

OCEAN CLASSROOM

The Study of Corals

Types of Coral Reefs

STUDENT GUIDE

THE
UNIVERSITY
OF RHODE ISLAND
GRADUATE SCHOOL
OF OCEANOGRAPHY

Guiding Question

“What types of coral reefs exist?”

Fringing Reefs

Fringing Reefs are the most commonly seen and are relatively young. They develop better on stable or rising coasts. These reefs grow very close to the shore and are generally attached to the shore. They grow near the coastline around both islands and continents. They are separated from the shore by narrow, shallow lagoons. The corals grow upwards to sea level or outwards towards the ocean.



Notable Fringing Reef : The Ningaloo Reef is the largest fringing reef on Earth, stretching 260 kilometers (155 miles) along the western coast of Australia in the East Indian Ocean. It is also the only large reef positioned very close to land. The reef supports over 500 species of fish, 300 species of corals, 600 species of mollusks, and many other marine invertebrates.

Barrier Reefs

Barrier Reefs also parallel the coastline but are separated from the coastline by deeper, wider lagoons. At their shallowest point, they can reach the water's surface forming a “barrier” to navigation. Barrier reefs are the largest in size of all types of coral reefs. These reefs are a lot less common than fringing reefs or atolls. Nonetheless, notable examples can be found in the Atlantic and Pacific Oceans. The Great Barrier Reef in Australia is the largest and most famous barrier reef in the world.



Notable Barrier Reef: The Great Barrier Reef is the largest coral reef system on Earth. It's not a single reef as the name implies, but a very large complex composed of over 2,900 individual reefs. The reef stretches for over 2,300 kilometers (1,400 miles) over an area of 344,400 square kilometers (133,000 square miles). The Great Barrier Reef is located in the Coral Sea, off the coast of Queensland, Australia and can be seen from outer space.

Atolls

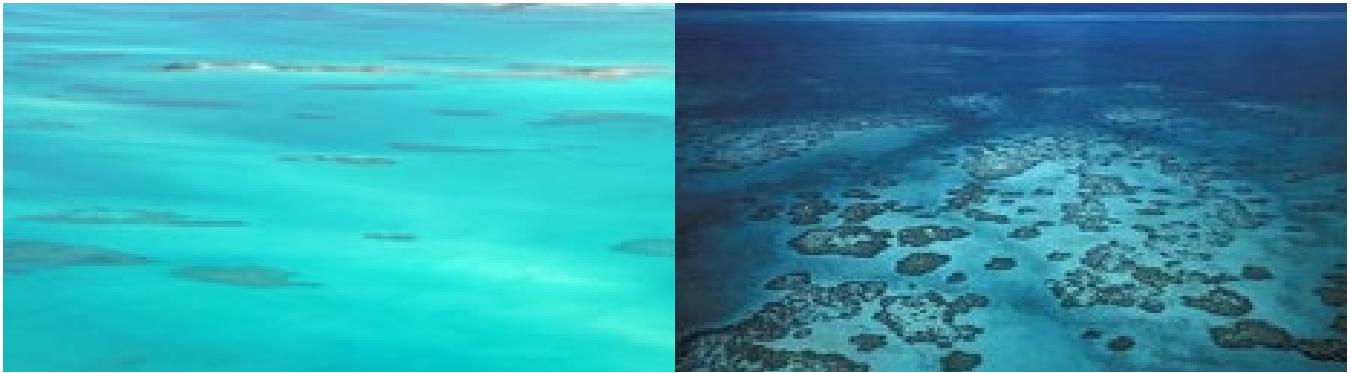
Atolls are oval, circular, or horseshoe-shaped coral reefs that contain coral rims. The rim surrounds a lagoon, either partially or completely. The lagoon is usually shallow and sandy, and access to the open ocean is through channels. If the coral rim surrounds the lagoon completely, then there will not be any water exchange with the ocean. Atolls form from volcanoes and they were once the fringing reefs that surrounded the volcanoes. As the volcano submerged and disappeared from the surface, the corals continued to grow up, becoming the only visible formations in the deep ocean.



Notable Atoll Most of Earth's atolls are found in the Indian and Pacific Oceans. The largest atoll in the world is 4,881 square miles (12,642 square km) long, and is called The Great Chagos Bank in the Indian Ocean. The atoll is administered by the U.K. through the British Indian Ocean Territory. The islands of the Great Chagos Bank are Nelson Island, Danger Island, Eagle Islands, and Three Brothers. All islands and the surrounding waters are a Strict Nature Reserve.

Patch Reefs

Patch Reefs are small, isolated reefs that grow up from the open bottom of the island platform or continental shelf. They usually occur in 10-20 feet of water and sometimes grow between fringing reefs and barrier reefs, or in an atoll. They vary greatly in size, and they rarely reach the surface of the water. Patch reefs are surrounded by sand and/or seagrass. Because of the size of the solid surface on which they grow and the variation in species of coral, patch reefs have different shapes and sizes. The sand rings surrounding the patches are the result of the herbivorous fish and invertebrates that feed on seagrass.



Notable Patch Reefs

Patch reefs usually occur within the lagoon behind a barrier reef or atoll rim. They are typically found at depths of 3-6 meters (10-20 feet). These reefs are quite common in the Caribbean and Pacific Islands. Most often, patch reefs are a part of larger reef ecosystems, so they are not recorded as individual reefs. Nonetheless, it's worth mentioning the Virgin Islands Patch Reefs, which are small ecoregions located on the islands of St. John, St. Thomas, and St. Croix.

Videos:**Types of Coral Reefs**

- https://www.youtube.com/watch?v=1wMrB37_Gvl&ab_channel=KhaledbinSultanLivingOceansFoundation
- https://www.youtube.com/watch?v=8d0MgxoECq8&ab_channel=ClarendonLearning
- https://www.youtube.com/watch?v=btRCAQHqbdY&ab_channel=Microdocs

Quiz on Coral Reefs:

- <https://quizizz.com/admin/quiz/5ac2809d6288c8001b24e5e1/coral-reef>

Guiding Question

“What types of coral reefs exist?”

Virtual Field Trips

Let's take a virtual dive in the Florida Keys to see some coral reefs with 360° camera views. Just click on the links below:

- <https://sanctuaries.noaa.gov/vr/florida-keys/>
- <https://sanctuaries.noaa.gov/vr/florida-keys/cheeca-rocks/>

Now, let's take a virtual dive in Samoa to see some giant corals in their reefs! Just click on the links below:

- <https://sanctuaries.noaa.gov/vr/american-samoa/tafeu-cove-underwater/>
- <https://sanctuaries.noaa.gov/vr/american-samoa/big-momma/>
- <https://sanctuaries.noaa.gov/vr/american-samoa/channel-at-rose-atoll/>

Now, let's take a virtual dive on a turtle's back in the Great Barrier Reef, Australia.

- <https://www.wwf.org.au/what-we-do/oceans/great-barrier-reef#gs.lztqsf>

Worksheet:

Coral Reef Food Web

A **food chain** is a series of organisms that eat one another so that energy and nutrients flow from one to the next. At the base of the food chain lie the **primary producers**. The primary producers are autotrophs and are organisms (all plants) that use photosynthesis to make their own food. Also, producers serve as food for other organisms. The organisms that eat the primary producers are called **primary consumers**. Primary consumers are usually **herbivores**, plant-eaters.

Note: Plankton is made up of phytoplankton (producers) and zooplankton (consumers). **Omnivores** eat both plants and animals. The organisms that eat the primary consumers are called **secondary consumers**. Secondary consumers are generally meat-eaters—**carnivores**. Not mentioned here are **decomposers**, organisms that break down dead organic material and wastes. Also, **scavengers** are organisms that eat dead and decaying matter. Because organisms in the coral reef ecosystem eat more than one type of food, we call this energy system a **food web**. A food web consists of many intersecting food chains and represents the different things an organism can eat and be eaten by.

For more help: Here are two Powerpoint presentations.

- <https://www.slideshare.net/coachpointer/food-chains-and-relationships>
- <https://www.slideshare.net/AkshayKumar409/foodchain-foodweb-and-ecological-cycle> (upper grades)

Worksheet:

Coral Reef Food Web *(continued)*

Using the list of organism names from the previous page, fill in each category below:

Producers

(plants)

Primary Consumers

(herbivores)

Secondary Consumers

(carnivores)

Omnivores

Food Web Games:

- <https://www.sheppardsoftware.com/science/animals/games/producers-consumers/>
- <https://www.sheppardsoftware.com/science/animals/games/food-chain/>
- <https://www.sheppardsoftware.com/science/animals/games/animal-diet/>
- <https://www.sheppardsoftware.com/science/animals/games/animal-diet-2/>
- <https://www.zephyrus.co.uk/foodpuzzlechain.html>
- <http://www.cserc.org/sierra-fun/games/build-food-chain/?gclid=CMfd1ImK5MoCFRSPfgodyBEAzg>

Essay:**The Importance of Coral Reefs**

Coastal Protection	Coral reefs protect coastlines from storms and erosion. Reefs act as a barrier and help to calm or buffer waves that could be destructive to property on the coasts. They help prevent the coastline from wearing away and keep waves from surging onto land and flooding property.
Habitat for Fish	Reefs provide a home for a wide variety of organisms, including fish people eat. Coral reefs are habitats for a vast array of plant and animal life. Scientists have not discovered all the organisms that make up this unique biodiversity.
Economy	Coral reefs are a source of food and provide jobs to local communities. Tourism is a major contributor to income. The basic value of tourism worldwide is estimated to be 9.6 billion dollars per year. Fishing, diving, and snorkeling on and near reefs add hundreds of millions of dollars to local businesses. And, coastal development of the land near these beautiful ocean areas is on the rise.
Medicines	Corals and some of the organisms that live in and around the reefs possess chemicals that can be used for communication or defense. In some cases, these chemicals have been found to have medicinal properties and can be repurposed and used in the treatment of a wide variety of illnesses ranging from cancer to HIV to Alzheimer's disease.

Extra Facts

Approximately 500 million people depend on coral reefs for food, coastal protection, building materials, and income from tourism. This includes 30 million who are virtually totally dependent on coral reefs for their livelihoods or for the land they live on.

Total net benefit of the world's coral reef ecosystems is estimated at almost 30 billion dollars a year!

The value from commercial fishing in coral reefs is over 100 million dollars.

Once coral reefs are damaged, they are less able to support the many creatures that inhabit them. When a coral reef supports fewer fish, plants, and animals, it also loses value as a tourist destination.

Videos

- <https://www.calacademy.org/educators/how-do-humans-depend-on-coral-reefs>
- https://www.youtube.com/watch?v=eNqbSi_6KdA&ab_channel=NaturalHistoryMuseum
- https://www.youtube.com/watch?v=Pcau276KN0I&ab_channel=WhatIf

Group Assignment: Make a Valuable Poster

Now that you know a lot about coral reefs and their importance, your group must work together and create a poster about the value of coral reefs. Three examples are shown below. Include a title, some facts and lots of color!

The Value of Coral Reefs
Coral reefs have a value of \$9.9 trillion USD globally and are relied upon by at least 500 million people.

- COASTAL PROTECTION**
Coral reefs reduce wave energy by 97% before hitting the shore
- TOURISM**
70 million trips are supported by coral reefs annually
- FOOD PRODUCTION**
well-managed reefs produce 5-10 tons of fish/km² per year
- MEDICINE**
more than half of all new cancer drug research focuses on marine organisms
- BIODIVERSITY**
coral reefs cover <1% of the Earth's surface but are home to 25% of all marine fish species

The Nature Conservancy

THE IMPORTANCE OF CORAL REEFS

- Provides food for humans and marine life alike.
- Generates \$375 B through tourism and employment.
- Provides habitat & shelter for 25% of marine species.
- Protects coasts and beaches from wave erosion.
- 500 Million people benefit from reef protection.
- Assists in Carbon and Nitrogen fixing & recycles nutrients.
- Contributes to development of new medicines.

CORAL REEF BENEFITS

- BIODIVERSITY**
Home to a quarter of the world's marine species.
- FOOD SOURCE**
Provides food to more than 500 million people that live near the coast.
- TOURISM**
Provide a livelihood for millions of individuals in the tourism industry
- PROTECTION**
They serve as natural marine barriers that protect coastal communities from high impact waves.
- MEDICINE**
Important medicinal components have been found in several marine species that inhabit coral reefs.

Did you know:
Scientists have estimated that 75% of the world's corals are at risk and at least 10% have already died.

SHARE this message so everyone can learn about the environmental and economic benefits that coral reefs provide to our planet.

WILDCOAST COSTASALVAJE wildcoast.net