

TAR POLLUTION MONITORING IN CURACAO

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ABSTRACT

Petroleum pollution in the form of beach tar has been monitored in Curacao from 1980 until 1985 on two beaches. An average of 363 grams of tar per meter shorefront per visit was found on Boca Tabla beach on the windward side of the island, while an average of 44 grams of tar per meter shorefront per visit was found on Eastpoint 1, a sheltered beach on the eastpoint of Curacao. During the years of monitoring there has been a decline in tar found on both beaches.

INTRODUCTION

The island of Curacao, the largest island of The Netherlands Antilles lies 70 km off the coast of Venezuela at 12° North Latitude and 69° West Longitude. In Figure 1 the location of Curacao in the Caribbean is shown. The island is 61.2 km long and 3.2 km at its narrowest to 12.1 km at its widest with a total area of approximately 444 km² (Figure 2). The north coast, where the tradewind blows onshore, consists mainly of a long stretch of rocky cliffs with small inlets. The south coast consists of bays and beaches used for industrial, urban and recreational purposes.

As part of the Caripol Programme for Petroleum Pollution in the Caribbean Region the Environmental Service of the Health Service in Curacao has set up a programme to monitor tar balls on two of Curacao's beaches. Existing petroleum activities in Curacao are: an oil-refinery with a total capacity of approximately 58,000 tons/day; an oil-terminal for transshipment of oil products. These petroleum activities give Curacao an important place in the oil trade sea lanes.

The nearby island of Bonaire, located at 52 km east of Curacao also has an oil-terminal for transshipment of oil products.

Due to extensive oil operations in the Lake of Maracaibo, some 390 km from Curacao, there is a very important tanker route from Maracaibo to other parts of the Caribbean, including Curacao as a major importer of Venezuelan crude petroleum.

SAMPLING SITES

For this study two sites were selected, which were known to occasionally suffer from oil pollution. Other more popular beach sites were considered and visited for a limited period of time but showed no tar ball findings at all. For reason of limited personnel and lack of motivation when no pollution was recorded visits to such beaches were discontinued.

The first sampling site, Boca Tabla at 12° 23' North Latitude and 69°07' West Longitude, is located on the north-west side of the island (Figure 2). It is a cove made up of coarse sand and rock slabs. The prevailing easterly winds blow onshore. East Point, the second sampling site, is located on the south-east side at 12° 01' North Latitude and 68° 46' West Longitude (Figure 2). It consists of three beaches all three divided by rock slabs. The prevailing winds blow offshore. Neither of the beaches is used by public: Boca Tabla is rough and dangerous, while East Point is on private property.

METHODS

Tar weight was determined according to the method described in the Caripol Manual for Petroleum Monitoring (IOCARIBE 1980). The tarballs containing sand and debris were weighed, after which the tar is dissolved with hexane by Soxhlet extraction; the remaining sand and debris were dried and weighed. The difference in weight was the weight of the tar.

The transect lengths of shorefront sampled were usually from 1-2 meters.

RESULTS

Tar balls have been monitored at regular intervals since October 1980 at Boca Tabla and East Point Beaches. The data for Boca Tabla are shown in Table 1. From 1980-1982 the length of shorefront sampled varied from 1-3 meters. From 1983-1984 the total length of shorefront of 3 meters was sampled. During this period distances between high and low tides were not recorded. In 1985 a transect of 2 meters was sampled. The average amount of tar found per visit per meter shorefront from 1980-1985 was 363 grams.

Table 2 shows the yearly averages of tar found per visit per meter shorefront at Boca Tabla. It can be seen that a strong decline has occurred in the amounts of tar found from 1980 until 1985.

The results for Eastpoint beach are shown in Table 3. From 1980 till the first half of 1982 three transects defined as Eastpoint I, II and III were sampled. From the second half of 1982 till the end of 1984 only one transect was sampled at Eastpoint with a shorelength of 14 m.

In 1985 two transects of two meters each were sampled (Eastpoint I and Eastpoint II) and a beach with a shorelength of 62 m was visually inspected (Eastpoint III). The average amount of tar found per visit at Eastpoint I in the years 1980, 1981, 1982 and 1985 was 44 grams per meter shorelength.

The amounts of tar per visit found at Boca Tabla and Eastpoint Beaches from 1980-1985 are shown in Figure 3. Amounts of tar are expressed on a logarithmic scale. For

Eastpoint the amounts of tar collected per visit in all transects are given. The figure shows that especially from 1980 until 1982 high amounts of tar were found and Boca Tabla and to a lesser extent at Eastpoint Beach.

In 1982 a decline can be seen in the amounts of tar found at both Boca Tabla and Eastpoint beaches. From 1983 on tar findings Boca Tabla ranges from 10-100 grams. To Eastpoint only a few visits were made in 1983 and 1984, with tar findings ranging up to 25 grams.

From the 1985 data, Eastpoint had tar in only 28% of the visits, while at Boca Tabla in 87% of the visits tar was found. An explanation for these findings is that Boca Tabla is a small inlet on the rocky windward coast with high energy waves. The inlet most probably acts as a trap for tar balls. A dumping site for municipal wastes was located at approximately 30 km eastwards of Boca Tabla. This site is suspected to have also contributed to the high tar ball amounts at Boca Tabla. As of 1982 garbage disposal at this site was considerably reduced and sent to a Landfill and per 1 January 1986 the site was closed for municipal wastes. Eastpoint beach on the other hand is a sheltered beach with less high wave action on the easterly point of the island. Though not quite on the leeward side of the island the average amount of tar found here is much less than the average amount of tar found at Boca Tabla. Earlier studies (Corredor, 1983) found tar ball movements in the sea to be closely related to wind speed and direction.

In accordance with the differences between the amounts of tar found at Boca Tabla and East Point, more tar was also found on windward beaches than on leeward beaches in Bonaire (Newton) and Grand Cayman (Burton).

LITERATURE CITED

- BURTON, F. 1985. Presentation Caripol Symposium; unpublished results.
- CORREDOR, J. E. 1983. Pelagic Petroleum Pollution off the South-west Coast of Puerto Rico. *Marine Pollution Bulletin*. 5: 166-168.
- IOCARIBE. 1980. Caripol Manual for Petroleum Monitoring (available from secretary IOCARIBE c/o UNDP, Apartado Postal 4540, San José, Costa Rica. C.A.).
- NEWTON, E. 1985. Presentation Caripol Symposium; Unpublished results.

TABLE 1.—Amounts of tar at Boca Tabla Beach; no distances between high and low tides were recorded from 20-01-83 until 25-10-84.

Date D-M-Y	Shorefront length (m)	Distance between High and Low Tide (m)	Tar per meter Total Weight of Tar (grams)	Shorefront (grams/m)
03-10-80	.1	53	8087.5	8087.5
29-12-80	1	53	174.4	174.4
17-02-81	1	30	2088	2088
30-06-81	2.8	34	9585	3423
12-10-81	2.0	38	103.4	51.7
24-11-81	2.7	33	1243.4	460.5
27-01-82	3	30	291	97
10-02-82	2.8	38	242.8	86.7
25-02-82	2.8	28	2017.8	720.6
23-03-82	2.8	34	846.3	302.3
06-04-82	2.8	34	857.9	306.4
27-04-82	2.5	34	228.9	91.6
22-06-82	2.7	3	0	0
07-07-82	1	3	23.6	23.6
22-07-82	2.8	4	49.6	17.7
05-08-82	2	4	12.2	6.1
20-01-83	3	—	91.7	30.6
20-02-83	3	—	30.9	10.3
17-03-83	3	—	58.9	19.6
22-06-83	3	—	52.5	17.5
02-08-83	3	—	52.9	17.6
15-08-83	3	—	74.6	24.9
15-09-83	3	—	12.6	4.2
10-10-83	3	—	40.2	13.4
07-11-83	3	—	27.3	9.1
29-12-83	3	—	24.0	8
24-01-84	3	—	2.9	0.1
09-03-84	3	—	2.1	0.7
29-03-84	3	—	2.7	0.9
03-05-84	3	—	85.3	28.4
24-05-84	3	—	480	160
25-10-84	3	—	11.9	4.0
18-01-85	2	5	9.8	4.9
04-02-85	2	5	0.4	0.2
19-02-85	2	3	12.3	6.2
06-03-85	2	3	9.3	4.7
19-03-85	2	3	131.8	65.9
02-04-85	2	4	144.4	72.2
02-05-85	2	4	14.9	7.5
14-05-85	2	5	34.2	17.1
06-08-85	2	3	60.1	30.1
20-08-85	2	2	68.6	34.3
09-09-85	2	5	19.0	9.5
24-09-85	2	5.7	26.7	13.4
08-10-85	2	—	219.3	109.7
22-10-85	2	4	81.5	40.8
05-11-85	2	2	0	0

TABLE 2.—Yearly averages of tar (grams) per meter
shorefront for Boca Tabla.

Year	Number of visits	Average tar per meter shorefront
1980	2	4131
1981	4	1506
1982	10	165
1983	10	16
1984	6	32
1985	14	30

TABLE 3.—Amounts of tar at East Point Beach; no distances between high and low tides were recorded from 14-07-82 until 19-07-84.

Location	Date D-M-Y	Shorefront length (m)	Distance between high and low tide (m)	Total weight of tar (grams)	Tar per meter shorefront (grams/m)
Eastpoint I	17-10-80	1	11.1	368.1	368.1
"	27-11-80	1	11.1	25.0	25.0
"	05-02-81	1	11.1	70.0	70.0
"	04-06-81	1	11.1	35.6	35.6
"	13-10-81	1	11.2	21.0	21.0
"	09-02-82	1	11.1	0	0
"	26-02-82	1	11.1	0	0
"	25-03-82	1	11.1	7.1	7.1
"	14-04-82	1	11.1	14.3	14.3
"	21-01-85	2	3	0	0
"	25-02-85	2	3	0	0
"	22-04-85	2	3	0	0
"	22-05-85	2	4	10.5	5.2
"	08-07-85	2	2	0	0
"	07-08-85	2	2	171.6	85.8
"	12-09-85	2	2	26.4	13.2
Eastpoint II	27-11-80	1	14.7	39.3	39.3
"	04-06-81	1	14.7	0	0
"	13-10-81	1	14.5	0	0
"	09-02-82	1	14.7	746.0	746.0
"	26-02-82	1	14.7	0	0
"	25-03-82	1.5	14.7	0	0
"	29-04-82	1	14.1	145.6	145.6
"	21-01-85	2	3	0	0
"	25-02-85	2	3	0	0
"	22-04-85	2	3	0	0
"	08-07-85	2	2	0	0
"	07-08-85	2	2	0	0
"	12-09-85	2	2	0	0
Eastpoint III	04-06-81	25	5	341.6	13.7
"	13-10-81	24	4	14.8	0.6
"	09-02-82	25	5	0	0
"	26-02-82	1	5	76.9	76.9
"	25-03-82	25	6	0	0
"	21-01-85	62	2	0	0
"	08-07-85	62	2	0	0
"	07-08-85	62	3	0	0
Eastpoint	14-07-82	14	—	44.6	3.2
"	05-12-82	14	—	34.8	2.5
"	08-02-83	14	—	22.6	1.6
"	11-10-83	14	—	2.7	0.2
"	09-02-84	14	—	2.7	0.2
"	19-07-84	14	—	2.6	0.2

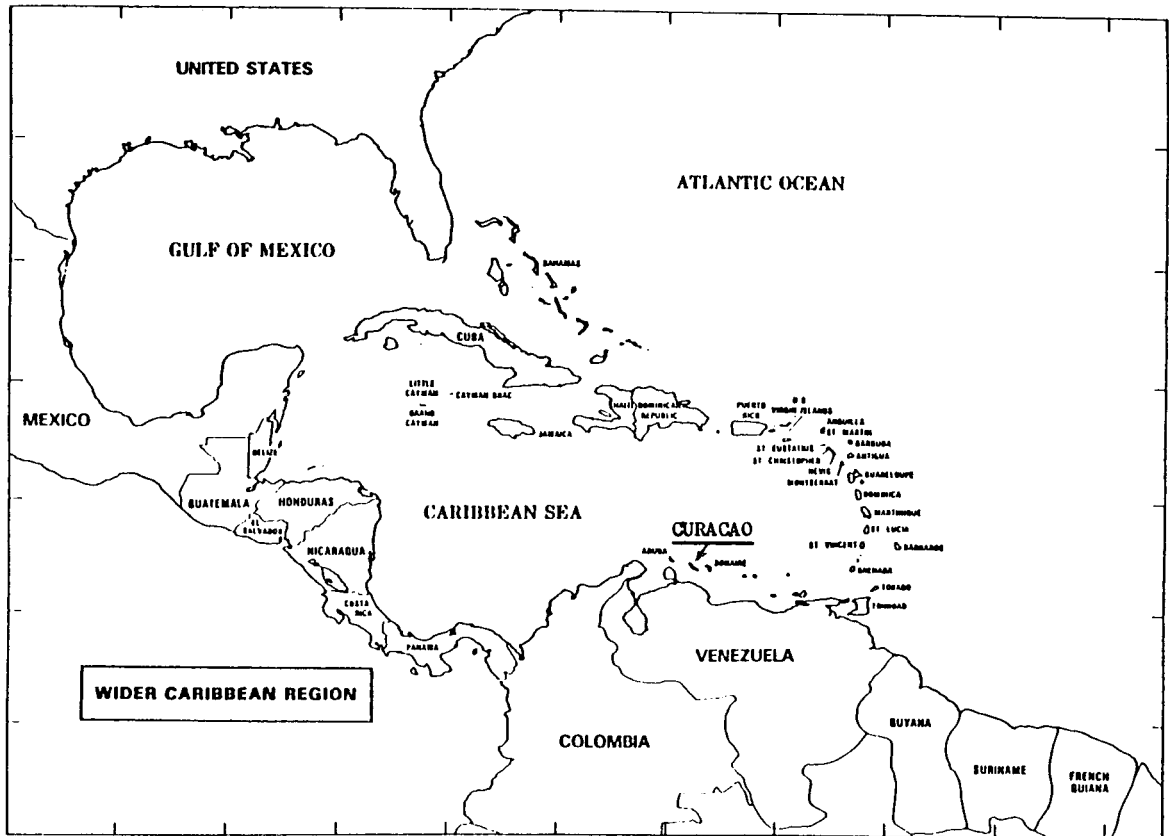


FIGURE 1. Location of Curacao in the Caribbean.

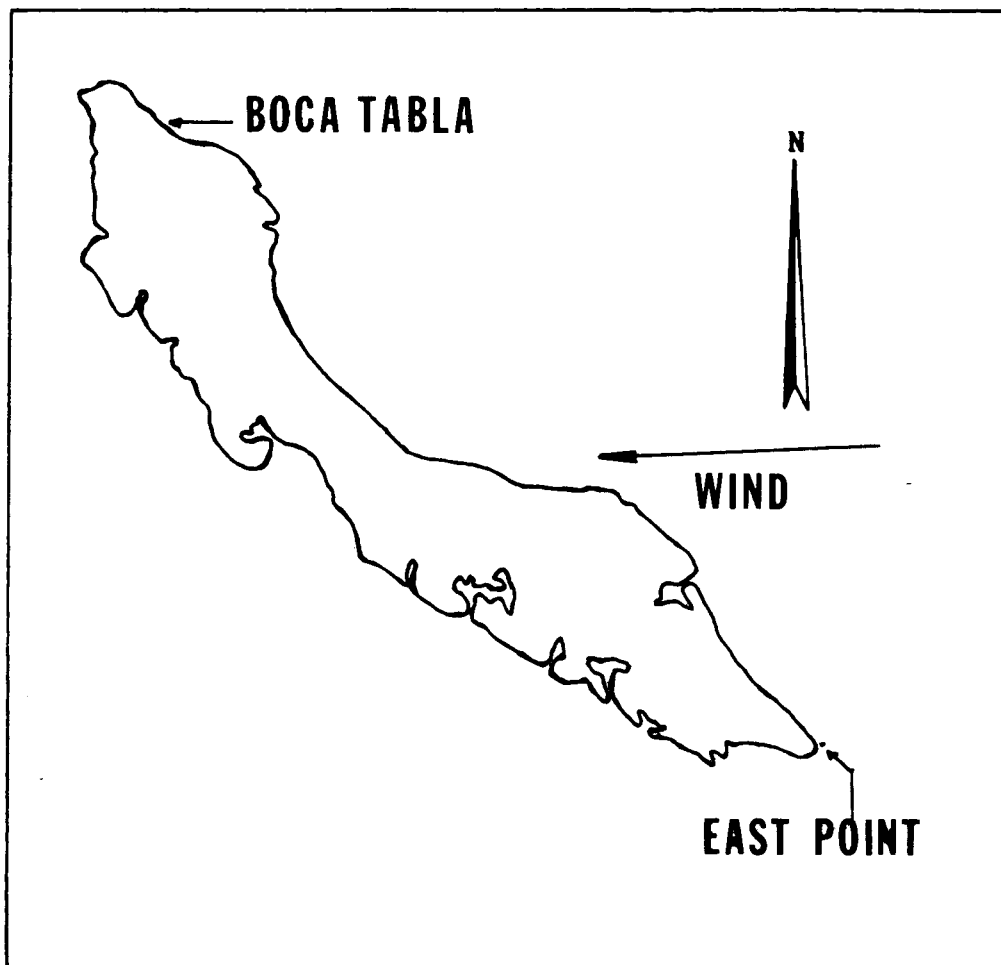


FIGURE 2. The island of Curacao (12°N. Lat., 69°W. Long.).

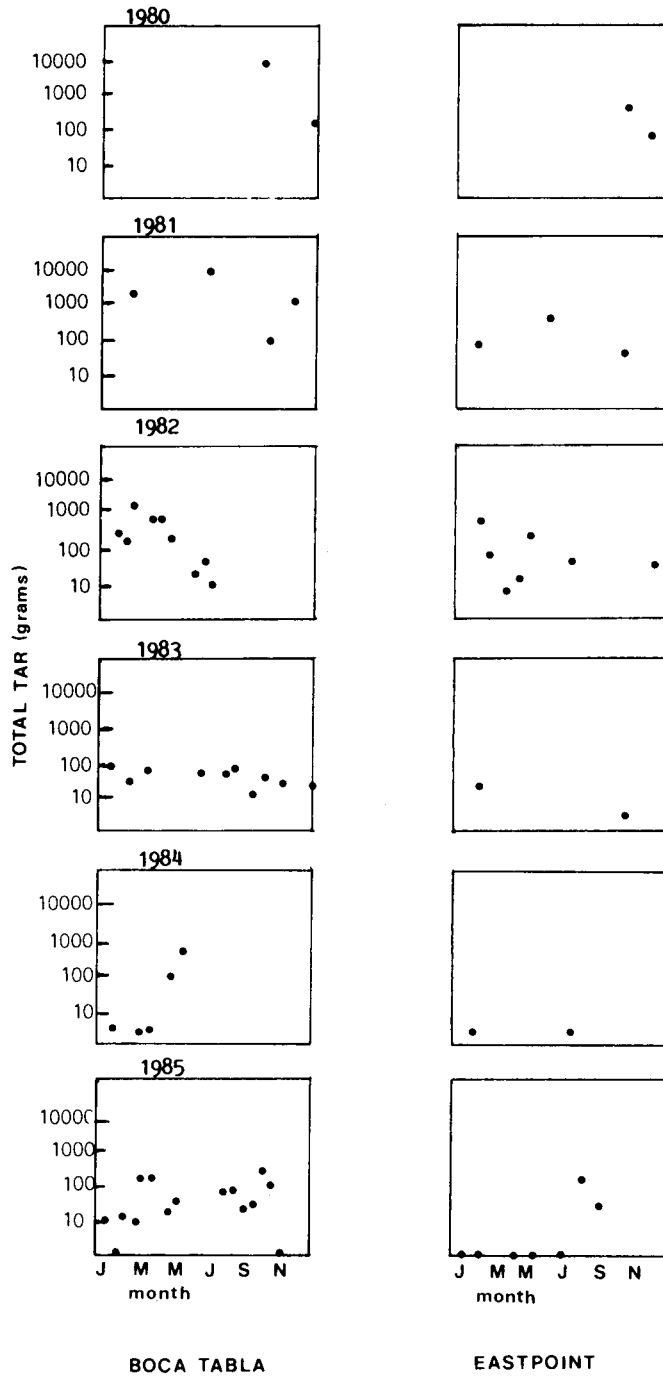


FIGURE 3. Total amounts of tar (grams) collected per visit at Boca Tabla and East Point beaches from 1980-1985; results for Boca Tabla are shown in the left graphs, results for Eastpoint in the right graphs.