

# ABUNDANCE AND DISTRIBUTION OF PENAEID LARVAE AS AN INDEX OF PENAEID PRAWN RESOURCES OF THE INDIAN OCEAN

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## ABSTRACT

Based on 1927 plankton samples collected during the International Indian Ocean Expedition (1960-65), an attempt is made to correlate the occurrence and abundance of penaeid larvae with the penaeid prawn fishery of the various regions, especially, in the Arabian Sea and Bay of Bengal. Larvae of penaeid species were found in large numbers in the Bay of Bengal, particularly in the waters around Andaman and Nicobar Islands and off Madras coast, and in the west coast of India, mainly in the Malabar coast, in the Arabian Sea.

## INTRODUCTION

Analysis of the data on the abundance of larvae of penaeids in 1927 plankton samples collected from the Indian Ocean during the International Indian Ocean Expedition (1960-1965) has shown that these larvae are more commonly represented in the area nearer the coast as indicated in the preliminary observations by Menon *et al* (1967). Further studies made in the Indian Ocean Biological Centre on the subsorted groups of penaeid larvae, especially with reference to the qualitative aspects and species composition, have revealed that these are found in concentrations of larger numbers in certain areas of the coastal waters than in others. So an attempt was made to correlate the occurrence and density of these larvae with the penaeid-prawn fishery of the various regions, particularly in the Arabian Sea and the Bay of Bengal.

Out of the total samples of plankton collected with Indian Ocean Standard Net, 1518 samples contained decapod larvae. Subsorting of the decapod larvae into the various families and groups showed that 463 samples contained larvae of prawns belonging to the family Penaeidae (Sub fam. Solenocerinae and Penaeinae). 353 samples contained larvae of the subfamily Penaeinae, which have been further identified into genera and species. For studying the density of the larvae the total number in each haul has been calculated from the data of subsamples sorted out and these numbers are used as indices of abundance of the larvae in various areas.

GENERA AND SPECIES REPRESENTED IN THE COLLECTIONS

Larvae of several of the genera including species of commercial importance in the coastal zones of the Indian Ocean have been identified from the collections. Developmental stages of 17 species belonging to 10 genera of Penaeinae have been located in the studies made so far. A list of the species is given below:

- Genus *Penaeus* Fabricius
  - Penaeus monodon* Fabricius
  - Penaeus indicus* H. Milne Edwards
  - Penaeus merguensis* de Man
- Genus *Funchalia* Johnson
  - Funchalia woodwardi* Johnson
- Genus *Metapenaeopsis* Bouvier
  - Metapenaeopsis andamanensis* (Wood-Mason)
  - Metapenaeopsis coniger* (Wood-Mason)
- Genus *Parapenaeus* Smith
  - Parapenaeus longipes* Alcock
  - Parapenaeus fissurus* Bate
  - Parapenaeus investigatoris* Alcock & Anderson
- Genus *Penaeopsis* Bate
  - Penaeopsis rectacuta* (Bate)
- Genus *Metapenaeus* Wood-Mason & Alcock
  - Metapenaeus dobsoni* (Miers)
  - Metapenaeus monoceros* (Fabricius)
  - Metapenaeus affinis* (H. Milne Edwards)
- Genus *Atypopenaeus* Alcock
  - Atypopenaeus stenodactylus* (Stimpson)
- Genus *Trachypenaeus* Alcock
  - Trachypenaeus curvirostris* (Stimpson)
- Genus *Parapenaeopsis* Alcock
  - Parapenaeopsis stylifera* (H. Milne Edwards)
- Genus *Trachypenaeopsis* Burkenroad
  - Trachypenaeopsis* sp.

The number of samples from which each genus was obtained is as follows:

*Penaeus*-46, *Funchalia*-9, *Metapenaeopsis*-64, *Parapenaeus*-42, *Penaeopsis*-113, *Metapenaeus*-67, *Atypopenaeus*-9, *Trachypenaeus*-14, *Parapenaeopsis*-11 and *Trachypenaeopsis*-2.

It is seen that larvae of the genus *Penaeopsis* are the most represented in the collection from 113 stations. It is particularly interesting to note that these larvae belong to a single species namely *Penaeopsis rectacuta*. *Metapenaeus* and *Metapenaeopsis* are the other two genera, the larvae of which are present in the collections in larger numbers.

#### LARVAL DISTRIBUTION OF PENAELINAE

Taking the whole Indian Ocean region, the maximum number of the larvae of Penaeinae are represented in the Bay of Bengal collections — more than 50% of the total number of larval specimens were obtained from this region. There itself two areas are outstanding in the occurrence of maximum concentrations of these larvae, one along the coast off Madras and the other off the Nicobar Island. In the Arabian Sea the region along the southwest coast of India is noticed to have the maximum abundance of the larvae.

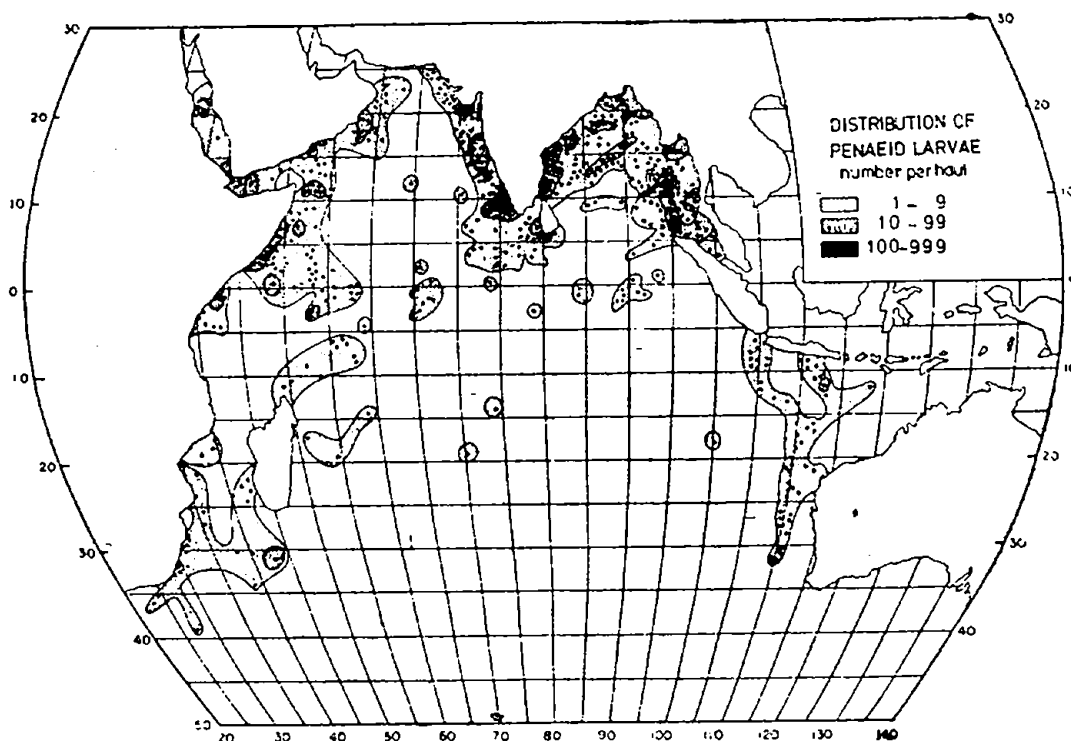


FIG. 1. Distribution of penaeid larvae in the Indian Ocean.

Among the individual stations maximum number of specimens were obtained from 3 stations, 244 larvae from St. No. 689 of INS KISTNA, off Madras on the east coast of India, 142 from St. No. 2005 of VARUNA, off Alleppey on the southwest coast of India and 109 from St. No. 515 of INS KISTNA, off the Nicobar Island (for details of stations ref: IOBC, 1969). Based on the number of larvae per haul, the highest number of larvae (100-999) are represented in three regions (Fig. 1) off Madras in the east coast of

India, a region east of the Nicobar Island and along the southwest coast of India. The next higher grade of intensity of larvae (10-99), are noticed around the Andaman and Nicobar Islands, middle of east coast of India, northern part of the Bay of Bengal, regions north of Sumatra and west of Thailand; west coast of India covering Ratnagiri and Mangalore, and north and south regions of the Somali coast. Areas with least intensity (1-9) are found along the rest of the coastal waters of the Indian Ocean including South African coast, South of Java and Sumatra and northwestern Australian coast with a few scattered small areas in the mid Indian Ocean. The central and southern parts of the Indian Ocean are found to be devoid of these larvae.

Among the species represented in the larval collections, *Penaeopsis rectacuta* Bate deserves special mention as the species occurred in most of the samples, indicating a wider distribution in the Indian Ocean. The maximum intensities of the larvae of this species are found in the southwest coast of India, around the Andaman and Nicobar Islands and off the Somali coast of Africa. A point of interest to be noticed in the case of the larvae of this species is that they are seldom present in samples from depths lesser than 50 m, indicating thereby that it is not an inshore species. Most of the stations occupied during the IIOE being outside the 50m-depth region, except for a few stations along the west coast of India sampled by the research vessels Varuna and Conch, the larvae of most of the littoral commercial species are represented in very small numbers in the samples. The species represented in the larval collections from different regions of the coasts where larvae have been noticed in higher density in their order of abundance are indicated in table 1. It is quite clear that *Penaeopsis rectacuta* is the only species met with in all the regions.

#### RELATIONSHIP OF DENSITY OF LARVAE WITH THE FISHERY

From observations of various authors it is well known that the penaeid prawns spawn in the sea, the inshore species spawning in the areas of lesser depths and the deep-water species spawning in deeper waters. It is also clear from several studies that in the case of most of the commercially important penaeids mass movement of the metamorphosing larvae towards estuarine nursery areas takes place, the juveniles later returning to the sea for spawning and completing the life cycle (Kutkuhn 1966, George 1968). Excepting for this shoreward movements of the larvae there has been no report of large scale movements of larvae from coast to coast or from one region to the other. Therefore the occurrence of the larvae would naturally indicate the presence of a spawning population of adults in the neighbourhood.

Thus the areas of high density of these larvae in the plankton samples may be considered as areas of higher concentrations of a spawning stock. By these indications it would seem that in the east coast of India, off Madras, and areas around the Andaman and Nicobar Islands and in the Arabian Sea, the

TABLE 1. *Species represented in the larval collections in different coastal regions of the Indian Ocean.*

Area	Species
Somali coast	<i>Metapenaeopsis andamanensis</i> <i>Penaeopsis rectacuta</i> <i>Parapenaeus</i> sp. <i>Penaeus</i> sp.
Gulf of Aden	<i>Penaeopsis rectacuta</i> <i>Metapenaeus dobsoni</i> <i>Penaeus</i> sp. <i>Metapenaeopsis andamanensis</i>
Saudi Arabian coast	<i>Metapenaeopsis coniger</i> <i>Penaeopsis rectacuta</i>
Bombay and Ratnagiri coast	<i>Metapenaeus affinis</i> <i>Penaeopsis rectacuta</i>
South west coast of India	<i>Penaeopsis rectacuta</i> <i>Parapenaeus</i> sp. <i>Metapenaeus</i> spp. <i>Metapenaeopsis andamanensis</i> <i>Penaeus indicus</i> <i>Trachypenaeus curvirostris</i>
East coast of India (off Madras to Orissa)	<i>Penaeopsis rectacuta</i> <i>Parapenaeus</i> sp. <i>Metapenaeopsis andamanensis</i> <i>Metapenaeus</i> spp. <i>Penaeus indicus</i> <i>Parapenaeopsis</i> sp.
Rangoon coast	<i>Penaeus</i> spp. <i>Metapenaeus</i> sp. <i>Penaeopsis rectacuta</i> <i>Parapenaeus</i> sp.
South of Andaman and around Nicobar Islands	<i>Penaeopsis rectacuta</i> <i>Metapenaeopsis</i> spp. <i>Penaeus</i> sp. <i>Metapenaeus</i> sp. <i>Parapenaeopsis</i> sp. <i>Trachypenaeus</i> sp.

west coast of India especially the middle and southwest coasts are regions of denser populations of penaeid prawns. In recent years the penaeid-prawn fishery of the west coast of India, particularly the southwest coast, has increasingly come into the picture. In fact the southwest coast of India accounts for nearly 50% of the penaeid prawn landings of the country (Mohamed 1969). So the

indication of higher concentrations of penaeid prawns by the occurrence of their larvae along this region is something that could be expected. By the same token the indications of higher densities of penaeid prawns off Madras, off Ratnagiri and Mangalore coast are quite interesting as these areas are also being exploited for penaeid prawn fishery. This would indicate that there is every likelihood that the areas around the Andaman and Nicobar Islands also might prove highly potential fishery grounds for penaeid prawns.

#### DISCUSSION

The present study corroborates the preliminary observations made by Menon *et al* (1967) that the decapod larvae are distributed nearer the shore. A study of the figure showing the stations with prawn larvae indicates that most of the open-ocean regions are either devoid of penaeid larvae or having very few numbers. From this, it would appear that really deep-water and oceanic species of penacinae are very few in the Indian Ocean region.

An interesting feature which has emerged from this study is about the distribution of the larvae of the species *Penaeopsis rectacuta* and a possible relationship with its fishery. As mentioned earlier the larvae of this particular species are represented in the maximum number of samples and higher concentrations of the larvae have been noticed in samples from southwest coast of India as well as from the region of the Andaman and Nicobar Islands. Recent exploratory fishing operations in deeper waters (100-150 fathom depths) off Kerala have brought to light the existence of large quantities of this species alongwith some other pandalid prawns indicating possibility of commercial exploitation (Kurien 1964, George 1966, Joseph and Radhamma 1970). The higher concentrations of the larvae of the species in this region may be taken as an indication of the presence of fishable stock of the species in these waters. If so, it would naturally follow that in the other areas, where these larvae are met with in higher densities, also there may be concentrations of adults available for fishing. Thus it would be tempting to conclude that around the Andaman and Nicobar Islands as well as off the north and south of the Somali coast of Africa there may be large quantities of this prawn available for exploitation.

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