
This paper not to be cited without prior reference to the authors

PRELIMINARY RESULTS ON THE EFFECTS OF DUMPED INDUSTRIAL WASTE DERIVED
FROM THE TITANEDIOXYDE PROCESS ON FISH AND SHRIMPS

R. DE CLERCK (x) and J. VAN DE VELDE

The density and diversity of fish and shrimp stocks as well as of other marine organisms has been studied in a dumping ground along the Belgian coast.

Characteristics of the waste.

In March 1970, the Ministry of Communications issued a permit for the dumping of industrial waste from the production of titanedioxyde by a factory located in Antwerp.

The dumping takes place in an area with a radius of 3 miles, the centre of the area being situated at 51°30' N - 3°00' E (figure 1).

The dumping is carried out in the wake of the ship in order to dilute the waste as much as possible. The pump rate is about 750-900 tons/hour.

From year to year the quantity of the dumped material increased nearly linearly (figure 2). In the first half of 1973 137,548 tons of waste were dumped against 62,874 tons dumped in the second half of 1970. Approximatively 1,500 tons is dumped every two or three days. The composition of the waste is as follows (1) :

(x) Working group "Biology" (Commission for Applied Scientific Research in Sea Fisheries - T.W.O.Z. - I.R.S.I.A.).

H ₂ SO ₄	:	18 - 25 %
Fe	:	1 - 2 %
Al	:	0,5 - 1 %
Mg	:	0,2 - 0,8 %
Ti	:	0,05 - 0,2 %
Va, Cr	:	traces
in suspension	:	0 - 2,1 % of which <u>±</u> 50-60 % SiO ₂
	:	<u>±</u> 20-22 % TiO ₂
	:	<u>±</u> 0-20 % Al ₂ O ₃ and undissolvable compounds of Fe, Mg and Ca

Distribution and density of commercial fish, shrimps and other marine organisms.

1. Material and methods.

During the period March-October 1973 monthly a series of hauls was carried out by the R.V. "Hinders" on four stations in the dumping area (figure 1). The catch resulting from a 15 minutes' haul was sampled. Fishing took place during day time with an otter trawl (mesh size 18 mm).

2. Results.

- Commercial fish and shrimps.

A permanent but an unimportant fish stock was present on the dumping ground. The observed species were the following : plaice (*Pleuronectes platessa* L.), dab (*Limanda limanda* L.), flounder (*Pleuronectes flesus* L.), cod (*Gadus morhua* L.), whiting (*Merlangus merlangus* L.), sole (*Solea solea* L.), mackerel (*Scomber scombrus* L.), horse mackerel (*Trachurus trachurus* L.), sprat (*Clupea sprattus* L.), tub gurnard (*Trigla lucerna* L.), garfish (*Belone bellone* L.), pout (*Gadus luscus* L.), roker (*Raya clavata* L.), tope (*Galeorhinus galeus* L.).

The quantitative analysis given in table 1 during the period under review indicates that

- the highest concentration of whiting of about 320 species per hour fishing was found during August.

- a maximum density of 225 0-groups dabs per hour fishing occurred in October.

- the density of 0-group soles had a maximum value during October.

Notwithstanding a distance of about 10 miles from the coastline it appears that the density of sized and undersized shrimps on the dumping ground did not differ from the rest of the Belgian coast (2). The highest concentrations were found in August with 65,500 undersized and 6,500 sized shrimps per hour fishing.

- Non- Commercial fishes and invertebrates.

The results of the by-catch (3) show the presence in the dumping area of *Callionymus lyra* L., *Pomatoschistus minutus* Pallas, *Agonus cataphractus* L., *Aphia minuta* Risso and *Liparis liparis* L.

The by-catch of invertebrates consisted of about 50 species belonging to eight Phyla, viz. Porifera, Coelenterata, Annelida, Echiurida, Mollusca, Bryozoa, Arthropoda and Echinodermata.

In comparison to the Belgian coast, a rather high density of brittle-star (*Ophiura texturata* L.) occurred in the dumping area (up to 22.240 species per 1,000 m² were found). Also the common starfish (*Asterias rubens* L.) and the common hermit crab (*Pagurus bernhardus* L.) were abundant in the area.

3. Discussion.

This study gives the first results of investigations on the effects of dumped acid waste on the fish and shrimp stocks as well as on the other marine organisms. Taking into account that numerous interactions of other abiotic influences (currents, hydrological and meteorological conditions) are certainly interfering with the dumping activity, it appears that up to now no negative effects on the macro marine life can be stated. Further investigations on this problem will be continued.

References.

- (1) Figures given by the factory.
- (2) De Clerck, R., Cloet, N. and Redant, F., 1973 - Bestandsopname langsheen de Belgische kust (7). Med. Rijksstation Zeevisserij (CLO Gent) Publ. nr. 81 - B/10/1973.
- (3) Redant, F. 1973 - Kwalitatieve en kwantitatieve analyse van de epibenthische en benthische bijvangst - fauna van de experimentele garnaalvisserij. C.I.P.S. Math. Mod. Pol. North Sea - Technical reports 11-14.

Table 1 - The densities of the commercial fish and shrimp stocks per station and per month

Station and month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
<u>Station 44</u>																
III	34.470	-	-	12	4	8	4	-	-	12	-	4	-	12	-	-
IV	16.061	-	-	-	-	4	-	-	-	-	4	-	-	4	-	-
V	21.920	-	-	-	-	12	4	-	-	-	-	4	-	4	-	-
VI	3.232	60	24	-	-	36	16	532	208	-	8	16	-	60	-	-
VIII	6.560	8	-	-	-	632	16	-	-	4	12	-	-	1260	8	-
X		20	268	-	8	44	100	-	-	-	24	4	-	60	-	4
<u>Station 45</u>																
III	16.632	4	-	-	-	16	16	-	-	-	-	-	-	24	-	-
IV	25.472	8	-	-	-	20	4	-	-	-	4	-	-	-	-	-
V	29.700	4	4	-	-	12	20	-	-	-	-	-	-	-	-	-
VI	13.520	44	12	-	-	64	12	-	12	-	4	4	-	124	-	-
VIII	184.556	36	-	8	-	212	36	12	4	4	8	-	-	456	4	-
X		8	156	8	-	72	148	-	-	-	8	12	-	68	-	-
<u>Station 46</u>																
III	31.760	-	-	-	8	56	4	-	-	-	-	-	-	-	-	-
IV	25.649	12	-	8	-	92	-	-	-	-	-	-	-	-	-	-
V	56.984	12	4	4	8	72	12	-	-	-	-	4	-	28	4	-
VI	3.920	32	4	60	-	64	4	-	24	-	-	16	-	52	-	-
VIII	54.680	20	-	28	28	148	20	28	12	-	24	-	-	168	-	-
X		24	132	-	12	52	80	-	4	-	4	24	4	68	-	-
<u>Station 47</u>																
III	26.160	4	4	20	-	12	4	-	-	-	-	-	-	32	-	-
IV	9.157	-	8	-	4	-	-	-	-	-	8	-	-	8	-	-
V	29.016	-	-	-	-	24	12	-	-	-	-	4	-	-	-	-
VI	2.320	24	-	4	-	92	-	4	240	-	-	96	-	16	-	-
VIII	34.832	4	44	-	8	284	20	-	-	-	12	92	-	276	4	-
X							32				24	92		40		

- 1 : shrimps
- 2 : plaice
- 3 : dab
- 4 : flounder
- 5 : cod
- 6 : whiting
- 7 : sole
- 8 : mackerel
- 9 : horse mackerel
- 10 : herring
- 11 : sprat
- 12 : tub gurnard
- 13 : garfish
- 14 : paut
- 15 : roker
- 16 : tope

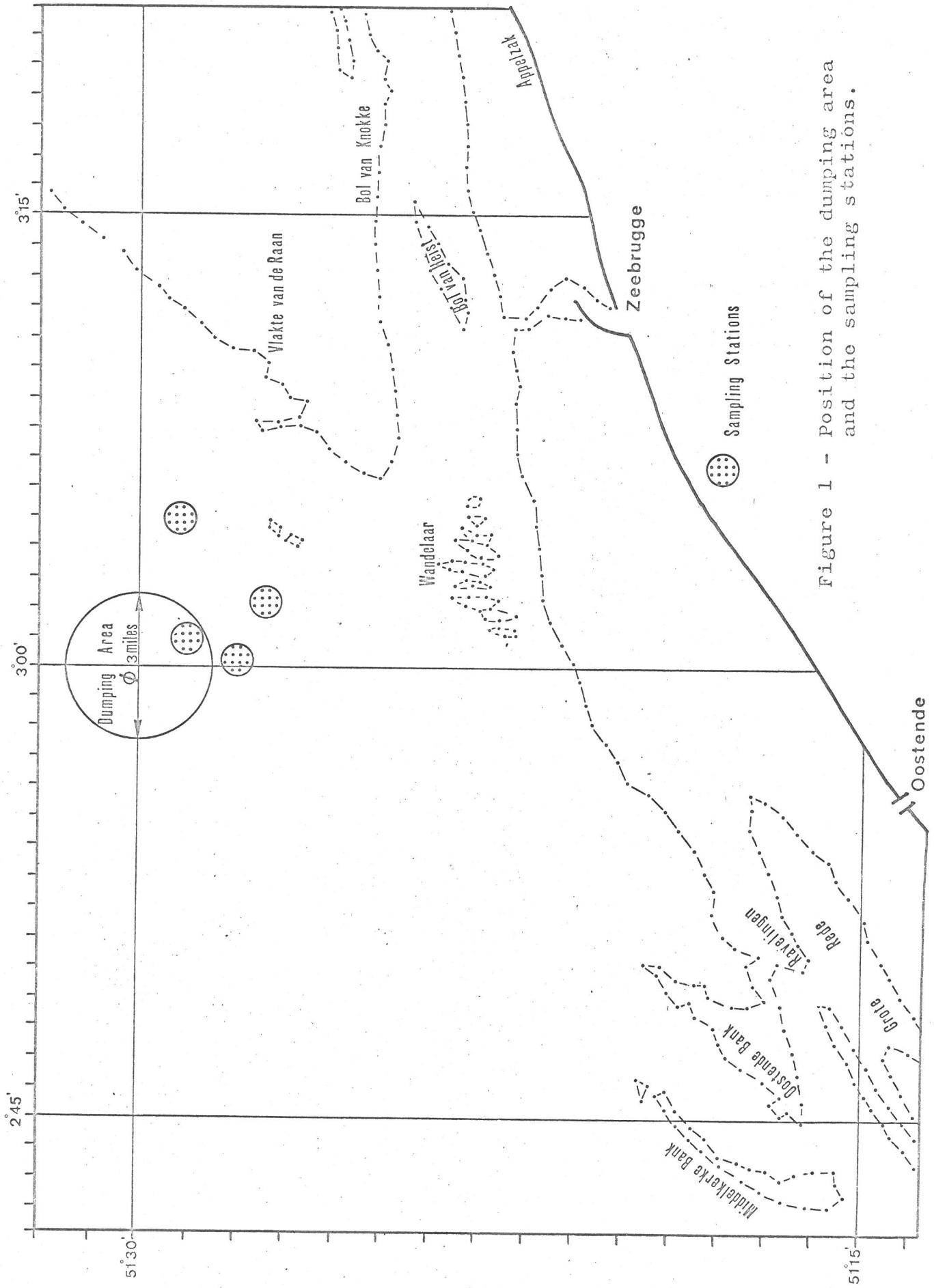


Figure 1 - Position of the dumping area and the sampling stations.

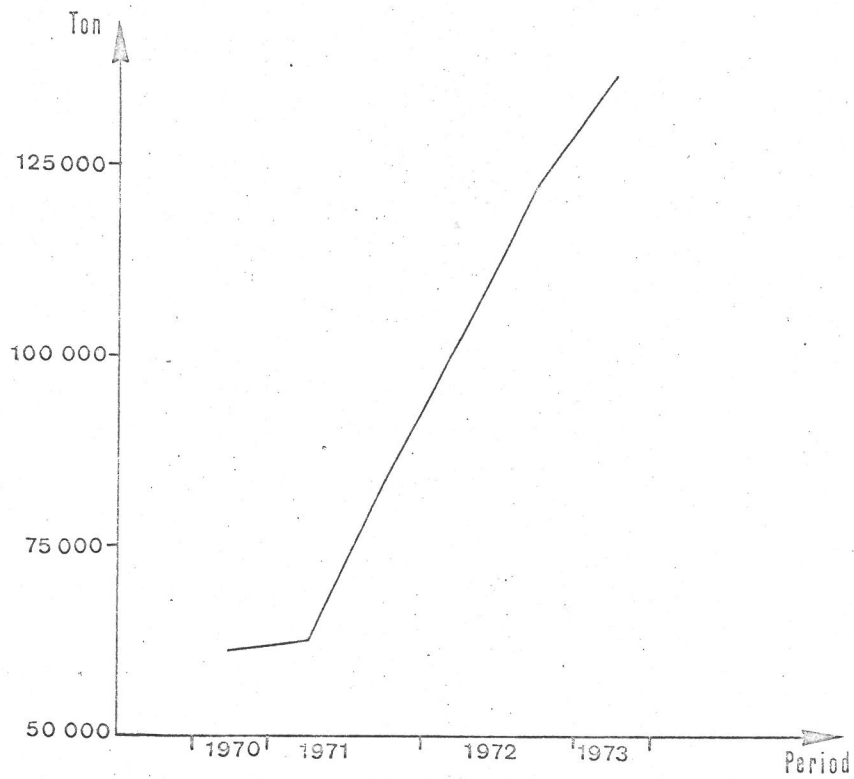


Figure 2 - The amount of dumped material during the period 1/7/1970 - 30/6/1973.