

## Marine Osteoporosis

### Activity Summary

In this lesson students will explore the effects of acidic oceans on certain marine organisms in the ocean food web. Students will conduct a science experiment using the scientific method to see the effects of increased acidity on certain species. The experiment will show how certain marine organisms are affected by higher acidity in the ocean versus how they are affected by less acidic water.



Photo: Joe Hoyt, NOAA

### Timeframe

- 30 minutes for initial set up
- 5-10 minutes each day for 3-5 days after set up to record observations

### Learning Objectives

Students will be able to use the scientific method to hypothesize, test, record, and make conclusions 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 CO<sub>2</sub> is absorbed into the water the resulting chemical process reduces the amount of available carbonate ions used 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 reefs. 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.

## Prep/Materials

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

## Experiment

1. Fill 2 1-liter bottles
  - a. One with tap water
  - b. One with carbonated water
2. Place small chicken bones or small pieces of shell into each bottle and replace bottle cap
3. Hypothesize what will happen in the 2 bottles
4. Record observations (in writing and by sketching) each day for 3-5 days after experiment has begun
5. After the items have started to react to the carbonated water, have students review their hypothesis and determine whether it was correct

## Conclusion

1. What happened to the bones or shells in the carbonated water? The tap water?
2. How long did it take before you saw a change in the bones/shells in either of the bottles?
3. How does this relate to ocean acidification and the effects it has on certain marine organisms?