

Benthos - Crabs, Corals, and more - Tutorial Script

Molting is a process where the exoskeleton of an organism is shed, and a new one grown. Arthropods all have exoskeletons and thus must shed them if they plan to grow. How does that happen? How do you shed an old exoskeleton and create a new one, but still leave room to grow? As they molt, arthropods absorb lots of water and swell up. As their new exoskeleton grows, these organisms are considered soft shelled. If you've ever eaten soft-shelled crab, you know that it tastes different than hard-shelled crab. Why? All the extra water in the tissues. Once the exoskeleton hardens completely, the water is expelled from the body, and there's now room to grow. All arthropods molt, but some, such as barnacles, do so only in their larval stages. An interesting behavior of many crabs is that the male will pull the female into an embrace after her exoskeleton has molted. This embrace is a courtship that can last for weeks. When the female is released, her exoskeleton is hard.

What happens to all the molted exoskeletons? They become part of the **detritus** that sinks to the bottom of the seafloor, along with other organic debris, such as feces and dead carcasses. This is the primary food source for deep-sea benthic organisms.

Now let's look back at those cnidarians and their stinging cells. How do they work? Do all cnidarians really have a sting? Anemones as well? Yes, they do, and here's how it all works: **Cnidoblasts** are cells with a hair trigger and a capsule (nematocyst) containing an inverted, coiled hollow thread. Some threads have tiny barbed blades and sharp tips with toxin. Once used, these barbs are discarded and replenished with a new one. Stinging cells are deployed on tentacles that bend or retract to the mouth. When the tentacles and barbs entangle prey, the cnidarian draws the tentacles to its mouth and deposits them into a saclike digestive cavity. These stinging cells are a part of all cnidarians - be they anemones, corals, or jellyfish. Some toxins are so potent they can kill a human, such as the toxins of the box jellyfish. Other barbs are too weak to penetrate human skin or have weak toxins that we can barely feel, such as those of the moon jelly.

Fire coral is a species of coral that has a particularly painful sting. However, most tropical corals are not toxic to humans. Corals and anemones are both considered the polyp form. Jellyfish are medusa forms. What that means is that corals and anemones are similar to jellyfish but stuck upside down on a rock. And jellyfish are like anemones that have been freed from the rock and allowed to swim. How can you tell the difference between anemones and corals? They're both polyps, and they both form clone colonies. However, almost every species of coral lives in a calcium-carbonate housing. Anemones do not. These houses build up large structures in a variety of shapes, each filled with a clone that has budded off the original. All these different coral clones are connected together not only by their houses, but also by their tissue. Cloned anemones do not have houses, nor shared tissue. This picture shows one of the rare corals that while sharing tissue does not build itself a calcium carbonate housing. This image shows a solitary coral common along the Pacific Coastline. It has a calcium carbonate house, but is solitary and has no cloned neighbors.

Tropical corals, like those found in this reef off of Western Australia, in the Indian Ocean are **hermatypic corals**, which means, as discussed in the Living Ocean lecture, they are mixotrophs. They participate in a mutualistic relationship with small dinoflagellate algae known as zooxanthellae. The waste of the coral fertilizes its garden of zooxanthellae, and the garden feeds the coral. These types of corals require clear, warm, salty water. Sunlight must penetrate deep enough to reach the reef so the algal gardens can photosynthesize. That means the water must be clear of suspended particulates and plankton. So these reefs form where there is no nearby river and the waters can maintain a constant warm temperature. In addition, since corals are sessile, they need a solid surface on which to attach, so they need hard rock or other material. They cannot attach to mud or sand. As a result, we find these coral reefs only in tropical climate zones, generally on the western edges of the equatorial oceans. Why? What happens in the Eastern equatorial oceans? As you'll recall from our previous lectures, the eastern equatorial oceans alternate between upwelling and downwelling based on the strength of the trade winds. That type of fluctuation would kill a coral reef. And nutrients bring plankton which means a reduction in the photic zone. Ironically, coral reefs can survive only where there are no nutrients in the water. So where do the autotrophs get their nutrients then? The waste of the coral. Coral reefs are truly oases in marine deserts -- self-contained and sustaining ecosystems.

Before we leave cnidarians, we should discuss another group of animals that prey on anemones and use the undigested stinging cells for their own protection. These animals are called **nudibranchs** and are gastropod mollusks. As you can see in these images, they come in a variety of shapes and sizes. Because they feed off anemones, they are predators. The colorful cerata and tufts that line their backs have these stolen stinging cells and act as deterrents to their own predators.

Pause now.

For more information and more detail, continue on to the next video in the series.

Crabs, Corals, and More

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Nekton & Benthos Series:

Nekton: Whales, Fish, and More
Benthos: Intertidal Zone
Benthos: Crabs, Corals, and More
Deep Sea Vent & Seep Communities

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