Lesson Plan - Reproduction on the Reef

Module Summary

This module begins by exploring the reefs of Little Cayman, explaining how coral reefs underpin much of the life in our oceans and support species through various stages of their lifecycle. The educators will guide students through the complex process of coral reproduction and why coral reproduction is important to maintain healthy and resilient reefs for future generations. Participants will engage through the interactive platform by asking questions, taking part in live polls, chatting with the CCMI team, and completing an in-class worksheet (provided). The lesson promises an immersive learning experience as together we uncover how corals clone themselves through budding and fragmentation and how they increase genetic diversity though the phenomenon known as coral spawning. All education materials align with the Cayman Islands and United Kingdom Science National Curriculums and the Ocean Literacy Principles.

Wednesday, 8th May 2024; 10am EST (UTC-5)

Duration: 35-minute broadcast, 1 hour lesson

Years 4, 5, and 6

Learning Objectives

- Recognise that the ocean supports a great diversity of life and that coral reefs are one of the most diverse habitats on the planet
- Recognise that coral reefs are important nursery areas, providing shelter and cover from potential predators
- Identify the different types of organisms found on the reef (e.g., plants, animals, vertebrates, invertebrates) and give reasons for classifying organisms
- Understand the difference between asexual and sexual reproduction in corals
- Understand broadcast spawning and why it's important for resilience against future threats
- Describe Cayman-specific details about broadcast spawning
- Describe factors that affect coral spawning, including pollution, global warming, disease etc.
- Understand how we can use knowledge of coral reproduction for coral restoration

The Cayman Islands and United Kingdom National Science Curriculum

- Recognise that environments can change and that this can sometimes pose dangers to living things (Living things and their habitats – Year 4)
- Describe the life process of reproduction in some plants and animals (Living things and their habitat – Year 5)
- Describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences (Living things and their habitats – Year 6)
- Give reasons for classifying plants and animals based on specific characteristics (Living things and their habitats – Year 6)
- Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution (Adaptation and inheritance – Year 6)

Ocean Literacy Principles

- Ocean Literacy Principle #5: The ocean supports a great diversity of life and ecosystems
- Ocean Literacy Principle #7: The ocean and humans are inextricably interconnected

Description of Live Lesson

This module will take place on a coral reef ecosystem along the coast of Little Cayman in the Cayman Islands, where the CCMI team will guide students through a series of learning objectives. The topside host will communicate in real time with students who join in as our remote audience/virtual dive buddies and the underwater educator. Participants will gain an understanding of the vast diversity of life found on coral reefs and the ways in which we classify these organisms. During the lesson, CCMI educators will teach students the exact mechanisms of both asexual and sexual reproduction in corals and how knowledge of these processes help the researchers to restore reefs and promote adaptation to changing environmental conditions. The hosts will share information about CCMI's own research, explaining how the researchers manipulate coral reproduction in our own restoration efforts.

These topics align with the Science National Curriculum of the Cayman Islands and the United Kingdom and the Ocean Literacy Principles. Students can complete the worksheet and supplemental booklet during the live lesson, and they are encouraged to ask questions about the materials to the host or educator at any time during the broadcast. Pre-recorded footage may be used to show key concepts, should these observations not be seen naturally during the live lesson.

Live broadcast outline (35 mins)

00:00 – 02:00 Welcome back to Reefs Go Live and CCMI team introductions
02:00 – 04:30 The ocean, and specifically coral reefs, hosts a great diversity of life
04:30 – 09:30 Classification of organisms on the reef
09:30 – 10:30 Overview of coral reproduction
10:30 – 11:50 Asexual reproduction in corals: budding and fragmentation
11:50 – 15:00 Sexual reproduction in corals: broadcast spawning
15:00 – 15:45 Cayman-specific details on coral spawning
15:45 – 19:35 Coral spawning increases genetic diversity
19:35 – 22:00 Answer questions
22:00 – 25:00 Factors impacting coral spawning
25:00 – 27:30 Using asexual reproduction in coral restoration
27:30 – 30:00 Using sexual reproduction in coral restoration
30:00 – 33:30 Answer questions and final shoutouts
33:30 – 35:00 Lesson summary, thank you, and goodbye

Necessary Materials

- Internet connection
- Computer/phone
- Projector (optional)
- Speaker/headphones
- Notebook paper (one sheet per student)
- Pencils/pens
- CCMI worksheet and/or booklet (one copy per student)

Useful additional resources

- www.reefresearch.org/what-we-do/education/teacher-resources/
- www.reefresearch.org/what-we-do/education/reefs-go-live/
- https://reefresearch.org/what-we-do/research/restoration/#1648675605699-152a6400-aa01
- https://www.youtube.com/watch?v=JA17Du7gyyk&t=1s
- https://reefresearch.org/what-we-do/conservation/coral-nursery/
- https://reefresearch.org/what-we-do/research/coral-nursery/

“Reproduction on the Reef” Key Terms

The CCMI educators may refer to the following key terms throughout the live lesson. Listen carefully to the broadcast to learn some new vocabulary about scientific investigation and researching on the reef!

Adapt – when a living thing changes its shape or behaviour, improving its ability to survive. These changes are passed onto future generations through the organisms’ genes.

Asexual reproduction – the form of reproduction where an organism makes a copy of itself through budding or division; offspring are genetically identical to the parent organism

Breed – production of offspring or young

Broadcast spawning – mass release of gametes (eggs and sperm) for fertilisation in the water

Budding – method of asexual coral reproduction where an organism splits itself in half and a new induvial pulls away from the parent forming a genetic clone

Classification – the categorising of organisms based on their shared qualities or characteristics

Coral nursery – place where scientists grow corals underwater on specialised structures, with the goal of replenishing depleted coral reefs from what is grown in these places

Critically endangered – this is an even higher level of risk than being endangered. When a species is critically endangered, there are very few of them left in the wild, meaning there is a very high risk of species disappearing from the Earth (becoming extinct) in the near future.

Ecosystem – naturally occurring system made up of organisms and their environment

Fertilisation – when a sperm cell and egg cell join; becoming a new organism

Fragmentation – method of asexual coral reproduction where pieces of coral are broken off from the parent coral, with each new piece growing into a new individual coral

Gametes – female and male reproductive cells, i.e.: eggs and sperm

Genetic diversity – the range of different traits inherited by different individuals of the same species

Global warming – significant increase in the “normal” temperature of Earth over the last century

Invertebrate – any animal without a backbone

Juvenile – A young species in its early life stages

Nursery ground – place where juvenile species can grow safely before they are big enough to venture out on their own

Outplanting – transplanting of corals from a nursery onto a reef or other structure in the ocean

Polyp – tiny soft bodied animal related to jellyfish and sea anemones, which make up a coral

Population – the total number of one type of animal or plant living in one area

Reproduction – production of the same type of living thing through sexual or asexual processes

Resilience – ability of an ecosystem or species to bounce back from negative environmental influence

Restoration – renewal of a damaged, degraded, or destroyed ecosystem by active human intervention

Sedimentation – process of material falling through the water column and building up on the benthic habitat

Sexual reproduction – Form of reproduction where offspring are produced when males and female gametes join; offspring are genetically different from the parents

Taxonomy – the process of organising living things into groups that have common characteristics

Vertebrate – animal with a backbone