

## OCCURRENCE OF LARVAE OF COMMERCIALY IMPORTANT PENAEID PRAWNS ALONG THE CENTRAL WEST COAST OF INDIA

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### ABSTRACT

Penaeid larvae occurring in the coastal waters of the central west coast of India extending between 5 and 40 m depth zones in four transects and along 10 m depth zone between Vengurla and Janjira were studied. Larvae of six species of commercially important penaeid prawns were identified in these regions, viz., *Metapenaeus monoceros*, *M. dobsoni*, *M. affinis*, *Penaeus indicus*, *P. merguensis* and *Parapenaeopsis stylifera*. In general, larvae were comparatively more abundant in the southern transects than in the northern transects. In the northern transects, larvae were mainly distributed between 5 and 10 m depth zones and in the southern transects, between 10 and 20 m depth zones. *M. monoceros* was found to be the dominant species, their larvae contributing to about 32.12% of the total larvae collected followed by *M. affinis* with 24.60%. Breeding in *M. monoceros*, *M. affinis* and *M. dobsoni* appears to be continuous whereas *P. indicus*, *P. merguensis* and *P. stylifera* had a discontinuous breeding during the period of investigation.

Of the 10 stations studied between Vengurla and Janjira, a major portion of the penaeid larvae occurred in Ratnagiri. Larvae of *M. dobsoni* were distributed in all the stations and were contributing to about 67.90% of the total larvae recorded.

### INTRODUCTION

The larval occurrence and abundance in a particular region is indicative of the spawning behaviour of the species concerned and the proper larval recruitment to the nursery grounds, to a great extent, determines the success of any fishery. A major portion of India's penaeid prawn landings come from the west coast, especially the south west coast. Of late, the coastline along the central west coast of India is being increasingly exploited for these highly priced prawns. An adequate knowledge of the different aspects of the occurrence and distribution of penaeid larvae of this area is, therefore, very essential for a proper assessment and

determination of the fishery potential. Earlier studies on the spawning season and larvae of constituent species are available mostly from certain areas of the west coast (George, 1962, 1968, 1973; Mohamed, Rao and George, 1968; Rao, 1972, 1973a; Achuthankutty, George and Goswami 1977; George and Goswami, 1977). The present paper gives an account of the occurrence of penaeid larvae along this poorly known areas of the central west coast of India.

### MATERIAL AND METHODS

Surface zooplankton samples were taken from 4 transects in the central west coast (Fig. 1). From each transect,

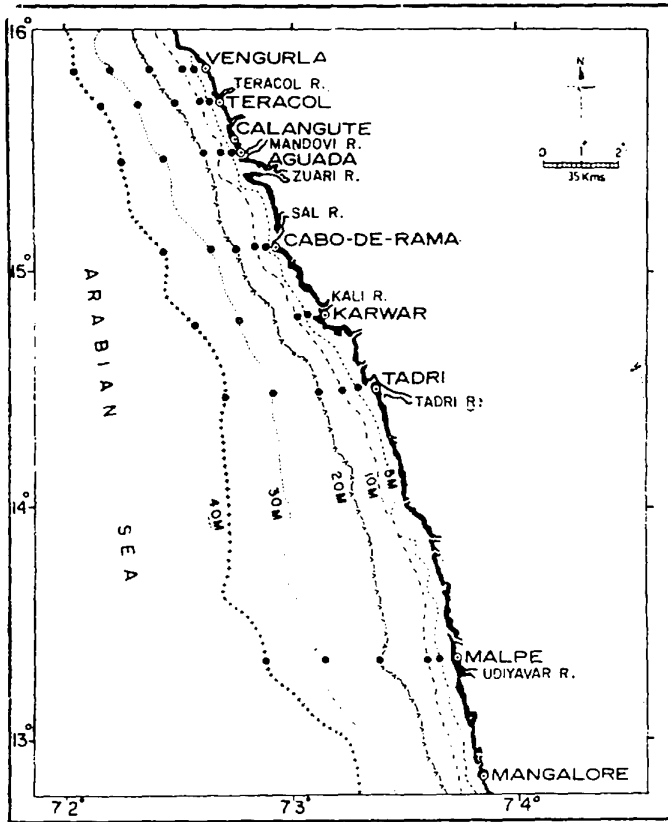


Fig. 1. Map showing the four transect stations.

samples were collected from 5, 10, 20, 30 and 40 m depth zones using a HT net (mouth area 0.25 m<sup>2</sup> and mesh width 0.3 mm) and towing it for 5 minutes. These samples were preserved in 5% formaldehyde and the penaeid larvae were sorted out from 20 to 100% of the samples and their number raised to total. The percentages were calculated from the average values. In Karwar, monthly observations were made from January to May, 1972; in Vengurla from January to April, 1972; in Aguada in February and

April 1972; and in Cabo-de-Rama in March and May, 1972.

Another set of zooplankton samples were collected from 10 stations extending from Vengurla to Janjira (Refer Fig. 1; Bhargava, Selvakumar and Singbal, 1973) for 9 months (September 1970 to May 1971). In all these stations vertical samples were collected from 10 m to surface from 10 m depth zone.

The larvae were identified by using the larval characters described by Menon

(1952); Mohamed, Rao and George (1968), Raje and Ranade (1972a & b) and Rao (1973b).

## RESULTS

### Species composition

Larvae of 6 species of commercially important prawns were represented in collections from these 4 transects, viz., *Metapenaeus monoceros* (Fabricius), *M. dobsoni* (Miers), *M. affinis* (Milne Edw.), *Penaeus indicus* (Milne Edw.), *P. merguensis* de Man and *Parapenaeopsis styliifera* (Milne Edw.). Of these *M. monoceros* was constituting about 36.12% of the total larvae collected followed by *M. affinis* with 24.60%. The contributions of other species were, *M. dobsoni* 19.53%, *P. styliifera* 14.40%, *P. merguensis* 3.14% and *P. indicus* 1.94%.

### Relative abundance of larvae

Relative abundance of penaeid larvae in the 4 transects along the different depth zones is presented in Fig. 2. In general more larvae occurred in the collections from the southern transects than from the northern transects of the central west coast. Of the total penaeid larvae, 51.07% was recorded from Cabo-de-Rama, 18.62% from Karwar, 16.22% from Aguada and 14.09% from Vengurla. In Vengurla and Aguada (northern transects), 66.76% and 77.64% of the total larvae respectively was collected from 5 m zone and the maximum numbers of 284 and 300 respectively was noted in February. In 10 m zone also they occurred in fairly good numbers (26.4% and 19.16%) but beyond this zone, the distribution was sparse. In Cabo-de-Rama transect, larvae were mainly distributed in 10, 20 and 30 m zones; with the highest numbers in 10 and 20 m in May (310 and

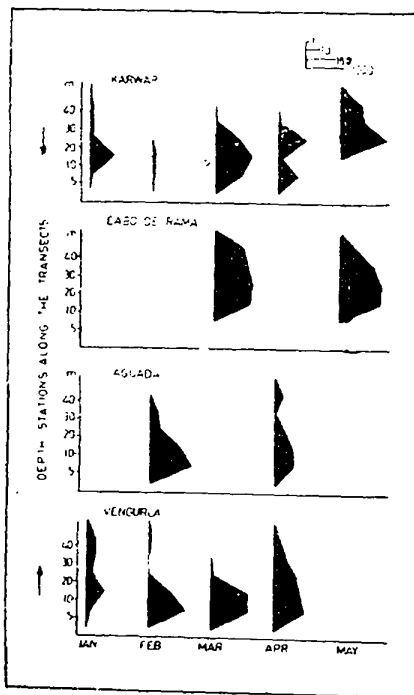


Fig. 2. Relative abundance of penaeid larvae in the four transects along different depth zones in different months.

411 numbers). In Karwar transect also, larvae were found to be distributed abundantly in 10 and 20 m zones (13.68% and 73.32%) and the maximum number of 650 was recorded in May from 20 m. This shows that penaeid larvae are mainly concentrated in the coastal waters up to 10 m zone in the northern region and between 10 and 20 m zones in the southern region of the central west coast of India.

### Relative distribution of specific larval components

*Karwar*—Larvae of all the 6 species were encountered in this region (Table 1

Table 1. Distribution of larvae of *Metapenaeus dobsoni*, *M. monoceros* and *M. affinis* along the four transects in different months.

Months	Species	Karwar				Cabo-de-Rama				Aguada				Vengurla							
		Depth stations (m)				Depth stations (m)				Depth stations (m)				Depth stations (m)							
		5	10	20	30	40	5	10	20	30	40	5	10	20	30	40	5	10	20	30	40
January '72	<i>M. dobsoni</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	<i>M. monoceros</i>	—	28	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3	—
	<i>M. affinis</i>	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	1 2
February '72	<i>M. dobsoni</i>	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	<i>M. monoceros</i>	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	<i>M. affinis</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—
March '72	<i>M. dobsoni</i>	10	15	25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	<i>M. monoceros</i>	34	88	10	—	—	—	13	5	1	2	—	—	—	—	—	—	—	—	80	20
	<i>M. affinis</i>	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	35	71
April '72	<i>M. dobsoni</i>	—	—	18	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	<i>M. monoceros</i>	11	—	23	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	20
	<i>M. affinis</i>	—	2	15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
May '72	<i>M. dobsoni</i>	—	—	35	1	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	<i>M. monoceros</i>	46	89	355	13	9	—	100	20	—	6	—	—	—	—	—	—	—	—	—	—
	<i>M. affinis</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	253	80

and II). Of these, *M. monoceros* was dominant with 60.92% of the total larvae, mainly distributed between 10 and 20 m zones. Their highest number of 355 was recorded from 20 m in May (Table I). Next in abundance was *P. stylifera* (18.59%). Larvae of this species were present only in the samples of May and occurred in large numbers along 20 m and were not collected from 5 and 10 m (Table II). This was followed by *M. dobsoni* (9.76%), their larvae were seldom recorded beyond 20 m (Table I). The occurrence and distribution of the larvae of *P. merguensis* (7.49%) (Table II) were similar to those of *P. stylifera*. Larvae of *P. indicus* (Table II) and *M. affinis* (Table I) were present in small numbers (1.62% each) mainly in 20 m zone and were completely absent in 5 m zone.

Protozoae were the important larval constituents of *M. dobsoni*, *M. monoceros* and *P. stylifera* followed by mysis. Postlarvae were occasionally present in very small numbers. *M. affinis* and *P. indicus* had more of mysis stages and *P. merguensis* had protozoae and postlarvae.

*Cabo-de-Rama*— This region was dominated by larvae of *M. affinis* (35.02%), followed in abundance by those of *M. monoceros* (29.09%), *M. dobsoni* (17.95%), *P. stylifera* (14.91%), *P. indicus* (2.96%) and *P. merguensis* (0.07%). No larvae were collected from 5 m zone. Larvae of *M. affinis* were widely distributed along 20 m zone, with a maximum of 253 recorded in May (Table I) and those of *M. monoceros*, *M. dobsoni* and *P. stylifera* along 10 and 20 m zones (Table I & II). The highest number of *M. monoceros* larvae (155) was collected from 20 m zone in March and those of *M. dobsoni* (110) and *P. stylifera* (100) from 10 m zone in May. *P. merguensis* and *P. indicus* larvae were collected in small numbers (Table II), the former from 20 m and beyond.

*M. dobsoni*, *M. monoceros* and *P. stylifera* were mainly represented in the samples by mysis and post larval stages whereas *M. affinis* by only the mysis stages. The larval stages of *P. merguensis* and *P. indicus* were either mysis or postlarvae.

*Aguda*— Larvae of all the 6 species occurred in this transect also (Tables I & II). The dominant species observed was *M. dobsoni*, the larvae contributed to about 77.67% of the total. *M. affinis* was next in abundance (16.70%), followed in succession by *M. monoceros* (2.70%), *P. stylifera* (1.71%), *P. merguensis* (0.73%) and *P. indicus* (0.49%). Larvae of *M. dobsoni* were abundant in 5 m zone and the highest number of 280 was recorded in February (Table I). *M. affinis* larvae also showed the maximum abundance in the same month from 10 m zone (Table I). *P. merguensis* larvae were collected from 20 m and beyond and the other 3 species from 10 m and beyond in smaller numbers.

As for the larval components, *M. dobsoni* had more of mysis and postlarvae and all the other species had mainly mysis stages.

*Vengurla*— In Vengurla, as in Cabo-de-Rama, larvae of *M. affinis* were present in larger numbers (42.29%) followed in the order of abundance by *M. monoceros* (18.81%), *M. dobsoni* (17.39%), *P. stylifera* (12.87%), *P. merguensis* (5.53%) and *P. indicus* (3.11%). Larvae of all these species were mainly distributed along 5 and 10 m zones (Table I and II). The highest number of *M. affinis* larvae (240) was collected from 5 m in February, those of *M. dobsoni* (80) from 5 m and *M. monoceros* (70) from 10 m in March and *P. stylifera* (40) from 5 m in February.

Major larval constituents of *M. dobsoni* and *M. monoceros* were mysis and postlarvae. *M. affinis* and *P. stylifera*, on the

Table II Distribution of larvae of *Penaeus merguensis*, *P. indicus* and *Parapenaeopsis stylifera* along the four transects in different months.

Months	Species	Karwar			Cabo-de-Rama			Aguada			Vengurla					
		Depth stations (m)			Depth stations (m)			Depth stations (m)			Depth stations (m)					
		5	10	20	30	40	5	10	20	30	40	5	10	20	30	40
January '72	<i>P. merguensis</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	<i>P. indicus</i>	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—
	<i>P. stylifera</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
February '72	<i>P. merguensis</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	<i>P. indicus</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	<i>P. stylifera</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
March '72	<i>P. merguensis</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	<i>P. indicus</i>	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—
	<i>P. stylifera</i>	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—
April '72	<i>P. merguensis</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	<i>P. indicus</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	<i>P. stylifera</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
May '72	<i>P. merguensis</i>	—	—	55	23	11	—	—	—	—	—	—	—	—	—	—
	<i>P. indicus</i>	—	—	10	5	1	—	—	—	—	—	—	—	—	—	—
	<i>P. stylifera</i>	—	—	205	8	2	—	—	—	—	—	—	—	—	—	—

other hand, had more of protozoae and mysis. *P. merguensis* and *P. indicus*, whenever present, were mainly represented either by mysis or postlarvae and occasionally by protozoae also.

#### Spawning periods

Considering the larval occurrence as an indication of the spawning period, *M. dobsoni*, *M. monoceros* and *M. affinis* were found to breed throughout the period of investigation. In the case of *P. indicus*, *P. merguensis* and *P. stylifera*, a discontinuous breeding activity was noted. Most of the species at Karwar had a peak breeding activity in May and those in Vengurla varied between February, March and April depending on the species.

#### Occurrence of penaeid larvae along 10 m coastal line between Vengurla and Janjira (Goa to Bombay coastline)

Of the 10 stations investigated for a period of 9 months, 34.21% of the total larvae occurred in Ratnagiri, 22.10% in Jaigad and 11.58% in Sriwardhan. All the other stations especially those located south of Ratnagiri had lesser number of larvae. In Deogad, no larvae were recorded during the period of investigation. In the region south of Ratnagiri, Malvan had the maximum larvae (7.37%).

Total penaeid larvae at each of the 10 stations during different months is given in Fig. 3. *M. dobsoni* was the dominant species (67.90%), their larvae distributed in almost all the stations in varying numbers. They were abundant in Ratnagiri (57 out of 65), Jaigad (34 out of 45) and Sriwardhan (12 out of 23). Postlarvae of this species were largely present in the samples. Larvae of *M. Monoceros* (11.58%) were occasionally collected from station south of Ratnagiri and more often in smaller numbers from Ratnagiri.

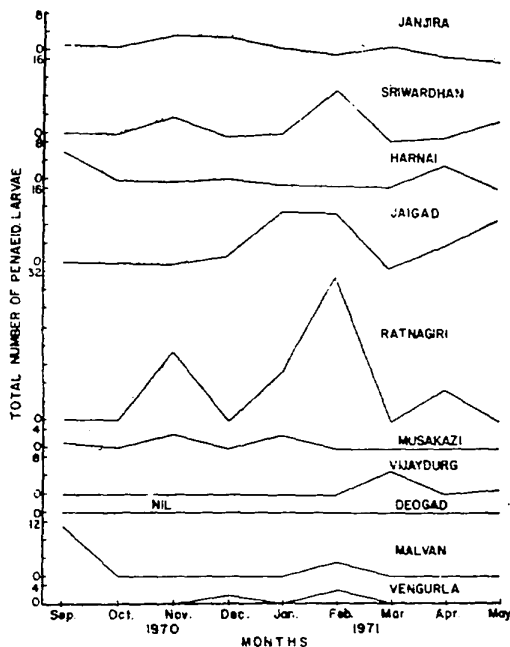


Fig. 3. Relative abundance of penaeid larvae along 10 m depth zone between Vengurla and Janjira in different months.

Jaigad and Janjira. This species was represented either by mysis or postlarvae. *P. indicus*, the larvae of which formed about 7.37% of the total larvae, were recorded from stations north of Musakazi. *P. stylifera* larvae (7.89%) were absent in most of the samples but were often recorded from Harnai. Larvae of *P. merguensis* and *M. affinis* were observed occasionally.

#### DISCUSSION

Based on the larval abundance, Menon (1952), George (1962), Rao (1968), Achuthankutty, George and Goswami (1977) and George and Goswami (1977) have studied the spawning seasons of different species of penaeid prawns of the inshore waters and estuaries of the west coast of India.

Most of the commercially important penaeid prawns have been reported by these authors to spawn in the close inshore waters. The present study is also in conformity with their findings in that larvae of most of the species occurred in larger numbers inside 20 m coastal line. The presence of fewer numbers of *M. affinis* larvae in the inshore waters along west coast were attributed to the species spawning in deeper waters (Subramaniam, 1967; George, Raman and Nair, 1968; George and Goswami, 1977). However, it is of interest to note that the larvae of this species were collected in fairly good numbers from Vengurla and Cabo-de-Rama, suggesting that this species may be breeding in close inshore waters in certain regions of central west coast of India.

Continuous breeding for *M. jobsoni* has been reported by several authors (George, Raman and Nair, 1968; Rao, 1968; George, 1970; Achuthankutty, George and Goswami, 1977; George and Goswami, 1977) with some variations in the peak breeding seasons from place to place. The main peak observed in February in the southern part of central west coast is in agreement with the studies of George and Goswami (1977) from the inshore waters of Goa. However, in the northern part, the peak was noticed in May. But the primary peak observed in January in the estuaries of Goa (Achuthankutty, George and Goswami, 1977) was not seen in these regions. A year-round investigation in these areas might throw more light on this aspect.

The peak breeding of *M. affinis* in January reported from Calicut waters (Subramaniam, 1967) and Goa waters (George and Goswami, 1977) was, however,

not noticed in the present study. But the northern transect of Vengurla and the southern transect of Cabo-de-Rama, where the larvae of this species occurred abundantly had the peak in February and in May respectively.

Larval distribution of *M. monoceros* was almost similar as reported from Gulf of Kutch (Srivastava, 1953) and Goa (George and Goswami, 1977) with peaks in March and May in the southern transects where they were present in fairly good numbers.

Although Rao (1972) has reported a year-round breeding in *P. indicus* from Cochin region, the data available for five months show that this species does not breed continuously in the central west coast. The discontinuous breeding in *P. merguensis* and *P. stylifera* observed in these regions is in agreement with the findings of Achuthankutty, George and Goswami (1977) from Goa estuaries.

Occurrence of larvae of most of the commercially important penaeid prawns in abundance in the southern region of the central west coast of India would probably indicate a larger breeding stock of these species in these grounds. Hence, proper commercial exploitation of this stock should be investigated.

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