

## VARIATION IN TRACE METALS IN TWO POPULATIONS OF GREEN MUSSEL *MYTILUS VIRIDIS* L. FROM GOA

N. B. BHOSLE and S. G. P. MATONDKAR

National Institute of Oceanography, Dona Paula-403 004, Goa

### ABSTRACT

Seven trace metals were analysed from the tissues of green mussel *Mytilus viridis*. The specimens were from the natural beds at Velsao and from the ropes suspended at Dona Paula for mussel culture. In general, the rope cultured animals showed a higher concentration of metals than those from the natural beds. These changes seem to be related to their continued submergence in sea water.

The green mussel *Mytilus viridis* is found in marine and estuarine regions of Goa. Recently commercial culture of green mussel in Goa waters has been demonstrated. The mussels grow to marketable size (60 mm) in about 5 months on ropes at Dona Paula, a locality where no natural beds are found (Qasim, Parulekar, Harkantra, Ansari and Nair, 1977).

The distribution of few trace metals has been reported recently from the Goa area (Zingde, Singbal, Moraes and Reddy, 1976). Sankaranarayanan and Reddy (1973) determined the levels of copper, whereas Kamat and Sankaranarayanan (1975a, b) reported the distribution of iron in Goa waters. Cultured animals grow fast and have a greater caloric value than those obtained from the natural environment (Qasim, Parulekar, Harkantra, Ansari and Nair, 1977), so it was decided to monitor the bioaccumulation of trace metal variations in these animals.

Methods for culturing green mussel are described elsewhere (Qasim, Parulekar, Harkantra, Ansari and Nair, 1977). Samples of green mussels were collected at fortnightly intervals from the rafts anchored at Dona Paula and from the natural beds at Velsao from March to December, 1976. The meat was removed from the shells and it was oven dried at 80°C to constant weight. Before the analysis, all the glasswares were washed with acid. Dried powder of whole meat (0.2 g) was digested with HNO<sub>3</sub>, perchloric acid and HCl and the residue was dissolved in glass distilled water. The resulting solution was used for estimating Fe, Mn, Zn, Co, Ni, Cu and Pb using an atomic absorption spectrophotometer (Hilger and Watts Atomspecks H 1550). Standards were also treated the same way.

The results are based on mean values of three replicate analysis and are expressed in ppm (dry weight). Table I shows the metal concentration in green mussel collected from Velsao and from the suspended ropes at Dona Paula. Rope cultured animals had higher metal concentration than those from the natural beds at Velsao Bay. Iron was maximum (2751 ppm) in rope cultured animals as compared to the animals from the natural beds (2090 ppm). Lead concentrations varied from 1.15 to 12.73 ppm in cultured animals and from 1.92 to 6.36 ppm in animals from the natural beds. However, Mn, Cu, Zn, Ni and Co were within the range of concentration normally occurring in nature (Bowen, 1966).

Table I. Variations of trace metals in green mussel *Mytilus viridis* L. (  $\mu\text{g/g}$  dry wt. )

Sr. No.	Locality	Date of Collection	Mn	Co	Ni	Fe	Cu	Pb	Zn
1	Velsao	5-3-76	31.86	1.05	9.30	768.65	9.46	1.92	10.46
2		6-4-76	53.14	3.17	10.40	1200.74	7.42	2.70	8.69
3		19-4-76	34.89	1.19	6.32	549.34	7.98	4.24	9.01
4		6-5-76	48.18	1.98	3.55	740.42	10.02	6.36	8.48
5		15-5-76	47.12	1.85	1.11	1087.83	11.50	1.54	8.93
6		15-7-76	46.23	1.58	6.78	1357.08	8.53	3.08	9.08
7		13-8-76	65.01	2.65	6.32	1035.72	7.23	3.08	10.52
8		10-9-76	24.26	1.98	10.60	816.41	7.98	6.17	9.75
9		8-10-76	35.25	3.97	8.19	1437.41	8.35	5.40	8.37
10		8-11-76	34.18	8.73	7.81	1380.96	7.61	4.62	5.90
11		23-11-76	66.07	2.10	8.56	2090.99	19.30	3.85	8.51
12		8-12-76	17.53	2.91	10.79	555.85	7.61	3.08	7.92
13		20-12-76	26.92	3.78	7.07	634.02	8.72	3.08	6.96
14		8-3-76	71.56	3.97	7.40	1487.36	11.69	3.47	6.71
15	Dona Paula ( Raft culture )	22-4-76	61.29	5.16	15.07	1074.81	13.17	4.24	5.37
16		8-4-76	61.29	1.32	10.61	2751.07	11.32	9.83	5.75
17		20-4-76	69.16	4.76	5.58	2614.28	10.24	12.73	4.98
18		7-5-76	57.75	2.64	2.97	1170.34	15.96	3.47	4.34
19		26-5-76	67.31	2.18	4.09	1370.10	14.85	6.36	6.22
20		10-6-76	89.46	2.77	4.46	1261.54	12.62	5.78	5.93
21		25-6-76	94.06	3.64	1.72	1782.66	12.25	6.94	7.98
22		7-7-76	70.15	2.38	5.58	1704.49	6.12	3.47	8.51
23		20-7-76	46.23	—	—	1052.01	6.96	10.41	11.29
24		4-8-76	35.60	2.64	4.46	772.99	8.91	10.80	10.46
25		24-8-76	66.07	3.97	2.23	1083.49	9.28	2.89	8.05
26		23-9-76	65.89	2.77	1.69	977.10	10.02	3.08	7.87
27		9-10-76	56.33	2.57	4.46	801.28	5.29	4.62	5.40
28		20-10-76	60.40	4.36	1.48	872.87	10.39	4.62	7.74
29		9-11-76	63.95	1.58	2.23	1103.03	5.75	2.31	7.52
30		23-11-76	69.44	6.61	5.02	827.27	8.72	1.15	5.97
31		23-12-76	73.69	2.77	6.14	1074.81	2.99	8.68	7.42

### Variation in trace metals in two populations

Iron and manganese concentrations of *M. viridis* reported here from both the localities are much higher as compared to the values reported by others (Bryan, 1973; Boyden, 1975). In the estuarine waters of Goa, an average value of 45.2 mg/l for manganese has been reported (Zingde, Singbal, Moraes and Reddy, 1976). Particulate iron concentration of 4–105 mg/l and 5–180 mg/l from the Mandovi and Zuari estuaries respectively have been recorded earlier (Kamat and Sankaranarayanan, 1975a). Annual variation of dissolved iron ranged 0.01–2.2 mg/l from Mandovi estuary and 0.02–3.5 mg/l from Zuari estuary (Kamat and Sankaranarayanan, 1975b). Higher concentration of iron and manganese in the green mussel is, therefore, because of a greater concentration of these metals in waters which comes from the ore bearing hinterland (Zingde, Singbal, Moraes and Reddy, 1976).

Although in general, there were not much differences in the metal accumulation in the green mussel collected from the two sites, the raft cultured animals had a tendency to accumulate more metal concentration than those from the natural beds. The accumulation of high concentration of metals in the green mussel depends on the relative concentration of these metals in the surrounding waters (Boyden and Romeril, 1975).

Metals in particulate form are important in determining their concentration in filter feeding bivalves (Boyden and Romeril, 1975). Since the rope cultured mussels were submerged, they feed almost continuously and hence they will evidently have greater accumulation of these metals. From the present results, it appears that in cultured animals, it would be necessary to monitor the metal concentration for maintaining the quality of meat.

### ACKNOWLEDGEMENT

Authors are highly grateful to Dr. S.Z. Qasim, Director, NIO for his keen interest, constant encouragement and valuable suggestions on the manuscript. We are thankful to Dr. R. Sen Gupta and Dr. (Miss) Aditi Pant, for their critical comments. We also express our sincere thanks to Dr. A. H. Parulekar for suggesting the problem, going through the manuscript and to his colleagues for providing the material.

### REFERENCES

- Bowen, H. J. M., 1966. *Trace Metal in Biochemistry*. Academic Press, London and New York, 31.
- Boyden, C. R., 1975. Distribution of some trace elements in Pook harbour, Dorset. *Marine Pollution Bulletin*, 6 (12): 180–187.
- Boyden, C.R. and M. G Romeril, 1974. A trace metal problem in pond oyster culture. *Marine Pollution Bulletin*, 5(5): 74–78.
- Bryan, G. W., 1973. The occurrence and seasonal variation of trace metals in Scallops, *Pecten maximus* (L.) and *Chlamya opercularis* (L.). *Journal of Marine Biological Association*, U. K., 53: 145–166.
- Kamat, S. B. and V. N. Sankaranarayanan, 1975a. Concentration of particulate iron in estuarine and coastal waters of Goa. *Indian Journal of Marine Sciences*, 4: 34–38.
- Kamat, S. B. and V. N. Sankaranarayanan, 1975b. Distribution of iron in estuarine and nearshore waters of Goa. *Indian Journal of Marine Sciences*, 4: 30–33.

- Qasim, S. Z., A. H. Parulekar, S. N. Harkantra, Z. A. Ansari and Ayyappan Nair, 1977. Aquaculture of green mussel *Mytilus viridis* L.: Cultivation on ropes from floating raft. *Indian Journal of Marine Sciences*, 6(1) : 15-25.
- Sankaranarayanan, V. N. and C. V. G. Reddy, 1973. Copper content in the inshore and estuarine waters along the central west coast of India. *Current Science*, 42 (7): 223-224.
- Zingde, M. D., S. Y. S. Singhal, C. F. Moraes and C. V. G. Reddy, 1976. Arsenic, copper, zinc and manganese in marine flora and fauna of coastal and estuarine waters around Goa. *Indian Journal of Marine Sciences*, 5: 212-217.