THE PLASTIC OCEAN

FOR THE TEACHER

Discipline
Human Interaction

Theme
Pollution

Synopsis
Students measure the strength of plastic six-pack rings and classify plastic samples according to how animals would see them.

Key Concept
Plastic pollution from human activities can harm or kill marine animals when they eat drifting plastic or become entangled in it.

Science Process Skills
observing, inferring, comparing, organizing

Vocabulary
pollution, plastic, litter, entanglement

MATERIALS
- 5-20 plastic 6-pack rings
- broom handle, iron bar, or piece of pipe
- two 12 foot lengths of rope
- measuring tape

INTRODUCTION
Every year over 14 billion pounds of trash are dumped into the ocean, much of it from large ships and fishing boats. Some of it sinks to the bottom, some of it is eaten by marine animals, and much of it floats in the upper water column. Non-biodegradable plastics are among the most damaging and potentially harmful pollutants in the sea; they don't break down. Because they don't decompose, plastic garbage in the ocean is accumulating from year to year.

Plastics are particularly dangerous to marine animals because they often are relatively invisible or transparent, so animals swim into them inadvertently. Plastic fishing lines, nets, and packaging are dumped into the ocean where they can drift around for years, trapping fish which then become deadly bait for mammals, birds, and turtles, which in turn also become entangled. Gulls are caught with 6-pack plastic rings around their necks with no way to remove them. Plastic strips from shipping containers and fishing nets become wrapped around the necks of seals and sea lions where they tighten as the animals grow. In addition, animals mistakenly eat certain plastic products that resemble their normal food items. Seabirds will take plastic resin pellets for fish eggs, and sea turtles mistake plastic bags for jellyfish. Plastics may be responsible for as many deaths of marine animals as oil spills and other toxic substances. Plastics dumped at sea eventually wash ashore onto beaches where they endanger gulls and shorebirds. Likewise plastics left or washed on shore are eventually carried by wind and tides back into the ocean. Collecting trash off beaches is our only opportunity to break this unending cycle of death caused by plastic pollution.

Recycling of plastics is limited because of the great variety in materials used and lack of affordable recycling programs. Some scientists have developed a substance made of mixed plastic and cornstarch that may be partially biodegradable. This will be especially useful to farmers using mass quantities of sheeting to prevent weed growth. And some polyethylene plastics degrade when exposed to the ultraviolet radiation of the sun. An additional problem with plastics is that most are petroleum-based products. Commercial use of plastics not only adds to marine pollution, it continues to deplete our limited reserves of oil. Many cities and individuals have made choices to decrease their use of plastic packaging to reduce the need for its manufacture and eventual dispersal.

INTO THE ACTIVITIES

Sizing Up Six-Packs

Ask for volunteers to match their strength against six-pack rings. First, have two students try to break a ring on his/her own. If they are not successful, have them try it together, combining their strength.

Loop several six-pack rings onto the broom handle, pipe, or iron bar and lay the broom handle across the top of a piece of playground equipment such as monkey bars with the 6-packs hanging down. Make sure the broom is secure and well-supported. Have volunteers of different weights try hanging from the rings, one at a time, each from a new six-pack. Be prepared with an adult or aide "spotting" for students in case they lose their grip and fall. Measure each

six-pack to see how much it has been stretched and compare this with an unstretched original.

Give as many students as want the opportunity to test the strength of the six-pack rings so they are convinced from their own experience. While some students are testing, others can be measuring and recording results.

Tug of War
Fold two six-pack rings together lengthwise into a four-layer three-ring. Now tie a rope to each end of the three-ring loops and play tug of war, starting with two students on each end of the ropes. Add two students at a time until the rings finally break. Make sure you are on a lawn or soft surface to prevent hard falls.

THROUGH
THE ACTIVITIES

Sampling Plastics
Ask students to collect as many examples of plastic from their homes as they can find over a period of a week. Have them bring these samples to school and spread them out where everyone can see the diversity of materials. Caution students to rinse out containers before bringing them in to get rid of remaining food or any chemicals.

Separate the samples into three groups: 1) those that might be perceived by marine animals as FOOD, and 2) those that might ENTANGLE or possibly KILL animals, and 3) those that would probably have NO EFFECT or not bother animals at all. Discuss each sample as you look at it, trying to imagine how it would be seen by an animal.

After beginning the classification of the plastics samples, let students take the lead and go around in a circle, each person picking a piece and saying how they would classify it.

DISCUSSION
1. Do you think a trapped seabird, seal, or turtle could exert enough strength or pressure to break out of plastic six-pack rings entangled around their necks? How many people does it take to break these loops? Why are these plastic rings made so strong?

2. How long do you think it would take for a plastic six-pack ring to rot in the ocean? (Some plastics last up to 450 years, but we don't really know how long it takes for plastic to decompose in the ocean.)

3. Why are there so many kinds of plastic? Which of your samples of plastic could be used again or recycled? Where did you find each of the samples of plastic? How might they travel from that source to the beach or ocean?

4. Why would it be dangerous for people to leave plastic litter on the beach? (It would be washed into the ocean and float around where marine animals could become entangled or try to eat it.)

BEYOND
THE ACTIVITIES

Follow up with a survey of the school grounds, looking for more examples of plastic litter. Make a display of samples, both from the school and from home, to show other classes how plastic litter might be perceived by animals.

Tack or nail a selection of plastic samples to a board and put them outdoors where they will not be disturbed for one month. Check the samples once a week and record the changes you see. How does plastic deteriorate? How long do you think it takes to completely break down?

Adopt a beach, stream, park, or sidewalk, and patrol it regularly for plastic litter. Collect what you find and weigh it. Let the newspapers know what you are doing and how much you are collecting. Help others become aware of the extent of the problem.

Make posters explaining how to cut six-pack rings so the loops are broken and no longer dangerous to animals. Post them around the community or in stores where people buy soft drinks. Make other posters which encourage people to protect marine life by reducing the amount of plastic they buy and use.

Show your class the slideshow or video, "Marine Debris and Entanglement" from the Center for Marine Conservation. For information, call or write:

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