements identified, most are from the sturgeon (2,549), sardine or herring (1,510), salmon (1,135) and bat ray (944). Marine, euryhaline and freshwater species are represented and probably reflect the exclusively local exploitation of fishery resources by the Costanoan Native American fishermen. Based on these remains, splittail, hitch and hardhead are recorded for the first time from San Pablo Creek. Ten of the species found here have not been previously reported from middens on the San Francisco Bay. These remains are from sites that date back to more than 3,000 years before present.

INTRODUCTION

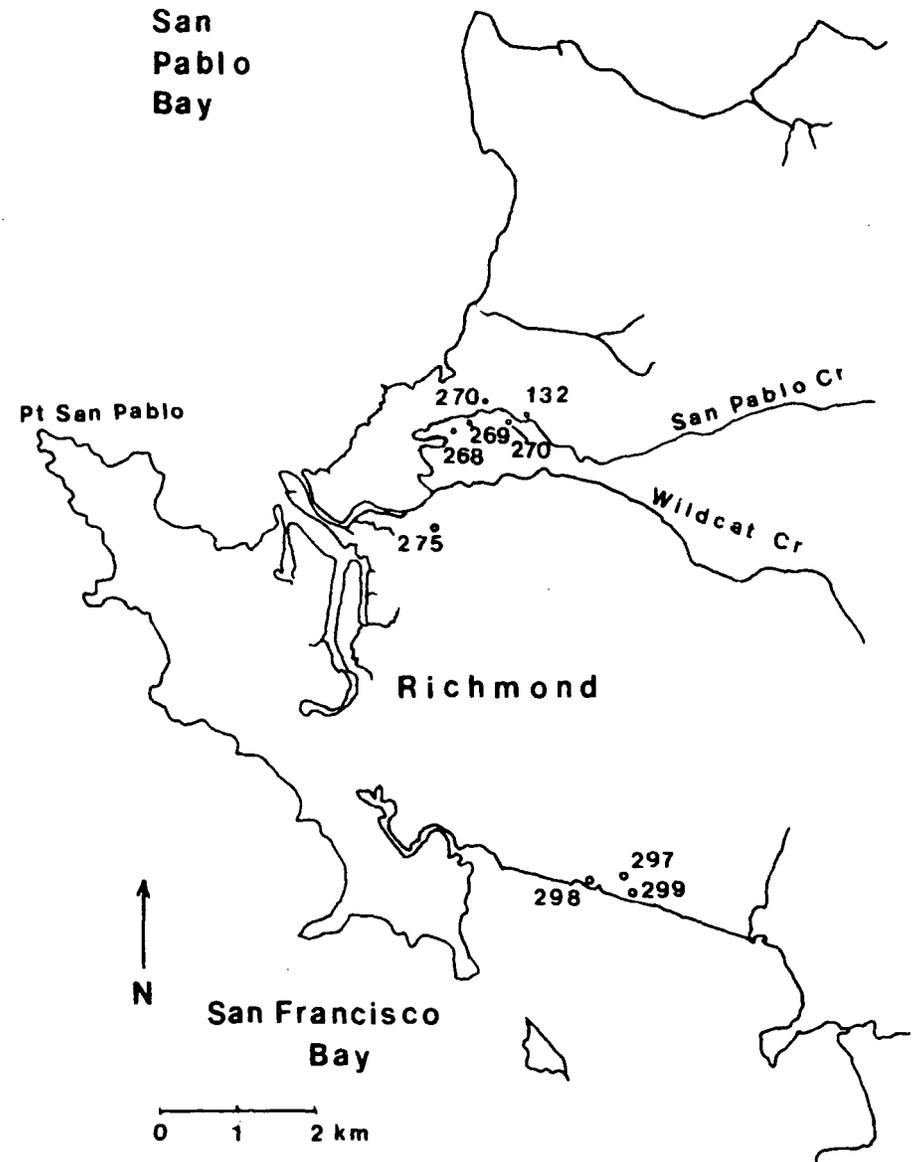
The remains of fishes that are associated with archaeological sites of native Americans not only provide information concerning dietary habits and fishing methods of prehistoric peoples, but contribute to our understanding of zoogeography (Gehlbach and Miller 1961, Gobalet 1990). They may also provide information regarding the population dynamics of species in ecosystems that have been dramatically altered during historic times (e.g., Schulz and Simons 1973, Schulz 1979). In the Richmond-San Pablo region of the San Francisco Bay area, the containment of streams forced by rapid urbanization has resulted in an alteration of the waterways to an extent that it is potentially catastrophic to the aquatic life of the area (Nichols et al. 1986); indeed many local environments no longer contain the pristine fish fauna reported by Skinner (1962) or Leidy (1984). This is a local manifestation of a far greater problem addressed by Miller (1961).

Far too often the findings from archaeological investigations receive limited distribution since they are published in site reports that satisfy legal requirements for environmental analysis of development projects and become part of the gray literature. It is the objective of this paper to reach a broader audience and to report on the fish remains found at nine archaeological sites in the Richmond-San Pablo region of western Contra Costa County, California.

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Nine sites were sampled. The six northern sites (CA-CCO-132, -268 through -271, and -275) are located along the lower reaches of Wildcat or San Pablo Creeks which arise in the San Pablo Hills to the east and flow into San Pablo Bay, a portion of the San Francisco Bay (Fig. 1). The three southern sites (CA-CCO-297, -298, and -299), collectively known as the Stege Mounds, are located along

FIGURE 1. Location of the study sites in the San Francisco Bay area of California.



the northeastern perimeter of the San Francisco Bay within the Richmond Harbor area. Testing and mitigation studies were undertaken in the area on archaeological sites CCA-CCO-268 through -271 (Banks and Orlins 1979), CA-CCO-269 and 270 (J. Holson, unpubl. data), CA-CCO-275 (Banks and Orlins 1980), CA-CCO-297 (Banks and Orlins 1987), CA-CCO-297 and 298 (Banks and Orlins 1981), CA-CCO-299 (Banks and Orlins 1985). These site reports have not been widely circulated, but are on file at the Northwestern Information Center, California Archaeological Inventory, Sonoma State University, Rohnert Park. Contributions on the fish remains appear in these reports.

The primary period of occupation was the Middle Horizon Period (1,000 B.C. to A.D. 500) though some occupation is indicated during the Early and Late Horizon (Table 1). The occupants were Costanoan (Ohlone) speaking and prior to European contact in the 1770's, they ranged from San Pablo Bay south to Monterey along the coastal ranges of California (Moratto 1984). The Huchiun tribelet was the largest group of Costanoan speakers in the San Francisco Bay area with a population of 580-800 people occupying the region from Rodeo Creek in Contra Costa County to Temescal Creek in Emeryville, Alameda County (Milliken 1981). The Richmond-San Pablo area contained a pair of villages totaling 100-200 persons in 1772 according to the early records of Pedro Fages and Father Crespi (see Milliken 1979). High population densities were probably maintained by the rich resources of the diverse estuarine habitat. However, these actual numbers sound low and perhaps disease had already lowered numbers by the 1770's. The exploitation of fishes was quite extensive. Loud (1924) found 527 stone net sinkers at one Stege Mound, CA-CCO-300, and Follett (1975b) suggested the use of watercraft, seines and gill nets at the West Berkeley shellmound (CA-Ala-307) about 5.6 km south of the Stege Mounds.

Table 1. Period of occupation of sites within Richmond-San Pablo area* (modified from Banks and Orlins 1981).

Site	Date of transition			
	1,000 B.C.		Phase 1	Phase 2
	Early horizon	Middle horizon	Late horizon	Late horizon
CCO-268		X		
CCO-269		X		
CCO-270		X		
CCO-271		X	X	
CCO-275	X	X	X	
CCO-297			X	X
CCO-298 ^b	X	X		X
CCO-299			X	
CCO-300	X	X		

*Based on radiocarbon dates, artifacts, and/or obsidian hydration.

METHODS

Most of the fish remains were obtained by using 1/4 in. and 1/8 in. mesh screens, a technique biased toward the recovery of remains of large fish (Fitch 1969, Casteel 1972). Column samples from sites CA-CCO-269, -297, -298 and -299 were subject to microscopic analysis. The column sample from CA-CCO-269 was screened with 40 mesh/in using the methods of Fitch (1969). These materials have been deposited at the Archaeology Laboratory of Contra Costa College, San Pablo, California.

Identifications were made by comparison with museum fish skeletons and scales from the California Academy of Sciences; the Museum of Anthropology, University of California at Davis; California State University, Bakersfield; and University of California, Los Angeles. Radiographs were taken of elasmobranch centra at the Veterinary Hospital of the University of California, Davis and compared with those of L.J.V. Compagno, then of Stanford University. Compagno identified the seven gill shark tooth and angel shark centra.

Identifications are made to the lowest possible taxon following the nomenclature of Robins et al. (1980). Distinguishing between the green sturgeon, *Acipenser medirostris* and white sturgeon, *A. transmontanus*, based on limited skeletal materials was not attempted for reasons elaborated by Follett (1975b). Because diagnostic bones were not present, the atherinids may be either topsmelt, *Atherinops affinis*, or jacksmelt, *Atherinopsis californiensis*; the clupeids either the Pacific herring, *Clupea harengus*, or Pacific sardine, *Sardinops sagax*; the salmon are probably chinook, *Oncorhynchus tshawytscha*, or coho, *O. kisutch*; the rockfish, any of dozens of species in the genus *Sebastes*.

RESULTS AND DISCUSSION

A minimum of thirty-four species of fishes were identified in these studies (Table 2, Table 3). Gobalet (unpubl. data) reported 36 species alone, in another record of remains at CA-CCO-297. Included however, were four exotic species and considerable other evidence of recent perturbation of the site; these remains are evidently historic and were not considered in this study. Loud (1924) indicated that the site had been leveled prior to 1924. Follett (1975a) previously reported the remains of sturgeon, leopard shark, *Triakis semifasciata*, and white sea bass, *Atractoscion nobilis*, from the Stege Mounds (probably CCO-298 or CCO-300) in Richmond, California.

The exploitation of a diversity of aquatic habitats by Native Americans is indicated because the fish species are either marine, freshwater, or those that move between these habitats (Table 2). Natural history summaries of these species can be found in Skinner (1962), Moyle (1976), or Eschmeyer, Herald and Hamman (1983). Excellent reviews of the fishing techniques used by the native fishermen are found in Rostlund (1952), Follett (1974, 1975b) and Salls (1988).

Table 2. Fishes identified from archaeological sites in Contra Costa County, California.

Marine taxa	Common name
<i>Myliobatis californica</i>	bat ray
Rajidae ^a	skates
<i>Squatina californica</i>	Pacific angel shark
<i>Triakis semifasciata</i>	leopard shark
<i>Galeorhinus zyopterus</i> ^a	soupin shark
<i>Squalus acanthias</i>	spiny dogfish
<i>Notorynchus maculatus</i>	sevengill shark
Clupeidae	Pacific herring, Pacific sardine
<i>Engraulis mordax</i>	northern anchovy
<i>Porichthys notatus</i>	plainfin midshipman
Atherinidae	topsmelt, jacksmelt
<i>Atractoscion nobilis</i>	white seabass
<i>Amphistichus</i> sp.	barred, calico, redbtail surfperch
<i>Cymatogaster aggregata</i>	shiner perch
<i>Embiotoca</i> sp.	black perch or striped seaperch
<i>Hyperprosopon</i> sp.	spotfin, walleye, silver seaperch
<i>Hypsurus caryi</i>	rainbow seaperch
<i>Phanerodon furcatus</i> ^a	white seaperch
<i>Rhacochilus toxotes</i>	rubberlip seaperch
<i>R. vacca</i>	pile perch
<i>Cebidichthys violaceus</i>	monkeyface prickleback
<i>Sebastes</i> sp.	rockfish
<i>Citharichthys sordidus</i> ^a	Pacific sanddab
Euryhaline taxa	
<i>Acipenser</i> sp.	white or green sturgeon
<i>Dorosoma petenense</i> ^b	threadfin shad
<i>Oncorhynchus</i> sp.	chinook or coho salmon
<i>Morone saxatilis</i> ^b	striped bass
Embiotocidae	surfperches
Gobiidae	gobies
<i>Gillichthys mirabilis</i>	longjaw mudsucker
Cottidae	sculpins
<i>Platichthys stellatus</i>	starry flounder
Freshwater taxa	
Cyprinidae	minnows
<i>Pogonichthys macrolepidotus</i>	splittail
<i>Lavinia exilicauda</i> ^a	hitch
<i>Mylopharodon conocephalus</i> ^a	hardhead
<i>Catostomus occidentalis</i>	Sacramento sucker

^aDoubtful identification.

^bIntroduced species.

The bat ray, *Myliobatis californica*, (944), sturgeon (2,549), Pacific sardine or Pacific herring (1,510), and salmon (1,135) are the most abundant (Table 3) in numbers of elements identified. Since sampling techniques varied at each site and because microscopic examinations were undertaken only at sites CCO-269, CCO-297 and CCO-298, comparisons between sites on the availability or the preference for these fishes by the aboriginals are speculative.

The bat ray, attaining a weight of 95 kg (Miller and Lea 1972), white sturgeon, 629 kg in California (Fry 1973 in Follett 1975a), and chinook salmon, 57.5 kg

Table 3. Number of elements identified by archaeological site.

Species	CCO-132	CCO-268	CCO-269	CCO-270	CCO-271	CCO-275	CCO-297	CCO-298	CCO-299
Leopard shark		2	2	1		4	155	13	2
Bat ray	2	40	492	13	4	27	310	21	35
Sturgeon	36	40	1,908	190	71	112	160	27	5
Sardine or herring			2				1,338	170	
Northern anchovy							19	5	
Salmon	15	59	658	201	54	26	40	77	5
Minnows or suckers		1	4		2				
Splittail			6	1	3				
Sacramento sucker		6	2						
Plainfin midshipman		4	58	11	1	16	35	2	2
Topsmelt or jacksmelt			62	5	2		117	11	5
White seabass							22		
Barred, calico, or redbtail surfperch		1	1				74		
Black perch or striped seaperch		10		3	2		53	2	
Rainbow sea perch			1				7		
Spotfin, walleye, or silver surfperch		2		2			1		
Rubberlip seaperch							7		
Pile perch							9	1	
Surfperches		3	9	7		1	16	2	
Longjaw mudsucker			2	6			6		
Starry flounder					1		4		
Rockfish							24		
Total ^a	53	163	3,213	466	140	187	2,405	332	54

^aTotal includes miscellaneous: Soupin skark (CCO-270, 2 elem.); angel shark (CCO-297, 1 elem.); skate (CCO-297, 2 elem.); spiny dogfish (CCO-298, 1 elem.); sevengill shark (CCO-275, 1 elem.); threadfin shad (CCO-298, 3 elem.); hitch (CCO-271, 1 elem.); hardhead (CCO-271, 1 elem.); striped bass (CCO-269, CCO-297, 1 elem. ea.); monkeyface prickleback (CCO-270, 2 elem.); white seaperch (CCO-268, 1 elem.); shiner perch (CCO-297, 1 elem.); goby (CCO-297, 1 elem.); splittail (CCO-297, 2 elem.); Pacific sanddab (CCO-269, 1 elem.).

(Miller and Lea 1972), are all large species that would have been significant and reliable food sources. The Pacific herring and Pacific sardine are of lesser size but nevertheless reach 45 cm in total length (Miller and Lea 1972). The superabundance of sturgeon at CCO-269 suggests ready availability of the anadromous sturgeons from San Pablo Bay, its sloughs and possibly San Pablo Creek. A single modest-sized sturgeon (10-25 kg) would contain considerably more meat than hundreds of silversides or herring or dozens of minnows. Thus the numbers of elements identified do not reflect the edible portion available from each fish.

The anadromous coho salmon and the freshwater Sacramento sucker, *Catostomus occidentalis*, have been recorded from San Pablo Creek by Leidy (1984). Remains questionably identified as splittail, *Pogonichthys macrolepidotus*, from CA-CCO-269, -270, and -271, hitch, *Lavinia exilicauda*, and hardhead, *Mylopharodon conocephalus*, from CCO-271, if taken from the adjacent San Pablo Creek, as seems reasonable, document the prehistoric presence of these freshwater minnows. The paucity of remains from the suckers and minnows, however, would argue against their being a significant resource or a reliable indicator of zoogeography. If the salmon taken were coho, San Pablo Creek itself would be the likely source. However, if the salmon were chinook salmon, it is reasonable to assume that watercraft were used in San Pablo Bay to capture these fish during their migrations into the Sacramento and San Joaquin Rivers (see Skinner 1962). Evidence here suggests that both the creek and bay were extensively exploited.

Data from CCO-268 through -271, and -275 all indicate similar exploitation of the fishes characteristic of the region with obvious differences from the fishes exploited at sites CCO-297 through -299, located just 9 km southeast at the present Richmond Harbor (Fig. 1). Fishes found at the southern sites, but not at the northern ones, are the surfperches (*Amphistichus* sp., *Cymatogaster aggregata*, *Embiotoca* sp., and *Rhacochilus* sp.), Pacific herring and Pacific sardine, white sea bass, rockfishes and northern anchovy, *Engraulis mordax*. These fishes are all generally found in rocky areas or more open water, the environments of Richmond Harbor. The exclusively freshwater fishes are found only at the sites on San Pablo Creek and Wildcat Creek to the north. Sturgeon, salmon, and bat ray are commonly found at archaeological sites throughout the San Francisco Bay area and at both the northern and southern sites studied here. These data suggest local exploitation and no trade for fishes from distant locations.

Fishes reported from these nine archaeological sites that have not been previously found at other sites in the immediate San Francisco Bay area are the Pacific angel shark, *Squatina californica*, spiny dogfish, *Squalus acanthias*, sevengill shark, *Notorynchus maculatus*, northern anchovy, shiner perch, *Cymatogaster aggregata*, Pacific sanddab, *Citharichthys sordidus*, longjaw mudsucker, *Gillichthys mirabilis*, splittail, hitch and hardhead. It is possible that remains of these fishes have been identified at sites in the Bay Area, but the findings are in poorly distributed site reports. The remains of the two introduced

species identified here, the threadfin shad, *Dorosoma petenense*, and striped bass, *Morone saxatilis*, were found near the surface of the sites where recent deposition would be expected.

Since the marine fishes of the three southern sites tend to be open water forms or those that inhabit rocky areas, the local aquatic habitat has apparently changed little from the time of aboriginal occupation. The diversity of species at the six northern sites however, indicates a variety of aquatic habitats. The Costanoans used watercraft to fish the open bay (Follett 1975b) but probably exploited the extensive salt marshes that fringed the San Pablo Bay as well. Sturgeon and bat ray could have been speared or netted in shallow marshy waters. The exclusively freshwater species are noteworthy. Since splittail and hitch are found in slow moving waters, hardhead in undisturbed sections of streams, and Sacramento suckers in a variety of habitats (Moyle 1976), it appears that San Pablo Creek flowed year-round to maintain populations of freshwater fishes. It would have terminated in a marshy freshwater delta that graded into the salt marsh. Sturgeon and salmon probably ascended its main channel. This suggested habitat is in marked contrast to that of today where, if the streams flow at all, it is through reclaimed marshland down canals maintained for flood control. The sluggish freshwater habitat of the native species is clearly no longer present. Conservation efforts might be directed toward reestablishing the freshwater marsh.

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