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Prevalence of helminth parasites infecting *Mastacembelus armatus* (Lacepède, 1800) from different rivers of Mizoram, northeast India

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Abstract

The study deals with the prevalence of helminth parasites in *Mastacembelus armatus*, a spiny eel, collected from the rivers of Mizoram. The study gives the first overview on the helminth community infecting *M. armatus* in the rivers of Mizoram and reveals the presence of nematode, cestode and trematode. The cestodes recovered belongs to the genus *Senga* sp. and *Bothriocephalus* sp. whereas the nematode belong to the genus *Spinitectus* sp., *Neocamallanus* sp., *Capillaria* sp. and *Eustrongylides* sp. and the trematode *Clinostomum* sp. Nematode was found to be the most predominant parasitic group followed by cestode and the trematode respectively. The Tuikum and Tuirial rivers flowing near the garbage dumping ground show the maximum diversity with all the three group of parasites present. Among the helminth parasite recovered the nematode *Capillaria* sp. and the trematode *Clinostomum* sp. are both considered potential zoonoses.

Key words: M. armatus; Helminth parasites; Nematode; Cestode; Trematode.

Introduction

Fish is regarded as the cheapest source of protein among the urban and rural populace and they are extensively used as a protein-rich diet for humans.[1] A majority of fishes carry heavy infection of parasites, which causes deterioration in the food value of fish and may even result in their mortality. As much as 30,000 helminth species have been estimated to be parasites of fishes, many of which are known to be serious menace to their hosts. Helminth parasites are important not only because they cause fish diseases but also because they are an essential component of global biodiversity.[2] Many of the helminth parasites are a matter of major public

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health concern, especially in Asia, as they can be transmitted to humans and domestic animals only through fish.[3] Most parasitic infections acquired from raw fish involve helminths cestodes (tapeworms), trematodes (flukes), or nematodes (round worms). In recent years diseases transmitted by fish have probably become more widely distributed and have greater economical and medical impacts than recognized earlier.[4] People eating raw, lightly smoked, lightly salted, dried or pickled fish are most susceptible to helminth infection. In India, like most tropical countries, several parasitic infections are part of everyday life. Similarly, in Northeast India traditional food practices and culinary habits of many native societies are in harmony with those of the neighbouring Near East countries, therefore, several helminth infections have been reported to occur. The feeding pattern of fish is an important factor in their infestation with parasites. According to Luque and Poulin[5], predatory fish species harbor a greater diversity and abundance of larval helminths than herbivorous and planktivorous species. Predatory fish are exposed to more infective helminth larvae in their diet; thereby making them more susceptible to higher parasite colonization than phytophagous and planktivorous fish. Mastacembalid species are found at high altitude as well as low land in both still and running water.[6] They are voracious feeder and forages at night on benthic insect larvae, worms and some submerged plant material thus making them more susceptible to helminth infections.[7]

A wide range of parasitic infections of fresh water fishes have been studied from various parts of India. In recent past, many workers[8-16] have observed the prevalence, intensity and abundance of helminth parasites in fishes. Such kind of work is lacking on *Mastacembalus armatus* collected from the three river drainages of Mizoram. As fishes constitutes an important part of the diet of the people of Mizoram and *M. armatus* being one of the most common freshwater fishes consumed, it is, therefore, essential that a thorough investigation on the helminth parasites associated with fishes need to be undertaken.

Keeping in mind the aforesaid statement, the present investigation was undertaken to study the parasitic community, prevalence, intensity and abundance of helminth parasite in *M. armatus* from Mizoram.

Materials and Methods

Study area

The state of Mizoram is situated in the southern part of northeastern India covering an area of 21,081 km^2 with maximum height of 2,743.90 approx., bordering Bangladesh in the south-west and Myanmar in the east having the Tropic of Cancer passing through it. The major rivers of Mizoram are the Tuirial, Tlawng, Tuirini, Tuivai, Mat, Kolodyne, Tuichong, Karnafuli and Serlui. The major rivers of Mizoram could be categorized under three major drainage system[17], viz. Barak-Meghna drainage system, Indo -Bangladesh; Kolodyne (Kaladan) drainage system, Indo-Myanmar; and Tuichong-Karnafuli drainage system, Indo-Bangladesh.

Survey and collection of fish hosts

A survey and collection of fishes was done using cast net and other local method from different rivers of Mizoram and its tributaries.

Recovery of the parasites

Fishes collected from different collection site were brought to the laboratory for examination. The external body surface and organs such as gills, eyes, scales, fins, buccal cavity etc were examined for the presence of ectoparasites, the peritoneal lining of the body cavity, the internal organs such as heart, lungs, liver, gall bladder, spleen, stomach, intestine, swim bladder, kidneys, gonads, viscera, mesenteries etc. were examined thoroughly for recovery of the helminth parasites. The parasites recovered were duly processed for suitable whole mount preparations

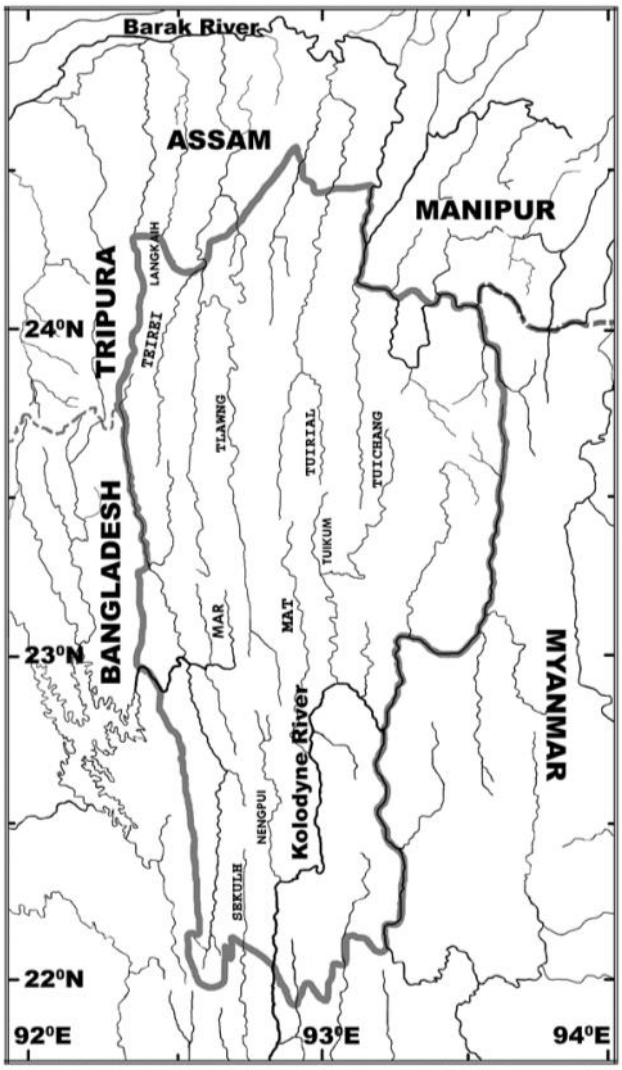

Figure 1. Location of collection sites in Mizoram

following standard procedures.

Light microscopy

Monogenea, trematodes, cestodes and Acanthocephala: The freshly recovered parasites were washed in saline solution. They were gently flattened between a glass slide and a cover slip and fixed overnight in 70 % ethyl alcohol. Whole mount preparations were made by staining in Borax carmine or Meyer's carmalum, dehydrating through ascending grades of alcohol, clearing in methyl benzoate and finally mounting in Canada balsam.

Nematodes: The recovered worms were stretched and fixed in warm 70 % alcohol. For permanent mounting, the alcohol-fixed worms were cleared in ascending grades of glycerine till pure glycerine and finally double mounted using Kaiser's glycerine jelly (50 ml water + 80 g gelatine + 50 ml glycerol + 0.1 g phenol); for temporary mounting, the specimens were immersed in

lactophenol (20 ml lactic acid + 20 ml phenol + 40 ml glycerine + 20 ml distilled water) overnight and temporarily mounted using the same solution on the glass slide. The permanent slide were observed and studied under Motic SMZ-140 microscope, generic identification of the parasites was done following standard reference works.

Obervations were recorded to calculate the prevalence and intensity of helminth infection in the fish hosts. The parasitological terminology of Bush *et al.*[18] has been used.

Results and Discussion

A total of 186 *Mastacembelus armatus* were collected in between October 2014 to April 2016 from 12 different rivers of Mizoram (Fig 1). Altogether, 130 fishes were found to be infected with either one of the helminth parasites and a total of 700 parasites were collected in the present studies. The survey results revealed the presence of nematodes, cestodes of the pseudophyllidean group and trematodes. Nematode was found to be the predominant group and shows 100% prevalence in the fishes collected from Langkaih, Ngengpui, Muthi, Mar, Sekulh, Teirei, Tuikum rivers followed by cestode. The trematodes form the least prevalent and were collected from only four rivers (Fig. 2). The cestodes recovered belong to the genus *Senga* sp. and *Bothriocephalus* sp. whereas the nematodes belong to the genus *Spinitectus* sp., *Neocamallanus* sp., *Capillaria* sp. and *Eustrongylides* sp., and the trematode of *Clinostomum* sp. The overall prevalence of helminth parasites was found to be quite high in the fishes collected from Langkaih, Ngengpui, Muthi, Mar, Sekulh, Teirei and Tuikum with all of these rivers showing 100% prevalence. The lowest prevalence observed in Mat River (28.5%) may be attributed to small sample size. Mean intensity and Abundance was found to be highest in river Mar (32.56) and lowest in river Tuichang (1.67, 1) (Table 1). The parasites recovered from the Tuirial and Tuikum rivers shows the most diverse group with all the three group of parasites recovered. It was also observed that the prevalence intensity and abundance of the parasite also varied in the fishes depending on the different sampling sites. Two parasites *Capillaria* sp. and *Clinostomum* sp. reported in the present study are both a potential zoonotic parasites.

The present study gives the first overview on the helminth parasites infecting *Mastacembelus armatus* in the rivers of Mizoram. The study ob-

Table 1. Overall Prevalence, mean intensity and abundance of parasite in different rivers of Mizoram.

Collection sites	No of host collected	No of host infected	Prevalence (%)	Mean Intensity	Abundance
Chhimtuipui	15	10	66.7	10	6.67
Langkaih	2	2	100	5	5
Ngengpui	1	1	100	14	14
	1	1	100	6	6
Mat	7	2	28.5	1.5	0.42
Mar	9	9	100	32.56	32.56
Sairang	29	15	51	2.13	1.10
Sekulh	10	10	100	3.6	3.6
Teirei	2	2	100	3.5	3.5
Tuichang	10	6	60	1.67	1
Tuikum	2	2	100	18	18
Tuirial	98	70	71	2.18	1.56

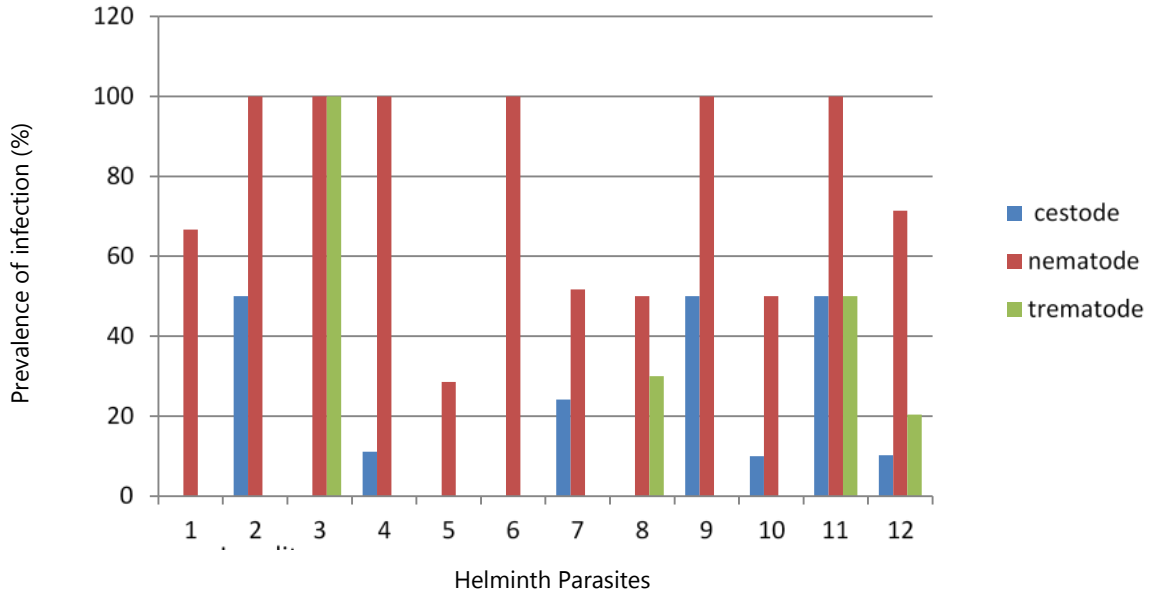

Figure 2. Prevalence of cestode, nematode and trematode in *M. armatus* from different rivers of Mizoram.

served that the nematode is the predominant group of helminth recovered from the spiny eel fish host followed by cestode and trematode. It is evident here that the recovery of the group of parasites may not similar in different region as Dhole *et al.*[19] reported a high incidence of trematode and cestode with nematode being the least encountered in Marathwada region.[19] Further, Vankara *et al.*[20] observation on the parasitic fauna of *M. armatus* reported that digenean was the predominant species and the nematode being the minimum prevalence. Only two species of cestode have been reported in the present studies such as *Senga* sp. and *Bothriocephalus* sp. Patil *et al.*[21] studied the prevalence and density of cestode parasites in *M. armatus* in Sangli district of Maharashtra; the cestode parasites recovered were *Circumonchobothrium* and *Senga* with their prevalence and density of infection were 31.66% and 0.45% respectively.

It is interesting to note that the river Tuirial which flows near the human settlement, and also near the city dumping ground, tends to harbour more diverse group of parasite with mostly all the three group of parasites present in a single host. This is in agreement with Moller and Anders[22] who concluded that fish from more polluted water tend to harbour more helminth parasites than those from less polluted waters. As was observed in the present studies the prevalence, intensity and abundance also varied with different rivers from which the fish was collected. Polanski[23] summarised that the main factors determining the variety of parasite fauna as well as the intensity and incidence of infection can depends on the diet of the host, lifespan of the host, the mobility of the host throughout its life including the variety of habitats it encounters, its population density and the size attained, large hosts provide more habitats suitable for parasites than do small ones. During this study, *Mastacembalus armatus* was taken into account as it was the most heavily infected of all the fish that we have collected due to their voracious feeding habit and forages at night on benthic insect larvae, worms and some submerged plant material thus making them more susceptible to helminth infections.[7]

Woolhouse[24] estimated that 75% of emerging human pathogens are zoonotic. Forty to fifty million people worldwide are infected with foodborne trematode (FBTs) infections alone.[25,26]

Though still not able to identify at the species level, both *Capillaria* sp. and the trematode *Clinostomum* sp. are potential candidate for zoonosis. It is worth mentioning that *C. complanatum* is considered as the potential fish-borne zoonotic trematode (FBT). The metacercaria of *C. complanatum* are also important in the view of fish-borne zoonosis as there were also reports of human infection, due to consumption of not properly cooked infected fishes.[27-29] Therefore, in view of prevalent culinary practices and food habits of the natives, *Capillaria* sp. and *Clinostomum* sp. emerged as the only potential zoonosis and warrants a thorough epidemiological study in suspected focal areas of infection in the region.

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