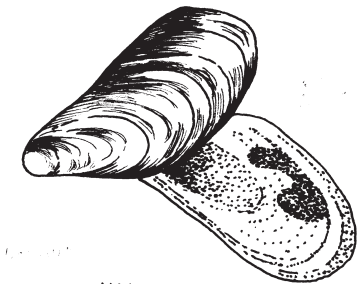
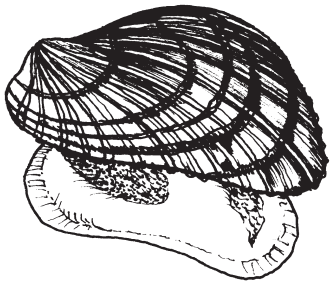
A Field Guide to Tijuana Estuary Organisms

MOLLUSCS

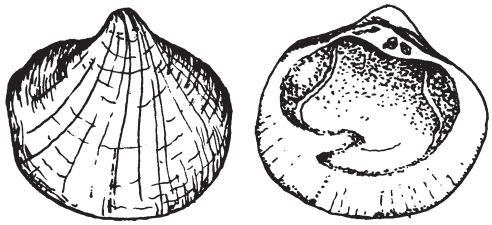
Bivalves



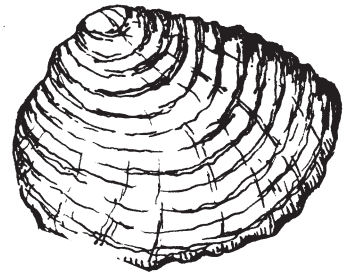
Bay Mussel - *Mytilus galloprovincialis* - (100mm)
A smoother, smaller and more wedge-shaped version of the California mussel, the bay mussel has a bluish black shell. It is up to 10 cm in length, pointed and wedge-shaped at one end. When the two halves of the shell open, the large closing muscle and four pairs of gills are apparent. The byssus gland at the end of the foot produces a sticky thread that enables the mussel to attach itself to rocks, wood, or even firm mud. The bay mussel pumps over one liter of seawater per hour, filtering nutritive particles from the water. Mussels can attach to each other to form mussel beds. Although this mussel was long considered a native mussel called M. edulis, it is now known to be an exotic species native to Europe.



Asian Mussel - *Musculista senhousia* - (10-25mm)
From the same family as the bay mussel, it is another invader in the New World. Asian mussels probably accompanied Japanese oysters brought to Washington for out-planting. They then spread with ballast water or in ocean currents. Suspension feeders, they too filter large amounts of water. A variety of fish and shorebirds savor these mussels. The Japanese name for this mussel means "cuckoo shell" because its color resembles this bird's plumage. Like the bay mussel, it produces byssal threads from a special gland on the foot. Living in the soft bottom of the estuary, it uses the byssus to create a "cocoon" in the sediment. These cocoons can form very dense mats, although densities have been relatively low in the Tijuana Estuary.

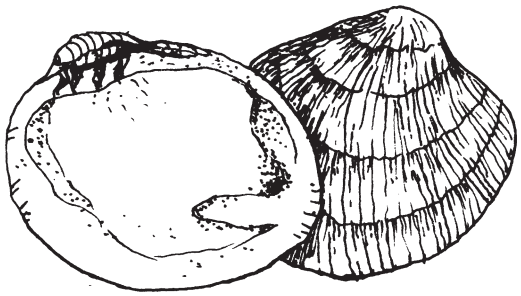


Smooth Cockle - *Chione fluctifraga* -(50-60mm)
The chione is named after Chione, a Greek goddess who mated with the sea god Poseidon; it is also called the smooth Venus clam. Its ribs and concentric growth ridges are weakly developed, so the surface of this 9 cm.-long cockle remains smooth. It is chalky white on the outside, with purplish pigmentation along the border of the interior muscle scars. Like all cockles, it lives just beneath the substrate, both intertidally and subtidally. It is a suspension feeder, using its short siphons to filter food from the water column.

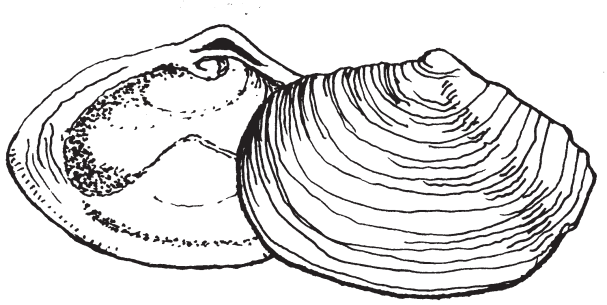


Wavy Cockle - *Chione undatella* - (45-60mm)
Another bivalve mollusk, the wavy Venus clam has prominent concentric growth ridges, set close to one another. Its ribs are markedly visible all over the white shell. Another benthic invertebrate, it lives just beneath the sandy intertidal mud. It grows up to

6.5 cm. Like Chione fluctifraga, C. undatella is a member of the Veneridae family, named after Venus. Both were popular human food sources in the past.



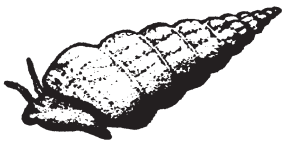
Littleneck Clam - *Protothaca staminea* -(40-60mm) Its shell's numerous, radiating ribs are well developed and prominent; the concentric ridges that criss-cross them are less so. The inside of the shell is white, the outside yellow or tan, with or without V-shaped brown markings. Typically, littlenecks live in the sand and mud under rocks in the low tide zone, at depths up to 20 cm. The size and density of clambeds increase with tidal depth, where more food is available and the substrate is more stable. Approximately 6 cm. in length, littlenecks take four to six years to mature. With so slow a growth rate, depleted clambeds take ten to twenty-five years to repopulate and mature.



Bent-nose Clam - *Macoma nasuta* - (40-60mm) Bent to the right, the bent-nose clam's shell is white, but covered with a protective gray periostracum. The 5 cm.-long clam is content in a mixture of mud, sand, gravel and clay to a depth of 20 cm. It lives at low tide lines. It extends its siphon above the surface to suck fine organic debris into its digestive tract, a process called deposit-feeding. Undigested mud and sand are expelled out the excurrent siphon beneath the surface. The separate siphons change colors. They are white when they are extended and orange when they are extracted.

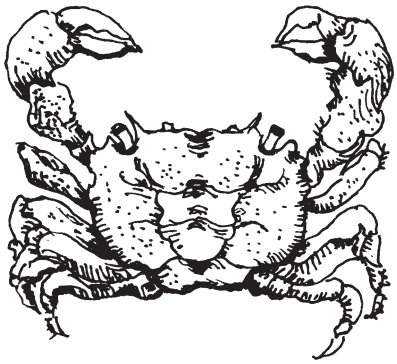
California Jack-knife Clam - *Tagelus californianus* - (60-100mm) The Jack-knife Clam is white to gray in color with a brown protective covering. Its hinge is located in the middle of the shell. This mollusk reaches a length of 10 cm. It inhabits sand, mud, or muddy sand near the low tide level, though it prefers sediments with some silt and clay. It cannot burrow into sediments that are composed primarily of sand. A suspension feeder, it lives about 10 cm or more below the substratum surface. It extends its two diphons into the water through separate openings to feed on plankton Fish and birds prey upon the jack-knife clam.

Gastropods



California Horn Snail - *Cerithidea californica* - (25-45mm) Strewn by the thousands per square meter over the high-tide zone, this is the most conspicuous snail in the estuary. The shell is black, about 2 cm. long, and has 8 to 10 whorls. Dragging across the mud flats, leaving visible tracks, it scoops organic debris and algae with its radula. The horn snail hosts many marine parasitic trematodes that later go on to infect birds and fish. The clapper rail is among the animals that eat the horn snail.

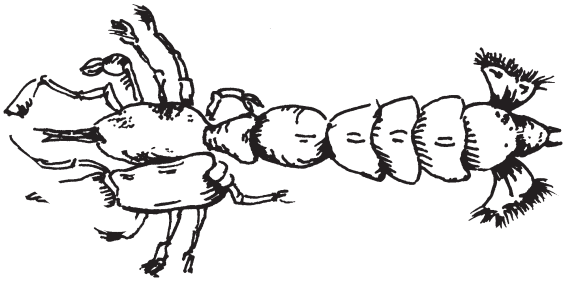
Salt Marsh Snail - *Melampus olivaceus* - (10-14mm) It is so called because it resembles a ripe olive. This snail is an air-breathing pulmonate, unlike the horn snail (which uses gills). Like many gastropods, this snail eats from its elongate aperature as it walks. Under the thick external layer of the shell that protects it from acids, it is brownish with white bands. Miniscule at 10-14 mm., the abundant salt marsh snails hide under debris and pepper estuary shores at drift lines. They crawl along driftwood in pickleweed marsh and are a favorite food of the light-footed clapper rail. (Shells are in the regurgitated clapper-rail pellets.)



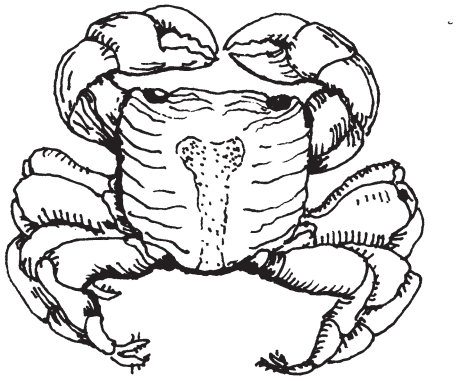
Yellow Shore Crab - *Hemigrapsus oregonensis* - (5cm) Also called a mud crab, this species is yellowish tan with dark mottled spots on its shell and hairy legs. Its carapace has three teeth. At its biggest, the yellow shore crab is 5 cm. It scuttles around the tide line scavenging for green algae and plant debris, and filter feeding when necessary. It either digs into the sides of mud banks and burrows down to water level, or lives under rocks in the intertidal zone. It is a popular food for the clapper rail.

CRUSTACEANS

Decapods



Red Ghost Shrimp -*Neotrypaea californiensis* - (10-12cm) White with a faint tinge of pink, this ghost shrimp measures up to 10 cm. in length. In undisturbed estuarine waters, ghost shrimps tunnel almost incessantly, burrowing into the sediment. This activity creates a home for the shrimps and numerous other animals. The burrows protect the shrimps' soft, opalescent bodies. As they wriggle along, the crustaceans collect food from the sediments and from the water flowing through the burrows. That the ghost shrimp can survive without oxygen for as long as six days makes it an ideal estuarine animal. Male shrimp have one large claw, an enticement to females. It has been overharvested in some areas for use as bait.

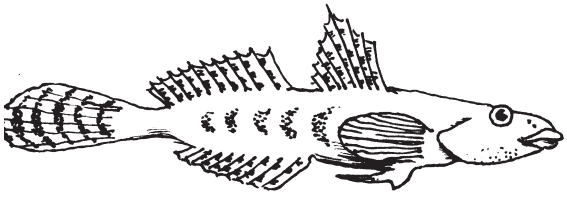


Striped Shore Crab - *Pachygrapsus crassipes* - (5cm) The most commonly encountered crab on the intertidal shores of Southern California, the striped shore crab bustles along rocks, tide pools,and marshes. In soft-sediment areas, these "macro-invertebrates" create burrows in which to live. They feed on seaweed and any decaying organic matter they find or scrape from the rocks. With an upper surface that is dark green, with lighter lines running from side to side, they are most visible when they move. Their legs are dark purple.

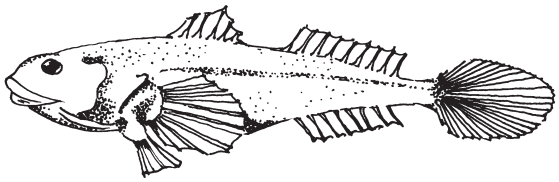
FISH

Bony Fish

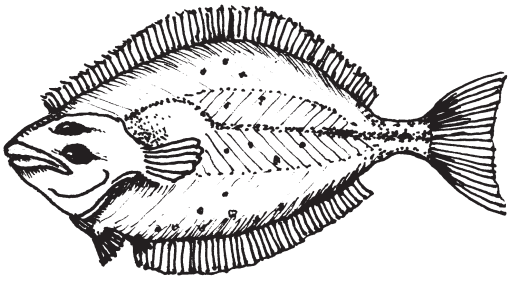
Arrow Goby- *Clevelandia ios* - Small (7 cm.) and resourceful, the arrow goby survives neatly in the erratic and sometimes harsh estuarine environment. This tiny darting fish takes refuge and spawns in burrows abandoned by ghost shrimp and innkeeper worms. If these havens are unavailable, the fishes may just bury themselves under the soft intertidal sand and mud. One female lays a thousand eggs at a time, leaving them unattended in a burrow. An arrow goby's upper body is mottled gray and black. Its belly is lighter in color. Arrow gobies feed on a wide variety of invertebrates, such as copepods, nematodes, and ostrapods. Stranded arrow gobies are popular food for birds.



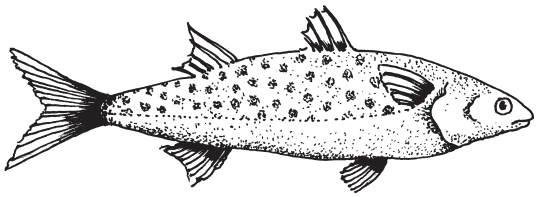
Yellowfin Goby - *Acanthogobius flavimanus* - (30cm) Though native to Asia, this species was probably introduced by ballast water in northern California in 1959 and first appeared in the estuary in 1980. It has now established itself in the estuary and adapts well to freshwater, brackish or salt water. It inhabits muddy and sandy bottoms. This goby grows up to 30 cm. and is brownish with conspicuous dots on the dorsal fins. It often has 5 or more indefinite patches on its side. Its upper caudal fin barred. The yellowfin goby deposits its eggs in Y-shaped nests.



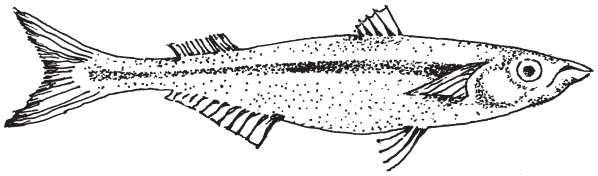
Longjaw Mudsucker - *Gillichthys mirabilis* - (10cm) One of the most abundant fish in the marsh, the mudsucker forages during high tide on copepods, isopods, amphipods, and algae. The mudsucker's mouth is extremely large, its upper jaw extending to the gills. Olive-colored and mottled with brown, it is lighter on the bottom than on the upper surface. It grows to 10 cm. in length. It has a tremendous ability to withstand extreme environmental conditions, such as high temperatures and salinities found in isolated marsh pools.



California Halibut - *Paralichthys californicus* - With an oblong and compressed body, this flatfish is a member of the left-eyed flounder family. Nonetheless, about 40 percent of California halibut have their eyes on the right side. They are dark brown to black on the eyed side and white on the blind side. Their numerous teeth, very large mouth and a high arch in the middle of the top side over the pectoral fin set them apart from other flatfish. This commercially-important fish spends its juvenile stages in the estuary (as a nursery), moving to open water when they are older. Favoring sandy shallow water, they grow to about a meter and a half. They feed on anchovies and other small fishes.

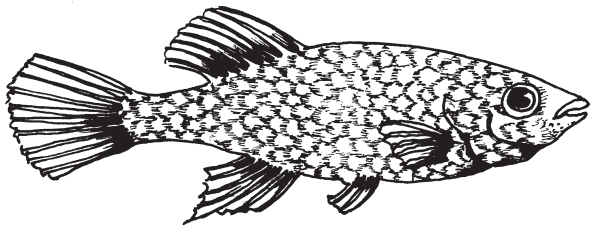


Flathead mullet - *Mugil cephalus* - (1-1.5m) From half a meter to a meter in length, the mullet's upper body is olive-green to gray in color. It has silvery sides and a white belly, with short pectoral fins and a large 'V' shaped tail. This fish's flattened head, large eyes, and thin lips are notable. Its presence in tidal creeks is often noted by the splashing sounds it makes when it leaps out of the water. Withstanding variable salinity, it is a common fish over sand or mud-bottomed areas of the estuary. However, it must return to offshore saltwater in order to breed in large schools. During the summer, mullets accumulate fat before roeing. Their stomachs have a "gizzard" that breaks down rough organic material. Mullets deposit their eggs in the mud where they remain dormant until the next season.

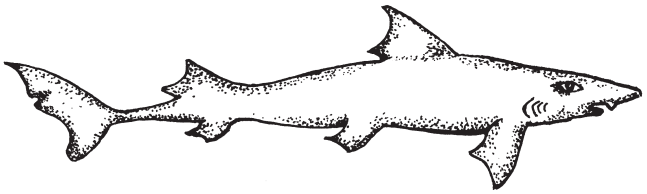


Topsmelt - *Atherinops affinis* - (40cm) Forked teeth distinguish topsmelts from other silverside fish like jacksmelt and grunion. They use them for gnawing at small crustaceans. Approximately 40 centimeters long, topsmelts are blue gray on their upper surface and silver on the lower. The silver streak runs from gills to tail fin on either side. Of their two separate dorsal fins, one has spines and the other soft rays. Topsmelt are so named because they swim in schools near the surface, creating a slithering subsurface shimmer.

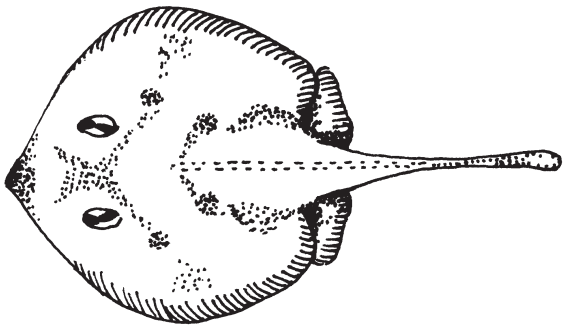
Cartilaginous Fish



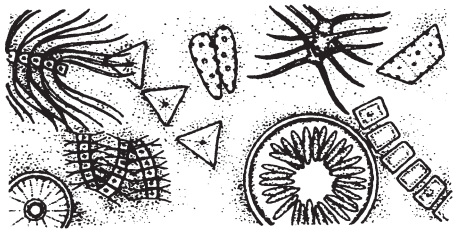
California Killifish - *Fundulus parvipinnis* - (11cm) At home in salt, brackish, or fresh water, the California killifish is most frequently seen in the estuary's upper tidal reaches. They feed on crustaceans,insects, and many other invertebrates. Up to 11 centimeters long, their blue, green and purple tones appear iridescent. Killifish give birth to live young that take refuge in the high marsh.



Gray Smoothhound Shark - *Mustelus californicus* - (116cm) Sleek, slender and long, the smoothhound shark averages about 116 cm. in length. The face of this shark, with its large oval eyes, resembles its genus name, "mustelus," which means weasel. Behind each eye is a noticeable spiracle. Its body is darker above than below. It can be spotted in shallow offshore waters and in the estuary at depths of around two meters or less. It has low blunt teeth and a large second dorsal fin. The dorsal fin originates slightly behind the free rear tip of the pectoral fins. The lower lobe of the caudal fin is usually indistinct. It eats ghost shrimp, innkeeper worms and small fish and may be preyed upon by larger sharks.

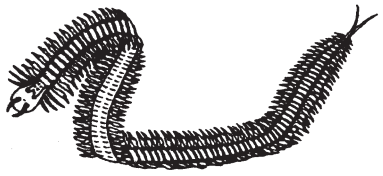


Round Stingray - *Urobatis halleri* - (50cm) Our most common stingray, the round stingray feeds upon bottom-dwelling worms, clams and fish that it scoops out with its powerful pectoral fins. Its upper surface is brown and speckled; its lower surface is yellowish. Its body is a circular disk with a tail slightly less long than its body. The stingray reaches up to 50 cm. in length. It uses its long venomous spine, located approximately halfway down the length of the tail, primarily for defense. Mostly, it lies motionless in the sandy and muddy bottoms of relatively shallow channels, only exposing its eyes. It is also found on beaches, and can inflict a painful wound if it is stepped on. (Do the "stingray shuffle" to avoid this.) Round stingrays segregate by age and sex, leaving males and juveniles to occupy shallower habitats.



Diatoms - Mud is covered with microscopic, single-celled algae called diatoms. They are beautifully decorated, symmetrical cells enclosed in a silicon "shell." They contribute enormous amounts of organice material and oxygen to the estuarine system. Diatoms can photosynthesize so quickly that they produce organic compounds faster thatn they can assimilate them. The compounds are exuded into the water where they become available to other microscopic organisms such as bacteria. Look for an oil-like sheen on the mud surface or a brownish foam along the shore and you'll know that diatoms have been busy.

Amphipod - There are many different species of amphipods in Tijuana Estuary. They are tiny crustaceans resembling a shrimp. The common "sand flea" found in beach wrack is one kind of amphipod. Others are associated with certain algae and are bright green in color. The small, brown amphipod found in tidal pools in the mud eats the detritus that accumulates there. Amphipods range in size from microscopic to 3 cm.



Polychaete Worms - This group of worms is well represented on the mudflats. Polychaetes are made of many segments, each with "parapodia," leg-like structures on each side. Many are microscopic or seldom seen. Others, like those listed below, are conspicuous members of the mudflat community.