

CULTURE STOP



CORAL REEFS

The Coral Animal

What most people consider a coral reef is a skeleton of a small animal called a coral polyp. So although they look like tough rocks, coral are actually delicate living creatures, which is why they can both grow and die. A single section of coral is formed by a thousands of genetically similar polyps, which are generally only a few millimeters in diameter. These coral polyps are a special kind of animal (kingdom Animalae), which belong to the phylum Cnidaria, which is Greek for “nettle.” They get this name because all corals have cnidocytes, a stinging organism that they use to capture prey and to punish snorkelers who get too close. Jellyfish and sea anemones (also famous for their stings) also belong to the phylum Cnidaria.

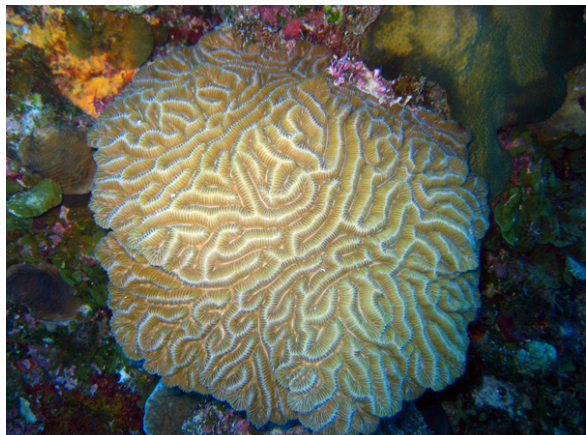
Types of Reefs

Coral reefs begin to form when free-swimming coral larvae (the babies of the polyps) attach to the submerged edges of land. As the corals grow and expand, reefs take on one of three forms: fringing reefs, barrier reefs, or atolls. Fringing reefs, which are the most common, extend seaward directly from the shore, forming borders along the shoreline. Barrier reefs also border shorelines, but they are separated from land

by a lagoon of open water. Atolls form when a fringing reef forms around a volcanic island that subsides completely below sea level. As the coral continues to grow upward, an atoll forms (National Oceanic and Atmospheric Administration). The reef we’re swimming in is the Belize Barrier Reef, a section of the MesoAmerican barrier reef, the second longest in the world. It was named a UNESCO World Heritage site in 1996.

Sea Fans

Sea fans are another type of coral. Although they look like plants, they, too, belong to the animal kingdom (Animalae). As a group they’re called gorgonians, which is a reference to Greek mythology. The three Gorgons, one of whom was Medusa, all had hair made of living venomous snakes that squirmed



Brain Coral



continuously. Early marine biologists thought the waving fans looked like the waving living hair of the Gorgons.

Environmental Factors

In order for reefs to develop, the polyps must have good environmental conditions. These consist of 5 factors: pH, clarity, water temperature, wave action, and nutrients.

pH. The pH measures the degree of acidity or alkalinity in the water. Because the backbone of the coral is calcium carbonate, an alkaline compound, too much acid means the coral can't grow or repair itself. The reef can even erode in too much acidity. The main cause of increasing ocean acidity is atmospheric carbon dioxide.

Clarity. Clarity is important because the small algae that live inside the coral, called zooxanthellae, need to photosynthesize. The relationship between the coral polyp and its zooxanthellae is a great example of a mutualistic symbiotic relationship. The coral polyp protects the small zooxanthellae and provides the raw material for the algae's photosynthesis. In turn, corals can get up to 90% of their nutrients from the zooxanthellae in the form of glucose and amino acids. This relationship is so important that on sunny days, corals produce twice as much calcium carbonate as they do on cloudy days.

Temperature. While coral can exist in anywhere, even in cold waters like off the coast of Washington and Alaska, the important reef-building corals exist only in the tropics. While

a few species of coral can survive at the extreme ends of 18-36 degrees Celsius (64-98 degrees Fahrenheit), the optimum temperature for reefs is 26-27 degrees Celsius (78-81 degrees Fahrenheit). Coral dies if the water is a degree or two beyond its normal range. Evidence of temperature damage first appears as coral bleaching. Coral bleaching occurs as the water warms and kills the coral's algae because it is no longer able to photosynthesize. Without the algae, the coral loses both its color and its nutrients. Additionally, warmer water allows harmful species of algae to grow on top of the coral, thereby reducing clarity, blocking sunlight, and inhibiting photosynthesis.

Waves. The coral polyps and their zooxanthellae can't move. They rely on wave action to bring them nutrients, carry away waste products, and disperse their reproductive materials.

Nutrients. Reefs grow best where salinity is constant and where the water is nutrient poor. Because corals grow so slowly, when the water is nutrient-rich, other fast-growing plants beat them out. For example, chemical run off leads to algae growth that smothers the coral and kills it.

Why Reefs Matter

Biodiversity. Coral reefs have the highest density of biomass in the world (the most living stuff per cubic meter) and rank second in the world's biodiversity (the most different type of stuff per cubic meter), following only tropical rainforests. Yet all this diversity is packed into only 1% of the earth's surface.



Elkhorn Coral



Fire Coral

Despite the reef's compact geography, only 10% of all reef species have been cataloged, which means we don't yet know the wealth of knowledge reefs hold. However, biologists estimate that at least 25% of all marine species inhabit the reef (NOAA). Belize's barrier reef is especially biologically rich, with more than 65 coral species and over 300 fish species. There are only 70 species of coral and 500 species of fish in the entire Caribbean Sea.

Economics. Simply put, if we lose the coral reefs, life in the oceans may not survive beyond vegetation and algae. The loss of reefs will affect the economies of the world. First, coral reefs are the nurseries for thousands of species of fish and their loss will cause a collapse in the fishing industry. They also function as barriers to coastal shorelines, protecting coastal habitat, species, and people. This includes preventing shoreline erosion and lessening the impact of storms. In a place like Belize, where tourism is the number one economic producer and the reef the number one attraction, maintaining the reef's health is both biologically and economically sound. Yet more than 40% of Belize's reef has been damaged since 1998.

Reef Damage

Worldwide. Belize isn't the only place where the reef is losing ground. Because reefs inhabit the same region where human population growth is greatest in the world, humanity has had a severe detrimental effect on this fragile environment. To date, about 10% of all coral reefs have been destroyed worldwide. There are some areas impacted more severely than

others. For example, in the Philippines, 70% of the reefs have been totally destroyed and only 5% remain in good condition.

Causes. While hurricanes, shifting winds, and currents like El Niño can damage reefs, the rate of reef destruction has greatly accelerated in the past 40 years due to human factors. The first way people degrade the reef is through indirectly changing its environment. As previously mentioned, corals are extremely sensitive to temperature. Green house gasses have caused the oceans to warm; the 11 warmest years on record have occurred within the past 13 years.

Dynamite. People also hurt the reef itself. This is best exemplified by the Philippines, where fishermen commonly use dynamite and cyanide to stun reef fish so they're easily caught. Dynamite blows up the reef and the cyanide kills its algae. In other places, dropping anchor, net fishing, and pollution have destroyed entire sections of reefs. Finally, over fishing contributes to the reef's destruction. Each fish plays a role within the ecosystem. The large predator fish that end up on the dinner table keep under control the population of smaller fish that nibble on the reef. Without those large fish, small fish eat a lot more.

Reef Recovery

Most coral reefs grow at a rate of about .2 inch per year. When the reefs are lost, they will take thousands of years to regenerate. They are the most ancient species of animals on the earth and have survived numerous extinction periods throughout earth's long history. Yet today, this ecosystem is in peril. Ironically, the same tourism that can damage the reef may also be its salvation. As people see and learn more about reefs, they're more likely to support their protection. But this works only with responsible snorkelers and divers. When you swim in the reef, be careful not to step on or harm any part of it. And remember it. It's not likely to be the same 10 years from now.