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Parasitic infestation in *Clarias batrachus* at haor region of north-eastern Bangladesh

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Abstract
Clarias batrachus has a great demand and high market value in Bangladesh. Diseases and parasitic infestations are the most severe limiting factors in culture and management of this fish. The study was conducted to investigate parasitic infestation in *C. batrachus* during August to December 2016. Fish samples were collected from five beels of two haors of North-eastern Bangladesh. The study summarizes the percentage of prevalence, mean intensity, abundance and the effect of parasite on length and weight of *C. batrachus*. A total of 113 fishes were investigated of which 100 individuals were found infested with five different parasites i.e. *Lytocestus indicus, L. birmanicus, Bovienia serialis, Pseudocaryophyllaeus indica* and *Orioentocreadium batrachoides*. Variations in prevalence were observed in different months. The highest prevalence (100%) was observed in November and the lowest (68.75%) in September. Changes in the nature of growth and loss of weight as a result of parasitic infestation were noticed. Length, weight and condition factors were found greatly affected due to parasitic infestation. The highest gain of mean head length (11.11%) was found at the higher level of infestation in larger length group and the lowest value (2.51%) was found in higher level of infestation of medium length group. The highest loss of weight (21.30%) and the lowest loss of weight (7.65%) were noticed in smaller length group and larger length group, respectively. The highest condition factor (1.20) was found in uninfested fish and the lowest (0.98) in infested fish. This information will be useful for management and aquaculture of the species through prevention and management of the parasitic infestation.

Keywords: Magur, Parasitic effect, Infestation, Length, Weight, Condition factor

1. Introduction
In Bangladesh two species of indigenous catfish i.e. Magur (*Clarias batrachus)* and Singhi (*Heteropneustes fossilis)* are delicious fish items, taking part an important portion from the ancient time. In addition *Clarias batrachus* is a fish of great demand and attracts the attention of farmers for its high market value in Bangladesh. Among the freshwater fishes, catfish is a significant group of fish in our country, and it is getting increasingly popular in aquaculture sectors showing a promising future for commercial culture [2]. However, once easily available in the nature, the fish in the recent time becomes scarce due to reduction of habitats, loss of breeding and nursery grounds, diseases and parasitic infestations, irrigation schemes, over fishing of juveniles and brood fish etc. The most severe limiting factors in culture and management of this fish are diseases and parasitic infestations [11]. According to (Cross 1993) normal growth of fishes is interrupted or inhibited if they are heavily infested with endoparasites, viz. trematodes, nematodes, cestodes and acanthocephalans [6]. These fish parasites like those of other vertebrate's parasite, feed either on digested contents of the host's intestine or the host's own tissue [19].
Different scientific studies have been conducted on fish parasites in many other countries by (Osnas and Lively 2004) [20], (Dias *et al.*, 2006) [8] and (Hechinger *et al.*, 2007) [10]. Comparatively little works have been done on digenetic trematodes on Bangladesh. A considerable works on systematics of caryophyllaeid cestode of *Clarias batrachus* have been carried out from this subcontinent particularly from India by Mackiewicz, 1981 [16]; Agarwal, 1985 [1]; and Hafeezullah 1986 [9]. As *Clarias batrachus* is a highly infested fish by different caryophyllaeid cestode parasites, their influence on this host is an essential task for determining its successful culture practice.

Though only few works have been conducted on these cestodes of fishes from Bangladesh by Sanaullah and Ahmed (1978) [22], Rashid *et al.*, (1983, 1985) [17, 18], Chandra and Khatun (1993) [3], Chandra and Wootten (1997) [4] Khalil *et al.*, (2013) [12] and Laboni NN (2011) [14]. Laboni NN (2011) [14] found the loss of weight (1.63%) and the highest percentage loss of weight (26.38%) were noticed in the small length group while it was (7.44%) in large length group. The highest condition factor (1.13) was found in uninfested fish and the lowest (0.85) in infested fish. The present research work was therefore performed to evaluate certain effects of parasitic infestation on length, weight and condition factor and also prevalence, mean intensity, abundance of *Clarias batrachus* in relation to month, sex and size.

2. Materials and Methods

2.1 Field Work: A total of 113 host fish of *C. batrachus* were collected during the period from August, 2016 to December, 2016. Live and fresh fishes were collected from five beels of which two from Hakaluki haor of Moulovibazar, two from Tanguar haor of Sunamganj and Dhankuri beel of Zakiganj, Sylhet, Bangladesh.

2.2 Laboratory Work: After collection of the host specimen, they were brought to the Disease Laboratory, Department of Fish Health Management, Sylhet Agricultural University, Sylhet. Before investigation the source of the fish was recorded in a data book, the total length (TL), standard length (SL), head length (HL), sex and weight of the fish were recorded. The host fish were divided into 3 length groups (<19, 19-22 and >22 cm).

The total length of each fish was taken from the tip of the lower jaw to the tip of the lower lobe of the caudal fin. The head length has taken from the tip of the lower jaw to the operculum while the body length, from the operculum to the tip of the lower lobe of the caudal fin. The method adopted by Desbrosses (1948) was followed to find out the relationship between the head length and the total body length.

The formula = $(100\times lt)/x$, where $1t$ = the length of the head and x = the total body length was applied for all the fish. The fishes were classified into different length groups. The average length and weight of uninfected and infected specimen, belonging to each group were categorized. The loss of weight was then calculated by deducting the average weight of infested fish from that of uninfested fish. Then the percentage of loss of weight was calculated. Based on the intensity of attack, hosts coming under different length groups were categorized and the percentage of loss of weight was calculated. Condition factor was employed to evaluate the effect of parasite on the host. Condition factor was calculated by employing the formula $k=100\times w/l^3$ Where w = the weight of the fish in grams; l = the length in centimeters. The magnitude of parasitism was indicated by the difference in k values of an infested and an uninfested fish.

3. Results and Discussions

During the period of investigation 100 fishes were found infested with 783 parasites of five (5) different species named *Lytocestus indicus, Lytocestus birmanicus, Pseudocaryophyllaeus indica, Orientocreadium batrachoides, Bovienia serialis.* These parasites were also reported by Sanaullah (1976) [21], Rashid *et al.* (1983) [17] and Chandra *et al.* (1993) [4] from this host.

It was found that, the highest Prevalence (100%) was found in the months November and December. However, mean intensity (11.39), and abundance (11.35) were higher in December and lower in September. Chhanda (2011) [5] observed the highest prevalence (100%) and mean intensity (25.94) in December and lower in August in *C. batruchus* which was also coincided with the findings of Laboni (2011) [14].

For the present study the experimental fishes were first differentiated as infested and uninfested and their average total length is presented in table 1 and their differences noted as 0.65 and the percentage loss of length 3.34. The highest percentage gain of mean head length (4.90) was observed in 19-22 length group and the lowest percentage gain of mean head length (3.64) was observed in small length group <19 presented in table 2. The highest gain of mean head length (11.11%) was found at the higher level of infestation (more than 7) in larger length group whereas, the lowest value (2.51%) was found in higher level of infested fish of medium length group (19-22) in table 3. It is indicated that there was non-significant differences among different length groups after applying t-test at 5% level of probability.

The present finding also coincides with the findings of several authors. Khalil *et al* (2013) [12] reported higher gain of mean head length (4.07) in medium length group (17-21) of *H. fossilis*. However, Laboni *et al.* (2011) [14] found highest percent loss of mean head length (4.49) in small length group and the lowest percent loss of mean head length was observed in large length group. Sproston and Hartely (1941) [23] were on the opinion that parasites showed a selective infestation of larger fishes.

Table 1: The average total length (TL) of Uninfested and infested *C. batrachus* and the percentage of loss of length

SL. No.	Infested or Uninfested	Number Examined	Mean length (cm)	Loss of length (cm)	% Loss of length
1.	Uninfested	13	$20.26^{\pm}2.53$	-	-
2.	Infested	100	$19.60^{\pm}1.59$	0.65	3.34

Table 2: Relationship between head length and total length (TL) of uninfested and infested *C. batrachus* by different groups of parasites.

Length groups (cm)	Mean Head length (cm)		% Gain of mean head length
	Uninfested (cm) Mean ±SD	Infested (cm) Mean ±SD	
<19	$3.66^{\pm0}.23$	$3.84^{\pm0.50}$	3.64
19-22	$4.46^{\pm0}.31$	$4.69^{\pm0.60}$	4.90
>22	$4.70^{\pm0.00}$	$4.90^{\pm0.72}$	4.08

Table 3: Relationship between head length and total length at different level of infestations of parasites in *C. batrachus*

Length groups (cm)	<19			19-22			>22		
Infestation	Uninfested	Low level of infestation (1-7)	Heavily infested (more than 7 parasites)	Uninfested	Low level of infestation (1-7)	Heavily infested (more than 7) parasites	Uninfested	Low level of infestation (1-7)	Heavily infested (more than 7) parasites
Number examined	5	12	16	7	22	31	1	6	13
Mean Head Length (cm)	3.66±.23	3.85±.32	3.83±.61	4.61±.31	4.43±.46	4.49±.69	4.80±0.00	5.35±.63	5.40±.79
% Gain of mean head length	-	4.93	4.43	-	3.91	2.51	-	10.28	11.11

Due to parasitic infestation the difference of weight was 3.78 g and the percentage loss of weight was 4.40 presented in table 4. In this investigation the highest loss of weight (21.30 g) was noticed in the smaller length group in table 5. The highest loss of weight 24.09% was found at higher level of infestation in smaller length group, whereas the lowest value 5.18% found in low level of infested fishes of large length group in table 6. It was indicated that there was non significant differences after applying t- test at 5% level of probability**.** Khalil e*t al.* (2013) [12] reported that, the highest loss of weight (3.34%) was found at high level of infestation in smaller and medium sized length groups of *H. fossilis*. Considerable loss of weight was also found by Chhanda (2011) [5]. Loss of weight as a result of crustacean infections has been observed by Lechler (1935) [15] and Kabata (1958) [11].

Table 4: The average weight of uninfested and infested fish including percentage loss of weight.

SL. No.	Infested or uninfested	Number Examined	Mean weight (gm)	Loss of weight(gm)	% Loss of weight
1	Uninfested	13	$84.50^{\pm 17.11}$	-	-
2	Infested	100	$80.78^{\pm}24.18$	3.78	4.40

Table 5: Percentage loss of weight in different length groups infestation of parasites in *C. batrachus*

Infestation	<19		19-22		>22	
	Uninfested	Infested	Uninfested	Infested	Uninfested	Infested
Number Examined	5	28	7	53	1	19
Mean weight (g)	$71.8^{\pm 3.42}$	56.50±10.05	86.43±3.78	77.23±7.02	135.0±0.00	124.6±5.87
% Loss of weight	21.30	-	10.64	-	7.65	-

Table 6: The average weight, percentage loss of weight in different level of infestation of parasites in *C. batrachus*

Length groups (cm)	<19			19-22			>22		
Infestation	Uninfested	Low level of infestation (1-7) parasites.	High level of infestation (more than 7) parasites.	Uninfested	Low level of infestation (1-7) parasites	High level of infestation (more than7) parasites.	Uninfested	Low level of infestation (1-7) parasites	High level of infestation (more than7) parasites.
Number Examined	5	12	16	7	22	31	1	6	13
Average Weight (gm)	71.80±3.42	59.17±11.45	54.50±5.59	86.43±3.78	78.86±7.82	76.06±6.27	135.00±0.00	128.00±5.66	122.15±5.16
%Loss of weight		17.59	24.09		8.76	11.90		5.18	9.51

The uninfested fish have higher condition factor (1.20) than the infested one (0.98) (table 7). The highest condition factors (1.31, 1.06 and 1.12) were found in uninfested fish in small, medium and large length groups than the infested one (1.03, 0.92 and 0.89) (table 8). The highest (%) loss of condition factor 18.32 and 22.90 were found in smaller length group at low and high level of infestation respectively than others group. The lowest (%) loss of condition factor 11.76 and 10.78 were found in large length group (table 9). Overall, differences in infestation level of the host organism, it was higher in high level of infestation group than small and medium infestation group**.** The present study findings was in agreement with the finding of several authors. Das *et al.* (1997) [7] described the mean values of condition factor and

relative condition factor are 1.0755 and 1.0144 for catfish culture. When, the values are in less than the mean values then the fishes fall in alarming situation due to parasitic infestation. The highest loss of condition factor was found (1.31%) in small length group. The lowest loss of condition factor was (0.89%) found in large length group. In *C. batrachus* the condition factor decreases when the number of parasites increases in host fish which agrees the finding of Kabata (1958) [11] in case of infestation by *Lernaeocera*. It also coincides by the observation of Sproston and Hartely (1941) [23].

Table 7: Condition factor of uninfested and infested *C. batrachus*

Infestation	Uninfested	Infested
Mean length (cm)	19.60±1.59	20.26±2.53
Mean weight (g)	84.50±17.11	80.78±24.18
Condition factor	1.20	0.98

Table 8: Relationship between infestation and the condition factor of fish parasite in different length groups of *C. batrachus*

Length group (cm)	<19		19-22		>22	
Infestation	Uninfested	Infested	Uninfested	Infested	Uninfested	Infested
Number of fish examined	5	28	7	53	1	19
Mean length (cm)	17.60±0.54	17.61±0.96	20.07±0.92	20.34±1.0	22.60±0.00	24.17±1.81
Mean weight (gm)	71.80±3.42	56.50±10.02	86.43±3.78	77.23±7.02	135.0±0.00	124.67±5.87
Condition factor	1.31	1.03	1.06	0.92	1.12	0.89

Table 9: Condition factor in different level of infestation in *C. batrachus*

Length groups (cm)	<19			19-22			>22		
Infestation	Uninfested	Low level of infestation (1-7 parasites)	High level of infestation (more than 7 parasites)	Uninfested	Low level of infestation (1-7 parasites)	High level of infestation (more than 7 parasites)	Uninfested	Low level of infestation (1-7 parasites)	High level of infestation (more than 7 parasites)
No. of fish examined	5	12	16	7	22	31	1	6	13
Mean length (cm)	17.60±0.54	17.69±0.69	17.55±1.15	20.07±0.92	20.44±1.05	20.23±0.98	23.60±0.00	24.21±2.40	23.69±1.31
Mean weight (g)	71.80±3.42	59.17±11.45	54.50±5.59	86.43±3.78	78.86±7.82	76.06±6.27	135.0±0.00	128.0±5.66	122.15±5.16
Condition factor	1.31	1.07	1.01	1.06	0.92	0.91	1.02	0.90	0.91
% Loss of condition factor	-	18.32	22.90	-	13.20	14.15	-	11.76	10.78

4. Conclusion

The parasitic infestation in the host fish was found to vary in different size and sex during different months. Parasitic infestation is one of the concern and most important threats in aquaculture system and wild environment habitats, which threatens fish population and pose a definite barrier to the development and maintenance of health of fishes. The study of parasitology is important from point of view of fishery management, fish yield and to check the spread of human and animal disease for which fish act as a carrier. The parasitic detrimental effects upon fish are diversified. Loss of weight, length were found in the present investigation as a result of parasitic infestation. From the study it can be suggested that, the larger sized fishes are suitable for harvesting. Waterbody management strategy has to perform in proper way to reduce the parasitic infestation as water quality is one of the main factor of parasitic infestation. The disruption of parasitic life cycle have to perform by removing the intermediate hosts from the water bodies in captive areas to eliminate the parasitic infestation though it is difficult in open water bodies. On the other hand pollution of water should be protected to reduce parasitic infestation. Further investigations are suggested on the histopathological effect for detailed understanding of the effect of parasitism on host fish, *C. batrachus*.

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