

# LESSON 1 An Introduction to the Coral Reef Habitat

## Lesson at a Glance

Students create concept maps to determine the basic needs of organisms for survival. Through a PowerPoint presentation, students are introduced to coral reef habitats, reef zones and types of coral common in Hawai‘i. After the presentation, the class will discuss coral reef characteristics, and what it would be like to live in a coral reef. The lesson wraps up by having the students write a descriptive poem about common coral species found on the reef.

## Lesson Duration

Three 45-minute periods

## Essential Question(s)

What environmental conditions determine where coral reefs form and how they are structured for survival?

What are the features of the types of corals that build coral reefs in Hawai‘i?

What role do coral colonies play in a marine environment?

## Key Concepts

- Coral colonies together form a reef structure that provides different habitats for organisms.
- Different types of corals (e.g. finger, lobe, cauliflower, and rice coral) have distinct characteristics and need specific living conditions to survive.
- Corals have different structures that function to enable their survival.

## Instructional Objectives

- I can describe the living conditions coral reefs need to develop and survive.
- I can identify different types of coral and describe specific living conditions it needs to survive.
- I can describe the relationship between the structure of coral animals and its function for survival in the coral reef habitat as colonies.
- I can describe the role coral colonies play in a marine environment.

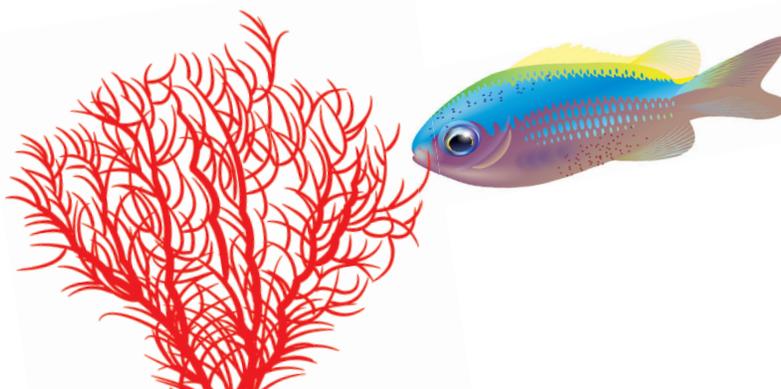
### Related HCPS III Benchmark(s):

Science SC.3.3.1  
Describe how plants depend on animals.

Science SC.3.4.1  
Compare distinct structures of living things that help them to survive.

Science SC.3.5.1  
Describe the relationship between structure and function in organisms.

Language Arts LA.3.4.1  
Write in a variety of grade-appropriate formats for a variety of purposes and audiences.



## Assessment Tools

### Benchmark Rubric:

<b>Topic</b>		<b>Interdependence</b>	
<b>Benchmark</b> <a href="#">SC.3.3.1</a>		Describe how plants depend on animals	
<b>Rubric</b>			
<b>Advanced</b>	<b>Proficient</b>	<b>Partially Proficient</b>	<b>Novice</b>
Classify plants by their dependence on animals.	Describe how plants depend on animals.	Name very few ways in which plants depend on animals.	Recognize that plants depend on animals.

<b>Topic</b>		<b>Cells, Tissues, Organs, and Organ Systems</b>	
<b>Benchmark</b> <a href="#">SC.3.4.1</a>		Compare distinct structures of living things that help them to survive	
<b>Rubric</b>			
<b>Advanced</b>	<b>Proficient</b>	<b>Partially Proficient</b>	<b>Novice</b>
Group living things by the distinct structures that help them to survive and provide justification for the grouping	Compare distinct structures of living things that help them to survive	Describe a few ways in which distinct structures of living things help them to survive	Name distinct structures of living things that help them to survive

<b>Topic</b>		<b>Unity and Diversity</b>	
<b>Benchmark</b> <a href="#">SC.3.5.1</a>		Describe the relationship between structure and function in organisms	
<b>Rubric</b>			
<b>Advanced</b>	<b>Proficient</b>	<b>Partially Proficient</b>	<b>Novice</b>
Classify the structures of organisms according to their function	Describe the relationship between structure and function in organisms	Identify the relationship between structure and function in an organism	Recall that structures in organisms are related to the functions they perform

<b>Topic</b>		<b>Range of Writing</b>	
<b>Benchmark</b> <a href="#">LA.3.4.1</a>		Write in a variety of grade-appropriate formats for a variety of purposes and audiences, such as: <ul style="list-style-type: none"> <li>• stories with a beginning, middle, and end and poems with sensory details</li> <li>• short reports on content area topics</li> <li>• pieces related to completing tasks</li> <li>• friendly letters</li> <li>• responses to literature</li> <li>• pieces to reflect on learning and to solve problems</li> </ul>	
<b>Rubric</b>			
<b>Advanced</b>	<b>Proficient</b>	<b>Partially Proficient</b>	<b>Novice</b>
Insightfully adapt writing to grade-appropriate formats for a variety of purposes and audiences	Adapt writing to grade-appropriate formats for a variety of purposes and audiences	Write with some adaptation to grade-appropriate formats for a variety of purposes and audiences	Write with little adaptation to grade-appropriate formats for a variety of purposes and audiences



## Assessment/Evidence Pieces

*This lesson serves as an introduction and is not for assessment. Some formative assessments may be made using the following:*

### Lesson

- Class – discussion on PowerPoint
- Class – completion and discussion of Corals of Hawai'i worksheet
- Class- discussion on relationship of individual coral animals and colonial reefs
- Coral Reef Poem

## Materials Needed

Teacher	Class	Group	Student
<ul style="list-style-type: none"> <li>• Chart Paper</li> <li>• Method to present PowerPoint</li> </ul>	<ul style="list-style-type: none"> <li>• None</li> </ul>	<ul style="list-style-type: none"> <li>• None</li> </ul>	<ul style="list-style-type: none"> <li>• None</li> </ul>

## Instructional Resources

PowerPoint Presentation: *Coral Reef Habitat*

PowerPoint Presentation: *Adaptations for Living on a Reef*

Student Worksheet: *Corals of Hawai'i*

Student Reading: *Poetry Examples*

Student Reading: *Reef Types (Optional)*

## Student Vocabulary Words

**adaptations:** special traits that help living organisms survive in a particular environment.

**atolls:** ringed coral reef island enclosing a lagoon.

**back reef:** commonly called the lagoon of a coral reef, it lies immediately shoreward of the innermost margin of the reef crest zone, and extends all the way to the shore.

**barrier reef:** reef separated from the land mass by a lagoon.

**benthic:** occurring on the bottom of a body of water.

**cauliflower coral (*Pocillopora meandrina*):** a common reef building coral species in Hawaiian reefs; branching coral with a cauliflower-like shape; found in areas with strong currents and wave action.

**colonies:** groups of individuals living together, usually genetically identical, asexual clones.

**coral reef zones:** the different areas of a coral reef determined by exposure to sunlight, water depth, currents, and wave surge. A typical coral reef includes beach, lagoon, reef crest, fore reef, and back reef zones.

**finger coral (*Porites compressa*):** a common reef-building coral species in Hawaiian reefs; columnar shape with many finger-like branches; found in areas protected from waves.

**fore reef:** often called the “reef front” begins at the seaward base of the reef crest.

**fringing reef:** coral reefs that form directly adjacent to a land mass.

**habitat:** the place, or environment in which a plant or animal naturally lives and grows.

**lagoon:** a shallow body of water separated from the ocean possibly by a barrier reef or sandbar.

**lobe coral (*Porites lobata*):** a common reef-building coral species on Hawaiian reefs; it forms massive colonies with lobed branches; olive-green, brown, yellowish-light green, or blue-gray color; found in wave-exposed areas.

**patch reef:** an isolated coral growth forming a small platform in a lagoon, barrier reef, or atoll.

**reef crest:** the highest (most shallow) part of the reef, and lies between the shoreward, protected back reef zone and the outer fore reef zone.

**reef flat:** area of high land impacts and low wave energy on the fringing reef.

**reef slope:** area of high coral cover and moderate to low wave energy on the fringing reef.

**rice coral** (*Montipora capitata*): a common reef building coral species in Hawaiian reefs; branching, plate-like, or encrusting shape; white, white with brownish coating, or blue coloration; found in all reef environments (except the branching form, which lives where it is protected from waves).

**seagrass:** various grass-like plants that inhabit coastal areas.

**survival:** the ability to stay alive. Often aided by adaptations that can be passed on to offspring and evolve over many generations.

## Lesson Plans



### Lesson Preparation

- Review the Science Background provided in the Unit Overview.
- Preview PowerPoint presentations *Coral Reef Habitat* and *Adaptations for Living on a Reef*. Make arrangements to project them.
- Make copies of the Student Worksheet on *Corals of Hawai‘i* and the Student Readings *Poetry Examples* and *Reef Types*, one for each student.
- Print out pictures of coral reef organisms for Section 1 Part A below. Pictures of coral reef organisms may be found at <http://www.photolib.noaa.gov/brs/rfind13.htm>
- Make a large Venn Diagram on a piece of chart paper.
- Make a large matrix on the chalk or white board.

### I. Survival in the Coral Reef Habitat

A. Identify basic needs for organisms to survive.

1. Draw a large (two ring) Venn Diagram on the board. Place students in an area where they have room to mingle amongst each other. Give each student a picture of a coral reef organism (i.e. goatfish, forcepsfish, butterflyfish, damselfish or “mamo”, cleaner wrasse, parrotfish, yellow tang, Moorish Idol, Humuhumunukunukuapua’a, porcupinefish) or a mammal (i.e. human, dog, cat, monkey, rabbit, lion, deer, horse, etc.) and ask students to first make observations of their own organism.
2. On your signal ask students to move amongst each other and make observations of the different organism each student has. Give a signal for students to stop. Ask students that if they were to consider all of these organisms as one big group, what characteristics do all of these organisms have in common? Through questioning and discussion, guide students to identify that they are all living and have basic needs for survival, which includes: air, food, water, sunlight, space, shelter, and the right range of temperature. List these needs in the middle of the Venn diagram.

B. Identify structures and their functions that enable organisms to survive.

1. Ask students, if they now had to sort themselves into two groups, which organisms would belong in each group? Guided questioning and discussion may be necessary to assist the students with sorting themselves into the two groups.
2. Ask students what we would call the group that consists of humans, dogs, deer, etc. When the appropriate answer is given, label the left ring of the Venn diagram with “Mammal.” Then ask students to identify what mammals have that are in common. Again, with guided questioning and discussion, have students identify the following characteristics: warm blooded, have hair or fur, four limbs, babies born live, and breathe air with lungs. List these characteristics on the Mammal side of the Venn diagram.
3. Repeat the above procedure to identify and characterize “Fishes”: are cold blooded, have scales, fins and a tail, lay eggs and breathe through gills. “Fishes” and their characteristics should be listed on the right side of the diagram.

4. Explain to the students that different organisms have different body parts or “structures,” to meet the basic needs all organisms have in common. For example, humans have arms and legs and fish have fins and tails. These “structures” which “function” to help them to survive are called “adaptations.” Explain that the adaptations an organism has depends on where they live.
5. Introduce the term habitat as “a specific environment that meets an organism’s needs” (ScienceSaurus, 2005). Announce that for this unit of study, we will be learning about the coral reef habitat. Ask students, “Based on what you know about this habitat, which group of organisms is best adapted for this environment? How do you know?” Examples of student responses include:
  - Fishes have a tail and fins to enable them to swim in the water.
  - Fishes have compressed bodies to enable them to swim amongst the coral.
  - Fishes have gills to breathe in water.
6. Conclude by showing PowerPoint *Adaptations for Living on a Reef* reinforcing that organisms, like fishes, have structures that function to enable survival in a coral reef habitat.

## II. Types of Coral

- A. Handout Student Worksheet *Corals of Hawai‘i* to each student. Present the *Coral Reef Habitat* PowerPoint. Have students make notes on their worksheet as the coral information is presented.
- B. Review the coral reef zones. Ask students to compare the physical characteristics of each coral zone. Ask:
  1. Which zone receives the most sunlight?
  2. Which zone has the most wave action?
  3. What would it be like to live in each zone?
- C. Discuss which types of coral might live in each zone, using their knowledge of structures and their functions to justify “why.”
- D. Reconnect to prior learning about habitats and develop students understanding that each reef zone is a unique habitat for plants and animals to live in, but that all zones are connected as part of the coral reef environment.
- E. Conclude their learning about the types of corals and their habitats by creating a class matrix. Divide students into four groups, according to the types of coral: lobe, finger, rice, and cauliflower. Ask student groups to summarize and record the physical features, characteristics of the reef zone it is found in, and what it looks like to post in the matrix as shown in the example below.

Name of Coral	Physical Features	Reef Zone Characteristics	What it Looks Like
<b>Finger Coral</b>	<ul style="list-style-type: none"> <li>• <i>Long thin branches</i></li> <li>• <i>Bumpy</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Fore reef</i></li> <li>• <i>Deeper Water</i></li> </ul>	
<b>Lobe Coral</b>			
<b>Rice Coral</b>			
<b>Cauliflower Coral</b>			

## III. Coral Poetry

- A. Have students select a specific coral and write a poem about it, using the descriptions of corals listed on the board. Poems should include a description of the features of the coral type, and the environmental conditions of the reef zone where it lives.
- B. Optional resource: share student readings on “*Reef Types*,” which compares fringing reefs, barrier reefs and atolls (evolution of coral reefs), included in these resources as an alternative focus for poetry activity.
- C. Give each student a copy of the Student Reading *Poetry Examples*. Review *Poetry Examples* with students. This can be done as homework, or in class.
- D. Have students share their poems with the class.  
*[Suggestion: If short on time then do the poetry activity during writer’s workshop sessions or language arts time.]*

# LESSON 1 Corals of Hawai'i

NAME: \_\_\_\_\_ DATE: \_\_\_\_\_

Lobe Coral Info



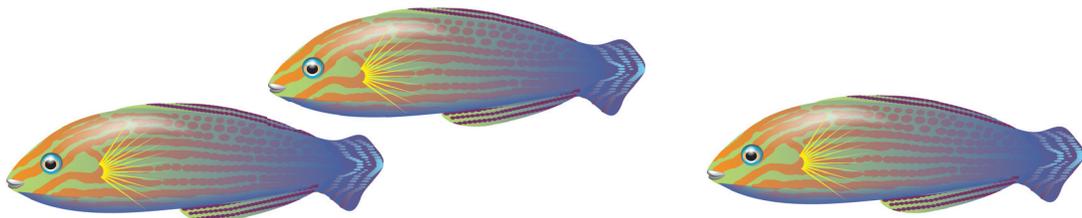
Finger Coral Info



Rice Coral Info



Cauliflower Coral Info



# LESSON 1 Student Reading

## Poetry Examples

### Example of an Acrostic Poem for Finger Coral:

(An acrostic poem is a poem in which special letters spell another word)

Fragile branching coral  
 In deeper water to protect from big waves  
 Name in Hawaiian is *pōhaku puna*  
 Growing in the fore reef  
 Every branch looks like a finger  
 Reaching to the sunlight

### Example of a Cinquain Poem for Lobe Coral:

A cinquain is a five-line poem:

Line 1: one word (subject or noun)

Line 2: two words (adjectives that describes line 1)

Line 3: three words (action verbs) that relate to line 1

Line 4: four words (feelings or a complete sentence) that relates to line 1

Line 5: one word (synonym of line 1 or a word that sums it up)

Example:

Lobe

Large, round

Forms reef crest

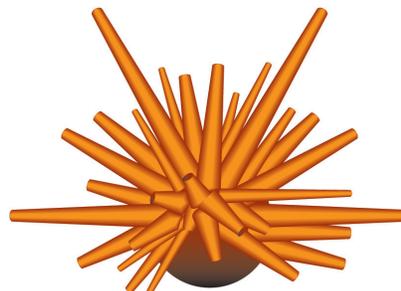
Strong, likes crashing waves

Puna

### Example of a Haiku Poem for Cauliflower Coral:

(A Haiku poem consists of 3 lines; line 1 has 5 syllables, line 2 has 7 syllables and line 3 has 5 syllables.)

Shaped like the veggie  
 Cauliflower coral likes  
 Strong waves and currents



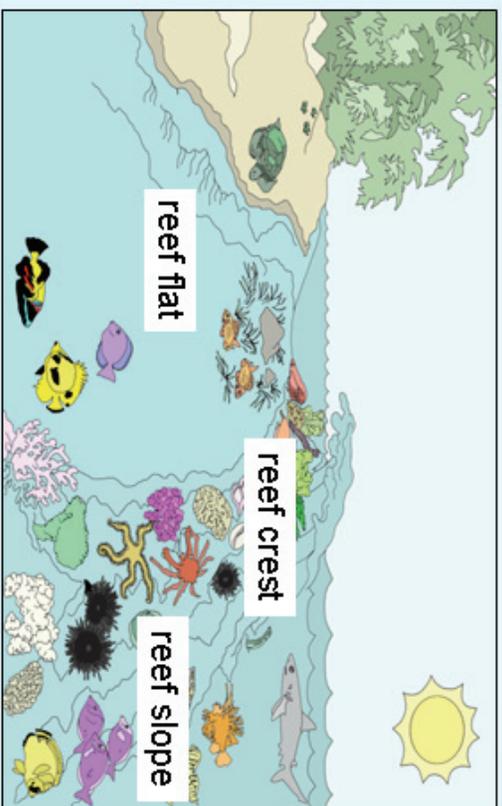
# REEF TYPES Optional Resource for poetry activity

## Fringing Reef



**Fringing reefs** develop along shoreline margins of islands, forming a *skirt* around the base of the land mass. Corals and other reef building organisms quickly colonize the available shallow waters that surround the island. Once all the available horizontal space is colonized, corals begin to grow upward towards the sun until they reach just below the sea surface, maximizing as much space as possible for growth.

## Fringing Reef



Most fringing reefs can be further divided from the land to the sea into the reef flat, reef crest, and reef slope. The **reef flat**, located directly adjacent to land, often receives large amounts of rain run-off, and as a result has low coral diversity. The **reef crest** is the most exposed part of the fringing reef because of its exposure to high energy waves. The **reef slope** extends seaward below the reef crest and has the highest coral abundance and diversity.

# REEF TYPES Optional Resource for poetry activity

## Barrier Reef



A **barrier reef** is a fringing reef that has been separated from land due to island subsidence, or sinking into the sea, and encloses a **lagoon** between the reef and the subsiding island.

## Barrier Reef



The picture above is a satellite image of the barrier reef off of Belize, in Central America. Barrier reefs help protect the mainland from the destructive forces of breaking waves. This not only protects the shoreline from erosion, but also produces calmer waters on the inside of the reef, between the reef and the mainland, which act as a nursery area for young fish and other marine species.

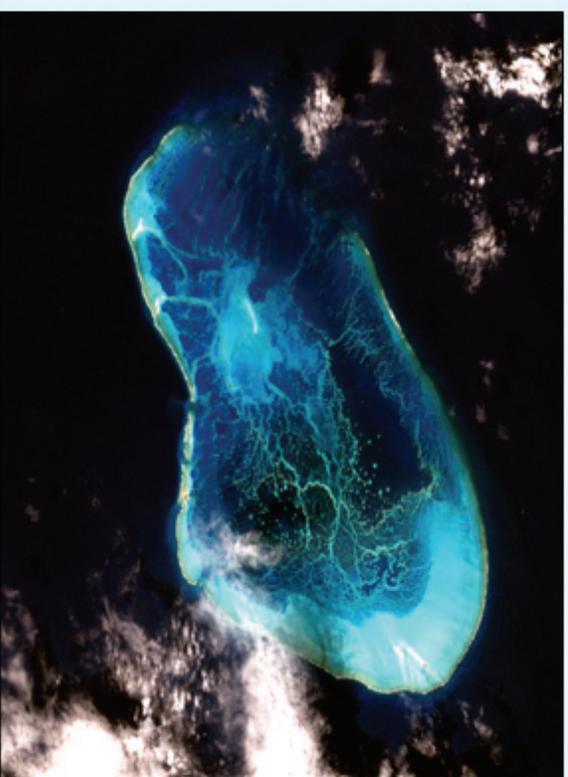
# REEF TYPES Optional Resource for poetry activity

## Atoll



As islands continue to sink from subsidence and eventually disappear beneath the sea surface, atolls will form as long as the rate of coral growth surpasses the rate at which the island is subsiding. **Atolls** are low-lying islands comprised of a ring of coral reef enclosing a lagoon.

## Atoll

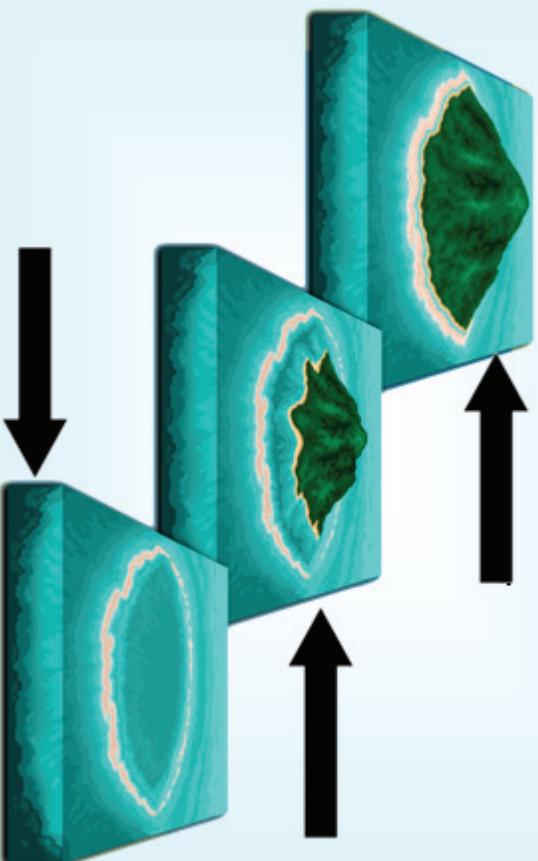


The most visible structure of the atoll is the ring of coral reef enclosing the shallow lagoon. Most of the Northwestern Hawaiian Islands are low islands that are characterized by atolls, for example, the Midway Atoll, Pearl and Hermes Atolls, and Kure Atoll. The picture above is a satellite image of Pearl and Hermes Atoll.

# REEF TYPES

Optional Resource for poetry activity

## Name That Reef!



Test yourself on what we just learned!

## Island Ages

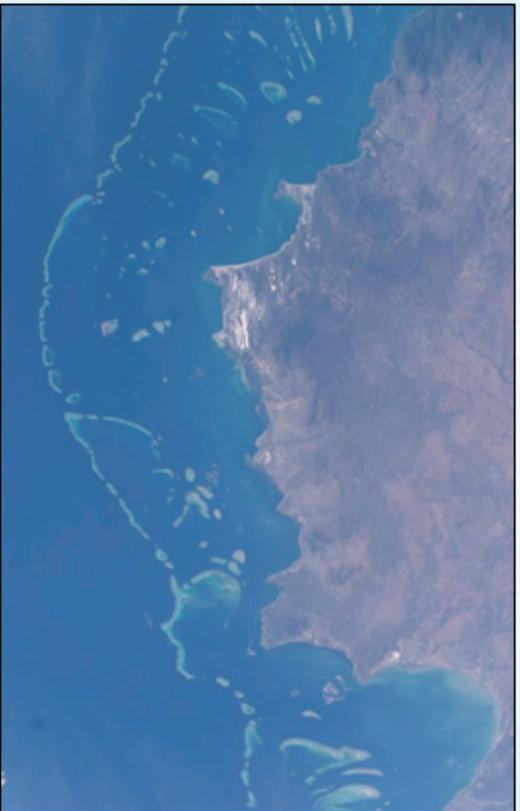


The relative ages of islands can be compared based on the type of reef structure surrounding the island. Younger islands tend to have fringing reef structures or barrier reef structures, and are usually high islands because of the amount of volcanic landmass still present above the surface. Older islands that have little, to no volcanic landmass left above the sea surface are usually low islands. They are composed primarily of sand or coral material, and have lagoons enclosed by a barrier reef. Low islands are considered atolls when the land mass is no longer above the sea surface.

# REEF TYPES Optional Resource for poetry activity

## FOCUS:

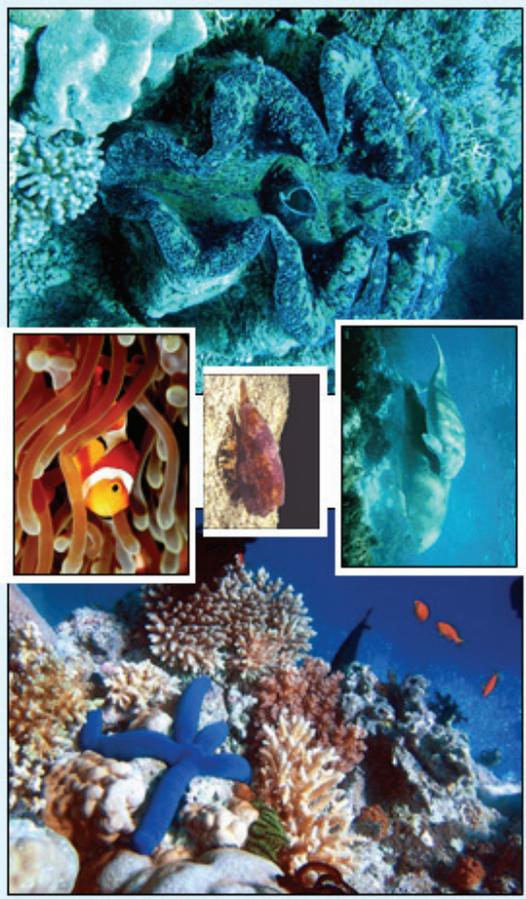
### Great Barrier Reef, Australia



The Great Barrier Reef is so big, it can be seen from outer space. The image above is a satellite image of the far northern section of the reef.

## FOCUS:

### Great Barrier Reef, Australia



The Great Barrier Reef is home to a diversity of life. The reef system is home to thirty species of cetaceans, six species of sea turtles, salt water crocodiles, dugongs, seventeen species of sea snake, and more than 1500 species of fish. 400 species of both hard and soft corals are found on the reef. This is one productive area!