

THE SURVEY OF PARASITIC CRUSTACEANS INFESTING IN FISHES

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ABSTRACT

A parasite could be considered as an organism, an animal or plant, which lives in or on another organism obtained from it part or all of its organic nutrients, and commonly exhibiting some degree of adaptive structural modifications. Such an organism (the parasite), could cause some degree of real damage to the host. Usually, there is a disparity in size of the two organisms, the larger form being the host, and the smaller one, the parasite. The site of infection has also been used to classify the types of parasitism. Ectoparasitism includes those forms parasitizing in the body surface of the host while endoparasitism entails those parasites not visible on the surface. The survey of parasitic crustaceans (Copepod and Isopod) infesting in fishes were done by collecting fishes mainly from Ayikkara beach, a major fish – landing centre in Kannur and also from fish markets at Thazhe chovva, Thalassery and Mahe. The survey was made for a period of three months. The survey was based on fishes such as Rastelliger Sp, Sardinella Sp, Mugil and Cephalus Sp. From the survey, it was evident that majority of the parasitic copepod infection occurs in marine fishes and the isopod parasite, Rocinella was found only in one type of fish. It was also noticed that the fishes collected from Thazhe chovva had significant levels of isopod infestation. About 113 marine fishes examined, 8 fishes were infected with different types of copepod parasites.

Key words: *Parasitic crustaceans, adaptive structural modifications, fishes, infestation.*

INTRODUCTION

A parasite could be considered on organism, an animal or plant, which lives in or on another organism obtained from its part or all of its organic nutrients, and commonly exhibiting some degree of adaptive structural modifications. Such an organism (the parasite), could cause some degree of real damage to the host. Usually, there is a disparity in size of the two organisms, the larger from being the host, and the smaller one, the parasite. If this relationship is only occasional, with the parasite papering to normally exist in free-living conditions, as in scavenger flies for example, the condition is termed facultative parasitism or accidental parasitism. If the parasite is always dependent on host for its development, the relationship is termed obligatory parasitism. Temporary parasites visit the host for only a short time to feed. Continuous parasites characteristically infest on the host during its entire life span.

The site of infestation has also been used to classify the types of parasitism. Ectoparasitism includes those forms parasitizing on the body surface of the host while endoparasitism entails those parasites not visible on the surface, for example, within the skin tissues, the host blood, the digestive tract, respiratory passage, and / or other internal sinuses.

Of approximately 35 animal phyla, there is at least a single species that is parasitic. The exceptions to this rule are the echinoderms among invertebrates, the vertebrates and a few minor phyla. Among invertebrates, protozoa, platyhelminthes, nemathelminthes, arthropoda and annelida comprise the major parasitic forms.

Parasitic Arthropods

Arthropoda represent the largest number of known animals most members are free-living and are found in an array aquatic (freshwater and marine) and terrestrial habitats. However, some members of the class Crustacea (copepod, isopoda, cirripedia, amphipoda), Insecta, Arachnoidea, Tardigrada and Pentastomida are parasitic. Although many of these arthropod parasites are of little medical or economic importance, they are of considerable interest to biologists, especially parasitologists, from the biological stand points (Cheng C. Thomas, 1964).

Parasitic Crustaceans

They are aquatic arthropods, head characteristically consist any of six segments with five pairs of appendages including two pairs of antennae. The remainder of the body consists of thorax and abdomen. Parasitism exists in several groups of crustaceans like Copepoda, Branchiura, Cirripedia, Isopoda and Amphipoda, which differ from each other in diverse ways (R.L. Kotpal, 1989).

Parasitic copepods

Parasitic copepods are generally parasitic on fishes and are called fish-lice. The copepods constitute one of the largest crustacean groups. The body is usually more or less depressed into three parts head, thorax and abdomen, though fusion or reduction of body parts or segments occurs very often. In those copepods, which are permanently fixed in or on their hosts, the body is rigid.

Classification of parasitic copepods is based on external morphological features. The internal anatomy, worked out by Wilson, Dedie etc. for some forms, is not yet in general use for taxonomic purposes.

The copepods include about 4500 known species, of which the majority is free-living aquatic forms. The symbiotic members of this sub class are found as ecto – and/or endosymbionts in vertebrates and invertebrates. The ectosymbiotic species commonly are found attached to the body surfaces of fishes and amphibians, more commonly on fishes. On fish host, the parasites attach to the fins, the gills and/or the mouth. These copepods are true ectoparasites rather than epizootic, for they draw their nourishments from the host's tissues.

Copepod parasites on fishes come under three sub orders namely:

- Siphonostomatoida
- Poecilostomatoida
- Cyclopoida

These sub orders can be distinguished from one another by observing their mouth parts. Majority of parasitic copepods (67%) belong to Siphonostomatoida, while Poecilostomatoida and Cyclopoida account for 31.5% and 5% respectively. As many as 85% of the copepod species are marine but the remaining are brackish or freshwater forms.

Parasitic Branchiura

They are small group of crustacean parasites, which cause harmful impact on fishes. They comprise fewer than 150 species grouped in five genera. The common genus coming under Branchiura is *Argulus*.

The order Argulidea, representing the Branchiura is distinguished from parasitic copepods by its peculiar structure, the presence of compound eyes, respiratory areas etc.

Both males and females can swim freely, and they leave their hosts regularly during the breeding season. They parasitize on freshwater and marine teleosts and occasionally on amphibian tadpoles, without having any strict host specificity.

Parasitic Isopoda

The order Isopoda belongs to the super order Pericardidae, under sub class Malacostraca. Its species are commonly known as “sow bugs”. “pill bugs”. “Wood lice”, “waterslators” and “gribbles”, The parasitic isopods infesting on fishes belong to the sub-order Flabellifera. Well adapted to their parasitic way of life, isopods can cause considerable damage to the host tissues at the infection sites.

Isopods can be easily distinguished from other pericardids for having a dorso-ventrally flattened body, head being fused to the first thoracic somite to form a cephalothorax, but having no carapace. Isopods possess sessile eyes, uniramous antenna, abdomen being composed of six somites, and one or more somites being fused with the telson to form a pleotelson. Five pairs of biramous abdominal appendages are also present.

Majority of the isopods are free – living, although some are commensals or parasites. All the species of the suborder Epicaridae are parasitic.

Parasitic Amphipods

Amphipods are malacostracan crustaceans characterized by small to medium-size, laterally compressed body, uniramous ambulatory thoracic legs, and sessile eyes and with no carapace. Approximately 6,000 species are known at present.

Parasitic and semiparasitic amphipods can be found on a wide variety of hosts, both invertebrates and vertebrates; some are associated with plants. Several groups have been specialized as associates or ectoparasites of fishes. Most of them are facultative rather than obligate parasites and may live freely on bottom or in water column. Some amphipod parasites of fishes may be termed “hitch – hikers”. Clinging to various skin surfaces of gills by means of clamp – like gnathopods or prehensile peraeopods. Parasitic amphipods are usually found on slow moving benthic sharks and bony fishes of cold or deep waters. Amphipods are actively feeding surface mucus, skin tissues, body water and discarded food items of the host.

MATERIALS AND METHODS

Collection of fishes for parasitic survey

Collection of fishes for parasitic survey was made mainly from Ayikkara beach, a major fish-landing centre in Kannur district, about 7 kilometers away from the college campus. Collection was also made from fish markets at Thazhe Chovva, Thalassery and Mahe. Care was taken to collect fresh fishes as soon as they were captured.

Examination of fishes for parasitic crustaceans

The present survey was based on fishes such as *Rastelliger* Sp. *Sardinella* Sp, Mugil, Cephalus Sp [(ripper (local name)] obtained during the collection. The body parts of the fishes were examined carefully and thoroughly with the help of dissection microscope and hand lens. The gills were incised and placed into a petri dish partially filled with saline. The gill filaments were scraped with a scalpel and examined under a dissection microscope.

Collection of crustacean parasites from fish hosts

The parasites attached to the gills were removed by separating each gill filaments using a needle, brush and a pair of forceps. Some parasites were found in the mucus produced by the gills. The parasite, after being collected from the host's body, were placed on a clean glass slide and then identified using appropriate taxonomic key, and if necessary, preserved in formalin for further observations.

RESULT AND DISCUSSION

COPEPOD PARASITES

Survey of crustaceans parasitizing on fishes

The survey was made for a period of 3 months from November 2003 to January 2004. The first collection was made from Ayikkara beach and the fishes were brought to the laboratory for examining. Crustacean parasites were collected from the *Rastelliger* and *Trichiurus* sp.

Out of the 18 *Trichiurus* sp examined, two fishers were found to be infected with one genus of copepod parasite, *Lernanthropus* which in turn was represented in two species, such as *Lernanthropus tylosuri* (male) and *L. corniger* both male and female and *caligus* sp.

Copepod parasites

Features of Lernanthropus tylosuri

Male: Cephalothorax roughly squarish, broader behind, antennular lobe not clearly demarcated. Trunk segments, unlike other species, fully fused. Fifth and genital segments fused. Abdomen short but distinct. Caudal rami as long as abdomen, with five setae. Third leg a flattened apically rounded and spiny lamina, no trace of the endopod as in other species. Fourth leg longer than third, apically forked, limbs of the fork with apical bunch of spines fifth leg not observed (Plate I).



Features of Lernanthropus corniger

Female: Cephalothorax, anterior division of trunk and the dorsal plate forming sub equal, sub circular divisions. Anterolateral parts of cephalothorax bent downwards and also forwards as a pairs of large horns. Third legs fused with the trunk. Dorsal plate anteriorly narrowed, with even border. Fifth segment distinct but very short, genital segment large and swollen, abdomen one-jointed, caudal rami as long as abdomen, basal segment of antennules swollen its surface with scattered spinules. Basal segment of antenna with a large inner process, distal segment roughly rectangular and ending in a short process overlapping a grooved rectangular lobe, both lobes of maxillule fairly large, medium distal spine large, inner lobe with a short spine, basal segment of maxilla stout, distal segment with two spine and a few blunt teeth. Exopod of first leg stout, with five large barbed teeth, endopod well developed, with a long pectinate seta. Second leg much smaller than the first, third legs biramous, fourth leg with subsimilar rami reaching for beyond the dorsal plate fifth leg absent. (Plate II)



Male: Cephalothorax triangularly produced in the middle of its lateral borders, antennular lobe large and set off by a transverse groove. Trunk segments faintly indicated. Fourth segment fully fused with genital segment, abdomen small but distinct, caudal rami with five setae, dorsal side of body and of third and fourth legs spinulose, third leg uniramous, endopod indicated indicated, fourth leg biramous, exopod longer than endopod (Plate III).



Features of Caligus

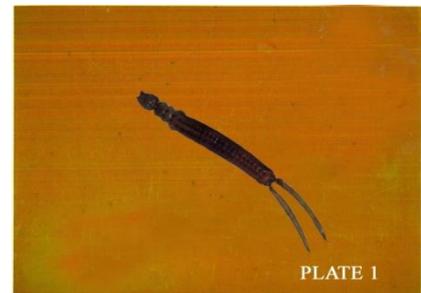
Caligus was obtained from Cybium Sp. The frontal plates with lunules. Fourth thoracic segments free, occasionally fused with genital segment and the whole much elongated. Genital segment swollen, with or without processes or lobes. Abdomen distinct, may be flattened or lobed. Caudal rami lamellar, antenna prehensile, post-antennal process absent or present, post-oral process generally present, maxilliped prehensile, sternal fork present or absent, legs as in the family (Plate IV).



35 specimens of Cybium were collected. Out of these, 5 fishes were of 750g. They were infected by the copepod parasite, *Pseudocycnus appendiculatus* (Male).

Features of Pseudocycnus appendiculatus

Male: Cephalothorax nearly circular, much broader than trunk, second thoracic segment nearly twice as long as the third, fourth segment drawn out into stout long processes carrying the fourth legs. Fifth segment partially fused with genital segment, carrying the set form fifth legs, abdomen distinct, caudal rami longer than the abdomen. Antennule five to six-segmented, second segment with large process. Antenna three jointed, narrowing, distal with two spines basal segment of maxilliped broad. Distal long and very slender, first leg clearly biramous basipod with long chitinised stylet, other leg as in the female (Plate V).



Features of Pseudocycnus armatus

Female: Cephalothorax considerably broad postero laterally. Produced into conical lobes and posteriorly narrowing to join the second thoracic segment, the stout maxilliped visible between these two second trunk segment transversely among, third and fourth short, laterally drawn out into projecting lobes, trunk about two third the total length of body minus the caudal rami. Caudal rami fused with abdomen, one and a halftimes as long as abdomen. Antennule seven segmented, second segment with curved dorsal process. Antenna slender, three jointed, third segment strongly curved and with a large median process. Maxillule as in *Pseudocycnus appendiculatus*. Distal segment of maxilla distally not expanded, armed with small spines. Basal segments of maxilliped massive with a pad like elevation done to its base, distal segment small, distally sharply curved and with an accessory process.



First and second legs, biramous, third uniramous, fourth a small tubercle carrying a seta, fifth absent (Plate VI).

Male : Cephalothorax circular, broader than the trunk, second thoracic segment narrow, third bordering backwards, other segments fused with genital segment to form a cylindrical trunk. Abdomen partially fused with trunk. Caudal rami with spinules and pectinate seta.



Antennule nine-jointed, second segment without processes. Antenna very slender, third segment distally well curved, with two processes, maxillule as in the female. Distal segment of maxilla armed with very small spinules. Basal segments of maxilliped stout, distal long and slender, with two process. First leg, a distally bilobed lamina, basipod with long chitinised stylet, other legs as in female. Fifth leg present, like fourth (Plate VII).

Out of the 15 specimens of *Tuna* sp. Examined, 32% of it was found to be infected with the copepod *Pseudocycnus* Sp. Seven specimens of *Belone* were not infected by any parasite.

TABLE – I
TABLE SHOWING THE SURVEY OF COPEPODS PARASITIZING ON FISHES

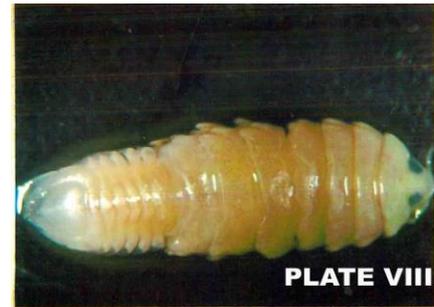
SI. No	Place of collection	Name of the fish (Scientific / Common name)	Number of fishes collected	Number of fishes infected With copepod parasites	Parasites collected	% of infection
1	Kannur	<i>Cybium</i>	5	1	<i>Pseudocycnus</i>	20.0%
2	Thalessery	<i>Cybium</i>	6	2	<i>Pseudocycnus</i>	33.3%
3	Thalessery	<i>Cybium</i>	3	1	<i>Pseudocycnus</i>	33.3%
4	Ayikkara	<i>Tuna</i>	13	4	<i>Pseudocycnus</i>	30.7%
5	Ayikkara	<i>Cybium</i>	10	5	<i>Pseudocycnus</i>	50.0%
6	Ayikkara	<i>Belone</i>	2	-	-	-
7	Ayikkara	<i>Belone</i>	5	-	-	-
8	Ayikkara	<i>Cybium</i>	5	-	-	-
9	Ayikkara	<i>Trichurus</i>	9	2	<i>Lemanthropus</i>	22.2%
10	Ayikkara	<i>Cybium</i>	6	4	<i>Pseudocycnus</i>	66.6%
11	Ayikkara	<i>Trichurus</i>	9	1	<i>Calligus</i>	11.1%
12	Ayikkara	<i>Tuna</i>	2	1	<i>Pseudocycnus</i>	22.2%

ISOPOD PARASITES

Out of 38 *Rastrelliger* collected, 11 specimens were found to be infected, the percentage of infection being 21.1%. The only fish infected with isopod parasite was found to be *Rastrelliger*. They were infected with the isopod *Rocinella*. The parasite was found in the gill cavity of the host. It was also found that when the parasite was removed, the place where the parasite was attached, was seen as a depression.

Features of *Rocinella*

Rocinella sp was found in *Rastrelliger* sp. It clings to the gill pouch of the host. Its body is dorsoventrally flattened. Body is divided into three regions, cephalon, peraeon and pleon. The cephalon bears a pair of antennules and a pair of antennae, each consisting of a proximal peduncle and distal flagella. The mouthparts are paired appendages found in the large buccal mass, ventral to the cephalon. They are the mandibles and maxillae.



The mouth opening is bordered anteriorly by the labrum. The mouthparts are modified for piercing and sucking. The peraeon has well defined coxal plates and peraeonites. The paired uniramous legs of each paraenite is called as the paracopods which consists of 7 articles. All 7 pairs of paracopods are prehensile in the family Cymothoidea were as in Aegidae, only paracopods 1 – 3 are prehensile. The abdomen consists of five free pleonites, the sixth pleonite is fused with the telson to form a pleotelson. Each pleonite bears a pair of biramous lamelliform appendages. The pleotelson bears a pair of uropods and an outer exopod ramous from the peduncle (Plate VIII).

TABLE – II

TABLE SHOWING THE SURVEY OF ISOPODS PARASITIZING ON FISHES

Sl No.	Place of collection	Name of fish	Number of fishes collected	Number of fishes infected with isopod parasite	Isopod parasite collected	% of infection
1.	Thazhe Chovva	<i>Rastrelliger</i>	5	3	<i>Rocinella</i>	60%
2.	Thazhe Chovva	<i>Rastrelliger</i>	15	3	<i>Rocinella</i>	20%
3.	Thazhe Chovva	<i>Rastrelliger</i>	18	2	<i>Rocinella</i>	11.1%

Taxonomic Status of parasites surveyed

A. Copepod parasites

1. Genus *Lernanthropus* (Pillai, 1964)

Phylum: Arthropoda

Class : Crustacea

Order : Copepoda

Suborder: Caligoida

Family: Anthosomatidae

The copepod belonging to the Genus *Lernanthropus* was obtained from buccal cavity of fish *Trichiurus* sp (Fig-1)

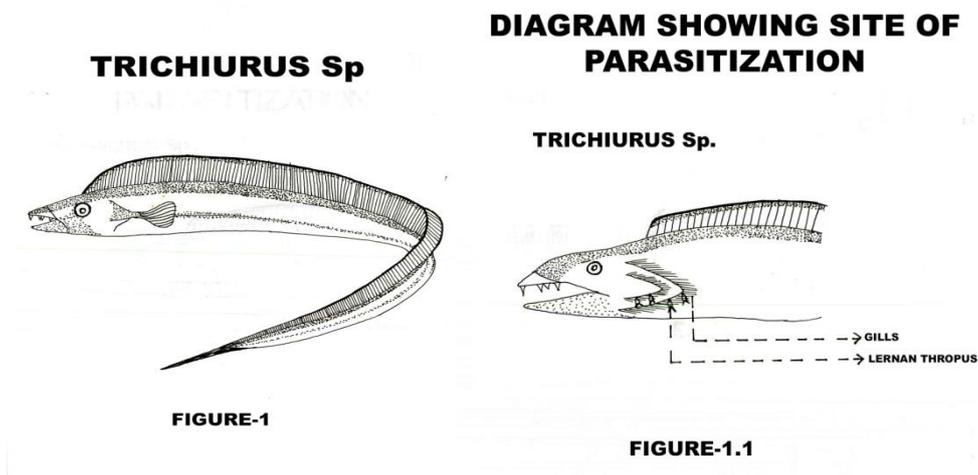


DIAGRAM SHOWING APPENDAGES OF LERNANTHIROPUS Sp

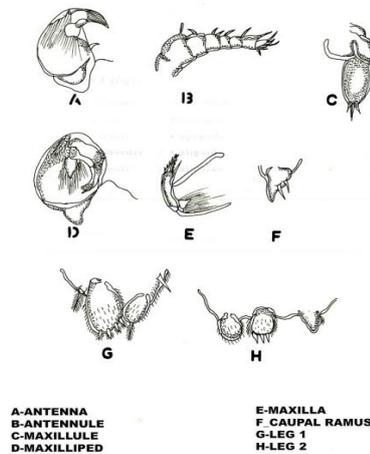


FIGURE-1.2

2. Genus *Caligus* (Thomsen, 1949)

Phylum: Arthropoda

Class : Crustacea

Order : Copepoda

Suborder: Caligoida

Family: Caligoidae

Caligus sp were obtained from buccal cavity of the fish *Cybium* (Fig. 2)

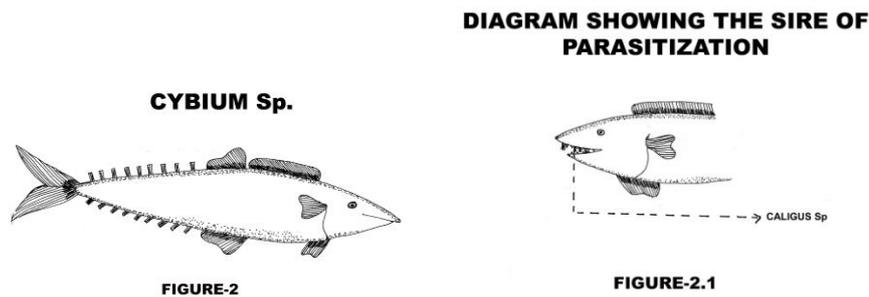


DIAGRAM SHOWING APPENDAGES OF CALIGUS Sp.

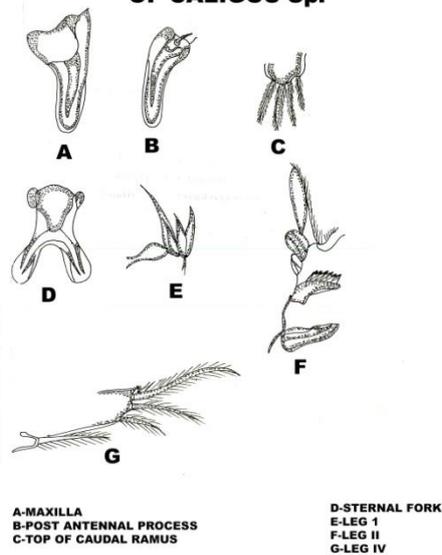


FIGURE-2.2

3. Genus *Pseudocycnus* (Heller, 1868)

Phylum: Arthropoda

Class : Crustacea

Order : Copepoda

Suborder: Caligoida

Family: Pseudocycnuidae

Pseudocycnus sp. were obtained from gill filaments of *Cybiium* sp. (Fig. 3)

DIAGRAM SHOWING THE SITE OF PARASITIZATION

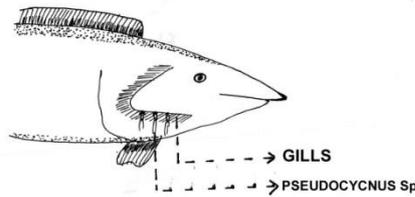


FIGURE-3

DIAGRAM SHOWING APPENDAGES OF PSEUDOCYCNUM Sp.

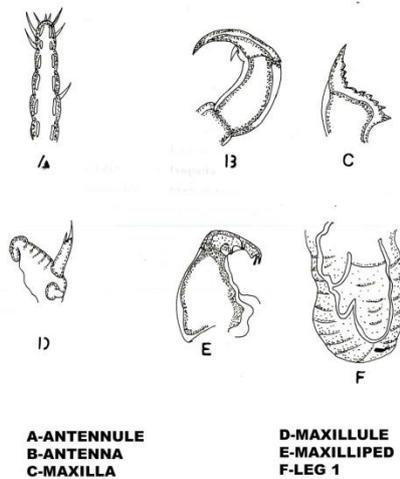


FIGURE-3.1

B. Isopod Parasites

Genus Rocinella (Leach, 1818)

Phylum: Arthropoda

Class : Crustacea

Order : Isopoda

Suborder: Flabellifera

Family: Aegidae

The *isopod* belonging to the Genus *Rocinella* was found clinging to the gill pouch of the host (Fig 4)

RASTRELLIGER Sp.

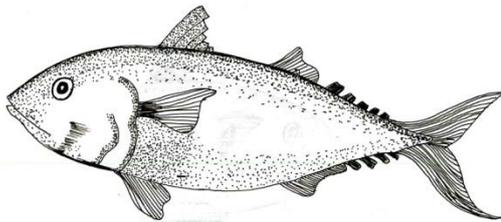


FIGURE-4

DIAGRAM SHOWING SITE OF PARASITIZATION

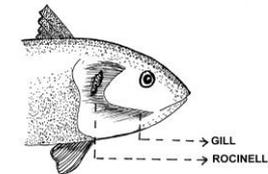
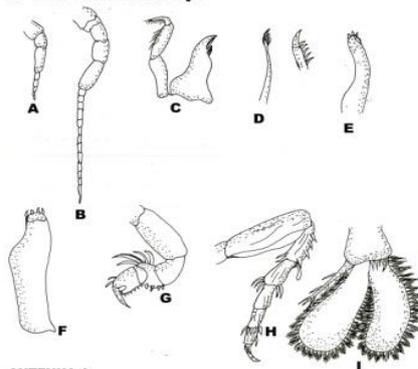


FIGURE-4.1

3G

DIAGRAM SHOWING THE APPENDAGES OF ROCINELLA Sp.



ANTENNA 1
ANTENNA 2
MANDIBLE
MAXILLIPED
MAXILLA 2
MAXILLA 1

G- UROPOD
H-PEREOPOD
I-PEREOPOD 7

FIGURE-4.2

CONCLUSION

The present study carried out on parasitic crustaceans, allows us to have a fairly good understanding on the crustacean parasites that infest on marine fishes of Kannur district.

Copepod and Isopod crustaceans parasitizing on fishes, are known to display a wide range of adaptive modifications. Copepods are the most commonly occurring parasitic forms infecting the marine fishes of Kerala (Pillai, 1985) and are known to damage the gills of fishes by feeding the tissues of the gill lamellae or on the blood circulating within the lamellae. It was noticed that the heavy parasitic crustacean infection is known to cause mass mortality of fishes.

From the present survey (Sreeja T.V., 2002 and Raji M.K., 2003), it is evident that majority of the parasitic copepod infection occurs in marine fishes and the isopod parasite, *Rocinella* was found only in one fish, such as *Rastrelliger* sp. They are obligatory parasite. From the survey it was also noticed that the fishes collected from Thazhe Chovva had significant levels of isopod infestation.

From about 113 marine fishes examined, 28 fishes were infected with different types of copepod parasites like *Lernanthropus* sp., *Pseudocycnus* sp etc., showing that the percentage parasites infection is considerable.

The rate of infection was found to be high in *Cybium*, which was infected mainly with a copepod parasite (*Pseudocycnus* sp), percentage of infection being 84%. The *Rastrelliger* on the other hand, was found to be infected highly by the isopod parasite *Rocinella* (90%).

The collected copepods comprised members from both the sexes. Female copepods were found generally with egg sac.

Some parasite of the genus *Pseudocycnus* sp. obtained from Tuna were found to be larger in size.

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