

Lesson Plan 2: Coral Reefs

Learning objectives

- To understand what a coral reef is and where they exist
- To understand the importance of this habitat and the threats it faces

Main teaching points and questions (tick symbol) to engage/prompt the children - refer to background notes for more detailed teaching information

Activity 1: Introduction (5 minutes)

Choose four questions to ask the class. Discuss as a group.

1. What is a coral reef and where are they found?
 - ✓ Has anyone seen them on tv or been on holiday to a tropical country?
2. What is a coral?
 - ✓ Is it an animal, vegetable (plant) or mineral (rock)?
3. What types of coral are there?
4. What else lives on a coral reef?
 - ✓ What animals and fish do you remember from the last lesson? What animals have you seen in cartoons or films (e.g. Finding Nemo, Free Willy).
5. What dangers are there to coral reefs?
6. How can we look after them?
 - ✓ Do you remember what we learned in the marine conservation lesson?

Activity 2: Worksheets (15 minutes)

Choose from one of the three activities: coral reef word search, coral reef collage, or 'match the name with the picture' (in lesson 1).

Give out one worksheet to each child. Read the instructions and questions as a class and let them complete the worksheets alone.

Activity 3: Sharing and recap (5 minutes)

Ask one child from each table to tell you one thing they have learned today.

Further work

- Children can make their own coral reef animals during the next lesson or at home using the templates, and then create a coral reef within the classroom (see activity pack for templates).
- Think of a fun fundraising activity, such as a cake sale or sponsored swim/cycle/walk, to raise money for coral conservation (EDGE Coral Reefs).



Background information

Introduction

The seas and oceans cover over 70% of the surface of the planet and more than 90% of the biosphere's volume. Coral reefs inhabit less than 1% of the oceans and yet they support 25% of all marine life. They first appeared over 400 million years ago, before plants appeared on land, and now support between 1 – 3 million species many of which are found nowhere else (around 93,000 species already recorded). This makes them the most biodiverse of all aquatic ecosystems. Coral reefs grow in warm, tropical waters typically to a depth of around 30m, although they can grow much deeper, after which the lack of light prevents many coral species from growing. There are about 845 species of reef building corals.

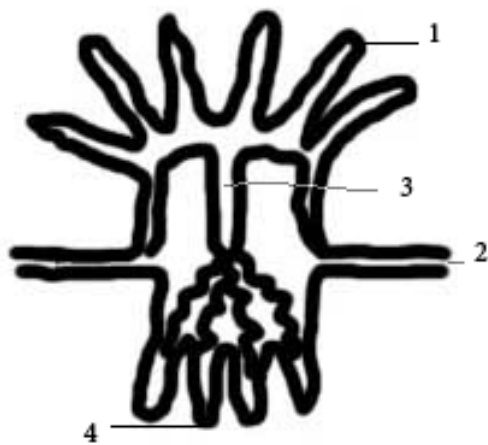
It should be noted that there are also cold-water corals, which can live to depths of 2000m. There are nearly as many cold water corals as there are tropical corals, but only a few cold water species develop into reefs (called mounds or banks in deep water). They live much deeper than warm water corals because they feed off tiny animals, called zooplankton, in the water. Cold-water corals are particularly vulnerable to damage from bottom trawling fishing gear.

Coral biology

A coral is **not a plant** but is made up of many invertebrate animals called polyps, which usually live in large colonies. There are two types of coral: hard corals, where the polyps produce a hard skeleton out of limestone (calcium carbonate), which remains after they die; and soft corals, which do not have a hard skeleton. Corals tend to be slow growing and are a fragile ecosystem because they cannot easily adapt to environmental change over a short period of time.

Most corals have a symbiotic (mutually beneficial) relationship with algae called zooxanthellae – pronounced 'zoo-zan-thel-ee'. These algae use the sun's energy to photosynthesise and produce energy, similar to plants, which the polyp uses for growth. Many polyps can also additionally catch small plankton with their stinging tentacles to supplement their diet. Some corals only feed in this way and do not have zooxanthellae – notably cold water corals, which are then able to inhabit deeper, darker waters. The zooxanthellae can also help give the corals their bright colours, although in some corals the colour is from the polyp's tissue, and this explains why the remaining skeletons of dead corals are white.

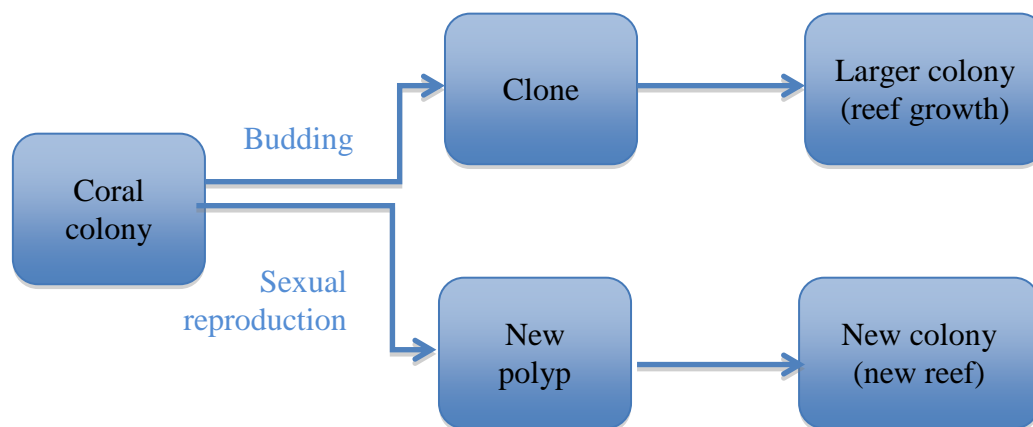
Diagram of a single polyp:



1. Stinging tentacles
2. Connects polyps to one another
3. Mouth and gullet
4. These lodge the polyp into the limestone skeleton

Life cycle

Most corals can reproduce both sexually and asexually by budding. Sexual reproduction, where they all simultaneously release eggs and sperm into the water, happens rarely and in some cases only on a single specific night of the year. Budding is the asexual reproduction of a polyp to produce an identical replica, which goes on to build the colony.





Marine life that relies on coral reefs

Over 25% of all marine life is thought to spend some or all of its lifecycle on a coral reef. Many of the fish and animals learned in the marine conservation lesson spend some or all of their lives on corals reefs, and the children can discuss these again to tie the two lessons together. Here is a reminder of some of the weird and wonderful sea animals that will excite and engage children:

Sea turtles

There are seven species of sea turtle, six of which are classified as endangered or critically endangered. They are reptiles that have adapted to life at sea but they must return to the surface to breathe and they still come onto beaches to nest. Many turtles suffocate or starve to death when they get entangled in fishing gear or if they mistake a floating plastic bag as their favorite food, jellyfish.

Whales, dolphins and porpoises (cetaceans)

There are over 80 species of cetaceans living in our seas. These mammals live permanently in the water but must return to the surface to breathe. The biggest whale, the blue whale, can reach up to 30m long.

Sharks and sting rays

These fish all belong to the same family. They tend to be slow breeders and live for many years, so over fishing can have a big effect on their populations. The biggest fish in the sea is the whale shark, a gentle giant that lives in tropical waters and eats tiny zooplankton. Sharks have been given a bad reputation as man-eaters but in fact you are more likely to be killed by a defective toaster.

Jellyfish


Jellyfish have soft bodies and long, stinging, poisonous tentacles that they use to catch fish to eat. A jellyfish is 98% water and they are found in every ocean, from the surface down to the deepest depths. The biggest, the lion's mane jellyfish, can be up to 2m wide!

Fish

There are plenty of different types of fish to talk about – here are some that might crop up:

- 'Nemo', or clownfish/anemone fish, are common on tropical reefs. They are found living in or near anemones, which can be poisonous to other species, from which it receives protection and access to food. All clown fish are born male and develop female organs as they mature. They are eaten by various fish but their





main threat comes from humans for the aquarium trade as marine animals are rarely bred in captivity.

- Seahorses are also a type of small fish that have armored plates all over their body instead of scales. There are about 50 different species of seahorses around the world. They live in seaweed beds in warm water and are very slow swimmers. Some are masters of camouflage which protects from enemies. The Australian leafy-sea dragon is one of the best camouflaged seahorses – check it out on Google.
- Bluefin tuna are large, predatory fish which can reach speeds of over 30 mph, which is as fast as a car. They are highly prized for sushi and as a result have been overhunted to the verge of extinction and are classified as critically endangered – rarer than a panda!
- Skipjack tuna are another, smaller species, which is not yet endangered. This is what we find in most tins of tuna in the supermarkets and you should choose pole and line caught tuna which has a lower environmental impact on other marine species like turtles and sharks. It is important to know the difference between different species of fish in order to make an impact each time we buy fish at a supermarket or restaurant. See the reference list for more help on choosing sustainably caught fish.


Human impacts and threats

An estimated half a billion people are heavily reliant on the ecosystem services coral reefs provide and around 44 million of these are engaged in the primary production of fish. That's almost three quarters of the UK population. However a much higher number of people – almost 3 billion, or almost half the world's population – gain about 15% of their protein from eating fish. Coral reefs supply around 10% of marine fisheries landings because many fish spawn and have their juvenile life stages around coral reefs, which provide considerable protection for young fish. Therefore they are important habitats to preserve both in terms of biodiversity and for the future of sustainable fisheries.

There are some particularly disturbing fishing methods that have a lasting effect on coral reefs. This includes

1. Bottom trawling: large nets are swept along the bottom of the sea bed to catch a specific fish species, but also catching everything else in its path and tearing up everything in its way, such as corals.



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2. Dynamite fishing: dynamite is detonated and the large explosion causes most surrounding wildlife to die, including large parts of coral reefs. The fish float to the surface and are collected by fishers. This form of fishing is illegal.
 3. Cyanide: a poison (sodium cyanide) stuns fish making them easy to catch, but for every fish killed an estimated 1m² of coral reef is also killed. This form of fishing is often used for collecting live animals for the aquarium trade. It is illegal.

Other anthropogenic impacts include


- Pollution – plastic, chemicals
- Damage from anchors, particularly in areas where tourism is unregulated and mooring buoys are not present
- Damage from SCUBA divers
- Development of coastlines – the resulting sediment can blanket the coral reef causing suffocation
- Climate change and warming seas – warming of the seas by as little as 1°C can cause the corals to expel their zooxanthellae (algae) thereby losing their main source of energy. The polyps die leaving just the skeleton. This is known as coral bleaching.

Solutions

Coral reefs are fragile ecosystems that provide us with many goods and services. Many human activities are having a direct impact on these ecosystems and so it is important to conserve them. Marine Protected Areas (MPAs) provide a significant contribution to the conservation of species and habitats and can restore the structure and function of the ecosystem. This is discussed in further details in the marine conservation lesson.

You and your class can take action at home to help make a difference:

- Try to use less plastic, for example buy a reusable water bottle and a canvas bag so that you don't need to buy bottled water or use plastic shopping bags, which might end up in the ocean
- Turn the lights off at home when they are not needed. This will help save energy and reduce your carbon footprint
- Turn the tap off whilst brushing teeth or you might be wasting up to 5 litres of water per minute
- If you have a tropical aquarium make sure you buy animals that were bred in captivity or caught in a sustainable way

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- Do a fundraising event to help conservation programmes around the world. For example you could organize a cake sale, a sponsored swim or think of something more adventurous! See below for more details.

EDGE Coral Reefs is a conservation programme that funds the research and protection of ten corals that were selected by scientists. EDGE is an acronym for Evolutionarily Distinct and Globally Endangered; they are threatened, extremely unique and are receiving little or no conservation attention. EDGE seeks to build conservation capacity in regions in which they occur by awarding Fellowships to support local conservation practitioners (EDGE Fellows) to research and conserve poorly-known EDGE species. Through providing funding, training and mentoring to these future conservation leaders, the programme is creating a global network of conservation practitioners who have the skills, knowledge and support to prevent the extinction of the world's most unique and threatened animals.

You can learn more about coral conservation and the work of the EDGE Coral Reef team at www.edgeofexistence.org. By teaching about these species you are helping to raise awareness of the importance of such remarkable and threatened animals. If you want ideas to take it further - and get your class/school on the website in recognition – then think of an exciting, novel and fun fundraising event and get in contact with the EDGE team (info@edgeofexistence.org).



References:

You can find out more about these issues by following the links:

Coral reef conservation

www.edgeofexistence.org/coral_reef_conservation/default.php

Coral polyps

www.edgeofexistence.org/coral_reef_conservation/coral_polyp.php

Threats to coral reefs

www.edgeofexistence.org/coral_reef_conservation/coral_bleaching.php

How you can help

www.edgeofexistence.org/coral_reef_conservation/how_you_can_help.php

Destructive fishing practices

www.zsl.org/conservation/regions/habitats/marine/project-ocean/destructive-fishing,1587,AR.html

Marine protected areas

www.zsl.org/conservation/regions/habitats/marine/
www.zsl.org/conservation/regions/habitats/marine/index,219,ZI.html

Sustainable fish and how to make the right choice

www.zsl.org/conservation/regions/habitats/marine/project-ocean/sustainable-fish,1584,AR.html
www.fishonline.org

Tuna

www.zsl.org/print/conservation/regions/habitats/marine/project-ocean/bluefin-tuna,1591,AR.html

Seahorses

www.zsl.org/conservation/regions/asia/project-seahorse/

Sharks

www.sharktrust.org

List of endangered fish and marine animals (including sea turtles and cetaceans)

www.worldwildlife.org/species/index.html

TED talk (Jeremy Jackson: How we wrecked the ocean)

www.ted.com/talks/lang/en/jeremy_jackson.html