

PHYLLOSOMAS OF SCYLLARID LOBSTERS FROM THE ARABIAN SEA*

By R. RAGHU PRASAD AND P. R. S. TAMPI

Central Marine Fisheries Research Station, Mandapam Camp

INTRODUCTION

IN an earlier paper (1957) the authors described a few phyllosomas of scyllarids collected from the Gulf of Mannar near Mandapam and so far this seems to be the only account of the larvae of these lobsters from Indian waters. The difficulty in establishing the specific identity of the various types of phyllosomas has been experienced by all workers. Only in a few instances, such as *Scyllarus arctus* (ref. Stephensen, 1928 and other earlier workers referred to by him), the monospecific *Thenus orientalis* (ref. Prasad and Tampi, 1957), and *Ibacus ciliatus* (ref. Harda, 1958) has it been possible to obtain the larvae hatched from the eggs and thus establish identity beyond doubt while at present identification of many other scyllarid larvae will necessarily have to be based on circumstantial evidence. The problem is particularly difficult in the case of Indian scyllarids. Meanwhile it has been possible to obtain some scyllarid phyllosomas and nisto stages from the region around the Laccadive islands (Fig. 1) during the cruises of the research vessel KALAVA in 1958 and 1959. A brief account of these phyllosomas is given in the present paper while the natant stages will be described at a later date along with similar material collected along our coast.

The authors are grateful to Dr. S. Jones, Chief Research Officer, for looking through the manuscript and for lending reprints of some of the papers from his personal library. Thanks are due to Shri C. T. Rajan for sorting out the larvae.

DESCRIPTION OF PHYLLOSOMAS

All phyllosomas described below have more or less the same basic characteristics assigned to the scyllarid phyllosomas by Gurney (1936), *viz.*, a fore-body that is wider than long and a much narrower hind body, an abdomen which is broad at its base in late stages, second antenna that is usually much shorter than the first in the beginning and later becoming a broad, flat and bilobed structure, first maxilla without palp, third maxillipede without setose exopod and pereopods with only short dactyls.

Scyllarus sp., I

Eight larvae of different sizes of what we consider as five distinct stages of the same species were present in the collections as per details given in the table below.

* Published with the permission of the Chief Research Officer, Central Marine Fisheries Research Station.

Table on collections of *Scyllarus* sp., I.

Date	Station	Length (mm)	Approx. Stage	Figure No.
29.4.59	448	1.60	II	2
29.4.59	448	3.40	V	3
29.4.59	Near Agatti	4.40)		4
29.4.59	448	4.65	VI or VII	
29.4.59	Near Agatti	4.76 f		
29.4.59	Near Agatti	4.98)		
29.4.59	Near Agatti	8.00	VII or VIII	5
29.4.59	Near Agatti	11.50	X	6

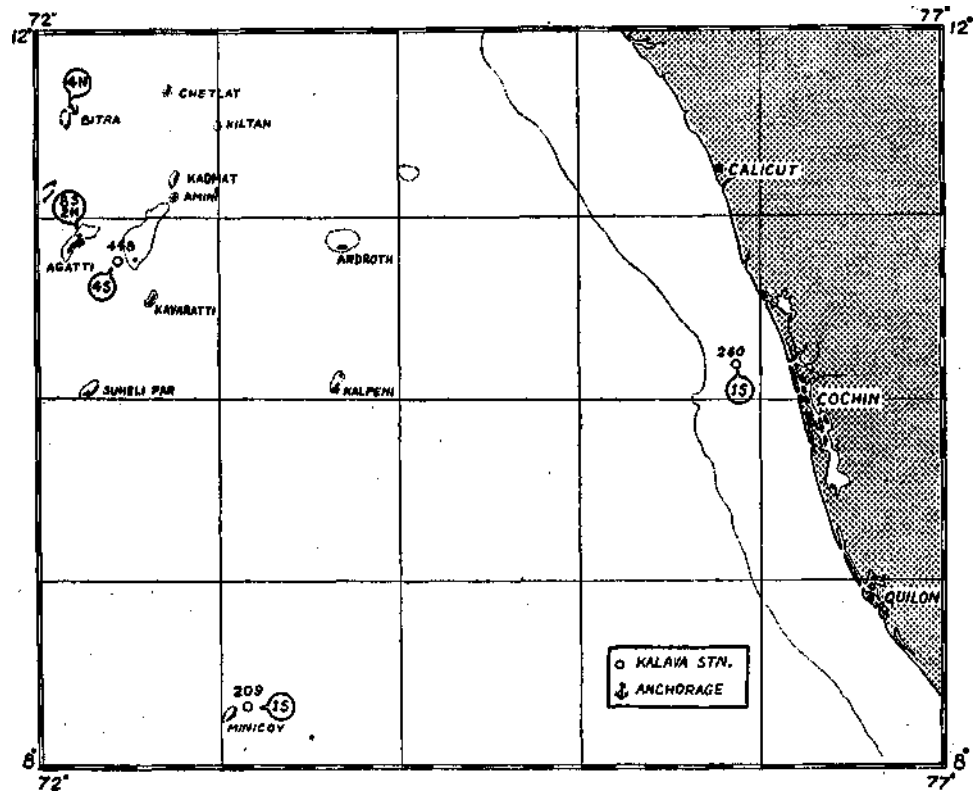


FIG. 1. Map showing the stations from where scyllarid phyllosomas and nistos were obtained. The numbers in circles indicate the number of larvae (S, for phyllosomas and N, for nistos) collected at each station.

Fig. Z^{A-D}.

the larva has a fore-body as broad as long with a slightly tapering posterior border. The hind-body is much narrower than the fore-body. The eye possesses a stalk, the first antenna is twice as long as the scind and in place of the inner flagellum is a single seta. The second antenna consists of a single segment. Second

maxilla possesses a small apical segment with 4 plumose setae on an elongated basal segment. The first maxillipede is hardly recognisable while the second and third are uniramous appendages, the latter being slender and as long as the pereopods. Both the first and second pereopods are fully developed with setose exopods, whereas in the third the exopod is only a small non-setose segment. The fourth pereopod, present as an unsegmented rudiment, is as long as the abdomen. The third maxillipede as well as the three pereopods each has a coxal spine. Another spine is present on the basipod at the point of articulation of the exopod. Dactyls in these walking legs are short. Abdomen is short, ending in a pair of strong spines (broken in the specimen and indicated by dotted lines in the figure).

The articulated nature of the eyes, the non-setose but relatively long exopod segment in third pereopod and the presence of the rudimentary fourth pereopod suggest that this larva belongs to Stage *II* in a developmental series.

Fig. 3, A-D

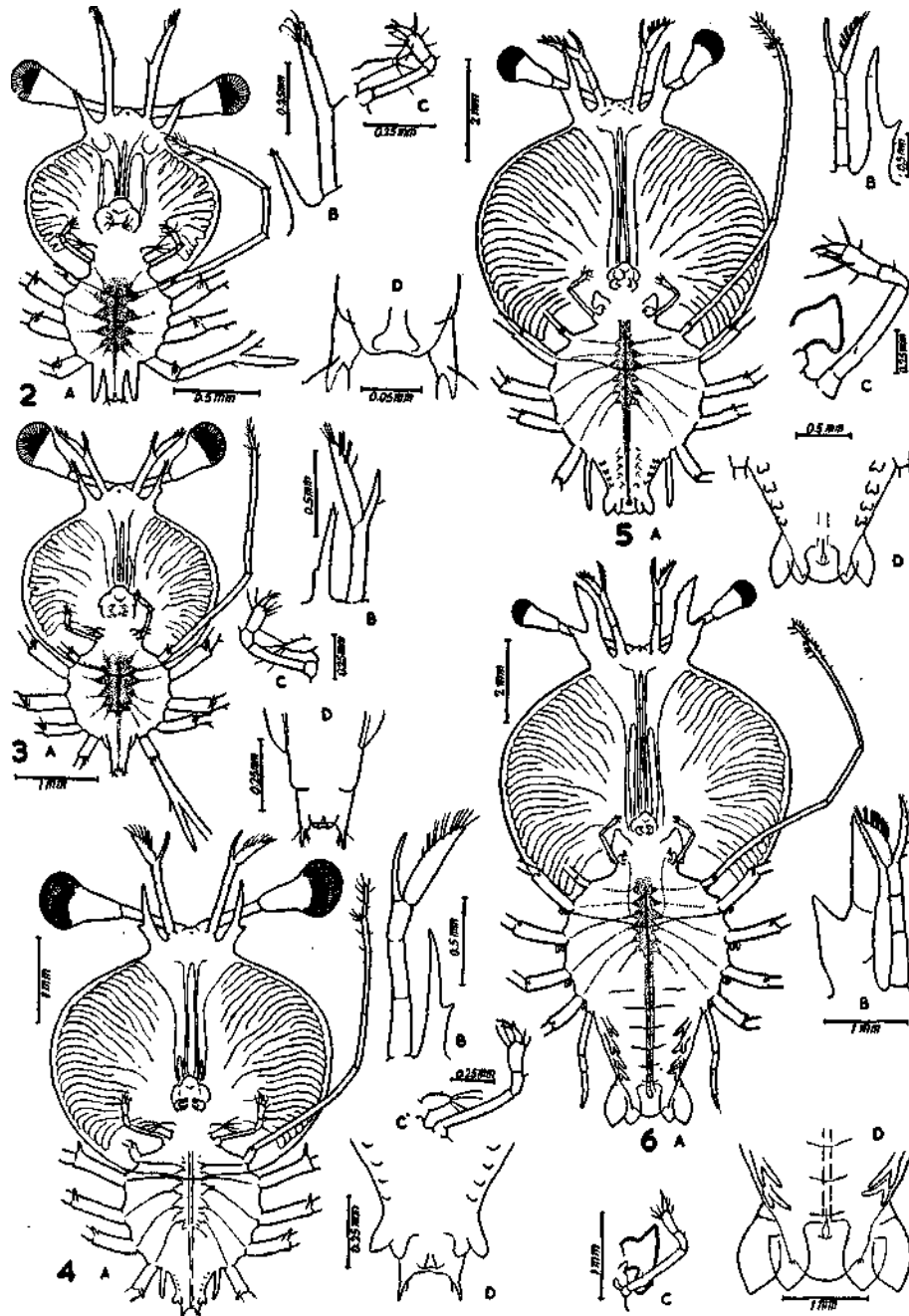
The width of the fore-body is nearly the same as its length and the broadest region is almost in the middle. The first antenna shows an inner flagellum. The second antenna is more than half the length of the former with a rudimentary outer process. Maxilla, maxillipede and the first two pereopods are the same as in the earlier larva, while the exopod of the third pereopod is fully formed. The fourth pereopod is also well developed except for the non-setose single segmented exopod. Fifth pereopod is seen as a rudiment. Changes in the abdomen are not appreciable from the previous larva except that the prominence of the uropods is evident. The structure of the appendages indicates a considerable advance in development in this larva leaving a wide gap between this and the larva described earlier so that it seems justifiable to consider this as belonging to Stage *V*.

Fig. 4, A-D

There are four larvae ranging in length from 4.40 to 4.98 mm. in the same collection, all of which appear to be in the same stage of development (regarded as Stage *VI* or *VII*) and the one of 4.40 mm. is figured here. The three segments of the antennular peduncle are indicated and the outer process of the second antenna is more pronounced. The second maxilla and second maxillipede remain without much change but the marginal setae of the second maxilla are wanting in the 4.98 mm. specimen. The fourth pereopod is fully formed with a setose exopod while the fifth is composed of only one segment, nearly three-quarter the length of the abdomen. The most significant character of the larvae is their abdomen which is broad at the base with terminal spines and rudiments of uropods and pleopods.

Fig. 5, A-D

The resemblance with the earlier stage in the shape of the shield, abdomen and appendages is evident. The second antenna is shorter than the first. The second maxilla has flattened and is devoid of marginal setae. The rudimentary first maxillipede is more prominent than in all earlier larvae and the indication of an exopod of the second maxillipede is seen. The fifth pereopod is nearly as long as the abdomen but the coxal segment alone is demarcated. Excepting on this leg coxal spines are present in others and on the third maxillipede, but these are less conspicuous than in the larvae described earlier. Pleopods are in the form of low biramous buds. The uropods are leaf-like and the telson shows, a pair of small marginal spines. The characters of these larvae indicate a stage following the earlier one, shown in Fig: 4.



FIGS. 2-6. Different stages of *Scyllarus* sp., I: 2, Stage II; 3, Stage III; 4, Stage VI (VIII); 5, Stage VII (VIII?); 6, Stage X. A. phyllosoma larva; B. First and second antennae; C. Second maxilla and second maxillipede; D. Abdomen. This lettering holds good for figures 2-11.

Fig. 6, A-D

A slight change in the shape of the shield from that of the previous larva is noticed and this phyllosoma seems to be fairly well advanced in development. The second antenna is as long as the first, flat and distinctly bilobed, the inner process shows segmentation and bears a few marginal setae. Second maxilla is flat and without marginal setae. First maxillipede is bilobed, and a rudimentary bud of the exopod is seen on both the second and third maxillipedes. Gills are present on the coxal segments of the third maxillipede and the first four pereopods while the fifth one does not possess gills. This pereopod is as long as the abdomen and divided into 3 segments besides the coxa which bears a small spine. The abdomen itself is about 2.5 mm. long and shows considerable change from that of the larva described earlier. Segmentation is clear, the pleopods are long and biramous and the uropods are also well developed. The telson retains the pair of marginal spines.

The authors are inclined to place this larva in Stage X, and judging from the development of the second antenna, maxillipedes and pleopods, this might as well represent the last stage in the series of phyllosomas before metamorphosing into the natant stage.

It might be mentioned here that this larva corresponds in its developmental stage to the one described by us earlier as phyllosoma VII (1957, Fig. 12, page 65). However, there are differences in the shape of the fore- and hind-body in the two larvae, the relative length of the antennae and the presence of the exopod rudiment on third maxillipede indicating that these two larvae belong to two distinct species.

Scyllarus sp., II

Two larvae, 2.8 mm. (Fig. 7 A) and 6.75 mm. (Fig. 8A) in length, were obtained on 29-4-1959 at station 448 and from an anchor station near Agatti respectively.

Fig. 1, A-D

The fore-body is wider than long, and twice as broad as the hind-body. The inner flagellum of the first antenna has developed; the second antenna is slightly longer than the antennular peduncle and shows the rudiment of the outer branch. Second maxilla is composed of two segments, the small terminal one bears four plumose setae. First maxillipede resembles those of other scyllarid larvae and has no exopod at this stage. The same description applies to the third maxillipede also. Four pereopods are well developed although the fourth one shows only a rudimentary exopod. All the pereopods and the third maxillipede possess coxal spines; besides, the pereopods have another spine on the basipod adjacent to the exopod. The dactyls are short and almost claw-like. The fifth pereopod is present as a bud closely apposed to the abdomen. The abdomen is broad at the base and terminates in a pair of spines. Indications of the uropods are also seen.

Fig. 8, A-D

The broadest portion of the shield is near its anterior region. The fore-body is wider than long and is twice as broad as the hind-body. The antennular peduncle is distinctly three segmented and the inner flagellum is prominent. The second antenna is bilobed, the outer process being nearly as large as the inner and the whole antenna itself is longer than the antennular peduncle. Second maxilla is flat and destitute of marginal setae; first maxillipede is rudimentary; the second maxillipede shows indication of a developing exopod. The four pereopods have the setose

exopod, spine on the coxa and the basipod and also rudiments of gills which are visible only from the dorsal side. The three segmented fifth pereopod, which is as long as the abdomen, also shows a minute coxal spine. The base of the abdomen is relatively broad. Four pairs of deeply cleft pleopods, well developed uropods and a telson with a pair of strong spines are present.

Both these phyllosomas, which evidently belong to the same species, differ from those described as Species I or others described by us in our earlier publication (1957) in the size, shape of the shield and other characters. Compared to the developmental stages of these larvae with other known forms, the phyllosoma shown in Fig. 7 seems to represent Stage III or IV while the one in Fig. 8 might belong to Stage VII.

Scyllarus sp., III

A single phyllosoma (Fig. 9, A-D) obtained in the collections outside Minicoy Reef on 20/21-2-1958 and measuring 19.0 mm. is the largest scyllarid larva so far obtained by us. The shield is as broad as long and the width of the hind-body is nearly two-thirds that of the fore-body. The first antenna shows a three segmented peduncle and a well developed inner flagellum. Second antenna is flat, bilobed and two segmented and only slightly shorter than the first antenna. The leaf-like second maxilla has a few short hairs on the inner margin. The first maxillipede is a bilobed bud. Both the second and third maxillipedes have a rudimentary exopod. Gills and coxal spines are present on the third maxillipede as well as on all the pereopods although the fifth leg is only uniramous and as long as the abdomen. The spine on the basipod is prominent on the first 4 legs. Deeply cleft pleopods, well developed uropods and a telson with two spines are present.

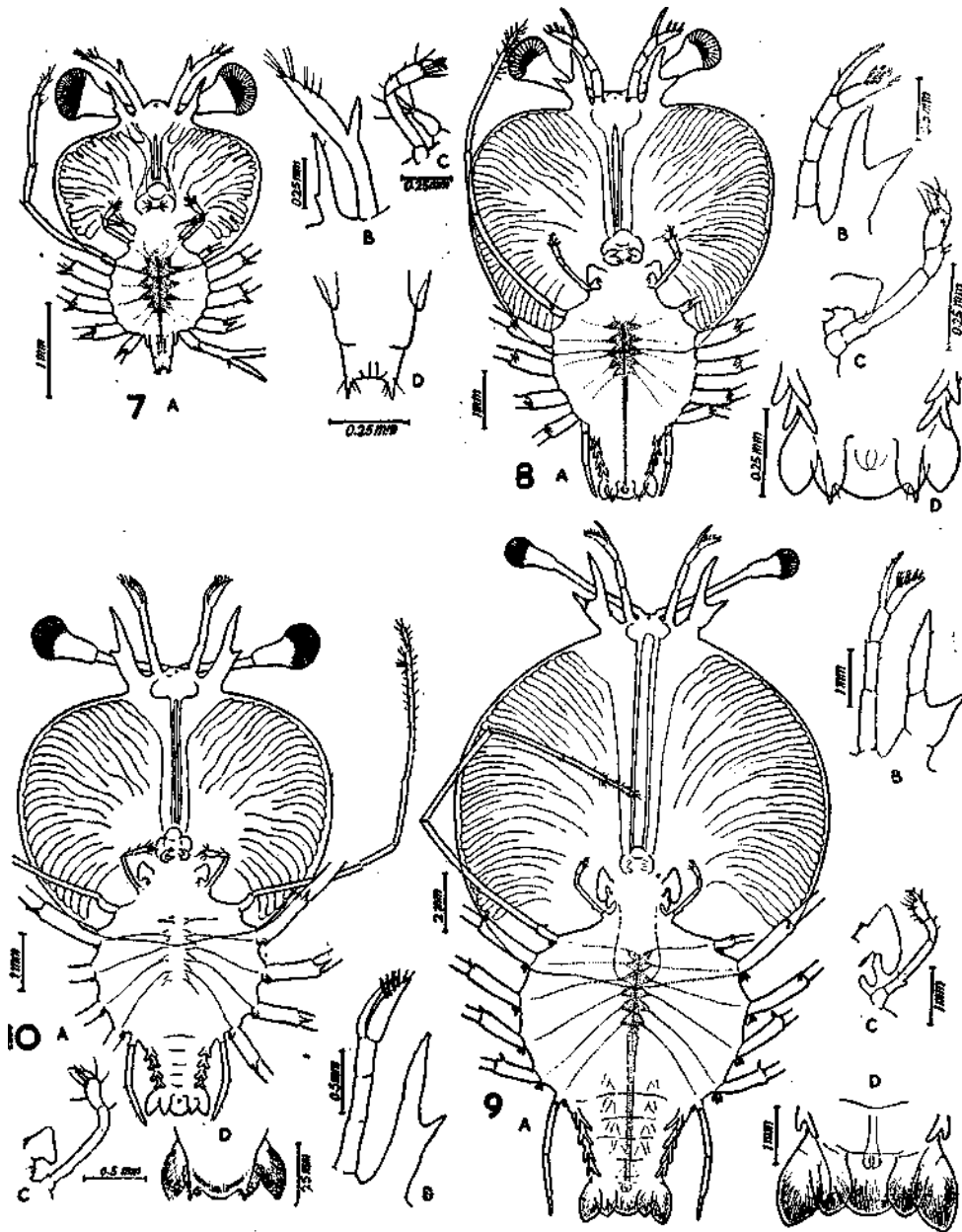
This represents an advanced larva, probably belonging to the last stage (Stage X) considering the development of the maxillipedes, gills and the abdominal appendages.

Scyllarus sp., IV

Two larvae (7.5 mm. and 7.8 mm. long) were obtained in the midnight collections (00. 30 hours) near Agatti on 29-4-1959 and the larger one is figured here (Fig. 10, A-D). The shield is broader than long and the width of the hind-body is slightly more than half that of the fore-body. Both the first and second antennae are well developed and both are nearly of the same length. The inner process of the second antenna shows three minute marginal teeth. Second maxilla consists of a single flat segment. First maxillipede is rudimentary, neither the second or third maxillipede possesses an exopod although it may be seen as a slight protuberance on the second maxillipede. The 4 fully formed pereopods have moderately long coxal spines and prominent spines on the basipods at the articulation of the exopod. Fifth pereopod is 3-4 segmented and is a little longer than the abdomen. Rudiments of gills are present on the four pereopods which may be seen better from the dorsal side. Abdomen is broad at the base. Pleopods are cleft buds while the uropods are well developed. The telson of this larva also shows the two spines.

In the proportion of the fore- and hind-body and the stage of development of the appendages compared to the size of the larva, this phyllosoma differs from

all those described earlier in this account. Probably there might occur two more stages before passing on to the natant stage, that these can be provisionally placed in Stage VIII.



FIGS 7 & 8. Show Stages/// (IVf) and VII respectively of *Scyllarus* sp., II. 9. *Scyllarus* sp., III. (Stage k)- 10. *Scyllarus* sp., IV. (Stage VIII).

Scyllarides sp.

A single larva 9.5 mm. long (Fig. 11, A-D) was present in the collections from Station 260 on 15-4-1958, which is different from the phyllosoma of *Scyllarus* spp. The most striking feature of this larva is the somewhat trapezoid shape of the shield with the broadest portion near the anterior region. The hind-body is only half as broad as the fore-body and, compared to the other scyllarid larvae mentioned in this account, the abdomen is much longer being as long as the hind-body. The first and second antennae are well developed, the inner process of the latter is as long as the first antenna while its outer lobe is flattened and bears two marginal teeth.

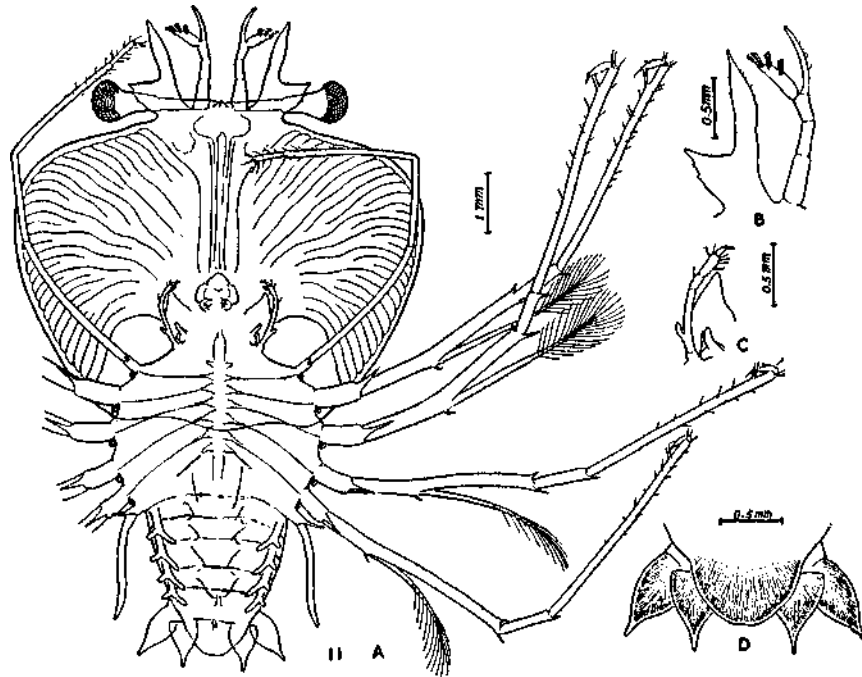


Fig. 11. *Scyllarides* sp.

Second maxilla is greatly enlarged and leaf-like. The first maxillipede is bilobed and is prominent, the second maxillipede has a rudimentary exopod while the exopod is absent in the third maxillipede. Four pereopods are well developed, each having a long coxal spine, longer than those in the larvae of *Scyllarus* spp., and a spine on the basipod near the articulation of the exopod. The dactyles are also short. The fifth leg which is uniramous and shorter than the abdomen, has four segments and possesses a prominent coxal spine. But gills are present only in the first four legs besides the third maxillipede. Pleopods are biramous buds. Uropods are leaf-like with an acutely drawn out tip while the telson has a rounded entire margin devoid of spines which seem to be other characteristic feature of this particular larva.

The resemblance of this phyllosoma with the larva described by Gurney (1936, Fig. 37, page 432) as of *Scyllarides* is note-worthy although the stage of development and the sizes do not quite tally. The similarity in the general form of the

two larvae, their antennae, legs with long coxal spines and the abdominal appendages are particularly striking although there is some difference in the shape of the uropods and the absence of exopod rudiment in the third maxillipede of the present form. Stephensen's (1923) description of what he believed to be the larva of *Scyllarides latus* show a pair of long apical spines on the telson in a stage corresponding to Stage IV of *Scyllarus arctus*. Since the present larva is relatively more advanced it is possible that the apical spines are lost in these later stages and the authors consider the present larva as belonging to a species of *Scyllarides*. Only two species of *Scyllarides*, viz., *S. elisabethae* and *S. squamosus* have been mentioned in Barnard's recent account (1950) of the South African lobsters, of which the latter is considered as the Mauritius species. Besides these there is very little information on the distribution of the genus in Indian waters.

SUMMARY

The paper describes the phyllosomas of four species of *Scyllarus* and one of *Scyllarides*, collected from west coast of India.

REFERENCES

- BARNARD, K. H. 1950. Descriptive catalogue of South African Decapod Crustacea (Crabs and Shrimps) *Ann. S. African Mus.*, 38 :1-837.
- GURNEY, R. 1936. Larvae of Decapod Crustacea. Pt. III—Phyllosoma. 'Discovery' *Rep.*, 12:400-440.
- HARADA, E. 1958. Notes on the naupliosoma and newly hatched phyllosoma of *Ibacus ciliatus* (von. Sie bold). *Publ. Seta Mar. Biol. Lab.*, 7 :173-180.
- PRASAD, R. R. AND P. R. S. TAMPI. 1957. On the Phyllosoma of Mandapam. *Proc. nat. Inst. Sci., India*, B 23 : 48-67.
- STEPHENSEN, K. 1923. Decapoda-Macrura excluding Sergestidae. *Rep. Danish Oceanogr. Exped.* 1908-10, 2, Biology, D 3 : 1-85.