

## DISTRIBUTION OF PLANKTONIC DECAPODS WITH SPECIAL REFERENCE TO *ACETES* FROM NEARSHORE WATERS OF BOMBAY

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### ABSTRACT

Distribution and seasonal variation of decapod larvae were studied from eight stations off Versova and Mahim during Nov. 1979 to Dec. 1980. Decapod larvae were encountered throughout the year contributing 7.27% of total zooplankton. Numerically, they were more at Versova (av. 1766/100 m<sup>3</sup>) than Mahim (av. 970/100 m<sup>3</sup>). *Acetes* spp. were common along both the transects. They were represented by *Acetes indicus*, *A. siibogae* and *A. erythraeus*. The effect of physico-chemical parameters in the occurrence of decapod larvae is discussed.

### INTRODUCTION

Decapods usually contribute to a sizeable part of zooplankton collected from the oceanic and coastal areas of Indian ocean (Menon & Paulinose, 1973). These includes epiplanktonic decapods and decapod larvae including commercially important forms, which is quite common in zooplankton samples. *Acetes* forms a fairly good percentage of the annual marine fish (crustacean) landing particularly in Maharashtra and Gujarat coast (Bal & Rao, 1984). Also their swarming in very shallow inshore and estuarine areas was reported by Omori (1974, 1977) and Nair (1977). A few studies on the zooplankton from the nearshore waters of Maharashtra (Bal & Pradhan 1945; Pillai, 1968; Belsare *et al.* 1975; Gajbhiye & Desai 1981; Gajbhiye, 1982) include their records from the nearshore waters of Bombay. Considering the importance of decapod larvae a detailed study on the group was taken up to evaluate their occurrence, seasonal distribution in relation to the variations in physico-chemical parameters.

### MATERIALS AND METHODS

Monthly samples were collected from November 1979 to December 1980 from two transects covering 8 stations located off Versova and Mahim (Fig.). Due to technical problems samples could not be collected in June. Zooplankton

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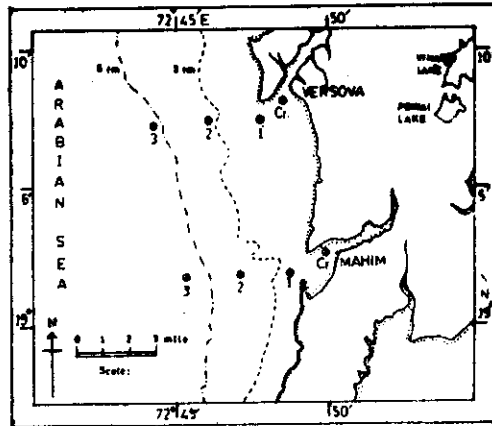


Fig. Location of stations.

samples were collected during the ebb and flood tides using an H.T. net (0.25 m<sup>2</sup> mouth area; mesh size 0.3 mm) fitted with a TSK flow meter. Decapods were sorted out from the collections and the density was calculated in terms of no/100 m<sup>3</sup>. Relevant chemical parameters like salinity, DO, and nutrients were estimated.

## RESULTS AND DISCUSSION

### *Physico-chemical parameters*

A detailed account on the physico-chemical parameter of the present area of study had been reported by Nair *et al.* (1983). Annually salinity varied from 1.79 (Mahim) to 37.07‰ (Versova) with low values confined to the monsoon period. Dissolved oxygen fluctuated from 0.1-8.72 mg/l. Zero values of DO were usually obtained from the creek stations particularly during low tide. Very high values of phosphate (60.86 µg. at/l) and nitrate (85.18 µg. at/l) were recorded from the creek stations. The creek stations of Versova and Mahim respectively received about 300 and 350 mld of domestic waste from nearby areas thereby contributing to the high nutrient values (Gajbhiye, 1982). The deteriorating conditions observed at the creek station gradually decreased towards offshore stations of each transect suggesting the improved water quality towards off shore area (Gajbhiye, 1982).

### *General distribution pattern of decapods*

#### **Versova transect :**

At the creek station, the percentage contribution of decapod larvae varied from 0.13 to 28.83 and 0.51 to 40.86 respectively for flood and ebb tides

(Table 1). The mean seasonal value was higher for monsoon (1824/100 m<sup>3</sup>) and premonsoon (1013/100 m<sup>3</sup>), periods than the postmonsoon period 251/100 m<sup>3</sup>. The frequency of occurrence was 100% during both the tides (Table 1). The highest (8710/100 m<sup>3</sup>) and lowest density (17/100 m<sup>3</sup>) appeared during flood and ebb tide respectively in July 80 and November 79.

At st. 1, the percentage composition varied from 0.13-46.43% and 0.51-40.86% between flood and ebb tides and decapods were found in all collections except in two samples. The peak in decapod population was observed in July 1980 (24320/100 m<sup>3</sup>) whereas minimum value (28/100 m<sup>3</sup>) was recorded during August 80. The appearance of decapods was very poor during postmonsoon period (av. 609/100 m<sup>3</sup>) as compared to monsoon (av. 4341/100 m<sup>3</sup>) and premonsoon seasons (av. 1097/100 m<sup>3</sup>).

For the st. 2, the frequency of occurrence was 100% irrespective of the tides, with the percentage contribution amounting from 0.05 to 61.20 for flood and 0.29-26.19% for ebb tide. The maximum (45111/100 m<sup>3</sup>) and minimum (9/100) density were recorded during July and August 80 respectively. The recorded mean values for the monsoon period (10785/100 m<sup>3</sup>) was several times higher than premonsoon (1163/100 m<sup>3</sup>) and postmonsoon (628/100 m<sup>3</sup>) periods.

At st. 3 also they were present in all the samples and their percentage composition showed a variation of 0.14 to 14.76 and 0.10 - 24.22% (respectively for flood and ebb tide) of the total zooplankton. The highest density was observed during monsoon (av. 4592/100 m<sup>3</sup>) than premonsoon (av. 408/100 m<sup>3</sup>) and postmonsoon (av. 628/100 m<sup>3</sup>). The maximum (20267/100 m<sup>3</sup>) and minimum (27/100 m<sup>3</sup>) density were during July and August 80 respectively.

#### Mahim transect:

At the creek station the percentage composition varied from 0.58-26.36 and 0.12-26.47 between flood and ebb tide. The percentage of occurrence was 92.3% and 46.15% respectively in flood and ebb tide. The maximum and minimum population densities of decapods were respectively 900/100 m<sup>3</sup> (Nov. 80) and 6/100 m<sup>3</sup> (Dec. 80). They were totally absent on so many collections (Table 1). During the monsoon months (av. 23/100 m<sup>3</sup>) the density decreased compared to premonsoon (av. 41/100 m<sup>3</sup>) and postmonsoon (av. 115/100 m<sup>3</sup>). At st. 1 the percentage composition of decapods was 0.12-62.94% and 0.25-56.38% during flood and ebb tides respectively with 100% occurrence for

Table — 1: Variation of planktonic decapods (no/ 100m<sup>3</sup>) during flood (FI) and ebb (eb) tides along Versova and Mahim transects.

Months	Versova Transect						Mahim Transect									
	Creek		St. 1		St. 2		St. 3		Creek		St. 1		St. 2		St. 3	
	FI	Eb	FI	Eb	FI	Eb	FI	Eb	FI	Eb	FI	Eb	FI	Eb	FI	Eb
Nov 79	494	17	203	103	743	331	596	361	48	—	2800	213	1177	276	421	197
Dec	423	369	400	651	323	900	1224	1700	40	80	310	250	3859	1600	1167	1813
Jan 80	267	140	206	457	414	1619	612	700	48	9	457	237	291	826	711	790
Feb	225	29	800	85	320	152	39	36	10	—	88	340	—	113	178	329
Mar	320	2053	245	3200	280	1333	278	187	93	—	175	560	110	120	133	160
Apr	137	4000	2000	1643	1100	1400	753	660	2	—	38	9973	194	450	1807	500
May	593	747	600	—	175	4542	365	940	224	—	388	160	1167	698	276	376
Jul	8710	310	24320	1200	45111	18710	20267	6430	—	—	870	640	1067	1840	6969	3413
Aug	900	410	28	130	9	240	27	260	80	18	140	80	151	140	267	180
Sept	107	343	258	107	485	155	366	200	40	—	150	187	76	120	183	543
Oct	213	23	1404	640	58	124	91	78	160	12	200	566	427	103	1271	400
Nov	299	46	—	552	560	683	141	153	900	40	576	243	24824	1365	7824	4440
Dec	640	81	1350	1333	1035	740	1486	388	29	6	38	320	873	2520	1371	3724

both the tides. Both the maximum (9973/100 m<sup>3</sup>) and minimum (38/100 m<sup>3</sup>) density were noticed during April 80. The average density was higher in premonsoon period (1490/100 m<sup>3</sup>) than monsoon (345/100 m<sup>3</sup>) and postmonsoon (519/100 m<sup>3</sup>)

At st. 2 the percentage composition was 0.0-27.46 and 0.14-13.88% respectively for flood and ebb tide and the frequency of occurrence was 92.3% for flood and 100% for ebb tide. The highest (24824/100 m<sup>3</sup>) and lowest (76/100 m<sup>3</sup>) density were recorded respectively during Nov. 80 and Sept. 80. Comparatively their density was more during post monsoon (av. 3279/100 m<sup>3</sup>) than premonsoon (av. 357/100 m<sup>3</sup>) and monsoon (av. 566/100 m<sup>3</sup>) months.

At st. 3 they were found in all the zooplankton collection contributing 0.32-39.08% during flood tide and 0.17-11.65% during ebb tide. The maximum and minimum counts of decapods were 6969/100 m<sup>3</sup> (July 80) and 133/100 m<sup>3</sup> (March 80). The mean seasonal value was higher during monsoon (1926/100 m<sup>3</sup>) and postmonsoon (1590/100 m<sup>3</sup>) than premonsoon (470/100 m<sup>3</sup>) months.

Decapods of the families Alpheidae, Palaemonidae and brachyuran zoea were the most common groups along both the transects.

#### Distribution of *Acetes*-

At the Versova transect the frequency of incidence of *Acetes* varied from 15.38-46.15% (Table 2). The percentage of occurrence was 23.08, 30.77, 34.62 and 26.93% respectively for creek, sts. 1, 2 and 3 irrespective of tides. The percentage composition of *Acetes* varied from 0.01-0.81, 0.001-5.41, 0.003-4.8 and 0.01-1.17% for the above stations in the respective order. The maximum density (310/100 m<sup>3</sup>) was observed at st. 2. Very often *Acetes* was absent in the area of study (Table 2).

At the Mahim transect the distribution of *Acetes* was very poor and was absent in the creek. Their frequency of occurrence for sts. 1, 2 and 3 were 23.08, 30.77 and 19.23% respectively. Their percentage composition varied from 0.003-0.17, 0.004-1.45 and 0.002-0.09% respectively at sts. 1, 2 and 3. The maximum (220/100 m<sup>3</sup>) numerical abundance was recorded at st. 2. whereas minimum value (1/100 m<sup>3</sup>) was common to most of the stations.

Adults and all the different larval stages were encountered in the collections. The three species found in the collections were *Acetes indicus*, *A. sibogae* and *A. erythraeus* of which *A. indicus* was the dominant species in the collection.

Planktonic decapods represented 7.27% of the total zooplankton-population of the Versova/Mahim area. Most of the stations showed two peaks annually, a major one in July and second in April/May. Decapods were more abundant along the Versova transect (av. 1766/100 m<sup>3</sup>) than the Mahim transect (970/100

Table — 2: Variation of *Acetes* population (no/100 m<sup>3</sup> during flood (F.) and ebb (eb) tides along Versova and Mahim transects.

Months	Versova Transect						Mahim Transect										
	Creek		St. 1		St. 2		St. 3		Creek		St. 1		St. 2		St. 3		
	Fl	Eb	Fl	Eb	Fl	Eb	Fl	Eb	Fl	Eb	Fl	Eb	Fl	Eb	Fl	Eb	
Nov 79	-	-	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dec	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Jan 80	-	-	23	-	19	19	9	10	-	-	-	-	-	10	-	-	-
Feb	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Mar	-	-	-	5	-	-	-	-	-	-	11	4	30	70	-	-	23
Apr	-	-	-	16	-	-	-	-	-	-	-	-	-	-	-	-	-
May	4	-	-	-	-	10	-	10	-	-	-	-	-	-	-	-	-
Jul	2	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aug	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sept	-	23	124	59	78	227	27	1	-	-	10	21	1	220	2	29	-
Oct	21	-	-	-	252	310	110	12	-	-	-	21	11	3	-	2	-
Nov	-	-	-	-	-	2	-	-	-	-	-	1	-	-	-	-	-
Dec	1	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-

m<sup>3</sup>) Among the various stations studied the numerical density of decapods was more at st. 2 of both the transects, the average values being 3893/100 m<sup>3</sup> for st. 2 of Versova and 2632/100 m<sup>3</sup> for st. 2 of Mahim. Their total numbers decreased considerably during low tide at most of the stations. Distribution of decapods showed seasonal variability between the two transects, being more abundant during monsoon period at Versova while at Mahim the pattern was irregular.

In the case of *Acetes*, even though they were numerically poor, whenever present they contributed significantly to the standing stock. Their appearance varied significantly during monsoon & postmonsoon months. The peak values were observed during September month with very low or nil values during most of the remaining part of the year (Table 2).

#### ACKNOWLEDGEMENT

The authors are grateful to the Director, NIO, for providing necessary facilities

#### REFERENCES

- Bal, D. V. and Pradhan L. B. 1945. A preliminary note on the plankton of Bombay Harbour, *Curr. Sci.*, **14**: 211-212.
- Bal, D. V. and Rao, K. V. 1984. *Marine fisheries*. Tata McGRAW press, 470 pp.
- Belsare, S. G., Mhasawade, D. M. and Gore, P. S., 1975. Observations on the Plankton and Hydrological features. *J. Biol. Sci.* **18** : 11-21.
- Gajbhiye, S. N. and Desai, B. N. 1981. Zooplankton variability in polluted and unpolluted waters around Bombay. *Mahasagar-Bull. natn. Inst. Oceanogr.* **14**: 173-182.
- Gajbhiye, S. N. 1982. Ecology of zooplankton with special reference to polluted environments off Bombay. *Ph.D Thesis* submitted to Bombay University 497 pp.
- Menon. P. G. and Paulinose, V. T. 1973. Distribution of decapod larvae in the Indian Ocean. *IOBC Hand book, NIO*; **5** : 163-171.
- Nair, V. R. 1977. Aggregation of *Acetes johni* (Crustacea : Decapoda : Sergestidae) off Maharashtra Coast. *Indian J. mar. Sci.* **6** (2) : 186-187.
- Nair, V. R., Gajbhiye, S. N. and Sayed. F. H. 1983. Organic carbon content of zooplankton from the nearshore waters of Bombay. *Indian J. mar. Sci.* **12** : 183-185.
- Omori, M, 1974, *Adv. Mar. Biol.* **12** : 233-234.
- Omori, M, 1977, Distribution of warm water epiplanktonic shrimps of the genera *Lucifer* and *Acetes* (Macrura, Penaeidea, Sergestidae) *Pro. Symp. Warm Water Zooplankton, NIO-UNESCO, Goa* 1-12.