

BASELINE

Marine Pollution Bulletin, Volume 18, No. 2, pp. 92-94, 1987
Printed in Great Britain.

0025-326X/87 \$3.00+0.00
© 1987 Pergamon Journals Ltd.

Organochlorine Residues in Zooplankton off the Saurashtra Coast, India

Zooplankton samples were collected by neuston net (250 μm) at the sea surface for about 40 min. taking care to avoid shipboard contamination (Grice *et al.*, 1972; Jensen *et al.*, 1972). The plankton samples free of tar balls, paint chips, and other debris were transferred to a hexane-washed enamel tray, washed to remove extraneous material, dried on filter paper, packed in hexane-washed aluminium foil and deep-frozen for analysis in the shore laboratory.

About (10–20 gm) of the sample, dried at 50°C for 1 h, was mixed with an equal amount of acid-washed sand and anhydrous sodium sulphate (1:4). Preparation of the samples for GC analysis and lipid percentage was carried out according to the technique described by

Harvey *et al.*, (1972).

A Perkin-Elmer 3920-B GLC equipped with a ^{63}Ni electron capture detector and a glass column (3.65m \times 0.63cm) packed with 25% OV-17 + 2.5% QF-1 on 80–100 chromosorb W-AW was used. The samples were run at a column temperature of 200°C, injector at 225°C, and detector at 245°C under Argon Methane (95:5) flow 60 ml min^{-1} . Calculations are based on wet wt of the samples. The sensitivity was 0.1 $\mu\text{g g}^{-1}$ for *p,p'* DDD. Figure 1 gives a typical chromatogram of the standard and the sample.

Concentrations of *p,p'* DDD and *p,p'* DDT and *t*-DDT on wet wt basis and lipid basis are presented in Table 1. The values range from 0.38 to 1.63 $\mu\text{g g}^{-1}$ (wet wt) and from 17.5 to 379.46 $\mu\text{g g}^{-1}$ (lipid basis). Recovery values ranged between 87 and 103%. This compares favourably with the recovery reported by Harvey *et al.* (1972) for the OECD spiked corn oil intercalibration exercise. High values were obtained at

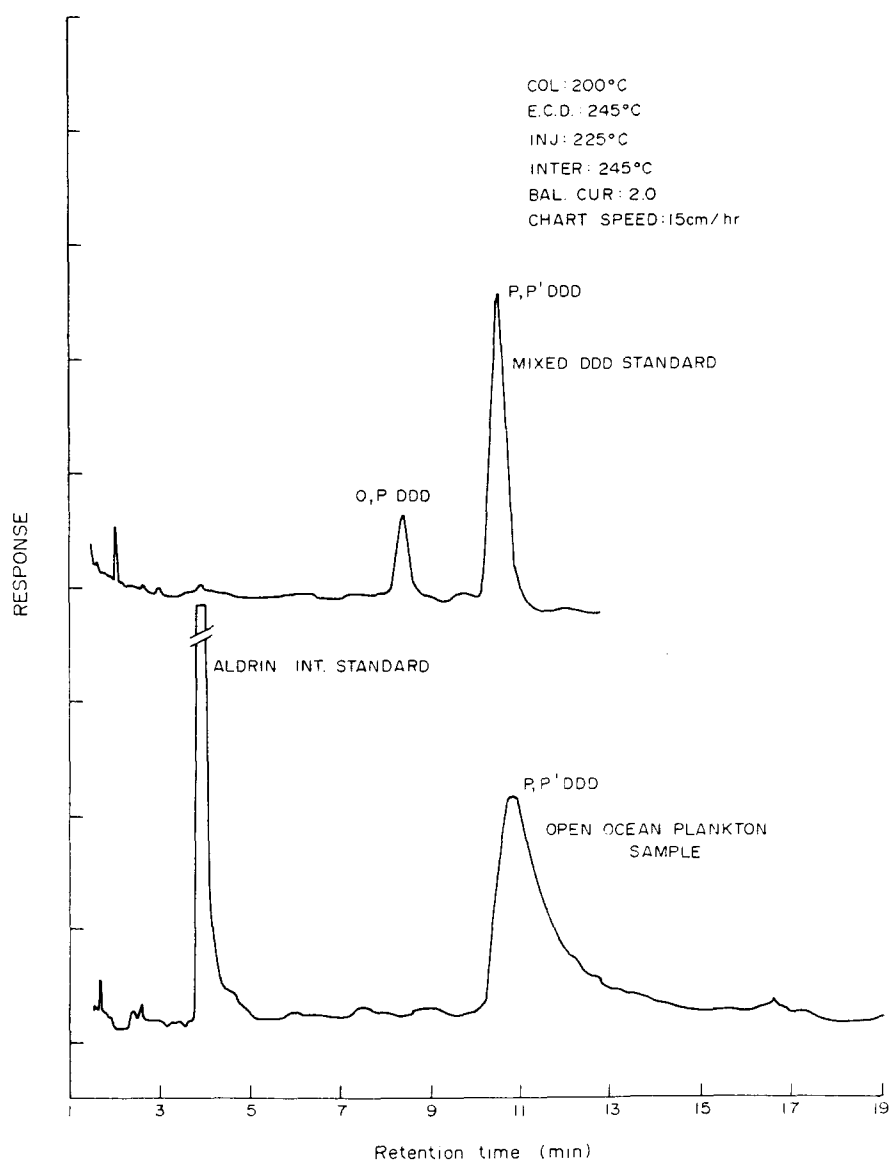


Fig. 1 Gas chromatograms of standard and sample.

stations near the coast. Values ranging from 0.05 to 3.21 $\mu\text{g g}^{-1}$ (mean 1.49 $\mu\text{g g}^{-1}$) wet wt for t-DDT were reported in zooplankton samples collected from the Eastern Arabian Sea; South of Bombay (Lat. 16°02'N, Long. 71°49'E to Lat 17°34'N Long. 71°32'E) (Kureishy *et al.* 1978). The concentration range of t-DDT in zooplankton samples collected from the Atlantic Ocean is 0.101–0.002 $\mu\text{g g}^{-1}$ (average 0.0281 $\mu\text{g g}^{-1}$) (wet wt) (Williams & Holden, 1973).

Fig. 2 shows the concentration of t-DDT (wet wt) observed in the present investigation. This is the first record of *p,p'* DDD in zooplankton from the Arabian Sea. The sampling stations extending from Gujarat to Bombay show significant amounts of Σ DDT, since these areas are adjacent to agricultural centres which use chlorinated hydrocarbons in large quantities.

55,000 tonnes of pesticides and insecticides are used in India annually (Sen Gupta & Quasim, 1985). High boiling hydrocarbons can be transported in the form of vapours and aerosols. Tanabe & Tatsukawa (1980) have reported values ranging from 10.9 ng m^{-3} to 0.93 ng m^{-3} in the air over the Eastern Arabian Sea. In addition to DDT and its metabolites traces of α , β benzene hexachloride, chlordane, heptachlor were detected but could not be quantified because of their extremely low concentrations.

S. T. KANNAN
R. SEN GUPTA*

National Institute of Oceanography,
Dona Paula
GOA 403004, India

*To whom correspondence should be addressed.

TABLE 1
Concentration of DDT and metabolites ($\mu\text{g g}^{-1}$) on wet weight

Station Number	Position Lat°N Long°E	Date of Collection	Major zoo-plankton	O,P DDT	P,P DDT	O,P DDE	P,P' DDE	P',P DDD	t-DDT	Extractable Lipid (%)	Concentration on Lipid Basis
293	16°02' 71°49'			2	0.9	N.D.	0.31	N.D.	3.21	6	53.5
304	18°35' 72°42'			N.D.	N.D.	—	0.05	N.D.	0.05	1.6	3.125
297	19°02' 69°57'			1.28	N.D.	0.15	N.D.	N.D.	1.43	3.7	38.6
299	19°10' 71°00'			N.D.	N.D.	N.D.	0.33	N.D.	1.27	2.3	55.2
3446	19°59' 68°28'	20.3.85	Hydromedusae	N.D.	N.D.	N.D.	N.D.	0.379	0.338	1.25	30.4
3449	20°02' 70°48'	21.3.85	Copepods	N.D.	N.D.	N.D.	N.D.	0.595	0.560	1.09	54.8
3451	20°41' 71°44'	22.3.85	Phytoplankton	N.D.	0.15	N.D.	N.D.	0.905	1.055	0.278	379.46
3444	21°30' 69°10'	19.3.85	Copepods	N.D.	N.D.	N.D.	N.D.	0.83	0.83	4.74	17.5
3442	22°13' 68°56'	19.3.85	Copepods	N.D.	N.D.	N.D.	N.D.	1.63	1.63	4.78	34.07
3441	22°24' 68°38'	19.3.85	Crabs (young)	N.D.	N.D.	N.D.	N.D.	0.576	0.576	1.53	37.4
3438	22°30' 67°36'	18.3.85	Copepods	N.D.	N.D.	N.D.	N.D.	0.512	0.512	2.37	21.5

1–4 were investigated by Kureishy *et al.* (1978); N.D.—Not Detected

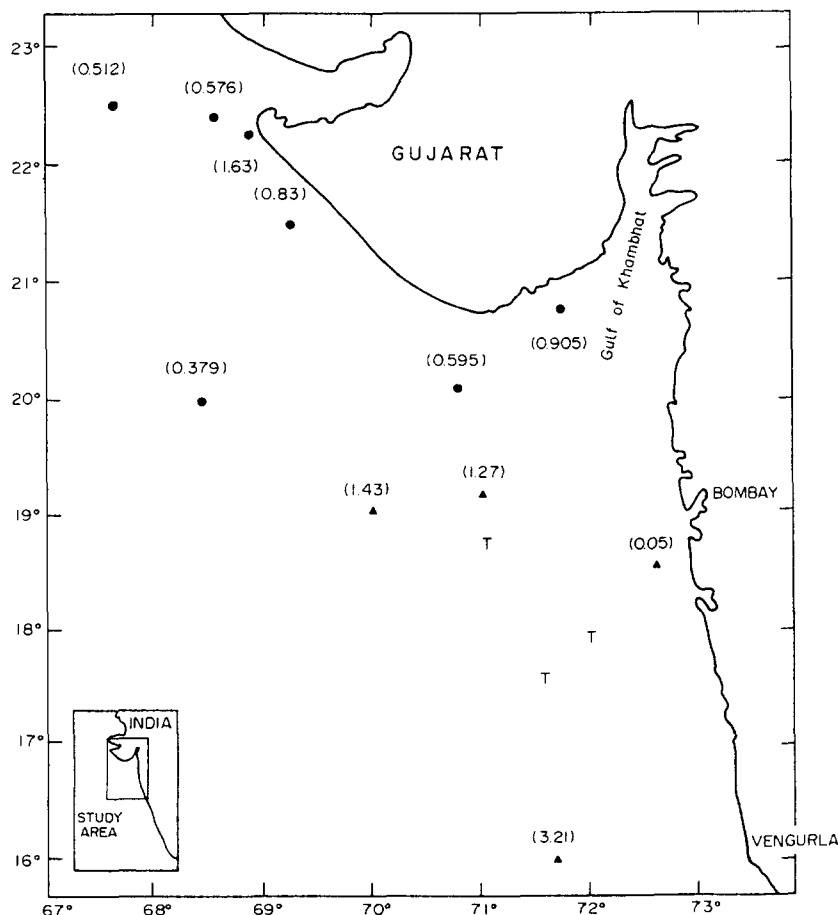


Fig. 2 DDT in zooplankton in the eastern Arabian Sea. 1978 observations, 1985 observations, T presence of organochlorine residues in trace quantities.

The authors wish to thank Dr. H.N. Siddiquie, Director, NIO for his constant encouragement and for providing the facilities, Dr. N. B. Bhosle and Mr. Tariq Kureishy for suggestions, Dr. Usha Goswami for identifying the zooplankton groups, and Dr. M. S. Chari for collection of samples on board R. V. GAVESHANI.

Grice, G. D., Harvey, G. R., Bowen, V. T. & Backus, R. H. (1972). The collection and preservation of open ocean marine organisms for Pollutant Analysis. *Bull. Environ. Contam. Toxicol.* **7**, 125-132.

Harvey, C. R., Miklas, H. P., Bowen, V. T., & Steinhauer, W. G. (1972). Observations on the distribution of chlorinated hydrocarbons in Atlantic Ocean organisms. *J. Mar. Res.* **32**, 103-118.

Jensen, S., Renberg, L. & Olsson, M. (1972). PCB contamination from boat bottom paint and levels of PCB in plankton outside a polluted area. *Nature* **240**, 358-360.

Kureishy, T. W., George, M. D. & Sen Gupta, R. (1978). DDT concentration in zooplankton from the Arabian Sea. *Ind. J. Mar. Sci.* **7**, 54-55.

Sen Gupta, R. & Quasim, S. Z. (1985). The Indian Ocean—An environmental overview. In *Oceans—Realities and Politics* (R. C. Sharma, ed.), pp. 7-40. Rajesh Pubs, New Delhi.

Tanabe, S. & Tatsukawa, R. (1980). Chlorinated hydrocarbons in the North Pacific and Indian Oceans. *J. Oceanogr. Soc. Japan* **36**, 217-226.

The Times of India, Directory and Year Book (1984), p. 146.

Williams, R. & Holden, A. V. (1973). Organochlorine residues from Plankton. *Mar. Pollut. Bull.* **4**, 109-111.

LETTERS

Waiting

Sir

Without expressing myself on behalf of the other authors, I am quite proud over the attention Ed Goldberg (*Mar. Pollut. Bull.* **17**, 523) has given our article on one of the IOC Programmes (*Mar. Pollut. Bull.* **17**, 341-352). According to my experience attributes such as small, witty and sexy are usually helpful in attracting the attention of Ed Goldberg, and none of these can be attributed to our article. It is also flattering that Ed writes a comment after having waded through and apparently come out alive. He is of course right in saying that the article does not identify present, fairly new global problems in marine pollution research. This was not the intention as Ed also acknowledges. The article is an attempt to describe a global international and inter-governmental programme which is developing, with several aims, and to present some of the results which have been obtained over the ten-year

period of going. The aim of the programme is to help define and identify regional and global marine pollution problems. Another important aim is to create a basis for tackling problems of various levels of complexity in different regions. A large element in the programme concerns development and introduction of techniques and training in use of these. Significant steps have been accomplished, implying that capabilities of making observations and analyses are existing in many regions. These capabilities can be used to tackle also some of the problems Ed Goldberg is pointing at.

The IOC programme is actually also considering some of the priority problems Ed Goldberg alludes to, like eutrophication and biological effects of contamination on individual to community levels. However, this is hopefully going to be the subject of a second article.

GUNNAR KULLENBERG

*Intergovernmental Oceanographic Commission,
UNESCO, Place de Fontenay, Paris.*

CONFERENCES

Marine Radioactivity

The 30th International Congress of C.I.E.S.M. was held at Palma (Majorca) on 20-25 October 1986. Among other activities a round table was organized by the Committee of Marine Radioactivity concerning the consequences of the Chernobyl accident on the marine environment. The chairman of the round table was Catherine Papadopoulou of the Nuclear Research Centre 'Demokritos', Athens and there were numerous researchers from various Mediterranean countries. They presented very interesting data on the radioactivity in marine organisms after Chernobyl.

C. Triulzi (Italy) has measured radioactivity in plankton and in algae of the Northern Adriatic, S. Balestra (Principality of Monaco) has taken similar measurements of algae along the coast of Provence, and

M. Florou (Greece) gave information on radioactivity in certain algae and phanerogams of the Aegean. S. Bonotto (Belgium) has identified the following radionuclides ^{131}I , ^{103}Ru , ^{106}Ru , ^{134}Cs , ^{125}Sb , ^{110}Ag , ^{95}Zn , ^{95}Nb , in *Fucus spiralis* in the English Channel.

These are the first results, not yet published, of the research in marine environment which reveal the presence, especially in plants, of Chernobyl radionuclides. They have already been identified in the air, the soil and the terrestrial organisms of various countries. According to Bonotto, we can expect, as a consequence of the run-off process, an increase of such radionuclides at the mouth of rivers and in the nearby marine areas. Therefore even though the radioactivity levels should not surpass the norms established by the EEC, a system of monitoring in marine organisms is necessary. This step was also proposed by Branica (Yugoslavia) who