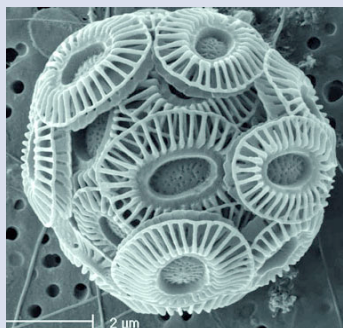


Education

Marine Osteoporosis



Grade Level

- 4th - 8th

Materials

- Chicken bones or small pieces of shell
- 2 1-liter bottles
- Tap water
- Carbonated water
- Paper and pencil to record observations



Activity Summary

In this lesson students will explore the effects of acidic oceans on certain marine organisms, in the ocean food web, and to humans. Students will conduct a science experiment using the scientific method to see the effects of increased acidity on certain species. They will also investigate the causes for increased ocean acidity and discuss ways to minimize the impact as an individual and as a society.

Learning Objectives

Students will be able to:

- Use the scientific method to hypothesize, test, record, and make conclusion on the effects of acidity on certain marine organisms.

Background Information

The process of ocean acidification (the decreasing pH of the ocean water) affects the organisms living within those waters. Many organisms use various forms of calcium carbonate to form their shells and skeleton. The increasing acidity of the water affects these organisms. As CO₂ is absorbed into the water the resulting chemical process reduces the amount of available carbonate ions used to by organisms to create their shells and skeleton. In addition to reducing the available carbonate ions the decreased pH makes the ocean water more corrosive.

Some of the organisms most immediately affected by ocean acidification include: sea urchins, abalone, corals, and some species of plankton (such as pteropods and coccolithophores). If the ocean water continues to grow more acidic these organisms will be unable to form their shells and grow. The loss of these organisms will greatly impact the marine food web.

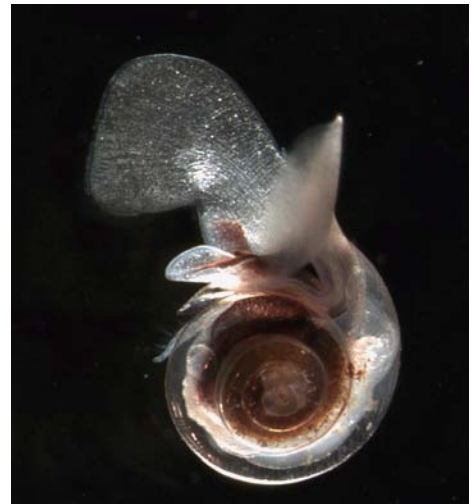
Plankton is at the base of the marine food web. Plankton are organisms that cannot swim against the current. Some plankton are algae and some are animals. Phytoplankton (algae-plankton) include coccolithophores and zooplankton (animal plankton) include pteropods. Planktonic feeders include bivalves (mussels, clams, scallops, and oysters), sand crabs, and anchovies. Baleen whales, such as blue whales, are also planktonic feeders. As the base of the marine food web plankton are incredibly important. If oceans become inhospitable to plankton the removal of that portion of the marine food web could result in disaster to many other marine species.

The increasing acidity of the ocean also has an effect on habitat. Coral reefs provide habitat for a large and diverse number of organisms. Many species of fish and invertebrates inhabit coral reef. If the coral can no longer successfully grow at optimum rates they will not be able to maintain the reef. Without the reefs the biodiversity of the ocean will decrease.

Ocean acidification may also affect important fisheries. Sea urchins, crabs, lobsters, and shrimp all use calcium carbonate to create their shells and skeletons. These are very important fisheries worldwide. A loss in species population would not only affect the marine food web, but would also affect the availability of food for humans as well as a means of livelihood for many people worldwide.

Preparation/ Materials

- 1-liter bottles or containers with lids
- Water (tap and carbonated)
- Chicken bones, clam shells, urchin tests, small abalone shells, other snail shells, piece of coral skeleton



Learning Procedure

Experiment 2

1. Place small chicken bones or small pieces of shell into 2 1-liter bottles (1 containing tap water and the other containing carbonated water)
2. Hypothesize what will happen in the 2 containers
3. Record observations (in writing and by sketching) each day
4. After the items have started to react to the carbonated water have students review their hypothesis and determine whether it was correct

WEBSITES & ADDITIONAL RESOURCES

1. <http://www.vims.edu/bridge/> - Click on Ocean Science Topics: Biology
2. NOAA: <http://www.pmel.noaa.gov/co2/OA/>
3. Ocean Acidification Network: <http://ioc3.unesco.org/oanet/index.html>
4. National Resources Defense Council: <http://www.nrdc.org/oceans/acidification/default.asp>
6. Channel Islands National Marine Sanctuary: http://channelislands.noaa.gov/sac/pdf/CWG_OAR_final.pdf
7. Carillons National Marine Sanctuary: http://farallones.noaa.gov/pdfs/manage/OceanAcidification_021209.pdf
8. <http://www.oesd.noaa.gov/BWET/09conference/materials.html>
9. Climate Change Animations: <http://www.archipelago.co.uk/articles/climate-change-animations-launched>



For More Information

National Education Coordinator NOAA
National Marine Sanctuary Program 1305
East-West Highway, N/ORM63 Silver
Spring, MD 20910
(301) 713-3125 (301) 713-0404 (fax)
sanctuary.education @noaa.gov

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