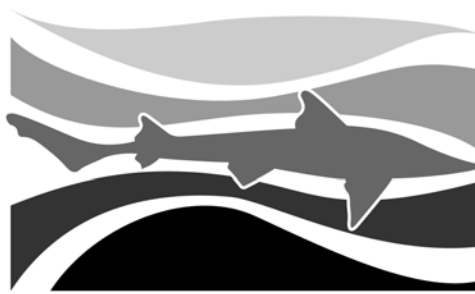


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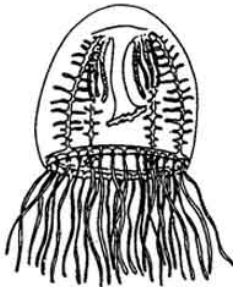
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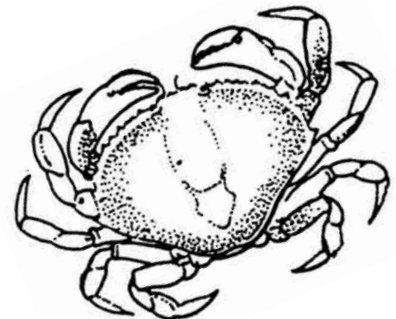
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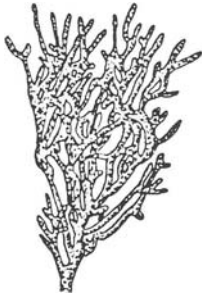
Revised by:
Andrea Swensrud
Megan Platt

Edited by:
Andrew N. Cohen

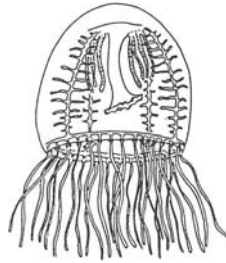


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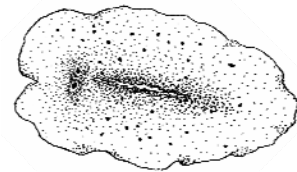
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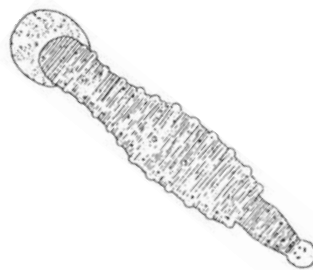
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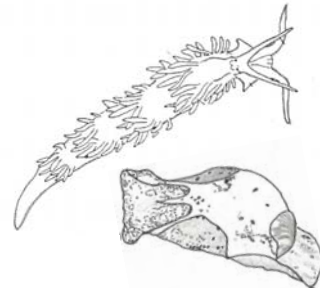
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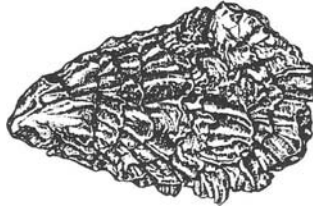
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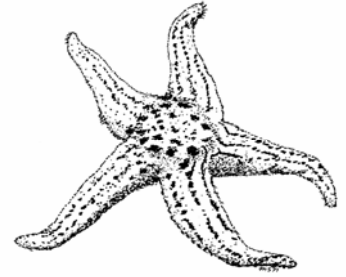
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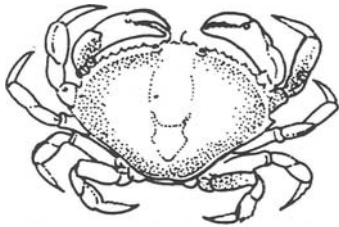
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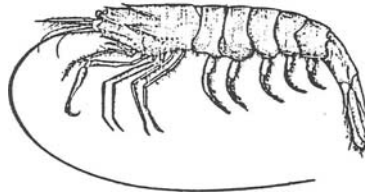
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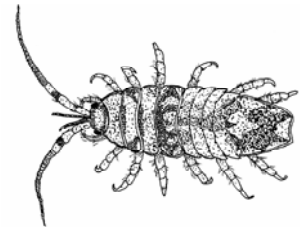
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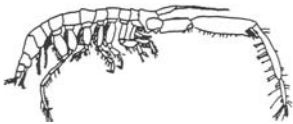
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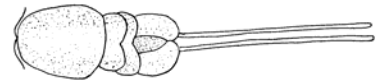
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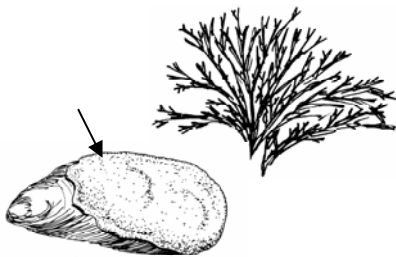
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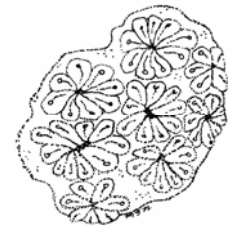
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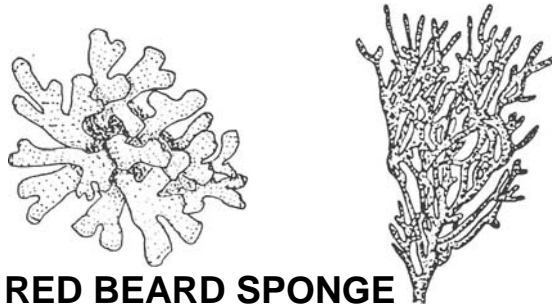
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RED BEARD SPONGE
Clathria prolifera

DESCRIPTION: Red to orange-brown and bush-like, to 25 cm in height, with numerous finger-like projections, which distinguishes it from other red or orange sponges on the coast. Flat and encrusting when young, it is easily confused with several similarly colored sponges.

FOOD: Bacteria and detritus. Sponges absorb these particles from the water which flows through their body by a current created by the sponge.

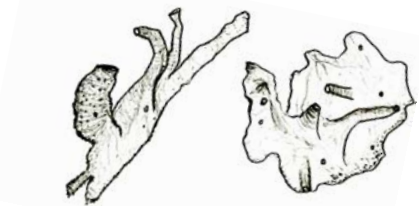
PREDATORS: Nudibranchs (sea slugs).

ORIGIN/ RANGE: Native to the Atlantic Ocean from Nova Scotia to at least South Carolina. First seen in S.F. Bay in the mid-1940s. Introduced with the Eastern oyster or as fouling on ships. Also introduced to Humboldt Bay and Willapa Bay on the Pacific Coast.

FACTS OF INTEREST: Sponges provide a good habitat for other living things. One sponge may harbor hundreds of small organisms.

HABITAT: Found on oyster shells, rocks or pilings in calm water. Low intertidal to 26 m.

TAXONOMY: PHYLUM - Porifera, CLASS - Demospongiae, ORDER - Poecilosclerida, FAMILY - Microcionidae, SUBFAMILY - Microcionina



YELLOW SPONGE
Halichondria bowerbanki

DESCRIPTION: A yellowish sponge with irregular branches which form flattened masses. Very porous. Texture of interior when torn like that of bread; also called Crust of Bread Sponge. Sometimes has a sulfurous smell.

FOOD: Filter feeds on plankton.

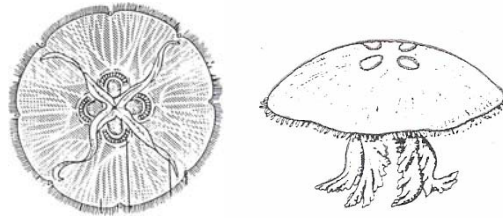
PREDATORS: Nudibranchs, including the Monterey dorid (false sea lemon).

ORIGIN/ RANGE: Native to the North Atlantic Ocean. First seen in S.F. Bay in the early 1950s, but possibly introduced considerably earlier in shipments of Eastern oysters or as fouling on ships. Also introduced to Humboldt Bay and Coos Bay on the Pacific Coast.

FACTS OF INTEREST: There are five separate growth forms, from encrusting to branching, which possibly represent more than one species.

HABITAT: Attaches to docks or other hard substrates, such as mussels.

TAXONOMY: PHYLUM - Porifera, CLASS - Demospongiae, ORDER - Halichondrida, FAMILY - Halichondriidae



MOON JELLY

Aurelia sp.

DESCRIPTION: Bell is disk-shaped, translucent to whitish, relatively flat and up to 40 cm in diameter, like a large dinner plate. It has short tentacles around the rim and 4 longer, frilly tentacles hanging from the center. There are 4 visible gonads which are purple in males and yellow or white in females.

FOOD: Plankton. Food is captured on the surface of the bell by mucus and then transported by cilia (tiny hairs) to the tentacles where it is passed to the mouth.

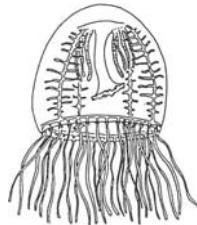
PREDATORS: Ocean sunfish (*Mola mola*) and sea turtles feed on *Aurelia aurita* (though neither of these are found in S.F. Bay).

ORIGIN/ RANGE: *Aurelia aurita* has been reported as having a broad global distribution, including the North Atlantic and both coasts of the North Pacific, however this probably represents two or more similar species. An *Aurelia* species found in South S.F. Bay, which has sometimes been extraordinarily abundant in Foster City Lagoon, is thought to be an introduction from Japan, since one genetic study found it to be more similar to Tokyo Bay specimens than to specimens from Monterey Bay and British Columbia. The right name for the native Pacific Coast species may be *Aurelia labiata*.

FACTS OF INTEREST: Moon jelly embryos settle on subtidal and intertidal substrates and form polyps. These polyps feed like anemones, then eventually bud off into tiny jellies.

HABITAT: Found in coastal waters, harbors, bays and estuaries.

TAXONOMY: PHYLUM - Cnidaria, CLASS - Scyphozoa, ORDER - Semaestomeae, FAMILY - Ulmaridae



BELL MEDUSA

Polyorchis sp.

DESCRIPTION: Bell is globular, to 4 cm tall, with four distinct radial canals. Tentacles hang from the rim of the bell. A red spot is present at the base of each tentacle.

FOOD: Zooplankton, such as copepods, and amphipods. Plankton landing on the jelly are transported to the mouth by the tentacles.

PREDATORS: Some fish species.

ORIGIN/ RANGE: Pacific Coast native. Ranges from British Columbia to San Diego.

FACTS OF INTEREST: This jelly swims and drifts. It swims up, pulling in its tentacles towards its body, then drifts down with its tentacles extended in a halo around it.

HABITAT: Found in harbors, bays, and the open ocean.

TAXONOMY: PHYLUM - Cnidaria, CLASS - Hydrozoa, ORDER - Hydroida, FAMILY - Polyorchidae



COMB JELLY (CTENOPHORE)

Pleurobrachia sp.

DESCRIPTION: Transparent, radially symmetrical, gelatinous sphere to 15 mm in diameter with 8 vertical rows or "combs" of cilia (tiny hairs) on body. Two tentacles that can be extended or retracted are located on sides.

FOOD: Zooplankton are captured and moved to the mouth via tentacles.

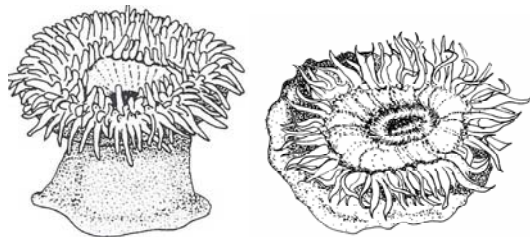
PREDATORS: Other ctenophores and plankton-eating fishes.

ORIGIN/ RANGE: Pacific Coast native. Worldwide distribution.

FACTS OF INTEREST: Can bioluminesce (glow) in darkness. The cilia of the combs move in a wave-like fashion, aiding in locomotion.

HABITAT: Found in harbors, bays, and the open ocean in depths of up to 3,000 meters.

TAXONOMY: PHYLUM - Ctenophora, CLASS - Tentaculata, ORDER - Cydippida, FAMILY - Pleurobrachiidae



BAY ANEMONE

Unidentified

DESCRIPTION: Burrows in mud. Column to about 3 cm in diameter. Color variable, including pink, pale green, beige and yellow-orange, somewhat translucent, sometimes with radial black lines on the oral disk; with bumps, called verrucae, in vertical rows on column. Tentacles as long as column is wide, sometimes with white spots.

FOOD: Shrimp, plankton, fish.

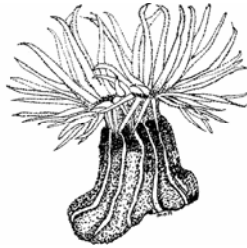
PREDATORS: Probably nudibranchs, which are noted to feed on similar anemones.

ORIGIN/ RANGE: Cryptogenic (unknown). Noted since 2003 in Redwood Creek; also present on the east side of the South Bay.

FACTS OF INTEREST: Has been observed crawling inside and living in containers in MSI's aquarium. This behavior might provide it protection against predators.

HABITAT: Occurs in soft muddy bottom in Redwood Creek, in low intertidal and shallow subtidal waters.

TAXONOMY: PHYLUM - Cnidaria, CLASS - Anthozoa, ORDER - Actiniaria, FAMILY - Actiniidae



ORANGE-STRIPED GREEN ANEMONE

Diadumene lineata

DESCRIPTION: Smooth, shiny greenish, dark olive or olive-brown column, usually with orange vertical stripes, sometimes with gray or yellow stripes. Up to 3 cm tall, with 25-100 slender, often translucent tentacles that are pale grey, green, pink or yellow.

FOOD: Captures plankton and detritus from the water using sticky tentacles.

PREDATORS: The introduced Asian nudibranch, *Cuthona perca*.

ORIGIN/ RANGE: Japan. Probably introduced to S.F. Bay via oyster shipments from the Atlantic Coast after it was introduced to the Atlantic as fouling on ships' hulls. Now found almost worldwide.

FACTS OF INTEREST: Can protect itself from extremes of temperature and salinity by secreting a mucous coating. Reproduces asexually; sexual reproduction has only occasionally been reported outside of Asia.

HABITAT: Attaches to pilings, shells, rocks, and debris, often just below the mud surface so that the anemone pokes out through the mud.

TAXONOMY: PHYLUM - Cnidaria, CLASS - Anthozoa, ORDER - Actiniaria, FAMILY - Haliplanellidae



ORANGE ANEMONE

Diadumene sp.

DESCRIPTION: Small flower-like body with a diameter to 1 cm. The pale tentacles can be retracted into the solid-colored column for protection. Color varies from orange, to flesh, to salmon pink.

FOOD: Carnivorous, eating mostly zooplankton. Each tentacle has stinging cells, or nematocysts, that are used to immobilize prey.

PREDATORS: Snails, sea stars, and nudibranchs (sea slugs).

ORIGIN/ RANGE: Possibly from the Atlantic Ocean. Unintentionally introduced into S.F. Bay. Native range unknown.

FACTS OF INTEREST: Nematocysts, or stinging cells, are small cells with a microscopic coiled tube that can be fired to sting prey. The nematocyst may only be used once, and then must be regenerated.

HABITAT: Found under rocks and on pilings in shallow water of bays and estuaries.

TAXONOMY: PHYLUM - Cnidaria, CLASS - Anthozoa, ORDER - Actiniaria, FAMILY - Diadumenidae



SLENDER SEA PEN

Stylatula elongata

DESCRIPTION: Long, stiff, peach to pink colored stalk; a little rough to the touch. Bulbous, fleshy base which anchors the colony in sandy or soft-bottomed habitats.

FOOD: Feeds on zooplankton and detritus with eight-tentacled polyps called autozooids.

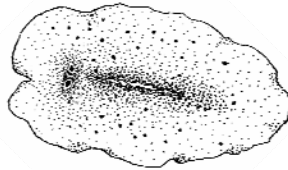
PREDATORS: Nudibranchs (sea slugs).

ORIGIN/ RANGE: Pacific Coast native.

FACTS OF INTEREST: Sea pens are colonial animals, made up of numerous polyps. The colony can borrow into the mud to escape disturbance or exposure at low tide. Bioluminescent when disturbed.

HABITAT: Common on intertidal and subtidal mudflats in bays and harbors of central and southern California.

TAXONOMY: PHYLUM - Cnidaria, CLASS - Anthozoa, ORDER - Pennatulacea, FAMILY - Vergulariidae



FLATWORM

Notoplana acticola

DESCRIPTION: An unsegmented, flattened worm about 25-60 mm in length, with its widest section in front. Two eyespots are located on the dorsal surface. Color is brown to pale gray with darker markings along the midline.

FOOD: Small crustaceans, zooplankton, and other worms. Also scavenges on dead animals. Has an extendable pharynx that injects digestive juices into prey in order to liquefy it.

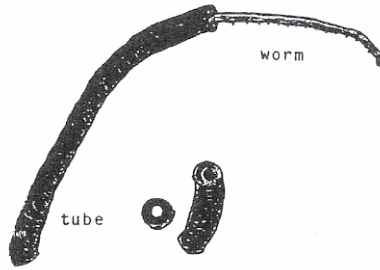
PREDATORS: Shore crabs and pile worms.

ORIGIN/ RANGE: Native to California. Ranges from Alaska to Baja California.

FACTS OF INTEREST: Most flatworms are hermaphrodites, having both male and female sex characteristics at the same time. They can go for months without food, but shrink considerably in size.

HABITAT: Found submerged in water underneath rocks.

TAXONOMY: PHYLUM - Platyhelminthes, CLASS - Turbellaria, ORDER - Polycladida, FAMILY - Leptoplanida



TUBE WORM

Sabaco elongatus

DESCRIPTION: A marine worm with a segmented body that is pink to reddish-brown. Body length averages 6-9 cm, and diameter is 1.5 mm. Tube is constructed of sediment and mucus.

FOOD: Detritus.

PREDATOR: Bottom-feeding fishes and crabs.

ORIGIN/ RANGE: Native to the Atlantic Ocean from Maine to Central America and unintentionally introduced to S.F. Bay, where it was first reported in the literature in 1960. Possibly introduced with shipments of the Eastern oyster, *Crassostrea virginica*, or a more recent introduction in ballast water. Now ranges from Canada to southern California.

FACTS OF INTEREST: As the tube worm moves through the mud, it creates a tube. It ingests the mud substrate and digests the living and dead microscopic plants, animals, and bacteria found inside.

HABITAT: Found in mud, sand, and mixed shell bottoms.

TAXONOMY: PHYLUM - Annelida, CLASS - Polychaeta, FAMILY - Maldanidae



PILE WORMS

Nereis spp.

DESCRIPTION: Body composed of segments with distinct extensions of the body (parapodia) on each segment. Color ranges from yellow-orange to red-brown to greenish. Mouth contains two large black jaws.

FOOD: Feeds on algae, bryozoans, sponges, small crustaceans, other worms, and dead animal matter.

PREDATORS: Bottom-feeding fishes, ducks, and shorebirds.

ORIGIN/ RANGE: One species unintentionally introduced from the eastern coast of U.S.; other species are native, with combined ranges from British Columbia to Peru.

FACTS OF INTEREST: During spawning, females and males swarm at night near the surface of the water. Fertilization is external, and the worms die soon after spawning.

HABITAT: Burrows in sand and mud. In sheltered waters and brackish estuaries to 160 m.

TAXONOMY: PHYLUM - Annelida, CLASS - Polychaeta, ORDER - Aciculata, FAMILY - Nereidida



BLOOD WORM

Glycera americana

DESCRIPTION: Segmented, red worm with a long proboscis (internal appendage which can be extended) with 4 black hook-like jaws on the end that can evert (extend out) from the head. May be up to 20 cm long.

FOOD: Other polychaetes (worms) and amphipods.

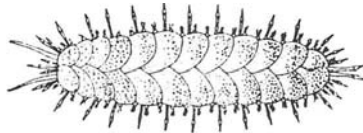
PREDATORS: Fishes, crabs, and shorebirds.

ORIGIN/ RANGE: Native to Pacific and Atlantic coasts. Ranges from British Columbia to Baja California and Peru. Found on Atlantic Coast from Canada to Brazil.

FACTS OF INTEREST: Blood worms can unroll their proboscis, extending it by turning it inside out. This exposes 4 black jaws which can be used for hunting prey or burrowing. Commonly used by fishermen for bait.

HABITAT: Burrows in muddy sand and mud, low intertidal on protected shores and subtidally to 315 m.

TAXONOMY: PHYLUM - Annelida, CLASS - Polychaeta, ORDER - Aciculata, FAMILY - Glyceridae



SCALE WORMS

Halosydna brevisetosa
Harmothoe sp.

DESCRIPTION: *Halosydna brevisetosa* is up to 60 mm long with 18 pairs of elytra (overlapping dorsal scales). Color ranges from red to tan to brown. *Harmothoe* sp. has 15 pairs of elytra.

FOOD: Scavenger and detritus feeder.

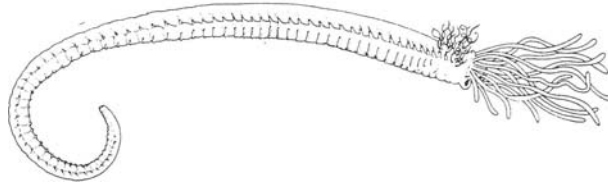
PREDATORS: Bottom-feeding fishes, predatory worms, and crabs.

ORIGIN/ RANGE: *Halosydna brevisetosa* is a Pacific Coast native. *Harmothoe* sp. could be a native species (*Harmothoe imbricata*) or an exotic species from the western Pacific (*Harmothoe praeclara*). *H. brevisetosa* ranges from Kodiak Island, Alaska to Baja California.

FACTS OF INTEREST: Some other species of scale worms have been found to live with tube worms in their tubes. This is an example of commensalism.

HABITAT: Found in mussel beds, plant holdfasts, and in fouling on docks in the low intertidal and shallow subtidal zones on rocky coasts and bays.

TAXONOMY: PHYLUM - Annelida, CLASS - Polychaeta, ORDER - Aciculata, FAMILY - Polynoidae



SPAGHETTI WORM

Thelepus crispus

DESCRIPTION: Brown, orange, yellow, or flesh-colored segmented worm up to 15 cm in length. A mass of red tentacles extends from the head.

FOOD: Detritus, which is transported to the mouth by the tentacles.

PREDATORS: Bottom-feeding fishes and crabs.

ORIGIN/ RANGE: Pacific Coast native. Ranges from Alaska to southern California.

FACTS OF INTEREST: These worms build thin tubes in soft mud or sand. When disturbed, the worm may leave its tube and build a new one in a different location.

HABITAT: Lives in the middle to low intertidal under rocks and in mud.

TAXONOMY: PHYLUM - Annelida, CLASS - Polychaeta, ORDER - Canalipalpata, FAMILY - Terebellidae



SLIME TUBEWORM

Myxicola infundibulum

DESCRIPTION: Surrounded by a thick mucous tube, the worm's body is orange or dark yellow in color and the tentacles are purple or brown; to 20 cm.

FOOD: Plankton, which it captures using tentacles.

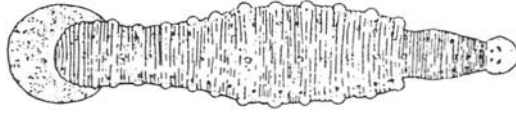
PREDATORS: Unknown.

ORIGIN/ RANGE: Cryptogenic (of unknown origin). Possibly introduced from the Mediterranean Sea. Found in S.F. Bay, United Kingdom and Norway.

FACTS OF INTEREST: When disturbed, the worm retracts rapidly into its tube and can reduce its length by half. This is why many times only empty portions of the slime tube are collected; the animal has retreated to greater depths within a much longer tube. It is used extensively in neurobiology studies because of this quick nerve conduction at the slightest disturbance.

HABITAT: Mud or sand to 30 m in wave-sheltered areas.

TAXONOMY: PHYLUM - Annelida, CLASS - Polychaeta, ORDER - Canalipalpata, FAMILY - Sabellidae



LEECH

Branchellion lobata

DESCRIPTION: Body is segmented, 3-4 cm long, yellow to dark brown in color with a sucker on each end. Found on eyes, claspers, fins, and in mouths of sharks, fish and squid.

FOOD: Blood. Leeches feed by making small cuts on the skin of the host and then ingesting the blood. An anticoagulant in the leech's mouth prevents the blood from clotting.

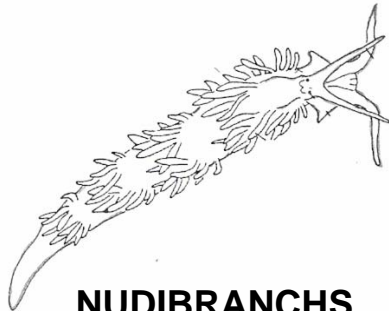
PREDATORS: Incidentally consumed when host is eaten. An example is when a larger shark eats a parasitized leopard shark.

ORIGIN/ RANGE: Pacific Coast native. Worldwide distribution.

FACTS OF INTEREST: These animals are protandric hermaphrodites. They start their lives as males and then change into females.

HABITAT: Found on marine fishes and elasmobranchs (sharks).

TAXONOMY: PHYLUM - Annelida, CLASS - Clitellata, ORDER - Rhynchobdellida, FAMILY - Piscicolidae



NUDIBRANCHS

Sakuraeolis enosimensis

Hermisenda crassicornis

DESCRIPTION: Body translucent, whitish and oblong, up to 80 mm. The dorsal surface has orange-brown cerata (soft projections) with white tips. A pair of rhinophores (like antennae) are located on top of the head. A blue line runs down each side of *H. crassicornis*; *S. enosimensis* lacks this blue line.

FOOD: *S. enosimensis* feeds on the introduced Atlantic hydroid, *Pinauay crocea*, in San Francisco Bay. *H. crassicornis* feeds on hydroids, but also small crustaceans, other nudibranchs, tunicates, sea pens, and stranded jellies.

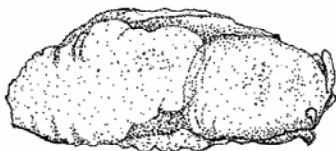
PREDATORS: A sea slug (*Aglaja inermis*), crabs, and bottom-feeding fishes are reported to feed on *H. crassicornis*.

ORIGIN/ RANGE: *S. enosimensis* is native to Japan and introduced to S.F. Bay. *H. crassicornis* is a Pacific Coast native, and ranges from Sitka, Alaska to Guardian Angel Island, Baja California.

FACTS OF INTEREST: The hydroids on which nudibranchs feed contain nematocysts, or stinging cells. The nudibranchs are able to block the discharge of the cells during digestion and then store the nematocysts in their cerata. These stolen stinging cells then become a defense for the nudibranchs.

HABITAT: Often found on hydroids and in fouling communities on docks.

TAXONOMY: PHYLUM - Mollusca, CLASS - Gastropoda, ORDER - Nudibranchia, FAMILY - Facelinidae



TORTELLINI SNAILS

Philine spp.

DESCRIPTION: Peach to white-yellow body and dorsal flap, between 15 to 30 mm in length. The shell is internal, occupying the posterior (rear) portion of the animal. The thin, translucent shell is broad and shallowly curved.

FOOD: Clams and other shellfish, however scientists are still investigating.

PREDATORS: Unknown, but possibly bottom-feeding fishes.

ORIGIN/ RANGE: More than one exotic *Philine* species may have been found in the Bay, at least one of which appears to be *Philine auriformis* from New Zealand. Other species from South Africa, Japan, Hong Kong and perhaps elsewhere have been reported in California waters, but it's not clear how many of these identifications are correct.

FACTS OF INTEREST: The population of this animal is seasonally variable, possibly because of predators or salinity levels. Probably invaded S.F. Bay via ballast water dumped by entering ships. *Philine auriformis* was discovered and collected by MSI and identified by the California Academy of Sciences in August of 1992.

HABITAT: Found in the soft substrate of bays and harbors.

TAXONOMY: PHYLUM - Mollusca, CLASS - Gastropoda, ORDER - Cephalaspidea, FAMILY - Philinidae



BUBBLE SNAIL

Haminoea japonica

DESCRIPTION: Mottled light to dark brown or orange-brown with brown and black spots. Covered with gelatinous slime. The internal shell is partially or completely enfolded by the lateral parapodial lobes (fleshy, winglike outgrowths). Body contracts when disturbed.

FOOD: Likely herbivorous, possibly eating diatoms from the surface of the mud or green algae. May also feed on detritus.

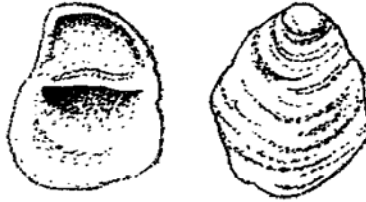
PREDATORS: Possibly the tortellini snail, *Philine auriformis*, or other predatory slugs. Some *Haminoea* species chemically defend against predators.

ORIGIN/ RANGE: Native to Japan and introduced to Washington state, S.F. Bay and the Mediterranean. First found in S.F. Bay in 2000.

FACTS OF INTEREST: Hermaphroditic. Only recently caught in Redwood Creek. There is little known about its habits in S.F. Bay.

HABITAT: Live on sandy or muddy bottoms of temperate bays and estuaries.

TAXONOMY: PHYLUM - Mollusca, CLASS - Gastropoda, ORDER - Cephalaspidea, FAMILY - Haminoeidae



EASTERN WHITE SLIPPER SNAIL

Crepidula plana

DESCRIPTION: Thick or thin white oval shell with brown markings. Can grow to more than 40 mm. The ventral surface (periostracum) is yellowish-brown.

FOOD: Small plankton and water-borne organic detritus.

PREDATORS: Crabs and shrimp.

ORIGIN/ RANGE: Native range in the Atlantic from Prince Edward Island to South America. Unintentionally introduced from the eastern U.S. with the Eastern oyster, *Crassostrea virginica*. First found in S.F. Bay in 1901. Also introduced to Washington state.

FACTS OF INTEREST: This snail starts out as a male, and then turns into a female. This is called protandric hermaphroditism.

HABITAT: Typically found on the inside of snail shells occupied by hermit crabs.

TAXONOMY: PHYLUM - Mollusca, CLASS - Gastropoda, ORDER - Neotaenioglossa, FAMILY - Calyptraeidae



CONVEX SLIPPER SNAIL

Crepidula convexa

DESCRIPTION: White to tan shell with light brown markings. Apex (point) of shell is at the front and may hang over the shell's lower edge.

FOOD: Small plankton and water-borne organic detritus.

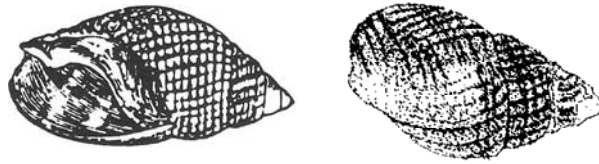
PREDATORS: Crabs and shrimp.

ORIGIN/ RANGE: Native to the Atlantic Ocean from Nova Scotia to Puerto Rico. Unintentionally introduced from the eastern U.S. with the Eastern oyster, *Crassostrea virginica*. First collected in S.F. Bay in 1898.

FACTS OF INTEREST: This snail starts out as a male, and then turns into a female. This is called protandric hermaphroditism.

HABITAT: In S.F. Bay it is typically found on the shells of other snail species and on oysters.

TAXONOMY: PHYLUM - Mollusca, CLASS - Gastropoda, ORDER - Neotaenioglossa, FAMILY - Calyptraeidae



EASTERN MUD SNAIL

Ilyanassa obsoleta

DESCRIPTION: Brown or black oval shell (20-30 mm high) with spiral lines. Aperture (opening) of shell is black.

FOOD: Omnivorous. Feeds on detritus and benthic diatoms. If available, eats dead animals including worms, mollusks, crustaceans, and fishes.

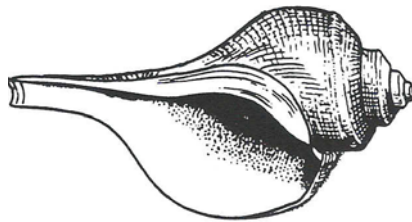
PREDATORS: Shorebirds and bottom-feeding fishes.

ORIGIN/ RANGE: Native to the Atlantic; found from the Gulf of St. Lawrence to Florida. Unintentionally introduced to S.F. Bay from the Atlantic Coast with the Eastern oyster, *Crassostrea virginica*. It is also found on the Pacific Coast in Boundary Bay, British Columbia and Willapa Bay, Washington.

FACTS OF INTEREST: When found in groups, these animals tend to show schooling behavior by moving or aligning in the same direction.

HABITAT: Very common on low intertidal mudflats in S.F. Bay.

TAXONOMY: PHYLUM - Mollusca, CLASS - Gastropoda, ORDER - Neogastropoda, FAMILY - Nassariidae



CHANNELED WHELK

Busycotypus canaliculatus

DESCRIPTION: Large (up to 185 mm), off-white to brown shell with a conical spire and smooth aperture. Outer surface may be covered with a thin brown tissue of hairs. Operculum (trap door) is brown.

FOOD: Feeds on clams, mussels and oysters using the edge of its own shell to chip away at its prey's shell until there is a large enough opening to insert its proboscis (feeding tube).

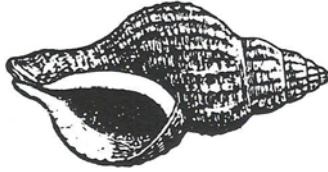
PREDATORS: Crabs, gulls, and humans. Humans use the shell ornamentally, and the foot is used in soups and chowders.

ORIGIN/ RANGE: Native to the Atlantic Ocean from Massachusetts to Florida. Introduced to S.F. Bay possibly with the Eastern oyster.

FACTS OF INTEREST: When foraging, this snail is attracted to water flowing from clams' exhalant siphons. It is the largest snail in S.F. Bay.

HABITAT: Found on muddy and sandy bottoms in intertidal and subtidal areas.

TAXONOMY: PHYLUM - Mollusca, CLASS - Gastropoda, ORDER - Neogastropoda, FAMILY - Melongenidae



ATLANTIC OYSTER DRILL

Urosalpinx cinerea

DESCRIPTION: Spiral shell is gray-brown or yellow, often with brown spiral bands. The aperture (opening) is reddish or purple. Shell is usually 20-35 mm in length.

FOOD: Mainly barnacles, mussels, oysters, clams, and other snails.

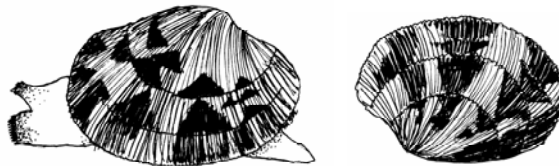
PREDATORS: Shorebirds and bottom-feeding fishes.

ORIGIN/ RANGE: Native range is from Eastern Canada to Northeastern Florida. Introduced to the Pacific Coast of North America and England. Introduced to S.F. Bay from the Atlantic Coast with the Eastern oyster, *Crassostrea virginica*, between 1869 and 1890.

FACTS OF INTEREST: Preys on animals by drilling through shell with a ridged radula (tongue) and feeding on the tissues inside.

HABITAT: Found in bays and estuaries in intertidal and shallow subtidal waters.

TAXONOMY: PHYLUM - Mollusca, CLASS - Gastropoda, ORDER - Neogastropoda, FAMILY - Muricidae



JAPANESE LITTLENECK CLAM

Venerupis philippinarum

DESCRIPTION: Shell to 50 mm and oval. Shell color usually yellow or buff with brown or black markings, but can have a variety of base colors including red, blue, yellow, green, etc. Dark markings form designs resembling mountain peaks or stripes on shell. Purplish tinge on inside of shell.

FOOD: Plankton and detritus are strained from water that is pumped into the body through the siphon.

PREDATORS: Leopard sharks, bat rays, perch, sturgeon, other bottom-feeding fishes, and crabs.

ORIGIN/ RANGE: Unintentionally introduced to S. F. Bay from Japan with the Pacific oyster, *Crassostrea gigas*. First collected in S.F. Bay in 1946, but probably introduced in the 1930s. Introduced to several other bays from British Columbia to Baja California.

FACTS OF INTEREST: Found in concentrations of up to 2,000 per square meter in S.F. Bay. Commercially grown in British Columbia and Washington, and sold in markets as the Manila Clam.

HABITAT: Common on coarse sandy mud of bays, sloughs, and estuaries, buried 2-4 cm below surface.

TAXONOMY: PHYLUM - Mollusca, CLASS - Bivalvia, ORDER - Veneroida, FAMILY - Veneridae



OVERBITE CLAM

Corbula amurensis

DESCRIPTION: Thin shells are white, tan, or yellow. One shell is larger than the other producing a small but distinct "overbite." Up to 25 mm in length.

FOOD: Primarily phytoplankton (diatoms), zooplankton, and possibly bacteria.

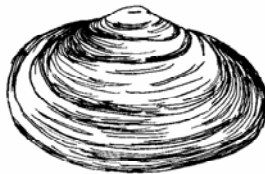
PREDATORS: Diving birds, crabs, and bottom-feeding fishes, like sturgeon and bat rays.

ORIGIN/ RANGE: Native to China, Japan, and Korea. Now abundant in all parts of the San Francisco Bay and the western Delta.

FACTS OF INTEREST: This clam was introduced from the ballast of cargo vessels as larvae. It was first collected in S.F. Bay in 1986 and has since spread throughout the Bay and Delta. In some areas, densities exceed 10,000 clams per square meter.

HABITAT: Primarily subtidal, but also occasionally found on intertidal mudflats in areas of brackish water.

TAXONOMY: PHYLUM - Mollusca, CLASS - Bivalvia, ORDER - Myoida, FAMILY - Corbulidae



ATLANTIC SOFTSHELL CLAM

Mya arenaria

DESCRIPTION: Shell up to 15 cm long, soft, oval, and is easily broken on the smaller clams. Outer shell white or gray, siphons dark.

FOOD: Plankton, which it filters from the water.

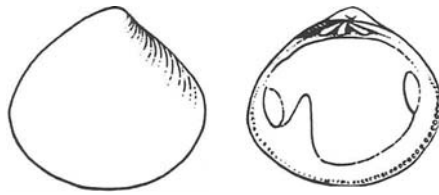
PREDATORS: Bat rays, sharks, ducks, and shorebirds.

ORIGIN/ RANGE: Introduced from the Atlantic Coast before 1874 with the Eastern oyster, *Crassostrea virginica*. Found from southern Alaska to S.F. Bay and on both Atlantic Coasts.

FACTS OF INTEREST: This clam is able to live in the mud and surrounding waters without any dissolved oxygen for as long as a week. This anaerobic respiration is a very rare adaptation for animals as complex as molluscs.

HABITAT: Fairly common, up to 25 cm or more below the surface in thick, dark mud; middle to low intertidal zone in the upper reaches of bays.

TAXONOMY: PHYLUM - Mollusca, CLASS - Bivalvia, ORDER - Myoida, FAMILY - Myidae



GEM CLAM

Gemma gemma

DESCRIPTION: Very small clam usually less than 5 mm. Shell white to buff, some with pink or purple coloration. Exterior shiny with concentric lines.

FOOD: Filter feeds on plankton.

PREDATORS: Crabs, sea anemones, tortellini snails, bottom-feeding fishes, ducks, and shorebirds.

ORIGIN/ RANGE: Native to the Atlantic from Nova Scotia to the Gulf of Mexico. Unintentionally introduced from the Atlantic Coast with the Eastern oyster, *Crassostrea virginica*, by the 1890s. Introduced to the Pacific in several bays in central California.

FACTS OF INTEREST: The female broods young in the mantle folds until they are fully formed. They are released in summer. Life span is no more than 2 years.

HABITAT: Found in muddy or sandy bottoms, low intertidal and subtidal waters to 100 m.

TAXONOMY: PHYLUM - Mollusca, CLASS - Bivalvia, ORDER - Veneroida, FAMILY - Veneridae



BAY MUSSELS

Mytilus trossulus
Mytilus galloprovincialis

DESCRIPTION: Thin, nearly smooth shell lacking radiating ridges. Color is bluish black. *Mytilus trossulus* typically reaches 6 cm in length, rarely longer in S.F. Bay; *Mytilus galloprovincialis* and hybrids can reach 10 cm in length.

FOOD: Filter feeder. Feeds almost continuously on detritus, zooplankton, and phytoplankton.

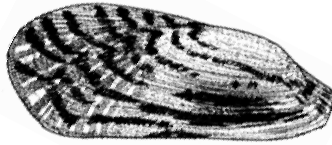
PREDATORS: Snails, crabs, and birds.

ORIGIN/ RANGE: *Mytilus trossulus* is a Pacific Coast native, *Mytilus galloprovincialis* was unintentionally introduced from the Mediterranean. Both species and hybrids between them are present in S.F. Bay and elsewhere in central California, with *M. trossulus* increasingly dominating further north and *M. galloprovincialis* increasingly dominating further to the south.

FACTS OF INTEREST: Usually found in dense clusters. The mussel anchors itself to buoys, floats, pilings and ships using byssal threads (hardened mucus) to grab on to the surface.

HABITAT: Found in calm bays and in tide pools which are protected from wave action. Common as fouling organisms on docks, pilings, buoys, floats, and ships.

TAXONOMY: PHYLUM - Mollusca, CLASS - Bivalvia, ORDER - Mytiloida, FAMILY - Mytilidae



GREEN MUSSEL

Musculista senhousia

DESCRIPTION: Smooth, thin, hairless shells which break easily. Color is dark with wavy brown or purple and green bands. Up to 2.5 cm in length.

FOOD: Filter feeds on plankton and detritus.

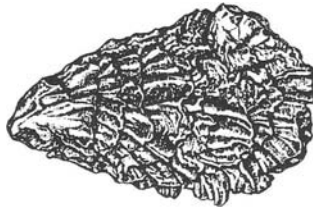
PREDATORS: Bottom-feeding fishes and shorebirds.

ORIGIN/ RANGE: Introduced from Japan with the Pacific oyster, *Crassostrea gigas*. Found off the coasts of China, Japan and the Philippine Islands. In the Eastern Pacific from British Columbia to Baja California.

FACTS OF INTEREST: The mussel often uses its byssal threads (hardened mucus) to form a baglike covering around itself; where the mussel is abundant, these threads form a continuous mat. Also attaches to rocks, docks, pilings, etc.

HABITAT: Lives in shallow waters of bays. Abundant in mud where it forms dense mats.

TAXONOMY: PHYLUM - Mollusca, CLASS - Bivalvia, ORDER - Mytiloidea, FAMILY - Mytilidae



OYSTERS

Crassostrea virginica, *Crassostrea gigas* & *Ostrea conchaphila*

DESCRIPTION: Oval, rough, corrugated shell that is white, gray, or yellowish in color. *C. virginica* to 25 cm, lacks bold ridges. *C. gigas*, which can grow even larger, has a rough, shingled appearance, often with strong, radiating ridges and valleys. *O. conchaphila* to 8 cm, sometimes rounded, with wavy margins.

FOOD: Filter feeds on plankton, bacteria and detritus.

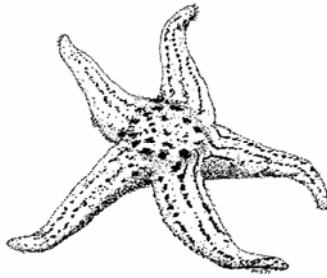
PREDATORS: Humans, bat rays, Atlantic oyster drill, and sea stars.

ORIGIN/ RANGE: One species is native to the Pacific Coast (*O. conchaphila*) and ranges from Alaska to Baja California. Two species have been imported for use in aquaculture: one from Japan (*C. gigas*), the other from the Atlantic Coast (*C. virginica*). Though neither is established in S.F. Bay, their shells can sometimes be found as remains from aquaculture conducted decades ago, or from more recent use of shells in habitat restoration or native oyster restoration projects. A small population of *C. gigas* was found on the southeastern shore of S.F. Bay in 2006, and an effort is underway to remove them.

FACTS OF INTEREST: An oyster can strain 7-26 liters (2-7 gallons) of water per hour. In a population, some oysters are males, some females, and some alternate between male and female throughout their life.

HABITAT: Found on rocks, soft mud, firm sand, or gravel in the intertidal zone.

TAXONOMY: PHYLUM - Mollusca, CLASS - Bivalvia, ORDER - Ostreoida, FAMILY - Ostreidae



PINK BAY STAR

Pisaster brevispinus

DESCRIPTION: Pink in color, radially symmetrical with 5 rays (arms), 50-70 cm.

FOOD: Mussels and other bivalves, sand dollars, and tube-dwelling polychaetes.

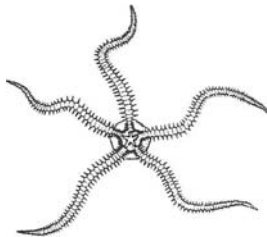
PREDATORS: Sea otters and gulls.

ORIGIN/ RANGE: Pacific Coast native. In S.F. Bay, lives only near the Golden Gate, as it cannot tolerate the lower salinities of the estuary. Ranges from Sitka, AK to Mission Bay, CA.

FACTS OF INTEREST: The body actually consists of five equal segments, each containing a duplicate set of various internal organs. They have no heart, brain, nor eyes, but can regenerate lost arms.

HABITAT: Found in muddy or sandy substrates, and can be part of dock fouling communities.

TAXONOMY: PHYLUM - Echinodermata, CLASS - Asteroidea, ORDER - Forcipulatida, FAMILY - Asteriidae



BRITTLE STAR

Order Ophiuria

DESCRIPTION: Has five thin flexible arms attached to a flat circular or star-shaped disk. Arms are sometimes bristly. Pairs of tube feet occur along ventral surface of arms allowing star to stick to surfaces. Color is brown to gray.

FOOD: Detritus and plankton are transported to the mouth via tube feet.

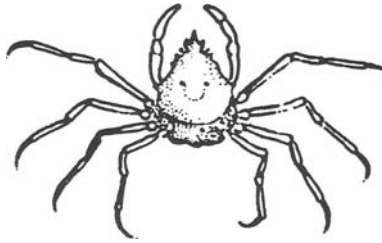
PREDATORS: Fishes, sea stars, and crabs.

ORIGIN/ RANGE: Pacific Coast native. Ranges from Alaska to San Diego.

FACTS OF INTEREST: An arm which is broken or bitten off can be regenerated. When disturbed, this animal wraps its arms around its central disk in a tight ball.

HABITAT: Found on sandy bottoms, under rocks, in mud flats, and around eelgrass roots from shallow intertidal to 367 m.

TAXONOMY: PHYLUM - Echinodermata, CLASS - Ophiuroidea, ORDER - Ophiuria



SPIDER CRAB

Pyromaia tuberculata

DESCRIPTION: Broad, bumpy, pear-shaped carapace (body shell) up to 18 mm wide. Walking legs are long and slender. Body and legs often overgrown with sponges, algae, and hydroids.

FOOD: Herbivorous, primarily eating algae and other plants.

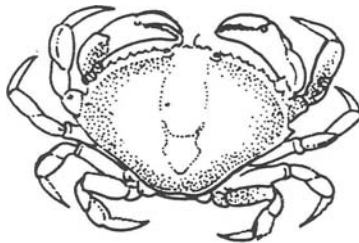
PREDATORS: Bat rays, sculpins, other bottom-feeding fishes, and pile surfperch.

ORIGIN/ RANGE: Pacific Coast native. Ranges from Tomales Bay to Colombia; introduced to Japan.

FACTS OF INTEREST: The hydroids, sponges, and seaweed covering the crab's body act as camouflage from its enemies. If the crab enters a new environment, it will remove the existing growths and replace them with forms common in that locality.

HABITAT: Low intertidal to 411 m. Found on floats and pilings, under rocks, and in dredge hauls.

TAXONOMY: PHYLUM - Arthropoda, CLASS - Malacostraca, ORDER - Decapoda, FAMILY - Inachoididae



CANCER CRAB

Cancer spp.

DESCRIPTION: Hard carapace (body shell), reddish-brown to purple in color. Small denticles, or teeth, along both sides of the shell's outer front margin.

FOOD: Barnacles, dead plants and animals, small clams and oysters, worms, and fishes. Eats shellfish by chipping away at the shell with its claws until the meat is reached.

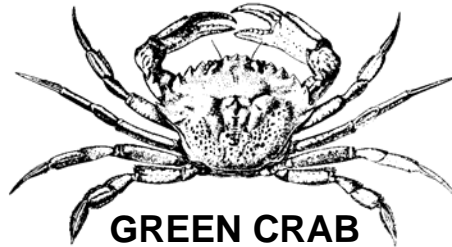
PREDATORS: Various fishes and sharks.

ORIGIN/ RANGE: Pacific Coast natives. Range from northern Alaska to San Pedro, California.

FACTS OF INTEREST: The Dungeness crab (*Cancer magister*), the largest edible crab on the west coast, accounts for 99% of California's yearly crab catch. The annual catch for the coast is 16 million kg, however no crabs may be taken commercially in S.F. Bay, which is a nursery for Dungeness crabs.

HABITAT: Found intertidally and subtidally to 230 m on sandy and muddy bottoms.

TAXONOMY: PHYLUM - Arthropoda, CLASS - Malacostraca, ORDER - Decapoda, FAMILY - Cancridae



GREEN CRAB

Carcinus maenas

DESCRIPTION: Hard carapace (body shell) that is greenish, grayish green, orange or reddish in color, with 5 teeth on each side of the shell's outer front margin. Last pair of legs somewhat flattened.

FOOD: Omnivorous; feeds on plants and animals including clams, mussels, crabs, and other organisms.

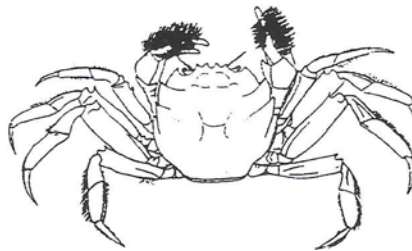
PREDATORS: Shorebirds, English sole, and other bottom-feeding fishes.

ORIGIN/ RANGE: Originally from Europe; introduced to the U.S. Atlantic Coast by 1817. From there, introduced to S.F. Bay, where it was first seen in 1989 or 1990. May have been introduced with shipments of marine baitworms from Maine. Found on Atlantic Coast from Prince Edward Island to New Jersey. On the Pacific Coast, has been collected in many bays from southern British Columbia to Morro Bay in California, but probably is established in only a few of these. Also found in southern Australia and Tasmania, Argentina, and apparently as hybrids in South Africa and Japan.

FACTS OF INTEREST: Green crabs readily prey on Dungeness crabs of equal or lesser size.

HABITAT: Lives in a variety of habitats, preferring bays and estuaries.

TAXONOMY: PHYLUM - Arthropoda, CLASS - Malacostraca, ORDER - Decapoda, FAMILY - Portunidae



CHINESE MITTEN CRAB

Eriocheir sinensis

DESCRIPTION: Hard carapace (body shell), up to 8 cm in width, grayish brown and white in color. A dense mat of hair covers the outside of the claws, giving them the appearance of having mittens.

FOOD: Omnivorous, feeding on marsh vegetation and small invertebrates.

PREDATORS: Unknown, but possibly shorebirds.

ORIGIN/ RANGE: Native to the coast and rivers of China and Eastern Korea along the shores of the Yellow Sea. Since 1994, the crabs have spread throughout S.F. Bay and the Sacramento/San Joaquin River Delta, but their numbers have decreased in the last few years. Also introduced to Western Europe.

FACTS OF INTEREST: These crabs were imported for sale in Asian food markets in San Francisco and Los Angeles. The state of California and the federal government banned the importation of live mitten crabs in the late 1980s. First collected by MSI and identified by Cal Academy in November 1994.

HABITAT: They are catadromous, living in rivers most of the year, and descending to bays and the ocean to spawn in the winter. Burrow in sediment ranging from mud to gravel to hardened sandstone.

TAXONOMY: PHYLUM - Arthropoda, CLASS - Malacostraca, ORDER - Decapoda, FAMILY - Varunidae



YELLOW SHORE CRAB

Hemigrapsus oregonensis

DESCRIPTION: Small, rectangular-bodied crab, to 3.5 cm. Yellow to gray or green carapace (body shell), sometimes mottled white, especially in juveniles. Pincer (claw) tips are yellow to white. Legs hairy.

FOOD: Feeds mainly at night on diatoms and green algae. Also scavenges on dead plant and animal matter.

PREDATORS: Bat rays, leopard sharks, brown smoothhounds, bottom-feeding fishes, and shorebirds.

ORIGIN/ RANGE: Pacific Coast native. Ranges from Alaska to Baja California.

FACTS OF INTEREST: Used as bait for pile surfperch, this crab can quickly bury into the mud to escape capture. Often feeds at night at low tide. May hold their pincers up in confrontation, but rarely fight.

HABITAT: Common on mud flats, where they are often found under rocks at low tide, and in eelgrass beds in bays and estuaries.

TAXONOMY: PHYLUM - Arthropoda, CLASS - Malacostraca, ORDER - Decapoda, FAMILY - Varunidae



HARRIS CRAB

Rhithropanopeus harrisi

DESCRIPTION: Small, brown to olive green crab. Legs are long, slender and somewhat hairy. Pincers (claws) are white-tipped with one pincer larger than the other. Four teeth on each side of the shell's outer front margin.

FOOD: Small crustaceans, such as amphipods and copepods, and detritus.

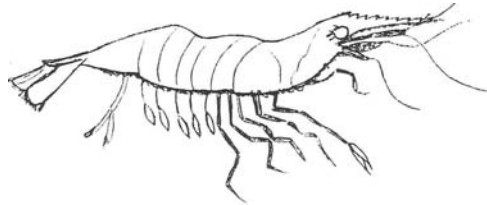
PREDATORS: Larger crabs, fishes and shorebirds.

ORIGIN/ RANGE: Native to the northwestern Atlantic from New Brunswick to Mexico. Introduced to the Eastern Pacific (in S.F. Bay and a few bays in Oregon), Eastern Atlantic, Black Sea and the Caspian Sea, most likely through ballast water or by clinging to the hulls of ships; it could also have reached the Pacific Coast with shipments of the Eastern oyster, *Crassostrea virginica*.

FACTS OF INTEREST: This crab was discovered on the Pacific Coast in Lake Merritt, Oakland in 1937. It has a broad tolerance of salinity.

HABITAT: Found mainly in shallow brackish water, sometimes fresh water, on muddy or sandy bottoms. Found in South S.F. Bay in the upper parts of sloughs.

TAXONOMY: PHYLUM - Arthropoda, CLASS - Malacostraca, ORDER - Decapoda, FAMILY - Panopeidae



KOREAN SHRIMP
Palaemon macrodactylus

DESCRIPTION: Reddish, translucent or nearly transparent carapace (body shell) lacking patterns or markings. Prominent rostrum (head spine); rostrum's dorsal surface has 9-15 spines. Has agile pincers.

FOOD: Omnivorous, scavenging whatever may be found. Pincers specially adapted for scraping algae off of rocks.

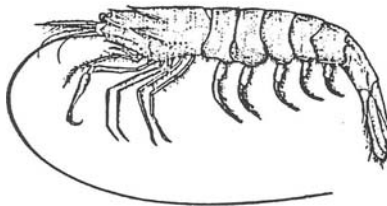
PREDATORS: Bottom-feeding fishes.

ORIGIN/ RANGE: Native to Korea, Japan, and northern China. First collected in S.F. Bay in 1957, possibly as a result of increased shipping and vessel traffic associated with the Korean War. Introduced to a few bays from Coos Bay, Oregon to Los Angeles.

FACTS OF INTEREST: Populations mix with schools of the native Bay shrimps (*Crangon* spp.) and have become a part of the commercial bay shrimp industry catches.

HABITAT: Abundant in many tidal creeks where brackish water conditions exist. Populations extend into open bay waters.

TAXONOMY: PHYLUM - Arthropoda, CLASS - Malacostraca, ORDER - Decapoda, FAMILY - Palaemonidae



BAY SHRIMPS
Crangon spp.

DESCRIPTION: Semi-transparent carapace (body shell) usually with black spots or markings and long antennae. Average body length of 55 mm. Three species of *Crangon* with different salinity ranges are commonly found in S.F. Bay.

FOOD: Mysids (small shrimp), amphipods, clams, and plants.

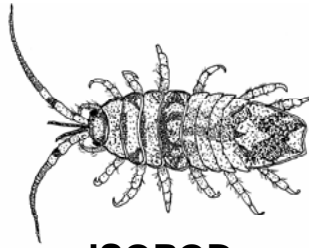
PREDATORS: Striped bass, sturgeon, staghorn sculpin, flatfishes, and sharks.

ORIGIN/ RANGE: Pacific Coast natives. Range from Chirikof Island, Alaska to San Diego, California.

FACTS OF INTEREST: S.F. Bay has had a commercial shrimping industry for over 100 years. The shrimp used to be caught for human consumption; today the shrimp are caught for bait. Catches have decreased in recent years.

HABITAT: Found subtidally on sandy or muddy bottoms to 50 m.

TAXONOMY: PHYLUM - Arthropoda, CLASS - Malacostraca, ORDER - Decapoda, FAMILY - Crangonidae



ISOPOD

Synidotea laevidorsalis

DESCRIPTION: An elongate, dorso-ventrally (top and bottom) flattened, segmented body with curving, clinging legs, and long antennae. Eyes located on dorsal surface. Color is greenish brown or brown.

FOOD: Feeds on hydroids.

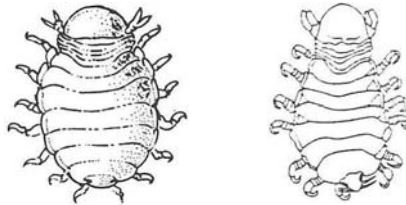
PREDATORS: Important food source for young striped bass, starry flounder, steelhead, king salmon, white sturgeon, other fishes, and diving ducks in the Bay.

ORIGIN/ RANGE: Native to the western Pacific (Asia). Introduced to Europe, South America, Australia and the United States in San Francisco Bay, South Carolina and New Jersey.

FACTS OF INTEREST: Since it was discovered in S.F. Bay in 1897, it has invaded South America and other places.

HABITAT: Found in S.F. Bay on hydroids and other fouling organisms.

TAXONOMY: PHYLUM - Arthropoda, CLASS - Malacostraca, ORDER - Isopoda, FAMILY - Idoteidae



FISH GILL ISOPODS

Elthusa californica

Elthusa vulgaris

DESCRIPTION: Body ovate and flattened, usually cream or white in color, with two eyespots on dorsal surface. The legs have long pointed tips for clinging to the host fish. Size ranges from approximately 3-26 mm in length. Males are smaller than females. Normally found in gill cavities of fishes such as shiner surfperch, striped bass, staghorn sculpin, and flatfishes.

FOOD: Isopods attach to fish gills and feed on blood.

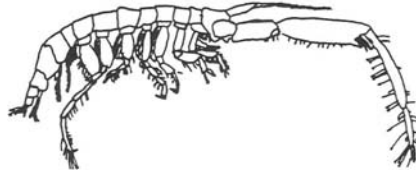
PREDATORS: Incidentally consumed by predators of fish, such as harbor seals and sharks.

ORIGIN/ RANGE: Pacific Coast natives. Range from Alaska to Columbia.

FACTS OF INTEREST: These parasites are protandrous hermaphrodites, which means they begin life as males then turn into females as they mature.

HABITAT: Found on the gills of many fish species.

TAXONOMY: PHYLUM - Arthropoda, CLASS - Malacostraca, ORDER - Isopoda, FAMILY - Cymothoidae



AMPHIPODS

Corophium spp.

DESCRIPTION: A small shrimp-like animal that rarely reaches 1 cm long and has a slightly compressed body (flattened side-to-side).

FOOD: Detritus. Abdominal appendages create a current and the fine hairs on them strain out the food. The food is then scraped off by mouth parts.

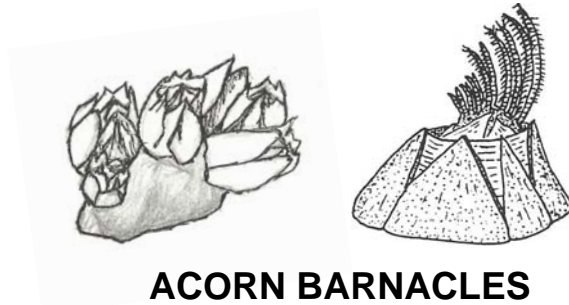
PREDATORS: Bottom-feeding fishes including starry flounder and English sole, surfperches, shrimp, and crabs.

ORIGIN/ RANGE: Worldwide distribution. S.F. Bay species include several exotic species, and one native species that is usually found only at lower salinities in the Bay.

FACTS OF INTEREST: These animals construct soft muddy tubes, are very efficient scavengers, and recycle more organic shore debris than any other animal. These mud burrowers aerate the mud by increasing water flow.

HABITAT: Common in shallow muddy sand and mudflats in bays; also amongst fouling organisms.

TAXONOMY: PHYLUM - Arthropoda, CLASS - Malacostraca, ORDER - Amphipoda, FAMILY - Corophiidae



ACORN BARNACLES

Balanus spp.

DESCRIPTION: Calcareous shell white to gray, to 22 mm in diameter. Texture variable; ridged or smooth.

FOOD: Small phytoplankton, zooplankton, and detritus. Filters food from the water with limbs called cirri.

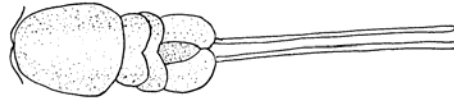
PREDATORS: Sea stars and snails, including the Atlantic oyster drill.

ORIGIN/ RANGE: Most barnacle species seen in S.F. Bay are Pacific Coast natives. One species was introduced from the Atlantic Coast, and another from the southern hemisphere.

FACTS OF INTEREST: Barnacles, because of their calcareous shells can be confused with molluscs (snails, clams, etc.), but they are actually crustaceans, more closely related to crabs and shrimp.

HABITAT: Common intertidally and subtidally on pilings, rocks and other hard surfaces.

TAXONOMY: PHYLUM - Arthropoda, CLASS - Maxillopoda, ORDER - Sessilia, FAMILY - Balanidae



SHARK COPEPOD

Family Pandaridae

DESCRIPTION: Parasite usually found attached to head, gill openings, and trailing edge of fins on fishes. Small, oval-shaped body with two long, thin tails. Green to gray in color and up to 1 cm.

FOOD: Possibly blood or skin.

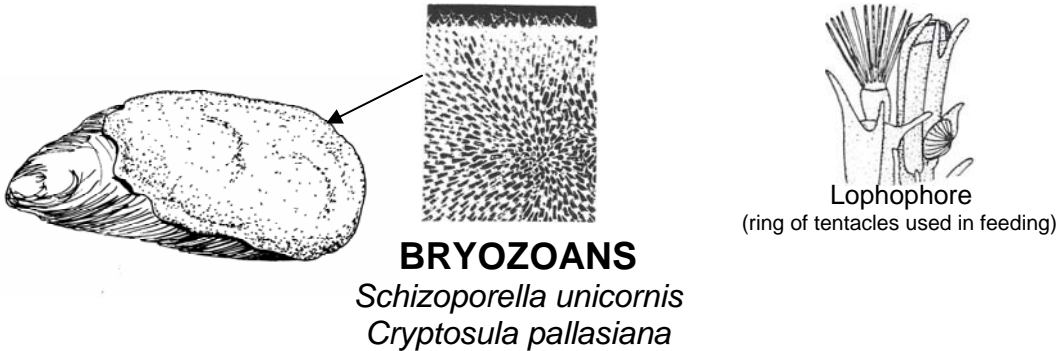
PREDATORS: Incidentally eaten when host is consumed.

ORIGIN/ RANGE: Pacific Coast native. Worldwide distribution.

FACTS OF INTEREST: Young copepods insert their heads into the skin of their hosts. When the skin heals around the wound (and the copepod's head), it is permanently attached. The head may form a cyst in the flesh of the host after the copepod dies.

HABITAT: Found on the head, gill openings, and trailing edge of fins on fishes.

TAXONOMY: PHYLUM - Arthropoda, CLASS - Maxillopoda, ORDER - Siphonostomatoida, FAMILY - Pandaridae



BRYOZOANS

Schizoporella unicornis
Cryptosula pallasiana

DESCRIPTION: Flat, hard, encrusting sheet found on shells, rocks and other hard surfaces. A bryozoan colony consists of many individuals (called zooids) arranged in a regular pattern. *S. unicornis* is deep orange; *C. pallasiana* is white or light orange.

FOOD: Bacteria, phytoplankton, and suspended detritus. Particles are swept into the mouth in water currents created by cilia (small hairs) on the sides of tentacles that are held out straight. The circle of tentacles on the head of a zooid is called a lophophore.

PREDATORS: Nudibranchs (sea slugs) and some small fishes.

ORIGIN/ RANGE: *S. unicornis* was introduced from Asia to the northeastern Pacific from British Columbia to California. *C. pallasiana* is reported in the North Atlantic Ocean from Europe, the Mediterranean and Black Seas, and in North America from Nova Scotia to Florida, though it may not be native in all these areas. It has been introduced to the Pacific Coast in many bays from southern British Columbia to San Diego and has been reported in Hawaii, Japan, New Zealand, Australia, Argentina and Chile.

FACTS OF INTEREST: Sexual reproduction is used in forming new colonies. Once there is a colony, it reproduces asexually. Most individual zooids are used in feeding; others are modified for other functions such as protection, reproduction, and attachment to substrate.

HABITAT: Distributed in bays and harbors from low intertidal to 60 m.

TAXONOMY: PHYLUM - Ectoprocta, CLASS - Gymnolaemata, ORDER - Cheilostomata, FAMILY - Schizoporellidae /Cryptosulidae



Close-up of *Bugula*

MOSSY BRYOZOAN

Bugula neritina

DESCRIPTION: Reddish brown to purple, branching and algae-like in appearance. It is actually a colony of many tiny animal units (zooids).

FOOD: Plankton, detritus, and bacteria.

PREDATORS: Unknown; incidentally consumed when sea grapes are eaten by sharks.

ORIGIN/ RANGE: Native region is unknown, but probably subtropical or tropical waters. Introduced to several bays on the Pacific Coast from Coos Bay, Oregon to Baja California. Also reported from the Atlantic, the Mediterranean and Caribbean seas, the Pacific and the northern Indian Ocean.

FACTS OF INTEREST: There are two forms (which may be two species) of *B. neritina* on the Pacific Coast. One is the source of a compound that is being tested as a potential anti-cancer agent.

HABITAT: Grows on hard surfaces including docks, boat hulls and other organisms, and is frequently found on sea grapes (*Molgula manhattensis*).

TAXONOMY: PHYLUM - Ectoprocta, CLASS - Gymnolaemata, ORDER - Cheilostomata, FAMILY - Bugulidae



LEATHERY SEA SQUIRT

Styela clava

DESCRIPTION: This tunicate is brown, elongate and club-shaped. Surface “skin” is prune-like and warty. Body tapers at base where it attaches to the substrate. Two siphons usually visible at top. To 12 cm.

FOOD: Plankton, which it filters from the water.

PREDATORS: Adults have none. Larvae are eaten by fish, and newly settled larvae are eaten by snails.

ORIGIN/ RANGE: Native to Asia, from the Sea of Okhotsk south to Shanghai. Found in California in 1930s. Introduced to the Pacific Coast in several bays from Vancouver Island in British Columbia to Ensenada in Baja California, possibly via ship fouling or ballast. Also introduced to the North Atlantic from Prince Edward Island to New York and from Denmark and Ireland to Spain, and to southern Australia.

FACTS OF INTEREST: This tunicate is harvested and eaten in South Korea. May live to 3 years.

HABITAT: Found in calm areas to at least 25 m in depth. A common fouling organism.

TAXONOMY: PHYLUM - Chordata, CLASS - Ascidiacea, ORDER - Pleurogona, FAMILY - Styelidae



SEA GRAPE

Molgula manhattensis

DESCRIPTION: This tunicate has a globular body, somewhat compressed, usually 1-3 cm in diameter. Color translucent, yellow-green to gray-green in clean individuals. Two siphons at top.

FOOD: Water is pulled into the body through one siphon and plankton are filtered out using a mucous net. The remaining water is flushed out the other siphon.

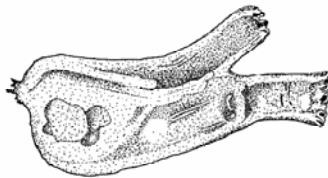
PREDATORS: Leopard sharks and brown smoothhound sharks.

ORIGIN/ RANGE: Introduced from the Atlantic. Ranges along Pacific Coast, Japan, northwest Africa, Australia, and the east coast of America excluding the Florida peninsula.

FACTS OF INTEREST: Larvae contain a nerve cord (similar to a spinal cord) and gills.

HABITAT: Found on hard, soft, and mixed substrate in calm or moderately protected waters (estuaries) from low intertidal to 30 m.

TAXONOMY: PHYLUM - Chordata, CLASS - Ascidiacea, ORDER - Pleurogona, FAMILY - Molgulidae



SEA VASE

Ciona intestinalis

DESCRIPTION: This tunicate is transparent, elongate, and floppy. Two visible siphons. Internal organs clearly visible through outer skin.

FOOD: Plankton and detritus which it filters from the water.

PREDATORS: Unknown.

ORIGIN/ RANGE: *C. intestinalis* from the northern Atlantic Ocean was first recognized in California in San Diego in 1897. The related and similar *C. savignyi* from Japan was first recognized in southern California harbors in 1986. Both have since spread northward to S.F. Bay, probably via ship fouling or possibly ballast water. Now found widely throughout the world spanning the tropics and subarctic coasts. Occurs on the Pacific Coast on Vancouver Island in British Columbia, possibly in Oregon, and in S.F. Bay, Monterey Bay and several southern California bays.

FACTS OF INTEREST: *Ciona* spp. harbor the probably non-native commensal amphipod *Leucothoe* sp. within their body cavities.

HABITAT: Found on rocky shores and in estuaries attached to hard substrate and sometimes algae. A common fouling organism.

TAXONOMY: PHYLUM - Chordata, CLASS - Ascidiacea, ORDER - Enterogona, FAMILY - Cionidae



COMPOUND TUNICATES

Botryllus schlosseri, *Botrylloides violaceus* & *Botrylloides diegensis*

DESCRIPTION: Firm and gelatinous in texture and ranging in color from white to yellow, orange, and reddish brown. These colonies are found under docks or pilings, or attached to other animals such as mussels. Consist of individual zooids arranged in a star pattern (*Botryllus schlosseri*) or rows and chains (*Botrylloides violaceus* and *Botrylloides diegensis*).

FOOD: Plankton. These animals use siphons to pump water into their body where food (detritus and plankton) is strained using a mucous net.

PREDATORS: Fishes, snails, and crabs.

ORIGIN/ RANGE: Found worldwide. These three species are introduced to S.F. Bay and many other sites on the Pacific Coast.

FACTS OF INTEREST: Larvae contain a nerve cord (similar to a spinal cord) and gills.

HABITAT: On pilings, rocks, and under docks in bays and harbors. They live in the low intertidal and shallow subtidal.

TAXONOMY: PHYLUM - Chordata, CLASS - Ascidiacea, ORDER - Pleurogona, FAMILY - Styelidae