



## MARINE LIFE PROFILE: SEA CUCUMBERS

Hawaiian name:	loli
Scientific name:	Holothuroidea
Size:	variable, 1 inch (2.5 cm) to 3 feet (0.9 m), depending upon species
Diet:	detritus (plant and animal organic debris)

Sea cucumbers are "spiny animals", members of the grouping, or phylum, Echinodermata and relatives of the seastars and sea urchins. All echinoderms are marine and nearly all are bottom-dwellers. They are unique in having a 5-part body design and a water-vascular system of internal canals which provides hydraulic power for their many muscular tube feet. Echinoderms lack a distinct "head" end, and most live mouth-side down on the seafloor. They have a large internal body cavity that is fluid-filled, and circulating fluids carry gases and nutrients throughout the body. Echinoderms have an internal skeleton of calcium carbonate plates called ossicles, and in familiar echinoderms the sea urchins, extensions of the skeleton form the spines for which this group is named.

Sea cucumbers differ from other echinoderms in having an elongate, cylindrical body with the mouth and anus at opposite ends. Because their body is muscular and soft rather than spiny, sea cucumbers are sometimes confused with sea slugs (snail relatives that lack a prominent shell). An easy way to tell sea hares and sea cucumbers apart is to look for a head. Sea slugs, like snails, have a head with sensory tentacles. Sea cucumbers, like other echinoderms, lack a distinct "head". Instead, the mouth end of a sea cucumber is ringed by 5 feeding tentacles used in gathering food particles. Sea cucumbers either gather detritus (bits of plant and animal matter) and bacteria from seafloor sediments or filter particles from the water.

Sea cucumbers lack some features common in other echinoderms. The 5-part body design you can see in seastars and even sea urchins is harder to find in many sea cucumbers. Some sea cucumbers have 5 rows of tube feet running the length of the body. But, in many sea cucumbers, you have to look internally to see the pattern -- five muscle bands run the length of the body. A few sea cucumbers have 5 "teeth" around the anal opening. These "rump teeth" are not used in feeding, but may protect the cucumber from parasitic fish that shelter in the cucumber's body.

The skeleton and spines that are so prominent in other echinoderms are reduced in sea cucumbers. Instead of a rigid skeleton, sea cucumbers have a muscular body wall that contains only microscopic skeletal ossicles. The muscular body wall provides support, and so does the water inside the cucumber's large body cavity. This "water skeleton" also acts like a circulatory system.

Like other echinoderms, nearly all sea cucumbers have tube feet. The suckered tube feet are important for both attachment and movement. In many species, the tube feet are all found on one side of the animal, providing greater grip in wave-swept habitats. One group of sea cucumbers (synapid or apodous cucumbers) lack tube feet all together and move by muscular waves which pass down the length of the body (peristalsis) – they are found in quiet-water habitats.

Sea cucumbers have some structures that other echinoderms don't! A special respiratory structure, called the respiratory tree, is derived from a branch of the sea cucumber lower digestive tract. Cucumbers obtain oxygen by pumping seawater in and out of the anus. The water that may drain from a sea cucumber's body is "exhaled" water from the respiratory tree.

Sea cucumbers may lack spines and the protection of a rigid skeleton, but they have many different means of defense from predators. With soft, flexible bodies, they are able to crawl under rocks and into reef crevices. Some species have repellent or toxic chemicals in the skin that make them distasteful. Others eject sticky threads (Cuvierian tubules) from the anus -- these threads entangle and immobilize potential predators and the cucumber crawls to safety. Still other sea cucumbers can eject (eviscerate) part of the digestive system as a defensive mechanism, regenerating lost parts later.

Like most echinoderms, sea cucumbers reproduce sexually and many are broadcast spawners. Males release sperm and females release eggs into the water and fertilization is external. A barrel-shaped planktonic larva results that drifts in plankton before settling to the seafloor and metamorphosing into a benthic (bottom-dwelling form). A few sea cucumber species retain the young and brood them until they emerge as crawling juveniles. Some species have also been reported to reproduce by fission (splitting in half), a form asexual reproduction

There are more than fourteen species of sea cucumbers in Hawaii's shallow waters, ranging in size from about 1 inch (2.5 cm) to 3 feet (0.9 m). They occur in tide pools, on reefs, in bays and lagoons, and in deeper waters. Examples of common tidepool species are the black sea cucumber (*Holothuria atra*), ashy cucumber (*Holothuria cinerascens*), banded sea cucumber (*Holothuria pervicax*), and white-speckled (rump-toothed) sea cucumber (*Actinopyga mauritiana*). In the quiet waters of Kāne'ōhe Bay, the prickly sea cucumber (*Ophiodesoma spectabilis*) is common. Sea cucumbers, in general, were known as loli by early Hawaiians, but only certain species were eaten. Sea cucumbers are highly prized as a delicacy in many cultures including those of Asia, Pacific Islands, and Mediterranean Europe.

Sea cucumbers play an important role in reef "recycling". They feed by gathering organic detritus and even bacteria from the water or the sand. They speed the breakdown of these bits of plant and animal debris -- extracting energy for their own survival and recycling materials that seaweeds can absorb as fertilizers. The sand that sea cucumbers process along with the detritus they consume is eliminated as strings of sandy beads. This processing helps "turn over" sediments.

### **Classification:**

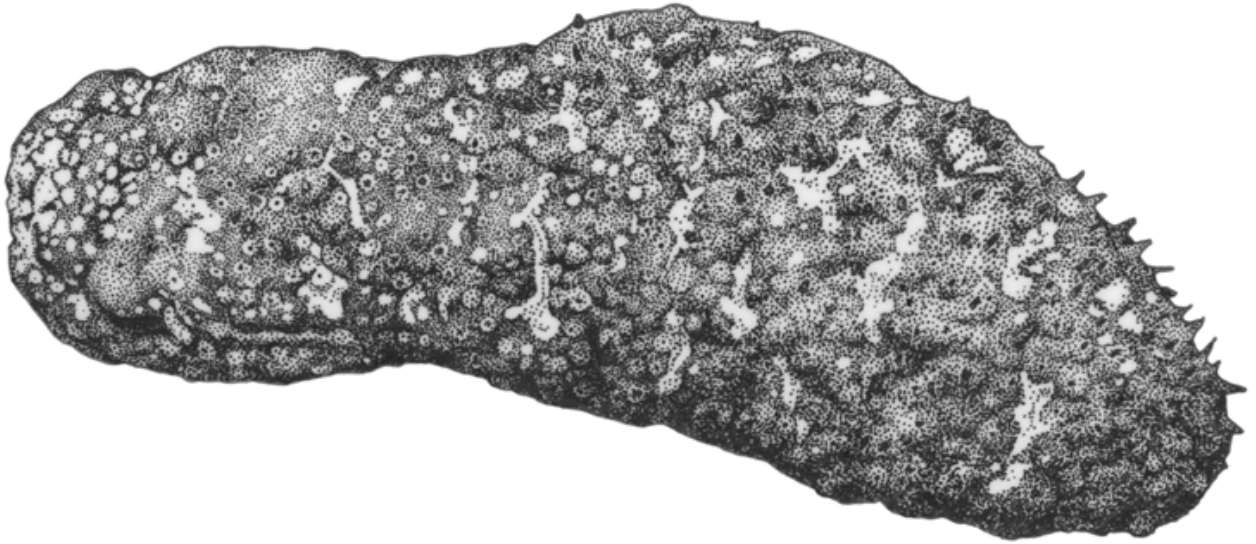
Phylum Echinodermata

Class Holothuroidea

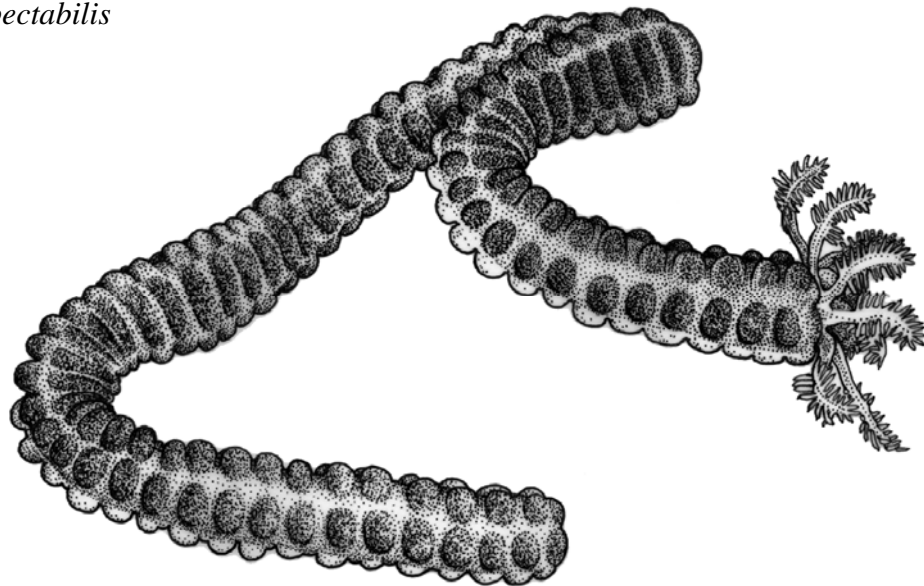
Order Aspidochirota

Family Holothuriidae

**White-speckled/Rump-toothed**  
*Actinopyga mauritiana*



**Prickly sea cucumber**  
*Ophiosoma spectabilis*



## MARINE LIFE PROFILES: HAWAIIAN SEA CUCUMBERS

### **Ashy sea cucumber**

Hawaiian name: loli

Scientific name: *Holothuria cinerascens*

Distribution: Indo-Pacific, including Hawai'i

Size: to 6 inches long

Diet: plankton, organic detritus

The ashy sea cucumber is probably the most common sea cucumber on Hawaiian shorelines. The body of this species is black covered with a thin gray membrane giving the appearance that it's coated with ashes. This sea cucumber has a relatively narrow band of small, weak tube feet and is found in more protected locations on the reef flat and in tidepools where it either wedges its body tightly into cracks and crevices or clings to the bottom surfaces of rocks. This cucumber is a suspension feeder, it collects drifting detritus from the water with highly branched feeding tentacles that are coated with mucus. When extended, the tentacles look like sprigs of black parsley.

### **Black sea cucumber**

Hawaiian name: loli

Scientific name: *Holothuria atra*

Distribution: Indo-Pacific, including Hawai'i

Size: to 12 inches long

Diet: organic matter, detritus

The thick, hard body wall of this black sea cucumber is often covered with sand grains. One of the larger Hawaiian cucumber species, it often grows to a foot in length. When handled, the body sometimes gives off a red pigment. Apparently, this chemical is repellent or toxic to predators and may provide protection for the cucumber. The mouth curves toward the bottom where it scoops up detritus particles and sand with branched feeding tentacles. After all the organic matter has been digested, the undigested material, mixed with mucus is eliminated in long strands resembling necklaces of sandy beads. A small black and white spotted crab (*Lissocarcinus*) is sometimes found living in or around the mouth opening as a commensal. The crab apparently makes a living feeding from the cucumber's tentacles and body surface and does not appear to harm its host. White parasitic snails (Family Eulimidae) may be attached or embedded in the body wall where they feed on the cucumber's body fluids.

### **Whitespeckled or rump-toothed sea cucumber**

Hawaiian name: loli

Scientific name: *Actinopyga mauritiana*

Distribution: Indo-Pacific, including Hawai'i

Size: to 12 inches long

Diet: organic matter, detritus

This sea cucumber is common on shallow reef flats and tidepools where there is moderate to heavy wave action. It is colored a chocolate brown and flecked with white spots over the top and sides. The body wall is thick and muscular to resist wave impact and strong tube feet are concentrated along one side, forming a "sole" for clinging to the rocks. The terminal mouth is usually extended downward like a vacuum cleaner as its scoop-like feeding tentacles gather sand and detritus from the bottom. Undigestible sand is eliminated through the anus in strings of sandy beads. This species is also called the rump-toothed sea cucumber in reference to the 5 triangular teeth visible in the anal opening. Presumably, these teeth serve as a deterrent to infection by the parasitic pearl fish (*Carapus*) which enters the anal opening of sea cucumbers to live within the lower digestive tract.