Prevalence of Enteroparasites in Selected Fish Species

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Abstract- Prevalence of enteroparasite in three indigenous fish species *Anabas testudineus*, *Heteropneustes fossilis*, and *Mystus gulio* from six different regions of Vembanad Lake was studied. About 15 species of parasites were identified from the alimentary canal of observed fish hosts. Of the 15 parasites identified, five of them comprised trematode worms; six of them comprised nematode worms, one acanthocephalon, one Ciliophora, one crustacean and one Myxozoa. Most of the parasites were observed in the intestine of host fish. Crustacean *Noto diaptomus* and nematode *Huffmanella sp* were present in both stomach and intestine. The nematodes *Ascaridida sp* and *Centrocestus canius* were present in their larval stages. Other parasites were in their adult stage. *Anabas testudineus* had the highest parasitic prevalence. All the observed specimens of *Anabas testudineus* were infected with *Camallanus anabantis* and *Capillaria sp.* All of *Heteropneustes fossilis* showed infestation of *Capillaria sp*. Entire *Mystus gulio* was infected with *Myxozoa sp. Acanthocephalon Pallisentis sp.* was present in all the three host species. Highest mean abundance was exhibited by *Myxozoa sp* in *M. gulio.* Greatest mean intensity was exhibited by *Parascarophis sp* in *A. testudineus.*

Index Terms- acanthocephalon, enteroparasite, mean abundance, prevalence, trematode

I. INTRODUCTION

India's inland fishery resources are acclaimed for their fish diversity and their spectacular productive potential. Kerala is gifted with a vast expanse of inland waters like rivers, canals, estuaries, lakes, ponds, tanks, *etc.* and they always attracted attention for its fish production. It has been recognised as a powerful income and employment generator. Fish diseases form the most serious limiting factors in fishery sector and they act as prime cause for poor growth and severe mortality that affects the fish yield and its marketability. Since fishes are prime source of protein they act as carriers of parasites and intermediate host of various parasites (Luangphai, 2004). Previous research studies on fish parasites regularly reported the presence of protozoans, myxozoans, monogeneans, digeneans, larval cestodes and ectoparasitic crustaceans in fish (Das, 2002; Mondal *et al.*, 2014).

It is believed that parasites are as important as their host fish. Even though fishes are good source of quality protein, but their various diseases due to parasitic infections raise threat to culture fish (Yooyen *et al.*, 2006). MacKenzie (1999) opined that parasites can signal information about environmental pollution. Heavy endoparasitic infestations impede the normal growth of fish. Heavily infested fishes were posed to food deterioration and ultimately leading to their death (Gupta *et al.*, 1953). Bashirullah (1972) succeeded in locating *Encredium dacci*, *Camallanus adamsia*, *Camallanus ophicephali*, *Pallisentis* sp. in the intestine of *Channa sp.* and *Genarchopsis* sp. in the stomach. Chowdhury (1992) was also able to recover these parasites except the helminthes *Genarchopsis* sp. Intestinal parasites infect the liver of the host fish and inhibit digestive activity by inhibiting vitamin and blood sugar metabolism and finally affecting their growth (Rohde, 1993).

Liang-Sheng,(1960), Bychowsky (1962), Shomorendra and Jha (2003), Gambhir *et al.* (2006), Geetarani *et al.* (2010, 2011), Sangeeta *et al.* (2010, 2011), Ghani and Bhuiyan (2011) and Ghani *et al.* (2014) studied the community structure of endoparasitic helminths in various host fishes. Ejere *et al.* (2014) studied parasitic fauna in five fishes in Nigerian fresh water ecosystem. Jyrwa *et.al*. (2016) made a checklist of helminth parasites on edible fishes of Northeast India. Mohammed *et al.* (2017) studied the haematology of fish to analyse the intensity of parasitic infection.

Parasites are ubiquitous, primarily surviving in a dynamic equilibrium with their host and they are often overlooked in fish health assessments. Changes in the environment, both anthropogenic and environmental, can alter the parasite/host equilibrium and cause disease or mortality in fish. Therefore it is imperative that one should have knowledge of both parasites and parasitic communities within a host fish population. With the increasing attention in aquaculture throughout the world, parasitic infestation are treated as one of the major threats for fish health management and aquatic crop production.

In the present study an attempt was made to analyse the enteric parasites in three edible fish species *viz. Anabas testudineus*, *Heteropneustes fossilis* and *Mystus gulio* collected from Vembanad Lake.

II. MATERIALS AND METHODS

The fish hosts were randomly sampled (n=100) from each species. Selected species were *Anabas testudineus*, *Heteropneustes fossilis* and *Mystus gulio*. Pithed fish were examined for parasites in three regions of alimentary canal (1) mouth and the buccopharyngeal cavity, (2) stomach from gullet to the pylorus, and finally (3) the intestine. The parasites collected were identified and preserved and photographed for further studies. Prevalence, Mean Intensity, Abundance or Relative Density was determined using the statistical method given by Margolis *et al.* (1982) and presented in percentage.

III. RESULT

A total of 100 fishes from each fish species was observed for the enteroparasitic infestation. About 15 species of parasites were identified from the alimentary canal of observed fish hosts (Table 1). Of the 15 parasites identified, five of them comprised trematode worms; six of them comprised nematode worms, one acanthocephalon, one ciliophora, one crustacean and one myxozoa.

Most preferred habitat for these parasites in the host body was intestine. However, two parasites (crustacean *Noto diaptomus* and nematode *Huffmanella sp)* were found in intestine as well as stomach. Out of fifteen parasites, the nematodes *Ascaridida* sp and *Centrocestus canius* were at their larval stages. Other parasites were at their adult stage. *Anabas testudineus* exhibited twelve parasites, *Mystus gulio* was infected with five parasites whereas *Heteropneustes fossilis* contained only three parasites.

Table 2 depicts the prevalence of parasitism in three fish species. All the three host species showed 100% parasitic prevalence. All the observed *Anabas testudineus* were infected with *Camallanus anabantis* and *Capillaria* sp. All of *Heteropneustes fossilis* showed infestation of *Capillaria* sp. Entire *Mystus gulio* was infected with *Myxozoa sp*.. Acanthocephalon *Pallisentis sp.* was present in all the three host species.

Highest mean abundance (Table 3) was exhibited by *Myxozoa sp* (2000) in *M. gulio* followed by *Camallanus anabantis* (686.66) in *A. testudineus* and *Capillaria* sp (520) in *H. fossilis.* Least mean abundance was delineated by *Notodiaptomus* (5) in *M.gulio*.

Greatest mean intensity (Table 4) was exhibited by *Parascarophis sp.* (3000) in *A. testudineus* followed by *Myxozoa sp.*(2000) in *M.gulio.* Least mean intensity was exhibited by *Rhabdochona sp* (164.28).

IV. DISCUSSION

The biotic robustness of an ecological system often reveals the health of organisms occupying that system. In an aquatic ecosystem, those species that occupy the top of food chain like fish are generally regarded as symbol of overall system health. Parasitic infections in fishes are exceptionally regular, especially in wild population of diverse aquatic environments, where ecological requirements for intermediate hosts and parasite transmission are met. Parasitism affects the fishery industry by different ways such as retarding growth, mechanical injury, reproductive damage etc., which brings a huge economic loss. Along with fishery, it can also reduce the population of different animals, which are the final host of the parasite including human being.

Carnivorous fish generally noted for their rich parasite faunas than the herbivorous forms in both natural and culture systems (Beevi and Radhakrishnan, 2012). This corroborates the findings of the present study, in which all the three host fishes were carnivorous and they showed high abundance of parasites. The highest prevalence and mean abundance of parasitic manifestation was observed in *A. testudinus*. This might be due to its high predacious feeding habit and its habitat. The high prevalence of nematode and trematode parasite may be due to the fact that their intermediate host *viz*. Copepods form the chief diet of *A. testudineus* (Esch *et al.*,1990; Nmor *et al*., 2004; Iyaji *et al*., 2009; Lagrue *et al*., 2011).)

The recovery of intestinal nematode *Camallanus anabantis* from *A. testudineus* in the present study was corroborated by the resulst of earlier studies (Aruna *et al.*, 2011; Ranibala *et al.*, 2013; Das and Goswami, 2014; Bhuiyan *et al.* 2014). Even though earlier studies reported this parasite species in other fish species also (Soota, 1983), in the present study it was present only in *A.testudineus*.

Extensive array of protozoan form most commonly encountered metazoan as fish parasites (Klinger and Floyd, 2002). Both ecto and endo-parasitic protozoa cause damage to fish, by tearing down the skin and gill epithelium, hence even moderate protozoan infection was fatal to the host (Reda, 2011). Present investigation encountered a Ciliophora, *Trichodina* sp. in the buccal cavity of *A.testudineus*, even though they are considered as ectoparasites.

Digenean parasites prefer mucosa and epithelial tissue, hence, they will be clustering in the intestine, where the epithelial turnover rate is at its maximum (Crompton, 1973). Results of this earlier study endorse the presence of two digenean parasites in the posterior part of the gut in this study. The possession of thick cuticle by nematode larvae justifies their occurrence in the stomach, which equip them to tide over the harsh conditions while moving through the stomach to complete their life cycle.
Variations in composition, prevalence, abundance and intensity exhibited by parasites in the present study can be associated to factors such as host specificity, physico-chemical properties of water, metabolic state and weak immune system of fish. Accessory respiratory organ empower *A. testudineus* to survive in extremely unfavourable water. This accounts for abundance of parasites in *A. testudineus* when compared to the other host species.

V. CONCLUSION

Prevalence of enteroparasite on three species of fish from six different regions of Vembanad Lake was studied to identify the diversity of enteroparasite. About 15 species of parasites were identified from the alimentary canal of observed fish hosts. Of the 15 parasites identified, five of them comprised trematode worms; six of them comprised nematode worms, one acanthocephalan, one ciliophora, one crustacean and one myxozoa. Most of the parasitic diversity was observed in the intestine of host fish. Crustacean *Noto diaptomus* and nematode *Huffmanella sp.* were found to be present in both stomach and intestine. The nematodes *Ascaridida sp.* and *Centrocestus canius* were present at their larval stages. Other parasites were in their adult stage. *Anabas testudineus* had the highest parasitic prevalence. All the observed *Anabas testudineus* were infected with *Camallanus anabantis* and *Capillaria sp*. All of *Heteropneustes fossilis* showed infestation of *Capillaria sp*. Entire *Mystus gulio* was infected with *Myxozoa sp*. Acanthocephalon *Pallisentis sp*. was present in all the three host species. Highest mean abundance was exhibited by *Myxozoa sp*. in *M. gulio*. Greatest mean intensity was exhibited by *Parascarophis sp*.in *A. testudineus*.

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Table I: Intensity of enteroparasites in host fishes

PARASITE SPECIES / HOST SPECIES N=100	*C.canius*	*S.falcatus*	*C..anabantis*	*N.diaptomus*	*Trianchoratus sp*	*Huffmanella sp*	*Capillaria sp*	*Pallisentis sp*	*Rhabdochona sp.*	*Trichodina sp*	*Ascaridida*	*Myxozoa sp*	*Acanthostomum sp*	*Acetodextra sp*	*Parascarophis sp*
Anabas testudineus	+ 260/18	+ 14/6	+ 687/100	+ 9/4	+ 7/4	+ 84/22	+ 485/100	+ 122/41	+ 46/28	+ 64/14	–	–	+ 24/6	–	+ 180/6
Heteropneustes fossilis	–		–	–	–	–	+ 520/100	+ 152/38	–	–	–	–	–	–	+ 78/5
Mystus gulio	–		–	+ 3/2	–	–	–	+ 24/12	–	–	+ 90/13	+ 2000/100	–	+ 144/18	–

+, Presence of parasite; numerator: number of parasites recovered; denominator: number of infected fish.

Table II: Prevalence (%) of enteroparasites in host fishes

PARASITE SPECIES / HOST SPECIES N=100	***C.canius***	***S.falcatus***	***C..anabantis***	***N.diaptomus***	***Trianchoratus sp***	***Huffmanella sp***	***Capillaria sp***	***Pallisentis sp***	***Rhabdochona sp.***	***Trichodina sp***	***Ascaridida***	***Myxozoa sp***	***Acanthostomum sp***	***Acetodextra sp***	***Parascarophis sp***
Anabas testudineus	30	10	100	6.66	6.66	36.66	100	68.33	46.66	23.33	–	–	10	–	10
Heteropneustes fossilis	–	–	–	–	–	–	100	63.33	–	–	–	–	–	–	8.33
Mystus gulio	–	–	–	3.33	–	–	–	20	–	–	21.66	100	–	30	–

Table III: Mean abundance of enteroparasites in host fishes

PARASITE SPECIES / HOST SPECIES N=100	*C.canius*	*S.falcatus*	*C..anabantis*	*N.diaptomus*	*Trianchoratus sp*	*Huffmanella sp*	*Capillaria sp*	*Pallisentis sp*	*Rhabdochona sp.*	*Trichodina sp*	*Ascaridida*	*Myxozoa sp*	*Acanthostomum sp*	*Acetodextra sp*	*Parascarophis sp*
Anabas testudineus	1444.4	283	686	225	175	381.8	485	297	164.28	457.14	–	–	400	–	3000
Heteropneustes fossilis	–	–	–	–	–	–	520	253	–	–	–	–	-	-	1560
Mystus gulio	–	–	–	150	–	–	–	200	–	–	692	2000	–	800	–

Table IV: Mean intensity of enteroparasites in host fishes

PARASITE SPECIES / HOST SPECIES N=100	***C.canius***	***S.falcatus***	***C..anabantis***	***N.diaptomus***	***Trianchoratus sp***	***Huffmanella sp***	***Capillaria sp***	***Pallisentis sp***	***Rhabdochona sp.***	***Trichodina sp***	***Ascaridida***	***Myxozoa sp***	***Acanthostomum sp***	***Acetodextra sp***	***Parascarophis sp***
Anabas testudineus	433	23.33	686.66	15	11.66	140	485	203	76.66	106.6	–	–	40	–	300
Heteropneustes fossilis	–	–	–		–	–	520	253.33	–	–	–	–	–	-	130
Mystus gulio	-	–	–	5	–	–	–	40	–	–	150	2000	–	240	–