

Dive 2: Lesson Plan - Underwater Symbiosis

Module Summary

This module showcases an exploration dive on a pristine coral reef where our educators discuss the role of symbiosis and specifically, symbiotic relationships in our oceans. Students will be given an in-class activity to assist with the learning and development of understanding different symbiotic relationships such as mutualism, commensalism, and parasitism. The educator will take the students on a tour of a diverse coral reef pointing out examples of these different relationships.

Year 4

Learning Objectives

- Explain symbiosis
- Define mutualism, commensalism, and parasitism
- Describe examples of symbiosis seen terrestrially and in the ocean
- Recognize these different kinds of relationships and identify them daily
- Change a negative symbiotic relationship in your life to a positive one

Science National Curriculum Alignment

- Observe similarities and differences among animals and among plants (Year 4).
- Find out about other animals, including how they grow, feed, move and use their senses (Year 4).
- Investigate a local habitat, including the relationship between the animals and plants found there, and develop skills in classifying animals and plants by observing external features. *For example, classify minibeasts by observing the number of legs and note the conditions in which they were found* (Year 4).

Description of the live dive

The dive takes place on a pristine coral reef, rich with marine life. The underwater educator communicates with the lesson host on the boat and with the engaged remote classes that were live at the time. The educator takes the students through a series of fun facts and learning objectives regarding underwater symbiosis, all in alignment with the Science National Curriculum of the Cayman Islands. Students will have an in-class activity to complete during the lesson. Pre-recorded footage and images are used to demonstrate underwater symbiosis, adding to these processes that were discovered naturally during the broadcast.



Live broadcast outline (45 mins)

- 00:00 - 03:00 CCMI host welcomes students and outlines the lesson
- 03:00 - 05:00 CCMI host introduces the educator and the in-class activity
- 05:00 - 10:00 Educator defines different symbiotic relationships
- 10:00 - 15:00 Educator describes examples of symbiosis on the reef
- 15:00 - 20:00 Questions
- 20:00 - 30:00 Educator explores the coral reef pointing out different symbiotic relationships
- 30:00 - 35:00 Educator asks students to identify symbiotic relationships in their daily lives and how they impact those relationships in a positive or negative way
- 35:00 - 40:00 Questions
- 40:00 - 45:00 CCMI host on the boat recaps the live dive and concludes the lesson

Materials

Internet connection, laptop, projector, speakers, paper, pencils/pens, CCMI activity sheet, and CCMI fun fact sheet.

Useful resources

- www.reefresearch.org/reefs-go-live
- www.projectaware.org
- www.doe.ky
- www.education.gov.ky/education/curriculum
- www.oceanservice.noaa.gov/kids/

Fun Fact Sheet - Underwater Symbiosis

1. Symbiosis, meaning “living together”, is a biological interaction between two organisms where at least one of the organisms benefit from the relationship (Zandonella 2016).
2. The first symbiotic relationship was discovered in 1879 between trees and lichen by Dr. Anton de Bary, and the term symbiosis was officially coined (de Bary 1879).
3. There are three different kinds of symbiosis: mutualism (both organisms benefit), commensalism (one organism benefits with little/no effect on the other), and parasitism (one organism benefits to the detriment of the other) (Zandonella 2016).
4. Corals have a mutualistic symbiotic relationship with zooxanthellae. Zooxanthellae are microscopic algae that live inside the corals polyps and provide the coral with 95% of its food. In turn the coral provides a protected home in which the zooxanthellae live (Barnes 1987).
5. The symbiotic relationship between coral and algae began more than 210 million years ago (Sigman 2015).
6. Zooxanthellae help give corals their beautiful colours. Different species of coral contain different kinds of zooxanthellae, which creates the many different colours on a coral reef (Barnes and Hughes 1999).
7. Corals and algae survive symbiotically within a certain temperature range. When oceans warm above a certain temperature, the relationship will be lost. Temperature-stressed coral have no choice but to expel the algae from their tissues, or the algae may choose to leave the stressed-out coral. This is called coral bleaching (Barnes and Hughes 1999).
8. A great example of mutualistic symbiosis in the Cayman reefs is the relationship between the giant anemone and Pederson’s cleaning shrimp. The tiny shrimp are immune to the sting and thereby protected from predators by living within the anemone’s tentacles. In turn, the anemone gets a thorough cleaning of parasites and removal of any nearby waste (Wood 2007).
9. A common commensal symbiotic relationship seen in the Cayman Islands is the nuclear feeding between an apex predator and another consumer, such as a stingray and a bar jack, a shark and a remora, or an eel and a Spanish hogfish. Nuclear feeding is when an apex predator does the hunting and the following consumer picks up the leftovers. At the same time the consumer is also protected from other predators by traveling with their companion (Zandonella 2016).
10. A parasitic symbiotic relationship is seen on the reef when isopods attach themselves to various reef fishes. These isopods occasionally eat the tongue of its host’s mouth and lives inside the host fishes’ mouth, acting as a replacement tongue for the remainder of its life (Karsten 2015).

In Class Activity Sheet – Underwater Symbiosis

You're the scientist! Today we want you to help our CCMI scientist spot symbiotic relationships on the reef. When you think you see a symbiotic relationship, decide if it is: **mutualism** (where both organisms benefit), **commensalism** (where one organism benefits and one remains unaffected), or **parasitism** (where one organism benefits and the other suffers). Below are some examples of underwater symbiosis; however, there are many more to discover! When you spot a symbiotic relationship, using the cut-out faces below, decide if it is **mutualism**, **commensalism**, or **parasitism** by placing the correct cut-out over that relationship. Be sure to ask our scientist if you think you have spotted a new example of symbiosis or have any questions! Thanks for your help; enjoy the dive!



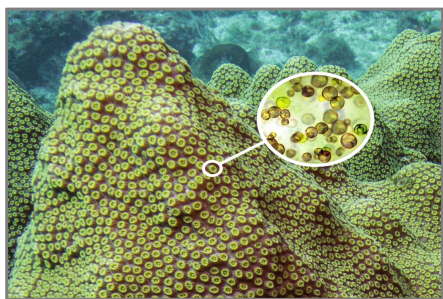
grouper and cleaner gobies



bar jack and southern stingray



soldierfish and isopod




corals and zooxanthellae



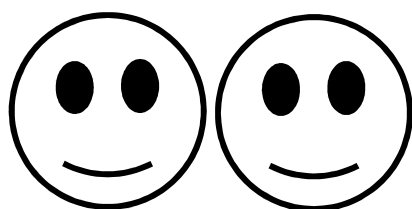
shrimp and anemone



damselfish and coral

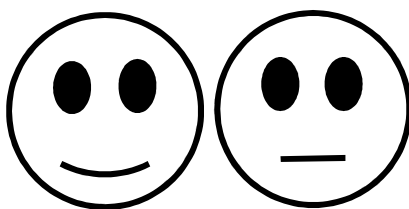
Cut 

Here



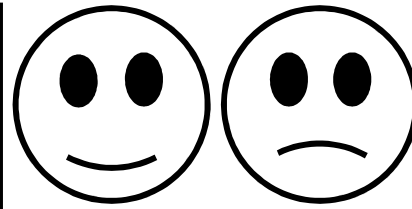
Mutualism

(Both organisms benefit)



Commensalism

(One benefits, one is unaffected)



Parasitism

(One benefits, one suffers)