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Seasonal Variation in Population Dynamics of Helminth Parasites in *Clarias batrachus* from Natural wetlands of Sylhet, Bangladesh

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ABSTRACT

A year round field investigations were conducted with the aim to examine the seasonal variation in population dynamics of helminth parasites in *Clarias batrachus* from different natural aquatic habitat of north-eastern region of Bangladesh, Sylhet. This article summarizes the percentage of prevalence, mean intensity, abundance and index of infestation of helminth parasites in the *C. batrachus* during different months and seasons of the year in accordance with temperature, humidity and rainfall. The investigation period were categorized into four seasons i.e. pre-monsoon (February-April), monsoon (May-July), post-monsoon (August- October) and winter (November- January). A total 180 *C. batrachus* host individuals were examined and among them 139 (67.87%) specimens were found to be infested with 2205 individuals of parasites of three different groups namely trematode, cestode and nematode. Almost (100%) prevalence of helminth infestation were recorded from both male and female *C. batrachus* during the winter (Nov-Jan), followed by (Feb-April) pre-monsoon (66.67-86.67%) and (Aug-Sep) post-monsoon (66.67-80.00%) while lowest (53.33-60.00%) in monsoon or rainy season (May-July). Lower range of environmental temperature (21.05–25.05^{0}C), associated with moderate humidity (62.00-64.00%) and scarcity of rainfall increases the intensity of helminthes parasitic infestation in *C. batrachus*. In consistent to this, with the gradual increasing in ambient temperature (28.01-30.01^{0}C) and humidity (75.00-89.00%) associated with moderate rainfall (33.40-790.90 mm) declining the intensity of helminthes infestation in *C. batrachus* of the study area.

KEY WORDS: Seasonal variation**,** Population dynamics, Helminth, temperature, *Clarias batrachus*, Natural wetland

INTRODUCTION

Walking catfish, *Clarias batrachus* (Linneaus, 1957) is traditionally popular and important as food fish and widely distributed throughout the South and South-east Asia [1] including Bangladesh considered as an excellent source of good quality proteins and polyunsaturated fatty acids that is why suggested by doctors to pregnant women, lactating mothers, elderly peoples, children and the patient diet [2].These edible fishes are known to harbour a number of parasites which cause deterioration in their health, hence their market and nutritive value is severely affected. The most severe limiting factors in culture and management are diseases [3, 4, 5, 6, 7] and parasitic infestations [8]. Parasite is an important factor in fisheries and aquaculture for causing diseases and in many cases responsible for fish mortality [9, 10, 11]. Assessment of infection levels in the host as well as host population provides important information about the success of the parasite life cycle and the severity if its pathogenicity and the effectiveness of host immunity [12, 13]

Many authors have carried out studies on the helminth parasites and population dynamics of those occurring in piscian hosts and work on different aspects of parasites [12, 14]. The scientists all over the globe have contributed a lot of work on the helminth parasites in this selected host [15] explained the helminth parasites of *C. gariepinus* (Clariidae) in Lakki lagoon, Lagos, Nigeria [16] studied the intestinal parasites of *C. gariepinus*, recorded new tapeworm, *Lytocestus alii* species from *C. batrachus* at Amaravati, Maharashtra, India [17]. However few research has so far recorded in the past concerning the seasonal variation in the population dynamics of helminth parasites incidence i.e. prevalence, mean intensity, abundance and index of infestation in *C. batrachus* from the natural waters of Bangladesh. So, the present research work has aimed to investigate the seasonal variation in population dynamics of helminth parasites in *C. batrachus* during different seasons in accordance with temperature, humidity and rainfall from natural wetlands of **north-eastern region i.e.** Sylhet basin, Bangladesh.

MATERIALS AND METHODS

Study area and Sample collection: A total 180 *C. batrachus* (15 in each months) were collected from different fish markets of Sylhet namely *Majortila, Batashor, Bandhar, and Kazir bazaar*, which were harvested from flood plains and haors of north eastern region, Bangladesh (Fig. 1) throughout the year starting from February, 2014 up to January, 2015. Monthly mean temperature (^{o}C), humidity were measures by using Silver Indoor Digital Thermometer & Hygrometer (LC Technology 302-604S) and rainfall (mm) data from the meteorological department and investigate their influence on the rate of incidence, prevalence, and infestation.

Parasitological investigation: After collection of the specimens, they were brought to laboratory, autopsied, and examined for helminths infestation by using standard methods. Endo-helminth parasites were collected, washed with saline solution and preserved in 10% formalin solution. Then stained with Grenacher's Alcoholic Borax

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Carmine, dehydrated, cleared in xylene, mounted in DPX, processed to a permanent slide and identified under a compound microscope while drawings are made with the aid of camera lucida. The identification of the collected parasites was made with the help of "Systema Helminthium" vol. II. "Cestode of vertebrates" [19, 20, 21, 22, 23] and population dynamics of cestode parasites were determined by using following formulae.

i. Prevalence (%) = $\frac{\text{No. of host fish infested}}{\text{No. of host fish examined}} \times 100$

ii. Mean Intensity = $\frac{\text{No. of the parasites collected}}{\text{No. of the infested hosts}}$

iii. Abundance = $\frac{\text{No. of the parasites collected}}{\text{No. of the hosts examined}}$

iv. Index of Infestation = $\frac{\text{No. of host infected} \times \text{No. of parasite collected}}{(\text{No of host examined})^2}$

Statistical analysis: Data interpretation was done by using MS excel and SPSS 17 (Chicago, USA) software performed to detect the significance differences.

The morphological, physiological and ecological factors affect the host specificity. The morphological factors are those which like a parasite with its host at the site of attachment [24]. The ecological factors means distribution and environment of the host and physiological factors means the diet and mode of feeding [25, 26] also explained the distribution of parasites are host specific.

The present investigations revealed that the temperature, humidity, and rainfall has strong influence on the prevalence, mean intensity, abundance and index of infection of endo-helminth parasites occurring in *C. batrachus* (Table 2). Comparatively low infestation were recorded in the months of April to June with comparatively high ambient temperature (27.85-28.08^{0}C), moderate humidity (53.00-82.00%) and high rainfall (117.30-741.30 mm), followed by the months of July to October with high temperature (28.01-30.01^{0}C) and humidity (75.00-89.00%) and moderate rainfall (33.40-790.90 mm) existed in the study area (Table 2). The incidence of prevalence was highest in the month of November, December and January with low temperature (21.05–25.05^{0}C); moderate humidity (62.00-64.00%) and no rainfall were exhibited in the study area (Table 2). This attributed that tolow environmental temperature, moderate humidity and scarcity of rainfall favored the incidence of helminths infection in the *C. batrachus.*

The low environmental temperature during the months of November to January associated with high relative humidity may be the possible causes of high parasitic intensity during winter. The high intensity of diseases and mortality of fishes winter seasons due to colder temperature and other water quality parameters in Bangladesh were long been reported [10, 3, 27, 28]. Temperature, feeding habits of host, availability of infective intermediate hosts and parasite maturation are known to be significantly influencing incidence of the parasite infection [25].

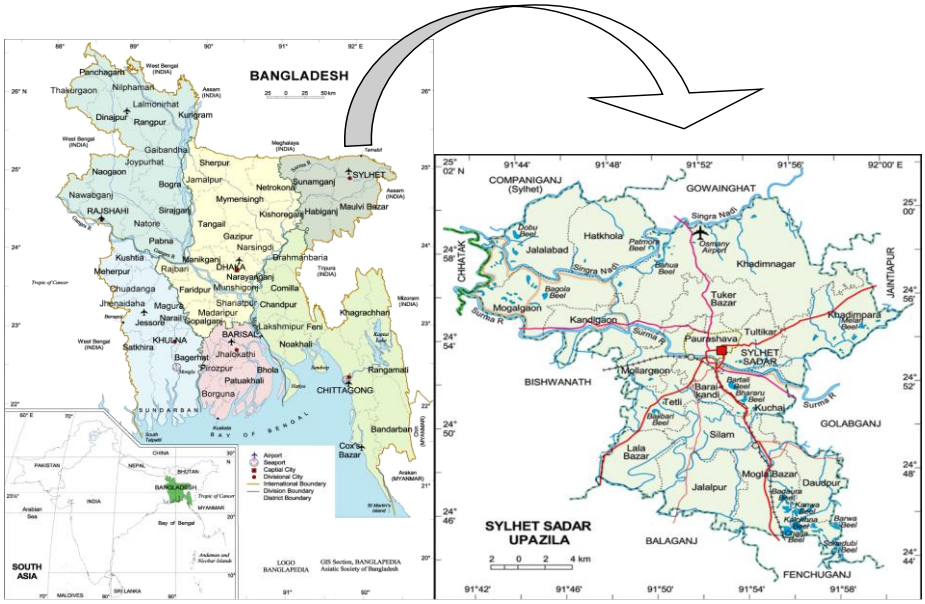

Fig. 1. Showing geographical location of the study area located at Sylhet, Bangladesh [18]

RESULTS AND DISCUSSION

The present research indicates that out of 180 *C. batrachus*, 139 (67.87%) were infested with 2205 helminth parasites individuals (Table 1). Almost (100%) p revalence of helminth infestation were recorded from both male and female *C. batrachus* during the winter (Nov-Jan), followed by (Feb-April) pre-monsoon (66.67-86.66%) and (Aug-Sep) post-monsoon (66.67-80.00%) while lowest (53.33–60.00%) in monsoon or rainy season (May-July) (Fig. 2). Somehow similar finding also reported from [12, 14] and 136 (45.33%) individuals of cestode parasites were recovered from 300 *C. batrachus* in Aurangabad, India [13].

Present investigation revealed that the morphological, physiological and ecological variables has significantly influence in the occurrence and distribution of helminthes parasitic infestation in *C. batrachus* (Table 1-2 & Fig 2).

CONCLUSION

Findings of the current study suggested that the high infection (level of prevalence, incidence, intensity, density and infection index) of helminth parasites in *C. batrachus* were occurred during the months of November, December

Table 1.Incidence, density, prevalence, intensity, abundance and infection index of helminthes parasites in the population of *C. batrachus* from study area.

Months of the year	Seasons of the year	No of Host Examined	No. of Host infected	No. of Parasite collected	Prevalence %	Mean Intensity	Abundance	Index of Infection
February, 2014	Pre-	15	13	276	86.67	21.23	18.40	15.95
March, 14	Monsoon	15	11	194	73.33	17.64	12.93	9.48
April, 14		15	10	302	66.67	30.20	20.13	13.42
May, 14		15	9	195	60.00	21.67	13.00	7.80
June, 14	Monsoon	15	8	60	53.33	7.50	4.00	2.13
July, 14		15.	9	128	60.00	14.22	8.53	5.12
August, 14	Post-	15	12	203	80.00	16.92	13.53	10.83
September, 14	Monsoon	15	10	274	66.67	27.40	18.27	12.18
October, 14		15	12	102	80.00	8.50	6.80	5.44
November, 14		15	15	66	100.00	4.40	4.40	4.40
December, 14	Winter	15	15	323	100.00	21.53	21.53	21.53
January, 2015		15	15	280	100.00	18.67	18.67	18.67

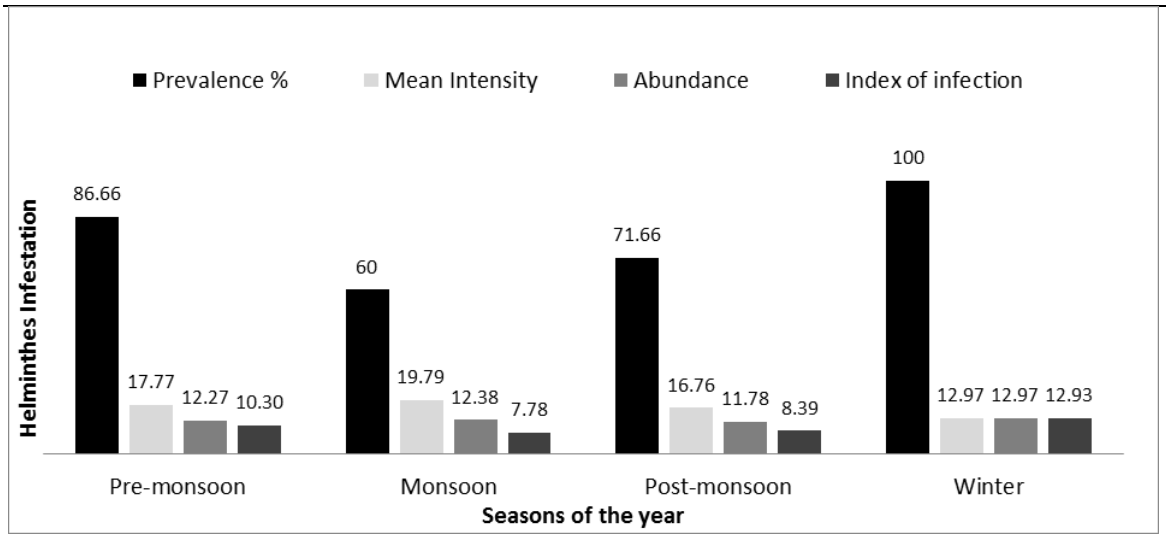

Fig. 2 Seasonal vriation inprevalence, intensity, abudance and infection index of helminths parasites in host *C. batrachus*

Table 2. The influence of temperature, humidity and rainfall on the incidence, intensity, density and index of infection of the helminth parasites occurring in *C. batrachus*

Months of the year	Prevalence	Mean Intensity	Abundance	Index of infection	Temperature (^{0}C)	Humidity (%)	Rainfall (mm)
February, 2014	86.66	21.23	18.40	15.95	20.07	62.00	34.20
March, 14	73.33	17.64	12.93	9.48	25.25	49.00	65.50
April, 14	66.67	30.20	20.13	13.42	28.25	53.00	117.30
May, 14	60.00	21.67	13.00	7.80	27.85	72.00	540.10
June, 14	53.33	7.50	4.00	2.13	28.08	82.00	741.30
July, 14	60.00	14.22	8.53	5.12	30.01	75.00	311.40
August, 14	80.00	16.92	13.53	10.83	29.00	82.00	790.90
September, 14	66.67	27.40	18.27	12.18	28.55	80.00	721.60
October, 14	80.00	8.50	6.80	5.44	28.01	89.00	33.40
November, 14	100.00	4.40	4.40	4.40	25.05	64.00	0.00
December, 14	100.00	21.53	21.53	21.53	21.05	62.00	0.00
January, 2015	100.00	18.67	18.67	18.67	20.01	66.00	0.00

and January i.e. winter whereas lowest in monsoon might be associated with the lower temperature, moderate humidity and scarcity of rainfall in winter season. Though present findings depicted contour of helminthes infestation

in *C. batruchus* however there might be a high possibilities to transfer endo-parasites to human food chain and associated impact pathways on human health need to be investigate in future.

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