Metazoan Parasites Infecting Brackish Water Fishes of Kannur District, Kerala: A Preliminary Study

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Abstract

The brackish water bodies in the northern part of Kerala are renowned for their diverse fish population. The present study includes the collection and identification of brackish water fishes and metazoan parasites infecting them. The fish were collected from Brackish waters of Varam Kadavu and Dharmadam. The collection was made from August 2024 to May 2025. Of the Brackish water fish examined, only 9 genera of fish were infected with metazoan parasites. The encountered parasites include Copepod, Isopod, Monogenea, Digenea, nematode and cestode (larva). The fish *Arius arius*, *Caranx hippos* and *Tenualosa ilisha* exhibited multiple parasitism. *Arius arius* was infected with the metazoan parasitic group, such as monogenea and copepod, *Caranx hippos* with copepod, monogenea, digenea and cestode (larva) and *Tenualosa ilisha* with isopod and monogenea. The 6 genera of examined fish have shown no parasitic infestation.

Introduction

The brackish water environment represents a unique ecosystem of high fertility that supports a rich natural fishery. The brackish water bodies in the northern part of Kerala are renowned for their diverse fish population. A Brackish water ecosystem is an environment found in areas where freshwater from rivers or streams mixes with saltwater from the ocean. This creates water with moderate salinity-more saline than freshwater but less saline than seawater (Gibson et al., 2002; Tanzil et al., 2020). Brackish ecosystems are highly dynamic, nutrient-rich, and extremely productive, supporting a diverse array of plants, fish, birds, and invertebrates that are adapted to fluctuating salinity levels (Schubert et al., 2010). Kerala has been endowed with an expansive body of brackish waters, which include various sectors referred to as backwaters, lakes, lagoons, estuaries, and mangrove swamps. These backwaters have played a significant role in the socio-economic and cultural history of Kerala. (Nandakrishnan & Prasad, 2024).

The brackish water bodies in the northern part of Kerala are renowned for their diverse fish population. However, these fish species are facing a severe threat from the problems posed by

different parasitic groups (Nisha et al., 2021). Brackish water fishes serve as intermediaries in the transfer of parasites between marine and freshwater environments and vice versa (Rekharani and Madhavi, 1985). A detailed knowledge of metazoan parasites' biology and ecology, and the effects of these parasites on their hosts, are of huge importance, even more so today than in the past, due to the ever-increasing role of aquaculture and fisheries in supplying global food demands.

Literature Review

Parasites are ubiquitous and have been recognised as an important component of the ecosystem, and in recent years, the research efforts to document the parasites have increased (Giari et al., 2022). Parasitism affects the viability of host organisms of diverse habitats. They reduce the host fitness in different levels from parasitic castration to modification of host behaviour. (Sasal et al., 1996; Athanassopoulou et al., 1999; Rijin et al., 2018; Nikhila et al., 2019). Further, fish parasites cause commercial losses in both the aquaculture and fisheries industries and may have human health, as well as socio-economic implications, both in developing and developed countries (Hadfield et al., 2012; Moon et al., 2016). A thorough understanding of the diverse effects of fish parasites on their hosts is, therefore, central to the development and maintenance of fisheries worldwide (Poulin, 2011; Swaraj et al., 2025). Many ecologists now recognise that parasitism and diseases are important factors affecting the viability of natural fish populations and communities, and studies have shown that parasites regulate population sizes of their respective hosts (Bruce, 1986; Combes, 1996; Sasal et al., 1996; Hudson et al., 1998; Athanassopoulou et al., 1999; Tompkins et al., 2002; Barber and Poulin, 2002).

Brackish water fish serve as hosts to a wide range of parasites that are taxonomically diverse and exhibit a wide variety of life cycle strategies. Metazoan parasites mainly include Platyhelminthes (flatworms), nematodes (roundworms), acanthocephalans and crustaceans (Kabata, 1985; Rohde, 1994; Nikhila et al., 2019). Many of these parasites are passed directly between ultimate hosts; others need to navigate through a series of intermediate hosts before reaching a host in which they can attain sexual maturity. (Bruce, 1986; Izawa and Choi, 2000). The available literature reveals that the studies on brackish water fishes of the area are limited to investigations on their systematics, economic values, nutritional values and culture potential. In this context, the current study was undertaken to investigate and record the metazoan fauna associated with edible brackishwater fishes of Northern Kerala, employing a multidisciplinary approach.

Design

Collection Site

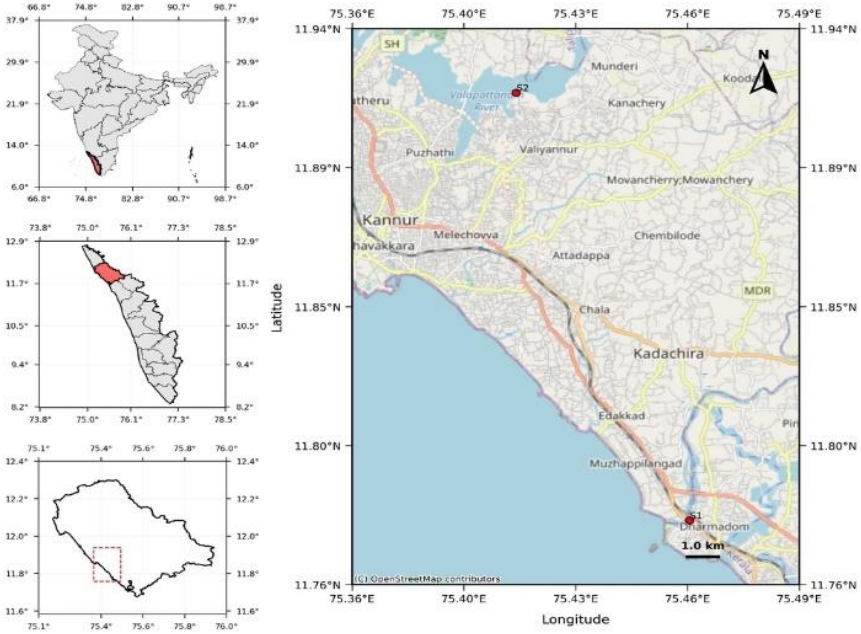


Fig. 1 Map showing the study area

The present study includes the collection and identification of brackish water fishes and metazoan parasites infecting them. The fish were collected from Varam Kadavu and Dharmadam. The collection was made from August 2024 to May 2025. 15 different genera of fish were examined. The fish examined belongs to 12 different families.

Parasitological Studies

Fish were brought into the laboratory in suitable containers. Before the dissection, the length and breadth of the fish were taken, and then a photograph of the same was taken. The fish was identified using FishBase and WoRMS. The method suggested by Kennedy (1979) was used for parasitological studies. First, the fish was observed for ectoparasites such as copepods and isopods; for this, the body surface, fins, gills, eyes and buccal cavity were carefully examined by using a hand lens. Skin scrapings were taken and observed under a microscope for ectoparasites. The obtained copepods and isopods were directly preserved in vials containing 70% alcohol. Gills were carefully removed and transferred to a petri dish containing 0.6% saline solution, then examined for parasites. The parasites attached to the gills were carefully removed by using forceps and a needle, and observed under a microscope after transferring the parasites to a clean slide. The identified parasites were press-fixed using 70% alcohol. For examining the presence of endoparasites, the abdomen was dissected, and each organ was

transferred into a separate petri dish containing 0.6% saline solution. Each organ was carefully observed for parasites. The stomach and intestine were opened longitudinally to dislodge the parasite. Each organ was teased using a needle to locate the parasites. Parasites were isolated by using a glass dropper, forceps or smooth-bristle brushes. After isolation, debris from the parasites was cleared, then it was press fixed and stored in 70% alcohol, and a few were in 5% formalin. Nematodes obtained were mildly heated in 70% alcohol and then press-fixed. The properly pressed fixed specimens were washed in distilled water to remove the alcohol content and then stained with acetocarmine. Each specimen was kept in stain for at least 2 or 3 minutes. The overstained specimens were transferred to acid alcohol to destain. After that, the stained specimens were passed through an alcohol series (30%, 50%, 70%, 90% and absolute) for dehydration and cleaned in xylene. The cleaned specimens were mounted in a clean slide using DPX. Properly stained specimens were observed under the microscope and identified using standard identification literature. Photographs of the stained specimens were taken using a Leica microscope (Labo-med Stereo Triangular Microscope, Model: Luxeo 6z).

Results

A total of 65 individuals of brackish-water fish were analysed. These specimens came from 13 different families and 15 different genera (Table 1). The comparatively low frequency of infection among the studied population was indicated by the fact that only 18 of the fish examined were found to be infected with metazoan parasites. A total of 24 parasites were recovered from the examined fish (Table 2).

Table 1: Details of Brackish water Fishes collected during present study (NFO: Number of fishes observed, NFI : Number of fishes infected**,** + : Presence of parasites, - : Absence of parasites, IMP: Infection with Metazoan Parasites)**.**

Sl no	Name of the Host Fish	Fish Family	NFO	NFI	IMP
1	*Arius arius (Hamilton,1822)*	Ariidae	2	2	+
2	*Caranx hippos* (Linnaeus,1766)	Carangidae	10	4	+
3	*Chelon macrolepes* (Smith,1846)	Mugilidae	5	1	+
4	*Drepane punctata* (Linnaeus,1758)	Drepaneidae	8	0	-
5	*Epinephelus malabaricus*(Bloch &Schneider,1801)	Epinephelidae	1	1	+
6	*Escualosa thoracata* (Valenciennes,1847)	Dorosomatidae	3	0	-
7	*Etroplus suratensis* (Bloch,1790)	Cichlidae	4	0	-

8	*Johnius carutta* (Bloch, 1793)	Sciaenidae	7	0	-
9	*Mugil cephalus* (Linnaeus,1758)	Mugilidae	5	2	+
10	*Mystus tengara* (Hamilton,1822)	Bagiridae	2	2	+
11	*Nematalosa nasus* (Bloch, 1795)	Dorosomatidae	5	3	+
12	*Pomadasys furcatus* (Bloch & Schneider,1801)	Haemulidae	3	2	+
13	*Sillago maculata* (Quoy&Gaimard, 1824)	Sillaginidae	5	0	-
14	*Tenualosa ilisha* (Hamilton,1822)	Dorosomatidae	2	1	+
15	*Terapon jarbua* (Forsskal, 1775)	Teraponitidae	3	0	-

In detail, both ectoparasites and endoparasites were found in *Caranx hippos*, which are members of the Carangidae family and exhibit a relatively high level of infection. A total of ten *Caranx hippos* were inspected, of which four were infected with metazoan parasites. Likewise, fish from the Dorosomatidae and Mugilidae families also showed a relatively high level of infection. Copepod infestation was observed in *Caranx hippos* and *Arius arius*. Of the total fish examined, only *Caranx hippos* were infected with digenea. Nematode infection was seen in *Mystus tengara, Pomadasys furcatus, and Epinepheles malabaricus.* Cestode larvae were observed in *Chelon macrolepis* and *Caranx hippos.* Multiple parasitism was exhibited by *Caranx hippos, Nematalosa nasus,* and *Tenualosa Ilisha* (Table. 2).

Table 3: Details of Metazoan Parasites infecting Brackish water fishes during the present study

Sl no	Infected Fish Host	Fish family	Recovered parasite group	Site of infestation
1.	*Mystus tengara* (Hamilton, 1822)	Bagiridae	Nematode	Intestine
2.	*Mugil cephalus* (Linnaeus,1758)	Mugilidae	Monogenea	Gills
3.	*Caranx hippos* (Linnaeus,1766)	Carangidae	Copepod Monogenea Digenea Cestode larva	Gills Gills Intestine Intestine
4.	*Pomadasys furcatus* (Bloch & Schneider,1801)	Haemulidae	Nematode	Intestine
5.	*Tenualosa Ilisha* (Hamilton,1822)	Dorosomatidae	Isopod	Branchial cavity

			Monogenea	Gills
6.	*Epinephelus malabaricus* (Bloch &Schneider,1801)	epinephelidae	Nematode	Intestine
7.	*Chelon macrolepis* (Smith,1846)	Mugilidae	Cestode larva	Intestine
8.	*Arius arius* (*Hamilton,1822*)	Ariidae	Copepod Monogenea	Gills
9.	*Nematalosa nasus* (Bloch, 1795)	Dorosomatidae	Monogenea	Gills

Discussion

Studies revealed that brackish water fishes have a rich metazoan parasite fauna. In *Arius arius,* nematode parasites from the gastrointestinal tract were recorded. During the present study period, a crustacean parasite, *Caligus* sp. and monogenea were obtained from the gills of the *Arius arius*. The examined *A. arius* shows a complete absence of endoparasites (Sattar et al., 2016). *Caranx hippos* was one of the fish that exhibited multiple parasitic infections. Two types of monogenea and a *caligus* sp were present in the gills of the host fish. In addition to digenea, a cestode larva was also obtained as an endoparasite. In 2001, Luque & Alves recovered metazoan parasites in *C. hippos. Caligus robustus,* a copepod parasite and monogenean, *Cameocotyle carangis,* were reported.

The presence of nematode parasites was observed in the intestine of *E. malabaricus*. No other endoparasites or ectoparasites were present. Selvakumar et al (2015) reported *Phillometra sp,* which is a nematode that normally infects the gonads. Two different species of the monogenean genus *Pseudorchabdosynochus* were recovered by Justine & Sigura (2007). During the present study, no ecto or endo parasites were obtained from the fish *J. carutta* but Nadzari (2007), documented ectoparasites like Monogenea and copepods infecting the gills of the fish. This shows the role of geographical variation in metazoan parasite infection.

The result of the present study showed that the collected brackish water fishes harboured parasitic fauna that included representatives of Copepod, Isopod, Monogenea, Digenea, Nematode and Cestode (larva). When comparing with the previous reports, the examined fish shows low diversity of parasites only in terms of number. The low diversity of parasites in the sample fish may be due to climate changes, differences in the region and this should be addressed in future studies.

Conclusion

The present study was conducted to analyse the fish diversity and the metazoan parasites infecting brackish water fishes of Dharmadam and Varam Kadavu, Kannur. 15 different genera of fish were examined. The fish examined belongs to 12 different families, namely Ariidae, Carangidae, Mugilidae, Drepaenidae, Epinephelidae, Dorosomatidae, Cichlidae, Sciaenidae, Bagiridae, Haemulidae, Sillaginidae, and Teraponitidae. Of the fish examined, only 9 genera of fish were infected with metazoan parasites. The encountered parasites include Copepod, Isopod, Monogenea, Digenea, nematode and cestode (larva). *Arius arius*, *Caranx hippos* and *Tenualosa ilisha* exhibited multiple parasitism. *Arius arius* was infected with the metazoan parasitic group, such as monogenea and copepod, *Caranx hippos* with copepod, monogenea, digenea and cestode (larva) and *Tenualosa ilisha* with isopod and monogenea. The 6 genera of examined fish show no parasitic infestation. The present study reveals that the examined fish exhibits relatively low parasitic infestation. The presence of parasites in examined fishes indicates that the fish in this region are suitable hosts for them. Factors determining observed infection characteristics are typically complex and may be based on a variety of factors, including morphological, physiological, behavioural, immunological, genetic or nutritional. So the future research may be focused in such a way to demonstrate the role of host biology on metazoan parasite infection rate, the gathered information would be useful to adopt the strategies for the management of crustacean parasitism in culture fisheries.

Acknowledgments

The authors gratefully acknowledge the fishermen of Dharmadam and Varam Kadav for their support in sample collection. The authors would like to thank the faculty members of the Department of Zoology, Sree Narayana College, Kannur, for their support during the period of study.

Author's Contribution

AK is the main worker on the topic and prepared the draft of the manuscript. RK drew out the concept, supervised the work and corrected the manuscript. All authors read and approved the final manuscript.

Conflicts of interest/Competing interests: None

Availability of data and material: N/A

Code availability: N/A

Ethics approval: N/A

Consent to participate: All the authors have agreed to the submitted version of the manuscript

Consent for publication: All the authors have given their consent for the publication of the manuscript

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