

THE LARVAE OF DECAPODS AND FISHES OF AMBA ESTUARY, MAHARASHTRA

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A B S T R A C T

Larvae of fishes and decapods found in zooplankton collections from two stations (Mankule and Patalganga) in Amba estuary adjoining Mumbai harbour were studied during 1989-90 covering three seasons. The percentage contributions of decapods and fish larvae to the total zooplankton population were 3.63 and 0.03 respectively. In the assessment of larval stocks environmental parameters and the presence of adult fish caught in the area were considered. The estuarine area supported fairly high fishery potential as compared to the nearshore coastal waters of Mumbai. The total fish catch showed an increasing trend during September (av. 21.1 kg/hr). *Harpadon nehereus*, *Coilia dussumieri* and *Johnius dussumieri* were recorded in the estuary irrespective of tide, time or season. The decapod larvae of *Acetes*, *Lucifer*, *Metapenaeus dobsoni*, *Metapenaeus affinis*, alpheidids, palaemonids (*Macrobrachium* sp.) and crab zoeae were common in the collections. The larvae of fishes mainly belonging to the families of Engraulidae and Clupeidae indicated the presence of possible breeding, spawning and nursery grounds in the vicinity of Dharamtar creek.

Introduction

Amba river originates from the Western Ghats as a narrow stream and after a meandering course along a length of over 140 km, it opens into the Mumbai harbour. The study area receives an average of 2100 mm of rain fall annually, of which 95% occurs during the southwest monsoon period. A bund in the river at Bandhara gate controls the flow of freshwater into the tidal waters during the monsoon period. The only information on zooplankton and fishery of the area is that of Tiwari and Nair (1991, 1993), Gajbhiye *et.al.* (1995) and Paulinose *et.al.* (1998). The biological and fishery potential of the segment between Mankule and Patalganga were estimated in the present study. The

important hydrographical and biological features of the Amba estuary described below are from studies undertaken during the year 1986-1987 (NIO, 1990). As the upstream of the river is narrow, the tidal height is more at the upper segments than at the lower estuary. The estuarine and riverine status of the Amba vary considerably with the flood and ebb tides. Generally, the estuary is shallow with an average depth of 3 m during an average tide. Surface salinity is highly variable with summer values as high as 27 ppt at Nagothane just down-stream of Bandhara and the entire estuary is under marine influence. The high riverine discharge during the monsoon, however completely flushes out even the traces of the sea water in the inner estuary to record a salinity of around 0.05 ppt even during the flood tide. The pH ranges between 7.6 and 8.4 indicating a typical estuarine condition. The lower estuary is characterized by high and variable suspended load due to the dispersion of bed sediment in the water column as a result of strong tidal current. The levels of nitrate, nitrite, ammonia and phosphate and their distribution revealed the influence of tidal ingression of the harbour water. Seasonal variation of zooplankton is discernible. The total fish catch is high during the postmonsoon as compared to the premonsoon. Overall, the estuary reveals a moderate biological potential with limited scope for exploitable fishery resources.

Material and method

The stations were located in the estuarine area (Fig.1) between Mankule

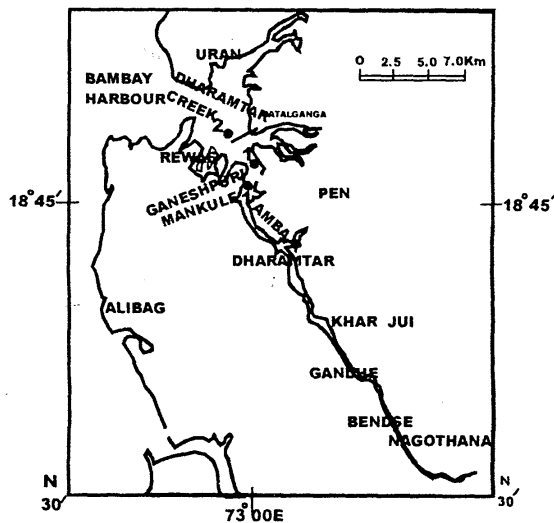


Fig.1 Location map

(Station 1) and Patalganga (Station 2). Sampling was done in June 1989, September 1989, January 1990 and May 1990. Collections were made at 2-hourly interval over a tidal cycle. Zooplankton samples were collected using an HT net (mesh 0.33 mm, mouth area 0.25 m²) attached with a TSK flow meter. Oblique hauls were made of 6 minutes duration and samples were preserved in 4% formalin. The fish eggs and larvae and decapod larvae in samples were sorted out and identified. The larval identification was done in consideration with the adults caught in the region during the study period. Bottom trawling in the area around Mankule and Patalganga was undertaken using a trawler for assessing total fish catch and its composition representing fish and crustaceans (Tables 1, 2, 3 and 4).

Table 1 : Composition (%) of major fishes in the total catch (kg) during June 1989

Groups	Mankule		Patalganga		
	F1	Eb	F1		Eb
			I	II	
Croaker (Dhoma)	*53.3	*37.0	*22.9	40.0	25.8
Anchovy (Mandeli)	26.7	46.3	8.7	25.0	36.9
Bombay duck (Bombil)	1	-	1.1	1.0	5.5
Cat fish (Shingada)	2	11.6	1.1	0.3	-
Eel (Wam)	-	-	11.5	-	-
Dori (Koth)	-	-	21.8	-	-
Ribbon fish (Wagati)	-	-	2.2	-	-
Flat fish (Lep)	-	-	-	1.7	-
Gobies	-	-	-	8.3	3.7
Sole	2.2	-	1.3	-	-
Shrimps	4.4	3.2	10.9	8.3	5.5
Acetes sp.	2.2	-	-	-	-
Squilla sp.	4.4	0.9	3.3	6.7	21.4
Crabs	-	-	3.3	6.7	-
Others	-	0.9	-	-	-
Total catch	4.5	6.48	9.17	6.0	3.61

* Significant contribution of juveniles

Table 2 : Composition (%) of major fishes in the total catch (kg) during September 1989

Groups	Mankule		Patalganga				
	Eb	F1	F1	Eb	Eb	F1	Eb
Croaker (Dhoma)	*9.6	31.1	7.6	13.0	-	26.1	8.0
Anchovy (Mandeli)	*35.2	45.5	22.8	26.5	31.7	13.1	3.2
Bombay duck (Bombil)	32.0	16.6	26.4	32.4	15.2	13.9	2.4
Cat fish (Shingada)	2.4	1.1	2.4	2.3	6.3	11.3	6.4
Eel (Wam)	3.2	-	-	-	-	-	-
Dori (Koth)	4.8	-	19.2	4.1	18.2	-	-
Ribbon fish (Wagati)	2.4	-	4.1	4.9	1.3	3.5	1.6
Mackerel (Bangada)	-	-	-	0.8	0.6	-	-
Pomfret	-	-	1.5	-	-	-	-
Shark (Mushi)	-	-	0.6	-	5.1	-	-
Sole	-	-	0.3	-	-	-	-
Ray	-	-	-	-	0.6	-	-
Gobies	-	-	-	-	-	0.9	1.1
Flat fish (Lep)	-	-	-	-	0.6	-	-
<i>Thryssa</i>	-	-	-	-	-	0.9	-
Shrimps	0.4	4.1	4.4	8.1	7.6	15.7	9.6
<i>Acetes</i> sp.	3.2	1.1	1.0	2.4	3.8	13.9	8.0
Crabs	-	-	9.3	1.6	0.6	-	47.9
Others	-	0.52	0.6	1.6	1.3	0.9	0.8
Total catch	9.38	14.48	33.30	24.60	23.70	11.50	12.54

* Significant contribution of Juvenile

Table 3 : Composition (%) of major fishes in the total catch (kg) during January 1990

Common Name	Mankule		Patalganga	
	F1	Eb	F1	Eb*
Croaker (Dhoma)	29.9	27.1	27.9	-
Anchovy (Mandeli)	0.8	1.7	0.6	-
Cat fish (Shingada)	1.5	5.4	3.1	-
Ribbon fish (Wagati)	-	1.3	-	-
Pomfret	-	1.3	1.0	-
Flat fish (Lep)	-	2.7	0.6	-

Gobies	0.8	-	-	-
Kothia (M)	22.5	-	-	-
Shrimps	7.5	37.8	6.2	-
Crabs	18.7	1.3	15.5	-
<i>Squilla</i> sp.	0.5	-	24.8	-
Lobster	18.0	21.6	20.2	-
Total catch	6.68	1.01	6.44	-

* No sample

(M) Marathi

Table 4 : Composition (%) of major fishes in the total catch (kg) during May, 1990

Groups	Mankule			Patalganga		
	F1	Eb		F1	Eb	
		I	II		I	II
Croaker (Dhoma)	20.8	35.9	72.4	20.6	21.0	34.2
Anchovy (Coilia)	8.7	31.2	-	27.4	28.0	21.4
Bombay duck (Bombil)	-	-	-	-	14.0	17.1
Cat fish (Shingada)	-	4.7	11.3	-	14.0	1.7
Eel (Wam)	-	-	-	3.4	-	-
Ribbon fish (Wagati)	20.8	3.9	-	3.4	-	-
<i>Thryssa</i> (Kati)	-	15.6	-	6.9	-	-
Shark (Mushi)	-	-	-	1.4	-	-
Gobies	-	0.3	-	-	-	-
Flat fish	-	-	-	-	-	4.3
Shrimps	13.0	-	11.3	20.6	7.0	8.6
<i>Acetes</i> sp.	26.0	-	-	6.9	-	2.1
<i>Squilla</i> sp.	-	-	4.5	6.9	7.0	2.1
Lobster	5.2	-	-	-	-	-
Crabs	5.2	7.8	-	1.4	0.8	8.6
Total catch	19.61	12.80	12.26	1.46	1.59	2.34

Results and discussion

The zooplankton biomass at Stn.2 (Patalganga) ranged from 3.5ml/100m³ (May'90) to 164.8 ml/100m³ (Sept.'89). Mankule revealed a lower biomass range of 1.2 ml/100m³ during May 1990 to 72.7 ml/100m³ during June 1989. The highest biomass recorded at these stations was due to dominance of medusae. The population count varied from 4670/100m³ to 672949/100m³ on the same day between ebb and flood tides respectively at Mankule during September 1989 and the corresponding average group diversity varied from 6-9. Whereas the maximum population was found during flood and the minimum during ebb tide at both Stations (Table 5). The above mentioned trend clearly reveals that most of the organisms are brought into the estuary from the adjacent coastal waters and they are not the permanent natives of the estuary. At Patalganga the population ranged from 2707 (during ebb) to 555267/100m³ (during flood tide) with a group diversity of 14 (Table 5). Patalganga recorded the maximum biomass during flood tide, while it was during ebb tide at Mankule where the dominance of coelentrates was evident.

Table 5 : Ranges of biomass (ml/100m³), population (number/100m³) and total number of groups at Amba estuary

Station	Date	Tide	Time (Hr.)	Biomass (ml/100m ³)	Population (No.x10 ³ /100m ³)	Larvae (%) of		Total number of groups
						Decapods	Fishes	
Mankule	June 1989	Eb	11.00	Min 11.7	7.4	10.80	0.30	9
			13.00	Max. 72.7	42.6	3.87	0.02	12
Patalganga	June 1989	Eb	14.00	Min. 31.5	29.5	5.05	0.04	13
			10.00	Max. 66.4	114.5	1.01	0.07	14
Mankule	Sep. 1989	Eb	17.00	Min. 1.9	4.7	19.74	-	6
			11.00	Max. 47.4	673.9	0.04	-	9
Patalganga	Sep. 1989		16.00	Min. 33.3	118.2	4.34	0.04	7
			22.00	Max.164.8	555.3	0.09	-	14
Mankule	Jan. 1990	Eb	17.00	Min. 25.2	21.3	11.56	0.10	14
			14.30	Max. 45.9	153.1	6.92	0.04	18
Patalganga	Jan. 1990	Eb	15.30	Min. 10.4	19.4	22.37	0.20	15
			12.00	Max. 45.9	50.5	2.51	0.11	18
Mankule	May 1990	Eb	09.40	Min. 1.2	5.3	42.94	0.50	11
			17.30	Max. 17.1	17.2	10.19	0.43	10
Patalganga	May 1990	Eb	09.00	Min. 3.5	2.7	38.38	0.52	14
			17.00	Max. 10.8	9.1	18.69	0.36	9

The group diversity (Table 5) varied from 6 (September'89) to 18 (January'90) (Table 5). The major groups were copepods, chaetognaths, decapods, ostracods, siphonophores, gastropods, cladocerans, amphipods, shrimp

larvae, lamellibranches, cephalopods, isopods, phyllosoma, ctenophores and Foraminifera (NIO, 1990). Copepods were dominant throughout the study period at both stations. A second peak of decapods and chaetognaths were evident at Patalganga and Mankule respectively (Fig. 2).

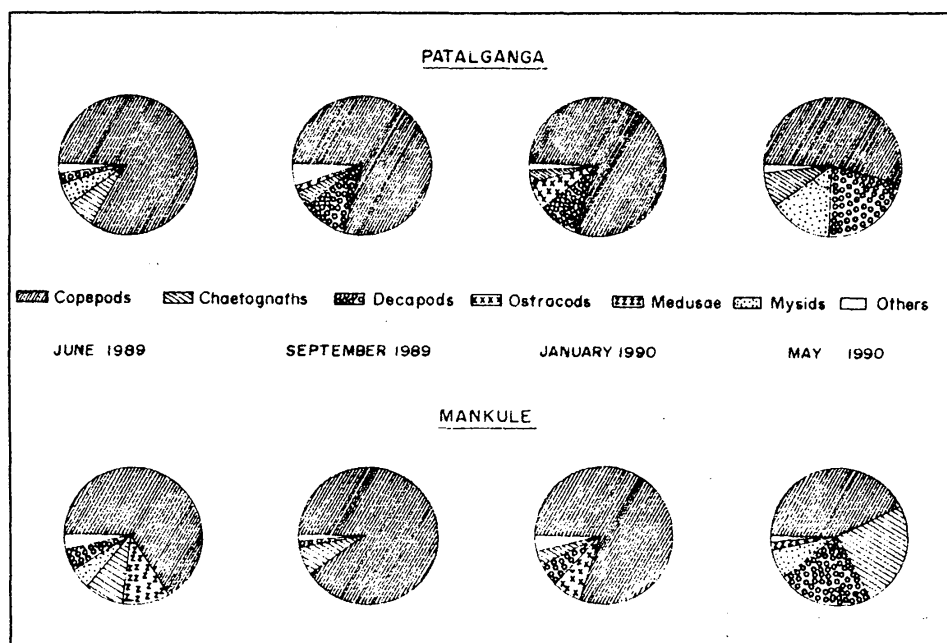


Fig.2 Average percentage composition of Zooplankton in Amba Estuary

The composition of decapods and fish larvae are presented in Tables 6 and 7. The dominance of *Acetes* was evident at both stations, followed by crab zoea and megalopa and alpheids (Table 6). *Acetes indicus* was absent during May in the estuary. Palaemonidae were mainly represented by *Macrobrachium rosenbergii*, *Palaemon semelinkii* and *Leandrites* sp. The alpheids were represented by *Alpheus*, *Synalpheus* and *Athanas* spp. The commercially important penaeid shrimps were few and almost absent in the collections at both stations during the study period, being represented by only *Metapenaeus dobsoni* in June and *M.affinis* during September at Mankule. However, *Acetes* was the dominant from among the decapod larvae with maximum percentage during postmonsoon at both these stations (53.6% at Mankule and 80.6% at Patalganga). Caridean shrimps ranked second to *Acetes* with their dominance during the premonsoon period whereas crab zoea dominated during the monsoon season.

Table 6 : Composition (%) of decapod larvae at Amba estuary

Decapod larvae	Mankule				Patalganga			
	1989		1990		1989		1990	
	June	Sept.	Jan.	May	June	Sept.	Jan.	May
<i>Acetes</i>	44.2	17.6	53.6	-	8.6	23.0	80.6	-
<i>Lucifer</i>	7.4	-	-	2.2	-	-	2.0	1.5
<i>Metapenaeus dobsoni</i>	3.9	-	-	-	-	-	-	-
<i>M.affinis</i>	-	0.2	-	-	-	-	-	-
<i>Leptochela</i> (Pasiphaeidae)	-	-	4.2	-	-	-	2.2	-
Alpheids	23.4	-	-	30.8	42.9	0.2	-	18.6
Palaemonids	0.9	3.9	4.5	12.0	42.9	0.2	4.3	50.3
Pandalids	-	3.9	-	-	-	-	-	-
Processids	-	-	-	-	-	6.3	-	1.1
Stomatopoda (<i>Squilla</i>)	-	4.6	-	-	-	18.5	-	1.1
Axiids	-	-	-	5.1	-	-	-	1.1
Upogebiidae	-	-	-	-	-	4.5	-	-
Porcellanid zoea	18.2	-	-	7.3	-	4.5	-	3.5
Pagurids	-	-	-	14.9	-	-	-	8.8
Crab zoea	2.2	69.9	37.7	27.7	2.9	23.8	10.8	14.0
Crab megalopa	-	-	-	-	2.9	18.9	-	-

Table 7 : Composition (%) of fish larvae at Amba estuary

Fish larvae	Mankule				Patalganga			
	1989		1990		1989		1990	
	June	Sept.	Jan.	May	June	Sept.	Jan.	May
<i>Thryssa mystax</i>	25.9	66.6	9.9	-	30.9	-	6.5	-
Engraulidae	27.0	-	11.1	-	20.0	1.3	4.9	-
Clupeidae	14.1	-	-	29.0	5.7	73.0	-	56.0
<i>Boleophthalmus glaucus</i>	11.8	-	35.7	-	10.9	-	15.9	-
Gobiidae	11.8	5.6	2.3	71.0	19.1	24.4	7.7	44.0
Percoidei	2.3	-	0.6	-	1.3	-	-	-
Sciaenidae	-	-	-	-	0.4	1.3	0.4	-

Labridae	1.2	5.6	37.4	-	0.9	-	63.4	-
Atherinidae	3.5	-	-	-	1.3	-	-	-
Eel	-	-	-	-	7.8	-	-	-
Serranidae	-	-	1.8	-	-	-	-	-
<i>Syngnathus</i> sp.	-	-	1.2	-	0.4	-	0.8	-
<i>Cynoglossus</i> sp.	-	-	-	-	-	-	0.4	-
Elopidae	1.2	-	-	-	-	-	-	-
Chaetodontidae	1.2	-	-	-	-	-	-	-
Blennidae	-	-	-	-	0.9	-	-	-
<i>Lates calcarifer</i>	-	-	-	-	0.4	-	-	-
Soleidae	-	22.2	-	-	-	-	-	-

Fish larvae were mainly of Engraulidae, Clupeidae, Gobiidae, Sciaenidae, Labridae, Syngnathidae and Percoidei. Gobiidae present throughout the collections at both stations were mainly represented by *Boleopthalmus glaucus* as the prominent species (Table 7). Engraulidae were next in dominance. They were absent during May at both stations. *Thryssa mystax* was the major species recorded with a dominance during the monsoon (September) at Mankule, whereas it was absent in Patalganga during that period (Table 7). Maximum number of fish eggs and larvae were observed in the samples collected during flood in June at Mankule. The maximum incidence of groups was found in June and the minimum in May at both the stations.

At Mankule, the fish catch mainly consisted of *Johnius dussumeiri*, *Trichiurus savala*, *Coilia dussumeri* and *Harpadon nehereus*. Among the shrimps, *Acetes* sp., *Atypopenaeus stenodactylus*, *Parapenaeopsis stylifera*, *Metapenaeus brevicornis*, *Exhippolysmata ensirostris*, and other crustaceans such as squilla, lobster and crabs were common.

The species diversity of fish showed an appreciable increase from Mankule (17) to Patalganga mouth (25). Overall, 8 species of fish, 12 of shrimps, 5 of crabs and one species of lobster were recorded during the study. The lobster formed one of the main catches at both stations during January 1990.

Salinity was minimum in September (5-25 ppt) and was maximum in May, June (34-38 ppt) at these stations (Tables 8 and 9). The zooplankton biomass and population were maximum during the low saline period at both stations but the diversity was maximum (18) during January at both stations, indicating the influence of temperature besides salinity on the distribution of

zooplankton in the Amba estuary. However, dissolved oxygen and nutrients do not seem to have any noticeable influence on the zooplankton (Tables 8 and 9).

Table 8 : Water quality at Mankule (only high and low tide values considered)

Parameter	1989		1990	
	June	September	January	May
pH	7.8-7.9	7.8-7.9	8.0-8.1	7.8-7.9
Salinity	37-38	5-25	31-34	37-38
DO	5.5-6.1	5.3-6.9	5.9-6.5	5.8-6.4
BOD	0.3-2.3	-	1.2-4.9	2.1
SS	174-715	-	72-336	154-295
PO ₄	88-161	19-75	48-73	82-130
NO ₃	329-438	107-156	281-472	412-432
NO ₂	9-22	1-28	11-57	12-17
NH ₄	8-22	30-115	2-68	1-8

Table 9 : Water quality at Patalganga (only high and low tide values considered)

Parameter	1989		1990	
	June	September	January	May
pH	7.8-7.9	7.8-7.9	7.9-8.1	7.9-8.0
Salinity	34-37	5-24	33-35	36-37
DO	3.7-6.3	5.1-5.9	5.8-6.5	5.6-5.8
BOD	1.4-4.5	-	0.4-3.0	0.5-1.3
SS	121-662	-	161-326	92-147
PO ₄	1-32	58-91	48-74	101-145
NO ₃	243-301	87-174	330-380	409-529
NO ₂	5-38	17-25	21-69	13-50
NH ₄	ND-7	10-53	2-32	6-12

ND – Not Detectable

The area was fairly rich in fishery potential with maximum catch just after the peak monsoon period. The area was rich for croaker, anchovy, Bombay duck and shrimps. High population density of non-penaeid larvae and crab zoeae and larvae of engraulids and clupeids indicate possible breeding and spawning

grounds in the vicinity of Dharamtar creek. The data obtained would serve as the baseline for future monitoring and ecological assessment of the estuarine ecosystem in the light of the industries cropping up along the Nagothana area.

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