

LARVAL MIGRATION AND GROWTH OF MARINE PRAWNS IN THE ESTUARINE HABITAT

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ABSTRACT

Larval migration and growth of *Metapenaeus dobsoni*, *M. monaceros*, *M. affinis* and *Penaeus merguensis* were studied in the Mandovi estuary and a nearby mangrove swamp for one year. In general, total number of larvae were more during the post-monsoon season (56.3%). The lower reaches of the estuary sustained the maximum density (73.2%). All species except *M. affinis* had an initial growth in the mangrove swamp and a later stay in the estuary before finally migrating back to the sea. *M. affinis*, on the other hand, was observed to grow mostly in the estuary. The sizes at which such active emigration occurs varies with species and habitat.

Keywords : Migration, prawns, estuary.

INTRODUCTION

Many species of marine prawns have an estuarine phase in their life cycle (George, 1962, 1973; Kutkuhn, 1966; Gunter, 1967). The adults spawn in the sea and the larvae migrate into the estuaries for development and initial growth to juvenile stages which subsequently migrate back to the sea and thus the cycle is repeated. A proper understanding of this migratory habit is necessary to know the population dynamics and biology of marine prawns. Moreover, this information could be used advantageously in shrimp culture operations. Achuthankutty, George and Goswami (1977) and Selvakumar, George, Achuthankutty and Goswami (1977) studied the penaeid larval distribution and migration into the estuarine system of Goa. However, detailed information on what happens to the larvae and postlarvae which enter these estuarine systems is lacking. In view of this, studies were conducted in the Mandovi estuary, Goa during 1978-79 to trace the migration and growth of penaeid larvae.

MATERIALS AND METHODS

Penaeid larvae were collected every fortnight using a HT net from three fixed stations, covering the lower, middle and upper reaches of the Mandovi estuary (Fig. 1). Salinity and temperature were also recorded at all these stations using a salinity-temperature bridge. Monthly samples of juvenile penaeid prawns were collected from a mangrove swamp during low tide by hauling a rectangular net of 5 mm mesh size through the bottom covering an area of about 50 m². Prawn samples were also taken once a month from stake net catches at Verem (Fig. 1). All prawns were identified upto species and the total length was measured from tip of rostrum to tip of telson.

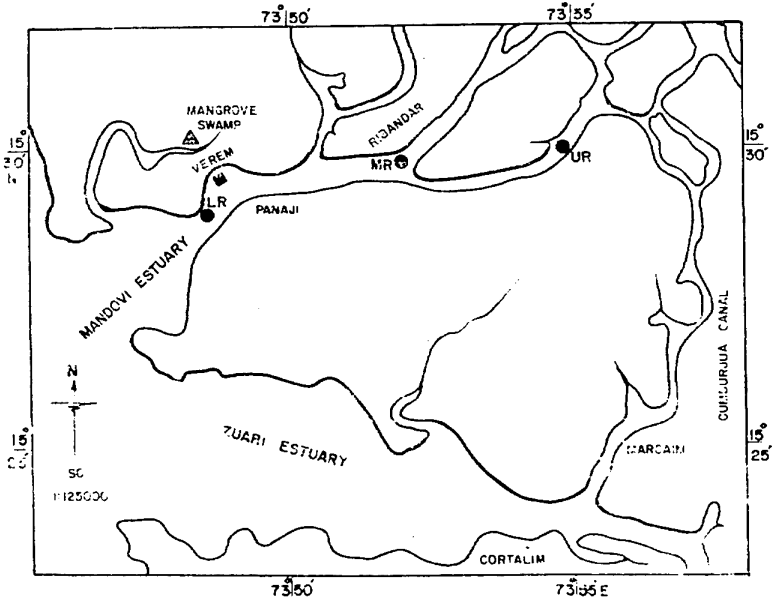


Fig. 1. Map showing station locations.

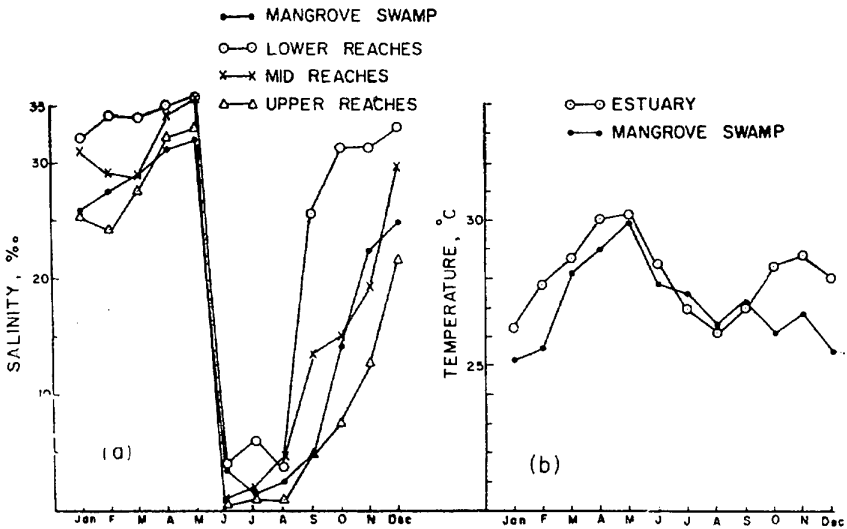


Fig. 2. Salinity (a) and temperature (b) in the estuary and the mangrove swamp during different months.

RESULTS AND DISCUSSION

Hydrography: Mandovi estuary is flanked by large areas of mangrove swamps. Salinity ranged in the lower reaches of the estuary (Fig. 2a) from 4 to 35‰, in the middle reaches from 2 to 35‰ and in the upper reaches from 1 to 32‰. In the mangrove swamp the salinity range was from 2 to 32‰. Temperature in the estuary ranged from 26 to 30.2 °C and in the mangrove swamp from 25.2 to 29.5 °C (Fig. 2b).

Larval occurrence: Maximum density of penaeid larvae (56.3%) was observed during the postmonsoon season (October-January) with the highest number in the month of January (Fig. 3b). Premonsoon seasons (February-May) accounted for 32.3% and the monsoon season (June-September) for 11.4% of the total larvae. Larvae of *Metapenaeus dohsoni* constituted 44%, *M. monceros* 20.6%, *M. affinis* 16.7%, *Penaeus merguensis* 12.2%, *P. indicus* 0.7% and *Parapenaeopsis stylifera* 5.8% of the total (Fig. 3a). The

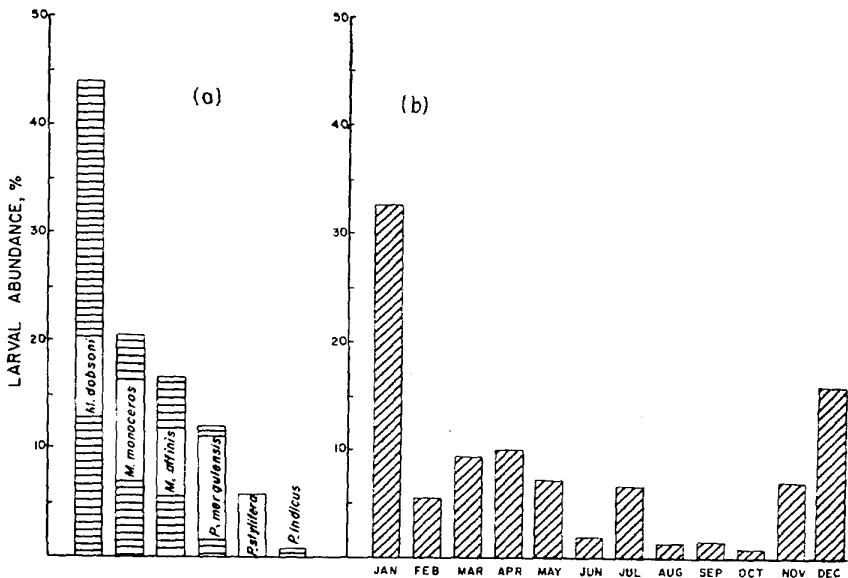


Fig. 3. Percentage composition of larvae of individual species (a) and total penaeid larval abundance during different months (b).

lower reaches of the estuary had maximum number of larvae of all species and the number progressively decreased to the upper reaches (Fig. 4). *P. indicus* and *P. stylifera* larvae were not present in the samples from the mid and upper reaches (Fig. 4). All species showed maximum larval density during

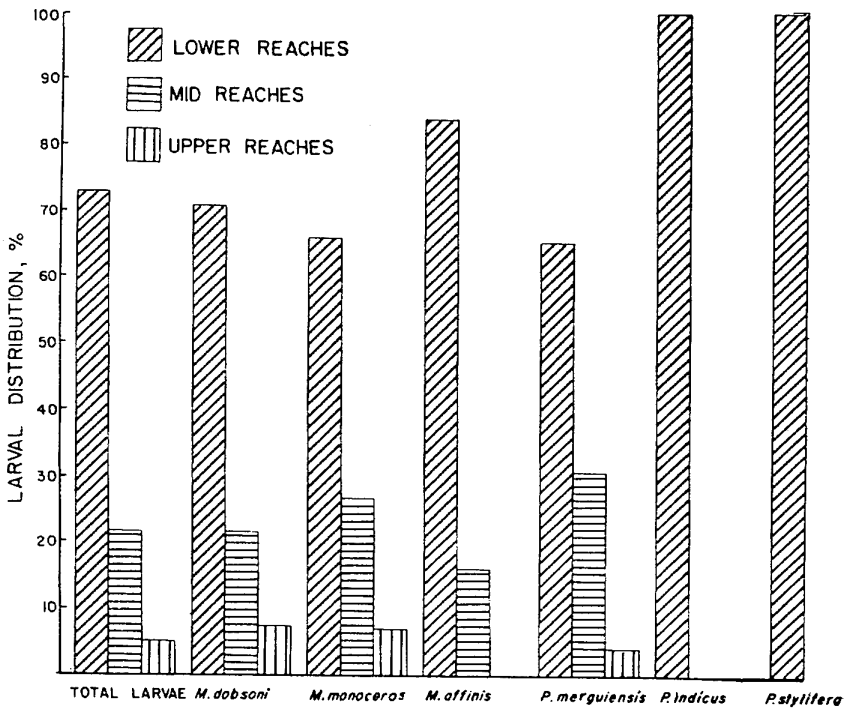


Fig. 4. Percentage composition of penaeid larvae in different regions of the estuary.

the postmonsoon season except *M. affinis* and *P. indicus* which were relatively more during the premonsoon season (Fig. 5).

Juvenile population in mangrove swamp and estuary: Samples from the mangrove swamp revealed the presence of juveniles of *M. dobsoni* (42.66%), *M. monoceros* (35.02%) and *P. merguensis* (22.32%). Maximum number of juveniles was observed in this area during the postmonsoon season. Collections from stake net also revealed the presence of the above mentioned species in addition to some other penaeid species in small numbers. Juveniles of *M. affinis* although not collected from the mangrove area were fairly abundant in the estuary (28.5%). In the stake net collections also *M. dobsoni* formed the dominant species (39.4%). *M. monoceros* contributed 21.7% and *P. merguensis* 10.3%.

Size frequency distribution: Percentage frequency of size distribution of the four species studied both in the mangrove swamp and stake net collections is given in Fig. 6. 50–60 mm was observed to be the maximum length

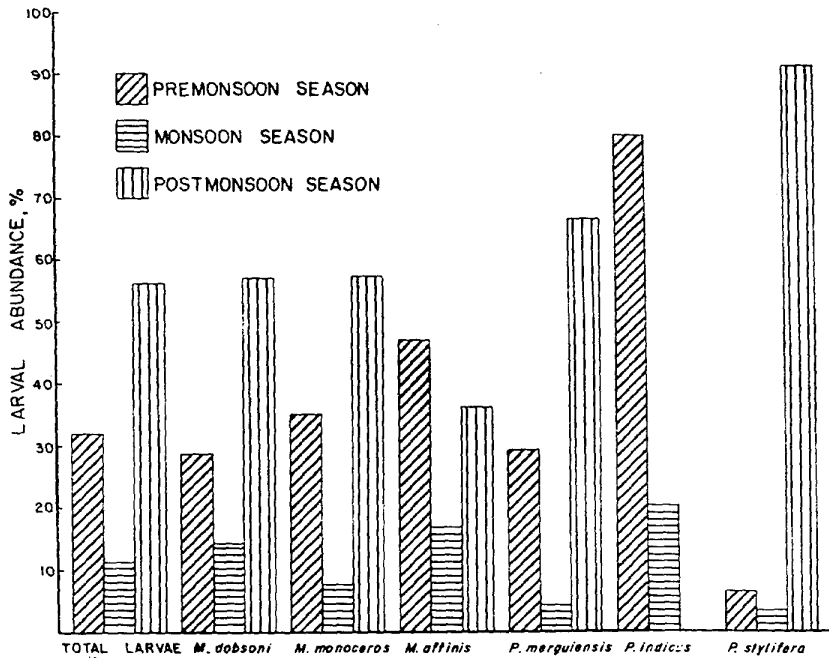


Fig. 5. Seasonal abundance of penaeid larvae in the estuary.

attained by *M. dobsoni* in the mangrove swamp while *M. monoceros* grows upto 70–80 mm in this environment. *P. merguensis* measuring upto 90–100 mm, were caught in the mangrove area. However, the penaeid population here was dominated by early juvenile stages. *M. dobsoni* of 80–90 mm, *M. monoceros*, *M. affinis* and *P. merguensis*, of 90–100 mm were caught in the stake net. In the estuary, larger or adolescent sizes were always dominating the catches. Average monthly growth rate of these species in the estuarine environment was found to be 5.6 mm for *M. dobsoni*, 8.3 mm for *M. monoceros*, 8.5 mm for *M. affinis* and 10 mm for *P. merguensis*.

The larval abundance in the Mandovi estuary suggests that peak spawning of most of the species of penaeid prawns occurs in Goa waters during the postmonsoon season followed by premonsoon season as reported earlier by Achuthankutty, George and Goswami (1977), Goswami and George (1977) and Selvakumar, George, Achuthankutty and Goswami (1977).

Low salinity of the estuaries has been reported to be one of the main factors influencing the penaeid prawn larval migration into this specialised ecosystem (Pearse and Gunter, 1957). Gunter (1950) suggested that under hyposaline conditions the growth of penaeid juveniles enhances. Later labora-

tory studies by Nair and Kutty (1975) on juveniles of *P. indicus* and Venkata-ramiah, Lakshmi and Gunter (1974) on postlarvae of *Penaeus aztecus* also led to the same conclusion. As the juveniles prefer low salinities it would be possible that a majority of them may be migrating to the nearby mangrove swamps where the salinity is relatively lower than the estuary. This would also explain why the early juvenile stages are abundant in the mangrove swamp and larger or adolescent ones are abundant in the estuary.

Barber and Lee (1975) observed that the number of postlarval *Penaeus plebejus* entering the bay was related to both light levels and state of the tide, with most postlarval shrimp entering during flood tides of the new moon phase. Young and Carpenter (1977) confirmed these observations.

It is interesting to note that juveniles of *M. affinis* rarely occurred in the mangrove swamp but were abundant in the estuary. It may be possible that juveniles of this species may be preferring a relatively high salinity for growth than the other species. However, there is no conclusive evidence to substantiate this point.

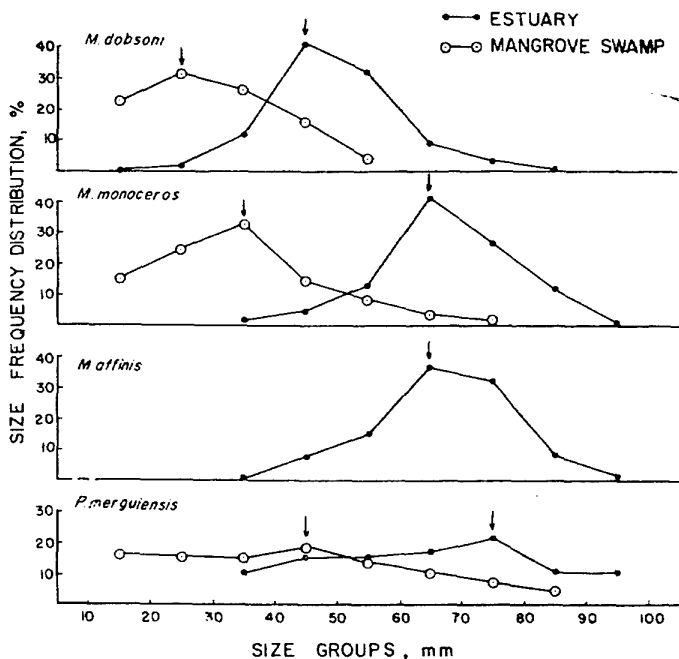


Fig. 6. Size frequency distribution of juveniles of *M. dobsoni*, *M. monoceros*, *M. affinis* and *P. merguensis* in the estuary and the mangrove swamp.

It is quite evident from the present investigation that postlarvae or early juveniles of the four species under investigation enter and stay in the estuarine habitat for their initial growth until they attain adolescent size which varies with species and migrate back to the sea for sexual maturity and spawning. The maximum period of stay in the mangrove swamp varies from 5-6 months for *M. dobsoni*, 7-8 months for *M. monoceros*, and 6-7 months for *P. merguensis*. However, the size at which they actively migrate to the estuary from the mangrove swamp varies with species. It was found to be 20-30 mm for *M. dobsoni*, 30-40 mm for *M. monoceros* and 40-50 mm for *P. merguensis* (Fig. 6). Size frequency distribution (Fig. 6) of these species indicated a further period of stay and growth in the estuary. The size at which *M. dobsoni* starts the active emigration to the sea is when it attains 40-50 mm whereas it is 60-70 mm for *M. monoceros*, and 70-80 mm for *P. merguensis*. Although *M. affinis* does not exhibit a pronounced mangrove phase for the initial growth, the adolescent ones start migrating back to the sea when they attain 60-70 mm in length.

The present study emphasises the significant role played by the estuarine habitat in completing the life cycle of many of the commercially important penaeid prawns. Hence, it is important that such nursery areas are properly protected and fishing operations restrained for having a long term sustainable marine prawn fishery.

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