

# Oil Pollution of the Seas Around India

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## 1. Introduction

Oil pollution is a widespread phenomenon and during the last few years considerable damage has been done to the marine environment as a result of indiscriminate oil discharge into the sea. Besides affecting human health through contaminated seafoods, the oil pollution also reduces the recreational utility of coastal waters, especially the beaches, and thus lowers the revenue from tourism. Data available from various sources indicate that millions of tonnes of oil is dumped into the sea annually in different regions of the world, and when we begin to exploit the offshore oil deposits more and more, the oil pollution is going to become a more serious problem.

Along the Indian coast, the oil pollution can easily be seen in the form of tar ball deposition on the beaches. In India, pollution from tar balls was first reported in 1970, and from 1972 onwards a detailed study has been undertaken by the National Institute of Oceanography to determine the magnitude of pollution, sources of pollution, fate and behaviour of the oil spills and their effect on marine life.

## 2. Sources of oil pollution

Oil pollution in the sea originates from :

1. damaged tankers,
2. offshore oil wells,
3. harbours and marine terminals, and
4. land sources.

Large spills of oil at sea result from accidental damage to oil tankers and such accidents are not uncommon because today more than 50% of sea-traffic is for oil transport.

In India, shipping activities have increased immensely in recent years. The Indian Merchant Fleet in 1947 had in operation 59 ships with a gross tonnage of 1.92 lakhs. This increased to 304 ships with a gross tonnage of 38.71 lakhs in 1974. The increase in the merchant fleet has resulted in a considerable rise in coastal shipping activities and during the last few years oil spills due to accidents have also increased. Perhaps the most well known oil spill so far reported at sea was from *Torrey Canyon* in the English Channel in 1967. In this mishap more than 1 lakh tonnes

of Persian crude was spilled which severely affected the marine life on the coasts of Britain and France.

In July 1973, off the Gujarat coast, *Cosmos Pioneer* ran aground spilling about 3,000 tonnes of light diesel oil. This resulted in mortality of marine life around Porbunder area. In September 1974, an American oil tanker *Transhuron* carrying 18,500 tonnes of furnace oil ran aground at Kiltan in the Lakshadweep Sea, spilling 3,325 tonnes of furnace oil and adversely affecting the marine life in the vicinity of Kiltan Island.



The American oil tanker *Transhuron* which ran aground in the Lakshadweep Sea at Kiltan and spilled several thousand tonnes of furnace oil in the sea.

The second source of oil pollution is from the offshore oil wells. With the extensive search for oil in the continental shelf and offshore regions, the chances of spills from the oil wells during the drilling operations or subsequently from permanent structures are going to be greater. An instance of blow out of oil well has been reported a few years ago from Santa Barbara, California.

The third source of oil pollution and perhaps the most consistent of all is partly from the residual oil pumped into the sea by the oil tankers which do not observe internationally prescribed conventions, and partly from the discharge of fuel or lubricating oils from the ships.

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The oil carrying vessels, even after unloading the oil cargo, seldom get completely empty. There is always some oil left in the tanks. In order to clean up their storage tanks, these tankers pump in sea water and then pump out the residual oil with sea water. This is generally done in those countries where the law does not restrict this operation while the ship is in the port. In other countries where such an act is considered an offence punishable by heavy fines and/or detention of the ship, cleansing of the storage tanks is unlawfully done at sea during the ship's return journey. This action is also considered an offence these days according to international conventions.

A few years ago, an American report accused 1600 ships in one year for discharging their residual oil, while these were berthed in U. S. ports. In recent years, both oil and shipping industries have become careful and this kind of pollution has become very restricted in many countries. The oil tankers are instructed to discharge their residual oil in large storage tanks, provided by the oil companies at ports, where it is burnt. However, the recent trends in building super tankers, largely dictated by economic considerations, pose several serious problems. There are only a few ports in the world where these giant tankers could berth, and therefore, they normally lighten their oil cargo by ship-to-ship transfer in deeper waters. The residual oil in these super tankers is pumped out into the sea. This presents new hazards and several of these marine terminals have become a big source of oil pollution.

Similar problems, although of smaller magnitudes, develop in harbours which provide berthing facilities to fishing trawlers, passenger ships, barges and coastal steamers. In these harbours, a thick film of oil is always present over the water and very often it covers several kilometres around the harbour.

Oil and petroleum by-products also enter the sea as a waste material from land sources through drain pipes, open channels, tributaries, rivers, etc. In certain parts of the coast of India, the quantity of this waste material is quite substantial and requires urgent attention.

### 3. Fate of oil

On reaching the sea, the fate of oil depends upon its physical and chemical properties and its interaction with the marine environment. Hydrocarbons are the most important constituents of petroleum and form upto 98 % of certain crude oils. The other components of crude oil are paraffins, cycloparaffins, naphthane, aromatics and olefins.

Some oil components such as lower aromatics, paraffins and nonhydrocarbon constituents are soluble in water and while the oil spreads over the surface of

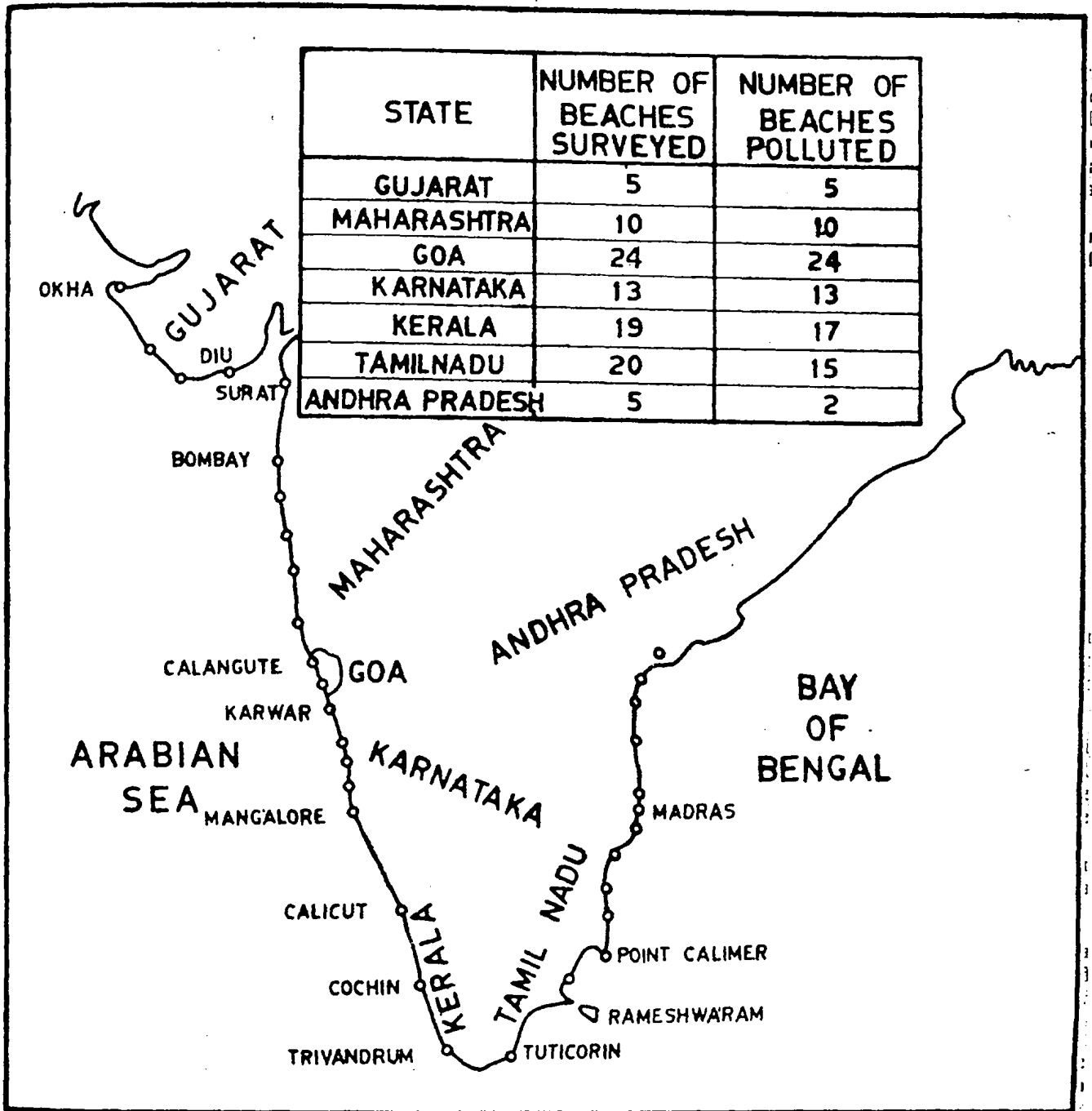
the sea, these get dissolved into the water rapidly. Other oils like the lubricating oil, motor oil and residual fuel oil are very thick and heavy. At tropical sea temperatures these form slicks which either sink to the bottom or keep floating. The oil also forms emulsions and very often it may give rise to grease-like consistency and produce 'mousse'. The *Torrey Canyon* slicks took 23 days to reach the English beaches. It has now been established that apart from the spreading character of the oil, its mechanical transport by wind, tides and currents determine the magnitude of coastal pollution.



Thick layers of oil appeared in rock pools at Kiltan as a result of oil spill.

The residues which remain after the evaporation of volatile substances are generally much denser than the oil originally spilled, and these readily sink. In deeper areas of the sea, crude oil may sink to the bottom and never reappear, but in shallow areas the slicks deposited at the bottom are stirred up by the wave action, particularly during the monsoon season and these are washed ashore.

In India, oil pollution in the form of slick or tar ball deposition on beaches was first reported in 1970 by the scientists of National Institute of Oceanography. Since 1972, in all 96 beaches have been surveyed both on the west and east coasts of India and of these 86 were found to have tar ball deposition of varying intensities. The tar ball deposition occurs either just before the monsoon (April-May) or during the early part of the monsoon (June-July). The magnitude of deposition varies from beach to beach. On the same beach the occurrence of tar balls varies at different tidal levels. Maximum deposition is generally found at the high water mark, where the tar lumps are also larger and heavier. The intensive deposition of tar balls during the monsoon months seems to be related to the reversal of currents and changes in the wind direction which help in washing the tar balls ashore.



Of the 96 beaches surveyed along the west and east coasts of India, 86 were found polluted with oil. The 33 circles along the coast indicate prominent beaches where regular observations are in progress.



Tar-like deposition appeared on the beautiful beach of Kiltan and caused considerable mortality of marine life.



Candolim beach, Goa, showing thick deposition of tar balls during the monsoon season.

The tar ball deposition along the Goa coast has been studied by NIO in greater detail. Of the 24 Goan beaches inspected regularly from 1972 to 1974

(Table 1), all were found to have tar balls of varying intensity. The most alarming feature of the study is that the tar ball pollution is constantly on the increase.

TABLE 1.—TAR BALL DEPOSITION ALONG THE BEACHES OF GOA FROM 1972 TO 1974. VALUES INDICATE MEAN WEIGHT IN g/m<sup>2</sup>

Beaches	1972	1973	1974	Remarks
HARMAL	—	93.2	188.3	Starts end of May. Heavy in June-July.
MANDREM	—	42.0	76.4	— do —
MORJIM	—	110.4	277.8	— do —
ANJUNA	12.3	250.0	337.3	— do —
VAGATORA	43.7	143.0	317.8	— do —
BAGA	314.4	548.5	96.8	Intense in June
CALANGUTE	532.1	78.5	83.8	Intense in June
CANDOLIM	150.0	165.7	200.2	June-July heavy
SINQUERIM	875.0	1045.0	1304.2	July heavy
MIRAMAR	75.5	90.0	105.2	May-June heavy
CARANZALEM	552.7	600.0	534.3	April heavy
DIAS	—	33.1	45.0	Starts in June

Beaches	1972	1973	1974	Remarks
SIRIDAO	40.2	63.7	50.3	Intense in June
VASCO	—	—	35.0	Starts late June
BAINA	100.7	135.0	200.4	Starts late June
BOGMALO	—	41.8	85.7	Intense in June end
VELSAO	—	—	100.0	Starts in April intense in June
CASAULIM	40.0	92.6	123.0	— do —
COLVA	10.1	15.7	14.8	Starts in May
BENAULIM	60.3	—	2.4	Starts in May
CAVELOSSIM	45.2	59.2	—	Starts in May
KHAINKHINNI	—	10.5	—	Starts in May
MASHEM	—	—	3.4	Starts late June
POLEM	12.2	9.6	18.9	Starts late June



Oil pollution at one of the beaches of Maharashtra.



The oil pollution finally takes the shape of bigger tar balls and slicks. These tar balls are difficult to remove from human feet and shoes where they invariably adhere.

#### 4. Conclusion

Adequate measures are absolutely necessary by the Government of India to prevent the indiscriminate discharge of residual oil from the tankers into the coastal waters of India. Oil companies must provide storage tanks at harbours and near the terminals for pumping residual oil and subsequently incinerating the oil waste within the storage tanks. There are several methods of international surveillance (moni-

toring) of oil pollution and these are being str followed by the different countries of the world protect the coastline from oil pollution. In I we have not yet given this problem a serious tho and hence the magnitude of oil pollution is increa very rapidly. Urgent action is required to comba pollution in India otherwise it is feared that soon it will seriously affect the living resou besides destroying the aesthetic value of most of beaches.

#### EDITOR'S COMMENT

It is absolutely necessary that appropriate action is taken now to prevent oil pollution and its harmful effects. This will take three basic forms : (a) Prevention, (b) Surveillance and (c) Remedial.

Prevention would involve, firstly, encouragement of modifications in ship-design so as to make accidental discharge of oil as improbable as modern technology permits. Secondly, port authorities should be induced to provide facilities to receive and dispose off oil residues. Ships should be encouraged to use the facilities by making access to those as convenient as possible. At present the procedure of landing oil residues is rather involved on account of procedural formalities ; it should be streamlined.

Surveillance may take the form of utilisation of the existing services or a newly set-up body, to patrol the areas, particularly the docks and harbours where discharge of oil is most likely. In the more advanced countries, communication satellites are also made use of for this purpose. The public too should be made aware of the problem and encouraged to report observation of pollution. Deterrent action taken should also be promptly promulgated for information of every one.

Remedial action will consist of having some agency (which operates like the Fire Brigade) which is equipped with the wherewithal and expertise to rush to a spill

at short notice and minimise the damage. Abun literature is available on the various near fighting pollution. New methods should also sought through research and development.

While the developed countries have become seri aware of the most damaging consequences of poll and have formulated comprehensive measures de with it, over here even though its harmful e have already become abundantly evident (and very likely to deteriorate further when off-shor production becomes a reality), no meaningful a appears to have been planned so far.

Unless urgent action is taken, it is feared tha marine based food resources will be seriously aff and the aesthetic value of our beaches irrepa damaged.

It may be noied that an International Confe on Dumping At Sea with representatives fron countries was concluded in London, in Dece 1975, to consider action to regulate emptying of into sea, wherein a "Comprehensive network agreements" to protect the world's oceans from tion was proposed. The London Dumping vention of 1972 prohibits dumping at sea of c dangerous substances and places stringent co on dumping of a large number of other subst. A permanent international secretariat is being lished in London.