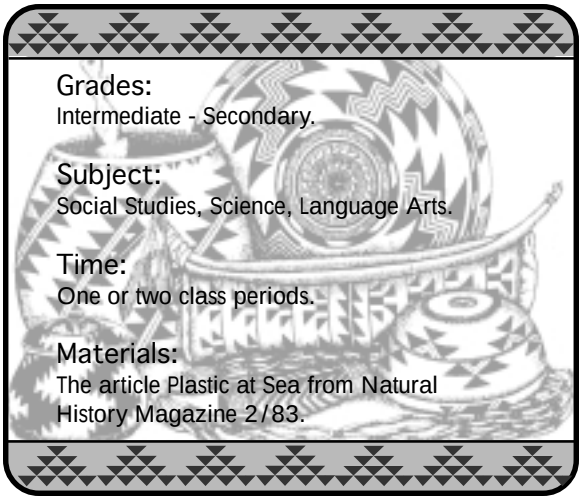
LESSON 12

Plastic Trash and Wildlife

Major Concept

The introduction of unnatural substances in the environment by people can do great harm to wildlife.



Objectives

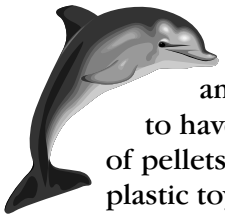
As a result of this activity students will be able to describe:

1. the negative effects of plastic solid waste on wildlife; and

2. what each person can do to avoid adding to this problem.

Background

Since the early 1970s, the amount of plastic in the marine environment has increased dramatically. Plastic negatively affects wildlife in a number of ways. Some animals mistake plastic for food to eat. For example, sea birds are known to have eaten plastic in the form of pellets, bits of polystyrene, even plastic toy soldiers. In addition, sea turtles, apparently regarding plastic bags as jellyfish upon which they regularly feed, have been found with balls of plastic in their stomachs. (One such ball, when unraveled, measured 9 feet wide and 12 feet long.) Other animals found to have eaten plastic in one form or another are: whales, dolphins, bottom fish, a manatee, sea snails and worms, and plankton. Another damaging effect of plastic trash on wildlife is the entanglement of animals in everything from six-pack holders to plastic rings, discarded fishing line and nets. Plastic debris is responsible for the death of 100,000 marine mammals. "Some government officials estimate that about 50,000 northern fur seals currently die in North Pacific waters each year as a result of entanglement in fishing gear. In 1975, the National Academy of Sciences estimated that commercial fishing fleets alone dumped more that 52 million pounds of plastic packaging material into the sea and lost approximately



298 million pounds of plastic fishing gear, including nets, lines, and buoys" (Plastics at Sea).

Procedure

1. Have each student bring to class any plastic litter found near his/her house.

2. Discuss: What non-renewable natural resource is plastic made from? (petroleum) What uses other than making plastics can you think of for this resource? (Referring to the collected plastic litter.)

   Inquire: What other material or container could have been used in place of this piece of plastic? Why is plastic litter even more of a problem than many other kinds of litter? Where did all this plastic come from? Why do people litter? Do you litter?

3. Have students make a list of the wildlife commonly found in the area where the plastic clutter and trash were recorded or collected.

   Ask: How will this plastic affect the wildlife we have listed? In what ways might this plastic litter endanger wildlife? Show accompanying pictures and share some of the information from Teacher Background.

   Ask: Why is so much material that harms wildlife manufactured? What can each of you do to lessen the negative impact of plastic trash on wildlife?

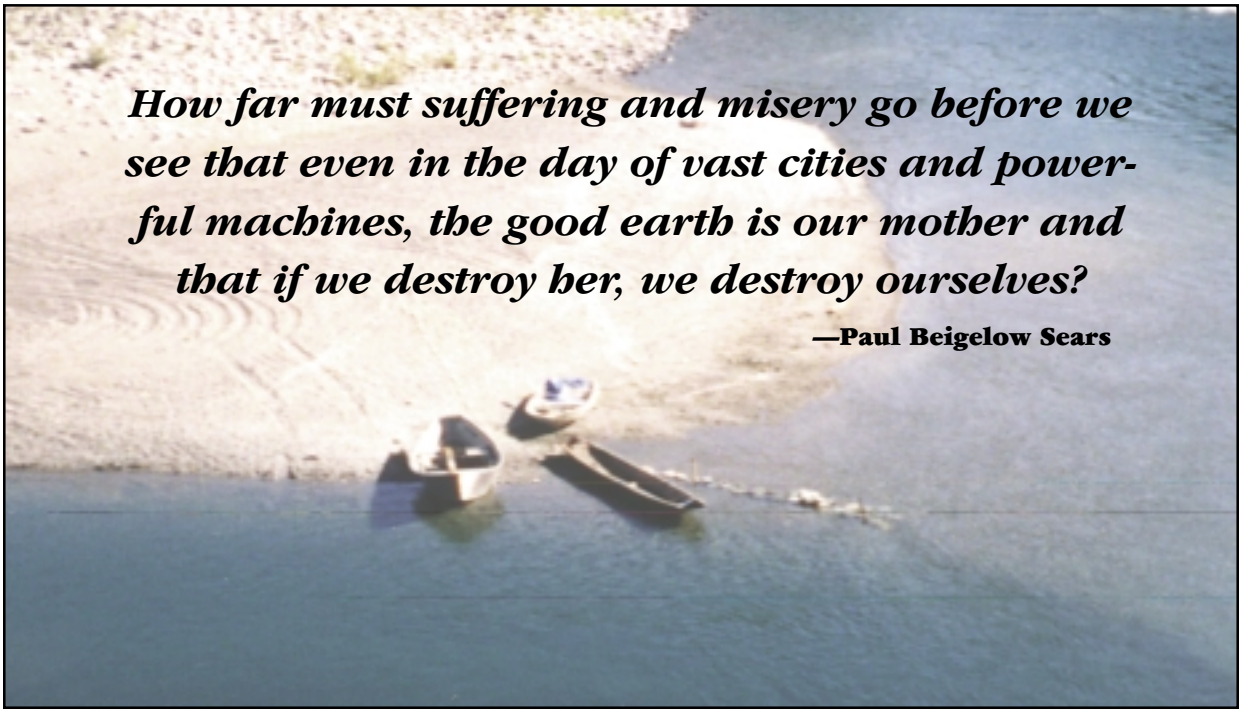
Discussion

From what nonrenewable natural resource is plastic made from?

Why is plastic litter even more of a problem than other kinds of litter?

In what ways does plastic waste and litter endanger wildlife?

Adapted from P*roject WILD*, 1986.



Plastics at Sea

by D.H.S. Wehle & Felicia C. Colernan

Throughout the 1970s, a number of biologists studying the feeding habits of sea birds in different oceans of the world recounted the same story the birds were eating plastic. Similar reports of plastic ingestion and of entanglement in plastic debris began to surface for other marine animals off southern New England, turtles off Costa Rica and Japan, whales in the North Atlantic. At the same time, plastic particles turned up in surface plankton samples from both the Atlantic and Pacific oceans; plastic debris was retrieved by benthic trawls in the Bering Sea and Britain's Bristol Channel; and plastic pellets washed ashore in New Zealand in such large numbers that some beaches were literally covered with "plastic sand." By the close of the decade, marine scientists around the world had become aware of a new problem of increasing ecological concern-plastics at sea.

Two forms of plastic exist in the marine environment, "manufactured" and "raw." Manufactured plastic material along beaches and adrift at sea is primarily refuse from transport, fishing, and recreational vessels. In 1975, the National Academy of Sciences estimated that commercial fishing fleets alone dumped more than 52 million pounds of plastic packaging material into the sea and lost approximately 298 million pounds of plastic fishing gear, including nets, lines and buoys. Raw plastic particles-spherules, nibs, cylinders, beads, pills, and pellets - are the materials from which products are manufactured. These particles, about the size of the head at a wooden match, enter the ocean via inland waterways and out fallstorm plants that manufacture plastic. They are also commonly lost from ships, particularly in the loading and unloading of freighters. Occasionally, large quantities are deliberately dumped into the sea.

Much of what we know about the distribution patterns and abundance of raw plastic in the world's oceans comes from plankton sampling of surface waters.

Inevitably, many animals foraging in the marine environment will encounter and occasionally ingest these widely distributed plastic materials. Sea birds choose a wide array of plastic objects while foraging: raw particles, fragments of processed products, detergent bottle caps, polyethylene bags, and toy soldiers, cars, and animals. Marine turtles on the other hand, consistently select one item—plastic bags. In the past few years, plastic bags have been found in the stomachs of marine turtles. Polystyrene spherules have been found in the digestive tracts of one species

of chaetognath (transparent, worm like animals) and eight species of fish in southern New England waters. They have also turned up in sea snails and in several species of bottom-dwelling fishes in the Several Estuary of southwestern Great Britain.

Marine mammals are not exempt from participation in the plastic feast. Stomachs of a number of beached pygmy sperm whales and rough-toothed dolphins, a Cuvier's beaked whale, and a West Indian manatee contained plastic sheeting or bags. In addition, Minke whales have been sighted eating plastic debris thrown from commercial fishing vessels. Curiously, plastic has not been found in any of the thousands of fur seal stomachs examined from Alaska.

The obvious question arising from these reports is, why do marine animals eat plastic? In the most comprehensive study to date, Robert H. Day of the University of Alaska maintains that the ultimate reason for plastic ingestion by Alaskan sea birds lies in plastic's similarity in color, size, and shape to natural prey items. In parakeet auklets examined by Day, for example, 94 percent at all the ingested plastic particles were small, light brown, and bore a striking resemblance to the small crustaceans on which the birds typically feed.

Marine turtles also mistake plastic objects for potential food items. Transparent polyethylene bags apparently evoke the same feeding response in sea turtles as do jellyfish.

Sea birds, marine turtles, and marine mammals all eat plastic. Perhaps ingesting plastic is inconsequential to their health. After all, cows are known to retain nails, metal staples, and strands of barbed wire in their stomachs for more than a year with no ill effects. For marine animals, however, the evidence is growing that in some cases at least, ingested plastic causes intestinal blockage. George R.Hughes of the National Parks Board, South Africa, extracted a ball of plastic from the gut off an emaciated leather back turtle; when unraveled, the plastic measured nine feet wide and twelve feet long. There is little doubt that the plastic presented an obstruction to normal digestion.

The 20 dead birds discovered on a beach in southern California, all with plastic in their digestive tracts, presents less clear case. Did the birds suffer an adverse physiological response after eating plastic or were they already under stress because of a reduced food supply and eating the plastic in a last-ditch effort to prevent starvation? The same question applies to other instances of emaciated animals that have eaten plastic. At this time, we don't have an answer.

We do know that plastic is virtually indigestible and that individual pieces may persist and accumulate in the gut. Ingested plastic may reduce an animal's sensation of hunger and thus inhibit feeding activity. This, in turn, could result in low fat reserves and an inability to meet the in-

creased energy demands of reproduction and migration. Plastic may also cause ulcerations in the stomach and intestinal linings, and it is suspected at causing damage to other anatomical structures. Finally, ingestion of plastic may contribute synthetic chemicals to body tissues. Some plasticizers, for example, may concentrate in fatty tissues, their toxic ingredients causing eggshell thinning, aberrant behavior, or tissue damage. When highly contaminated tissues are mobilized, these toxins may be released in lethal doses.

A more obvious effect of plastic pollution is the aesthetic one. Whether we venture deep into the woods, high atop a mountain, or out on the ocean to escape the trappings of civilization, our experience of the natural world is often marred by the discovery of human litter. Even more disturbing to the spirit is the sight of a young pelican dangling helplessly from its nest by a fishing line, a whale rising to the surface with its flukes enshrouded in netting, or a seal nursing wounds caused by a plastic band that has cut into its flesh. Unfortunately, such observations are becoming more and more common, another consequence of plastics at sea.

During the last 20 years, fishing pressure has increased dramatically in all the world's oceans, and with it, the amount of fishing-related debris dumped into the sea. In addition, the kind of fishing equipment finding its way into the ocean has changed. Traditionally, fishing nets were made of hemp, cotton, or flax, which sank if not buoyed up. These materials disintegrated within a relatively short time and, because of the size of the fibers, were largely avoided by diving sea birds and marine mammals. With the advent of synthetic fibers after World War II, however, different kinds at nets came into use. These new nets were more buoyant and longer-lived than their predecessors, and some of them were nearly invisible under water.

The result of these changes in net materials has been a tragic increase in mortality of air-breathing animals. Incidental catch refers to nontarget animals that are accidentally caught in an actively working net. Another kind of net-related mortality is known as entanglement and relates to any animal caught in a net that has been lost or discarded at sea. Unlike working nets, which fish for specific periods of time, these free-floating nets, often broken into fragments, fish indefinitely. When washed ashore they may also threaten land birds and mammals; in the Aleutian Islands, for example, a reindeer became entangled in a Japanese gill net.

Plastic strapping bands - used to secure crates, bundles of netting. and other cargo, are another common form of ship-generated debris. Discarded bands are often found girdling marine mammals, which are particularly susceptible to entanglement because at their proclivity for examining floating objects.

Sea birds that frequent recreational waters or coastal dumps are also subject to ringing by the plastic yokes used in packaging six-packs of beer and soda pop. Gulls with rings caught around their necks are sometimes strangled when the free end at the yoke snags on protruding objects. Similarly, pelicans, which plunge into the water to feed, run the risk of diving into yokes. If the rings become firmly wedged around their bills, the birds may starve.

Not all encounters with plastic prove harmful to marine organisms. Some animals are incorporating the new material into their lives. Algae, marine worms, and small crustaceans attach to plastic floating at sea; bacteria proliferate in both raw and processed plastic refuse.

Plastic provides these organisms with long lived substrates for attachment and transport; in some cases, hitching a ride on floating pieces of plastic may alter an organism's normal distribution.

Several species of tube-dwelling polychaetes construct the tubes of raw plastic particles present in benthic sediments. Marine birds all over the world incorporate plastic litter into their nests, but in this case, the use of plastic may be harmful because chicks can become entangled in the debris and die.

Instances of marine animals adapting to this new element in their environments do not alter the predominantly negative effect of plastics at sea. The problem is global and its solution will require international cooperation. Historically, the high seas have, in many respects, been considered an international no-man's land. Recently. however perception of the ocean as a finite and shared resource has caused many nations to express concern for its well-being.