

## Reef Communities

### Middle School & Senior Secondary

*In this Reef HQ Education program, students investigate the highly diverse and amazing reef communities found on the Great Barrier Reef.*

*Students will gain a fuller appreciation for the complex ecological structures, interrelationships, adaptations, biotic and abiotic requirements of reef communities.*

### Curriculum Links

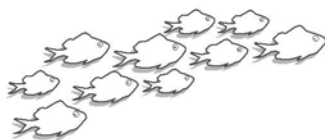
Completing this Reef HQ Education Program will develop students' ability to:

- Make generalisations about the types of interaction which take place between living and non-living parts of the environment;
- Collect information about the structure and function of living things and relate structure and function to survival;
- Evaluate the consequences of interactions between the living and non-living parts of the environment;
- Examine and prepare scenarios that describe the potential long-term effects of changes in biodiversity caused by human action on ecosystems;
- Explain why certain reef creatures live together in specific areas of the reef;
- Organise data into a meaningful and useful forms; and
- Appreciate the benefit that certain reef creatures bring to the reef community.

The following unit includes suggestions for activities that can be completed before and after your Reef HQ visit.



Australian Government  
Great Barrier Reef  
Marine Park Authority



Reef HQ is the education centre for the Great Barrier Reef



## Reef HQ Visit

This teacher resource is linked to a class visit to Reef HQ. The Reef HQ visit will enable students to:

- Observe a diverse array of reef ecosystems;
- Observe reef creatures and their peculiar behaviours;
- Observe reef creature interrelationships within the reef community;
- Investigate some of the structural adaptations that some of the reef creatures possess;
- Appreciate the varying ecological levels within reef communities;
- Understand that ecosystems are cyclic in nature; and
- Investigate the connection between the living and non-living components of the reef environment.

## Theme Overview

The Great Barrier Reef can be referred to as a great big city with lots of diverse and interesting inhabitants. Some creatures come out only during the day and some only come out at night, some move around a lot and others move around little, and still others don't move around at all. But together, the Great Barrier Reef hosts communities of creatures who all work together in such a way to make the reef a sustainable environment.

As the world's largest coral reef ecosystem the Great Barrier Reef is home to approximately:

- 500 species of seaweed
- 4000 species of molluscs
- 400 species of coral
- 1500 species of fish
- 16 species of sea snakes
- 6 breeding species of turtles
- Over 200 species of birds (including 40 species of sea birds)
- Some of the largest populations of dugongs in the world
- There are also visitors to the Reef including many species of whales, dolphins and porpoises.

While coral reef communities initially made the Great Barrier Reef famous, the area also comprises:

- Mangroves and estuaries;
- Sandy and coral cays;
- Continental Islands;
- Seagrass beds;
- Algal and sponge gardens;
- Sandy and muddy seabed communities; and
- Continental slopes and deep ocean trenches.



# Reef Communities – Activity Ideas

## Tuning In

Facilitate a discussion with the students about the meaning of 'community'. What it means to live in a community? How different roles and relationships within it, fit together to make a community sustainable and productive?

Examine the school as a 'community' and identify the different roles and relationships that are needed to keep the school community functioning.

Compare and contrast the needs of the school community to that of the reef community. Compare the roles of people in your community with that of organisms on the reef. For example, sanitation officer is like a decomposer or a farmer is like a producer.

## Preparing to Find Out

### Ecosystems

An ecosystem consists of all the interacting living elements (biotic) in an area together with the non-living elements (abiotic) of their environment.

Have students consider the reef ecosystem and list the major living (biotic) and non-living (abiotic) elements.

<b><i>Living (biotic) elements</i></b>	<b><i>Non-living (abiotic) elements</i></b>

### Adaptations

Introduce to the students the concept of 'adaptation' refer to the "Food Glorious Food Information Sheet" found in the *Reef Communities Challenge Activities*.

[http://www.reefed.edu.au/reefhq/reef\\_ed\\_programs/challenge\\_cards/index.html](http://www.reefed.edu.au/reefhq/reef_ed_programs/challenge_cards/index.html)

Have students consider and generate answers to the following questions

- Why are adaptations important?
- What are other examples of adaptations do the reef animals possess?
- How do they help reef creatures to survive in their environment?



## Finding Out

Visit Reef HQ and explore the reef up close. Encourage students to develop a list of questions they want answered about the Great Barrier Reef.

### GBR Explorer

Use the Great Barrier Reef Marine Park Authority's reef education website

[www.reefed.edu.au](http://www.reefed.edu.au)

The "GBR Explorer" is like an online encyclopaedia about the Great Barrier Reef.

## Sorting Out

Discuss with students their findings from Reef HQ and from individual or group research.

### Food Chains and Food Webs

In almost all ecosystems, the organisms fall into three nutritional groups:

Producers

Consumers, and

Decomposers.



Direct students to the "GBR Explorer" found on the Reef ED web site [www.reefed.edu.au](http://www.reefed.edu.au)

Students are to download images of a variety of Great Barrier Reef flora and fauna and group them into producers, consumers and decomposers. On an A3 sheet of paper have students construct a cross-section of a reef. The cross-section should show the interconnection between living and non-living elements of the community and the typical food web that exists there.

Analyse the ecological consequences in tropical reefs if particular representatives within the food web are removed.



Reef HQ Education

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Teaching Unit

## **Producer/Consumer/Decomposer**

Devise a marine food chain that consists of one of each of these. Compare this to an urban one.

Using some of the food chains developed, design a food web.

Choose an organism and find out about why it is a producer, or a consumer, or a decomposer. Write a creative story about the day in the life of your organism.

## **Going Further**

Examine with the students the benefits that particular living things bring to the reef community. This maybe that they are a predator to another reef creature that reproduces quickly, they may clean up the reef, they may be a food source etc...

## **Cause and Effect Wheels**

Construct a cause and effect wheel that examines and predicts what may happen to the reef if one or more of these reef creatures were to die out. For example, what could possibly happen if all crown of thorns were to die out?

Construct a cause and effect wheel that examines and predicts what may happen to the reef if one or more non-living elements were to deteriorate. For example, what could possibly happen if the amount of sunlight entering the water was reduced due to sediment run off?

## **Cycling of Matter**

Make a list of materials that you currently recycle. Classify them into those that are organic and those that are not. Are there other materials that could be recycled? Design a survey that asks people what they recycle. Graphically represent your findings.

Investigate how a recycling plant works and compare this to how nutrients are recycled in the ocean.

Devise a flow chart depicting the cycling of matter in a marine ecosystem.



## Making Connections

### Action Research Project

A community is the collection of organisms found in a habitat. Some communities are named after an obvious feature of the environment – rock pool, sand dune and reef communities are examples. Other communities after dominant plant species for example savannah grassland and mangroves.

Choose another type of community and research answers to the following inquiry questions:

- What and Where?

What type of community is it? Where is it located?

- How and Why?

How has this community formed? Why has this community formed in this location?

- What Impacts?

What are the major interrelationships occurring in this community and what impacts do they have on the community? What impacts are humans having on this community?

- How ought?

What is your preferred vision of the future for this community? How can we insure that this community is sustained for future generations?

Compare and contrast your chosen community to the reef community you have been studying.

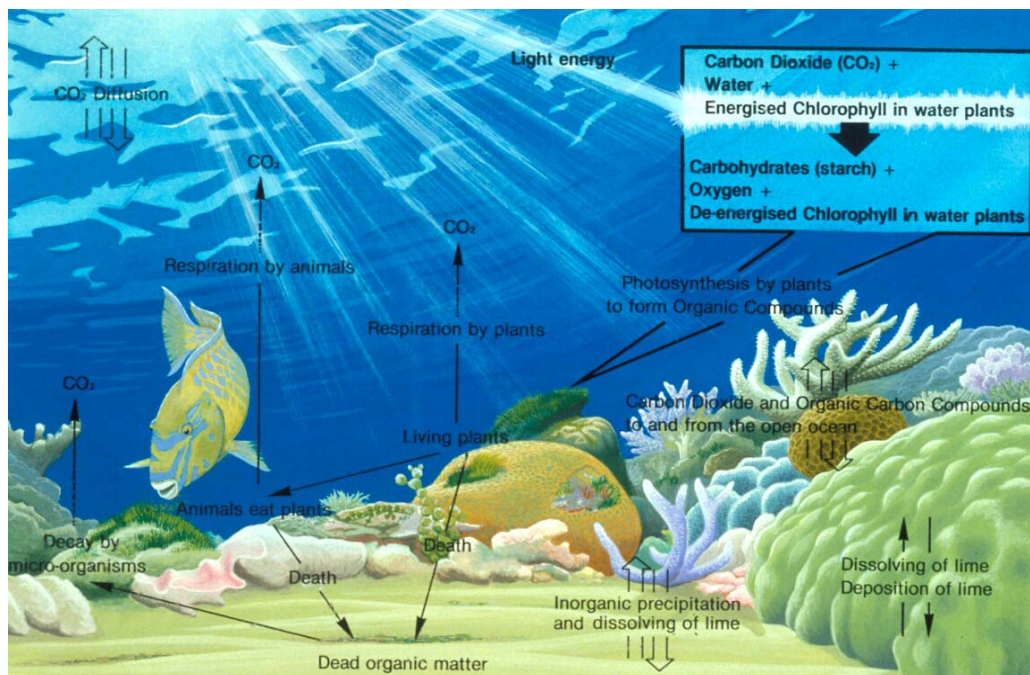
### Flow of energy

In order for organisms to maintain themselves, grow and reproduce, they require a supply of the elements of which they are made. These elements are obtained through *biogeochemical cycles*.

**Bio** "elements that flow through living organisms"

**Geochemical** "elements that cycle through rocks, water and atmosphere"

*Marine Carbon Cycle*



Provide students with a copy of the marine carbon cycle. Ask students to research an additional essential element to the survival of the reef. Ask students to produce a diagrammatical representation of this biogeochemical cycle for reef survival.

Define the terms: solid, liquid, gas, precipitation, condensation, and evaporation. Using these terms, draw and label a simplified diagram of the water cycle.

Did you know? You can recreate the water cycle using a Bunsen burner, beaker of water and a watch glass with a cube of ice on it.

Compare the nitrogen, oxygen, and carbon cycles on the land to those in the marine environment.

### **Class Debate**

Divide students into debating teams and call upon them to debate topics such as:

- Oceans are for everybody. People should be able to take as much as they want from the ocean;
- Humans need energy to survive. We should mine the Reef for oil and natural gas;
- Tourism makes money. More tourists should be allowed to travel within the Great Barrier Reef World Heritage Area; and
- Biotechnology could lead to many useful and sometimes lifesaving materials and medicines being generated. The increased government funding should be given to reef biotechnology research.

### **Taking Action**

#### **Community Education**

Students then can help increase others awareness of an endangered communities by designing a poster, brochure or information sheet. This project should detail the community, why it is endangered and what people can do to help. Display these posters on school notice boards, during school assemblies or in the school library.

#### **Submission/Proposal**

Take the information gathered during the completion of the action research project and develop a formal submission or proposal to be sent to local, state or federal members with regard to a community that is considered to be at risk of degradation.

#### **Become a Reef Guardian School**

This is an exciting, innovative program that encourages students, teachers, parents and friends to become involved in protecting our environment and the Great Barrier Reef. Reef Guardian Schools are environmentally active and participate in reef education through activities and environmentally friendly initiatives. Students and teachers promote best environmental practices and the importance of Reef protection to their communities. To find out more go to:

<http://www.reefed.edu.au/guardians/>



## Websites

Queensland Studies Authority – Science Syllabus

<http://www.qsa.qld.edu.au/yrs1to10/kl/science/docs/syllabus/syllabus.pdf>

Queensland Studies Authority – Biology Syllabus

[http://www.qsa.qld.edu.au/yrs11\\_12/subjects/bio\\_science/syllabus.pdf](http://www.qsa.qld.edu.au/yrs11_12/subjects/bio_science/syllabus.pdf)

Queensland Studies Authority – Multi Strand Science Syllabus

[http://www.qsa.qld.edu.au/yrs11\\_12/subjects/multi\\_science/syllabus.pdf](http://www.qsa.qld.edu.au/yrs11_12/subjects/multi_science/syllabus.pdf)

Reef ED

[www.reefed.edu.au](http://www.reefed.edu.au)

Great Barrier Reef Marine Park Authority

<http://www.gbrmpa.gov.au>

Reef HQ

<http://www.reefHQ.com.au>

Australian Institute of Marine Science

<http://www.aims.gov.au/>

CRC Reef

<http://www.reef.crc.org.au/>

Department of Environment and Heritage

<http://www.deh.gov.au/>

Department of Primary Industries

<http://www.dpi.qld.gov.au/home/default.html>

National Geographic - Virtual World "Great Barrier Reef"

[http://www.nationalgeographic.com/earthpulse/reef/reef1\\_flash.html](http://www.nationalgeographic.com/earthpulse/reef/reef1_flash.html)

## References & Resources

Begon, L. Harper, J. & Townsend, C. *ECOLOGY Individuals, Populations and Communities 2<sup>nd</sup> Edition*. Melbourne: Blackwell Scientific Publications, 1990.

Great Barrier Reef Marine Park Authority, *Reef Manual 4<sup>th</sup> Edition*, GBRMPA, Townsville, 2003.

Roberts, M. Reiss, M. & Monger, G. *BIOLOGY Principles and Processes*. South Melbourne: Thomas Nelson Australia, 1993.

Webber, H. & Thurman, H. *Marine Biology 2<sup>nd</sup> Edition*. New York: Harper Collins Publishers.

