



# Exploring Coral Reefs

**C**oral reefs cover more than 77,000 square miles and are diverse and productive ecosystems, rivaling the great tropical rainforests in the sheer abundance of plant and animal life they harbor. Learning about coral reefs can be a great way to generate interest and excitement about natural ecosystems globally and locally and a good starting point for studying a variety of biological concepts. By getting involved in the protection and preservation of coral reefs, students will realize that an individual can make a difference.

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**Objectives:** To learn about coral reefs and what you can do to help preserve them. To learn about ecosystems and biodiversity locally and globally.

**Ages:** Primary, Intermediate & Advanced

**Materials:** Additional teacher guides - *Coral Reef: Color & Learn* and *Coral Reef Resources* available from CES.

**Subjects:** Science, Geography, Language

## Where are Coral Reefs?

Coral reefs occur only in shallow areas of the tropical oceans where the water temperature remains around 21° **Celsius**. Generally speaking, reefs can be found between the **Tropics of Cancer and Capricorn**. Coral reefs cover less than 0.2 percent of the world's ocean beds and are found along the coasts of 110 tropical countries.

## What is a Coral Reef?

Coral Reefs are created by colonies of small, anemone-like animals (in the same **phylum** as jellyfish - Cnidaria) which produce a calcium carbonate **exoskeleton** and live **symbiotically** with **photosynthetic** algae. (Note: calcium carbonate is the same thing as limestone or chalk!)

The algae provides corals with food and oxygen, and the corals provide nutrients and shelter in exchange. Coral reef ecosystems are highly productive because of this symbiotic relationship even though the tropical oceans tend to be relatively nutrient poor. Because of its vital relationship with photosynthetic algae, coral needs sunlight to grow. This means that it needs clear water and can only grow to depths to which the sun light can penetrate (80 meters or less).

## Diversity of the Reefs

Coral reefs are the most species-diverse areas of all marine habitats, approaching tropical rainforests in their species richness. Up to one quarter of all marine species and one fifth (4,500) of known marine fish species live in coral reef **ecosystems**.

The reefs of the **Indo-Pacific** are much more species diverse than those of the tropical Atlantic (**West Indies**). While a Caribbean reef might have 35 species of coral and 400 species of fish, a Pacific reef may have 300 coral species and 1000 fish species.

Primitive coral reefs existed about half a billion years ago, long before there was any life on land. About 230 million years ago modern types of reef building corals appeared. Coral reefs are the oldest structures in existence created by living creatures, with some approaching 6,000 years in age.

## Human Impact

An estimated 60% of the global population lives within roughly 100 kilometers of the shore (that's 3.4 billion people). By the year 2025, it is estimated that 8 billion people will be living on the planet - a 45% increase in just 30 years. A 1992 assessment found that 5-10% of coral reefs have been destroyed. Significant portions of the reefs have been degraded or destroyed in 93 countries.

## Threats to Coral Reefs:

- pollution
- erosion of nearby land areas (due to deforestation) and subsequent smothering of corals by sediments
- mining and dynamiting of corals to be used for building materials
- cyanide poisoning (used to stun fish for the live fish trade market)
- damage from recreational use
- overfishing
- coral bleaching

Overfishing has affected the coral reef areas bordering at least 80 countries. Overfishing affects other marine species, not just the fish stocks. Often, populations of both the target species and the predators that feed on these species decline and are replaced by stocks of lesser commercial value.

**Coral bleaching** occurs when corals expel resident algae in response to stress from pollution, sedimentation, or natural localized warming cycles. Bleaching occurred within reefs in all tropical oceans of the world during 1983, 1987, and 1991 and that bleaching was correlated with water temperature increases of 1° C or more.

## The Future

If we don't take action today, approximately 30% of all reefs may decline in the next 20 years.

## Why Should We Care?

Coral reefs are the most biologically diverse marine ecosystem. Reefs provide homes for thousands of species of plants and animals, many of which have not yet been identified.

Coral reefs are becoming the new frontier source for medicines.

Coral reefs, as well as mangrove forests, are important nursery areas for large ocean going fish.

Many reef fish species are important food sources: between 20-25% of the fish catch in developing countries is taken from coral reef ecosystems.

## Definitions

**Celsius** - Fahrenheit =  $9/5(^{\circ}\text{C}) + 32$

0° Celsius is equal to 32° Fahrenheit

**coral bleaching** - when corals expel the algae living with them. Due to stress on the coral from pollution, etc.

**ecosystem** - a major interacting system that involves both organisms and their non living environment.

**exoskeleton** - an external skeleton. Arthropods (insects, spiders, crustaceans, etc.) have exoskeletons as do hard corals. We have internal skeletons.

**Indo-Pacific** - East Africa and the Red Sea across the Indian and Pacific oceans to the west coast of the Americas.

**keratin** - a tough fibrous protein present in the skeletons of gorgonian corals such as sea fans. Hair, finger nails, horns and feathers also have keratin in them.

**photosynthesis** - The utilization of light energy to create chemical bonds and new compounds.

**phylum** - a major category of the classification of organisms which comes after the category of kingdom and before class. The five kingdoms are: Animalia, Plantae, Fungi, Monera (bacteria), and Protista (mostly single celled organisms which are more complex than bacteria)

**symbiosis** - When two or more dissimilar organisms live together. Includes parasitism (association is detrimental to one), commensalism (one benefits and there is not much effect on the other) and

**mutualism** (both benefit).

**Tropic of Cancer** - the parallel of latitude which is north (about 23 1/2 degrees) of the equator and is the northernmost latitude reached by the overhead sun.

**Tropic of Capricorn** - the parallel of latitude which is south (about 23 1/2 degrees) of the equator and that is the southernmost latitude reached by the overhead sun.

**West Indies** - the Caribbean/West Indian region and down to the coast of Brazil.

## Coral Reef Activities

1. Find the location of coral reefs on a map. Where are the Indo-Pacific and the West Indian reefs, the tropics of Cancer and Capricorn?
2. Use the coral reef coloring sheet and the nature notes for teachers as a starting point to learn about animals and plants that make coral reefs their home. Cut these animals out and make a coral reef mobile to hang in the classroom. (see "Coral Reef - Color & Learn" coloring sheet and "Coral Reef Nature Notes".)
3. Create a coral reef in the classroom. Paint or color a mural on large pieces of paper showing coral reef plants and animals. Use streamers to make waves near the ceiling.
4. Visit a local aquarium and look for coral reef creatures. Identify fish from the Indo-Pacific and West Indian regions of the world.
5. If you live near a beach with tidepools, look for creatures which also live in coral reefs such as sea stars, brittle stars, sea anemones...
6. Hold a fun fund-raiser to **Adopt A Reef®** in Palau, Indonesia or the Dominican Republic. (see "Heroes For the Earth, Turning Ideas Into Action")
7. Learn more about coral reefs and what you can do to help preserve them. (see "Coral Reef Resources" - a resource guide for teachers and students.)

## References:

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