

PRELIMINARY NOTES ON THE DECAPOD LARVAE OF THE ARABIAN SEA

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The note presents some general facts regarding the distribution of some of the larger groups of decapod larvae in the Arabian Sea. Their relative numbers and the families and subfamilies, so far as can be recognized, represented within each group are also indicated. Suitable charts to illustrate distribution are provided. The data collected on the distribution of larvae of the family Penaeidae are presented separately in this note. Their general distribution in the Arabian Sea and the stations at which fairly good numbers were captured are described and illustrated with suitable charts. The possible effect of the time of haul and the season on the number of larvae caught is explained. The probable parentage of the more commonly encountered types of larvae is indicated.

1. A GENERAL SURVEY OF ALL MAJOR GROUPS EXCEPTING SERGESTIDS AND PHYLLOSOMA

The following notes are based on a preliminary examination of the decapod larvae obtained from the plankton samples collected during the course of the International Indian Ocean Expedition, from the Arabian Sea. The material is not complete since during the initial sorting of the entire sample the Sergestids and Phyllosoma larvae were removed. The rest of the collection from each station is being subsorted into a number of smaller groups, families or sub-families in order to facilitate their detailed study later by specialists. As the subsorting progressed some amount of data relating to their distribution, composition, numbers etc. accumulated and they have been made use of in the preparation of these notes. In the circumstances the notes could not be anything other than purely preliminary in character and may require to be modified in part or supplemented in the light of the results of further study.

Though decapod larvae form an important constituent of the plankton they seldom occur in these collections in large numbers. Possibly the method of collection of plankton (vertical hauls) may be partly responsible for it. Another peculiarity of the present collection is the absence of the early larval stages e.g. nauplii and early protozoae of Penacids. This is true of most of the other groups also excepting a few Carideans belonging to 2-3 families such as Pasiphaeidae and Pandalidae and some crabs. Swarms of larvae of various species in different stages of development have been noticed in the sea by previous expeditions (Gurney 1924) and the presence of only 1 or 2 stages of a species in most of the present collections is, in all likelihood, the result of the method adopted. Complete series of larvae may not thus be available in regard to most of the species. Nevertheless it may be possible

to establish the probable parentage of several with the help of published descriptions of similar larvae and post larvae. The value of the collection, assessed from the point of view of their biology suffers therefore to some extent.

Material collected by earlier expeditions has served to establish a relationship between the numbers of larvae and the proximity to land of the stations at which they have been collected (Ortmann 1893). This implies that larvae of littoral species usually remain in the neighbourhood without moving out into the open sea. The positions of some of the stations in the Arabian Sea occupied during the course of I.I.O.E. that have yielded fairly good numbers of larvae are shown in Fig. 1. At stations 2005 (Varuna), 2004 (Varuna), 194 (A. Bruun cruise No. 4) and 47 (Argo, Dodo cruise), the numbers of larvae caught are remarkably large, varying between 1460 to 680. It would seem that the relationship generally holds good in regard to the present collections also. Gurney (1924) has stated that the 'Terra Nova' collections, "so far as they permit conclusions to be drawn, fully confirm Ortmann's result." It is true not only in regard to the total number of larvae collected but also to the variety i.e. the number of species represented. Occasionally as many as a dozen species have been secured at some stations around the Minicoy and Maldive Islands (Station 102, cruise No. 4 and Station 104 on the same cruise of I.N.S. Kistna). It should be added however that these collections, though rich in variety, are not always equally rich in numbers.

Larvae belonging to all the main groups of decapods are present in the collection excepting those mentioned earlier; but their numbers vary widely. It may be stated in general that caridean and crab larvae occur in much larger numbers than any other group at quite a number of stations. Figures 1—4 furnish information on the distribution of the larvae of the Penaeidae and two other major groups namely the Anomura and the Brachyura. The Caridea has been left out of consideration here because the subsorting into families or subfamilies is somewhat unsatisfactory owing to the difficulty experienced in recognizing some of the families, especially their early stages, during the course of subsorting when it was not possible to dissect out and study appendages.

The Penaeids will be dealt with in a separate note since a start may be said to have been made towards a more detailed study of the family and some additional data collected. This was done in view of the economic value of the adults of a number of species and in the hope that the study might yield useful information regarding the life histories of some that still remain imperfectly known. A few Stenopid larvae and Amphion have been secured but their numbers are inadequate for studying their distribution.

In regard to the distribution of the Anomuran larvae (Fig. 4) a general resemblance to that of Penaeids is quite evident. They however seem to occur in comparatively larger numbers in the Gulf of Cambay and neighbourhood than the Penaeids. Among them those of the family Axiidae belonging to the Thalassinidea and the Galatheids have been obtained at more stations than some of the other families. Callianassidae (Thalassinidea), Paguridae and Albuneidae have also been obtained from several stations; but Porcellanidae and other families have been taken only rarely. Except Pagurids the number of larvae belonging to any Anomuran group has not been large at any station.

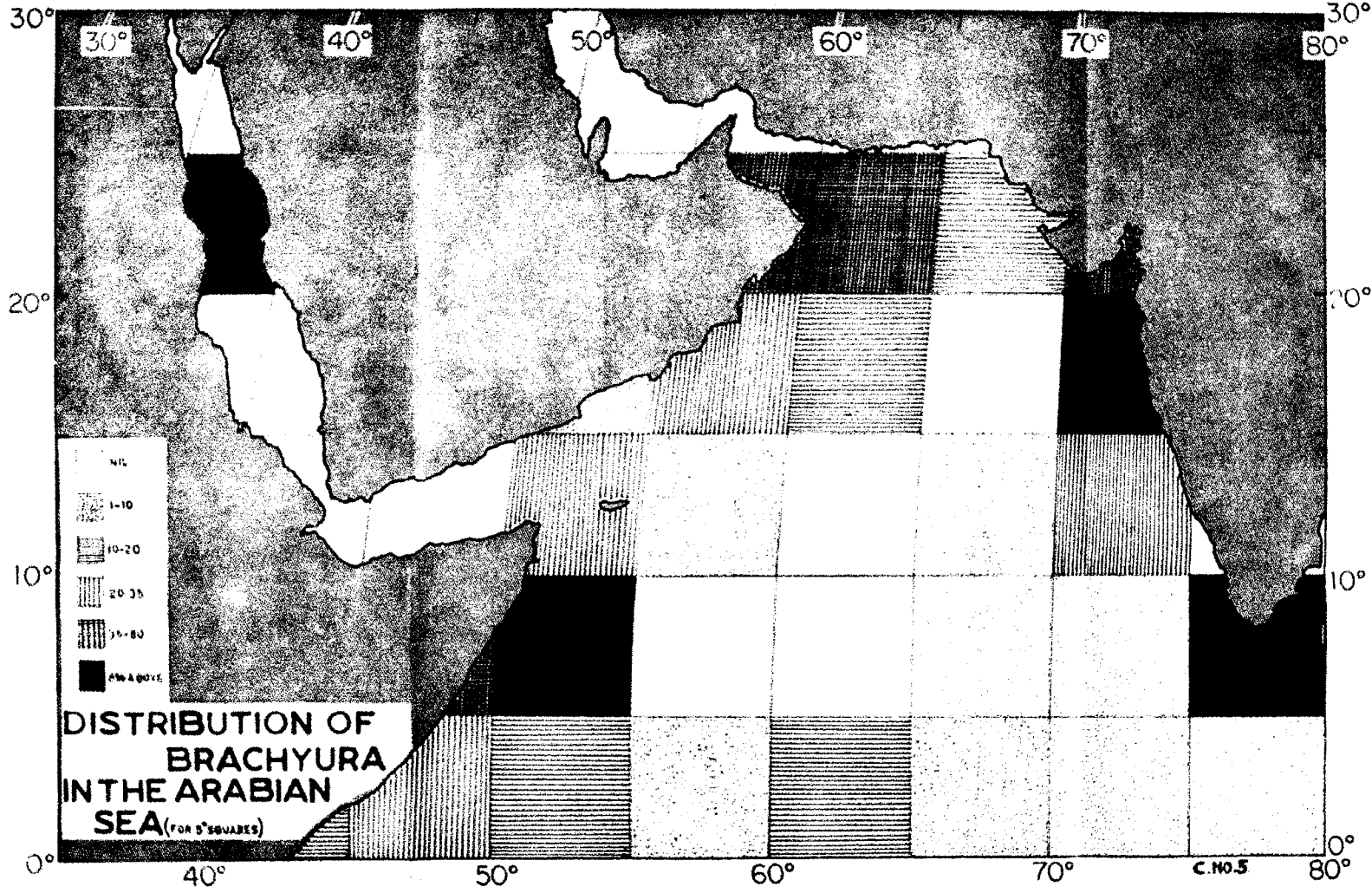


FIG. 1. DISTRIBUTION OF BRACHYURA IN THE ARABIAN SEA (FOR 5° SQUARES).

In contrast to the Anomura, Crab zoeae and megalopae (Fig. 5) are noticed in much larger numbers, the greatest numbers occurring in the regions surrounding the southern tip of the Indian Peninsula (a common feature in the distribution of all the 3 groups dealt with here), off the Maharashtra Coast and the northern part of the Somali Coast of Africa. Further away from the two latter regions in the same latitudes there are considerable areas which are apparently barren and from which hardly any larvae have been caught. Larvae provisionally ascribed to the primitive Brachyuran group. Dromiacea have been frequently noticed, but only in small numbers. They seem to belong to more than one genus. Nothing can be ventured here in regard to the comparative numbers and stations of capture of any of the other groups of crabs without further detailed study of the material.

2. PENAIDAE

The data collected during the subsorting of the plankton samples, and supplemented by what could be obtained in the course of a subsequent rapid re-examination of some of the Penaeid larvae from a few stations are presented in this brief note. The reason for selecting the Penaeids first for further study have been explained in the previous note. The pattern of distribution of Penaeid larvae conforms in a general way with that of the entire order (minus Sergestids and Phyllosoma) and is illustrated in Fig. 2. The maximum average number from a 5°-square area (Marsden square) has been obtained around the southern extremity of the Indian peninsula (1) and off the Somali Coast of Africa (2). Immediately outside these regions the average catch is much less, below 50%. Minimum numbers have usually been recorded from areas situated far away from land. An exception however is the area adjoining the Gulf of Kutch. This is rather strange in view of the fact that the prawn fishery of the area has been reported to be fairly good. It may be that the breeding period of Penaeids here does not happen to coincide with the time of collection (the first half of November). South of it, there is a barren stretch of sea from which apparently no larvae have been caught. A similar area lies midway between the two zones of maximum occurrence (Lat. 5°-10° N, Long. 60°-65° E).

When the actual numbers secured from individual stations are taken into consideration it becomes apparent that the averages calculated are far below them in respect of several stations. Fig. 3 shows the positions of most of such stations. At three of them the number obtained is one over hundred. Two of the three stations are included in region No.1. The third, however lies far to the north of region No. 2, off the Coast of Arabia and at a comparatively greater distance from land. A number of other stations at which fairly good numbers of larvae are recorded, as shown in Fig. 3, located in the western part of the Arabian Sea are not also close to the coast. They could be larvae of littoral species that have drifted away from the coast. Or they may be larvae of deep water species; but the point could be settled only after further study of the material.

An attempt was made to discover if there is any relation between the numbers caught and the time of haul. Hauls which yielded 20 or more larvae were alone taken into consideration in this connection. Of the three hauls that brought up

over a hundred larvae in each (referred to in the previous para) two were made during the day and one at night. The data seem to indicate that night hauls in general do not have any marked effect on the number captured. It may be of interest to note here that previous workers on the group such as Dakin (1938) and Racek (1959) have recorded that late stages of *P. plebejus* and other species were obtained in sufficient numbers only in night hauls. Racek assumes that larvae rose to the surface at night and went down during the day. Heldt has reported that larvae of *Gennadas* and *Solenocera* are unaffected by variations of light intensity. Hall (1962) is not inclined to accept this observation as fully valid since he considers evidence on which it is based as insufficient.

The dates on which these hauls were made were also noted. All of them happened to be made during what may be called the monsoon period i.e. May-June to October-November. Collections made during the remaining months were generally much smaller. Equally small collections have been recorded, it is true, on a number of occasions during the monsoon period also. Nevertheless it is justifiable to infer that Penaeid larvae occur in good number in the plankton of the Arabian Sea in the monsoon months and that adult prawns breed in these months (vide Panikkar and Menon 1955).

Without detailed study of the material it is impossible to make any remarks on its composition i.e. on the genera and species represented. One of the more frequently encountered types of larvae at a majority of stations is that of *Gennadas*. Most of those seen are in the mysis stage of development; but a few late Protozoae taken at some stations also seem to belong to this genus. More than one species seem to be represented, since they exhibit several small differences in their size, character of rostrum, spines on the abdominal somites etc. A few juveniles and adults have also been obtained from some collections; but no attempt was made to identify them beyond determining definitely the genus they belong to. The adult prawns are stated to be mostly pelagic in habits and this may account for the occurrence of the larvae at so many stations (Barnard 1950; Ramadan 1938).

Larvae of the subfamily Solenocerinae are also quite common. The Protozoae stages have seldom been noticed, only the mysis stages occurring in practically all samples. In regard to the armature of the abdominal segments and carapace they exhibit a number of differences from the typical *Solenocera* larva (Heegaard 1966) and it is likely that they belong to different species of the genus. Some of them in all probability may even belong to some other closely related genus. The exact parentage will be indicated when systematic study of the group is taken up later.

It is not possible to state anything definite in regard to the parentage of other Penaeid larvae observed. Most of them are in the mysis stage of development and one or two early post-larvae have also been noticed in a very small number of collections. Though resemblances between these larvae and the figures of various species of the subfamily Penaeinae furnished by previous authors have been noticed they could not with any degree of certainty be ascribed to any of these species without further study of appendages, gills and other parts. No useful purpose would be served by indicating such superficial resemblances here. It can only be stated

that various species of Penaeinae seem also to be represented frequently in the collections.

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