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Distribution of Helminth parasites in different Organs and their seasonal rate of infestation in three Freshwater Fishes of Goalpara, Assam, India

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Abstract

The present study was conducted to identify and determine the organal distribution along with prevalence and intensity of infestation brought about by the helminth parasites in Anabas testudineus (Bloch), Colisa fasciata (Bloch and Schneider) and Trichogaster lalius (Hamilton) from three wetlands of Goalpara district, Assam during a period of Feb 2012 to March 2013. A total of 14 helminth parasites (7 trematodes, 6 nematodes and 1 acanthocephala) were detected from different digestive organs with the highest rate of infestation from intestine (74.4%, 59.5% and 45.6% viz. in A.testudineus, C.fasciata and T.lalius). The study reveals that helminthes show seasonality in prevalence, mean intensity and abundance of infestation. Irrespective of host the prevalence was maximum (63.9%, 65.9% and 66.5% in three host fishes) during pre-monsoon and minimum (43.7%, 52.4% and 44.4%) during monsoon while the intensity of infection was highest during monsoon. Density of infection or abundance was minimum during retreating monsoon while the value is approximately equal for entire three host species during rest of the seasons.

Keywords: Helminthes, infestation, prevalence, intensity, abundance, wetland, Goalpara.

Introduction

Fishes are good source of quality protein, but various diseases including parasitic infections pose a threat to fish culture[1]. Helminth parasites are hazardous to a number of fish species in every type of water body. Each helminthes parasite species prefer to live in a definite zone of the microhabitats, though some can migrate to the other organs, which are normally not their usual site of infection. Parasite interfere with nutrition, metabolism and secretory function of alimentary canal, damage nervous system[2] and even upset the normal reproduction of the hosts[3]. The present study attributes towards the rate of infestation in different organs of fish and their prevalence, mean intensity along with abundance in different seasons. Extensive damage caused by helminth parasites on fish organs indirectly effect its growth, development and reproduction and thus, may leads to further decline in the population of the host fish. Heavy infestation of endoparasites interrupts the normal growth of fish. Injured fishes carry heavy parasitic infection which detoriate their food and that may be the ultimate cause of their mortality[4]. Basirullah[5] worked on *Channa marulius, Channa striatus, Channa punctatus, Channa gachua* of Dhaka and showed that *Encredium dacci, Camallanus adamsia, Camallanus ophicephali, Pallisentis* sp. were located in the intestine and *Genarchopsis* sp. in the stomach of these host fishes. Chowdhury[6] also found these helminths in the same organ of these snakehead fishes except the helminthes *Genarchopsis* sp. which was found to be infesting the median and posterior region of intestine as well as a few nematodes in the body cavity. Intestinal parasites inhibit digestive activity inducing inhibition of vitamin and blood sugar metabolism and finally growth as well as glycogen metabolism by infecting the liver of the host fish[7]. Frequency of infestation and distribution of parasites within different organs of the fishes is influenced by age and diet of the fish and abundance of parasites within the host fish[8]. An attempt has been made to assess the organal distribution of helminthes and their seasonal variation of infestation in three host fishes viz. *Anabas testudineus* (Bloch), *Colisa fasciata* (Bloch and Schneider) and *Trichogaster lalius* (Hamilton).

Material and Methods

Twenty specimens of *A. testudineus, C. fasciata* and *T. lalius* were collected each month from three wetlands (Beels) adjacent to the mighty Brahmaputra of Goalpara district, Assam during a period from Feb 2012 to March 2013. Each fish was individually dissected and examined for the presence of parasites separately in body cavity, mesentery, intestine, liver, peritoneal wall, rectum, gills, head and muscle by adopting the methods employed by Mayer and Olsen[9], Cable[10], Madhabi *et al.*[11] Digenean trematodes were fixed in AFA solution (Alcohol-85 ml, formalin-10 ml, acetic acid- 5ml). Lectophenol was used to clear the nematodes and permanent slides were made according to Gibson[12]. Identification was carried out by morphological examination, as described by Yamaguti[13] and Soota[14]. On the basis of regional climatological changes the seasonal variation of parasites were studied by dividing the seasons as Pre-monsoon (PRM, March to May), Monsoon (MON, June to August), Retreating monsoon (RTM, September to November) and winter (WIN, December to February).

Statistical Analysis: Ecological terms such are studied as per Margolis *et al*[15].

$$\text{Prevalence} = \frac{\text{Total No.of Hosts Infected} \times 100}{\text{Total No.of Hosts Examined}}$$

$$\text{Mean Intensity} = \frac{\text{Total No.of Parasites}}{\text{Total No.of Infected Hosts Examined}}$$

$$\text{Abundance or Relative Density} = \frac{\text{Total No.of Parasites}}{\text{Total No.of Hosts Examined}}$$

Results and Discussion

A total of 14 different species of helminth parasites were recorded from three hosts (table 1). The parasites were mainly found in the digestive organs. The highest percentages of parasites were found in the intestine of the host fishes 32.9% (in *A. testudineus*), 53.5% (in *C. fasciata*) and 24% (in *T. lalius*) (table 1). The number of individual species of parasites was high (06) in the intestine of *C. fasciata.* Some species were found specifically in an organ while others were found in more than one organ. Same result was found by D'Silva *et al*[16]. Percentage of infestation in liver along with spleen is 9.9% in *A. testudineus* and 20.4% in *T. lalius.* 32.5% (*A. testudineus*) and 20.7% (*T. lalius*) of helminthes infest intestine simultaneously with pyloric caeca. *A. testudineus* is not infested by the single acanthocephalan species (*Pallisentis opheocephali*) collected during the study while it infest the liver and spleen (20.4%) in *T. lalius* and spleen along with peritoneal wall of mesentery (9%) in *C. fasciata.* During the present observation it was found that the parasites prefer to live in a definite zone of microhabitat, but some parasites were migrate to the other organs which was not their usual sites.

Table-1
Organwise list of parasites with their abundance percentage in *A. testudineus, C. fasciata* and *T.lalius*

Host fish	Parasites	Infected organs	Abundance
A. testudineus	*Asymphylodora kedarai* *Neopodocotyl indica* *Parascarophis sp* *Cosmoxynemoid nandusii*	Intestine	32.9%
	Clinostomum complanatum *Brahamputratrema sp.*	Liver, spleen Liver, spleen	9.9%
	Camallanus anabantis *Onchocamallanus sp.*	Intestine, p.w. of b.c Intestine, rectum	24.7%
	Camallanus opheocephali *Camallanus fotedari*	Intestine, P. caeca Intestine, P. caeca	32.5%
C. fasciata	*Allocreadium kosia* *Allocreadium mehrai* *Macrolecithus indicus* *Camallanus anabantis* *Cosmoxynemoid nandusii* *Neopodocotyl indica*	Intestine	53.5%
	Clinostomum complanatum	Liver, spleen, p.w of mesentery	17.5%
	Asymphylodora kedarai	Pyloric caeca	9%
	Camallanus opheocephali *Camallanus fotedari*	Intestine, rectum Intestine, P.w of b.c.	10.9%
	Pallisentis opheocephali	Spleen, p.w of mesentery	9%
T. lalius	*Allocreadium kosia* *Allocreadium mehrai*	Intestine	24%
	Asymphylodora kedarai *Macrolecithus indicus*	Intestine, P.caeca	20.7%
	Neopodocotyl indica *Camallanus opheocephali*	Intestine, rectum	11.3%
	Clinostomum complanatum	P.w of mesentery, P.w of b.cavity	17%
	Camallanus fotedari	Intestine, p.w of mesentery	06.4%
	Pallisentis opheocephali	Liver, spleen	20.4%

P.w=Peritoneal wall, b.c = body cavity, p.c = Pyloric caeca

Organwise fluctuation in percentage and mean intensity is calculated in table 2. The highest percentage of infestation (74.4%) of total helminth parasites was found in the intestine of *A. testudineus* and the lowest value (0.6%) of the same in the rectum of *C. fasciata*. Khanam *et al.*[17] also observed the maximum helminth infestation from intestine in *Macrognathus aculeatus*. Present finding is in conformity with Khatun[18] who concluded that host intestine is the most preferred site for helminthes infestation. Maximum (2.07) and minimum (0.02) value of mean intensity is found in the intestine and rectum of *C.f asciata* respectively. Sarma[19] also found the similar result during his study in three murrel host species.

The seasonal variations in prevalence, mean intensity and abundance or density of infestation of helminth parasites in three host fishes are shown in figure 1(A, B and C). In the entire three host species prevalence of infestation is maximum during pre-monsoon (63.9%, 65.9% and 66.5% in *A.testudineus, C. fasciata and T. lalius* respectively). During monsoon till retreated monsoon it is significantly low and then gradually increases in winter. The study reveals that mean intensity is maximum (5.1, 5.5 and 5.5 in three fishes) during monsoon and minimum during retreating monsoon (2.7, 3.1 and 2.9 viz. in *A. testudineus, C. fasciata*and *T. lalius*). During retreating monsoon the abundance or density of infestation was also found to be low while in rest of the three seasons the value of the same is approximately equal. The result is in conformity with Sarma[19] and Khanam *et al*[17]. From the result it is clear that helminth infection show seasonality and the seasonality in our study is in conformity with Khurshid *et al*[20] who established a positive correlation between helminth infestation in *Schizothorax sp*. and the seasons.

The study reveals that prevalence of infection during monsoon is lower than in the other seasons whereas helminth parasites maintain high infestation during pre-monsoon. This may be attributed to the development of parasite which requires moderate temperature and rainfall (Anarse *et al.*[21]) or lower water level during pre-monsoon intensify the problem of overcrowding of host species which perhaps accelerates the chances of transmission of parasites resulting in their increase of prevalence (Landsberg *et al*[22]).

Conclusion

It is clear from the present study that helminthes are distributed extensively in the entire gut of edible freshwater fishes. From various geographical regions it has been reported that eating raw or improperly processed fish transfer the parasitic infection to human causing severe laryngitis problem[23]. WHO estimated that more than 18 million people are at risk due to fish born trematode disease[24]. Since parasitic infection cause economic loss to fishery industry as well as zoonotic problem, more and more research works should be carried out on these aspects.

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Table-2
Organwise fluctuation in percentage of infection and intensity of infection of total helminth parasites in the three host fishes

Host	***A. testudineus***		***C. fasciata***		***T. lalius***	
Fish Examined	720		720		720	
Fish Infected	407		432		422	
Helminthes Collected	821		1502		870	
Organs	**Percentage (%)**	**Mean intensity**	**Percentage (%)**	**Mean intensity**	**Percentage (%)**	**Mean intensity**
Liver	6.1	0.12	11.9	0.42	12.9	0.27
Spleen	3.8	0.08	5.5	0.19	8.7	0.18
P.W of B.C.	2.6	0.05	5.2	0.18	3.5	0.07
Pyloric caeca	10.5	0.21	8.8	0.31	7.2	0.15
P.W of mesentery	00	00	8.5	0.29	19.5	0.42
Intestine	74.4	1.5	59.5	2.07	45.6	0.94
Rectum	2.7	0.05	0.6	0.02	2.4	0.04

P.w=Peritoneal wall, b.c = body cavity, p.c = Pyloric caeca

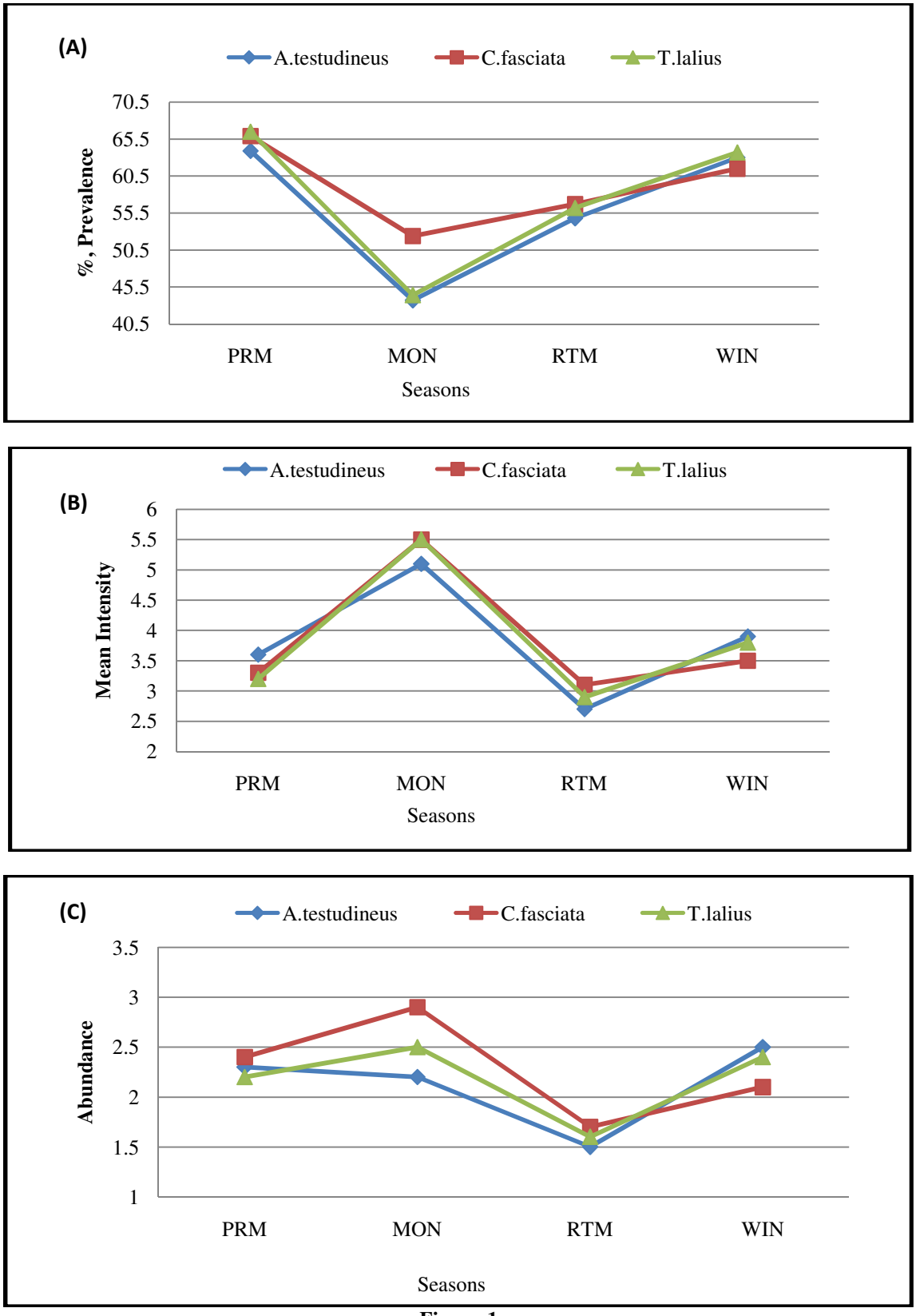

Figure-1

Seasonal fluctuation in Prevalence (A), Mean Intensity (B) and Abundance (C) of total helminth parasites in *A. testudineus, C. fasciata and T. lalius*

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