Northeastern University
Marine Science Center

Case Study: Role of Zooplankton in Recovery from Coral Bleaching

Part 1- Introduction to Coral Reefs

Coral reefs are beautiful ecosystems to enjoy, but their benefits go far beyond just their beauty. They are biodiversity hotspots and support more than 25% of all ocean life despite only covering about 1% of the ocean floor. They support livelihood of their surrounding communities as critical habitats supporting local fisheries and attracting tourists who support the local economy. Their structure also protects coastal communities from flooding events during storm surges or hurricanes.

https://ocean.si.edu

Corals themselves are animals that have a symbiotic relationship with a type of algae, zooxanthellae, that lives inside the coral tissue. This algae is what gives corals all its beautiful different colors. The coral acts as a home for this algae and in return the algae gives the coral animal energy through photosynthesis. Corals also get their energy by using their tentacles to feed on plankton in the surrounding waters. Unfortunately, corals are severely threatened right now by coral bleaching. When water temperatures increase, it results in the symbiotic algae leaving the coral animal, resulting in the tissue being nearly transparent and causing the white coral skeleton to show through, causing the coral to look bleached. Often the coral will appear to be dead in this stage, but many corals have different recovery mechanisms to be able to recover from bleaching events. These mechanisms depend on the exposure corals have had to bleaching events previously, how long the bleaching event lasts, and the specifics of the surrounding environment during the bleaching event. Some of these mechanisms include relying on stored energy reserves, switching the type of symbiotic algae the coral hosts, or increasing heat shock protein production to help the animal better cope with heat stress and not need to lose its algae.

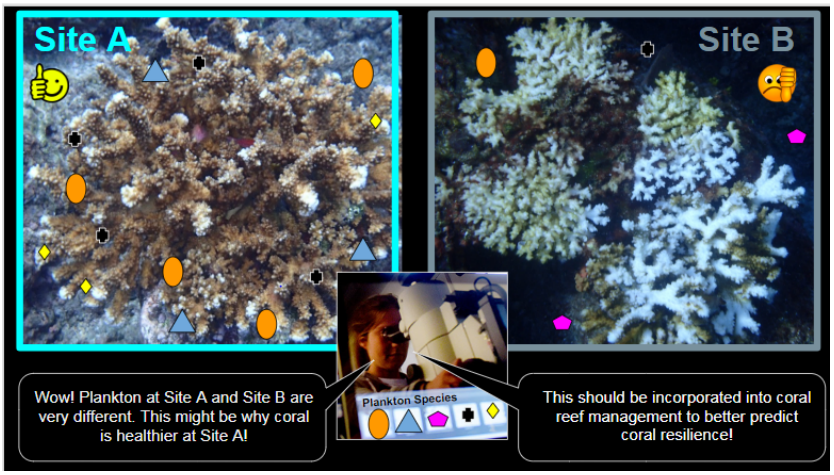
Questions

1. What are zooxanthellae and what relationship do they have with corals?

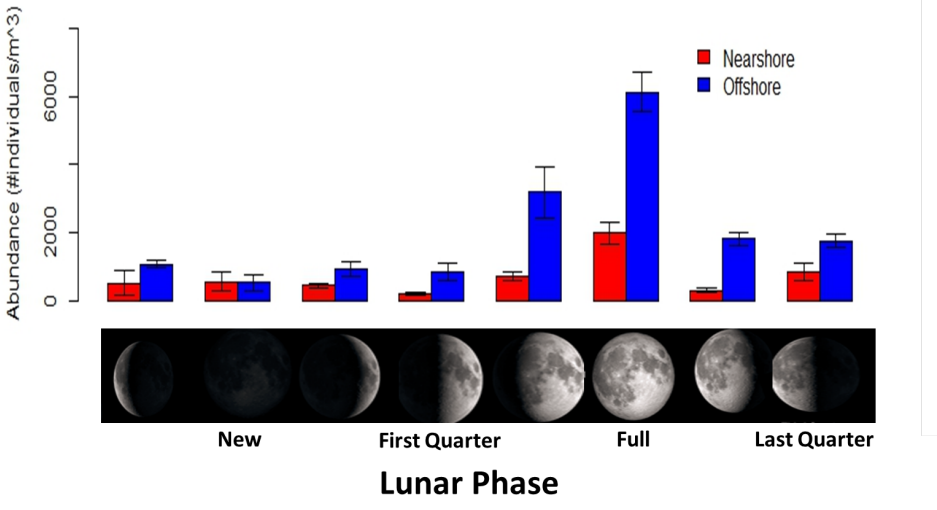
2. What is coral bleaching and why does it happen?

3. What are different ways corals can recover from bleaching events?

Part 2- Role of Zooplankton in Recovery from bleaching



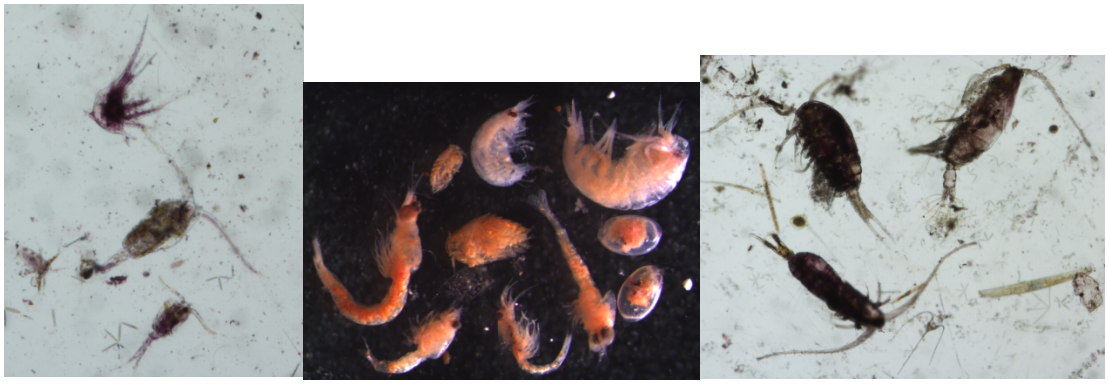
The Patterson Lab at the Marine Science Center is interested in how some corals can recover from bleaching by increasing their feeding behavior to feed on more plankton in the water. This allows them to still acquire energy otherwise lost during bleaching. If the bleaching event is short enough that the coral can continue to eat enough plankton to make up for energy lost from bleaching, when the water temperatures return to normal, the corals will gain their relationship with their symbionts back and return to being a healthy coral with its balance of getting energy by feeding and through photosynthesis. Corals can feed on a variety of particle sizes in the water making it difficult to identify the main components of its diet. Research in the Patterson lab focuses on the zooplankton communities that are available to the corals. However, little is known about zooplankton communities on reefs, for example how might the community differ from an inshore and offshore reef? These are some important things coral reef scientists are considering to better understand the role zooplankton can play in coral recovery from bleaching and help make predictions about a reef's potential for success.



Questions

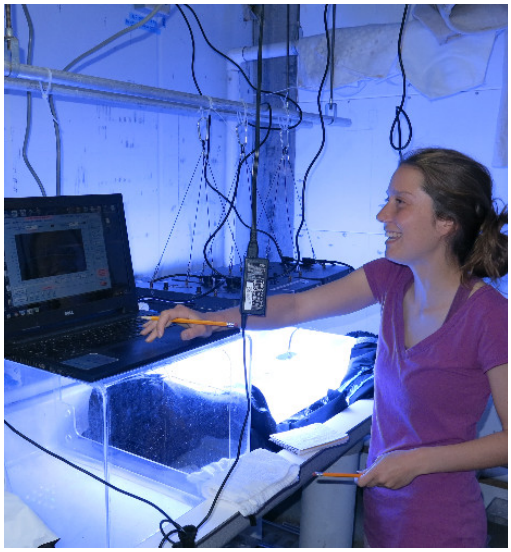
1. Using the graph above, what are some similarities and differences you see between zooplankton abundance at the Nearshore & Offshore sites during the different lunar phases of the month. What are some reasons you suspect support those similarities or differences?

2. Plankton come in all different shapes and sizes. Some plankton stay in planktonic form their whole lives while others are only plankton in their larval phase and grow up to become animals we are familiar with like crabs and barnacles! A few examples are given below. What are some important characteristics of different plankton that may affect their ability to help corals recovery from bleaching?



3. How can scientists use this information to make predictions about a reef's potential for success?

Marine Science Center Researchers Studying Corals and Zooplankton



Amanda Dwyer

Amanda Dwyer is PhD student in the Patterson Lab at Northeastern Marine Science Center. Her research involves understanding the role of zooplankton in coral health. Zooplankton can be an important resource for bleaching recovery and their community dynamics on coral reefs needs to be better understood. Additionally, she showed zooplankton can be a vector for coral disease during her field work in Bocas del Toro, Panama. In addition to studying our ocean environment, she also enjoys sharing her research with the community. After completing her degree, she plans to begin a career in marine policy to gain a better understanding of where policy and science overlap and how to make science more relevant and useable to policy makers.