

Penaeid Prawn Larval Abundance in the Mandovi Estuary, Goa

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Received 8 June 1977; revised received 1 September 1977

Seasonal distribution and abundance of commercially important penaeid prawn larvae at 10 stations in the Mandovi and Cumburjua canal estuarine complex of Goa were studied during 1971-72 with a view to determining their seasonal availability for large scale collection. Larvae and postlarvae of 6 species, viz. *Metapenaeus dobsoni*, *Penaeus merguensis*, *Metapenaeus monoceros*, *Parapenaeopsis stylifera*, *Penaeus* sp. and *Metapenaeus* sp., were available and these were sorted out from the plankton samples from these stations. *M. dobsoni* was the dominant species, contributing to 89.79% of the total larval population followed by *P. merguensis* (4.66%) and *M. monoceros* (4.28%). Larvae and postlarvae of the other species were negligible in numbers. In *M. dobsoni*, although the larvae were present throughout the year, the peak abundance was in January with a secondary peak in March and May. The other species had slightly different peaks in their larval abundance. From the total number recorded in the samples from different stations it was found that the stations near the mouth of the Mandovi estuary had the maximum number of larvae and postlarvae. The present study would indicate that large scale collection of postlarval prawns for stocking in pond culture practices could be possible from areas nearer the mouth of the Mandovi estuary in the months of January to July.

STUDIES on the seasonal occurrence and abundance of postlarvae and larvae of the penaeid prawns of commerce are important for understanding the spawning season of different species and for determining the proper time for fry collection in shrimp filtration and culture experiments. Although considerable work on these aspects on penaeid larvae has been done along the south west coast of India¹⁻⁸, information on the larvae of some of these prawns from the waters of Goa is limited^{9,10}. Mandovi estuary in Goa has been selected to make year round study of the abundance of penaeid larvae and postlarvae with a view to determining the possible source for seed collection.

Materials and Methods

Fortnightly, surface zooplankton samples were collected for 1 yr (June 1971 to May 1972) from 10 fixed stations (Fig. 1) from the mouth of the Mandovi estuary towards the upper reaches including the adjoining Cumburjua canal. Samples were collected with HT net (mouth area 0.25 m² and mesh width 0.3 mm) towed for 5 min and preserved in 5% formaldehyde. These samples were analysed for estimation of penaeid larvae which were sorted out from 20 to 100% of the sample, depending on their abundance, and their number raised to the total. Identification of the larvae was made using published descriptions^{6,7,11-13}.

Results

Species and Larval Composition

Larvae of 6 species of commercially important penaeids were encountered in the samples (Table 1). Protozoa stages 1 to 3, mysis stages 1 to 3 and

postlarval stages were present in the collections. The total number of larvae and postlarvae of different species and their percentage representation in the estuary and canal separately is shown in Table 1.

Distribution of the Larvae

Metapenaeus dobsoni — Larvae and postlarvae of this species are the most abundant (Table 1). Out of the total of 9975 larvae of all the species recorded, 8971 belong to *Metapenaeus dobsoni*. Relative abundance of the larvae in various sampling stations (Table 2) show a very high occurrence in the stations near the mouth. Maximum number of larvae are recorded at station 1 and postlarvae at station 2. Salinity data near the mouth of the

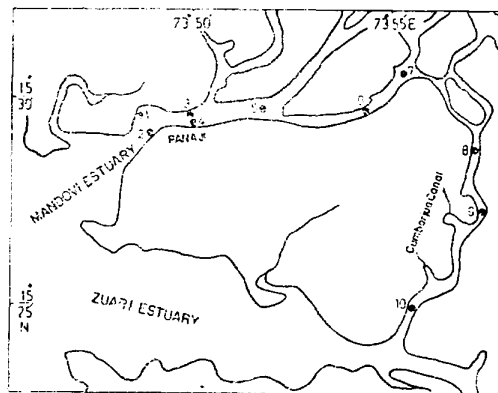


Fig. 1 — Position of different stations

estuary indicates that abundance of this larvae is directly related to higher salinity, the larvae thereby showing lesser penetration into waters with lower salinity. No larvae are present in the samples of Cumburjua canal during September to January and the maximum abundance of larvae and postlarvae of this species are in the canal stations during May when temperature and salinity were quite high.

In the samples from the estuary these larvae and postlarvae occur invariably throughout the year with the major peak during January, a second in March and a third minor peak in May (Table 3). During March the number of postlarvae is comparatively more while in the other peak months larvae is more. A slight rise in postlarval abundance is noticed in July. Occurrence of larvae of this species in the samples is comparatively poor from August to November.

Metapenaeus monoceros — Total number of larvae and postlarvae of this species is only 426, out of which more than half (243) are postlarvae (Table 1). Larvae found in the samples are only from the

stations near the mouth of the estuary (Table 2). This might indicate that the entry of the species into the estuary takes place at the postlarval stage. Postlarvae show a wide distribution, among a total of 243 postlarvae, 57 are present in the samples from Cumburjua canal.

A study of the occurrence of the developmental stages with reference to the season indicates (Table 3) that the major peak occurrence of the species is during the monsoon month of July, with secondary peaks in December-January and March-April. These stages are not recorded in any of the stations during August to November and February and May.

Penaeus merguensis — Neither larvae nor postlarvae of this species are recorded from samples from the canal, most of the specimens are from near the mouth of the estuary as in the case of the other species. Out of a total of 455 specimens, 352 are larvae and 103 postlarvae. Maximum number of larvae are observed at station 3 and postlarvae at station 2 (Table 2).

The peak abundance of the species in the estuary is in May. The larvae start occurring in January and then in March and reach the maximum in May. Their number dwindles off in June, July and they are completely absent from August to December.

Parapenaeopsis styliifera — This species is represented by small numbers of larvae, no postlarvae being obtained from any of the samples. All the 64 larvae are from the estuary samples and almost all the specimens are collected at the stations near the mouth. Larvae occur in significant numbers during March-May. In October and December, a few specimens each are collected.

Penaeus sp. — Larvae of this species are very limited in the samples and postlarval specimens are not recorded. No larval specimens are obtained from the canal samples. As in other species, the larvae are from the stations near the mouth of the estuary. Out of the 23 specimens recorded during the year, 20 larvae are observed in December indicating the peak abundance, 1 or 2 specimens are obtained in July and October (Tables 2 and 3).

Metapenaeus sp. — A few larvae belonging to the mysis stages of this species, slightly differing

TABLE 1 — LARVAL AND POSTLARVAL COMPOSITION IN THE ESTUARY AND THE CANAL

(Figures in parentheses represent per cent representation)

Species	Total larvae and post-larvae	Larvae		Postlarvae	
		Estuary	Canal	Estuary	Canal
<i>Metapenaeus dobsoni</i>	8971 (89.79)	6919 (99.82)	12 (0.17)	1998 (97.94)	42 (2.05)
<i>M. monoceros</i>	426 (4.29)	183 (100)	0	186 (76.54)	57 (23.45)
<i>Metapenaeus sp.</i>	36 (0.37)	32 (96.95)	1 (3.03)	3 (100)	0
<i>Penaeus merguensis</i>	455 (4.66)	352 (100)	0	103 (100)	0
<i>Penaeus sp.</i>	23 (0.24)	23 (100)	0	nil	nil
<i>Parapenaeopsis styliifera</i>	64 (0.65)	63 (98.44)	1 (1.55)	nil	nil
Total	9975	7572	14	2290	99

TABLE 2 — DISTRIBUTION OF LARVAE OF 6 SPECIES OF PENAEID PRAWNS AT 10 STATIONS IN THE MANDOVI ESTUARY

		Station No.										Total No.	Per-centage
		1	2	3	4	5	6	7	8	9	10		
<i>M. dobsoni</i>	L	1800	1783	1480	1039	541	199	72	2	5	5	8971	89.79
	P	90	775	307	541	148	89	48	36	10	1		
<i>M. monoceros</i>	L	57	116	6	4	—	—	—	—	—	—	426	4.29
	P	8	76	25	47	23	5	5	50	4	—		
<i>Metapenaeus sp.</i>	L	—	—	—	26	3	3	—	—	1	—	36	0.37
	P	—	3	—	—	—	—	—	—	—	—		
<i>P. merguensis</i>	L	21	61	145	30	92	3	—	—	—	—	455	4.66
	P	18	37	14	13	9	6	6	—	—	—		
<i>Penaeus sp.</i>	L	1	16	1	5	—	—	—	—	—	—	23	0.24
	P	—	—	—	—	—	—	—	—	—	—		
<i>Parapenaeopsis styliifera</i>	L	—	41	—	20	3	—	—	—	—	—	64	0.65
	P	—	—	—	—	—	—	—	—	—	—		

L=larvae; P=postlarvae.

TABLE 3 — SEASONAL DISTRIBUTION OF LARVAE OF 6 SPECIES OF PENAEID PRAWNS IN THE MANDOVI ESTUARY

		June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May
<i>M. dobsoni</i>	L	1	16	—	11	13	2	158	5265	297	437	184	542
	P	37	255	51	5	8	—	1	580	6	1003	67	32
<i>M. monoceros</i>	L	—	104	—	—	1	—	78	—	—	—	—	—
	P	11	80	—	—	1	—	—	58	1	46	46	—
<i>Metapenaeus</i> sp.	L	—	—	—	—	—	—	—	—	—	33	—	—
	P	3	—	—	—	—	—	—	—	—	—	—	—
<i>P. merguensis</i>	L	—	—	—	—	—	—	—	60	—	48	22	222
	P	8	5	—	1	—	—	—	23	—	28	37	1
<i>Penaeus</i> sp.	L	—	1	—	—	2	—	20	—	—	—	—	—
	P	—	—	—	—	—	—	—	—	—	—	—	—
<i>Parapenaeopsis stylifera</i>	L	—	—	—	—	4	—	3	—	—	30	6	21
	P	—	—	—	—	—	—	—	—	—	—	—	—

from the larvae of the two previous species of the genus, are present in the collections, mostly from the stations near the mouth of the estuary; only 1 larval specimen is recorded from the canal samples.

Thirty-three specimens out of a total of 36 are collected in March. The other larvae are recorded in June (Table 3).

Discussion

From the observations on the occurrence and abundance of the larvae in the plankton, some conclusions could be arrived at concerning the breeding season of different species. (Based on the occurrence of larvae in the inshore plankton and in the estuarine plankton of Goa, George and Goswami⁹ and Achuthankutty *et al.*¹⁰ came to the conclusion that *Metapenaeus dobsoni*, although breeding throughout the year, has peak spawning in the post-monsoon months.) George and Goswami⁹ expressed a doubt about missing a breeding peak during monsoon months due to the absence of sampling during that period. The present study with a year round sampling, while confirming previous conclusions, shows that they have missed only a minor breeding peak during the monsoon month of July. However, all these studies in Goa show slight difference in the peak breeding season reported for the species from the south west coast of India^{1,3,6,11} one of the peaks during November-December months reported there being absent here.

In case of *Metapenaeus monoceros*, George¹ noticed peak spawning in July-August and November-December in the Cochin waters. The same peaks have been observed in the present study although George and Goswami⁹ failed to observe these peaks in the inshore plankton of Goa.

As noticed by Achuthankutty *et al.*¹⁰, the larvae of all the species were abundant only near the mouth of the estuary. Based on the fact that even when the salinity values of the mid- and upstream stations were almost the same as those of the mouth stations the larvae were abundant only near the mouth, they concluded that salinity is not the sole factor which influences distribution of penaeid larvae

inside the estuary. One of the reasons for this may be that the larvae undergo regular moults and reach the postlarval stages most of which sink to the bottom to take up a benthic habit by the time they reach the upper reaches of the estuary.

For stocking purposes in shrimp culture experiments it is the late postlarval stages which are required to be collected from whichever source available. From the plankton sampling of the estuary, it is found that postlarvae of different species of penaeids were available in appreciable numbers only at the stations near the mouth of the estuary (stations 1 to 4). Therefore, large scale collections of postlarvae for stocking purposes would be possible only nearer the mouth area of the estuary. The period from January to July seems to be suitable for intensive collection of these seeds for stocking and culture. However, further intensive sampling of the surface as well as the water column is necessary for deciding about the proper time and place of collection.

Acknowledgement

The authors are thankful to Dr S. Z. Qasim, Director, for facilities and encouragement.

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