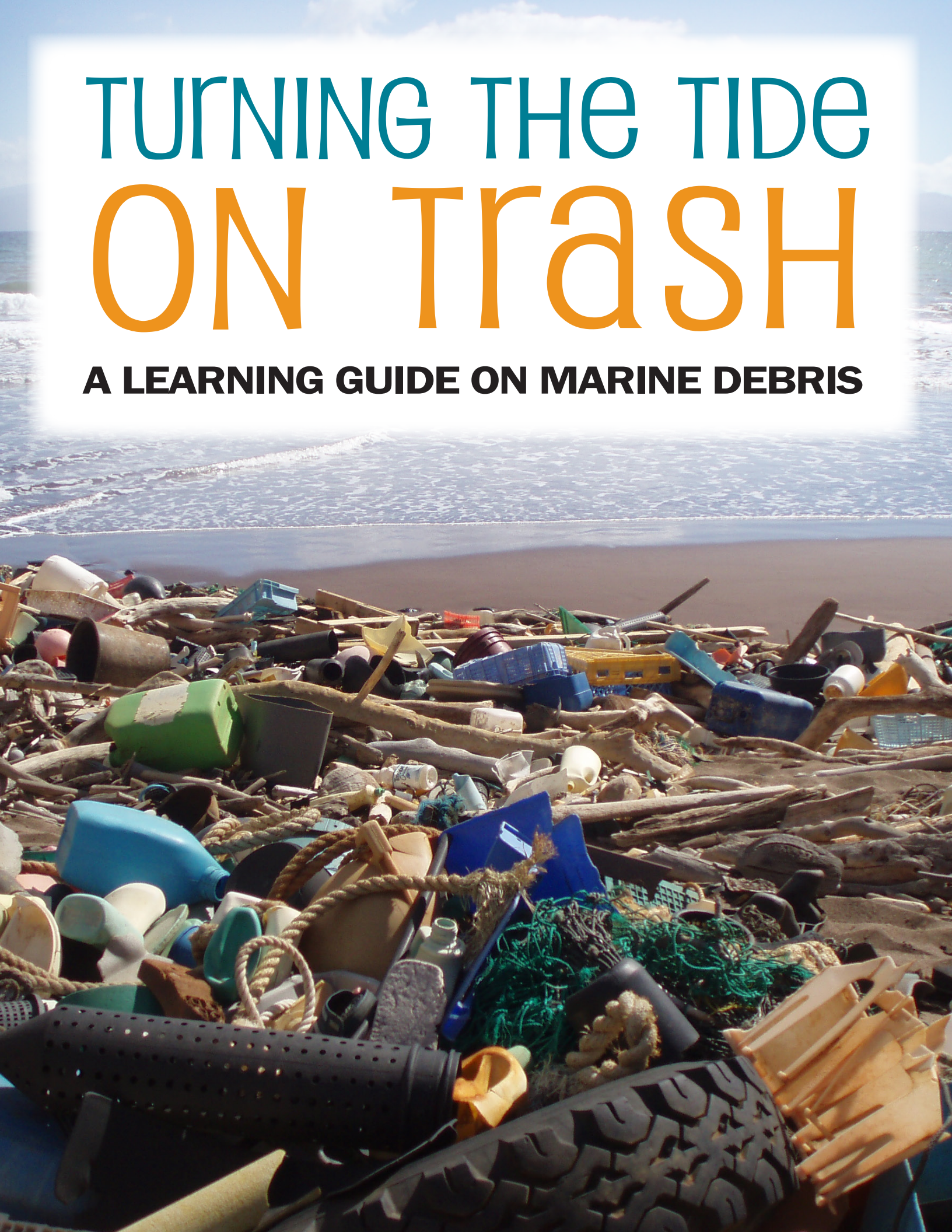
# Turning the Tide on Trash

## A LEARNING GUIDE ON MARINE DEBRIS



UNIT TWO

# The Effects of Marine Debris

*Entangled sea turtle*

J. Baker, NOAA

Marine debris can have serious impacts on both marine wildlife and humans. Debris can entangle, maim, and even drown many wildlife species. Animals can also mistake some debris for food; once ingested, these materials can cause starvation and/or choking. Although almost any species can be harmed by marine debris, certain species – including seals, sea lions, seabirds and sea turtles – are more susceptible to its dangers than others. For humans, marine debris can be a health and safety hazard. The impacts of marine debris can also result in economic hardships for coastal communities related to tourism and the fishing industry.

## How Does Marine Debris Affect Marine Wildlife?

The two primary threats that marine debris poses to marine wildlife are **entanglement** and **ingestion**. Entanglement results when an animal becomes encircled or ensnared by debris. Some entanglement occurs when the animal is attracted to the debris as part of its normal behavior or out of curiosity. For example, an animal may try to play with a piece of marine debris or use it for shelter. Some animals, such as seabirds, may see fish caught in a net as a source of food, and become entangled while going after the fish.

Entanglement is harmful to wildlife for several reasons:

- It can cause wounds that can lead to infections or loss of limbs.
- It may cause strangulation, choking, or suffocation.
- It can impair an animal's ability to swim, which may lead to drowning, or make it difficult for the animal to move, find food, and escape from predators.

Ingestion occurs when an animal swallows marine debris. Ingestion sometimes happens accidentally, but generally animals ingest debris because it looks like food. For example, a floating plastic baggie can look like a jellyfish, and resin pellets (i.e., small, round pellets that are the raw form of plastic, which are melted and used to form plastic products) can resemble fish eggs. Ingestion can lead to choking, starvation or malnutrition if the ingested items block the intestinal tract and prevent digestion, or accumulate in the digestive tract and make the animal feel "full," lessening its desire to feed. Ingestion of sharp objects can damage the digestive tract or stomach lining and cause infection or pain. Ingested items may also block air passages and prevent breathing, causing the animal to suffocate.

## ENDANGERED AND THREATENED SPECIES

Marine debris can pose significant threats to threatened and endangered species.

**Endangered species**: A species of animal or plant that is in immediate danger of becoming **extinct**.

**Threatened species**: A species whose numbers are low or declining. A threatened species is not in immediate danger of extinction, but is likely to become endangered if it is not protected.

In the United States and throughout the world, many species of plants and animals are in danger of going extinct. In the United States, these species and "... the **ecosystems** upon which they depend" are protected by the **Endangered Species Act (ESA)**.

The ESA is administered by two federal agencies:

- US Fish and Wildlife Service (FWS) **(www.fws.gov)**
- National Oceanic and Atmospheric Administration (NOAA) Fisheries, Office of Protected Resources **(www.nmfs.noaa.gov/pr/species/)**

NOAA Fisheries deals with marine species, and the FWS has responsibility over freshwater fish and all other species. Lists of endangered marine animals (including whales, seals, sea turtles, and fish) can be found at **www.nmfs.noaa.gov/pr/species/esa/.**

*Endangered green sea turtle*

There is also an international agreement called the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) that protects wildlife against over-exploitation by restricting international commerce in plant and animal species believed to be actually or potentially harmed by trade. This agreement between governments aims to ensure that international trade in specimens of wild animals and plants does not threaten their survival. For more information, visit **www.cites.org.**

*Hawaiian monk seal with fish trap piece on muzzle*

## Affected Animals

Marine mammals, sea turtles, birds, fish, and crustaceans all have been affected by marine debris through enganglement or ingestion. Unfortunately, many of the species most vulnerable to the impacts of marine debris are **endangered** or **threatened**. Endangered species are plants or animals that are in immediate danger of becoming extinct because their population levels are so low. Threatened species are plants or animals that may become endangered in the near future.

## Marine Mammals and Debris

A conservative estimate is that more than 100,000 marine mammals die every year from entanglement or ingestion of marine debris.[1] Of the different types of marine mammals, seals and sea lions are the most affected (primarily by incidents of entanglement) because of their natural curiosity and tendency to investigate unusual objects in the environment.[2] Fishing nets, fishing line, ropes, plastic sheeting and packing straps can be major problems for these animals. Some studies have linked the decline of the northern fur seal of Alaska and the endangered Hawaiian monk seal partially due to entanglement in marine debris.[3] Whales, including endangered humpback and gray whales, have been found entangled in derelict fishing nets and line, and some **stranded** (run aground) whales have been found with nets and other forms of marine debris in their stomachs. Manatees (another endangered species) have become entangled in crab-pot lines, and dolphins and porpoises can also get caught in abandoned or active fishing nets. Ingestion of debris by marine mammals appears to occur less frequently, but it has been reported for elephant seals, sea lions, certain types of whales and manatees. These cases are significant because they contribute to or result in the death of the animals due to suffocation or starvation.

*Entangled manatee*

[1] *David Laist, Marine Mammal Commission, private communication, March 22, 2007.*

[2] *Marine Mammal Commission Annual Report to Congress, 2002, http://mmc.gov/reports/annual/welcome.shtml (accessed May 25, 2007)*

[3] *Marine Mammal Commission Annual Report to Congress, 2002, http://mmc.gov/reports/annual/welcome.shtml (accessed May 25, 2007)*

## Sea Turtles and Debris

All six species of sea turtles found in the United States have been found entangled in different types of marine debris, such as fishing line, rope and fishing nets. However, ingestion of debris is an even greater problem for these species, as they are indiscriminate feeders. Sea turtles have swallowed plastic bags because they look like jellyfish, one of their favorite foods. Cases of turtles swallowing balloons, **tar balls**, and other debris that has become encrusted with algae and other marine forms have also been reported. Ingesting debris can block a sea turtle's digestive tract, leading to starvation and a painful death.

### SEA TURTLES

*Entangled loggerhead sea turtle*

Sea turtles are air-breathing reptiles that are well adapted to life in the marine environment. They inhabit tropical and subtropical ocean waters throughout the world. Of the seven species of sea turtles, six are found in US waters: green, hawksbill, Kemp's ridley, leatherback, loggerhead and olive ridley. All of these species are listed as endangered or threatened under the US Endangered Species Act. Learn more about sea turtles at **www.sefsc.noaa.gov/seaturtleSTSSN.jsp**

## Seabirds and Debris

*Entangled shearwaters*

Thousands of seabirds are thought to die from entanglement or ingestion each year. Since many seabirds feed on fish, they are often attracted to fish that have been caught or entangled in nets and fishing line. Unfortunately, when birds prey upon entangled fish, they can become entangled themselves. Entanglement in fishing line has been a particular problem for the brown pelican, which has been listed as an endangered species. Seabirds are some of the most frequent victims of **abandoned nets**. As many as 100 birds have been found in a single abandoned net.[4] Ducks, geese, cormorants, terns, plovers, gulls, and even penguins have been found entangled in debris. The ingestion of resin pellets and other small, colorful plastic pieces can also be a problem for wildlife. Many types of birds have been found to feed on these pellets, most likely because they mistake them for fish eggs or other types of food.

Plastic debris eaten by adult birds can be regurgitated as food for **hatchlings**. In 2006, teachers and scientists involved with the Northwestern Hawaiian Islands Multi-Agency Education Project found a dead Laysan albatross chick with 306 pieces of indigestible plastic in its stomach, some as long as six inches. Normally, the chick's diet consists of pieces of fish, fish eggs, squid and octopus.[5]

[4] *US Environmental Protection Agency, Assessing and Monitoring Floatable Debris, August 2002. EPA Document EPA-842-B-02-002. www.epa.gov/owow/oceans/debris/floatingdebris (accessed May 25, 2007)*

[5] *Patricia Greene, Northwestern Hawaiian Islands Multi-Agency Education Project, "Death of a Laysan Albatross Chick," July 2006, www.hawaiianatolls.org/research/June2006/albatross_death.php (accessed April 17, 2007).*

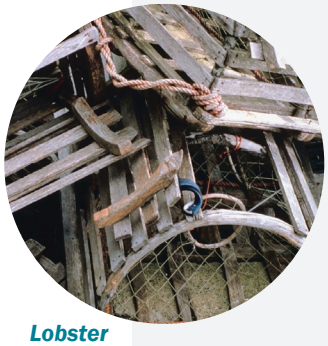
## Fish, Crustaceans and Debris

Fish and crustaceans (such as lobsters and crabs) are frequently caught in lost or discarded fishing nets and fishing line (also referred to as **derelict fishing gear**). This phenomenon is known as **ghost fishing** (see below). For example, a 1/2-mile section of nylon net was found in Lake Superior. The net had been abandoned for an estimated 15 years and contained 100 pounds of fish, much of which was rotten. It is estimated that coastal fishermen in the state of Washington have lost an estimated 150 to 300 **gillnets** per year over a 30 year period. These nets can measure 1,800 feet long and 100 feet deep, resulting in a dangerous ghost fishing situation.

*Entangled crab*

### GHOST FISHING

When fishing nets, fishing line, crab and lobster pots or other fishing gear are lost or discarded, they continue to "fish" for sea animals long after they have been forgotten by fishermen. Fishing nets and fishing lines from commercial fishing boats can be very long and can be transported by currents and waves for long distances. This ghost fishing catches seabirds, fish, sharks, sea turtles and other creatures and most die if they cannot free themselves in time to prevent drowning or starvation.



*Lobster traps*

*Fishing nets collected in Hawaii*

Lost traps also continue to attract fish and crustaceans, which enter them in search of food or shelter. In New England alone, it is estimated that nearly one-half million lobster pots are lost every year.[6] Over 900 derelict crab pots were observed during five days of sonar surveying in the northern Puget Sound, Washington, and studies show that derelict crab pots have a detrimental effect on the Chesapeake Bay – they continue to catch blue crabs and other important living bay resources without ever being retrieved.[7]

In addition to killing marine animals, derelict fishing gear can smother or scour many sensitive aquatic habitats such as **coral reefs**, **sea grass beds** and shallow areas of an **estuary**.

More information about how anyone, including boaters and fishermen, can reduce marine debris can be found at **www.MarineDebris.noaa.gov.**

[6] *US Environmental Protection Agency, Assessing and Monitoring Floatable Debris, August 2002. EPA Document EPA-842-B-02-002. www.epa.gov/owow/oceans/debris/floatingdebris (accessed May 25, 2007)*

[7] *NOAA Office of Response and and Restoration, "NOAA, Virginia Institute of Marine Science Announce Plans to Aid Chesapeake Bay Cleanup," Sept. 5, 2006, www.noaanews.noaa.gov/stories2006/s2693.htm (accessed April 17, 2007)*

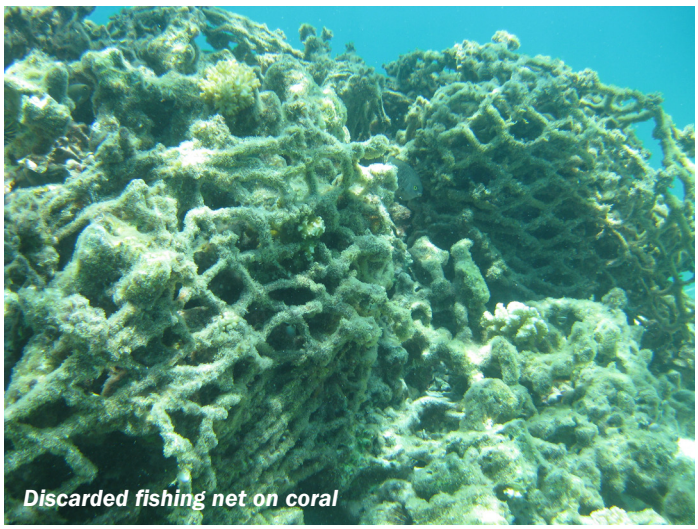
## MARPOL ANNEX V

MARPOL Annex V is an international treaty controlling marine pollution from ships. Countries which ratify MARPOL, including the United States, must pass laws that make it illegal to put ***any*** type of trash into the water from a vessel that is on a US lake, river, or in coastal waters up to three miles offshore. This includes fishing gear such as nets, crab pots, lobster pots, fishing line, and bait containers.

**www.imo.org**

## Other Impacts on Wildlife

Marine and coastal animals are also affected when their feeding grounds, nesting sites and other **habitats** are harmed by marine debris. For example, lost or discarded fishing gear and nets can drag along the ocean floor or through coral reefs, damaging the animals and plants that live there. Tarps and sheets of plastic can smother large areas of the ocean floor, coral reefs and other sensitive habitats.



*Discarded fishing net on coral*

*Pelican caught in fishing line*

As mentioned earlier, many marine animals ingest small pieces of marine debris (primarily made of plastic) that can accumulate in their bodies. **Zooplankton** and other small organisms have been found to ingest micro-particles of plastic. According to a report by the US Environmental Protection Agency, when animals higher on the **food chain** eat those small organisms, they also ingest the debris those organisms have eaten. The debris accumulates in their bodies.[8] The higher an animal is on the food chain, the greater the quantity of the debris that is consumed and accumulated. For example, eagles and other predators high on the food chain have been found with large concentrations of plastic pellets in their stomachs after preying on smaller birds, which ingested the pellets in fish they consumed. This accumulation is called **bioaccumulation**. **Biomagnification** refers to the tendency of pollutants to concentrate as they move from one feeding level (also called trophic level) to the next.

[8] *US EPA, "Assessing and Monitoring Floatable Debris," August 2002, Publication number EPA-842-B-02-002. Full Document at www.epa.gov/owow/oceans/debris/floatingdebris/ (accessed April 17, 2007).*

# How Does Marine Debris Affect Humans?

## Economic Impacts of Marine Debris

Marine debris also can have serious consequences for humans. Marine debris is visually unpleasant both on shore and floating on the water. Marine debris seen and found on beaches and shorelines degrades the quality of coastal areas and lifestyles. Coastal communities can lose millions of tourism dollars when large amounts of marine debris make their beaches unattractive and unsafe to visitors. In addition to the lost revenue, it can also be very expensive for coastal communities to clean up beaches littered with marine debris. Some beach communities spend thousands of dollars purchasing beach-cleaning machines and hiring people to operate the machines.

Lost or discarded fishing gear can financially harm a region's industries in several ways. In addition to the costs associated with replacing the missing gear, marine debris can cause costly or irreparable damage to boats. Fishing nets can wrap around propellers, plastic sheeting and bags can clog cooling water intakes and lost nets or lines can entangle vessels – possibly endangering the ship's crew. Marine debris that wraps around boat propellers or puncture the bottom of boats can disable vessels, thereby endangering human lives. This is especially serious if power is lost in a storm and the boat cannot return to shore or steering is hampered and the boat cannot avoid collision. Even submarines can be obstructed by abandoned fishing nets, making navigation and surfacing difficult.

***Entangled propellor***

When lobster or crab traps are lost, they can trap thousands of animals that consequently are never caught and sold. Ghost fishing also kills an untold number of fish that may have found their way to market or would have spawned the next generation. In 2004, the Northwest Straits Commission worked with local partners to survey derelict gear in Port Gardner, in northeast Washington. Their survey found 842 derelict gear items, with a density of 136 items per square kilometer. When some of the derelict crab pots were retrieved, researchers found that one-third were still actively capturing and killing Dungeness crab, an important commercial species.

The continual loss of animals from ghost fishing can impact populations of commercial and noncommercial species. Ghost fishing can also alter the **species diversity** (the number of species in a community) and the relative abundances of those species. Marine ecological communities, like terrestrial ones, are very complex. Death of wildlife due to ghost fishing is one more factor that affects species interactions in communities.

***Debris on mangroves***

[9] *Northwest Straits Marine Conservation Initiative, "Derelict Fishing Gear Removal," Not Dated, www.nwstraits.org/PageID/142/default.aspx (accessed April 17, 2007).*

## ENSNARED SUBMARINE

In 2005, a Russian submarine sank off Russia's eastern coast after becoming ensnared in a discarded fishing net and cables, which were wrapped tightly around the submarine's propeller and hull. An international rescue effort was launched to rescue the seven-man crew. The vessel's air supply was getting dangeroulsy low when the British Royal Navy cut the entangling debris and released the submarine. All Russian crew members survived. For more information, visit **www.cnn.com/2005/WORLD/europe/08/06/russia.sea/**

## Health and Safety Impacts of Marine Debris

Marine debris also can endanger people's health and safety. Sharp objects, such as broken glass and rusty metal, may cause injuries when people step on them on the beach or ocean floor. Abandoned fishing nets and lines can entangle scuba divers, with some divers barely escaping serious injury or death. Contaminated debris, including medical waste may pose a public health hazard through disease transmission.

*Debris on a Hawaiian beach*

## Key Points

- All species of wildlife can be harmed by marine debris, but certain species are more susceptible to its dangers because their behavior patterns attract them to marine debris. The impact of marine debris on endangered or threatened species is particularly significant because the numbers of these species are already so low.
- The entanglement of animals in marine debris can cause wounds, associated infections, strangulation and the impaired ability to swim, find food, and escape predators. Entangled marine mammals and sea turtles can drown if they cannot reach the water's surface to breathe.
- The ingestion of marine debris by animals can cause starvation, suffocation, internal injuries, and infections.
- Marine debris is an eyesore that litters open ocean and beach environments.
- Marine debris can cost coastal communities a great deal of money in lost tourist revenues. Cleaning up marine debris also can be expensive.
- The impacts of marine debris on an area's fishing industry can be significant. Marine debris damages boats and can kill fish and other important commercial species that otherwise would be sold.
- It can also impact marine ecological communities by changing the diversity and relative abundance of commercial and noncommercial species.
- Marine debris can endanger the lives of people when the functioning of boats and other vessels is impaired.
- It may also cause injuries or transmit disease directly to humans.

GLOSSARY

# Turning the Tide on Trash

**abandoned fishing gear:** See derelict fishing gear.

**abandoned net:** See derelict fishing gear.

**abandoned vessels:** Lost or discarded ships, boats, or other watercrafts.

**annex:** An addition to an established structure or document. The annexes in the MARPOL regulations are the sections containing the specific provisions of the law.

**aquatic habitats:** Freshwater or marine home or environment of a plant or animal; examples include streams, rivers, bays, salt marshes, sea grass beds, oyster beds, coral reefs, and oceans.

**awareness:** To be acquainted with an issue or fact.

**beach:** The part of a coast that is washed by waves or tides, which cover it with sediments of various sizes and composition, such as sand or pebbles.

**best management practices (BMPs):** A method, activity, maintenance procedure, or other management practice for preventing or reducing the pollution resulting from an activity. The term originated in the Clean Water Act. Specific BMPs are defined for each pollution source.

**bioaccumulation:** An increase in the concentration of a chemical in a biological organism over time, compared to the chemical's concentration in the environment. The accumulation process involves the biological storage of substances that enter the organism through respiration, food intake, epidermal (skin) contact with the substance, and/or other means.

**biodegradable:** A process by which microorganisms (bacteria) break materials down into compounds that can be reused in the environment.

**biodiversity:** Short for biological diversity, which refers to the diverse forms of life on Earth and involves three main components:
1. Genetic diversity – diversity within a species, including individuals, eggs, sperm, etc.
2. Species diversity – the different kinds of organisms and their numbers and distribution within an ecosystem.
3. Ecosystem diversity – the variety of habitats and communities of various species that interact in complex, interdependent relationships.

**biomagnification:** An increase in concentration of a pollutant from one link in a food chain to another; the tendency of pollutants to concentrate as they move from one trophic (feeding) level to the next.

**buoyant:** Capable of floating in water.

**business/industry:** Relating to companies, groups of companies, and their representatives engaged in commerce or trade in specific products or services.

**campaign:** An organized effort with a specific goal, such as informing a group of people about a particular subject.

**combined sewer overflow:** Pipes that carry a combination of sewage and stormwater are known as combined sewers. Unlike independent storm sewers, combined sewer pipes run to a sewage treatment plant rather than directly into a nearby body of water. During heavy rainstorms sewage treatment plants can be overwhelmed by the volume of water and discharge raw sewage directly into the receiving water body, bypassing the treatment plant. See outfall pipe.

**coral reef:** Limestone formations produced by living organisms, found in shallow, tropical marine waters. In most reefs, the predominant organisms are stony corals. Reef-forming corals do not grow at depths of over 100 ft (30 m) or where the water temperature falls below 72°F (22°C). Reefs are under numerous environmental pressures, including damage from derelict fishing gear.

**data:** A set of facts or information about a particular subject, which can be analyzed to learn more about the subject.

**debris:** Discarded items; trash and litter; man-made materials and solid wastes that are released accidentally or intentionally into the environment.

**degradable:** Capable of being broken down into smaller pieces by natural forces. See biodegradable and photodegradable.

**derelict fishing gear:** Fishing gear that has been lost or abandoned at some point during use; capable of catching marine life as it continues to float throughout the water column or trap animals. Also capable of smothering sensitive habitats such as coral reefs and sea grass beds. Examples of derelict fishing gear include: nets, crab pots, lobster traps, coils of abandoned or discarded monofilament fishing line.

**disposal:** The permanent storage or removal of trash from the environment.

**diversity:** A measure that combines the number of species in a community with the relative abundances of those species.

**ecosystem:** A natural community composed of biotic (living) creatures that live in connection with each other and abiotic (non-living) elements like sun, soil, and water. An ecosystem can be as big as a planet or as small as a puddle.

**endangered species:** Any species that is "in danger of extinction throughout all or a significant portion of its range," according to the Endangered Species Act of 1973.

**Endangered Species Act (ESA):** A 1973 Act of Congress that mandated that endangered and threatened species of fish, wildlife, and plants and their habitats be protected and restored.

**entanglement:** The looping of a piece of debris around part of an animal's body. Entanglement may impair swimming and feeding, cause suffocation, decrease ability to elude predators, and cause open wounds.

**environmental group:** An organization of individuals concerned with reducing and preventing environmental degradation.

**estuary:** A body of water at the lower end of a river which is connected to the ocean and semi-enclosed by land. In an estuary, sea water is measurably diluted by freshwater from the land.

**extinct:** A species that is no longer in existence. In biology and ecology, extinction is the ceasing of existence of a species. The moment of extinction is generally considered to be the death of the last individual of that species.

**fishing gear:** Equipment used for fishing (e.g., gillnet, handline, harpoon, seine, longline, midwater trawl, purse seine, rod-and-reel, trap, trawler, etc. but not vessels).

**foamed plastic:** A type of plastic that is generally made from polystyrene and consists of small spheres that are fused together. Foamed plastic is very light and easily breaks into smaller pieces. It is frequently used in disposable cups for hot beverages.

**food chain:** A series of animals and plants, each depending on the next for food. A food chain usually forms part of a much larger, more complex food web.

**food web:** A network of living things that depend on each other for food.

**garbage:** Spoiled or waste food that is thrown away, generally defined as food waste. It is also a general term for all products discarded.

**ghost fishing:** The capability of lost or discarded fishing gear, such as nets, traps, or fishing line, to continue to catch fish, shellfish, or other marine life.

**gillnets:** A type of large fishing net designed so fish can get their head into the holes in the net, but not their bodies. Fish become caught by their gills.

**gyre:** A circular pattern of currents in an ocean basin.

**habitat:** The area in which a plant or animal naturally lives, grows, and reproduces that provides adequate food, water, shelter, and living space.

**hatchling:** A bird, fish, or reptile (including a turtle) that has just hatched.

**ingestion:** The consumption of a piece of debris by an animal. Ingestion may cause blockages in the digestive tract, suffocation, or a false feeling of fullness that can lead to malnutrition or starvation.

**inland:** Land areas away from the coast, associated with watersheds.

**landfill:** A specially engineered site for disposing of solid waste on land that is constructed to reduce any hazards to public health and safety. Landfills usually have liner systems and other safeguards to prevent groundwater contamination.

**lifestyle:** The way a person conducts his or her life and how this impacts other people, animals, and the surrounding environment.

**litter:** Improperly discarded wastes; see debris.

**marine:** Relating to the ocean.

**marine debris:** Any man-made object discarded, disposed of, or abandoned that enters the coastal or marine environment.

**marine ecosystem:** A salt-water ecosystem, including oceans and shorelines. Ocean ecosystems include pelagic (sea surface) and benthic (sea floor) communities. Shoreline ecosystems range from rocky and sandy beaches to tidal pools and salt marshes.

**MARPOL Annex V:** MARPOL refers to the International Convention for the Prevention of Pollution from Ships, a set of international conventions concerned with the prevention of pollution (oil, hazardous substances, sewage, plastic, and garbage) from ships. Annex V is the section of this convention that addresses prevention of pollution by garbage from ships.

**medical waste:** Waste that comes from hospitals or other medical institutions and that may be infectious. Medical waste includes needles, bandages, glassware, and other items.

**municipal solid waste:** Garbage or refuse that is generated by households, commercial establishments, and industrial offices; includes durable goods, non-durable goods, containers and packaging, food wastes, and yard trimmings.

**navigable waters:** generally speaking navigable waters are streams, rivers, lakes and other bodies of water that can be used for commercial transportation.

**nondegradable:** Incapable of being broken down into simple compounds or components.

**offshore oil and gas platform:** A structure in the ocean or a bay that forms a base from which oil and gas drilling is conducted.

**outfall pipe:** A pipe that discharges water and other materials into a receiving water body.

**persistent:** In the environment this refers to the ability of a substance or material to remain in the environment for long periods of time without being broken into smaller components.

**photodegradable:** The ability to degrade due to exposure to ultraviolet radiation where the chemical bonds or links in the polymer or chemical structure of a plastic are broken.

**plastic resins:** Material used in making plastics; usually petrochemical-based.

**plastic resin pellets:** Small, round pellets that are produced as the raw form of plastic. Resin pellets are melted down and used to form plastic products. During plastic resin pellet production, transportation, and processing, some resin pellets can be released into the environment. The pellets resemble fish eggs, and can be mistaken for food by marine animals and sea birds.

**press release:** A brief report intended to provide news organizations with the basic facts of an event or issue and encourage them to cover it.

**recycling:** The collection and reprocessing of materials so they can be used again in a similar or different form.

**ring carrier:** See six-pack holders.

**salt marshes:** Low coastal grassland frequently overflowed by the tide. A maritime habitat found in temperate regions, but typically associated with tropical and subtropical mangrove.

**saturated:** Thoroughly wet; unable to absorb any additional liquid. Some marine debris items will float until they become saturated, and will then sink out of the water column to the bottom.

**seagrass beds:** Communities of grass-like marine

plants, usually on shallow, sandy or muddy bottoms of sea. Because these plants require sunlight to photosynthesize, they are limited to growing in shallow and sheltered coastal waters anchored in sand or mud bottoms. Highly diverse and productive ecosystems, seagrass beds are home to hundreds of associated species.

**sewage:** Used water and water-carried solids from homes that flow in sewers to a wastewater treatment plant. Also referred to as wastewater.

**sewage treatment plant:** See combined sewer overflow.

**six-pack holders:** Plastic rings that group a set of beverages and other liquids into a package for shipping and purchase.

**sludge:** Solids that remain after the wastewater treatment process that settle to the bottom of a septic tank or a treatment plant pond. Current regulations require that these materials are disposed of through land applications, incineration, or are land-filled.

**solid waste:** Any solid, semi-solid, liquid, or contained gaseous materials discarded from industrial, commercial, mining, or agricultural operations, and from community activities. Solid waste includes garbage, construction debris, commercial refuse, sludge from water supply or waste treatment plants, or air pollution control facilities, and other discarded materials.

**species diversity:** See biodiversity.

**storm drain:** A pipe system which includes grates, gutters, underground pipes, streams, or open channels designed to transport rain from developed areas to a receiving body of water.

**stormwater:** Runoff in the storm drain system.

**stormwater runoff:** The water that flows along streets or along the ground as a result of a storm.

**stormwater sewers:** See storm drain.

**stranded:** Run aground. See strandings.

**strandings:** A behavioral phenomenon where marine wildlife species that normally live in deeper waters swim into shallow waters or ashore when ill or affected by changes in their environment; species commonly known to strand include sea turtles, whales, and dolphins.

**tar balls:** Crude oil from seeps and spills often form tar residues or tar balls that become stranded on the shoreline.

**threatened species:** Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. A threatened species is not in immediate danger of extinction, but is likely to become endangered if it is not protected.

**trash:** Materials that have been made or used by people and discarded. Also referred to as waste, garbage, and solid waste.

**volunteer:** To offer to work for a cause without pay, generally because the cause is deemed important and in need of support.

**waste water:** Used water and water-carried solids from homes that flow in sewers to a wastewater treatment plant. Also referred to as sewage.

**zooplankton:** Small, usually microscopic animals that are suspended or swim in the water column, including larvae of many fish and benthic invertebrates; the animal component of plankton; the first consumers in a marine food chain.