

## CONCENTRATION OF TOXIC METALS IN BENTHIC ORGANISMS OFF BOMBAY COAST

P.K. VARSHNEY AND S.A.H. ABIDI\*

Centre for Inland Fisheries Operatives Training (CIFE),  
Chinhat - 227 105, Lucknow.

### ABSTRACT

Concentration of toxic metals namely Zn, Cu, Fe, Cd and Pb in the marine benthos off Bombay coast was estimated. Maximum concentration of Zn, Fe and Pb was from the organisms of Thana Creek. Higher concentration of Cu was encountered in benthic organisms off Versova. Cd was detected in some organisms and was maximum in the organisms collected from Mahim.

Hazards arising from the discharge of toxic metals from urban and industrial sources have necessitated the evaluation of levels of metals in marine organisms. Bioaccumulation of metals can occur from sea water, suspended particles, sediments and through food chain. The rate of accumulation depends not only on the availability of metal but also on a whole range of biological, chemical and environmental factors. The ultimate level found in an organism is governed by its ability to excrete or alternatively store the concerned pollutant, which leads to the accumulation of very high concentration of metal.

Information on the metal concentration especially in the marine benthos of coastal waters of India is limited. (D'silva and Kureishy, 1978; Kureishy *et al.* 1981; George and Kureishy, 1979, Zingde and Desai, 1981, Zingde *et al.* 1979; and Matkar *et al.* 1981). The Zn, Cu and Fe are essential elements provided they are within optimum limits, while Cd and Pb are good indicators of pollution. Benthic organisms are more or less sessile in habit and have a tendency to accumulate metals from the environment. Secondly, data on the concentration of Zn, Cu, Fe, Cd and Pb in marine benthos are scarce particularly for the coastal waters of Bombay. Hence, these metals have been selected for the present study.

Three localities along the coast of Bombay

(Lat, between 18°59' and 19°08'N and Long between 72°42' and 72°58'E) viz. Versova, Mahim and Thana were selected for the study. Benthic samples were collected using a van Veen grab of 0.04 m<sup>2</sup> during November, 1979 to December, 1980. The samples were kept in an ice box. Immediately after reaching the laboratory the samples were sorted out into different groups and dried at 70°C in an oven and stored in a desiccator. Hard shells, calcareous and cuticular parts were removed, dipping the organisms in dilute HCl. It was difficult to get all the common species in sufficient quantity and hence depending on the availability, species coming under the same taxonomic level were pooled together.

Metal analysis was done as per the method of FAO (1970). Readings were taken in Hilger - watts (Model-H. 1550) atomic absorption spectrophotometer and the results were expressed as ppm/g dry weight. (Table I).

Higher concentration of Cd was recorded in shrimps (31.66 ppm) collected from Mahim while the minimum (0.75 ppm) was in fish larvae. In natural conditions the concentration of cadmium reported for the crab *Cancer pagurus* ranged from 0.1 - 148 mg/g wet weight. (Overnell and Trewhellar, 1979) and the present observed level was within the reported range in the crab *Scylla serrata* (0.88 ppm).

\* Department of Ocean Development, Mahasagar Bhavan, Lodi Road, New Delhi - 110003.

Levels of Zn were generally high in polychaetes with maximum in *Prionospio cirrifera* collected of Thana followed by *P. pinnata* of Versova and Mahim. Bryan and Gibbs (1979) reported 940 mg/g dry wt of Zn in polychaete jaws. The present values of Zn in polychaetes appears moderate. The content of Zn in *S. serrata* and bivalves of Thana were 4.58 and 45.98 ppm respectively. In crabs the level of Zn was low compared to the previous report (83.5 & 60.7 mg/g wet weight) in the Bombay harbour (Matkar *et al.* 1981). The concentration of Zn in fish larvae off Mahim was 5.8 ppm and is very low compared to previous studies for *Arius* sp. (9.40 - 30.55 mg/g wet weight) (Matkar *et al.* 1981). In shrimp the Zn detected for Thana was 10 ppm. It is comparable to the values obtained for *Acetes indicus* (Matkar *et al.* 1981).

Higher concentration of Cu was found in *P. pinnata* from Versova (20.6 ppm) followed by polychaetes of Mahim and Thana. Gibbs and Bryan (1980) reported as high as 32-400 mg/g dry wt of Cu for the glycerid polychaetes. Copper level in *S. serrata* and bivalves off Thana were 5.64 and 28.22 ppm respectively. Value of 4.76 mg/g wet weight of Cu in *S. serrata* were reported for Bombay harbour bay (Matkar *et al.* 1981). Klump and Peterson (1979) found 7.6 - 200 mg/g dry wt of Cu in pelecypods while Zingde and Desai (1981) reported 16.1 ppm/g dry wt of Cu in *Meritrix casta*. In shrimps moderate values of Cu were observed at Versova (11.26 ppm), Mahim (16.27 ppm) and Thana (8.20 ppm). 11.2 mg/g wet wt of Cu in *Acetes indicus* for Bombay harbour (Matkar *et al.* 1981) and 28.90 ppm/g dry wt of Cu in *Metapaenaeus affinis* from Goa water (Zingde and Desai, 1987) indicate comparatively low concentration of Cu in the shrimps of Bombay. In fish larvae and crustaceans (copepods and tanadaceans) the Cu level were 1.28 and 4.16 ppm respectively. The reported value in fish (*Arius* sp.) for Bombay harbour bay was 0.88 - 435 mg/g wet wt of Cu (Matkar *et al.* 1981). Value as high as 77 - 259 mg/g dry wt of Cu was reported in amphipods (Icely, 1980)

Highest concentration of Fe was observed in polychaetes (411.8 ppm) from Thana. The level of Fe in *P. pinnata* from Versova and Mahim were respectively 240 and 250 ppm. In glycerid polychaetes jaws, the reported range was 24.2, to 430 mg/g dry wt (Gibbs and Bryan, 1980). In *S. serrata* and bivalves of Thana the concentration of Fe were respectively 98.67 and 368.18 ppm. For coastal waters of Bombay 114.22 - 295.5 mg/g wet wt of Fe was reported in crabs and bivalves respectively by Matkar *et al.* 1981. In shrimps the concentration values of Fe from Versova and Thana were same while it was low for Mahim. 15 mg/g wet weight of Fe was reported in *A. indicus* from Bombay harbour bay by Matkar *et al.* 1981.

The level of Pb in *P. pinnata* of Versova and Mahim were 7.60 and 15.25 ppm respectively while in *P. cirrifera* of Thana were comparatively very high (71.20 ppm). In bivalves, level of Pb from Thana was 28.53 ppm. In *Mytilus edulis* reported level of Pb was 0.470 mg/g dry wt (Bryan and Gibbs, 1979). In shrimps the values were comparable to Mahim (23.10 ppm) and Thana (22.14 ppm) than Versova (2.80 ppm). In fish larvae and crustaceans the Pb concentration were respectively 2.13 and 35.42 ppm. Icely (1980) reported 60.00 mg/g dry weight of Pb in amphipod crustacean. While for fish the reported value of Pb was 0.1 - 0.5 mg/g wet weight (Buggioni and Vannucchi, 1980)

Overall, the results of the present study on the concentration of heavy metals were comparable with the previous works of Zingde and Desai (1981) and Matkar *et al.* (1981). Maximum accumulation of Zn, Fe and Pb were observed in the organisms off Thana suggests the deteriorating environmental conditions of the creek system. Higher concentration of Cu was in benthic organisms of Versova while level of Cd was maximum in the organisms from Mahim.

Table 1 : Concentration of selected metals in macrobenthic organisms from the coastal water off Bombay

Area	Species	Concentration (ppm/g dry weight)				
		Cd	Zn	Cu	Fe	Pb
Versova	<i>Prionospio pinnata</i>	--	29.50	20.62	240.00	7.60
Mahim	<i>P. pinnata</i>	--	27.25	18.75	250.00	15.25
Thana	<i>P. cirriferra</i>	--	37.89	14.60	411.80	71.20
Thana	<i>Scylla serrata</i>	0.88	4.58	5.64	98.67	1.46
Thana	Bivalves	--	15.98	28.22	368.18	28.53
Versova	Shrimps	11.43	--	11.26	55.71	2.86
Mahim		31.66	--	16.27	26.67	23.10
Thana		--	10.00	8.20	55.71	22.14
Mahim	Fish Larvae	0.75	5.80	1.28	35.50	2.13
Versova	Crustaceans	--	--	4.16	50.33	35.42

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