

INFESTATION OF PARASITIC CRUSTACEANS ON PONY FISHES (PERCIFORMES: LEIOGNATHIDAE) OF MALABAR COAST OF INDIA

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ABSTRACT

Leiognathid fishes (Perciformes) are small to medium-sized bottom-dwelling fishes that constitute an important component of India's demersal fishery resources. The present study documents the species diversity of leiognathid fishes along the Malabar Coast of India and evaluates the threat posed by infestation of parasitic crustaceans. Fish samples were collected randomly from Aykkara and Azheekal fish landing centres in Kannur District, Kerala, during January–March 2018. A total of eight leiognathid species were identified, namely *Eubleekeria splendens*, *Nuchequula blochii*, *Leiognathus brevirostris*, *Secutor insidiator*, *Secutor ruconius*, *Karalla daura*, *Gazza minuta*, and *Gazza achemys*. Alpha diversity analysis revealed a Shannon–Wiener diversity index (H) of 1.678, Simpson's dominance index (D) of 0.2251, and Simpson's index of diversity (1–D) of 0.7749. Parasitological examination revealed four species of parasitic crustaceans. Copepod infestations included *Lernanthropus leiognathi* on *E. splendens* (5.3% occurrence; mean intensity 1.33) and *L. brevirostris* (5.9%; 1.0), *Lernanthropus secutoris* on *S. ruconius* (7.7%; 1.0), and *Nothobomolochus multispinosus* on *N. blochii* (3.8%; 1.0), primarily infesting the branchial cavity near the opercular hinge region. Additionally, the isopod *Catoessa boscii* was recorded from *G. minuta* (2.4%; 1.0), attached to the inner operculum with its mouth oriented toward the host's buccal cavity. *L. secutoris* exhibited host specificity to *Secutor* species, whereas *L. leiognathi* infested multiple leiognathid genera. The study highlights host–parasite associations in leiognathid fishes and emphasizes the ecological significance of parasitic crustaceans in demersal fish populations of the Malabar Coast.

Keywords: Demersal fishes, Kannur, Alpha diversity, host fishes, copepodes

INTRODUCTION

Fishes of the family Leiognathidae, popularly called silver bellies, pony fishes, slipmouths or tooth ponies (*Mullan* in Malayalam, *Karal* in Tamil, *Karalu* in Telugu) belong to the order Perciformes. They are small to medium-sized, oblong or round silvery bodied bottom-living fishes of shallow coastal waters, constitute a main group of demersal fisheries resources along the Indian coast (Abraham et al., 2011). They constitute 2.13% of the total marine production of India (CMFRI Annual Report, 2021) and the fishery was supported by 48 species belongs to 9 genera distributed along Indo-West Pacific, of which 16 species were recorded from the Cochin water, West Coast of India (Abraham et al., 2011), but there is no report on the diversity of pony fishes from the Malabar Coast. The present study aims to understand the diversity of this marine taxon of Malabar Coast and also its threats by the infestation of parasitic crustaceans.

Among the crustacean parasites, copepods represent the largest and diverse groups, are seen in the mouths, operculum and gills of all most all marine fishes (Huys and Boxshall, 1991) and displays

a wide range of adaptive modifications to survive on diverse hosts (Kabata, 1979). Majority of them can be seen with naked eyes and they typically carry their eggs in paired egg sacs, extruded from their genital apertures and carried until ready to hatch (Misganaw and Getu, 2016). There is not much study done on diversity and parasitic infestation of leiognathid fishes of Malabar coasts. Thus, studies on parasitic infestation on fishes have considerable significance. With increasing fishing pressure, the only option left for the sustainability of leiognathid fisheries is their rational management and is possible not only with a thorough knowledge on the dynamics of the fish stocks through the taxonomic studies and understanding its foremost threats.

MATERIALS AND METHODS

Fish sample collection and identification: Leiognathidae fishes were collected from Aykkara (11° 51'33" N, 75° 02'30" E) and Azheekal (11° 56' 16.62" N 75° 19' 29.6796" E), fish landing centre of Kannur district, Kerala, Malabar Coast of India during January to March 2018. Sampling of pony fishes was done fortnightly at random level. Collected fishes were identified up to the species level using morphometric character based on FAO Species Identification Guide for Fishery Purposes, Indian Ocean; Fish base (<http://www.fishbase.org>) and WoRMS (World Register of Marine Species, 2018) (available from <http://www.marinespecies.org>). The standard length (from tip of mouth to tip of caudal fin) and breadth of all the samples were measured. Mean and standard deviation of all measurements were calculated using Microsoft Excel. These measurements are useful in comparing and differentiating between morphologically similar species (Murty, 1978).

Diversity indices: Alpha diversity indices: Dominance-D, Simpson-1-D, Shannon-H, Brillouin of pony fishes were analyzed using the software Past3.

Parasitological examination: Collected fishes were thoroughly observed for the presence of parasitic crustaceans. General body surface, fins, gill cavity, gill filaments, operculum, mouth, nasal pore, eyes etc were closely observed with the help of a hand lens under the bright illumination. Recovered parasitic crustaceans were removed and preserved in 5% formalin for further study. Preserved parasites were cleared in a drop of 85% lactic acid prior to examination using a Leica S6D stereo microscope. Identification of copepods was based on the morphological features according to Yamaguti (1963), Kabata (1985) and Pillai (1985). The photographs of the fish were captured using iPhone 7 and the parasites were taken using Magnus MIPS 10MP microscope (OLYMPUS SZ61). Parasitic indices like prevalence and abundance were measured using the software Qp3 (Quantitative parasitology).

RESULTS AND DISCUSSION

Altogether 8 species under 6 genera of Leiognathidae fishes namely *Leiognathus brevirostris* Valenciennes, *Eubleekeria splendens* Cuvier, *Secutor insidiator* Bloch, *Karalla daura* Cuvier, *Nuquequula blochii* Valenciennes, *Secutor ruconius* (Hamilton-Buchanan), *Gazza minuta* Bloch, *Gazza achlamys* Jordan and Starks were collected through the present study (Fig.1). Collected species were listed in the table (Table 1) and the percentage of distribution of each species was also given (figure 1).

Table 1: List of Leionathidae fishes collected during the study period.

SI No	Name of species	Common Name	S L *	B**
1	<i>Leiognathus brevisrostris</i> Valensiennes	Short nose ponyfish	9.16 $\pm$ 1.22	3.86 $\pm$ 0.63
2	<i>Eubleekeria splendens</i> Cuvier	Splendid ponyfish	9.02 $\pm$ 0.68	4.29 $\pm$ 0.41
3	<i>Secutor insidiator</i> Bloch	Pugnose ponyfish	7.28 $\pm$ 1.01	3.06 $\pm$ 0.54
4	<i>Karalla daura</i> Cuvier	Gold stripe ponyfish	8.21 $\pm$ 0.13	3.2 $\pm$ 0.19
5	<i>Nuchequula blochii</i> Valensiennes	Two blotch ponyfish	7.82 $\pm$ 1.14	2.5 $\pm$ 0.46
6	<i>Secutor ruconius</i> (Hamilton-Buchanan)	Deep pugnose ponyfish	7.38 $\pm$ 0.98	3.59 $\pm$ 0.62
7	<i>Gazza minuta</i> Bloch	Tooth pony	8.75 $\pm$ 0.35	3.35 $\pm$ 0.21
8	<i>Gazza achlamys</i> Jordan and Stakes	Small toothed ponyfish	8.45 $\pm$ 0.01	3.7 $\pm$ 0.01

*SI- Standard length in cm, * B – Breadth in cm

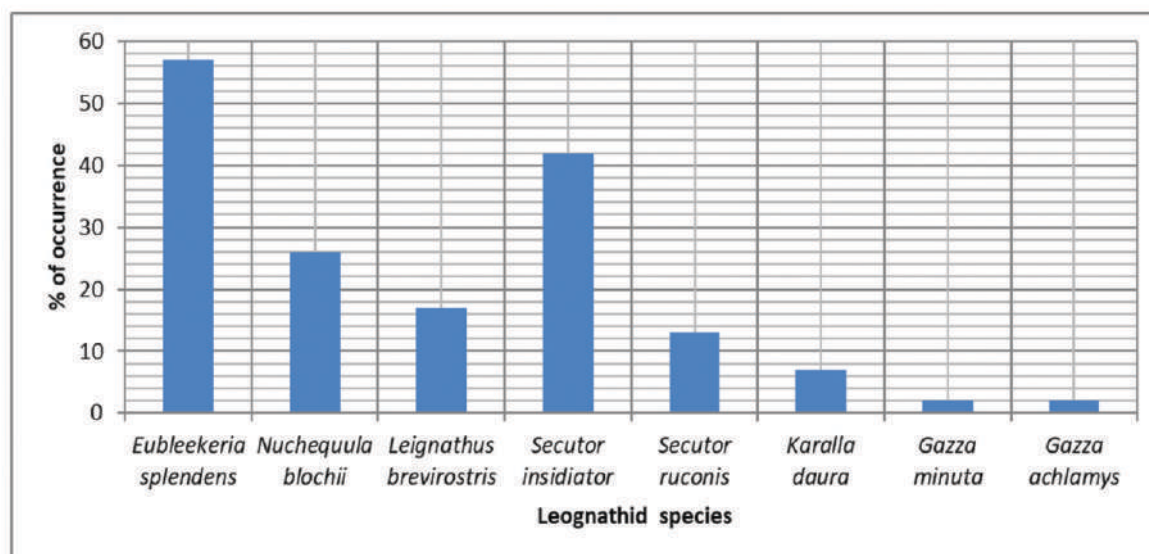


Fig. 1: Percentage of distribution of Leionathid fishes during the study period.

Diversity indices: Fish diversity was assessed by calculating the various diversity indices such as Shannon - Wiener diversity index (H)-1.678, Simpson's Dominance index (D)-0.2251, Simpson's index of diversity (1- D)-0.7749, Brillouin index- 1.594 using the software Past 3.

Parasitic Crustaceans infested on Leionathid fishes (Fig. 3): Of the 8 species of leognathid fishes collected from the commercial landings of marine fishes, 4 species of parasitic crustacean were recovered: *Lernanthropus leiognathi*, *L. secutoris*, *Nothobomolochus multispinosus* and *Catoessa bosicii* (Table 2). Of which *Lernanthropus* and *Nothobomolochus* are belonging to

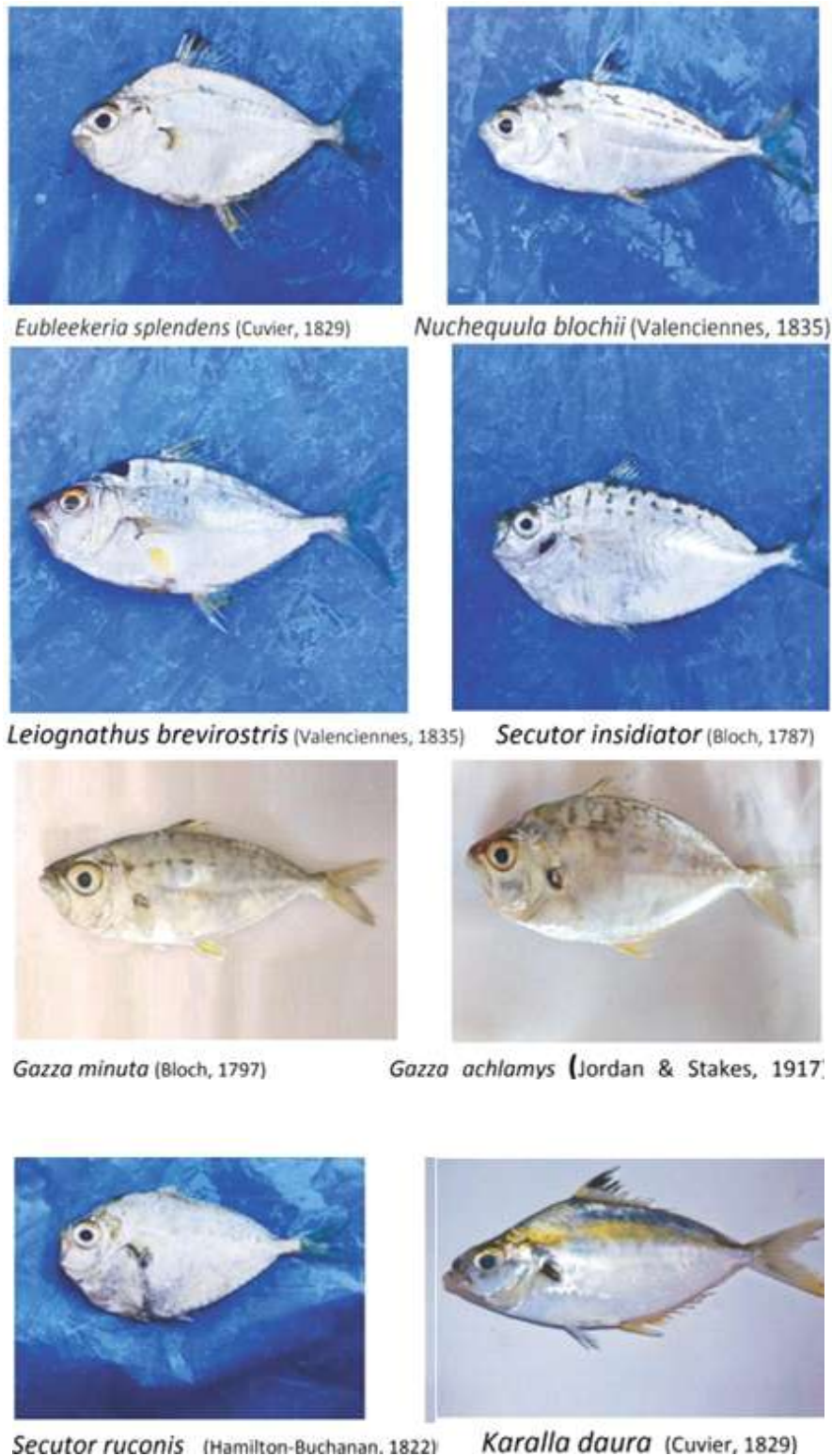


Fig. 2: *Leiognathidae* fishes collected during the study period

copepod whereas *Catoessa* is an isopoda genus. *L. secutoris* were found to be infested on the gill filaments of host fishes belongs to the genus *Secutor* while *L. leiognathi* prefer the host members of all *Leiognathus* genus except the genus *Secutor*. *Nothobomolochus multispinosus* found to be infested on the branchial cavity at the opercular hinge region as their microhabitat. One isopod species, *Catoessa bosicii* infested as attached to the inner side of operculum by its mouth was

directed towards the mouth opening of the host fish.

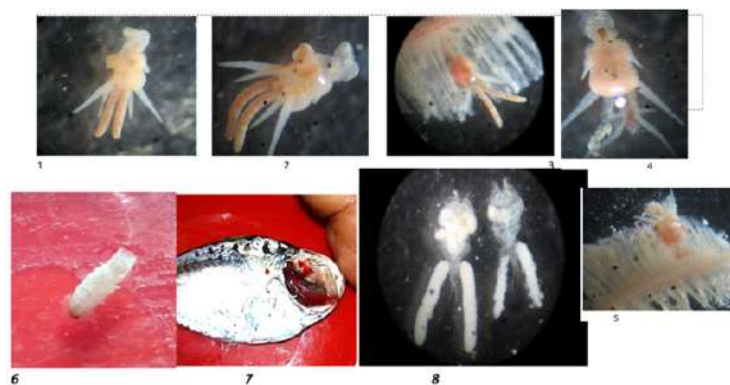
Table 2: Infestation of parasitic crustacean on Leiognathidae fishes of Malabar Coast.

SI No	Leiognathid sp.	NFO	NFI	NPR	Parasite sp	Site of infestation
1	<i>Eubleekeria splendens</i>	57	3	4	<i>Lernanthropus leiognathi</i>	Gill filaments of first and second gill arch
2	<i>Nuchequula blochii</i>	26	1	0	<i>Nothobomolochus multispinosus</i>	Inner operculum on hinge region
3	<i>Leiognathus brevirostris</i>	17	1	1	<i>L.leiognathi</i>	Middle gill filament of 1 st gill arch
3	<i>Secutor insidiator</i>	42	1	1	<i>Catoessa boscii</i>	Branchial cavity at inner operculum
6	<i>Secutor ruconius</i>	13	1	1	<i>L.secutoris</i>	Middle gill filament of 1 st gill arch
4	<i>Karalla daura</i>	7		X	-	-
7	<i>Gazza minuta</i>	2		X	-	-
8	<i>Gazza achlamys</i>	2		X	-	-

NFO= Number of fishes observed; NFI= Number of fishes infected; NPR= Number of parasites recovered

Table 3: Descriptive statistics on parasitic crustaceans' infestation on Leiognathidae fishes of Malabar Coast (Quantitative Parasitology- version 3)

SI No	Name of Host	Name of parasite	Prevalence	Mean Intensity	Median intensity
1	<i>E. splendens</i>	<i>L.leiognathi</i>	5.3%	1.33	1.0
2	<i>N. blochii</i>	<i>N.multispinosus</i>	3.8%	1.0	1.0
3	<i>L. brevirostris</i>	<i>L. leiognathi</i>	5.9%	1.0	1.0
4	<i>S. insidiator</i>	<i>C. bruci</i>	2.4%	1.0	1.0
5	<i>S. ruconius</i>	<i>L.secutoris</i>	7.7%	1.0	1.0



1. *Lernanthropus secutor* (Dorsal); 2. *L. secutor* (Ventral); 3. *L. secutor* attached on gill filament of *Secutor* fish; 4. *L. leiognathi* attached on gill filaments of *E. splendens*; 5. *L. leiognathi* (male and female in copulatory position); 6. *Catoessa boscii*; 7. *Catoessa boscii* attached on inner operculum of *S. ruconius*; 8. *N. multispinosus*

Fig. 3: The parasitic crustacean recovered from Leiognathidae fishes during the study period

DISCUSSION

Leiognathidae is represented by a high diversity of species among commercial marine landings of the Kerala coast. A total of 20 species of Leiognathidae known commonly from the seas around India, 16 species from Cochin and Neendakara on the western coast of India (Abraham, 2011) and in the present study 8 species were collected. Of which *Gazza achlamys*, a rare species reported first time from the Western Coast of India (Abraham et al, 2011) which is also recovered from present study. Out of the 8 species, *L. brevirostris* and *N. blochii* are the new report from the Kerala Coast.

Two types of diversity indices of leiognathid fish biodiversity are discussed are: Dominance Indices, and Information-Statistic Indices. Dominance Indices -Simpson's Index (D) are weighted toward the abundance of the commonest species and considers both the richness and evenness. In this index, 0 represents infinite diversity and 1, no diversity and present study D value is 0.2251. Simpson's diversity index, 1-D- the value of this index ranges between 0 and 1 and greater the value, the greater the diversity and the present study 1-D value is 0.7749.

Information-statistic indices can consider rare species in a community and widely used one is Shannon index (Hs). Values of Shannon index for real communities are often found to fall between 1.5 and 3.5. Thus, the value obtained from the present study (1.678) has no significance. The index becomes useful only while comparing two or more sites. Brillouin index (Hb) an information-statistic index reflects species abundance. It places more emphasis on species richness and is moderately sensitive to sample size (Hb 1.594).

The present study reveals that the fishes of Leiognathidae family infested by four parasitic crustacean species. *L. leiognathi*, *L. secutoris*, *N. multispinosus* (Copepoda) and *C. boscii* (isopoda) were collected from 4 species of fishes. The prevalence, mean and median intensity vary according to the parasitic species. The highest intensity was observed in *L. leiognathi*. These four parasitic crustaceans also showed specific attachment sites apparently to avoid the inter-parasitic competition for space and food. The isopod and Bomolochus species prefer buccal cavity and Lernanthropus strictly specific on gill filaments for their infestation site.

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