

Teaching notes and answers

Aims

- To list some of the features of a coral reef.
- To describe how coral reefs are important to people and how they are being damaged.
- To explain the effects of damage to the reef and the consequences for people.

Using this information, students give examples of how a lack of biodiversity can affect an ecosystem and how this, in turn, affects people.

Activity

Students gather snippets of information from different sources. They work individually or in pairs to feedback information to their group (3-5 students). Each person will answer a question about one aspect of coral reefs.

These are...

1. What is a coral reef?
2. How do people benefit from healthy coral reefs?
3. Why are coral reefs being damaged and destroyed?

Then, working together, groups use lots of examples to illustrate how damage to the coral reef affects its biodiversity. Using what they have learnt, groups try to predict the consequences of this damage to people.

Starter task

Show the class a short video clip such as '[Coral Reefs 101 National Geographic](#)' which is four minutes long. This gives a good description of coral polyps, reefs, and damage.

Main task

Provide each group with sheets for Task A, B, and C (pages 3-5). Individuals carry out one of the task sheets.

After a given period of time, students bring their results back to the group. Students share the information from their task with their group.

Task A - a diagram of a coral polyp needs to be available for task 1 students to view when they have completed their own diagram.

Click the following link for a coral polyp diagram:

https://oceanservice.noaa.gov/education/kits/corals/media/supp_coral01a.html

Task C - answers

Fishing boats take too many fish from the reef.	Not enough adult fish are left to reproduce and replenish fish stocks.
Cyanide and explosives are used to poison or stun fish so they can be picked up easily from the surface.	Poisons kill almost all reef organisms - they are indiscriminate. Explosives destroy the structure of the reef itself.
Climate change is making the sea warmer.	Corals become 'bleached' if the water is too warm. They eject all their algae which provide them with glucose.
Boats anchored above the reef cause damage through the movement of their anchor chain.	Small areas of intricate corals, which are home to numerous animals, are destroyed.
On land, run-off from farming and pollution from towns make rivers very dirty. These rivers empty into the sea.	Sediments turn the water cloudy. Chemicals make microscopic plants grow causing 'algal blooms' and cutting out sunlight.
Carbon dioxide is being added to the atmosphere. It dissolves in seawater making the water slightly acidic.	Limestone is destroyed by acid.
Scientists estimate that 11 billion items of plastic pollute coral reefs.	Bacteria colonise plastics in the ocean. These bacteria can cause disease. Plastics smother the coral colonies. Plastics are eaten by fish and other organisms.
Tourists disturb reefs in numerous ways e.g. diving, spear-fishing, jet-skis, hotel and street lighting, taking souvenirs, and pollution.	Reefs are complex and finely balanced ecosystems. Some reef organisms use moonlight to regulate breeding cycles or sound to find a mate.

Summary task

Class questions:

- How is damage to the reef ecosystem affecting the biodiversity of the reef? Examples?
- What are the consequences for local communities; for countries with reefs; for people as a whole? Short-term? Long-term?

Many of these changes have happened in one lifetime. Forty years ago most reefs were healthy and thriving. When today's students become young adults, some reefs could be all but destroyed, including the Great Barrier Reef. Let students know what they can do. There is plenty of information on the internet if they want to effect a change.

Extension task

Use the extension task (page 6) for the most enquiring students. They will need access to textbooks and internet.

Task A - what are corals?

Your job is to create a **large** drawing of a coral organism.

Use the description below to guide your drawing.

Draw in pencil only - no colours required.

You will probably try to draw the whole creature first, in 3-D. If you do, when you've finished, try to imagine your coral sliced in half from top to bottom and draw a diagram of this.

Using the **bold** keywords, add annotated labels (labels with snippets of information attached). To one side, add drawings to illustrate the ideas of 'colonies' and 'reefs'.

When you've finished, compare your diagram to the picture provided, but don't alter it.

Return to your group and use your diagram to explain what corals actually are.

- Read out your annotations.
- Say how you would alter your diagram now you have seen the picture provided.
- Ask your group if they have any questions.

What are corals?

Although they can look like plants, corals are actually **animals**. Each coral animal is called a **polyp**.

Polyps resemble a marshmallow. They have a hole running through the middle, rather like when you toast a marshmallow on a stick and push the stick right through the centre from one flat side to the other.

Tentacles surround the hole at the top. These look like the 'arms' of an octopus but without any suckers. Instead, polyps have special **stinging cells** inside their tentacles. Coral polyps capture and feed on small organisms floating or swimming in the sea.

To protect themselves and to have something to hold onto, polyps **secrete** (a little bit like sweating) molecules which create a rock called **limestone**. The bottom of a polyp holds tight to the limestone and it also creates a little **tunnel** for itself. When alarmed, the polyp will withdraw its tentacles and hide inside the tunnel. Limestone contains the elements calcium, carbon, and oxygen.

Coral polyps are amazing because they have another type of **organism** living inside their bodies. These are called **algae**. Algae have **chloroplasts** and can **photosynthesise**. They provide the polyp with **glucose** and, in return, the algae has a safe place to live.

Polyps live in large groups called **colonies**. Colonies of corals can resemble round boulders or the fanned branches of a tree. When colonies join together and grow on top of one another, a **coral reef** is formed. Reefs will only develop in warm, clear, shallow seas and the water must be neutral or alkaline.

Task B - research for question 1 and 2

Your job is to find answers to questions 1 and 2.
Have a look - what are these questions about?

1. What is a coral reef?
2. How do people benefit from healthy coral reefs?

- Cut up the table and sort the slips into two groups.
- One group will help you answer question 2.
- Decide how to organise these slips to create a sixty second presentation which will contribute towards answering question 2.
- Practice your presentation until you are ready to show it to your group.
- Now, look at your remaining slips and decide which questions each can help to answer.
- Group together the ones that help answer question 1. Share this information with your group.

Coral reefs trap tiny particles helping to keep the water very clean.	There are 800 species of reef-building coral.
Reefs protect and provide food for millions of fish.	Algae provide coral polyps with up to 90% of their nutrients.
Reefs are sheltered places where fish and other organisms lay their eggs.	The Great Barrier Reef is 20 000 years old!
Coral reefs help regulate carbon dioxide levels in the oceans.	The world's reefs cover only 2% of the ocean floor but support 25% of all marine life.
Coral reefs prevent the shallow, sandy sea bed from being washed away by wave action.	125 000 species rely on coral reefs.
Reefs provide an essential income for local fishing communities.	11 billion items of plastic are believed to pollute coral reefs around the world.
Countries with beautiful reefs attract tourists who bring in a lot of money.	275 million people rely on fish or other food from coral reefs.
Reefs protect vulnerable beaches, homes and fishing boats from stormy seas.	60% of all reefs are already seriously damaged.

Task C - research for question 3

Your job is to find out how coral reefs are being damaged and destroyed. With this knowledge, you can help your group decide the wider consequences of this destruction.

Look at the table. In the first column are the types of damage which are happening. The second column explains some of the consequences of this damage.

However, you may have noticed that column two is muddled up! Use arrows to join the damage to its consequence.

Now, number each type of damage from 1-8.

Put them in order, which do you think is the most destructive and which the least?

Look at your top three, why do you think these are the most serious threats to coral reefs?

Take this information back to your group and tell them about the three most serious threats to coral reefs; tell them about one other threat and describe a threat which could be easily solved.

Fishing boats take too many fish from the reef.	Reefs are complex and finely balanced ecosystems. Some reef organisms use moonlight to regulate breeding cycles or sound to find a mate.
Cyanide and explosives are used to poison or stun fish so they can be picked up easily from the surface.	Bacteria colonise plastics in the ocean. These bacteria can cause disease. Plastics smother the coral colonies. Plastics are eaten by fish and other organisms.
Climate change is making the sea warmer.	Corals become 'bleached' if the water is too warm. They eject all their algae which provide them with glucose.
Boats anchored above the reef cause damage through the movement of their anchor chain.	Not enough adult fish are left to reproduce and replenish fish stocks.
On land, run-off from farming and pollution from towns make rivers very dirty. These rivers empty into the sea.	Small areas of intricate corals, which are home to numerous animals, are destroyed.
Carbon dioxide is being added to the atmosphere. It dissolves in seawater making the water slightly acidic.	Poisons kill almost all reef organisms - they are indiscriminate. Explosives destroy the structure of the reef itself.
Scientists estimate that 11 billion items of plastic pollute coral reefs.	Limestone is destroyed by acid.
Tourists disturb reefs in numerous ways e.g. diving, spear-fishing, jet-skis, hotel and street lighting, taking souvenirs, pollution.	Sediments turn the water cloudy. Chemicals make microscopic plants grow causing 'algal blooms' and cutting out sunlight.

Extension task

Choose one of the following to investigate. You will need access to textbooks and the internet

- Research the chemistry behind the destruction of corals by the increasing acidity of seawater.
- Find examples of how marine organisms use sound and light.
- Fertilizers make plants grow. Surely, this is a good thing? Research what happens when agricultural fertilizers run-off into the sea. Why is this damaging to aquatic and marine ecosystems?
- Find out more about coral bleaching. Why is it a concern?