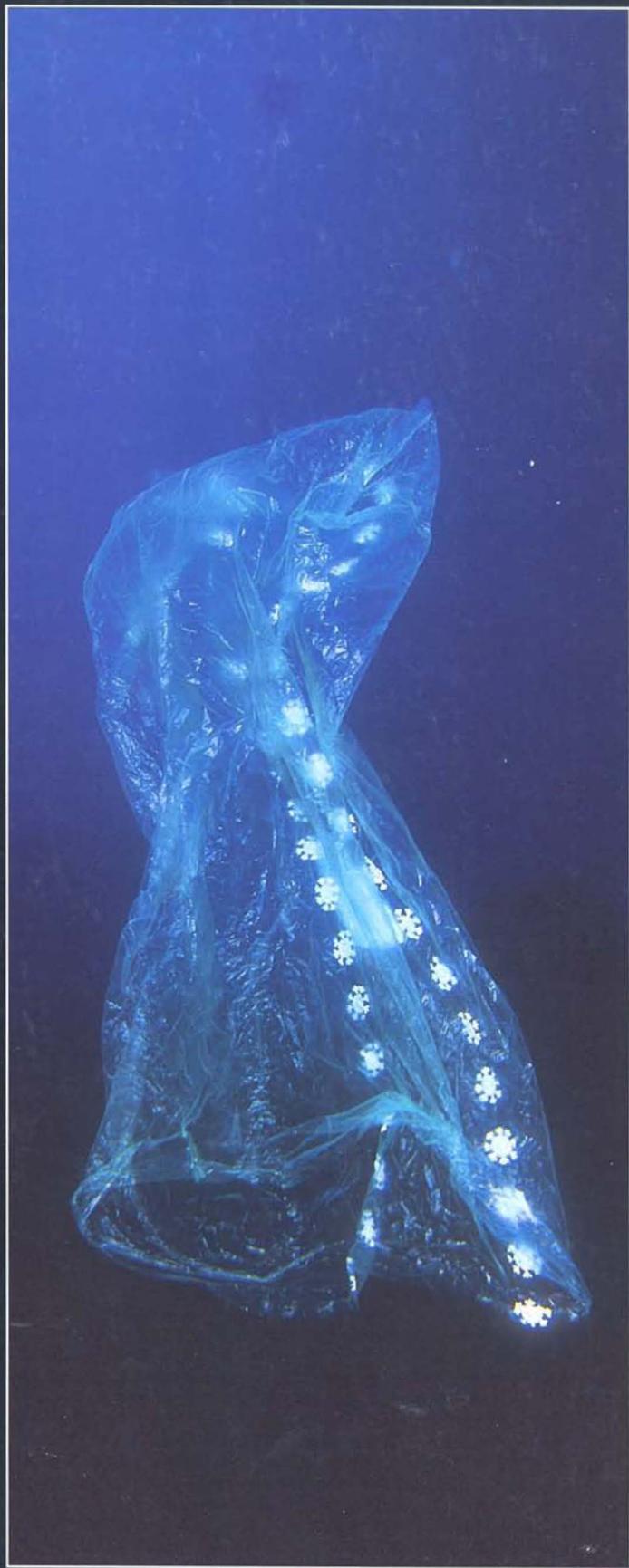


**Marine litter –  
trash that kills**





## Just some rubbish, isn't it?

Marine litter (marine debris) – is that really a problem? Surely, it is just some ugly rubbish on the beach that you can quite easily remove and be rid of. It cannot really be a major problem in the marine and coastal environment, compared to all the threats of toxic pollutants, eutrophication and coastal habitat destruction? Or can it? Unfortunately, the answer is that marine litter has become a more and more serious environmental, economic, health and aesthetic problem around the world.

- Marine litter items travel widely, over long distances, with ocean currents and winds. Marine litter travels around sea areas and between oceans. It is found not only in the water, on seabeds or on the beaches of densely populated regions, but also in remote places far away from obvious sources.
- Marine litter is long-lived and active for decades, directly and indirectly. It consists to a very great extent of plastics, and of metal and glass – materials that do not break down easily or quickly. Plastic litter is a source of persistent organic substances being spread in the marine environment.
- Marine litter is a visible threat to wildlife, but also an invisible one. It is found in horrendous quantities on the seabed, where it kills and injures out of our sight. 'Ghost fishing' by discarded or lost fishing nets is just one of several examples of that.
- Marine litter is a vicious killer of marine mammals, seabirds and many other life forms in the marine and coastal environment. Marine litter injures and causes physical pain and suffering to a wide range of animals, from the largest to the smallest of creatures.
- Medical and sanitary waste, and pieces of broken glass or metal, constitute a health hazard and can seriously injure people, directly or indirectly. Discarded fishing nets can be a safety risk to boaters and divers.
- Marine litter also threatens marine and coastal biological diversity by destroying coastal 'nurseries', where new life would otherwise emerge. And litter items can function as means of transport for invasive species between sea areas.

- Marine litter entails economic costs and losses to fishermen, boat owners in general, coastal communities (tax payers), farmers, power stations and individuals.
- Marine litter spoils and fouls. It is an eyesore and it destroys the beauty of the sea and the coastal zone. This degradation of waters and shores makes us avoid them – if we have a choice.
- When done deliberately, the release of marine litter items – garbage, waste, trash – is an expression of disrespect towards the sea and towards other living beings. If throwing your solid waste into the sea is considered acceptable, what stops us from using seas, lakes and rivers as dumps for other pollutants?

## Found where it should not be

Marine litter (marine debris) includes all objects that do not naturally occur in the marine and coastal environment – water surface, water column, seabed, shore – but are nevertheless found there. As defined by UNEP GPA, marine litter is 'any persistent, manufactured or processed solid material discarded, disposed of or abandoned in the marine and coastal environment'.

Marine litter includes items and material that are either discarded directly (thrown or lost directly into the sea), brought to the sea indirectly by rivers, sewage, storm water or winds, or left by people on beaches and shores.

Marine litter consists of articles that have been made or used by people and, subsequently, deliberately discarded or accidentally lost. In most cases, it is the result of careless handling or disposal of items of solid waste, including containers of liquid waste. However, it can also be material lost at sea in bad weather (fishing gear, cargo). Once in the water, it can blow around, remain floating on the water surface, drift in the water column, get entangled in algae on shallow bottoms, sink to the deeper seabed, or be washed up onto beaches sometimes many miles away.

Marine litter consists mostly of very slowly degradable waste items – items made of persistent materials such as plastics, polystyrene, metal and glass – from a large number of different sources. In many regions, plastics today constitute as much as 90–95 per cent of the total amount of marine litter. These large amounts of plastics constitute a significant

source of pollution with wide-ranging ecological and economic impacts in many regions of the world.

Marine litter includes, among others, galley waste and cargo room waste from commercial shipping, fishing nets and fishing boxes from fishing vessels, household waste, waste from industrial production or distribution, medical waste, and sewage-related waste. Among the many things, from a wide range of sources, which end up as litter in the marine environment in all parts of the world, one can find:

### Plastic and polystyrene items

- Plastic (resin) pellets, raw material for plastics.
- Six-pack rings (yokes).
- Sweets and crisp wrappers.
- Cutlery, straws, cups, saucers, etc.
- Sheeting (from stores or industry).
- Bags and sacks.
- Shrink wrap for household items.
- Disposable diapers (*sewage-related waste*).
- Sanitary towels (*sewage-related waste*).
- Tampon applicators (*sewage-related waste*).
- Cotton-bud sticks (*sewage-related waste*).
- Razors (*sewage-related waste*).
- Syringes and other medical waste, including bandaging and surgical gloves.
- Food containers (including bottles), caps and lids.
- Plastic bottles used e.g. for detergents, cosmetics, medicine and oil.
- Injection gun containers.
- Cans with oil or other forms of liquid hazardous waste.

- Jerry cans.
- Pens, combs, shoes and other items.
- Toys.
- Industrial packaging, including pallet shrink wrap.
- Nets (entire fishing nets, pieces of nets, fishing line).
- Strings, cord, strapping bands, lobster tags.
- Light sticks.
- Boxes (fish boxes from ships and markets, boxes from bakeries and grocers, etc.)
- Oil drums.
- Hard hats.
- Furniture and other large items.
- Explosive cartridges, drill hole plugs, blasting cap protectors.
- Styrofoam (polystyrene) bits or entire packaging items.
- Foamed cups and food containers.
- Buoys.

### Rubber items

- Condoms (*sewage-related waste*).
- Gloves.
- Party balloons.
- Boots.
- Tyres and tyre belts.

### Wooden items

- Construction timber.
- Pallets.
- Wood fragments, including pieces of plywood.
- Crab and lobster pots.



- Crates.
- Corks and ice lolly sticks.
- Paint brushes.
- Furniture.

### **Metal items**

- Aluminium or tin drink cans.
- Aerosol cans.
- Food cans.
- Paint tins.
- Foil wrappers and bottle caps.
- Fishing weights.
- Needles (on syringes).
- Oil drums.
- Bicycles.
- Various metal pieces.
- Industrial scrap, appliances and car parts.
- Wire mesh.
- Wire straps.
- Barbed wire and fencing.
- Metal sheeting.
- Chains.
- Ammunition (still explosive) and firearms.

### **Paper and cardboard items**

- Bags.
- Cigarette packets and cigarette butts.
- Cups.
- Waxed beverage cartons.
- Cardboard boxes and pieces of cardboard.

- Newspapers and magazines.
- Paper towels.

### **Textile and leather items**

- Clothing, including gloves and shoes.
- Pieces of cloth.
- Cleaning cloths.
- Cotton rope and strings.
- Sacking.
- Furnishing.
- Bandaging and swabs (*medical waste*).
- Sanitary towels, tampons, diapers (*sewage-related waste*).

### **Glass, pottery and ceramics items**

- Food and beverage bottles, jars and pieces of these.
- Bottles with pills and liquid medicine (*medical waste*).
- Light bulbs and tubes.
- Pots, crockery.
- Octopus pots.

## **From the surface to the bottom ...**

Marine litter is found everywhere in the marine and coastal environment, all around the world. It has a truly global distribution and is a truly global marine and coastal problem.

- Marine litter is found floating **on the water surface**. Almost 90 per cent of floating marine litter has been estimated to be plastic or polystyrene items. These light objects can easily



be blown around by winds and further transported on the water surface.

- Marine litter is also found **mixed in the water column**, where it can be temporarily transported vertically and horizontally.
- Marine litter is found **resting or drifting on the seabed at all depths**. In the North Sea, it has been estimated that some 70 per cent of the marine litter ends up on the seabed. Half of the remaining amount is found on beaches and half is floating on the water surface. Assessments made in the Dutch sector of the North Sea have indicated an average of over 110 pieces of litter per km<sup>2</sup> of seabed. If this is characteristic of the North Sea at large, a volume of at least 600,000 m<sup>3</sup> of marine litter could be found on the seabed. During a survey in the Mediterranean, 300 million pieces of garbage were found at a depth of 2,500 metres between France and Corsica. Consequently, large quantities of the entire input of marine litter around the world could be sinking to the bottom and be found on the seabed, both in shallow coastal areas and in much deeper parts of seas and oceans.
- Marine litter is found **lying on beaches and shores**, from where it can be transported to the sea by winds or waves.

### ... from the north to the south ...

Furthermore, marine litter is found where one least expects it, in supposedly pristine environments located far from any anthropogenic pollution sources. This shows how floating, persistent items, especially plastic and polystyrene ones, can travel and end up in a place far away from where they once entered the sea.

An astonishing amount of garbage has been found washed up on the shores of the remote Henderson Island, one of the Pitcairn Islands in the southern South Pacific. Almost 300 miles from the nearest inhabited island and over 3,000 miles from the nearest continent, Ducie Atoll is one of the most remote islands. Nevertheless, when visiting it in 1991, an American scientist found over 950 pieces of litter within a 1.5-mile stretch of beach. His findings included buoys, crates, plastic and glass bottles from 15 countries, jars, broken plastic pieces, pieces of plastic pipe, pieces of rope, shoes, fluo-

rescent tubes, light bulbs, aerosol cans, gasoline cans, cigarette lighters, copper sheetings, a piece of a truck tyre, a hard hat, a plastic coat hanger, a toy soldier and half a toy airplane, a football, a car floor mat, and an asthma inhaler.

In 36 places on Livingston Island in Antarctica, well over 1,600 pieces of litter, almost all of them plastic, were found in a survey made in 1997 by Chilean scientists. About one third of the items were strapping bands, ropes and net pieces from fisheries. Well over 700 of the items were made of expanded polystyrene.

Along the shores of Beaufort Sea of the Arctic, aerial surveys performed by Environment Canada revealed the occurrence of marine litter from oil and gas exploration activities, and pieces of polystyrene foam and polypropylene rope. In a survey made in the North Pacific Ocean, with the entire ocean divided into grids, there were sightings of litter in each grid. The foreshores of New Zealand's remote and uninhabited sub-Antarctic territories (Campbell Island and the Auckland Islands) are becoming polluted with litter that has floated from the mainland or been lost or thrown from boats. About 3,500 plastic resin pellets per km<sup>2</sup> have been reported floating on the surface in the Sargasso Sea.

The marine litter transportation mechanisms can also be illustrated by the situation in Scotland and Sweden. Surveys made over a decade indicate that the quantity of identified

#### A source of toxic substances

The use of plastics and other synthetic materials has increased dramatically during the past 30 years. This trend is reflected also in the composition of marine litter, which consists to about 60–80% of plastic items on average, and up to 90–95% in some regions. A very large proportion of the persistent marine litter originates from land-based sources. Long-lived, non-flexible plastic items are particularly harmful to sea birds, turtles, fish, crustaceans, seals, whales, manatees, sea lions and other animals that either ingest plastic items or get entangled in them.

Japanese researchers have recently established that plastic (resin) pellets, a very common component in marine litter, can be a source of toxic substances as they adsorb such substances from the seawater. PCBs, DDE and nonylphenols (NP) have been detected in pellets collected from four Japanese coasts. Pellets constitute about 70% of the plastic eaten by seabirds. Eagles and other predators high in the food web have been found with large concentrations of pellets in their stomachs after preying on smaller birds, and in that way toxic substances may bioaccumulate.

marine litter of Canadian and American origin found on Scottish beaches has increased by 30 per cent. Prevailing currents from the North Sea bring large amounts of litter from the entire North Sea area to the west coast of Sweden. Although only representing two per cent of the total coastal zone of the North Sea region, the Skagerrak area receives about one tenth of the litter in the North Sea.

Countries that have reported marine litter problems include Australia, Argentina, Barbados, Belize, Benin, Bermuda, Brazil, Chile, Colombia, Cyprus, Denmark, Dominica, Dominican Republic, Ecuador, Egypt, France, Germany, Grenada, Greece, India, Indonesia, Ireland, Italy, Israel, Jamaica, Japan, Kenya, Kiribati, Kuwait, Malaysia, Malta, Mexico, Netherlands, New Zealand, Nigeria, Norway, Panama, Papua New Guinea, Peru, Philippines, Portugal, Saudi Arabia, Singapore, Spain, South Africa, Sweden, Thailand, Turkey, United Kingdom, United States, and Venezuela.

## ... and from all kinds of places

Waste that becomes marine litter can enter the marine and coastal environment in many different ways, from sources at sea or on land.

Land-based sources dominate in the vicinity of urban areas, whereas ship-generated litter is a major source of litter on remote shores.

### Main sea- or ocean-based sources

- **Merchant shipping, ferries and cruise liners:** Household (galley) waste. Sewage. Cargo. Waste from cargo holds

(dunnage, wire straps, covering material, cargo residues). Non-oily solid engine-room waste. Packaging material (plastic sheets, boxes). Containers for oil or detergents. Discarded medical and sanitary equipment. Waste is dumped on purpose, due to inadequate storage facilities or negligence, or lack of reception facilities in ports of call. Sometimes it is lost accidentally through careless handling or bad weather.

- **Fishing vessels:** Fishing nets. Fishing lines. Fish boxes. Crab and lobster pots, oyster nets, and lobster tags. Strings for packaged bait. Rubber gloves. Household (galley) waste. Containers for oil or detergents, and sewage. Waste is dumped on purpose, due to inadequate storage facilities or negligence, or lack of reception facilities in ports. Sometimes fishing gear and equipment is lost accidentally through snagging, careless handling or bad weather.
- **Naval vessels and research vessels:** Much the same kind of garbage as from other vessels, but in the case of military vessels also dumping of military items may occur.
- **Pleasure craft:** Household waste. Sewage. Containers for oil or detergents. Recreational fishing gear (angling line and weights). Such waste is usually dumped due to negligence, ignorance or lack of reception facilities in marinas.
- **Offshore oil or gas platforms:** Drill pipes and drill pipe protectors. Hard hats. Cotton gloves. Storage drums. Containers for oil or detergents. Household waste. Discarded medical and sanitary equipment. Waste is usually dumped



from platforms on purpose. Sometimes equipment is lost accidentally through careless handling or bad weather.

- **Fish farming:** Net cages, construction material and feed bags.

### Main land-based sources

- **Municipal landfills located on the coast:** Solid household waste and other items from open waste dumps (landfills) on the coast. The waste can either blow to the sea or reach the sea when dumps are flooded. These landfills could be legal but poorly managed, or illegal.
- **Transport of waste by rivers from landfills or other sources along rivers and other inland waterways:** Solid household waste and other items from open waste dumps (landfills) along rivers. Waste can either be flushed into the river when the water level rises or when there are heavy rains. Waste can also blow from the dump into the river. Dumps could be legal but poorly managed, or illegal.
- **Discharge of untreated municipal sewage and storm water:** Advanced primary, secondary and tertiary municipal sewage treatment, including treatment of storm water, is still the exception rather than the rule in a majority of cities and municipalities around the world. Consequently, untreated or insufficiently treated sewage and storm water is discharged into rivers and directly into the sea. In the case of combined sewage and storm water pipe systems,

heavy rainstorms can also cause overflow in the treatment plant. Storm water carries with it literally all the solid items and liquids thrown on streets and other hard surfaces in municipalities that can be flushed away.

- **Industrial facilities:** Solid waste from landfills, and untreated wastewater. The enormous amounts of plastic resin pellets found in the sea today originate from industrial facilities and from ships carrying this industrial feedstock across seas. Other kinds of industrial waste include production scrap and packaging material.
- **Tourism:** People leave more than their footprints behind when they have been on the beach. They do not mind carrying or transporting plastic bags, various kinds of food packaging, beverage cans and cartons, toys and cigarettes to the beach, but seem to find it too difficult to dispose of the remains in litter bins or back home. Food packaging also blows onto beaches from bins and are dropped by people outside beach front food kiosks.

### 'Too much' – how much is that?

Several attempts have been made to estimate the total amounts of waste reaching the marine environment every year, most of which ends up becoming marine litter.

The U.S. Academy of Sciences has estimated the total input of marine litter into the oceans worldwide at approximately 6.4 million tonnes per year, nearly 5.6 million tonnes of which presumed to come from merchant shipping. As



much as eight million items of marine litter have been estimated to enter oceans and seas every day, about five million of which (solid waste) is thrown overboard or lost from ships. Over 46,000 pieces of mainly plastic litter are now believed to be floating on every square mile of ocean. In a 1998 survey, 89 per cent of the litter observed floating in the North Pacific Ocean was plastic. More than 1,000 pieces of litter per km of beach have been found in British Columbia, 77 per cent of which was plastic or styrofoam. According to surveys, another 100,000–500,000 pieces of litter have been found floating in the coastal waters of British Columbia.

In the Beachwatch 1998 Cleanup along the beaches of the United Kingdom, 322,751 pieces of garbage, weighing about 25 tonnes, were collected from 167 km of coastline. During the 2000 International Coastal Cleanup, about 7,000 tonnes of litter were removed from 30,000 km of beaches in 73 countries in all parts of the world.

According to OSPAR figures (see p. 14), the annual input of marine litter into the North Sea is estimated at some 70,000 m<sup>3</sup>. During the 1990's, some 64,000 m<sup>3</sup> of marine litter was gathered on some 200 km of rocky beach on the Swedish west coast. The average annual amount of litter removed from those beaches is 6,000–8,000 m<sup>3</sup>, much of which consists of labelled bottles, boxes, cans, bags, etc., which clearly reveal their origin from other parts of the North Sea area.

Concentrations of plastic resin pellets ranging from 1,300 to 3,600 pellets per km<sup>2</sup> have been reported from the Cape Basin region of the South Atlantic. Near industrial centres in New Zealand, concentrations of up to 100,000 pellets have been observed in one m<sup>2</sup> of beach. In 1990, American scientists reported a 200–400 per cent increase from 1972 to 1987

in the number of pellets present in the North Atlantic Ocean. In 1998, Japanese scientists at the National Institute of Health Science reported densities as high as 1,000–1,500 of plastic pellets per m<sup>2</sup> on Japanese beaches.

## A slow, vicious killer

Entanglement and ingestion are the two primary kinds of direct damage to wildlife caused by marine litter. Other threats to wildlife and ecosystems include destruction or smothering of the seabed, accumulation of toxic substances, physical disturbances from mechanical beach cleaning, and the transportation of invasive species.

### Entanglement

Entanglement and entrapment means that an animal becomes encircled or ensnared by litter, or that it manages to swim or crawl into an object (bottle, can, trap) but cannot get out of it. This may happen accidentally or because the animal is attracted to litter items as part of its natural behaviour – curiosity or search for food or shelter. Animals can get trapped by both smaller and larger litter items. Items snag on the seabed and act as traps or entwine around animals and restrict the possibility of them growing. Litter items may also become embedded in the animal's flesh as tissues grow around the item.

An animal may try to use a piece of marine litter for shelter or as nesting material. Fish and crustaceans enter various lost traps (in New England alone, nearly 500,000 lobster pots are lost every year) searching for food or shelter and never



find their way out again. Birds collect plastic items to build their nests and as a result their young can become entangled.

An animal may also mistake items or accumulations of litter as a source of food if plants and other animals are already trapped in that litter. Most seabirds feed on fish, and consequently they will be attracted to fish that is caught or entangled in nets and fishing lines. Discarded fishing nets will continue to trap marine mammals, turtles and seabirds and to catch fish as they continue to drift in the sea or along the bottom, often for very long time periods. Such ghost net fishing is a cruel and serious problem in many sea areas around the world.

When an entangled animal tries to free itself wounds can be inflicted by the net, rope, six-pack ring or whatever it has been trapped in. Even if it manages to survive, these wounds may be infected or lead to the loss of limbs, causing further pain and suffering to the animal. In most cases, however, the animal is killed through strangulation or suffocation. Entanglement can also impair an animal's ability to swim. That may subsequently cause it to drown or have difficulty in moving, finding food and escaping predators.

### Ingestion

Ingestion occurs when animals swallow litter items. Generally, animals swallow marine litter items because they resemble prey that is a normal part of the animal's diet. Typical examples of such food mix-ups are when turtles eat plastic bags, mistaking them for jellyfish, and when birds feed on or feed their young with plastic pellets, mistaking them for fish eggs, small crabs, or other planktonic organisms. Cattle are known to eat litter – plastic, glass or metal objects – that have

been washed ashore, and in many places farmers cannot let their animals graze on shore meadows.

Ingestion can lead to starvation or malnutrition if the ingested items block the animal's intestinal tract and prevent digestion. The swallowed litter items can also accumulate in the digestive tract and make the animal feel 'full'. It will then stop looking for real food, and that may lead to starvation.

When an animal ingests sharp objects, such as metal and broken glass, it can damage the digestive tract or stomach lining and cause infection and/or pain. Ingested items may also block the animal's air passage, which makes it impossible for the animal to breathe and eventually causes its death by suffocation.

### Destruction or smothering of the seabed

Litter in the marine environment may also destroy coastal habitats and interfere with biological production. Lost or discarded fishing gear and nets may drag along the sea floor, e.g., through coral reefs, seriously disrupting the animals and plants that live there. On shallow bottoms, plastic sheets can prevent sunlight from reaching plants, inhibiting their ability to produce energy through photosynthesis. Such a plastic cover may also limit the exchange of oxygen between water and sediments at greater depths, thereby hampering the life of bottom-living creatures. Litter buried in sediments can harm organisms dwelling there

### Accumulation of toxic substances

Plastic pellets can be a source of pollutants in that they adsorb toxic substances. Birds of prey and other animals high in the food web have been found with large concentrations



of plastic pellets in their stomachs after preying on smaller birds that previously ingested the material in fish. Furthermore, litter items can leach toxic substances to sediments and water, where it can be absorbed by small algae and animals and cause bioaccumulation in other animals feeding on them.

### **Transportation of invasive species**

Floating litter items have also been found to carry a variety of attached organisms, such as small crustaceans and other animals, algae, bacteria and fungi, to sea areas that these organisms would normally not reach. Pieces of plastic litter with organisms attached to them have been found at sites from the sub-Antarctic to the Equator.

### **Disturbances from mechanical beach cleaning**

Mechanical cleaning of littered beaches – raking and the use of heavy vehicles – may cause disturbances and stress to animals living in the coastal zone. Such beach cleaning activities can disturb turtles nesting and also make the sand too compact for turtles to be able to bury their eggs. Mechanical cleaning can also make beaches erode more easily through removal of natural, accreting material such as seaweed. Moreover, if some of the animals in the beach food web are removed, it can disrupt that web.

### **Costly, dangerous trash**

Marine litter also causes serious damage to people, property and livelihood and has significant economic repercussions on coastal and fishing communities.

### **Damage to fishing vessels and gear**

Fishing vessels are both a source of marine litter and victims of the same problem. If fishing gear (nets, lines, etc.) is lost there are costs associated with the replacement of that gear. Marine litter can also cause costly or irreparable damage to boats. Fishing nets and ropes can wrap around propellers, anchors, or drive shafts. Plastic sheeting and plastic bags can clog cooling water intakes. Problems with propeller foulings, blocked intake pipes and damaged drive shafts have been reported in the North Sea, Alaska, and the eastern coast of North America. According to studies from the Bering Sea and the Gulf of Alaska, 40–60 per cent of bottom trawls collected plastic and metal litter.

In the Shetland Islands, 92 per cent of the fishermen have reported recurring problems with accumulated litter in nets. The catch, net and other equipment could be contaminated by oil containers, paint tins, and oil filters, which may cost up to £2,000 in lost revenue each time. It is estimated that each boat could lose between £6,000 and £30,000 per year due to the negative effects of marine litter. In a survey in the U.S. (Oregon), 58 per cent of the fishermen indicated vessel problems due to plastic litter, at an average expense of \$2,725 per vessel. The cost of marine litter to the fishing community on the Swedish Skagerrak coast has been estimated to be over £620,000 each year.

Based on statistics of damage insurance for fishing vessels in Japan, plastic litter at sea is the leading cause of engine damage. Insurance companies estimate that a total of \$50 million has been awarded for repairs from damage incurred by marine litter.



### Animals particularly at risk

Of 115 species of marine mammals, 49 species are known to become entangled in and/or ingest marine litter. Seals and sea lions are curious by nature and have a tendency to investigate new things, sometimes with fatal results. Whales, dolphins and porpoises have been found entangled in fishing nets and line. Manatees have become entangled in crab-pot lines. Elephant seals, sea lions, manatees, pygmy whales, sperm whales, and round-toothed dolphins have all been found dead from suffocation or starvation after having ingested marine litter like plastic bags and plastic sheeting. Sea turtles also become entangled in fishing line, rope and nets, but ingestion is an even larger problem. They eat plastic bags because the bags look like jellyfish, their favourite food. The bags cause the turtle's digestive tract to become blocked, leading to starvation. About 100,000 marine mammals, including some 30,000 seals, and large numbers of turtles are killed by plastic marine litter every year, around the world.

Sea birds are frequent victims of abandoned or lost fishing nets. Because most seabirds feed on fish, they are often attracted to fish

caught or entangled in discarded nets or fishing lines. Many birds, including ducks, geese, cormorants and gulls, are also entangled in six-pack rings and other encircling pieces of marine litter. Of the world's 312 species of seabirds, 111 species are known to ingest plastics. Between 700,000 and one million seabirds are killed from entanglement or ingestion each year.

Fish and crustaceans (lobsters, crabs) are frequently caught in lost or discarded fishing gear. Corals are damaged when discarded fishing gear and nets drag along the ocean floor or through the reefs. When the reefs are destroyed it affects other animals that are dependent on that environment.

Many of the species most vulnerable to the risks posed by marine litter in their environment are endangered or threatened. This is true for, e.g., all species of sea turtles; the Hawaiian monk seal; the Northern fur seal; humpback whales and grey whales; manatees; and seabirds like the brown pelican.

### Safety risks at sea

If propellers are fouled with marine litter that impairs their function, or holes are punctured in the bottom of the boat, fishing boats and pleasure craft can be disabled, thereby endangering human lives.

This is especially serious if power is lost in a storm and the boat cannot return to port, or steering is hampered and the boat cannot avoid collision. In 1998, the British Royal National Lifeboat Institution (RNLI) attended over 200 incidents to vessels with a fouled propeller at a cost of about £900,000.

### Damage to power stations

Power stations have reported having to clean their near-shore cooling water intake screens more often, at considerable cost, due to accumulations of marine litter.

### Contamination of beaches

Floating litter as well as litter stranded on beaches and shorelines reduces the aesthetic values of the coast significantly. Coastal communities may lose substantial revenues from tourism every year when large amounts of litter make the beaches unattractive. Not only do communities lose revenues,



they must also clean up the beaches at high costs. Beach cleaning operations are necessary in many coastal communities around the world to maintain the recreational values of beaches and other coastal areas. The total annual beach cleaning cost as reported by 64 local authorities in the North Sea region (56 of which are in the U.K.) has been estimated at £2.9 million. Annual beach cleaning operations along the Swedish west coast alone cost about \$1 million.

### **Contamination of harbours and marinas**

Floating litter in commercial harbours and marinas must be removed in order to avoid damage to boats. It is also an issue of aesthetics.

### **Damage to people's health**

Marine litter can endanger people's health. Broken glass and pieces of rusty metal may cause injuries when people step on them either on the beach or on the seabed. Contaminated litter, including medical waste (syringes, bandages, etc.) and sewage-related waste, pose a public health hazard through transmission of infectious diseases. Scuba divers may get entangled in discarded fishing nets and ropes, and a number of divers have experienced serious injury or drowning as a result.

### **Injury to cattle grazing coastal areas**

In many exposed areas, marine litter is blown from the shore onto neighbouring farm or grazing land, where cattle may eat litter items. In many places farmers can no longer let their animals graze on shore meadows before these have been cleaned at considerable costs.

## **Agreements and measures**

Measures to reduce or prevent marine litter are part of a larger issue – waste management in society as a whole – and concerns each and every person. People who are waste-wise in general, and who realize that waste is a common problem and not one that 'someone else' is to take care of, will have the same responsible attitude towards the handling of waste that could end up as marine litter.

Good waste management must begin with preventing waste being generated in the first place. Pollution should be prevented at source. Waste that is never produced does not have to be disposed of and cannot become marine litter. Thus, every effort should be made to prevent the generation of waste. The second step is to collect waste that has been generated and make sure that it is being taken care of properly, either for reuse and recycling of materials and products or for environmentally safe disposal. Consequently, measures to reduce or prevent marine litter have to be taken in a large number of places, in connection with a large number of activities and by many people in many situations.

Education, information and training are vital components in all efforts towards more waste-wise thinking in society as a whole. Education and training is needed for ship owners, ship operators, crews, port authorities, fishermen, users of pleasure crafts and the general public, to raise the awareness of everyone on the sources and effects of marine litter and ways of reducing the problem at source. Also, regular clean-up operations do not only serve the purpose of removing litter from beaches, but also act as major educational and



information campaigns to reach people and make them feel that they can be part of the solution and not only part of the problem.

### **An important annex on garbage**

The International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) is the main international convention aimed at controlling pollution from the shipping sector. It covers all the technical aspects of pollution from ships, except the disposal of waste into the sea by dumping, and applies to ships of all types. It regulates what kind and quantities of polluting substances that ships may discharge into the sea. *Plastics may not be disposed of at sea.*

Annexes to the Convention cover regulations for specific kinds of pollution, and one of them (Annex V) deals with garbage. By March 2001, this agreement had been ratified by 100 states, corresponding to 86 per cent of the world tonnage. According to this agreement, all ships of 400 gross tons and above, or ships certified to carry more than 15 persons, should develop and follow a written garbage management plan. In the North Sea, the Baltic Sea and the Wider Caribbean regions, which have been designated as so-called Special Areas with regard to this agreement, discharges of all kinds of garbage (except food waste) into the sea are altogether prohibited.

All Contracting Parties to the MARPOL Convention should ratify Annex V on garbage. Regional and national authorities need to make sure that the requirements set out in that agreement are met by all ships and ports under their jurisdiction. Waste management routines onboard and reception facilities ashore are called for.

### **Dumping not allowed**

The Convention for the Prevention of Marine Pollution by Dumping of Wastes and Other Matter – the London Dumping Convention – was signed in 1972.

It is a global agreement aimed at controlling dumping of wastes at sea, but is only applicable to wastes that are loaded onto the ship from land-based sources for the deliberate purpose of dumping them at sea. Wastes and other matters that must not be dumped are specifically listed in an Annex to the Convention. Under the Convention, plastic materials and other materials which may cause problems of entanglement and ingestion by marine organisms constitute an environmental hazard. Dumping of such materials is, therefore, prohibited.

### **Regional seas working together**

The Regional Seas Programme of the United Nations Environment Programme (UNEP) was initiated in 1974 as a global programme. At present, it includes 14 regional sea areas and four partner seas with a geographical coverage of more than 140 coastal states and territories. It is an action-oriented programme and focuses not only on the mitigation and elimination of the consequences but also on the root causes of environmental degradation. The focus of work is on sustainable development of the coastal and marine environment through integrated management.

An important accomplishment of the Regional Seas Programme is the creation of regional mechanisms (conventions and action programmes) for co-operation between governments and commitments to shared goals. Management of solid waste and sewage are priority issues in a number of these regional action programmes aimed at controlling land-based sources of pollution.

The Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (UNEP GPA) was adopted in 1995. UNEP was designated as the GPA co-ordinating office and tasked to promote and facilitate the implementation of the programme at the national level, as well as to promote and facilitate the implementation at the regional, including sub-regional level, in particular, by supporting the Regional Seas Programme. Marine litter is one of the priority pollutant source categories within the GPA. In regional reviews of priority issues, solid waste management and marine litter have been given high priority in:

- the Mediterranean (particularly solid urban waste);
- the Caribbean (persistent synthetic and other materials including garbage that float, flow or remain in suspension, or settle to the bottom and affect marine life and hamper the uses of the sea);
- West and Central Africa; and
- Eastern Africa (reduced litter impact on the environment).

### **What to do onboard ships, boats and platforms...**

Efforts should, first of all, be made to reduce the generation of waste onboard merchant ships and oil and gas platforms. Waste management plans are needed for larger vessels and platforms, and preparations for proper waste management should be made in advance also by those who are onboard small vessels and pleasure craft. Waste should be stored onboard and discharged ashore to a proper reception facility.

### ... onboard fishing vessels ...

Efforts should be made to reduce the generation of waste onboard, and preparations should be made for storage of waste onboard until one comes ashore. Fishing gear, particularly drift nets, should be marked to make it possible to find them again if they are lost at sea. No fishing gear should be deliberately discarded, rather it should be taken ashore for proper disposal.

### ... with municipal landfills and sewage ...

Generally, efforts need to be promoted to enhance land-based waste management, including the proper management by municipalities and industries of inland and coastal landfills and wastewater treatment. Coastal communities/municipalities and those along rivers should make sure that open landfills for household waste and/or industrial waste are eliminated, as part of their overall waste management strategy. Sewage treatment, in adequately equipped facilities, should be a priority for all municipalities. Efforts should also be made to treat sewage from individual households.

### ... in households ...

Sanitary waste should never be flushed down the toilet but treated as any other kind of household waste. Household waste should be sorted and taken proper care of. Wise waste management begins at home.

### ... and when visiting a beach or a camping site

All beaches and camping grounds should be sufficiently equipped with waste bins to cater for the needs of visitors using these locations. However, as a visitor one should, pref-

erably, always take home one's own trash and make sure that it is properly sorted and disposed of for maximum recycling. Anyone capable of carrying full containers and bottles to the beach can also carry them home empty.

## Marine litter in the NE Atlantic

Litter in the marine and coastal environments has been an issue of concern in the Northeast Atlantic region, and particularly in the North Sea, for more than a decade. People in most of the countries in the region have become increasingly concerned about having their beaches and near-shore waters polluted by litter and by the effects on wildlife. As a result, the effects of litter on the quality of the coastal and marine environment, and the hazards posed to human health by some types of litter, have been well documented throughout the region.

Coastal clean-up operations have been conducted for many years in most of the countries of the region. Local communities or non-governmental organizations have to carry most of the often high costs of these operations. In many cases, governments refer to coastal cleaning as a municipal responsibility, although the problem cannot to any larger extent be prevented by the municipalities concerned.

The objective of NGOs like Coastwatch Europe, UK Marine Conservation Society, and Stichting De Noordzee, is to raise awareness of the coastal zone as a valuable common, shared and vulnerable resource. They also work to gather baseline data on European coasts, for the use by local communities, authorities, governments, and research organizations.

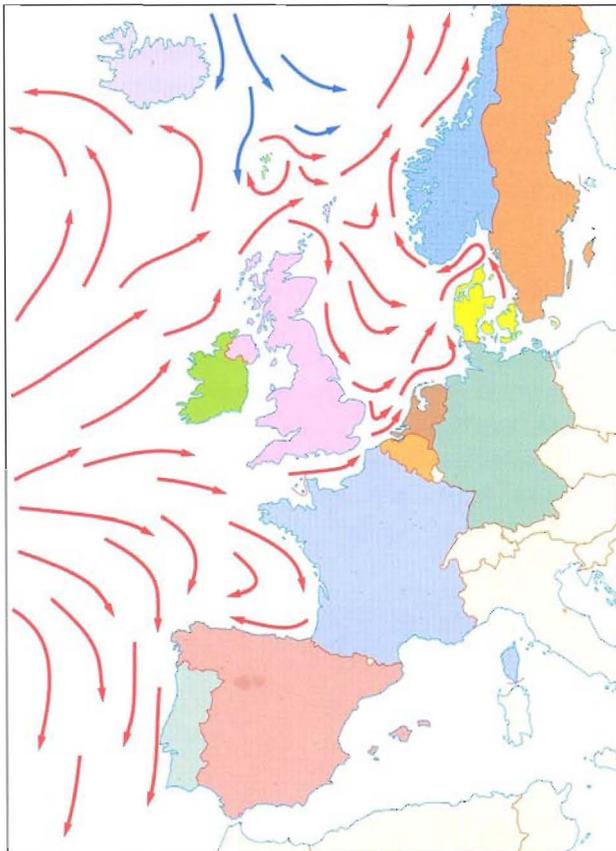


Annual marine litter surveys on beaches, following a common method, are an important part of their work.

### Early political recognition

The marine litter problem in the Northeast Atlantic region was politically recognized in the late 1980's. At their Second International North Sea Conference, held in 1987, the Environmental Ministers decided to initiate action within the UN International Maritime Organization (IMO) for designating the North Sea as a Special Area within the MARPOL Convention, for the purpose of the Annex on garbage.

These concerns were further manifested at the North Sea Conference held in 1995, when the ministers agreed on actions



Prevailing currents in the eastern part of the Northeast Atlantic. Marine litter may travel over long distances, across oceans and seas, for instance from the U.S. and Canada to Europe, or within the North Sea to its easternmost part, the Skagerrak coast of Sweden.

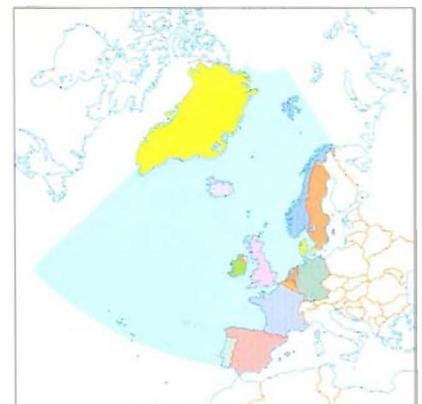
### OSPAR Convention and Commission

The 1992 Convention on the Protection of the Marine Environment of the Northeast Atlantic – the OSPAR Convention – entered into force in 1998. It replaced the 1972 Oslo Convention (pollution by dumping) and the 1974 Paris Convention (pollution from land-based sources) for the same sea area.

The OSPAR Commission is the executive body of the 1992 OSPAR Convention. At a Ministerial Meeting in 1998, the Sintra Statement was adopted setting out the political impetus for future action by the Commission. It includes a section related to environmental impacts of shipping. Countries are to co-operate, especially in the work of the IMO, to tackle threats to the marine environment from shipping. This is to be accomplished through the promotion of better waste reception facilities and their more effective use, including harmonized arrangements to remove economic, administrative or organizational incentives for ships not to use port waste reception facilities and through measures to eliminate marine litter.

to prevent or reduce the disposal of garbage, in particular plastics, to the North Sea. Action is to be taken to improve surveillance and control of waste from ships in order to prevent illegal dumping; request IMO to develop and implement techniques for waste treatment on board.; request Port Authorities to develop waste stream management plans in every harbour; make efforts to raise public awareness of the problems through information on existing regulations and environmental effects; and develop regulations making it mandatory for ships to deliver all garbage to a port reception facility before leaving port.

*The OSPAR Convention Maritime Area. Contracting Parties are Belgium, Denmark, the European Union, Finland, France, Germany, Iceland, Ireland, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom.*



This notwithstanding, marine litter remains a major problem in the coastal and marine environment in the Northeast Atlantic region. As pointed out in the OSPAR Quality Status Report 2000 :

- Sources of marine litter (up to 95 per cent consisting of non-degradable plastics) are mainly related to waste generated by shipping (fishing and commercial) and tourist and recreational activities;
- Floating litter and sunken pieces have been found in large quantities in all regions of the OSPAR maritime area;
- Impacts on marine life include the drowning of birds entangled in plastic sheeting, the death of birds, turtles and cetaceans caused by ingested plastic objects;
- Litter has also been found to carry a variety of epiphytic organisms to sea areas that these organisms would not normally reach;
- Economically, the recreational and commercial fishing sectors are likely to be the most affected by litter;
- As tourism, urban development and industrial pressure for development in the coastal zone increases, the problem of litter may also increase.

All discharges of plastics to the sea from ships are prohibited, but there seems to have been no subsequent improvement in the situation with regard to litter. Within the OSPAR Strategy on Marine Biodiversity and Ecosystems, attention is given to the ecological impacts of litter.

A number of regional agreements deal with and several organizations are working on marine litter or litter-related issues in the Northeast Atlantic region. Priorities for action

by the appropriate international, national and local authorities are identified in the Quality Status Report:

- Adequate enforcement of the requirements of MARPOL Annex V. These include the responsibility of Governments of countries around a Special Area to ensure that adequate reception facilities are provided at ports and terminals for the reception of garbage;
- Rapid adoption, implementation and adequate enforcement by EU member states of the European Parliament and Council Directive on Port Reception Facilities for Ship-generated Waste and Cargo Residues;
- Consideration of the designation of a larger part of the OSPAR maritime area as a MARPOL Special Area;
- Campaigns to educate the public and those involved in tourism, fishing and shipping industries on the issue of marine litter;
- Relocation and/or improved management of coastal land-fill sites from which garbage may escape to the sea.

### **Pilot project to monitor beach litter**

Policy and management decisions concerning litter must be based on solid information about quantities, trends and sources. Such information may best be generated through regular region-wide monitoring programmes. In 1999, an OSPAR Pilot Project on Monitoring Marine Beach Litter was endorsed. It could be viewed as a response to the need for more precise knowledge on marine litter. As stated in the Quality Status Report, 'improved and more standardised methodologies, including the establishment of reference areas, will be needed to properly assess the scale and impact of litter both on coasts



### EU policies on waste

The EU Directive on Port Reception Facilities for Ship-generated Waste and Cargo Residues was adopted in 2000. Its purpose is to 'reduce the discharges of ship-generated waste and cargo residues into the sea, especially illegal discharges, from ships using ports in the Community, by improving the availability and use of port reception facilities for ship-generated waste and cargo residues, thereby enhancing the protection of the marine environment.' The Directive is part of the EU policy on safe and clean seas. It is aimed at ensuring a major reduction in marine pollution by the provision of adequate waste reception facilities in all EU ports, including recreational ports and marinas. In addition, all ships, fishing vessels and recreational craft visiting these ports are to make use of the facilities provided.

- All ports and marinas are to provide adequate reception facilities for ship-generated waste and cargo residues;
- A waste management plan is to be developed for each port which is monitored and approved by Member states;
- Fee systems adopted by ports are to encourage vessels to use the facilities rather than to discharge their wastes at sea;
- Ships are to notify their intention to use facilities and quantities of waste on board before arriving in port;
- Members States are to monitor compliance with the Directive and apply sanctions;
- Authorities are to forward information on non-compliance to other EU ports which such ships may intend to visit.

The aim of the 1999 EU Directive on landfills is, by way of stringent operational and technical requirements on the waste and landfills, to provide for measures, procedures and guidance to prevent or reduce as far as possible negative effects on the environment.

and offshore. These, in turn, will provide a basis for assessing trends in the quantities and significance of litter throughout the OSPAR area. The objectives of the project are to:

- identify a representative selection of reference beaches throughout the OSPAR area;
- develop and test a harmonized survey protocol;
- ensure adequate quality assurance of the methods used and the data generated;
- produce a first assessment report on trends in quantities of different types of litter and sources of litter in the OSPAR maritime area;
- gradually expand the network of reference beaches to those Contracting Parties which are not participating in the pilot project;
- suggest how litter monitoring could continue as part of the regular monitoring of the state of the environment of the OSPAR maritime area (following the conclusion of the pilot project and on the basis of the experience gained).

The project is co-ordinated by Sweden, through the Swedish Environmental Protection Agency, as part of Sweden's responsibility as Lead Country within OSPAR for marine litter issues.

The agreed methodology is based on the identification of reference beaches and upon executing surveys, preferably four times a year, on these beaches. So far, just over 30 reference beaches are included in Belgium, Denmark (including the Faeroe Islands), the Netherlands, Portugal, Sweden, and the United Kingdom.



# References and contact points

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– International Coastal Cleanup (ICC) • [www.cmc-ocean.org/cleanupbro/index.php3](http://www.cmc-ocean.org/cleanupbro/index.php3)

## National and regional organizations

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Väst kuststiftelsen (West Coast Foundation), Sweden • [Vastkuststiftelsen@gr.to](mailto:Vastkuststiftelsen@gr.to)

### North and South America

US EPA Marine Debris Programme • [www.epa.gov/owow/oceans/debris/index.html](http://www.epa.gov/owow/oceans/debris/index.html)

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### Asia

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## Illustrations

**Front cover:** Tanzania: Plastic bag floating in the sea.

Credit: Pascal Kobeh/Still Pictures

**Back cover:** Venezuela, Caribbean coast: Rubbish left by tourists.

Credit: Julio Etchart/Still Pictures.

**Inside cover:** Entangled Northern fur seals. Credit: Rolf Ream, National Marine

Mammal Laboratory Alaska Fisheries Science Center (top left);

Littered North Sea beach (Skagerrak area). Credit: Thomas Carlén and

West Coast Foundation (top right);

Fish entangled in plastic six-pack rings. Credit: Ohio Department of Natural

Resources, by courtesy of The Ocean Conservancy (bottom left);

Rubbish polluting the quay. Credit: Sonhee Lee/Topham Picturepoint

(bottom right).

**Page 2:** Plastic resin pellets. Credit: Kansai Clean-up Office, Japan (left);

Plastic strapping bands on the shores of the Shetland Islands.

Credit: Karen Hall and KIMO.

**Page 3:** Litter on Kure beach, Hawai'i. Credit: NOWRAMP 2000 Expedition and

Bishop Museum (left).

Littered Skagerrak beach. Credit: Roland Olin and West Coast Foundation.

**Page 5:** Floating kids, Manila Bay, Philippines. Poor children collecting floating

waste for recycling. Credit: Hartmut Schwarzbach/UNEP/Still Pictures (left).

Diver collecting marine litter from the seabed. Credit: The Ocean Conservancy.

**Page 6:** Offshore oil platform, Ross Isle, North Sea. Credit: Husmo Foto (left).

Ecuador: Boy standing in sewage pipe. Credit: Topham Picturepoint/UNEP.

**Page 7:** Coastline dump with cars and garbage.

Credit: Topham Picturepoint (left).

Bags of collected marine litter on Skagerrak beach.

Credit: Thomas Carlén and West Coast Foundation.

**Page 8:** Fish killed by ghost net. Credit: Derek Jones, Canadian Ocean Habitat

Protection Society (left).

Seal trapped in discarded fishing gear. Credit: J.R. Henderson, National Marine

Fisheries Service, by courtesy of The Ocean Conservancy.

**Page 9:** Brazil: Entangled turtle. Credit: Topham Picturepoint/UNEP (left).

German North Sea coast: Seabird killed by fishing net.

Credit: Hartmut Schwarzbach/Still Pictures.

**Page 10:** Japan: Sunbathing on rubbish-strewn beach.

Credit: Hideo Wakata/UNEP/Still Pictures (left).

Discarded fishing ropes on Kure beach, Hawai'i.

Credit: NOWRAMP 2000 Expedition and Bishop Museum.

**Page 11:** Japan: Shellfish attached to discarded bottle.

Credit: Hideyuki Ihasti/UNEP/Still Pictures (left).

Discarded fishing nets entangled in boat propeller.

Credit: NOWRAMP 2000 Expedition and Bishop Museum.

**Page 13:** Unloading of ship-generated waste in the port of Rotterdam.

Credit: Stichting De Noordzee/North Sea Foundation (left).

Collection of fishing nets washed up on Dutch beach.

Credit: Wouter Scholten, Stichting De Noordzee.

**Page 14:** Maps: © Stig Söderlind.

**Page 15:** Various containers found on Shetland beach.

Credit: Karen Hall, Shetland Islands Council (left).

Seal killed by discarded fishing gear. Credit: Rob Penrose, Marine

Environmental Monitor, by courtesy of the Cumbria Marine Litter Project.

**Page 16:** Shetland Islands: Marine litter collecting at a marina break water.

Credit: Karen Hall, Shetland Islands Council (left).

Beach at Garderhouse, west coast of Shetland. Credit: Karen Hall.



Marine litter (marine debris) has become an increasingly serious environmental, economic, health and aesthetic problem around the world.

Marine litter items travel widely, over long distances, with ocean currents and winds, around sea areas and between oceans. It is found not only in the waters, on the seabeds or on the beaches of densely populated regions, but also in remote places far away from any obvious sources.

Marine litter is long-lived and active for decades, directly and indirectly. It consists to a very great extent of plastics, and of metal and glass – materials that do not break down easily or quickly.

Marine litter is a vicious killer of marine mammals, seabirds and many other life forms in the marine and coastal environment. It also entails substantial economic costs and losses to, e.g., fishermen, boat owners in general, coastal communities, farmers, power stations and individuals.

#### GLOBAL MARINE LITTER INFORMATION GATEWAY

*A node of the GPA Clearing-House Mechanism*

<http://marine-litter.gpa.unep.org>

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