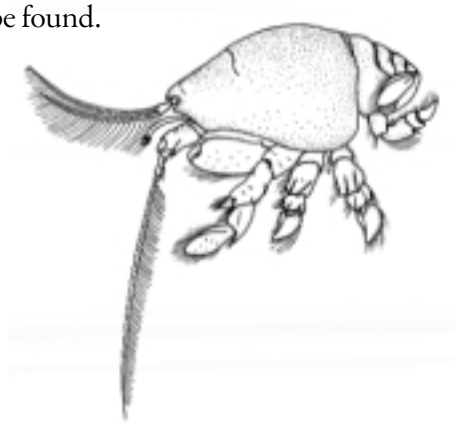
The Pacific Mole Crab

The sandy beach environment is not an easy place for organisms to live. Unlike the rocky intertidal ecosystem, there is no solid material on which to attach. Animals have to deal with crashing waves, changing tides, a beach that changes seasonally, and marine and terrestrial predators. The animals that live in this environment are buried in the sand. They all have adaptations that help them survive in the sandy beach ecosystem. It is in this environment that the Pacific mole crab can be found.



The Pacific Mole Crab

The Pacific mole crab (*Emerita analoga*), also known as the sand crab, is a common inhabitant of the sandy beach. They live along the Pacific coast from Alaska to Baja California in the northern hemisphere and between Ecuador and Argentina in the southern hemisphere. They live in the swash zone of the sandy beach intertidal zone. The swash zone ranges from the lowest to highest reaches of the waves at any given time. Because the swash zone changes with the tide, so does the location of the sand crabs.

Description

The sand crab is small in size, growing up to 35 mm long and 25 mm wide. It is gray or sand colored and does not have claws or spines. Like other crustaceans, they periodically molt, so the empty exoskeletons may be found on the shore. Males and females may look very similar at first glance, but there are some major differences. Females are larger with a carapace length of 14-35 mm, and the males reach 10-22 mm. If a female is carrying eggs, they will be found under the telson and will be a bright-orange mass. If a female is not carrying eggs, the pleopods to which she attaches eggs will be visible on the underside of the crab when the telson is lifted. There are three pairs of pleopods, and they resemble short threads.

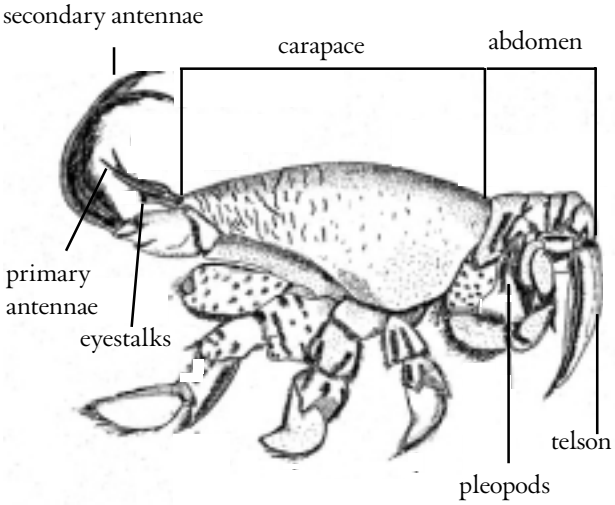
The crab spends most of its time buried in the sand. It has five pairs of legs that allow it to swim, crawl, and burrow, which are all done backwards. Its eyestalks reach above the sand. The first pair of antennae reach above the sand for respiration, and the second pair, resembling feathers, are extended when the crab feeds. The antennae collect small organisms, mostly dinoflagellates, then they are pulled into the body, and the food is scraped off. The food size ranges from 0.004 mm to 2 mm in diameter.

Emerita resembles another species of sand crab that live along the shore, the spiny sand crab, *Blepharipoda occidentalis*. This crab lives deeper in the subtidal zone and can reach 6 cm in length. The adult *Blepharipoda* feed on dead *Emerita*.

Natural History

Sand crabs are usually found on the beach in large numbers from spring to fall. In the winter, storms carry them offshore into sandbars. When the sand is transported back onshore in the spring, the crabs come with it.

During the reproductive season (February-October), females can produce one clutch per month of 50-45,000 eggs, which take approximately 30 days to develop. Once the eggs hatch, the larvae are planktonic



Female *Emerita analoga*

for about 4.5 months. They go through 8-11 larval stages, and during this time may drift far offshore. When they near the end of their larval stage, they hopefully return to nearshore waters. When the larvae settle onto the beach, it is called recruitment, and the crabs are considered "recruits." Recruitment can occur year-round, but large numbers of recruits are found in early summer and in the fall. The crabs move up and down the beach with the tides. Crabs move when the water rushes over the sand. Crabs also move down the length of a beach with longshore currents. These currents are created because waves approach a beach at an angle. As a wave returns to sea, it takes sand and crabs with it. The next wave goes in at an angle farther down shore and deposits the crabs in a new location.

Sand crabs are not distributed uniformly across a beach. Females are found lower in the intertidal zone than males and recruits. The crabs form large aggregations along the shore that are not uniformly spaced. Scientists have proposed biological reasons for this, such as predator avoidance and an advantage for mating. Physical reasons, such as water flow and wave shock, have also been proposed. A combination of multiple factors may explain the aggregations. The number of crabs on a beach can vary drastically from year to year, depending on environmental factors.

Predators and Parasites

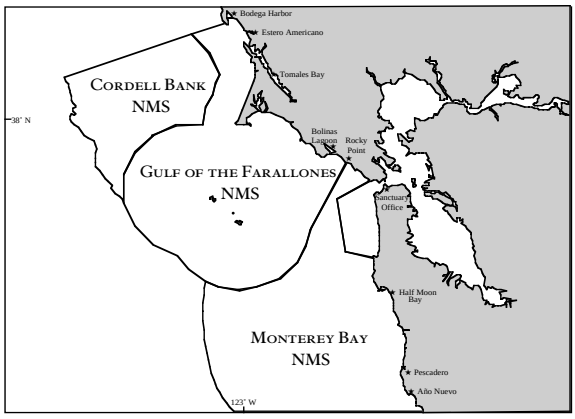
The main predators of the sand crab are fish, water birds, and shorebirds. Fish provide the greatest threat, and this may explain why sand crabs are mostly in the upper intertidal zone. The barred surfperch is a very common fish in the surf zone, and sand crabs have been found to make up 90% of its diet. The California corbina is another fish that eats sand crabs. Shorebirds, including sandpipers, Sanderlings, godwits, Blackbellied Plovers, Willets, and curlew, have been seen feeding on crabs within the swash zone. The Surf Scoter, a water bird, also feeds on sand crabs. The sea otter is a mammalian predator.

Sand crabs are known to carry parasites. They are an intermediate host of parasitic worms. These parasites are passed onto the predators of sand crabs. Sea otters and birds can eat many crabs per day, and the ingested parasites have been known to kill these predators.

Sand crabs are used by humans in a variety of ways. They are used as bait by fishermen. In southern California, approximately two million *Emerita* were taken for bait in one year. They have also been used to indicate levels of DDT and domoic acid in the waters off of California. Domoic acid is a neurotoxin produced by diatoms, a type of phytoplankton. When sand crabs eat the toxic plankton they become toxic to birds, otters, and fish that eat them.

Monitoring of Sand Crabs

The Farallones Marine Sanctuary Association is coordinating a sandy beach monitoring project. Through this program, San Francisco Bay Area high school students monitor the Pacific Mole Crab along the shores near their schools. The project is funded by the Gulf of the Farallones National Marine Sanctuary through the *T/V PUERTO RICAN* Oil Spill Restoration Fund. The *PUERTO RICAN* was a tanker vessel that spilled 1.4 million gallons of oil into the Gulf of the Farallones in 1984. The oil injured and killed many birds and washed onto beaches in the Gulf of the Farallones National Marine Sanctuary. This project is part of a curriculum that educates San Francisco Bay Area high school students about the local ecosystem. If you would like information on this program, please contact us at (415) 561-6625 or visit our web site at www.sandcrabs.org.



For more information contact:
Farallones Marine Sanctuary Association
(415) 561-6625 www.farallones.org
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