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Prevalence of *Isoparorchis hypselobagri* Southwell, 1913 (Digenea, Hemiuroidea, Isoparorchiidae), in Some Bottom Dwelling Fishes of Kolong River, Assam

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Abstract The present investigation was carried out to determine the prevalence, mean intensity and relative density of infection, monthwise and seasonal variation of helminth parasites in bottom dwelling fish species of Kolong River, Nagaon, Assam from May 2014 to April 2015. Three species of bottom dwelling fishes viz., *Mastacembelus armatus, Notopterus notopterus* and *Wallago attu* were undertaken during the investigation. A total of 696 parasites were collected from 120 host fish recovered from seven different sampling centers located within Nagaon district. Examination by standard method revealed presence of a helminth parasite, Isopararchis hypselobagri in the three bottom dwelling fish species under investigation. An overall 89.16% of the collected specimens showed infection with helminth parasites. Highest parasitic infection was found in *M. armatus* (96.67%) followed by *N. notopterus* (87.50%) and *W. attu* (70.00%). Hundred percent prevalence was found during the months of August, September, November, December, January and April. Lowest rate of infection (57.14%) was found during the month of October. Season-wise analysis revealed highest infection during winter season (96%) followed by monsoon (92%), pre-monsoon (87.03%) and post-monsoon (75%).

Keywords Prevalence, *Isoparorchis hypselobagri, Mastacembelus armatus, Notopterus notopterus, Wallago attu*.

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Introduction

The parasites and disease of fish constitute one of the most important problems confronting sustainable development of aquaculture industry. Fish parasites have great socio economic and human bealth implication in fisheries and aquaculture. Parasitic infection caused damage to host musculature, which reduces palatability, aesthetic quality and hence mar-

Table 1. Prevalence, mean intensity and relative density of helminth infection in *Mastacembelus armatus, Notopterus notopterus* and *Wallago attu* recovered from Kolong river.

Sl. No.	Species of fish	No. of fish examined	No. of fish positive (%)	Total No. of parasites recovered	Prevalence %	Mean intensity	Relative density
1.	*M. armatus*	60	58	431	96.67	7.431	7.18
2.	*N. notopterus*	40	35	176	87.50	5.02	4.40
3.	*W. attu*	20	14	89	70.00	6.35	4.45
	Overall	120	107	696	89.16%		

ketable value and ultimately leads to consumer rejection. Once the environmental parameters changes, the pathogenicity of pathogens become high and the fish with poor health and weak resistance will be infected. Hence the manifestation of fish disease is not an isolated phenomenon rather it is a complex interrelation of the host, causative agent and environment. Helminth parasites are a diversified group of parasites inhabiting almost every organ of the vertrebrate host which cause pathological, physiological and biochemical changes in the infected tissues and affects host physiology and thus induce stress in the host animal [1—3]. Host-parasite interactions are noticeably deleterious to the host [4—6]. Fish helminth parasites are generally found in all freshwater fishes. The parasite prevalence and intensity depend on many factors like parasite and its life cycle, host and its feeding habits and the physical factors of water body where the fish inhabit. The parasitic diseases, either alone or in conjunction with other environmental stresses [7], may influence weight or reproduction of the host, alter its population characteristics or affect its economic importance. The importance of parasite is related directly to the fish that may affect the general public health [8]. Digeneans are endoparasitic animals with a life cycle involving at least one intermediate host. Both adult and larval metacercarial stages are found in fish. About 1700 species of adult digeneans infect fish. Metacercariae are even more common than adults. There are several records of prevalence of digenetic trematode *Isoparorchis* in

Table 2. Monthwise prevalence, mean intensity and relative density of helminth parasites in bottom dweleing fishes in Kolong river irrespective of their species.

Months	No. of fish examined	No. infected	No. of parasites collected	Prevalence (%)	Mean intensity	Relative density
May (2014)	25	23	122	92.00	5.30	4.88
Jun	9	8	53	88.89	6.62	5.88
Jul	7	6	32	85.71	5.33	4.57
Aug	7	7	36	100.00	5.14	5.14
Sep	3	3	20	100.00	6.66	6.66
Oct	7	4	30	57.14	7.50	4.28
Nov	5	5	28	100.00	5.60	5.60
Dec	8	8	54	100.00	6.75	6.75
Jan (2015)	7	7	64	100.00	9.14	9.14
Feb	13	12	85	92.30	7.08	6.53
Mar	29	22	165	75.86	7.50	5.68
Apr	2	2	7	100.00	3.50	3.50

Table 3. Seasonal variation in prevalence, mean intensity and relative density of helminth parasites in bottom dwelling fishes in Kolong river irrespective of their species.

Seasons	No. of fish examined	No. infected	Prevalence (%)	No. of parasites collected	Mean intensity	Relative density
Pre-monsoon (Mar–May)	54	47	87.03	294	6.25	5.44
Monsoon (Jun–Sep)	26	24	92.00	141	5.87	5.42
Post-monsoon (Oct–Nov)	12	9	75.00	58	6.44	4.83
Winter (Dec–Feb)	28	27	96.00	203	7.51	7.25

Fig. 1. Map of the study area.

different freshwater fish species including bottom dwelling fishes [9—12] with scanty literature on the pathology produce by this parasite in its hosts [13—15].

Bottom dwelling fishes such as *M. armatus, N. notopterus, W. attu* have great market value in the state of Assam. These fishes constitute a major portion of the catches from different rivers of the state and known for their ethnic test. Moreover, *M. armatus* has significance as an ornamental value and its natural population status is being decreased. It is to be noted that this species has good muscle quality and considered as a delicacy of the state Assam. In riverine condition these fishes have been seen infested with heavy helminth infection in the present days.

This study has been undertaken in the Kolong River of Nagaon district to determine the prevalence, mean intensity and relative density of infection, monthwise and seasonal variation of helminth parasites in three bottom dwelling fish species viz. *Mastacembelus armatus, Notopterus notopterus* and *Wallago attu* in Kolong River of Assam.

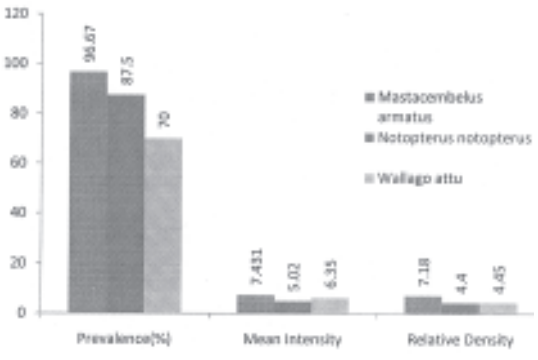

Fig. 2. Prevalence, mean intensity and relative density of helminth infection in *M. armatus, N. notopterus* and *W. attu* recovered from Kolong river in Nagaon district of Assam.

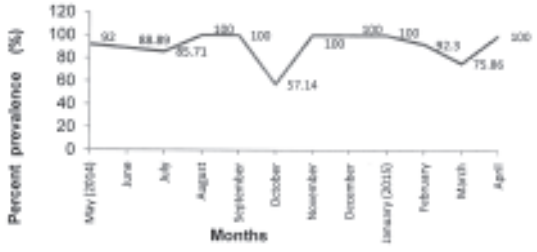

Fig. 3. Prevalence of helminth parasites in different months during the study period.

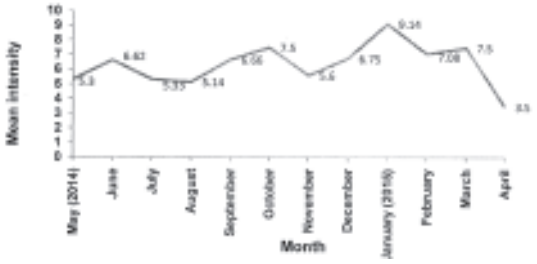

Fig. 4. Mean intensity of helminth parasites in different months during the study period.

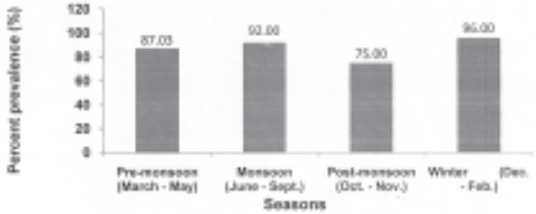

Fig. 6. Seasonal variation in prevalence of helminth parasites

Materials and Methods

The present prevalence study was conducted at 7 randomly selected sites along the Kolong river bank in the Nagaon district of Assam viz. Dharamtul, Raha town, Nagaon, Dimaruguri, Puranigudam, Samaguri and Hahnchora (Fig. 1). These sites were selected, after reconnaissance surveys made based on information of bottom dwelling fishes caught from river Kolong and sold in nearby market. The study was carried out from May 2014 to April 2015. The whole period of observation was divided into four seasons as per India Meteorological Department, Guwahati-15, as pre-monsoon, monsoon post-monsoon and winter.

The fish specimens collected from the selected sites and adjoining markets were brought to Fish Disease Diagnostic Unit of College of Fisheries, Assam Agricultural University, Raha for further analysis. Length and weight measurements of the specimens were recorded.

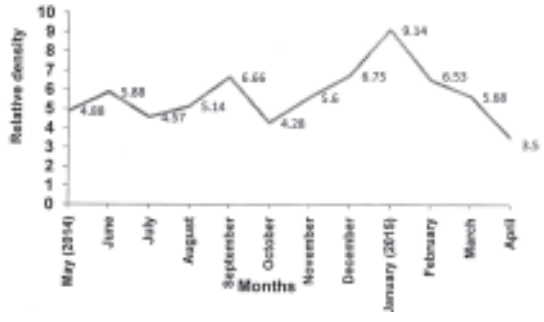

Fig. 5. Relative density of helminth parasites in different months during the study period.

The helminth parasites were collected from the infected host fish species during post-mortem phase by dissecting our the fish with a scissor and the visceral organs i.e. intestine; stomach, liver and heart were examined for the presence of helminth parasites. Collected parasites were gently washed several times with double distilled water to remove any tissues or debris attached on the surface of the body. Parasites were put in glass petri dishes containing distilled water. Thereafter, a few representative parasites were individually put in between two glass slides and compressed till their body became flattened revealing some of their internal structures. The slides were then tightened with rubber bands. The slides containing the parasites were put into 10% formalin for 48 h. When the parasites were fixed, both the glass slides were removed and the flattened parasites were put into 10% formalin and preserved. The fixed parasites were first washed overnight in flowing water to remove the traces of fixatives. After washing, the parasites were dehydrated in ascending grades of ethyl alcohol, i.e., 30%, 50% and 70%, 2 changes in each for 15 minutes. Dried parasites were subjected to staining with alcoholic borax carmine stain following the method described by Roberts [16]. They were destained in 1% acid alcohol. Thereafter, the stained parasites were again dehydrated in 70%, 80%, 90%, 95% and 100% ethyl alcohol, 2 changes in each for 15 minutes. The dehydrated parasites were momentarily put in clove

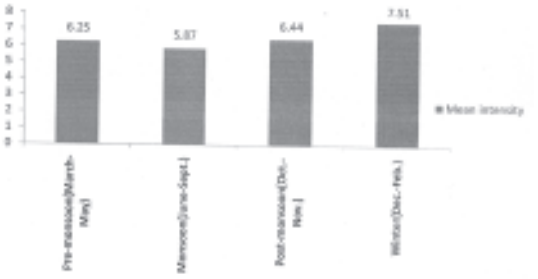

Fig. 7. Seasonal variation in the mean intensity of helminth infection.

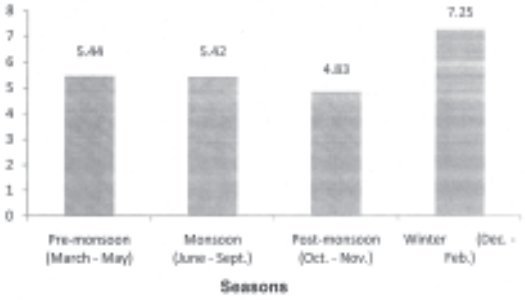

Fig. 8. Seasonal variation in the relative density of helminth infection.

oil and then cleared in xylene. Finally they were mounted on microslides (HIMEDIA, 25.4 mm × 76.2 mm (1´´ × 3´´), thickness 1.0–1.2 mm, Comer:90°) using DPX and covered with round cover glass (Blue Star, 18 mm diameter) or rectangular cover glass (Blue Star, size 22 × 30 mm) as and when necessity demanded. The stained and mounted permanent slides were observed under a trinocular research microscope (Nikon, Model: Eclipse E 200) with an image analyzer (Image Pro Express Ver. 6.0) to record the taxonomic identity using key morphological features as described by Shimazu et al. [12] and Yamaguti [17].

For statistical analysis the fishes were examined throughout the year for the helminth parasites and the following formula were used described by Margolis et al. [18]

Prevalence = Total no. of hosts infected/Total no. of hosts examined × 100,

Mean intensity = Total no. of parasites/Total no. of infected hosts examined,

Relative density = Total no. of parasites/Total no. of hosts examined.

Results and Discussion

In the present study a total of 120 bottom dwelling fishes were collected from 7 different sampling sites and examined for the presence of helminth parasites. Out of 120 fish examined, a total of 107 fish was found to be naturally infected with helminth parasites in different parts of their body, the per cent infection being 89.16 (Table 1 and Fig. 2). Three bottom dweling fish species viz. *Mastacembelus armatus, Notopterus motopterus* and *Wallago attu* were taken into consideration during the present investigation.

Highest prevalence of parasitic infection was found in *M. armatus* (96.67%) followed by *N. notopterus* (87.50%) and *W. attu* (70.00%). The mean intensity of parasitic infection in descending order was found to be 7.431, 5.02, and 6.35 in *M. armatus, N. notopterus* and *W. attu*, respectively. Similarly, the relative density of parasitic infection was found to be 7.18, 4.40 and 4.45 in *M. armatus, N. notopterus* and *W. attu*, respectively.

There was variation in the monthwise prevalence of helminthic infection (Table 2). The per cent prevalence was found to be highest (100.00%) during the months of August, September, November, December, January and April. Lowest rate of infection (57.14) was found during the month of October (Table 2 and Fig. 3). Along with the monthwise variation in per cent prevalence, there was also corresponding variations in mean intensity and relative density of the parasitic infection irrespective of host. Mean intensity and relative density of parasitic infection was found highest (9.14) in the month of January and lowest in the month of April (3.5) (Table 2 and Fig. 4 and 5). From the results it was observed that, in the study area irrespective of host species the helminthic infection was persistent throughout the year which ranges from minimum 50 to a maximum 100. This implies the fact that the study area is highly endemic for the patho-

genic helminth in fish.

Season-wise highest infection was found during winter season (96%) followed by monsoon (92%), pre-monsoon (87.03%) and post-monsoon (75%) season (Table 3 and Fig. 6). The mean intensity and relative density of infection was also found highest in the winter season which were 7.51 (Table 3 and Fig. 7) and 7.25 (Table 3 and Fig. 8) respectively. The highest infection recorded during the winter season may be due to increased concentration of infective stage (i.e. metacercariae) of the parasite from the intermediate hosts.

References

1. Chubb JC (1980) Seasonal occurrence of helminth parasite in fishes. Part-III. Larval Cestoda and Nematoda. Advances in parasitology. Academic Press. London and New York 18 : 1—120.
2. Cheng TC (1986) General parasitology. 2nd edn. Academic Press College Division, Harcourt Brace Jovanovich, London.
3. Pardeshi PR, Hiware CJ, Wangswad C (2012) Histopathology of the liver of *Mastacembelus armatus* (Lecepede, 1800) due to trematode parasite, *Allocreadium khami* n.sp. J Parasitic Dis 36 : 53—55.
4. Holmes JC, WM Bethel (1972) Modification of intermediate host behavior by parasites. In: Canning EU, Wright CA (eds). Behavioral aspects of parasite transmission. Academic Press, New York, pp 123—149.
5. Holmes JC (1979) Parasite population and host community structure. In: Nickol BB (ed). Host-parasite interfaces, Academic press, New York, pp 27—46.
6. Minchella DJ, ME Scott (1991) Parasitism: A cryptic determinant of animal community structure. Trends Ecol Evol 6 : 250—254.
7. Sures B (2008) Environmental parasitology. Interactions between parasites and pollutants in the aquatic environment. Parasite 434—438.
8. Hoffman GL, Dunbar CE (1963) Studies on *Neogagatea kentuckiensis* (Cable, 1935) n.comb. (Trematoda:Strigeoidea:Cyathocotylidae). J Parasitol 49 : 737—744.
9. Bhalerao GD (1932) A note on the probability of infection of man and domestic carnivores by *Isoparorchis hypsalobagri* (Billet, 1898). Ind J Vet Sci 2 : 406—407.
10. Bashirullah AKM (1972) On the occurrence of the trematode, *Isoparorchis hypselobagri* (Billet, 1898) in fishes, and notes on its life history. Norw J Zool 20 : 209—212.
11. Dhole J, Kadam K, Chavan R (2012) Taxonomic evaluation of a few Piscean trematodes from freshwater fish *Mastacembelus armatus* of Maharashtra State, India. J Exp Sci 3 : 17—19.
12. Shimazu T, Cribb H, Thomas, Miller L, Terrence, Urabe, Misako, Ha, Van, Nguyen, Binh, Thi, Tran, Shed'ko, Marina B (2014) Revision of *Isoparorchis* Southwell, 1913 (Digenea, Hemiuroidea, Isoparorchiidae), Parasites of air bladder of freshwater catfishes: A molecular and morphological study. Bull Natl Mus Nat Sci Ser A 40 : 15—51.
13. Zmeev GI (1936) The trematodes and csetodes of the fishes of the Amur River. Parazit Sborn. Zool Inst Akad Nauk USSR 6 : 405—436.
14. Sawada I, Osako J (1969) Studies on the occurrence of *Isoparorchis hypselobagri* (Billet, 1898) (Trematoda) in the body cavity and the muscle of *Zacco teminckii* from Nara Prefectures. Bull of Nara Univ of Education, Natural Sci 18 : 21—26, pls. 1—2.
15. Devraj M, Ranganathan V (1967) Incidence of *Isoparorchis hypselobagri* (Billet,.1898) among the catfishes of Bhavanisagar reservoir. Ind J Fish 34 : 232—250.
16. Roberts RJ (2012) Fish pathology. 4th edn. Wiley Blackwell, United Kingdom, pp 439—481.
17. Yamaguti S (1971) Synopsis of digenetic trematodes of vertebrates. Vol. I and II. Keigaku Publ Co, Tokyo, Japan.
18. Margolis L, Esch GW, Holmes JC, Kuris AM, Schad GA (1982) The use of ecological terms in parasitology. J Parasitol 68 : 131—133.