



Fish & Wildlife Conservation Commission

Florida Marine Research Institute

Living animals whose skeletons form the framework of Florida's multi-colored underwater reefs, corals are a diverse and ecologically important member of the aquatic ecosystem. Florida boasts the only living coral reefs in the continental United States, but these ancient, slow-growing structures are now imperiled by their own enormous popularity. Boat anchors and groundings, heavy use by divers and snorkelers, and pollution all cause damage that is taking a toll on these monuments of the sea that, for many people, are the very embodiment of Florida's underwater appeal.

## CORALS

### Architects of the Reef

A coral polyp consists primarily of translucent tentacles and a mouth. It feeds by waving its tentacles through the surrounding water to attract tiny wandering animals called zooplankton, which the polyp stuns with stinging cells located on its tentacles. When a polyp is feeding or defending its territory, it stretches itself out of its "cup" and spreads its tentacles like the branches of a tree. At rest, it pulls its tentacles back into the cup and closes its mouth tightly like a drawstring pouch.

### What Are Corals?

Corals are composed of tiny, cup-shaped animals called polyps, which are related to jellyfish. They begin life in tropical waters as free-floating larvae but eventually settle on the sea floor in large, sedentary colonies. A single polyp may be as large as a saucer or smaller than the head of a pin. Billions of these polyps working together, generation after generation, create one of nature's most spectacular and enduring wonders: a coral reef.

Incorrectly classified as plants until the mid-19th century, corals are actually animals that gather their food instead of producing it themselves as most plants do. But the corals do house within their tissues an assortment of microscopic plants called zooxanthellae, which use sunlight to photosynthesize. The coral polyps give these brownish-colored algae a safe haven from predators, and in turn, the algal "tenants" are believed to provide the polyps with a natural sunscreen as well as additional oxygen. Scientists are still investigating the nature of this mutually beneficial (symbiotic) relationship—which is replayed in many forms by various

AT A  
glance

### Here's How You Can Help Keep Our Reefs Healthy!

- Remember that all Florida coral is protected and may not be collected, harvested, or sold.
- Do not touch, grasp, stand on, sit on, or drag equipment over living coral.
- Try to retrieve fishing gear and equipment, especially monofilament line.
- Avoid running aground on the reef. "Brown, brown, run aground; blue, blue, sail on through."
- Anchor boats in sandy areas away from the reef, using mooring buoys if available.
- Do not dump trash on or near the reef—or anywhere else at sea.



inhabitants of the reef system.

Reef corals, in general, require clear water, bright light, oceanic salinities, and water temperatures that average about 70 degrees. Most types of polyps rest during the day, while the algae produce energy, and become active at night, unfolding their gaily colored tentacles to gather food.

Corals usually reproduce at night and at certain times of the year, producing a milky cloud of sperm and eggs that would be quickly gobbled by hungry fish if released during the day. Fertilized eggs soon hatch into larvae that drift for several days before settling onto a hard surface, where they immediately begin to construct skeletons to anchor themselves to the rock. At this time, the larvae also change from shapeless blobs into polyps with a mouth and tentacles. A polyp will remain in one place its entire life, growing new polyps by cloning itself, a process called “budding.”

Throughout their lives, coral polyps extract calcium from seawater and combine it with carbon dioxide to construct protective limestone skeletons. These skeletons form the gradually evolving framework of the huge and colorful coral reefs.

## How Coral Reefs Form

Living polyps grow on a graveyard filled with countless skeletons of other polyps. Over the centuries, millions of skeletal deposits are added to the colony, until the resulting structure may extend to just below the ocean’s surface. Since polyps must be in contact with water in order to collect food, only the outside layer of any coral formation is alive.

Because reefs are built polyp by polyp, they grow very slowly: estimates of growth range from one to 16 feet every 1,000 years. This continual work-in-progress forms the exquisite floral patterns and jagged pillars and spires of a coral castle. In addition to the algae that live within the coral polyps, other types, usually red algae or blue-green algae, grow on the reef itself. These

algae also produce limestone that cements diverse reef material, and they give the reef its vivid rainbow hues.

Coral reefs have been in existence for 200 million years. In prehistoric times, when the climate of North America was warmer, coral reefs were found over a much broader area. Although some scattered coral communities are found off western Florida and the coasts of Texas and Louisiana, the only living reef in the continental United States is located in the Florida Keys. Here, some 6,000 individual reefs are draped like a jeweled necklace along the coast for 130 miles from Key Biscayne to the Dry Tortugas.

## *Fast* FACT

*Florida’s reefs began to form 5,000 to 7,000 years ago, when sea levels rose following the last Ice Age.*

All coral reefs are in a constant state of flux. New polyps grow on the outer surface of coral reefs, causing the reefs to expand, and buffeting storms and coral-destroying animals grind the coral rock into sand, causing the reefs to shrink. If conditions are favorable for long periods, the reefs may reach awe-inspiring heights.

## Types of Reefs and Corals

Worldwide, there are three main types of coral reefs: fringing, barrier, and atolls. Florida has fringing/barrier reefs, which grow further offshore in deeper waters and rise steeply from the ocean floor, and also has patch reefs, a fourth type, which grow close to shore in shallow water. Atolls, ringlike coral islands encircling a shallow lagoon, are found primarily in the South Pacific.

Numerous species of coral are found in Florida reefs. Each kind lives in a separate colony that is shaped differently from the others. The colonies take on the various hues of the algae that live within them—usually red, green, and brown. Corals can generally be divided into two main categories: stony corals and octocorals.

Skeletons of dead stony (hard) corals and the



skeletal deposits of other types of corals, sponges, and algae are the building material of reefs. The most spectacular reef-building corals in Florida are brain, star, elkhorn, and staghorn. Brain coral is dome-shaped and has waves, folds, and ridges that resemble those of a human brain. It may be as small as a golf ball or as large as a boulder. Star coral is also dome-shaped, but it has a distinctive star pattern on its surface that is caused by the accordion-like folds within its polyp cups. Elkhorn and staghorn corals are so named because their branchlike projections resemble the antlers of those animals.

Octocorals, some of which are also called gorgonians, look like strange trees and shrubs, although they too are composed of living polyps. The name “gorgonian” aptly refers to the mythical Gorgons, sinister women with writhing snakes for hair. Unlike stony corals, octocorals are unable to build thick limestone skeletons. Instead, many octocorals are supported by an internal structure composed of a horn-like substance called gorgonin. Octocorals frequently grow on or near the reef like a fantastical, though carelessly sown, garden.

The most common octocorals in Florida are sea fans and sea whips. Sea fans are pale lavender or green fan-shaped corals. Their fans flutter in the ocean currents like lace curtains. Sea whips have long, feathery branches that spread in all directions. They can be orange, lilac, purple, yellow, brown, or buff.

## Reef Residents

Coral reefs are a study in deception, supporting many animals that look like plants, and many plants that appear to be animals. The most obvious example of such confusion is the sponge. Although it looks like a plant, it is an animal, albeit a simple one consisting of no more than a cluster of cells. It funnels seawater through a network of canals and pores to collect food, minerals, and oxygen.

From silvery, streamlined barracuda to spine-covered sea urchins, coral reefs attract a remark-

able variety of marine creatures, many of which are just as brightly colored as the reefs themselves. The reason for this color display is not known, although scientists suggest that the residents of the reef—with so many ledges and openings to hide within—may not need to camouflage themselves in drab attire as so many creatures of the open sea do. But like all animals, reef inhabitants have evolved a number of adaptations to improve their survival chances. The spiny lobster and the four-eyed butterfly fish, for instance, sport “eye spots” on their tails to direct a predator’s attention away from their vulnerable heads and bodies. Damselfish have a special coating of slime on their bodies that allows them to hide without injury among the poisonous tentacles of the sea anemone. And the parrotfish, which helps to make beaches by pulverizing coral into sand, creates its own sleeping bag of mucus that seals its scent from predators.

## FAST FACT

*Coral reefs occupy only 0.07 percent of the ocean floor—an area roughly the size of Texas—but they are home to as many as one-quarter of the world’s marine species.*

Although coral reefs are beautiful by day, they take on an even more dazzling appearance at night, as more of the polyps unfold and many reef residents come out of their daytime shelters to feed.

## Why Coral Reefs Are Important

Coral reefs are among the most biologically diverse ecosystems on earth. They are second only to tropical rain forests in the number of species they harbor and, indeed, are sometimes called “the rain forests of the sea.” Like their terrestrial counterparts, coral communities may contain valuable materials and medicines that may one day be useful to people. Australian chemists are already adapting the coral’s natur-



al sunscreen for use on humans, and the reef's porous limestone skeletons hold promise in surgical bone grafts.

In Florida, coral reefs are home to many of the state's most important fisheries resources, including spiny lobsters and groupers. Reefs also buffer coastal land from the damaging effects of storms and erosion and help to form the sandy beaches and quiet lagoons that are signatures of the state's tourism industry.

## Threats to Coral Reefs

Two centuries ago, enterprising residents of the Florida Keys waved lanterns from the shore to lure unsuspecting ships onto the hull-ripping reefs so the residents could salvage the cargoes for themselves. Although that activity has long since been halted, Florida's coral reefs today face an unintentional, but growing, threat from the very people who prize them most. Boaters frequently run aground or drop anchor on the coral heads, divers and snorkelers step on and bruise them, and pollution threatens to sully the clear waters that are vital to their survival.

### *F a s t F A C T*

*The reefs of the Florida Keys are the most popular diving destination in the world.*

An initial attempt to protect the reefs came in 1960, with the creation of John Pennekamp State Park off Key Largo, the world's first completely underwater park. That was followed by the designation of the Key Largo National Marine Sanctuary and, later, farther south, of Looe Key National Marine Sanctuary (both of these are now part of the Florida Keys National Marine Sanctuary). Additionally, state and federal officials enacted legislation to regulate fishing in

coral reef environments, eliminate harvests of stony corals, and phase out habitat collection, culminating in a ban on all collection of wild "live rock" by the end of 1996. Florida had been a major supplier of reef rock for the aquarium trade. State officials also designated all the waters of Monroe County as Outstanding Florida Waters, imposing stricter requirements on development.

Despite these measures, the number of visitors to the reefs continues to swell, along with the sewage and stormwater discharges associated with shore development in the Keys. Scientific evidence indicates that the excess nutrients contained in these discharges may be lowering water quality in or around the reefs.

Additionally, many corals have begun to lose their fantastic hues and are fading to a pale white. This process, called bleaching, occurs when the coral polyps become stressed by environmental factors and expel the colorful algae that live within their tissues. Although corals can live without their algae, the loss can slow their growth rate. Scientists believe that bleaching is caused by changes in worldwide weather patterns—especially prolonged periods of intense sunlight, high temperatures, and poor water circulation. Corals may recover their algae if these climatic patterns change, although they may remain stunted.

The cornerstone of the Florida Keys National Marine Sanctuary is a management plan that establishes a system of protective zones along the reefs. In some zones, only recreational use will be permitted; in others, some commercial fishing will be allowed. A few areas will be set aside solely for researchers. The management plan offers hope that the state's shimmering underwater mansions will continue to grow and flourish.



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