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PARASITIC COPEPODS FROM FISHES OF BAY OF BENGAL, VISAKHAPATNAM, ANDHRA PRADESH, INDIA

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ABSTRACT

Systematic studies on copepods parasitizing the marine fishes of Visakhapatnam coasts were undertaken. One hundred and six species of fishes belonging to seventy-eight genera of fifty-five families have been examined. The present study was concentrated mostly on food fishes. The following scombroid fish were parasitised with copepods during the years- 2023 & 2024 -*Euthynnus affinis, Scomberomorus guttatus, Scomberomorus commerson, Rastrelliger kanagurta, Thunnus thunnus.* Some other fish like-*Priacanthus hamrer, Johnius aneus, johnius carutta, Mugil cephalus, Caranx sausum, Saurida tumbil and Muraenesox talabonoides* were also examined. But these varieties were not parasitised with copepods at the time of examination. A list of hosts parasites and brief description of these parasites has given in this paper.

KEYWORDS: Visakhapatnam, Copepods, Marine fishes, Scombroid fish.

INTRODUCTION

The parasitic copepods are found as ecto and endoparasites of vertebrates and invertebrates. The ectoparasitic species lie attached to the surfaces of fishes and amphibians. On fish hosts copepods attach to the body surface, fins, gills and to the branchial cavity and occasionally on eye balls. Most of the parasitic copepods of fishes belong to the sub-orders Cyclopoida, Caligoida, Lernaeopodoida.

Studies on the parasitic copepods may be said to have started in the 18th century when Linnaeus (1746) reported the records of *Lernaea* and this was followed by the record of *Caligus* by Muller (1785). However, it was in the 19th century that great strides have been made by many European authors. Studies on copepod parasites began to receive increased attention of workers in various parts of the world and there has accumulated a voluminous literature scattered in many journals of different languages.

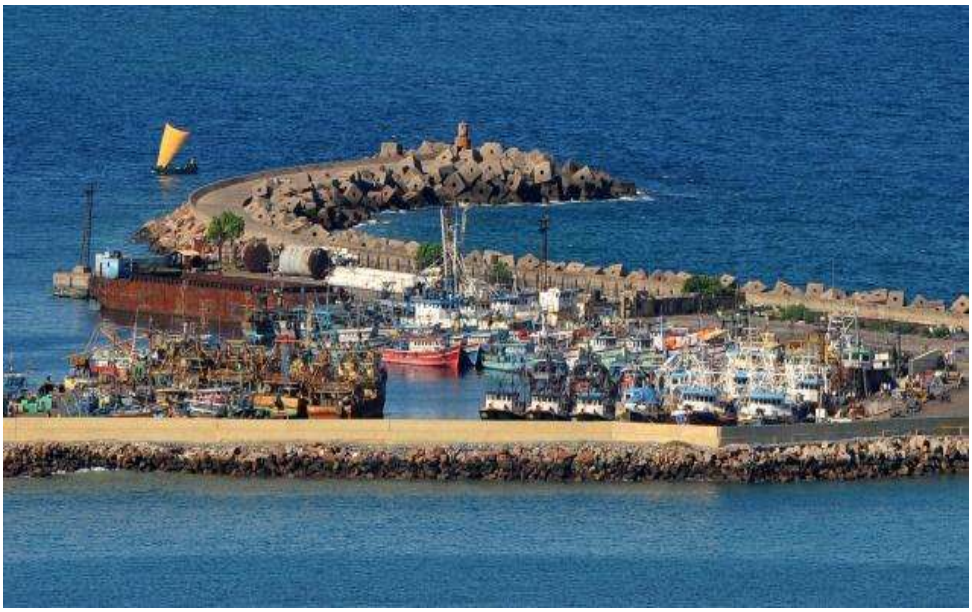
Copepod parasites mostly reported after 1980 are; Caligus sp., Lepeopthrius pectoralis, Lernaeocera branchialis (Copepoda), Caligus minimus, Lernanthropus kroyeri (Copepoda), (Cengizler et al., 2001). Saraiva A,*et al*., (2015), Rania AA *et al*.,(2015), Toksen E.,*et al*.,(2015), WoRMS Editorial, (2015), WoRMS.,(2019), WoRMS., (2020).

MATERIALS AND METHODS

Copepod parasites are commonly found on both Elasmo-branch and teleost fishes. In the present study fishes were obtained from offshore fishing station and local fish market of Visakhapatnam. (See Map). Most of the fishes were obtained from exploratory fishing trawlers “Meena Shodak” and “Meena Jawahar” operated off Visakhapatnam, Bay of Bengal, at a depth of 25 to 72 metres. It was not possible to get living fishes to examine the parasites. Most parasites were alive even three or four hours after the death of the host. Copepod parasites inhabit various regions in the body of the fishes. So, it was necessary to examine the fishes as far as possible soon after they were caught.

INDIA MAP SHOWING STUDY AREA - VISAKHAPATNAM COAST

VISAKHPATNAM - OFF SHORE FISHING STATION



Large parasites like Caligids could be easily located but smaller forms require careful search. They could not be easily distinguished from gill filaments. To avoid this the gills were cut and the filaments were carefully teased with a needle in a petridish. Small quantity of water was added to the residue and examined under a binocular dissection microscope. *Chondracanthus, Taeniacanthus, Bomolochus* and others could be collected in this manner. Lernaeids are another group in which the structure of the head is of utmost importance in identification. These parasites remain buried in the body of the host so a portion of the body of the host had to be cut to follow the course of the parasites up to its head. Cyclopoids are very small and undistinguishable from the mucous covering the gills of fishes. The best way to obtain them was to flush the branchial chamber with a pipette and examine the residue in a petridish under a binocular microscope.

Dissection of gills.

Dissection of intestine.

Fish Healthy Gill

Gill infestation with copepod parasites

Observation and Identification

Genus: *Pseudotaeniacanthus* Yamaguti and Yamasu

Pseudotaeniacanthus bengalensis n.sp.

Host: *Eel Fish*

Location: Gills

Several parasites were collected from the gills of Eel fish. Out of them only two were males. They were found in a state of copulation.

Female

The body is cyclopoid. Head fused with first thoracic segment and enlarged. The cephalothorax separated from the remaining segments with a well-developed dent on lateral sides measuring 0.38 X 0.48 mm. Second to fourth segments gradually narrow down posteriorly, with lateral lobes projecting prominently over respective basipods. Second segment transversely elongate measuring 0.16 x 0.43 mm. Compared with the second segment the third is little wider than longer measuring 0.16 x 0.40 mm. Fourth segment reaches middle of fourth basipod measuring 0.14 x 0.32 mm. The fifth segment is broader than longer measuring 0.08 x 0.20 mm and slightly overlaps the genital segment. Lateral margins of the fifth segment are rounded. The genital segment is slightly broader than long measuring 0.12 x 0.16 mm. Abdomen is long and four segmented, the first and second are subequal in length and breadth, each measuring 0.14 x 0.14 mm. The third segment is slightly narrower than first and second and is as broad as long measuring 0.11 x 0.11 mm. The fourth segment is broader than long measuring 0.08 x 0.09 mm. The caudal rami are longer than broad, each with a seta in the mid-lateral region and four setae at the distal end. Out of the four the outermost ones on either side are subequal. In the remaining two, one is three times shorter than the other. Egg sacs are cylindrical and reach almost the middle of caudal setae. The eggs are either round or polygonal in shape.

***Lernanthropus*.sp**

First antenna is six segmented. The basal segment itself divides into two small ones, each bearing three to four plumose setae. Along the mid-dorsal region of the first two segments there are small setae. The third segment is the longest, with seven plumose setae out of which the anterior most is long. The fourth segment with four, fifth with three and the six with five setae.

The second antenna is indistinctly four segmented. The basal segment rather stout and slightly shorter than the remaining segments and has a spine like seta at its distal end. The second segment has a typical seta like that of basal. The third segment with a linguiform process. Its lower border is fringed with spine like projections. There is a claw arising from the base of the dorsal margin of the prolongation. The fourth segment has five projections out of which four are claw like and the fifth one is long and setiform which extends far beyond the claws.

Hatschekia sp.

In the median line immediately in front of the second antenna there are paired, widely divergent, rod-shaped processes fitting into the ventral grooves of the head. Two thirds of the processes is fused into one and the remaining one third anterior part is separated wide apart. Each anterior process has eight to nine rows of well differentiated denticles. It has claw-like posterior processes which are almost straight. Basal segment of the mandible is large with two pectinate spine like processes. The maxilla with four setae, of which one is longest. The second maxilla is apparently two segmented with a long-pointed spine and a short one. The maxilliped is in the form of basal rectangular plate with an elongated neck like part which is a

concavity on its inner side bearing a bilobed structure at its tip and it has a spine like seta.

Basipod of first leg provided medially with one plumose seta. The exopod three segmented, second segment with one outer plumose seta, the terminal segment with ten plumose setae. Endopod three segmented, first and second segments with one plumose seta and the third segment with two bent spines and tipped with three plumose setae. The inner margin of these three segments of endopod is profusely fringed with long hairs. Both rami of second leg are three segmented, the endopod is broader than the exopod. The outer border of the first segment with two sets of spines. In addition, it bears one spine along the outer margin and hairs along the inner margin. The second segment with well differentiated spiny outer border, carrying one outer spine and inner seta, the third segment with spiny outer surface and has three spines and five setae. The first segment of endopod with outer plumose seta and inner hairy margin. The second segment with outer two plumose setae and inner border is hairy. In addition to this there is a row of small spines at its distal end. The terminal segment of endopod with inner spiny margin, carrying one small spine, one pectinate spine and three plumose setae.

In second, third and fourth legs, the basipodal part between the exopod and endopod has a row of spines. The third leg is almost similar to the second except for slight differences in the terminal segment of endopod. The third endopod segment in addition to having a row of spines, has a small spine, a pectinate spine and a stout spine.

Caligus sp.

In the fourth leg, the endopod is stouter and longer than the exopod. The first segment of the exopod has two sets of spines about five to six in number. In addition, it has a pectinate spine on its outer border, and hairs on its inner border. The outer margin of the second segment has a row of small spines, a single long spine and inner margin with a single long seta, third segment with a row of spines, three pectinate spines which increase in length towards the apex, and five plumose setae. The first segment of the endopod with plumose seta at the outer

margin and the inner margin is hairy. The second segment with plumose sets at its outer margin and hairs along the inner margin. It has a set of spines at its distal tip. The third segment has two rows of spines, one below the other, out of which the lower one is arranged in an arch like manner. This type of arrangement of spines in the segment gives the appearance of pseudosegmentation. The tip has one long pectinate spine in between the small spines.

The fifth leg is uniramous and two segmented. The basal segment has a spine. The terminal segment has four pectinate spines on either side of the distal margin. In between these pectinate spines there are smaller spines. The lateral margin on the inner side is beset with small spines. Total length of female: 1.53 mm.

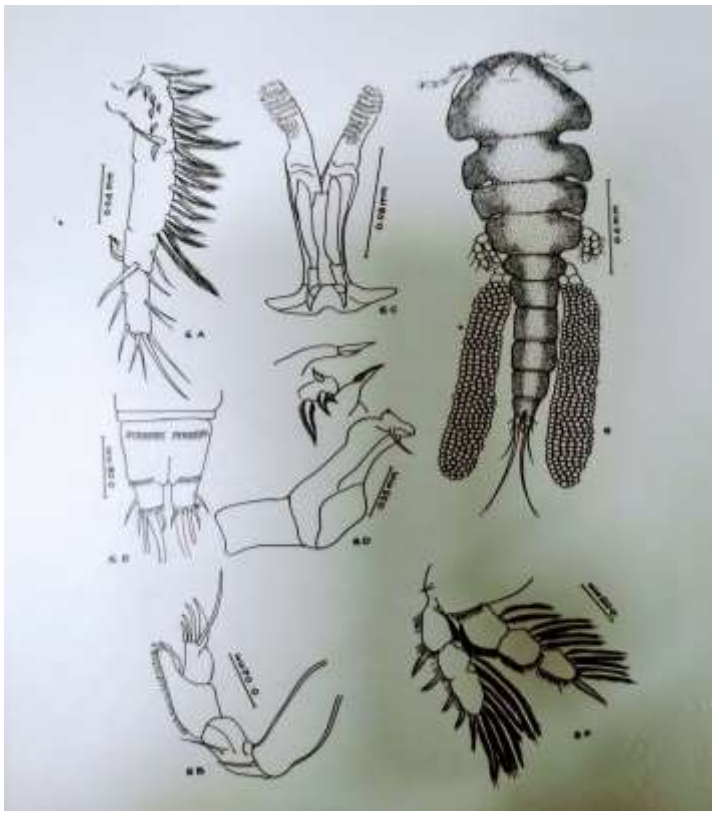


Fig*: Pseudotaeniacanthus bengalensis (Female).*

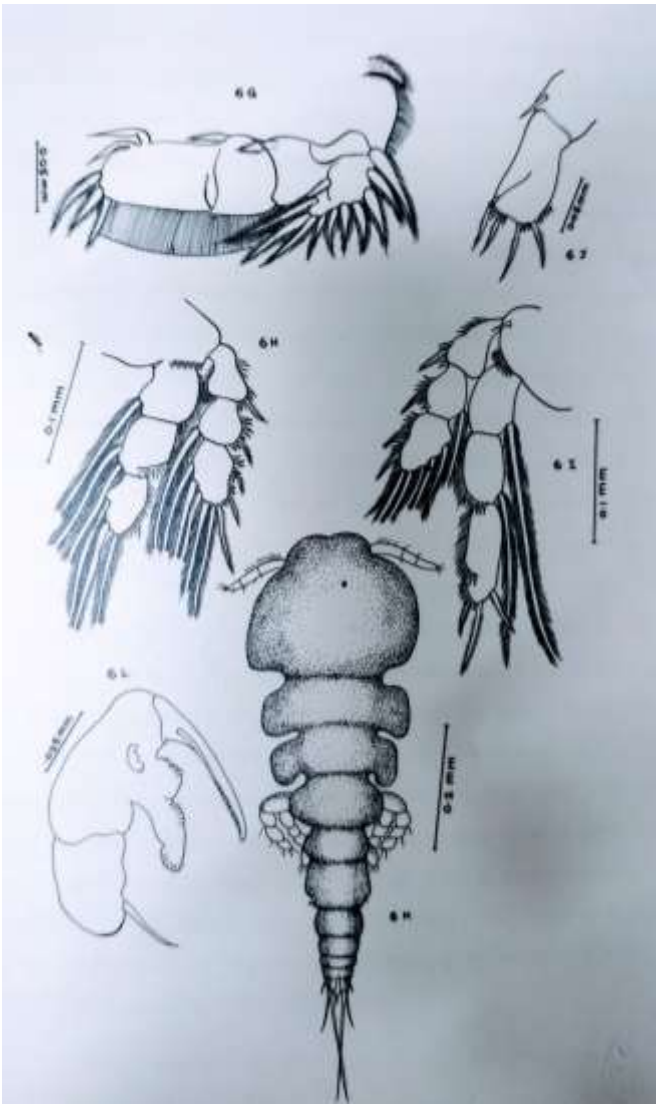
6A Antenna -1, 6B Antenna -2, 6C Post antennal process,
6D Mandible, Maxilla Maxilla -2 & Maxilliped. 6E Posterior part of the body 6F Leg -2.

Male

Only two males were collected from the gills of eels. The body is smaller and narrower than female. The cephalosome is well demarcated from the remaining segments with a well

differentiated groove. Second to fourth segments gradually narrow down towards the posterior end. The genital segment is somewhat squarish. From its lateral side the sixth pair of legs arises. The abdomen clearly shows four segments. The distal setae of caudal rami are very long, as long as the combined length of abdomen and caudal rami.

Almost all the appendages are similar to that of female except the maxilliped. The maxilliped of male is stout, sub-chelate and three segmented. The basal segment carries a long slender seta on its inner end. The second segment is expanded into an elongate blunt finger like projection. The tip of this process is cut into a few teeth. The outer border of this process shows two sets of dentieles. The third segment is blunt and claw like with its inner margin highly denticulated, carrying a long slender seta which arises from the base of the claw. The projection of the second segment is almost parallel to the claw of the third segment and it almost reaches the same length of the claw. Total length of male: 0.67 mm.



Pseudotaeniacanthus bengalensis (Female)

6G Leg -1, 6H Leg -3, 6I Leg – 4, 6J Leg- 5

6K Pseudotaeniacanthus bengalensis (Male), 6L Maxilliped (Male).

DISCUSSION

This genus was erected by Yamaguti et Yamasu, (1959a) the type species being *P. congeri* Yamaguti et Yamasu, (1959a) from the gills of *Conger myriaster* from Japan. Subsequent species are *P. pubi* Lewis (1967) and *P. longicauda* Pillai and Hameed (1974) and *Pseudotaeniacanthus* sp. Lewis (1968). *P. bengalensis* is distinguishable from *P. congeri* Yamaguti et Yamasu, *P. pubi* Lewis and *P. longicauda* Pillai and Hameed in the following characters. The abdomen of the present species shows some differences from that of *P. longicauda*. In *P. longicauda* the abdomen is longer than cephalosome and in *P. congeri* it is shorter than cephalosome. So, the present species thought resembles *P. pubi* in the post antennal process and in the armature of the legs it differs in the structure of the maxilliped of both sexes.

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