

OIL POLLUTION ALONG THE INDIAN COASTLINE

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SUMMARY

Oil in the form of tar balls is washed ashore along the Indian beaches. These were first noticed in 1970 (1). From 1971 to 1973, studies were undertaken along both east and the west coasts of India to determine the areas, seasons, and the intensity of deposition of tar balls and their possible origin. Figure 1.

The size of the tar balls, places and seasons of deposition vary a great deal. Therefore, for comparison of data from selected beaches, duplicate samples were collected from 0.1 m² surface at supra, high, mid and low tide marks and the weight of tar balls was determined and expressed as g/m².

The extraneous material associated with tar balls give some indication of their origin. Therefore, the associated material like debris, plastic beads and polychaete tubes etc., were also noted. In addition, the nature of beach (sheltered or open), its gradient and intertidal exposure were also measured.

A part of the west coast of India, from Ratnagiri to Karwar, was selected as a principal sector for repeated observations. Other beaches located along the west coast from Bombay to Porbander, and from Calicut to Trivandrum; were kept for single observation. Similarly, some beaches along the east coast of India, from Rameswaram in Tamil Nadu to Ongole in Andhra Pradesh, were studied only once. Repeated coverage of selected beaches gave the intensity and seasons of pollution whereas from the other areas an estimate of the extent to which the Indian coastline is affected by the deposition of tar balls could be made.

The tar balls were at first noticed in 1970 at the Vagator beach, Goa. During 1971, 6 beaches were inspected in Goa, of which 4 had tar balls. At the Calangute beach at the supra tidal area the deposition was heavy.

During 1972, the beaches of the 550 kms coastline on the west, from Ratnagiri in Maharashtra to Mangalore in Karnataka State were studied.

In Maharashtra of the 7 beaches studied, 6 had tar deposits. In Goa, 3 beaches - Anjuna, Baga and Calangute - had fresh tar deposits at low, mid and high tide marks. But in the southern part of Goa, i.e., at Colva beach no tar balls were seen. In the Karnataka State, from Karwar to Malpe, of the 11 beaches, examined, 8 had heavy deposition of tar balls at mid and high tide marks.

Along the east coast, during September 1972, 20 beaches in Tamil Nadu were inspected. Of these 7 were sheltered beaches in the Palk Bay and 13 were open beaches north of the Palk Bay. In the Palk Bay, mostly at the high tide mark, tar balls in small quantities were found at 5 beaches only. North of the Palk Bay, 10 beaches had moderate deposition of tar balls.

In the Andhra Pradesh, of the 5 open beaches, only 2 had moderate deposition of tar balls. All the 5 beaches were away from any estuarine influence.)

At Point Calimare where the beach area was large, the tar balls of different sizes were found in supra littoral region. These were solid tar lumps mixed with sand and were probably washed ashore during December-January of the previous year.

In 1973, along the west coast, 60 beaches were studied, of which 58 were found to be polluted. The details for each state are given in table 1.

Table I. Deposition of tar balls observed during 1973 in various maritime states along the west coast of India.

	Guja- rat	Maha- rash- tra	Goa ^a	Karna- taka ^b	Kera- la ^c
Beaches:					
Observed	5	10	14	11	19
Polluted	5	10	14	11	17

^a See Figure 2.

^b See Figure 3.

^c See Figure 4.

In Maharashtra and Goa, tar deposition started during the last week of May. In the third week of June, all of a sudden heavy deposition was seen.

The process of deposition was studied at Goa beaches on 23 June, 1973. Fresh and small tar lumps were first seen floating in water. With the incoming tide these were washed ashore. The size of tar balls varied from 1 to 4 mm. At first they were deposited at low tide mark but with the rising tide they were pushed higher up and ultimately came to lie at the high tide mark. At Sinquerim which is nearer to Marmugao Harbour, the intensity of deposition was as high as 4,460.0 g/m² and along the northern direction away from Marmugao Harbour, the intensity de-

creased. The details of deposition at some beaches are given in table II.

Along the Indian coastline oil pollution in the form of tar balls occur in many parts. On the west coast deposition starts with the approach of monsoon season i.e., in the months of May and June. Along the east coast tar deposition appears in December and January.

The deposition is not uniform. At some places, parts of the beaches in between the two levels of tar deposition, were completely free from tar. Maximum deposition occurred at the high tide mark. Sometimes the tar balls were found in soft or melted condition due to heat and get mixed with sand and form large lumps (see figures 1-4).

Table II. Details of tar ball deposition with associated extraneous material along some selected beaches.

Place of observation	Date	Deposition				Association
		EHWS	HTM	MTM	LTM	
<u>WEST COAST</u>						
<u>KARNATAKA</u> ^a						
Maravanthe	9.8.72	-	344.8	10.6	-	<u>Rhizophora</u> fruits, polychaete tubes and plastic beads.
Honavar	9.8.72	-	18.3	1.9	2.2	<u>Rhizophora</u> fruits and polychaete tubes
<u>G O A</u> ^b						
Arambol	31.5.73	93.2	-	-	-	Isolated, fresh and soft lumps
Sinquerim	23.6.73	4480.0	-	-	-	
<u>MAHARASHTRA</u>						
Deogarh	22.7.72	-	758.8	128.5	-	<u>Physalia</u> and <u>Rhizophora</u> fruits.
Ratnagiri	20.7.72	-	247.7	28.5	-	Fresh deposition. <u>Physalia</u> , <u>Lanthina</u> , <u>Rhizophora</u> , polychaete tubes and plastic beads.
<u>EAST COAST</u>						
<u>TAMIL NADU</u>						
Mandapam	7.9.72	-	5.9	-	-	Stray deposits mainly found at HTM.
Vedaranyam	11.9.72	120.1	138.7	-	-	Old deposition at HTM. Some unidentified hard black pieces were also collected.
<u>ANDHRA PRADESH</u>						
Mypaud	17.9.72	-	6.2	-	-	--
Ramayapat-tinam	17.9.72	-	75.5	-	-	Old stray deposition at HTM.

^aSee Figure 3.

^bSee Figure 2.

The polychaete tubes, and Rhizophora fruits which are associated with tar indicate that its origin is in the near shore areas. The deposition also appears to be influenced by estuaries. Along the sheltered beaches, the density of tar deposition was less.

It appears that tar balls come from the oil wastes and ship spillage discharged by the ocean going vessels (2). The degraded products of oil float for sometime or may sink (3). With the approach of monsoon conditions and due to changes in coastal circulation pattern and wind direction they are washed ashore.

The above observations indicate that at some selected points along the Indian coast it is important to start a project of monitoring oil pollution.

Sampling of tar balls should be done from coastal stations, oceanic islands and by research vessels and

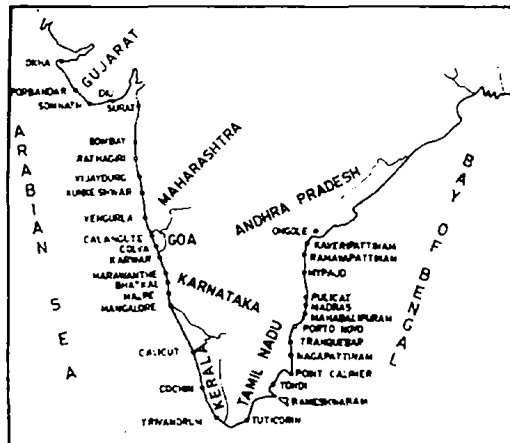
fishing trawlers from different parts of the ocean so as to obtain the distribution of tar balls at the sea surface. Then it would be important to study the influence of currents, waves and wind pattern which are largely responsible for bringing the tar balls ashore.

References:

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Key words: Indian beaches, Oil pollution, Quantitative study, Season, Source, Tar balls, Tide levels.

Figure 1.



Area surveyed for oil deposition along the Indian coasts during the year 1970-73.

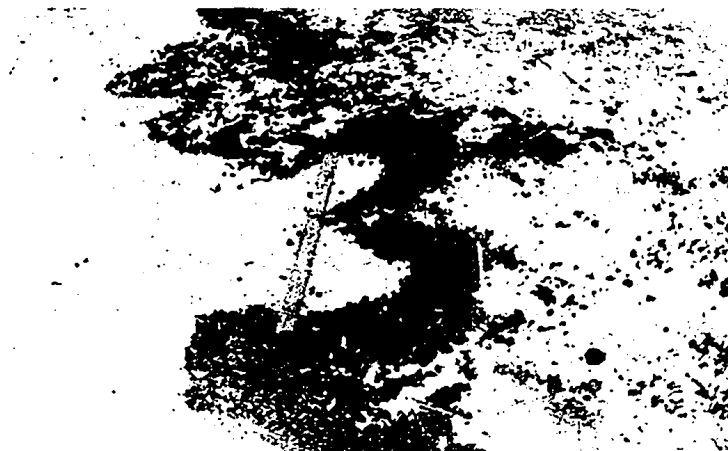
Figure 2.



Sinquerim beach, Goa: Tar deposition at different tide levels during 1973.



Candolim beach, Goa: Tar balls in the process of deposition during July 1973.



Sinquerim beach, Goa: Tar ball deposition at high tide level, during July 1973.

Figure 3.



Maravanthe beach, Karnataka State: Tar ball deposition during July 1973.

Figure 4.



Calicut beach, Kerala State: Tar ball deposition during 1973.