



NATIONAL AQUARIUM IN BALTIMORE.

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Fast Facts

- ❑ More plants and animals inhabit coral reefs than any place else, except tropical rainforests
- ❑ Coral reefs are the largest structures on Earth.
- ❑ Coral reefs are home to as much as one-quarter of all marine species.

Key Terms

Coral Bleaching -

Occurs when poor water quality kills coral, leaving behind a colorless skeleton.

Polyp - Soft, animal living inside hard, stony coral.

Zooxanthellae -

Small plants living in the tissue of reef-building coral.

Ask the Aquarium

*Fact Sheets from the
Conservation Education Department*

Coral Reefs

Coral reefs are diverse communities of marine plants and animals that rise above sandy ocean floors in some tropical areas of the world. The mass of the reef is composed of calcium carbonate (CaCO_3), laid down as the exoskeletons of animals called stony, or hard, corals. The surface of the reef is covered by the living part of the corals.

The tentacled polyps of stony corals resemble anemones and belong to the same phylum, Cnidaria. Other members of this large group include gorgonians (sea whips and fans), fire coral, jellyfish, and colonial anemone-like zoanthids. The tentacles on each coral polyp have sticky, stinging cells that help to stun and catch small animals that venture too close to the coral. When they come in contact with a bit of food, the tentacles pull it down to the central mouth to be digested. Many stony corals feed this way at night, then sink into the protective skeleton during the day, while some other cnidarians feed during the day.

All reef-building corals have algae called zooxanthellae living inside their tissues. Through the process of photosynthesis, the algae convert carbon dioxide and water into oxygen and carbohydrates; these carbohydrates provide nutrients for the coral polyp. The polyp, in return, uses oxygen for respiration and provides carbon dioxide to the zooxanthellae. Because these algae require light in order to perform photosynthesis, their coral hosts are restricted to relatively shallow (30 meters), clear water. The algae account for



Coral thrive in clear, shallow water, with an optimum temperature of 24°C (75° F).

about half of the weight of the coral body, and algal pigments give the coral its color. Since the algae play such a crucial role in coral survival, without it, coral reproduction comes to a halt.

Where Do Reefs Grow?

Reef-building corals have very specific requirements for growth that limit their distribution. The water must be clear, shallow, and warm, with an optimum temperature of 24°C (75° F) which is found in more tropical areas. Not all water along the tropical coastlines is suitable for coral reefs, however. Areas with high freshwater run-off, such as near the mouth of Amazon River, lack corals. Corals require a salinity of at least 25 parts per thousand (ppt) and do best in full sea water (35 ppt). Coral reefs are generally restricted to the eastern margins of continents where warm water from the equator arrives with the currents.

Consequently, coral reefs form off the coast of Florida, but not off

the coast of California, where the water is much colder. The major areas of reef development are in the Caribbean and the Indo-Pacific regions. The largest reef in the world, the Great Barrier Reef, is located off the east coast of Australia, and covers a span of 1,200 miles.

Coral Reef Ecosystem

Red, brown, and green algae are common on and around reefs. They are frequently calcareous, laying down a layer of calcium carbonate (CaCO₃) between their cells. Coraline red algae contribute to the reef structure by acting as mortar between the coral heads. Broken-down calcareous green algae are a source of carbonate sand for sandy bottoms and beaches.

In addition to the corals, many other animals feed, hide, and rest in the complex reef habitat. Sponges in brilliant colors grow as both encrusting patches and as freestanding shapes, including vase and basket sponges. Some mollusks live on the corals themselves, but many more live in the sandy areas and grass beds around the reef.

Arthropods such as crabs, shrimp, and spiny lobsters hide in the many nooks and crannies of the reef.

Fish are the most prominent animals of the reef. They exhibit glorious colors and fascinating ways of living. Many of them have seemingly strange body designs and/or social behaviors. These specializations provide efficient means of feeding, schooling, and protection for a variety of fish, and enable all areas of the reef to be used as feeding, resting, or hiding places during the day and night.

Coral Reef Fish

The rock-hard skeletons of corals do not protect them from all of the fish that inhabit the reef. Parrotfish

have a special adaptation, consisting of a bony "beak" with teeth that are fused together into upper and lower plates. This allows these fish to graze on algae that grow on dead coral- as well as zooxanthellae in live coral- by crunching pieces of the hard coral to get to the attached vegetable matter. The coral bits are then ground in a bony mill located in the throat and returned to the sediment in fine-grained form. This feeding strategy of parrotfish creates much of the coral-derived "sand" in and about the reefs. In fact, one parrotfish can make up to a ton of this coral sand per year.

Since a coral reef is made up of so many different kinds of fish and invertebrate species, encounters between individual animals are common. Interactions between fish of different species are often observed in the reef habitat. One example of this is a cleaning station. Smaller animals may appear to be "picking" or "biting" a larger one, with the "victim" doing nothing to defend itself. This is actually cleaning behavior; the smaller fish is removing parasites, debris, or infected tissue from the skin of the larger fish. The cleaner lives in a semi-permanent territory called a "cleaning station", which other fish recognize. Both parties benefit from this relationship: the larger fish gets rid of an irritant and the cleaner gets a meal without being harmed. Cleaners include small fish such as gobies, cleaner wrasses, and young porkfish, as well as many of the shrimp that live in surrounding sponges, anemones, and crevices.

Unique defense adaptations among fish species is also a very important feature of coral reefs. For example, the four-eye butterflyfish are thought to use fake eyespots to direct enemies to the wrong end of the fish (the tail).

Coral Reef Conservation

While the coral reef is one of the most complex and diverse environments in the world, it is also one of the most delicate. Coral reefs are harmed by anchors from fishing boats, and divers and snorkelers standing on reefs or collecting from them. Shoreline development, agricultural expansion, and sewage problems in tropical areas can also kill reefs by causing silt, sediments, and excess nutrients to wash into the sea.

Coral bleaching has become a serious threat to coral reefs around the world. This happens when extreme changes in temperature and salinity cause the coral to expel the zooxanthallae, leaving behind a colorless skeleton.

What You Can Do!

- Conserve water by using water-reducing fixtures, limit shower time, and fix leaks promptly.
- Reduce rainwater runoff through landscaping and porous pavements.
- Support sustainable use fisheries in food products.
- If you dive or snorkel, don't touch the coral - even the lightest touch with hands or equipment can damage sensitive coral polyps.
- Don't dump trash at the beach or at sea; plastic bags and other debris can injure or kill marine animals. Try to retrieve fishing gear and equipment, especially monofilament line.