

Technology Information Series - 1
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MARINE POLLUTION



**CENTRAL MARINE FISHERIES
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MARINE POLLUTION

Pollution is a big problem that has impact on all of the planet's ecosystems, including the oceans. Economic development has been most active in coastal zones, putting enormous pressure on coastal ecosystems. Marine pollution has increased throughout the world, mainly due to direct discharges from rivers, increased surface run-off and drainage from expanding port areas, oil spills and other contaminants from shipping and domestic and industrial effluent. Most of the world's wastes-some 20 billion tonnes of it a year-end up in the sea, often without any preliminary processing.

The United Nations joint Group of Experts on the Scientific Aspects of Marine Pollution (GESAMP) states that marine pollution is the:- "Introduction by man, directly or indirectly, of substances or energy into the marine environment (including estuaries) resulting in such deleterious effects as harm to living resources, hazards to human health, hindrance to marine activities including fishing, impairment of quality for use of sea water and reduction of amenities".

Major sources of pollution:

There are different types of toxic waste pollution and many of them cause various problems to marine life. The major pollutants in the marine environment are given in Table 1

TABLE 1 : Marine pollutants of global concern

Pollutant	Description
Petroleum hydrocarbons	Crude oil and some of its refined products and effects of sewage pollution are generally local ones but sewage may contain some of the other toxic chemicals
Halogenated hydrocarbons	Including compounds such as DDT and the PCBs together with their

degradation and combustion products (e.g. polychlorinated dioxins and dibenzofurans)

Other organic compounds

Endocrine disrupting chemicals (also referred to as oestrogenic chemicals)

Metals

Particularly mercury, cadmium and lead

Radionuclides

Particularly caesium -137, strontium - 90 and plutonium isotopes

Litter (Solid waste)

Particularly Persistent plastics and including lost fishing nets



Tar Ball Pollution

1. Sewage pollution:

The most important primary feature of raw sewage from a disposal point of view is its oxygen demand. The oxygen demand is the amount of oxygen that will be consumed by bacteria as they feed on and degrade the sewage waste. Sewage generally contains large amounts of nitrogen and phosphates, which can lead to phytoplankton blooms. Usually excessive nutrient discharge into the coastal waters will result in eutrophication. Red tides are caused by phytoplankton blooms, which deplete oxygen in coastal waters causing shellfish poisoning and a serious health hazard to consumers. Red tides have become a major concern in several countries.

2. Heavy metals:

Among the critical pollutants, heavy metals and pesticides are more common in Asian waters. All natural metals occur in seawater in greater or lesser amounts. Some such as iron, copper, cobalt and zinc are essential in small quantities for the healthy growth of marine organisms. Others, such as mercury, lead, tin and cadmium have no known biological role. All metals are toxic if present in excess but the most important marine contaminants are generally considered to be amongst the non-essential elements.

3. Pesticides and other persistent organic chemicals:

Pesticide usage has increased during the last three decades not only in the agriculture sector but also in the vector control programmes. Historically, the chemicals that have provoked the greatest concern in terms of their effects on the marine environment are the chlorinated hydrocarbons. These chemicals include such well known substances as the pesticide DDT and the PCBs (used largely in electrical apparatus).

4. Oil pollution

Oil pollution is a significant problem along major shipping routes and an increasing number of accidents have occurred in recent years. The total global production of crude oil is about 3 billion tonnes per year and approximately half of this is transported by sea. This means that on any given day, there are approximately 8.25 million tonnes afloat around the oceans. According to one estimate, between 0.05 and 0.1 percent of the sea's surface is covered with an oil film at any one time. Recent studies show that in many coastlines of the world, the tar ball concentrations have reached levels of kilograms per meter area of beach. Nearly 750-1,000 tonnes of the tar get deposited along the west coast of India every year.

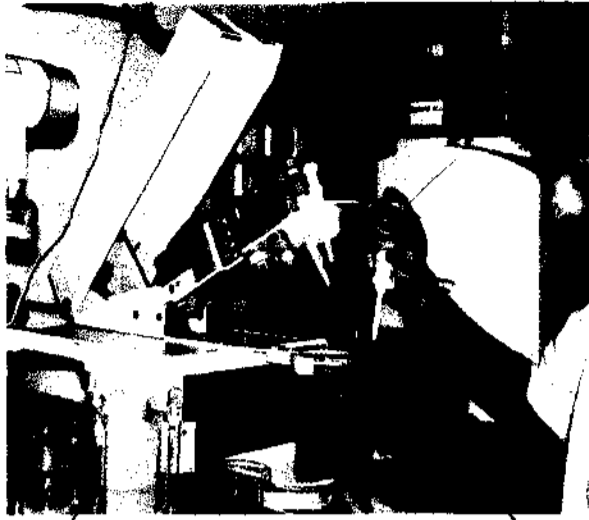
5. Radioactivity:

Radiation is another major toxic pollution source in the ocean but it is less well understood. The oceans contain appreciable amounts of radioactive materials, which derive from natural sources within the atmosphere and within the earth. Added to this, natural radioactivity is a mixture of artificial radioactive substances deriving from atomic weapons testing, other military activities and peaceful uses of nuclear



Water Sampling





Trace Metal Analysis

energy. Atmospheric and underwater tests of atomic weapons are a major source of radioactivity reaching the oceans. Other sources are now more important and include waste discharges from nuclear fuel reprocessing plants and nuclear power generating reactors, dumping of low level radioactive waste at sea and accidental discharges such as the unplanned return to earth of nuclear powered satellites .

6. Thermal pollution:

Thermal pollution affects the ocean in a negative way. Increase in water temperature causes a change (lowering) of dissolved oxygen levels. This disrupts the body of water's ecological balance, resulting in the suffocation of some plant and animal species while encouraging the overgrowth of others. The overgrowth and suffocation cause a cascade reaction with other organisms that are dependant on the ones that don't survive and with organisms that now have to compete with the overgrowing organisms.

7. Solid wastes:

Solid waste takes the form of plastics, metal, paper, a glass thrown or washed into the ocean in mass quantities.

Plastic, because of its strength, durability and buoyancy makes up the greater part of all debris found in the ocean and is by far the most harmful. Marine mammals, birds, turtles, fish, and crabs can often become entangled in plastic loops, strings and bands that can entangle them, wound them or prevent them from swimming.

Biomagnification of pollutants:

Biomagnification is a phenomenon where levels of toxic pollutants (such as heavy metals and PCB's) increase as we move up the food chain. This can also be called bioamplification. This happens because primary producers only absorb small amounts of toxins. Organisms tend not to get rid of toxins within them, so it accumulates over the course of their life. When one organism eats many organisms and each contains some heavy metals, the metals accumulate even faster within it. But, then herbivores eat many primary producers, so they accumulate a higher concentration of toxins. And then consumers that eat the affected herbivores consume even higher levels of toxins.



A view of human activity in coastal water





Mussel watch:

Mussels may hold one of the main keys to the monitoring of ocean pollutants. Because of their ability to concentrate many of these pollutants, they can provide a good indicator of the state of coastal waters. Unlike fish, mussels are easily collected and do not move. A network of marine laboratories currently collects mussel samples on a regular basis as part of a global mussel watch programme.

Conclusion:

What is the legitimate use of oceans? What are the acceptable limits of this use? The answers to these questions are not simple and are by no means universally agreed. Waste is a fact of life. By making all possible efforts to recycle it, the amount that requires disposal can be minimised. It cannot, however, be reduced to zero because the law of diminishing returns means that there comes a point where the effort required to clean up a waste still further causes a greater problem through the use of the resources required. There is therefore an irreducible minimum amount of waste that will always require disposal and in practice, the amounts will be much more than this theoretical limit.

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