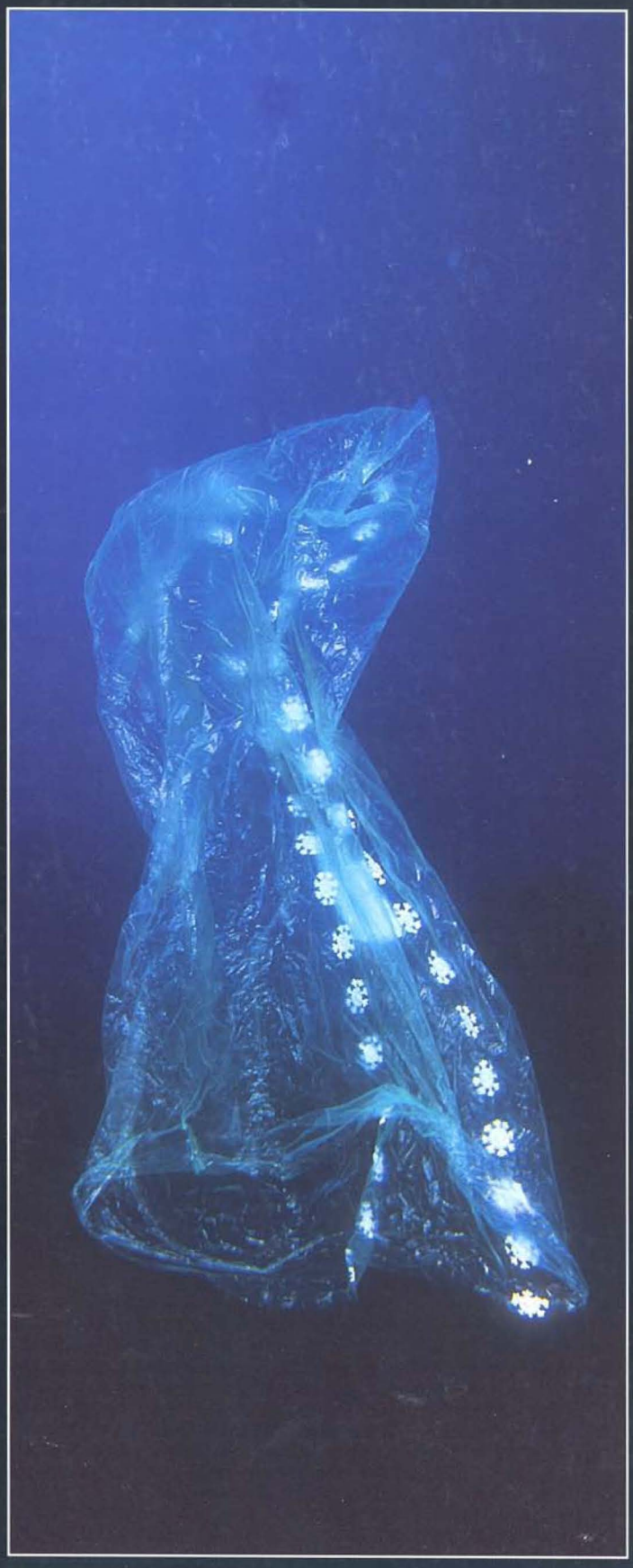
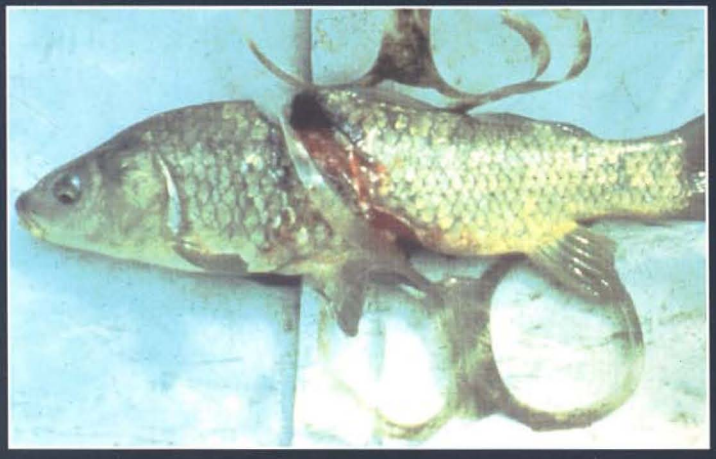
Marine litter – trash that kills





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^2 of seabed. If this is characteristic of the North Sea at large, a volume of least 600,000 m^3 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, fluorescent 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 floormat, 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^2 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