DISTRIBUTION OF AN ISOPOD PARASITE *Mothocya renardi* IN THE HOST *Strongylura leiura* FROM ARABIAN SEA GUJARAT COAST, INDIA

Abstract

Crustacean isopod parasites, particularly in the marine environment, are prevalent around warmer seas and can significantly impact local fish populations. Mothocya renardi, a notable species of isopod parasites, commonly infests fishes in shallow, turbid coastal waters. This study aimed to investigate the occurrence, taxonomy, and morphology of M. renardi infesting Strongylura leiura in the Arabian Sea around the northwest coast of India. Samples were collected from Dholai fishing harbor (Navsari District of Gujarat), during the post-monsoon months. Three specimens of S. leiura were found infected with pairs of male and female M. renardi in the brachial chambers, with all female parasites being brooded ovigerous. Detailed morphological analysis confirmed the presence of M. renardi, extending its known geographical range to the Arabian Sea.

Keywords: Isopod parasite, *Mothocya renardi*, *Strongylura leiura*, Arabian Sea, India

INTRODUCTION

Over 7000 species of crustacea are parasitic, exploiting an enormous range of invertebrate and vertebrate hosts in marine and freshwaters, and many more crustaceans exhibit other kinds of interspecific associations (symbioses) including commensalism, inquilinism, mutualism, and phoresis, with a similarly wide range of hosts1. Copepoda, Branchiura, Isopoda, Amphipoda, and Ostracoda, are known as the main groups comprising the parasitic crustacean, in addition, these groups are either ecto or endo parasites. In which the three major groups Copepoda, Isopoda, and Branchiura comprise the crustacean ecto-parasites for fish2. Crustacean ectoparasites on marine fish are diverse. Parasitic isopods are typically marine and usually inhabit the warmer seas they are mainly are found in shallow waters along the coastline3. They are blood-feeding; several species settle in the buccal cavity of fish, while others live in the gill chamber or on the body surface including the fins. Isopods can cause morbidity and mortality in fish populations4.

Isopods are typically dorsoventrally flattened peracaridans characterised by a relatively short head fused to the first pereon segment which bears the maxillipeds, a pereon of seven segments each bearing a pair of similar pereopods and the ventral brood pouch in mature females, and a pleon which usually exhibits some fusion between the posterior pleon segments and telson. Though free-living isopods tend to be detritivores while adult parasitic forms feed on host blood or host haemolymph. Their mouthparts form a cone with maxillipeds that tear at the flesh and tiny pointed mandibles that pierce into the tissue to penetrate blood vessels or blood sinuses5.

There are three major groups of isopoda: Cymothoids, Epicaridians and Gnathiids. Cymothoids are parasites of fish, both as immature forms and as adults. Epicaridians are parasites of crustacea, again as immatures and adults. Gnathiids are larval parasites of fish, the adults being free living and non-feeding. Cymothoid isopods are protandrous hermaphrodites. The first male to parasitize a fish changes into a female. Egg development apparently depends on the presence of a male, for each batch. Internal fertilisations occur immediately after the female has moulted, male deposits sperm into the female's genital opening. The sperm then fertilizes the eggs inside the female's body6. Gravid females release eggs into a brood pouch or 'marsupium' formed from their ventral oostegites. Here the eggs embryonate, hatch and undergo several moults to form the 'manca' stage. These are released from the brood pouch, sometimes more or less simultaneously as a result of contractions from the parent. The parent then moults, feeds, digests the meal, and eventually produces the next batch of eggs. Several batches may be produced during her lifespan. The mancae have only six pairs of legs (compared to seven in juveniles and adults), large compound eyes, and heavily setose pleopods with which they swim extremely rapidly. After a short free-swimming period, they are parasitic and need to find a fish to take their first meal within one to two days or they will die5.

During the work to assess the ichthyofaunal biodiversity of Dholai fishing harbor, some fish specimens were caught with parasites attached to them. Dholai is a minor fishing harbor situated along the southwest coast of Gujarat, India; it is an important place for the fishery sector of the south Gujarat region. It spans over 23 hectares of land and has facilities such as a net mending shed, auction halls, small yard for minor boat repair and maintenance. The majority of the fishing vessels carry out operations from the Gulf of Cambay region in the north to the Ratnagiri coast in the south7. The objective of this study was to identify the host, and parasite and describe its morphology along with its taxonomy.

Materials and Method

During the monthly specimen collection of ichthyofaunal diversity from Dholai Fishing Harbour on the southwest coast of Gujarat (Figure 1), the specimens of Strongylura leiura were collected during post monsoon months of September to November 2023, and brought to

the College of Fisheries Science, Navsari. Upon close inspection of the specimen, a pair of male and female ectoparasite was observed in all three specimens. It was identified as *Mothocya renardi*. Identification of the parasite was done using the Journal of Natural History 8. It was preserved in 70% alcohol. Host (Strongylura leiura) identification was done through FAO species identification sheets9. Morphometrics and Meristics were recorded and preserved in 10% formalin. Both the specimens of the parasite (*M. renardi*) and host were submitted to the aquatic biodiversity museum at the College of Fisheries Science, Navsari (Accession No: A 5.1.1.2 for S. leiura and C 3.1.1.1 *M. renardi*).

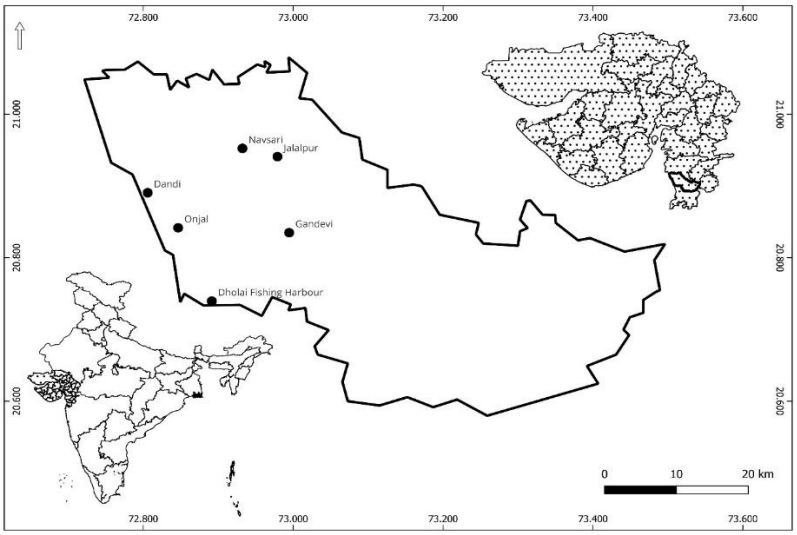

Figure 1: Location of Dholai Fishing Harbour (QGIS 3.32.0)

Result

The operculum of the *Strongylura leiura* was cut from the 7th branchiostegal rays upwards to remove the whole gill cover; this uncovered the whole gill filaments with the parasite still sitting in its original place. It was carefully removed for observation. Upon close examination, it was determined that there was tissue damage to the internal brachial cavity and gill filaments of host.

For identification according to the standard identification guides total 13 parameters of parasite and 22 morphometric parameters and meristic characters of host were recorded and presented here in table 1 and 2, respectively.

Mothocya renardi **(Gill ectoparasite)**

Kingdom: Animalia

Phylum: Arthropoda

Subphylum: Crustacea

Superclass: Peracarida

Class: Malacostraca

Subclass: Eumalacostraca

Superorder: Peracardia

Order: Isopoda

Suborder: Cymothoida

Superfamily: Cymothooidea

Family: Cymothoidae

Genus: Mothocya

Species: renardi

Family Cymothoidae has 39 genera, while 30 species come under Genus Mothocya. *Mothocya renardi* was originally described as *Livoneca renardi* by Bleeker, in 1857 which was revised as *Mothocya renardi*. Other synonyms which are currently categorized as unaccepted names include *Irona renardi*, (Schioedte & Meinert, 1884), *Irona melanosticta* (Barnard, 1914), and *Irona robusta*, (Nair, 1950).

Species Description:

Female: The total length of the specimen is 32 mm; the body is widest at pereonite 3 which is 2.4 times as long as wide. Cephalon width surpasses its length and the first pereonite is crescent-shaped to house the cephalon. The eyes are based on the front lateral side of the cephalon; they are small, one-third the width of the cephalon. The width of pereonite from Pereonite 1 to Pereonite 3 increases, body is widest at pereonite 3. From Pereonite 4 to Pereonite 7 it gradually decreases. Pereopods are without spines, with their main mechanism being attaching to the host. Among all pereopods, the first pereopod is the shortest, while the seventh pereopod is the longest. Pleotelson is expanded horizontally, width is 1.2 times its length. Oostegites were visible in the ventral view of the brood pouch in the fresh specimen.

Parameter	**Female**		**Male**	
	mm	% TL	mm	% TL
Total length (TL)	32	100.00	18	100.00
Width	13	40.63	8	44.44
Cephalon	3	9.38	3	16.67
Eye diameter	1	3.13	<1	-
Pereonite 1	3	9.38	6	33.33
Pereonite 2	9	28.13	7	38.89
Pereonite 3	13	40.63	8	44.44
Pereonite 4	12	37.50	7	38.89
Pereonite 5	11	34.38	6	33.33
Pereonite 6	10	31.25	5	27.78
Pereonite 7	8	25.00	4	22.22

Pleotelson width	11	34.38	5	27.78
Pleotelson length	9	28.13	4	22.22

Table 1: Morphometric parameters of *Mothocya renardi*

Colouration: Body uniformly creamy white without any pigmentation, including brood pouch while in fresh specimen. The hue of the brood pouch darkens to a deep brown within a few days following the death of the parasite.

Male: Males are generally smaller than females. Around 18 mm in total length. Body twice in length than width. Small eyes set on broad cephalon. Pereonites increase in width from the first to the third pereonite body widest at the third pereonite (8 mm), and decrease from the fourth to the seventh pereonite, similar as seen in the female. The length and width of the Pleotelson are symmetrical.

Coloration: Body creamy white with a band of dark pigmentation running along the median line of pereonites and pleonites.

Strongylura leiura, Banded needlefish (Host):

Taxonomy:

Kingdom: Animalia

Phylum: Chordata

Subphylum: Vertebrata

infraphylum: Ganthostomata

Parvphylum: Osteichthyes

Gigaclass: Actinopterygii

Superclass: Actinopteri

Class: Teleostei

Order: Beloniformes

Family: Belonidae

Genus: Strongylura

Species: Strongylura leiura

Species description: the banded needlefish or yellowfin needlefish has an elongated body that is laterally compressed. Both jaws are elongated with sharp teeth. Both jaws form around 13% of the total Length. And 50% of head length. The lateral line passes through the ventral side of the body. The dorsal fin originates far behind on the body; above the 7th or 8th ray of anal fins, the anterior margins of both fins create a semi-crescent-shaped lobe. A forked caudal fin differentiates this species.

Sr. No.	Parameter	% TL

Sr. No.	Parameter	% TL

1	Total length (TL)	100.00	12	Pectoral base	2.18
2	Standard length	90.10	13	Pre-pectoral length	26.14
3	Snout length	13.86	14	Pelvic fin length	5.54
4	Head length	25.54	15	Pelvic fin base	0.99
5	Eye diameter	2.18	16	Pre-pelvic length	55.84
6	Pre-orbital length	13.86	17	Anal fin length	17.62
7	Post-orbital length	16.63	18	Anal fin base	16.63
8	Dorsal fin length	15.05	19	Pre-anal base	71.29
9	Dorsal fin base	14.06	20	Body depth	5.94
10	Pre-dorsal length	73.27	21	Upper jaw length	13.07
11	Pectoral fin length	8.32	22	Lower jaw length	13.66

Table 2: Morphometric parameters of host *Strongylura leiura*.

Coloration: The dorsal side of the whole body green colored. A silver-colored strip runs on the lateral side of the body, which expands posteriorly. Below the strip, the ventral side of the body is white in color.

Discussion

Gill ectoparasite *Mothocya renardi* was observed from specimens of Strongylura leiura from Dholai fishing harbour, northwest coast of India. The banded needlefish resides in shallow coastal waters with high turbidity, around mangrove patches with sandy bottoms, and according to observations of Mertz3 marine isopods reside in shallow coastal waters, from these observations, it can be concluded that M. renardi have infested the host in shallow coastal waters. Out of all three specimens observed, all of them had infestations, with a pair of male and female present in the brachial cavity of host specimens. All three female were at the ovigerous stage in their lifecycle. The damage to the host was observed as necrosis of gill filaments, and damage of the branchial cavity by females (Figure 2), this causes disturbance to the normal respiratory function, which could result in the failure of adequate oxygen supply and inorganic ions for normal metabolic activities of fish, which leads to morbidity and mortality of host.

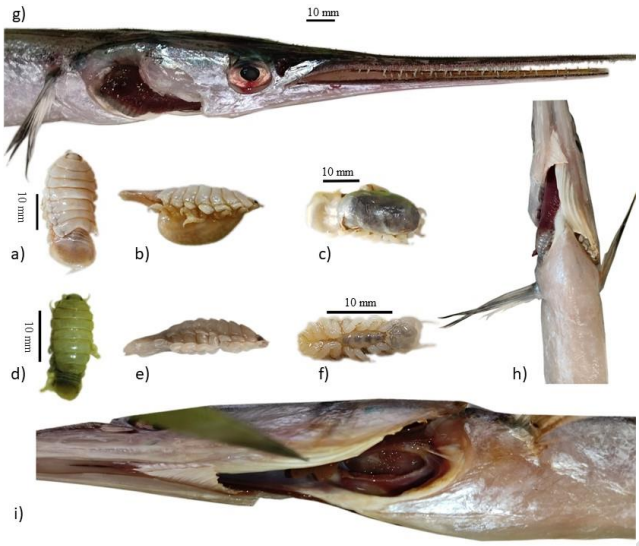

Figure 2: a) *Mothocya renardi* female dorsal view; b) Female lateral view; c) Female ventral view; d) *M. renardi* male dorsal view e) male lateral view f) male ventral view; g) Strongylura leiura position of parasite in gills lateral view h) host ventral view of brachial cavity i) host anterolateral view, damage done to brachial chamber by female parasite

Previous records confirmed the presence of *M. renardi* from India, northeast coast10, southeast coast11, and Malabar coast12, but this is the first recorded instance of M. renardi infestation from the northwest coast of India.

Conclusion

This study observed *Mothocya renardi*, a gill ectoparasite, infesting specimens of the *Strongylura leiura* from Dholai fishing harbor on the northwest coast of India. The presence of these parasites in the brachial cavity of the host fish, particularly in shallow coastal waters, suggests a habitat preference for such environments. All observed specimens of the banded needlefish were found to be infested, with both male and female parasites present. While previous records have documented the presence of *M. renardi* along various coastal regions of India, this study marks the first recorded instance of infestation from the northwest coast of India.

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