

DISTRIBUTION OF DECAPOD LARVAE IN THE BOMBAY HARBOUR-THANA- BASSEIN CREEK REGIONS

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ABSTRACT

Variations in the abundance and composition of larval decapods were studied from a 90 km stretch of the Bombay harbour-Thana creek-Bassein creek (BHTCBC) system for a period of 15 months. The larvae belonged to Penaeidea, Caridea, Anomura and Brachyura. Among these, brachyurans were the most abundant in the entire study area indicating good potential for crab fishery. *Penaeus*, *Metapenaeus* and *Parapenaeopsis* were the genera recorded in the family Penaeidae of which *Metapenaeus* spp. were the most common. Generally there was a higher abundance of *Penaeus* and *Metapenaeus* during monsoon probably indicating intense breeding. A few genera of decapods showed patchy occurrence in this system. Results of this first investigation were quantitatively and qualitatively evaluated with comments on fishery potential of the commercially important groups of decapods.

INTRODUCTION

Decapods are among the most important groups of crustaceans. This group consisting of penaeids, carideans, anomurans and brachyurans is one of the major component of the zooplankton community and often ranks next to copepods in abundance. The abundance of decapod larvae in the inshore waters is of greater significance from the point of view of commercial fisheries in that the distribution of larval stages have direct evidences of the fishery potential of the species concerned (Longhurst, 1983). The distribution of larval decapods and the breeding season of the commercially important penaeid prawns from the south and central west coast of India has been well documented (Nair and Paulinose, 1980; Achutankutty and Nair, 1983; Achutankutty, 1987 and Paulinose *et al.* 1987). The only detailed report on decapods from Bombay waters is that of Gajbhiye *et al.* (1982-83) dealing only with the distribution of *Acetes* in the Versova and Mahim creek. Apparently, no information is available on this important group from the Bombay harbour - Thana creek - Bassein creek (BHTCBC) system. The present study was therefore planned to observe annual variations in the abundance and composition of decapod larvae, with special emphasis on the distribution

pattern of commercially important groups such as penaeids, anomurans and brachyurans from the least investigated BHTCBC.

MATERIAL AND METHODS

Zooplankton samples were collected from the BHTCBC area for a period of 15 months (August 1985-October 1986). Monthly sampling was carried out from 8 stations covering over 90 km of the BHTCBC (Fig. 1). The stations were located in the Bombay harbour (stns. 1,2 & 3) Thana creek (stn.4), Bassein creek (stns. 5,6 and 7) and off Bassein (stn.8) in the coastal nearshore regions at 10 m depth contour. Due to navigational difficulties, samples could not be collected from stn. 8 during July 1986. For comparing the data, region between stns. 1-4 was considered as the Thana system and that between stns. 5-8 as the Bassein system. Samples were collected by Heron Tranter net (mouth area 0.25 m²; mesh size 300 mm). Decapod larvae were sorted, enumerated and identified to different families. Wherever possible, the individuals were assigned to specific level depending on the certainty of the taxonomic characteristics recognisable from the larval forms. Using the flowmeter readings, larval counts were converted to No/100m³.

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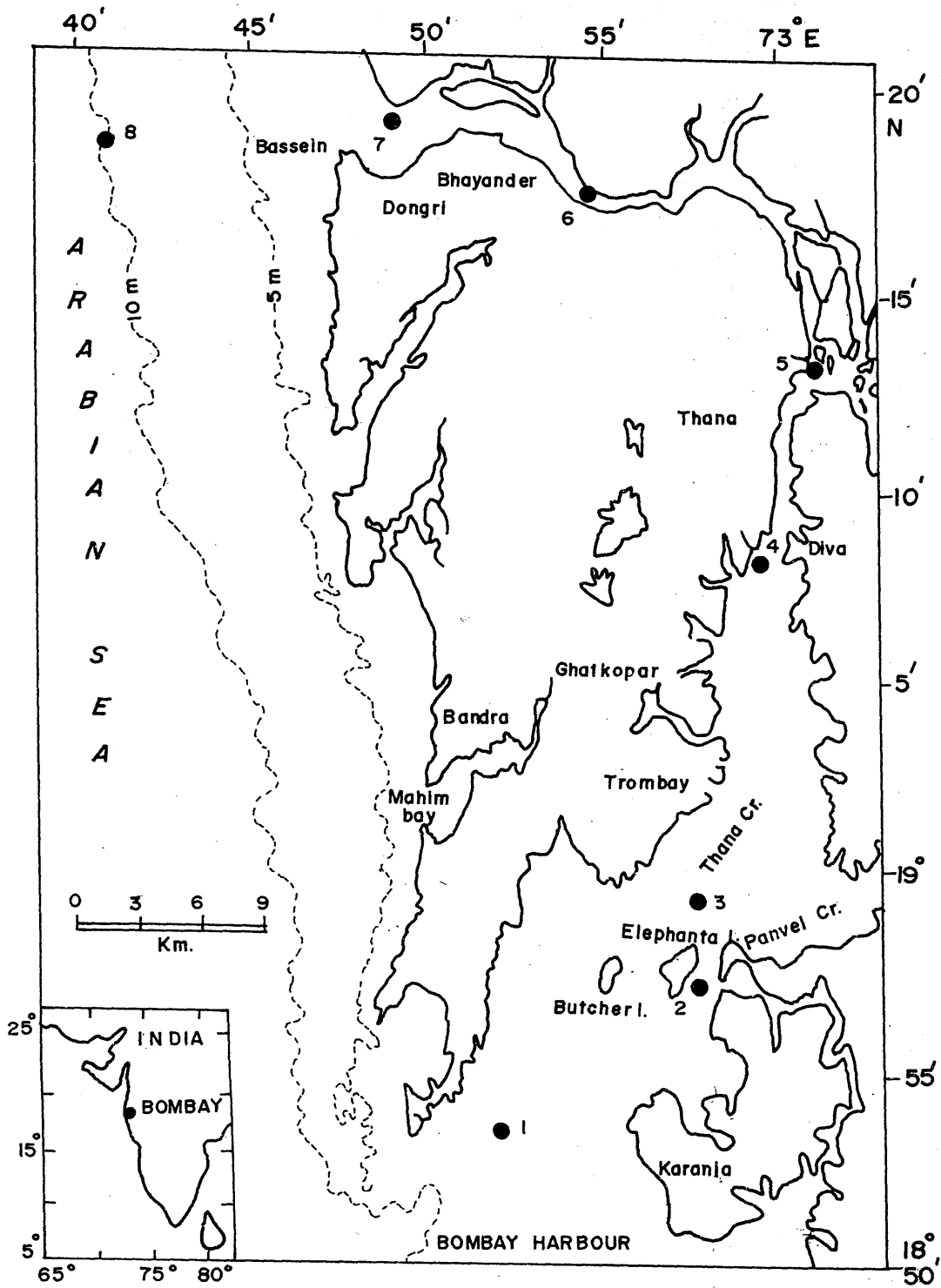


Fig. 1 : Location of sampling stations.

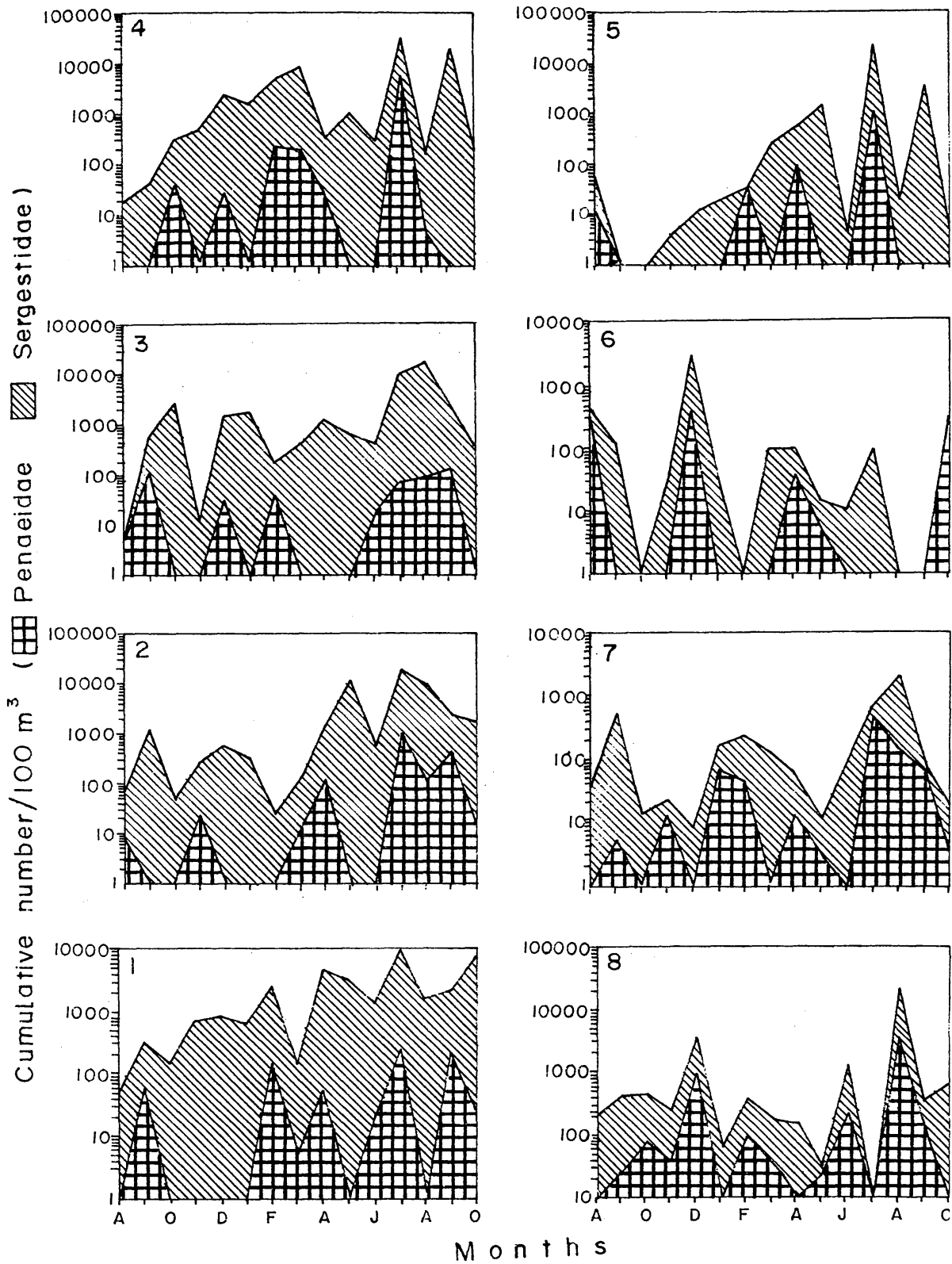


Fig. 2 : Distribution of Penaeidae and Sergestidae in the area of study. Figures drawn on

Table 1: Variations in A) population density of zooplankton (No/100m³) and B) percentage contribution of decapods to zooplankton community.

Sns.	Aug 1985	Sept.	Oct.	Nov.	Dec.	Jan 1986	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct
1 A	14636	223497	61899	58655	193826	84529	697068	12206	44628	48177	10655	96396	6673	53050	79750
B	1.13	1.69	11.36	6.0	2.49	3.23	0.56	8.77	45.20	7.99	38.43	10.56	34.87	10.59	20.70
2 A	35789	196924	131480	41299	51325	4418	34838	29731	36799	230436	10729	25130	49520	15238	104138
B	20.93	27.45	83.99	19.60	2.61	4194	6.03	1.88	6.94	11.98	81.26	98.22	48.17	26.62	3.14
3 A	48319	881370	1252235	61250	218414	31239	50050	46976	65562	149961	65983	114124	93758	51821	65255
B	5.57	8.70	76.95	14.51	1.41	35.12	22.07	2.03	4.86	11.60	1.72	10.53	70.02	22.66	0.91
4 A	232984	87813	73538	45427	407690	950243	194055	238979	6093	42299	32748	3669332	6522	153788	10407
B	0.04	1.14	0.44	4.83	2.66	0.56	5.79	8.34	6.84	4.64	32.27	0.86	11.53	14.35	17.22
5 A	13454	125704	56081	114192	16603	346766	266903	71378	28678	42640	24569	3267802	7544	334015	69512
B	3.34	2.56	3.66	0.32	0.07	0.09	0.05	1.39	1.39	5.33	13.63	1.41	34.48	2.07	77.32
6 A	815982	184229	85678	20991	70630	54219	111314	38274	25690	39926	3428	1018483	10900	28441	306066
B	0.20	0.62	0.76	0.96	5.03	0.25	2.14	0.77	1.89	0.42	2.39	0.28	10.89	5.84	11.64
7 A	19619	6688	22677	45574	1019	74459	76241	88664	13550	37459	21244	128688	14920	52230	268300
B	0.34	15.28	16.38	0.38	4.80	0.77	2.14	0.25	2.97	0.04	2.04	0.60	36.27	0.37	0.55
8 A	290220	53453	103389	33299	53663	516114	62988	72035	42381	29565	20896	-	96181	103351	988011
B	0.15	1.64	4.31	5.40	8.49	0.32	3.75	1.90	6.97	0.70	6.69	-	45.64	1.87	0.51

Table II: List of decapod families recorded in the area.

MACRURA			
Natantia		REPTANTIA	
Penaeidea		Families :	Calliannassidae Upogebidae
Family :	Penaeidae		
Species :	<i>Penaeus indicus</i>	PLEOCYEMATA	
	<i>Metapenaeus affinis</i>	Family :	Stenopidae
	<i>M. dobsoni</i>		
	<i>M. monoceros</i>	ANOMURA	
	<i>Parapenaeopsis</i> sp	Families :	Porcellanidae Paguridae
Family :	Sergestidae		
Species :	<i>Lucifer</i> sp	BRACHYURA	
	<i>Acetes</i> sp	Crab zoea	
	<i>Solenocera</i> sp	Crab megalopa	

RESULTS

In Table I the percentage contribution of decapods to the zooplankton population density are indicated. Their contribution varied between 0.04 to 83.99%. Comparatively higher abundance of decapod larvae were recorded from Thana system. Seasonal averages indicated higher larval density during monsoon in the Bassein system. While such a definite trend was not discernible in the Thana region.

Decapods in the collections belonged to Penaeidea, Caridea, Callianassidae, Upogebidae, Stenopidae, Porcellanidae, Paguridae and Brachyura (Table II). The major decapods were the larval stages, except the adults of *Acetes* and *Lucifer* belonging to Sergestidae. In general, the population of penaeid larvae (Fig.2) was higher at the inner creek stations (av.16.8%, 196/100 m³) as compared to the down stream and nearshore coastal areas (av.9.9%, 120/100m³). Compared to other stations, their percentage contribution to the total decapods was generally low at stn. 3 (av.2.8%). Generally, the penaeid larvae were abundant during the monsoon. Larval stages belonging to the genera

Metapenaeus, *Parapenaeopsis* and *Penaeus* were recorded during the present study. *Metapenaeus* was represented by *M.affinis*, *M.dobsoni* and *M.monoceros*, while *P.indicus* was the sole representative of the genus *Penaeus*. *Metapenaeus* spp. dominated the area and at stns. 3 and 5 the entire penaeid larvae belonged to this genus. Maximum population densities of *M.affinis* (890/100 m³) and *M.dobsoni* (72/100 m³) were observed during July 1986 at stns. 5 and 3 respectively. *M.monoceros* was recorded at stn.7 (5/100 m³) in September, 1985. *Parapenaeopsis* sp was recorded only at stn. 7 in January (69/100 m³) and stn. 1 (58/100 m³) in September, 1985. Even though *P. indicus* was more common during the premonsoon, the maximum abundance (947/100 m³) was observed during monsoon at stn.2.

Sergestidae was very common in this area and was recorded at all stations (Fig.2) with relatively higher concentration at Thana system (av. 2984/100 m³) than at the Bassein area (av.1060/100 m³). Their percentage contribution (40.6%) was higher at stn.4. Maximum population of 25162 individuals/100 m³ was ob-

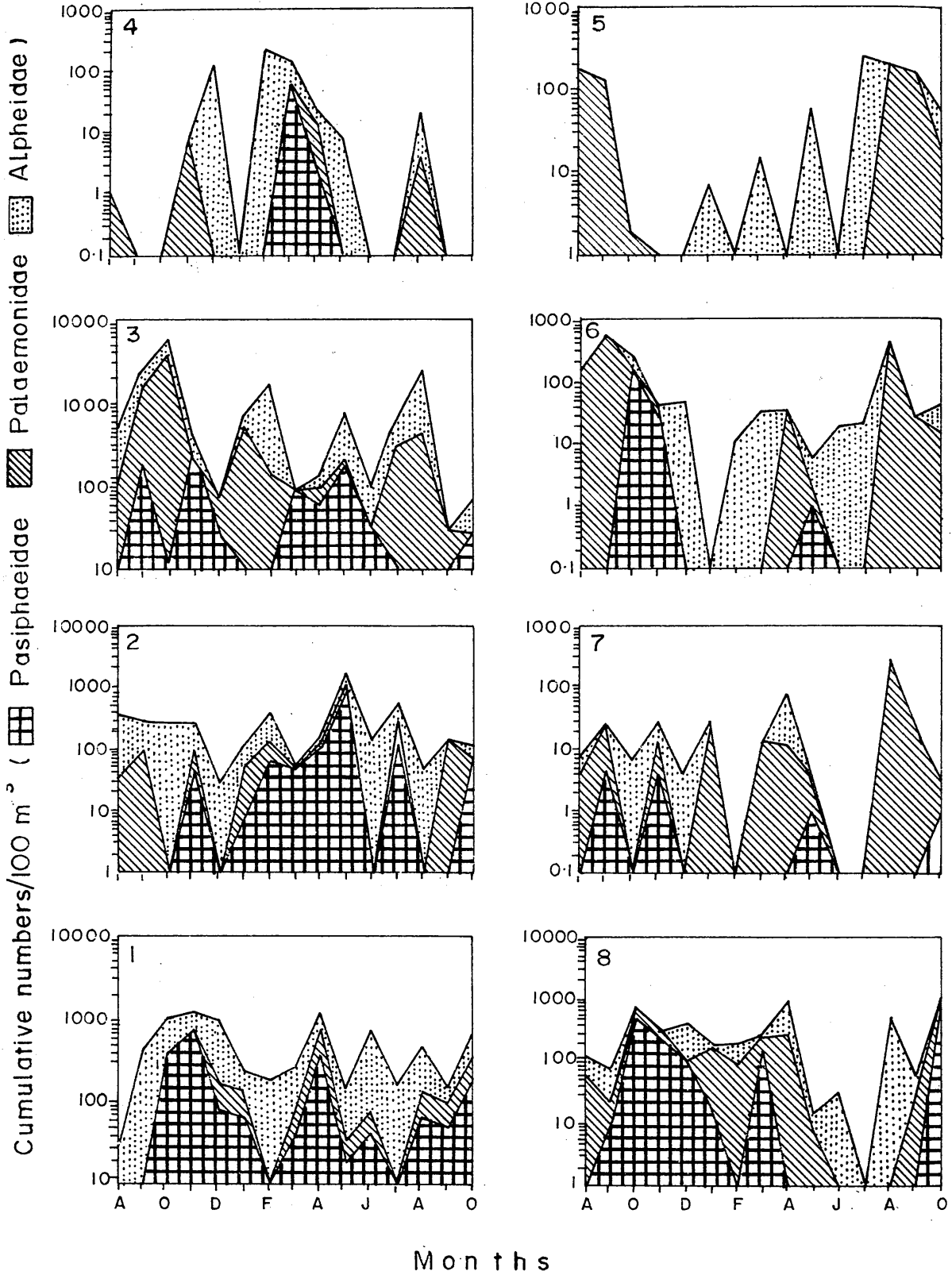


Fig. 3 : Variation in the composition of dominant caridean families. Figures drawn on

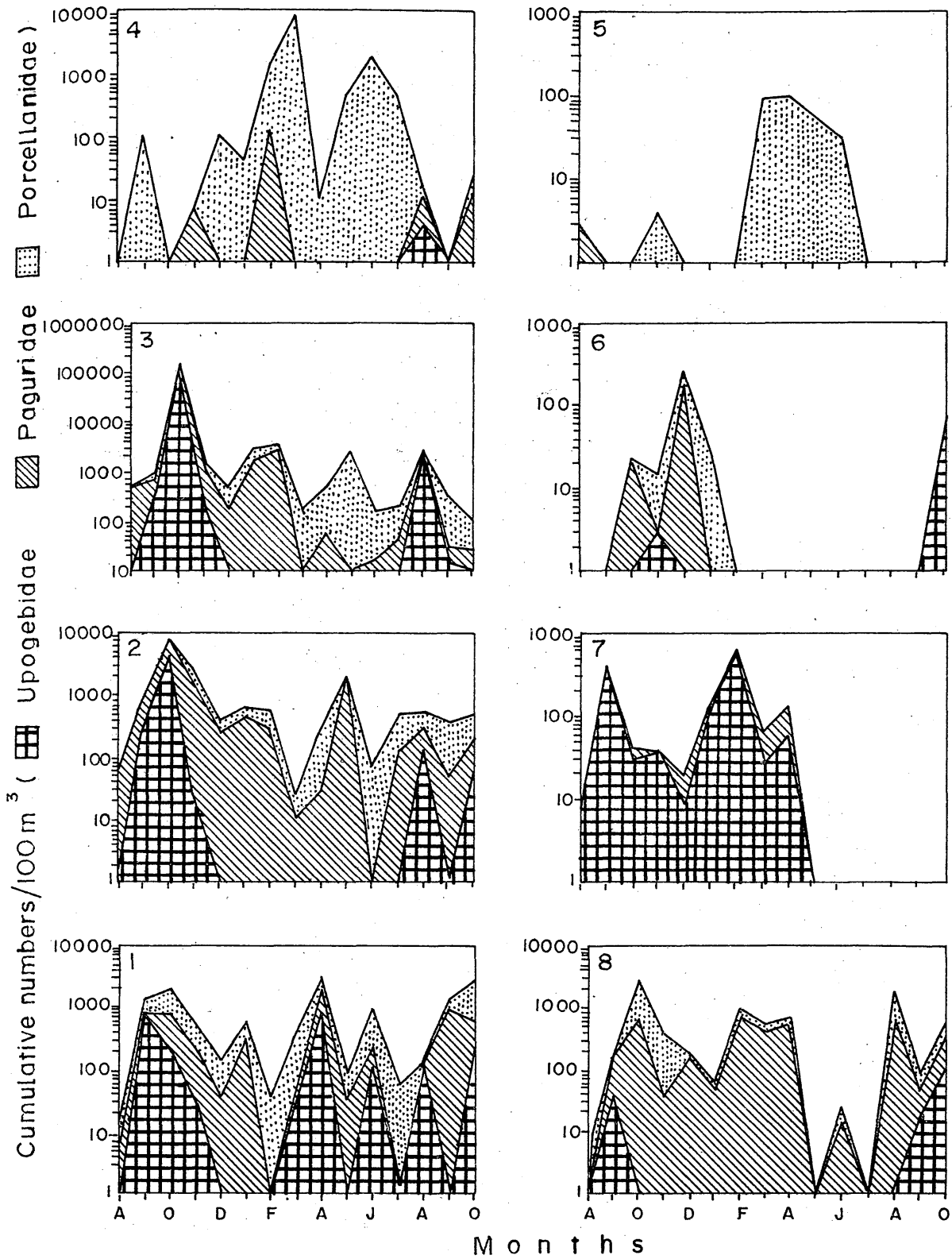


Fig. 4. Distribution of upogebids and anomurans in the study area. Figures drawn on log

served in July at stn.4, while the minimum ($4/100\text{ m}^3$) was recorded at stn. 5 in October and November 1985. Generally, the maximum population density was observed during the monsoon period. This family was represented by adults and larval stages of *Acetes*, *Lucifer* and larval stage of *Sergestes* and *Solenocera*. The occurrence of *Acetes* showed a peak during the monsoon months. Its highest population of $16691/100\text{ m}^3$ was recorded at stn. 8 during August 1986. Thana system sustained relatively a higher abundance of *Lucifer* (av. $1332/100\text{ m}^3$) than the Bassein region (av. $426/100\text{ m}^3$). The inner creek stations (stns 4 and 5) maintained a higher population density of *Lucifer* with peak values during monsoon period in the Thana system. Larval stages of *Solenocera* were very rare in the area as they were occasionally recorded only at stn.2 ($14/100\text{ m}^3$).

Carideans were well represented in the collections. Their percentage contribution (av. 6.2%) in the inner creek areas was relatively low compared to the outer stations (av. 9.6%). Contribution of Caridea to the total decapod population varied between 0.1 and 45.6%. Carideans occurred throughout the period of study at stns. 1,2,3 and 8. Pasiphaeidae, Palaemonidae, Alpheidae, Hippolytidae, Processidae and Crangonidae were the families recorded of which, Pasiphaeidae, Palaemonidae and Alpheidae were the most common and abundant ones (Fig.3).

Larval stages of Pasiphaeidae occurred at all stations except stn. 5. Their occurrence was generally very poor during the monsoon period. At stn. 4 it occurred only during the premonsoon. Palaemonids were found to be the most abundant among the caridean population contributing 0.1 to 45.6%. Stn. 5 sustained higher density during monsoon, while stns. 2 and 3 indicated higher density during the premonsoon and postmonsoon periods respectively. Larval stages of alpheids were common and present during the entire period of study at all the stations. Maximum population of alpheids was encountered during the premonsoon.

Members of the family Hippolytidae were recorded at all stations excepting stns. 6 and 8. Population density ranged between 1 (August 1985 and October 1986) and $256/100\text{ m}^3$ (May). Maximum abundance of this family was observed at stn. 1 particularly during monsoon and postmonsoon. Larvae of Crangonidae and Processidae were recorded only once at stns. 1 and 2 ($41/100\text{ m}^3$ and $8/100\text{ m}^3$) contributing a meagre 1 and 0.4% to the total decapod population respectively.

Stenopidae was another rare family represented by larvae of the genus *Stenopus*. Occasionally they occurred at all stations in small numbers except at stns. 2,5 and 7. Their contribution to the decapoda varied between 0.2% at stn.1 (October 1986) and 9.5% at stn.8 (April). Maximum population density ($280/100\text{ m}^3$) was recorded at stn.8 and the minimum ($14/100\text{ m}^3$) at stn. 3.

Callianassids were more abundant in the Thana system than in the Bassein area. This family contributed 0.1 to 33.1% of the total decapod population and were totally absent at stns. 5, 6 and 8. Population density fluctuated between 4 (stns.4 and 7) and $11449/100\text{ m}^3$ (stn. 3). At stn.4 they were present only during monsoon and at stn. 7 during postmonsoon. Their peak abundance was observed at stn.1 during the premonsoon and at stns. 2 and 3 during the postmonsoon. However, at stns. 2 and 3, they were absent during the premonsoon.

Compared to the Bassein system, Thana area sustained higher population density of upogebids (Fig.4). Sparse distribution of this group was generally observed in the creek stations.

Anomuran larvae were represented by Porcellanidae and Paguridae (Fig.4). They were very common at all stations and constituted from 0.3 to 60.5% of the total decapod population. At stn. 5 pagurids occurred only in August 1985 with the lowest density of $3/100\text{ m}^3$. Highest number of $41980/100\text{ m}^3$ was observed at stn. 3 in October 1985. At stn. 6

they were found only during the premonsoon. At stns. 1-3 maximum density was observed during the postmonsoon and at stns. 4, 7 and 8 their abundance was generally high during the premonsoon. Porcellanids were more common at stn. 1 and at stn. 6 their occurrence being limited to the postmonsoon period. Premonsoon indicated relatively higher density at stns. 4, 5 and 7, whereas stns. 1, 2, 3 and 8 sustained maximum abundance during postmonsoon.

Brachyura formed the largest group among the decapod larvae (Fig. 5). Zoeae formed the major constituent of the brachyuran community. When compared to the Bassein region, these larvae recorded a relatively higher abundance in the Thana system. In general, relatively higher and stable population of brachyuran zoea was observed during the postmonsoon period at stns. 1, 2, 3 and 4. At other stations, the monsoon period sustained higher abundance of this group. Population density of megalopa fluctuated between 4 to 98/100 m³. Low population of megalopa was obtained from stns. 1, 4, 5, 6 and 8 during the monsoon period. They contributed 0.4% (stn. 8) to 30.1% (stn. 6) of the total brachyuran population.

DISCUSSION

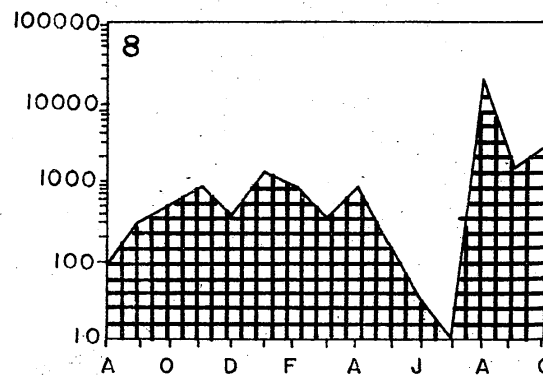
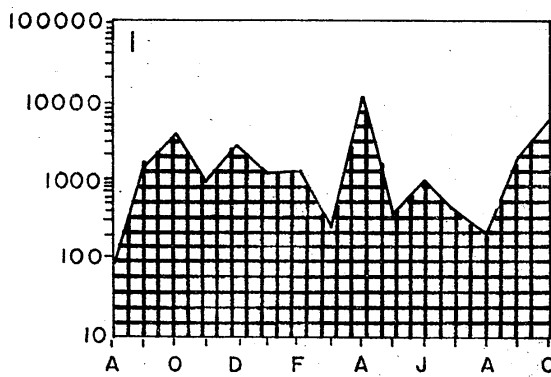
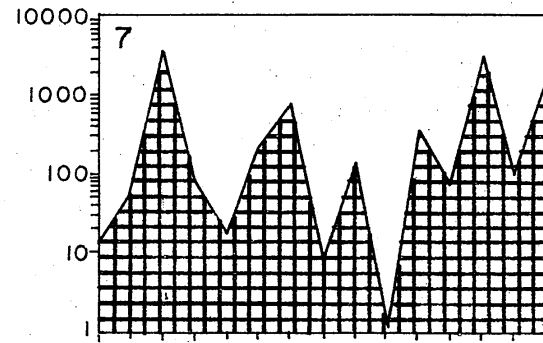
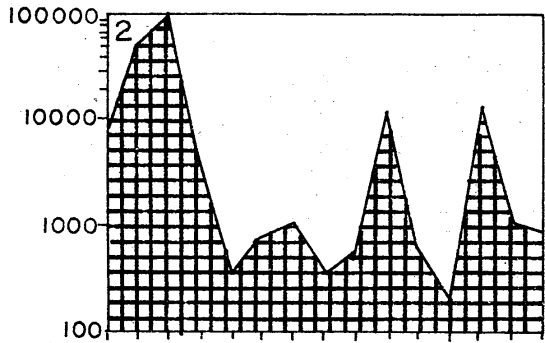
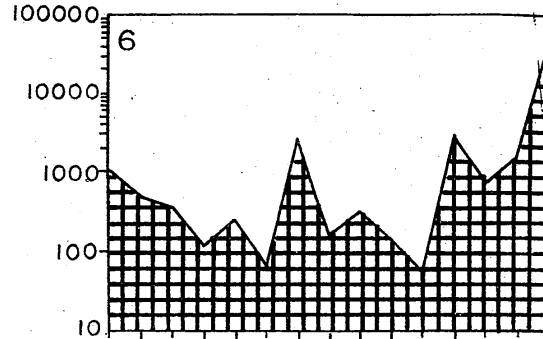
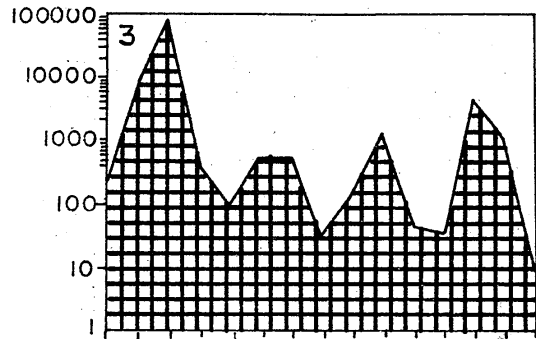
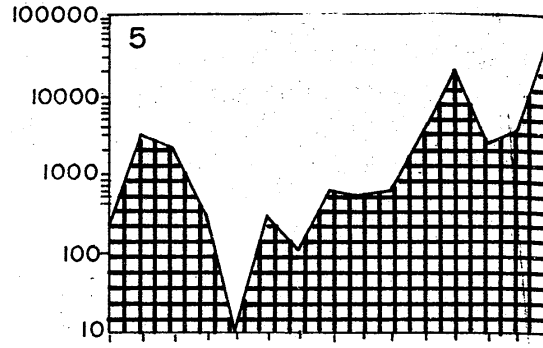
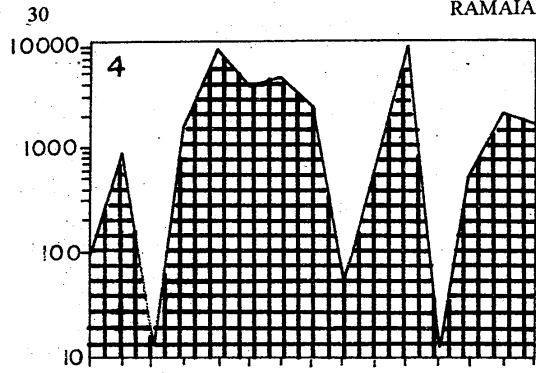
Larval decapods formed an abundant group in the zooplankton community, next to copepods. In the study area they contributed on an average 10.6% (av. 15942/100 m³) to the total zooplankton population. Thana system sustained six times higher density (av. 27380/100 m³) as compared to the Bassein region (av. 4503/100 m³). Density of this group was much higher than that reported by Gajbhiye *et al.* (1982-83) from Versova (av. 1776/100 m³) and Mahim (av. 970/100 m³) areas. During the present observation higher larval abundance was observed generally during monsoon.

Penaeid larvae were observed at all stations. They showed higher abundance at the interior station (stn. 4) of the Thana system. This station

receives large volumes of sea water during the flood tides from both the Bombay harbour and Bassein creek. Besides the lateral transport of larvae through such tidal waters, the abundance of penaeids in this area may also be due to the higher availability of phytoplankton and other food organisms. (Lodh, 1990). From this study, a very high abundance of penaeid larvae was noticed during the monsoon coinciding with favourable water quality and the abundance of food organisms (Lodh, 1990 and Neelam Ramaiah and Nair, 1993 a & b). Contrary to the earlier reports from the southwest and central west coast of India, where breeding generally occurs during the pre or postmonsoon season (Achutankutty and Nair, 1983 and Achutankutty, 1987), it appears to be during the monsoon in BHTCBC.

Lucifer population including adults and larval stages indicated abundance in the creek region (av. 1428/100 m³) compared to the outer locations (av. 748/100 m³). In general, their density was higher during the monsoon period. Adults and larvae of *Acetes* were more abundant in the Thana area (av. 1809/100 m³) than the Bassein region (av. 632/100 m³), with the outer locations sustaining two times higher density than the creek region. Their maximum number during the present study (18655/100 m³) was much higher than that earlier reported (Gajbhiye *et al.* 1982-83) from the Versova (310/100 m³) and Mahim (220/100 m³) area. Their distribution pattern in the area indicated a peak during the monsoon season. Abundance of *Acetes* larvae was observed during the post and premonsoon in the Goa estuarine system (Achutankutty and Selvakumar, 1979).

Caridean and brachyuran larvae were reported to be more abundant in the inshore and estuarine environments (Nair and Paulinose, 1980 and Achutankutty and Nair, 1981) compared to the oceanic regions (Madhupratap *et al.* 1981 and Paulinose *et al.* 1987). Similar trend was observed during the present study also. Density of alpheidids (2008/100 m³), palaemonids (3816/100 m³) and pasiphaeids



Months

(1009/100 m³) recorded here were much higher compared to the earlier observations, indicating the affinity of these larvae to inshore and estuarine regions. In the present study, brachyurans were abundant and contributed on an average 49.2% (av. 11685/100 m³) of the total decapod populations, probably indicating the preference to inshore and estuarine habitats besides the abundance of food organisms for their larvae. Their density observed during the present investigation was much higher than that reported earlier (Gajbhiye *et al.* 1982-83) probably indicating that the BHTCBC is an important breeding site for these brachyurans. The observations directly imply that this area is a good location for crab fishery.

Besides providing a systematic account for the first time on the annual cycles of decapod larvae, results of the present study in general highlight a good potential for decapod fisheries in the entire BHTCBC. Since it is difficult to taxonomically assign the larval stages to specific levels in most cases it would only be practical to make an assessment of family wise larval abundances so that a relative indication of the potential for the fishery of a particular group can be envisaged. In particular, results of this study, the first of its kind from the BHTCBC certainly highlight a vast potential for crabs, prawns and lobster fishery.

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