

## OBSERVATIONS ON THE FOOD AND FEEDING OF SOME PENAeid PRAWNS OF COCHIN AREA

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### ABSTRACT

An investigation into the food and feeding habits of 5 species of penaeid prawns viz. *Metapenaeus dobsoni*, *Penaeus indicus*, *Metapenaeus monoceros*, *Metapenaeus affinis*, and *Penaeus monodon* found common along the Kerala coast has been carried out based on samples collected from the inshore regions of Cochin during 1971-72. It has been observed that all the above species are omnivorous and detritus feeders, depending much on the benthos. The food in general consists of varying amounts of organic matter mixed with sand and mud. However, some amount of seasonal variation in the food and selective feeding has been noticed in some species particularly depending on the ecological conditions. Proportionately larger quantity of debris was noticed in the young prawns, while adults mostly depended on the common bottom animals including small molluscs and plant matter.

### INTRODUCTION

PRAWNS form one of the most economically important constituents in the marine fish landings in India. At present most of the catch comes from the inshore regions within the 20 fathom line. For increasing the production, it would be necessary to explore offshore resources and also to start intensive pond culture. Though prawn culture is carried out in some parts of the country, it has not yet overcome the various difficulties and reached a stage comparable to the one carried out in Japan. In this connection it would be advantageous to study the biology of the common forms with special reference to the food and feeding habits. An investigation into the food and feeding habits of the various species may help in gathering data for their successful culture in ponds.

Some of the important works on the food and feeding habits of penaeid prawns are those of Williams (1955) on some North American shrimps, Eldred *et al.* (1961) on *Penaeus duorarum*, Dall (1967) on some Australian penaeid prawns, Hall (1962) on the food of the Indo-west Pacific penaeids, and Tiews *et al.* (1968) on some Philippine shrimps. In India, Gopalakrishnan (1952) has studied the gut contents of *Penaeus indicus*. Panikkar (1952), Panikkar and Menon (1956), Kunju (1967) and George (1959) have recorded the food contents of penaeid prawns while studying the biology of different species. The present paper deals with the observations made on the food and feeding habits of some economically important penaeid prawns of the Kerala coast.

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### MATERIAL AND METHODS

The material for the present study was collected by random sampling twice a week from the commercial catches from the inshore regions of Cochin during 1971-'72. The specimens were preserved in formalin immediately after the catch. The

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total length of the specimen was measured from the tip of telson to the tip of rostrum. The stomach was carefully separated, split open, the contents spread on a counting slide and was examined under a microscope. The number of each species or group of organisms in each unit area was counted and recorded. The semi-digested, broken or finely comminuted nature of food materials rendered this task very difficult.

In evaluating the different food organisms the points method (Hynes, 1950) was followed. The percentage composition was calculated by allotting points to the various organisms based on their relative sizes as determined by visual estimation under a microscope. The points thus allotted were tabulated and the percentages calculated. The digested portion of the food when mixed with the mucus of the stomach was included with the debris while assessing the percentage composition of the gut contents.

#### ANALYSIS OF THE FOOD OF DIFFERENT SPECIES

Examination of the commercial catches from the inshore area of Cochin revealed that five species of penaeid prawns commonly occur. They are in the order of importance *Metapenaeus dobsoni*, *Penaeus indicus*, *Metapenaeus monoceros*, *Metapenaeus affinis* and *Penaeus monodon*. During the course of the present studies the stomach contents of 996 specimens belonging to these five species were examined. The food items were classified as debris, algal and plant matter, crustaceans, molluscs, polychaetes, sand, diatom, Foraminifera and miscellaneous items. The percentage composition of the stomach contents are given in Fig. 1 a-e.

##### *Metapenaeus dobsoni* Miers

This is one of the important species contributing to the inshore fishery of the Southwest coast of India. A total of 380 specimens of size 23 to 110 mm were examined of which 42 had empty stomachs.

It is seen that debris forms a major component (Fig. 1a). Both animal and plant matter were of almost equal importance in the gut content. The vegetable matter consisted of diatoms of the genera *Fragilaria*, *Coscinodiscus*, *Pleurosigma*, *Biddulphia*, algal filaments and fragments of seaweeds. Among the animal contents, crustacea formed the major part. Amphipods, copepods and decapod larvae were the most important. Appendages, stalked eyes and carapace were seen in a partially digested form. Copepods were generally abundant during May and November. The other food items encountered were small lamellibranchs, larvae of lamellibranchs, fish remains including muscles, scales, fins etc., Foraminifera, polychaete remains and miscellaneous matter like nematode fragments and spicules. Sand grains in the stomach were more during June and September than in other months. During May and November animal constituents were more than the vegetable matter. Polychaetes were abundant during September and October, and algal fragments during July and March.

Menon (1952) reported that the food of *M. dobsoni* consists of varying amounts of organic matter mixed with sand and mud. Panikkar and Menon (1956) have emphasized the importance of both planktonic diatoms and bottom detritus in the food of *M. dobsoni*, but Hall (1962) is of the opinion that "penaeidae in general cannot be considered plankton feeders". In the present observation both animal and plant matter were noticed in the stomach. Some of the stomachs were full of vegetable matter while others were full of animal remains.

*Penaeus indicus* H. Milne-Edwards

This species is common in the estuaries and backwaters almost throughout the year, although the size differs with the season. In the sea, it is generally caught during the post monsoon months. Of the 330 specimens of length 29-132 mm examined, 13 had no food materials in their stomachs.

The stomach contents showed a high percentage of debris (50.7%). Animal matter constituted 22.0% and plant 25.0%. Hall (1962) classified *P. indicus* and *P. monodon* as species feeding mainly on large crustaceans. More vegetable matter were noticed in the present study thus differing from the observation of Hall. This may be due to the differences in the environmental conditions. Hall also observed that in *P. indicus* the 'small' specimens fed mainly on plant tissue (Cladophora and Angiosperm tissue), while the large specimens fed predominantly on large crustaceans. But no size-oriented differences in the diet were noticed in the present observations.

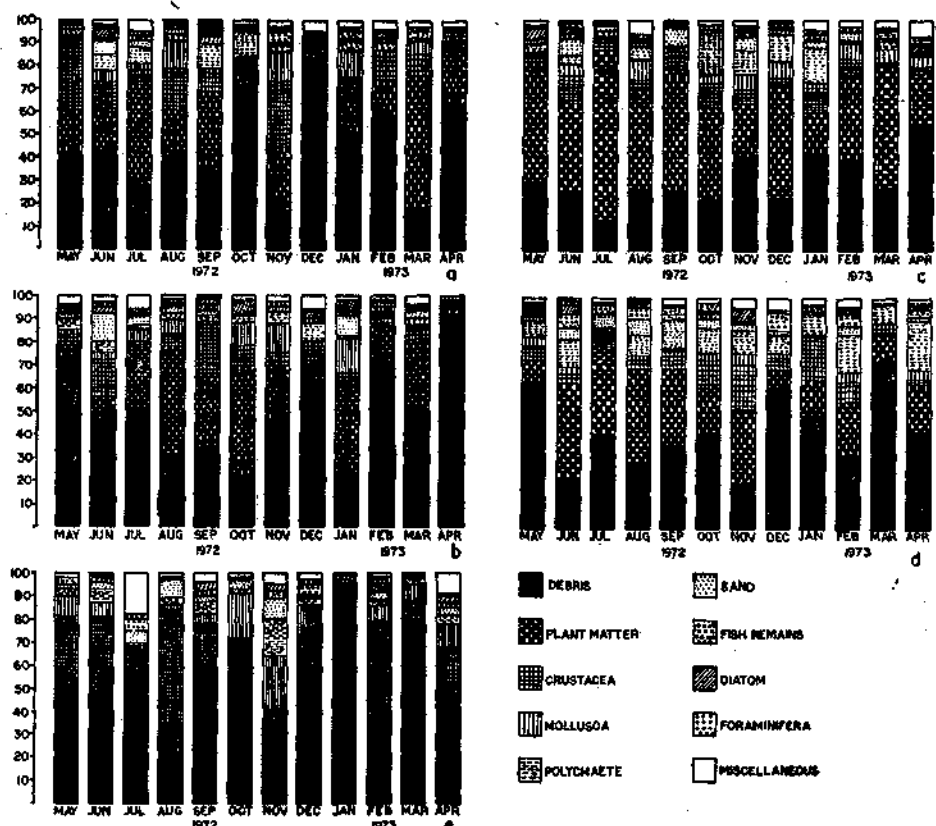


Fig. 1 a-e. Percentage composition of different food items in the common penaeid prawns collected from Cochin area during 1971-72. a. *Metapenaeus dobsoni*, b. *Penaeus indicus*; c. *Metapenaeus monoceros*; d. *Metapenaeus affinis*; and e. *Penaeus monodon*.

Algal fragments were observed in the stomach in plenty during August and October. Small quantities of diatoms such as *Fragilaria*, *Rhizosolenia* and *Coscinodiscus* were noticed during all the months, except in November. Vegetable

matter formed the dominant food item of this species, while crustaceans ranked next in importance. Heavy feeding on crustacean was observed during June and September. Juvenile gastropods and bivalves formed the major part of the diet during November and January. Some of the minor food items encountered were small nematodes and foraminiferans. During June and January sand grains were abundant. Polychaetes were dominant in December. Gopalakrishnan (1952) observed that vegetable matter and crustaceans formed the bulk of the food consumed by *P. indicus*. The present observation also shows the presence of large quantities of algal matter (Fig. 1b).

*Metapenaeus monoceres* Fabricius

This species constitutes to a rich fishery along the east and west coasts of India. Stomach contents of 210 specimens measuring 30-128 mm were examined; 20 specimens had empty stomachs.

The species showed a preference to vegetable matter, mainly seaweeds and algae during the greater part of the year. Diatoms were abundant during April, May and June. Comparatively lesser amount of debris was noticed in this species than in others (Fig. 1c). The common crustaceans met with were copepods, ostracods, amphipods and decapod larvae. During the post monsoon months large number of setae, tentacles and fragments of polychaetes were present. Small bivalves and gastropods, fish larvae, fish scales and muscles were also noticed. Sand particles were more during June and September. Tiews (1968) in his studies on the food and feeding habits of *M. monoceros* from Manila Bay and San Miguel Bay has observed that the main food was benthic foraminiferans, while the dominant item of food observed in the present study was vegetable matter. The difference in the diet may be due to the change in the habitat.

*Metapenaeus affinis* H. Milne-Edwards

This is also one of the important commercial species occurring along the west coast and the southern region of the east coast. Of the 120 specimens ranging in size 29-120 mm examined, 29 had empty stomachs.

The items of food found in the stomach in the order of abundance were vegetable matter mainly consisting of algae; polychaete remains, crustaceans, fish remains and molluscan remains. Amphipods and calanoid copepods were observed frequently during November and January. During April and July algal filaments were abundant. The polychaetes formed an important food item as they were present during almost all the months (Fig. 1d). Diatoms were noticed more in November. *Fragilaria* was the common diatom observed.

According to Subramanyam (1963) *M. affinis* is an omnivorous feeder and larger ones showed a preference to molluscan diet. Hall (1962) in his observation on the specimens caught from the Straits of Malacca has shown that the species feeds mainly on vegetable matter. But in the present study it is seen that the larger prawns showed a preference to polychaete diet whereas the younger ones preferred vegetable matter.

*Penaeus monodon* Fabricius

This is probably the largest marine prawn in India, but it does not form a dominant fishery anywhere. Out of the 56 specimens with a size range of 39-212 mm examined, 3 were with empty stomachs.

Debris composed of mud and organic matter constituted the main portion of the stomach content as in other forms while crustaceans ranked next in importance (Fig.1e). Rao (1967) examined the stomach contents of *P. monodon* from Chilka Lake and observed this species feeding mainly on molluscan remains. Hall (1962) classified *P. indicus* and *P. monodon* as species feeding mainly on large crustaceans. In the present study also, crustaceans were observed, the maximum being during August. Larval bivalves and shell fragments were abundant in October and November. Polychaetes were largely observed in November. Fish remains and diatoms were present frequently in the stomach. Sand constituted a significant portion of the stomach contents during August and November. Nematode fragments and other miscellaneous items were more during July and April.

#### GENERAL OBSERVATIONS

##### *Feeding habits*

From the analysis of the stomach contents it is evident that all the above five species may be considered as omnivorous and detritus feeders. Studies by Gopalakrishnan (1952), Williams (1956) and Eldred *et al.* (1961) have shown that animal remains, algal fragments, sand and detritus comprise recognizable components. Williams (1955) noted in the N. American shrimps that unrecognizable debris formed a major component and suggested that "soft material" may form the bulk of the diet. In general, penaeid prawns have been described as "omnivorous scavengers" or "detritus feeders". A purely herbivorous or carnivorous feeding habit is not seen in any of the species. The food in general consists of varying amounts of organic matter mixed with sand and mud. In almost all the prawns examined, a considerable portion of the stomach contents consisted of unidentifiable finely ground up matter. It was not possible to decide whether the "debris" had been ingested as such or ground up in the stomach. The average debris content was more in *P. indicus* and less in *M. monoceros*. There was greater amount of debris in young prawns and lesser amount in larger specimens, a fact noted in all the species. *M. monoceros* was found to feed more on vegetable matter than the other species.

Occurrence of benthic forms such as polychaetes, amphipods, bivalves, gastropods, foraminiferans, nematodes and also sand and mud indicates the pronounced bottom feeding habit of the prawns. However, the specimens collected from the areas connected to the paddy fields showed a large amount of plant matter showing that the species could adjust to various types of environmental conditions.

##### *Seasonal variations in the food*

Some amount of seasonal variations in the food have been observed in the different species examined. In the case of *P. indicus*, algal content was more in the stomach during the monsoon season, whereas the molluscan remains were more during the post monsoon months. During the premonsoon and the monsoon period, plant matter was more in *M. dobsoni* while the vegetable contents were low during the post monsoon period. In *M. affinis* and *M. monoceros* there was more vegetable content during the monsoon season. Crustaceans were common in the stomachs of *M. dobsoni* during the monsoon months, but in *M. affinis* and *P. indicus* they were prominent during the postmonsoon season. In *P. monodon* crustacean fragments were more during the premonsoon and monsoon periods. The above observations show that some sort of selection for food exists as there are variations in the stomach contents of the different species collected from the same habitat.

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