Zillion-to-one Shot

**Infinitesimal polyps
build reefs big enough
to see from space.**

Marine life in Belize — from fish and mangroves to humans — depends on the Belize Barrier Reef for survival. Largest reef in the northern or western hemispheres — so big astronauts can see it from space — this huge biological structure is actually a zillion tiny animals called polyps. Charles Darwin called it "the most remarkable reef in the West Indies." But why are such reefs important? Who uses them? How do they live?

Living on the reef. The Maya fished these reefs 2,500 years ago, and established trading posts along the cayes. Between AD 700 and 900, they dug Bacalar Chico Channel — which now separates Belize from Mexico — to facilitate marine trade with Santa Rita, where Corozal sits today. More Maya sites occupied South Water Caye, Sapodilla Cayes, and Glovers Reef Atoll.

Spanish explorers used the cayes to repair their boats. Seventeenth-century English pirate John Glover used one atoll to raid Spanish merchant ships and hide the treasure. Puritan traders settled in the cayes, becoming fishermen and plantation owners. In the 19th century, Garinagu refugees from political persecution settled around Stann Creek, and Mexican refugees from civil war settled on Ambergris Caye.

Today, the beautiful tropical reefs lure North Americans and Europeans to Belize. Tourism generates the country's greatest foreign exchange. In second place, the fishing industry, led by lobster and conch, also depends on the reefs.

The United Nations Educational, Scientific and Cultural Organization — which uses recognition, technical assistance, and training to help countries protect their natural and cultural heritage — declared the Belize Barrier Reef Reserve System a World Heritage site in 1996. The 372-square-mile site includes reserves at Bacalar Chico, the Blue Hole, Half Moon Caye,

South Water Caye, Glover's Reef Atoll, Laughing Bird Caye, and the Sapodilla Cayes.

Within the reserves live 500 species of fish, 65 stony corals, 45 hydroids, and 350 molluscs, plus assorted sponges, worms, and crustaceans. The waters harbor numerous West Indian manatees. Crocodiles, seabirds, and waterbirds populate the cayes, including red-footed boobies on Half-Moon Caye, brown boobies on Man O'War Caye, and common noddies on Glover's Reef. Three species of sea turtles nest in the lagoons: loggerhead, green, and hawksbill.

In 1982 researchers identified 178 species of vascular plants in coastal Belize. Mangrove forests that line bays and lagoons also protect corals from sedimentation, and shelter the juveniles of many species. Sea grass beds stabilize sediments and provide food for reef dwellers. Algae feed the living corals. In return, coral reefs protect mangroves, fish, and other residents from crashing waves.

The living reef. Solitary corals first appeared 400 million years ago. Reef-building corals, the largest order today, developed 25 million years ago. They form colonies of up to several thousand polyps, which act as tiny stomachs to process rock. Each polyp has a mouth with tentacles to catch plankton. Each hosts symbiotic algae, which provide oxygen, glucose, glycerol, and amino acids. In return, the polyp provides carbon dioxide, nitrates, phosphates, and habitat. The partnership works best in bright sunlight, clear salty water, and temperatures of 73° to 84°F. Mean temperatures on Belizean reefs range from 61° to 88°F.

Giant reef structures grow as polyps of stony coral, each just 1-3 mm in diameter, secrete a skeleton of calcium carbonate. The polyps live atop this rocky base. They connect to their neighbors with a thin layer of living tissue stretched over the limestone they built. Colonies come in 10 basic forms: branching, digitate (like fingers), table, elkhorn, foliose (like plates), encrusting, submassive (with knobs, columns, or wedges), massive (up to the size of a house), mushroom, and cup. Branching corals, which resemble trees, grow up to four inches per year. Massive corals grow just one to three quarters of an inch per year.

In the 1930s, Charles Darwin identified three typical structures of reef: barrier, fringing, and atoll. Barrier reefs parallel shorelines, separated by shallow lagoons. The Belize Barrier Reef runs 185 miles north to south, 12 to 25 miles offshore, hugging the edge of Ambergris Caye, then snaking

south almost to Guatemala. Fringing reefs, the most common, develop right onshore. Many cayes west of the Belize Barrier Reef have fringing reefs. Atolls, the rarest, develop on underwater mountaintops as necklaces of coral around shallow lagoons. Of the four American atolls, three exist in Belize. Turneffe Islands, Lighthouse Reef, and Glover's Reef atolls sit five to 30 miles beyond the barrier reef, in water a couple thousand feet deep.

The four major zones of a reef include flat, crest, buttress, and seaward slope. Closest to shore, a shallow flat zone remains calm and protected from breaking waves. It supports the greatest number of species, including snorkelers. Stout corals in the reef crest zone, sometimes peeking above the surface, serve as ramparts against waves. They protect crabs, shrimp, and other small animals in their labyrinthine cavities. The buttress zone slopes into deep water, with spurs of massive coral to blunt the waves, and channels between them to drain the sediments. It makes a good environment for larger fish. Below 65 feet, reduced wave action allows the largest number of species to thrive, including sponges, sea fans, non-reef-building corals, and wide-eyed wall divers.

Life or death. Around the world, 10 percent of reefs have been damaged beyond recovery. Another 30 percent languish in critical condition. Natural events like hurricanes have always stressed reefs. In many countries today, however, pollution by sewage and farm runoff, sedimentation by dredging and coastal development, and overfishing by commercial interests conspire to overwhelm a reef's defenses. Longer term, climate change from greenhouse gases can disrupt the temperature and chemistry of seas, making them unfit for corals.

Sometimes snorkelers and divers accidentally touch, bump, or even stand on corals, which can kill polyps, spread diseases, damage colonies, and injure the swimmers. To protect the reefs and themselves, snorkelers and divers stay away far enough to avoid contact.

"Despite the many pressures the Belize Barrier Reef is under," observes UNESCO, "the commitment of the government to conservation is clearly demonstrated…."

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