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Prevalence of helminth parasites infecting *Channa punctatus* Bloch, 1793 from Nadia district of West Bengal

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Abstract: *The present investigation was made to study the prevalence, seasonal variation and its intensity of infestation of helminth parasites in Channa punctatus Bloch, 1793 of Nadia district in West Bengal from January 2013–December 2013.Three helminth parasites Eustrongylides sp (Nematode), Euclinostomum heterostomum (Trematode) and Pallisentis allahabadii (Acanthocephalan) were collected from abdominal cavity, liver and intestine of the infected hosts. A total of 140 hosts were found to be infected from 540 fishes sampled. Sixty two fishes were infected with Eustrongylides sp with a prevalence rate of 44.28%, fifty (35.71%) fishes were infected by E.heterostomum while the acanthocephalan (P.allahabadii) infected 28 (20%) fishes. Eustrongylides sp exhibited highest prevalence in the month of May, E.heterostomum recorded highest in the month of July while P. allahabadii recorded peak prevalence in observed the month of October.Seasonal variation of parasitic infestation in hosts were found to affected by water quality of the fish farms. The overall parasitic infestation rate was found to be 25.92 %.*

Keywords- *Channa punctatus, helminth, Nadia, prevalence, water quality.*

I. Introduction

In tropical countries like India where there is increasing protein demand fishes acts as a cheap source of animal protein.It is known for its protein value, high content of essential minerals and for being low in saturated fats. Hence to obtain healthy and quality fish meat, it is necessary that the fish should be free from all types of pathogens like viruses, bacteria, algae, protozoans, helminths, annelids, arthropods and molluscs.

Parasites of fish constitute one of the major problems to fish health.Besides the direct losses caused by mortality, parasites have considerable impact on growth, resistance to other stressing factors, susceptibility to predation, marketability and pave way for secondary infections [1,2,3].

Helminth parasites remains one of the most important problem confronting aquaculture.Potentially all freshwater and brackish water fish may be affected by helminthes with heavier infections in predatory fish, particularly of species utilizing fish as intermediate or transient host [4].The snake headed freshwater fish, *Channa punctatus* Bloch ,1793 of the family Channidae has a wide geographical distribution, a high growth rate and contributes significantly to fishery sector in India.It usually inhabits swamps, pools, rice fields and is known for its nutritive and invigorating qualities.Data regarding the parasitic infestation of helminth parasites of fishes in Nadia district of West Bengal is limited.Many workers like Bhalerao [5, 6],Dayal [7],Gupta [8] have made valuable contribution on the taxonomy of digenetic trematode and cestode parasites.Fish nematodes of Indian region have been studied by Karve [9],Agarwal [10] and Soota [11] while Das [12],Sarkar [13],Agarwal [14],Tadross [15],Rai [16],Gupta and Gupta [17],Gupta and Fatma [18],Koul *et al.* [19],Bhattacharya [20], Gupta *et al.* [21] have worked significantly on acanthocephalan taxonomy but in order to control parasitic infestation of fresh water fishes much emphasis needs to be given on epidemiological studies so that preventive measures can be taken.

Therefore, the present study was undertaken to investigate the prevalence, mean intensity and abundance of infestation of helminth parasites and the seasonal variation of such infestation in relation to physicochemical parameters of the water quality of the fish farms.

II. Material And Methods

2.1 Collection of the hosts

The freshwater fish, *Channa punctatus* Bloch **,**1793 (17-21 cm long) weighing 50–75 g were collected from fish farms of Nadia district in West Bengal during the period of January 2013–December 2013 and were brought alive in the parasitology laboratory for examination .They were kept for 3 weeks under observation for acclimatization in glass aquaria (40 × 60 × 100 cm). Water was changed after every 24hr and commercial fish food was supplied to fish during acclimatization period. Dead fish (if any) were removed from the aquaria as soon as possible to avoid water fouling.

2.2 Collection of Parasites

Fishes were dissected out and body cavity was thoroughly examined for any parasite.Visceral organs were placed and dissected out in petridish containing normal saline (0.6% NaCl) to allow adhering parasites to be released. Collected nematodes were fixed in hot 70% ethanol and stored in glass vials containing glycerine alcohol (1:3).Nematodes were later cleared in lactophenol for morphological observation and identification. The trematodes were fixed in between the folds of glass slides and cover slips tied with rubber bands or thread. AFA or 70% ethanol were allowed to run through the slides and cover slips and the fixed specimens were then preserved in coupling jars containing 70% ethanol and 5% glycerine. In case of acanthocephalans, collected parasites were thoroughly washed with saline and kept in distill water to facilitate complete eversion of the proboscis. Further, parasites kept over glass slides were flattened under slight pressure of cover glass, fixed in A.F.A. and after 24 hours preserved in glycerified 70% alcohol. Relative parameters were measured and identification was performed using selected identification keys**.** [20, 22, 23, 24, 25, 26]

Prevalence, mean intensity and abundance concepts as suggested by Margolis et al. [27] were used in the present study.

$$\text{Prevalence \%} = \frac{\text{Total number of host infected}}{\text{Total number of host examined}} \times 100.$$

$$\text{Mean Intensity} = \frac{\text{Total number of parasite}}{\text{Total number of host infected}}$$

$$\text{Abundance} = \frac{\text{Total number of parasite}}{\text{Total number of host examined}}$$

2.3 Physicochemical analysis of water quality of fish farms

Water quality data viz. temperature (^{0}C), pH, dissolved oxygen (ppm) were analyzed during day time during the entire study period. Most samplings of water was done between 7 A.M. to 11 A.M. from the surface layer of the fish farms. The temperature was recorded at the time of sampling on the spot using centigrade thermometer, pH was measured with standard pH meter and the dissolved Oxygen was measured by APHA method [28].

2.4 Statistical Analysis

Parasites recovered were analyzed using the infection statistics of Margolis et al. [27]. Comparative analysis of parasite prevalence, mean intensity and abundance with respect to seasons and physicochemical analysis of water quality were carried out using student t-test. The mean values are compared at 1% level of significance ($P< 0.01$).

III. Results And Discussion

3.1 Monthly distribution (Prevalence, intensity and abundance) of parasites

A total number of 540 fishes (*Channa punctatus*) were sampled from January 2013 to December 2013 out of which 140 were found to be infected.Three helminth parasites were reported including one nematode *Eustrongylides* sp,one trematode *Euclinostomum heterostomum* and one acanthocephalan *Pallisentis allahabadii*. *Eustrongylides* sp were collected from abdominal cavity, liver and intestine, *Euclinostomum heterostomum* from liver and *Pallisentis allahabadii* from intestine of the infected fishes.The total number of parasites, prevalence, mean intensity and abundance of the three parasites are showed in Figures 2 ,3 and 4.A total of 469 helminthes parasites belonging to the Nematoda, Acanthocephalan and Trematoda were recovered. Sixty two fishes were infected with nematodes of the genus *Eustrongylides* sp with a prevalence rate of 44.28%, fifty (35.71 %) fishes were infected by the trematode (*E. heterostomum*) while the acanthocephalan (*P. allahabadii*) infected 28 (20 %) fishes.

The nematode, *Eustrongylides* sp showed prevalence varying from 13.33 % to 66.66 %.The prevalence of infection was maximum in the month of May ‘13 and minimum in September and December. *Euclinostomum heterostomum* exhibited peak prevalence in the month of July’13 and lowest in the month of December but the intensity of occurrence was highest in the month of May ‘13 and April’13.The acanthocephalan *Pallisentis allahabadii* showed maximum prevalence in the month of October ’13 but the intensity of infection was highest

during September'13.Thus prevalence and intensity of infestation of helminth parasites in *C. punctatus* were significantly (P<0.01) different in different months.

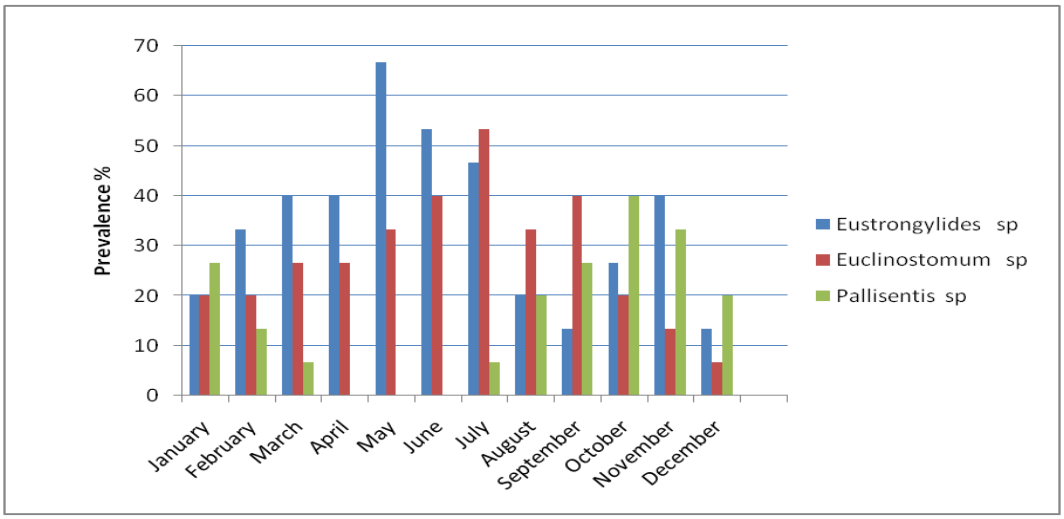

Figure 1-Graph showing monthly prevalence of helminth parasites in *Channa punctatus*.

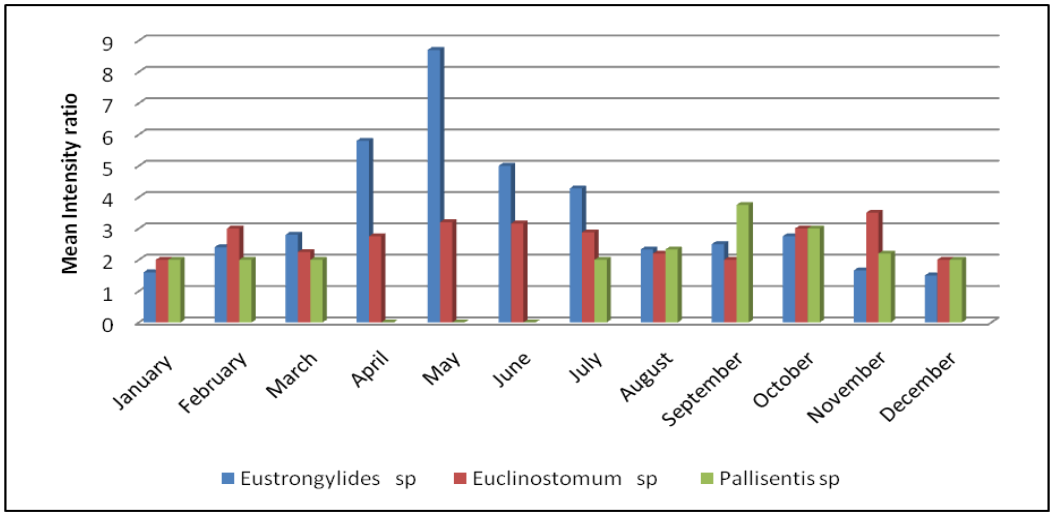

Figure 2-Graph showing mean intensity ratio of helminth parasites in *Channa punctatus*.

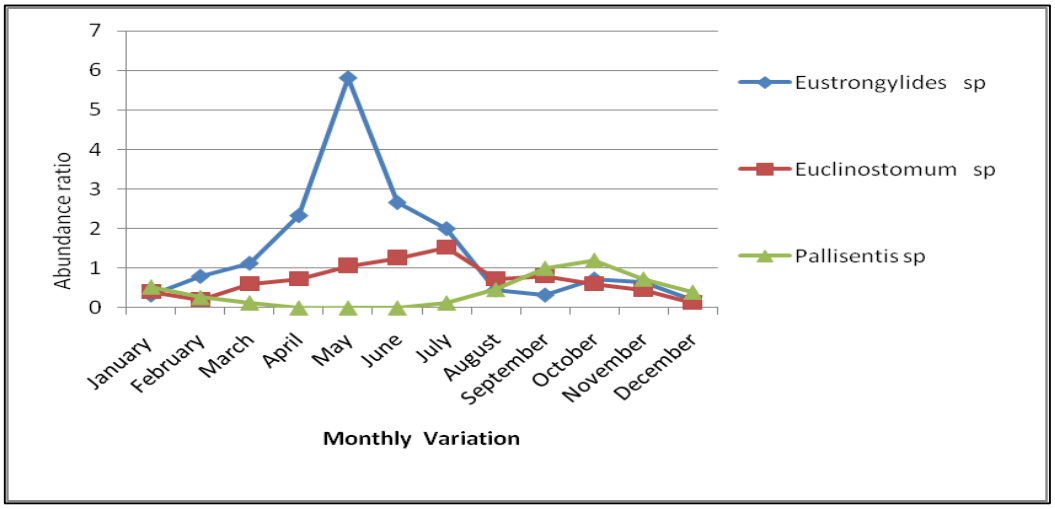

Figure 3- Graph showing abundance ratio of helminth parasites in *Channa punctatus*.

3.2 Seasonal distribution of helminth parasites

Seasonal variation in incidence of helminth parasitism in fishes was probably influenced by the life cycle of the parasites. Prevalence and intensity of *Eustrongylides* sp were highest during summer season and lowest during winter while abundance was considerably higher in summer season (Table 1).*Euclinostomum heterostomum* exhibited highest prevalence and intensity ratio during rainy season (42.22%) and lowest during winter season(Table 2).Autumn recorded highest prevalence due to infestation by *Pallisentis allahabadii* and winter lowest.

Table 1. Prevalence, intensity and abundance of *Eustrongylides* sp in *Channa punctatus* in different seasons.

Seasons	Number of hosts Examined	Number of host Infested	Prevalence (%)	Number of worms Collected	Mean Intensity Ratio	Abundance Ratio
Winter	45	10	22.22	20	2	0.44
Summer	45	22	48.88	114	5.7	2.53
Rainy	45	18	40	77	4.2	1.71
Autumn	45	12	25.66	26	2.16	0.57

Table 2. Prevalence, intensity and abundance of *Euclinostomum heterostomum* in *Channa punctatus* in different seasons.

Seasons	Number of hosts Examined	Number of host Infested	Prevalence (%)	Number of worms Collected	Mean Intensity Ratio	Abundance Ratio
Winter	45	7	15.55	17	2.42	0.377
Summer	45	13	28.88	36	2.76	0.8
Rainy	45	19	42.22	53	2.78	0.42
Autumn	45	11	24.44	28	2.5	0.622

Table 3. Prevalence, intensity and abundance of *Pallisentis allahabadii* in *Channa punctatus* in different seasons.

Seasons	Number of hosts Examined	Number of host Infested	Prevalence (%)	Number of worms Collected	Mean Intensity Ratio	Abundance Ratio
Winter	45	09	20	18	2	0.40
Summer	45	01	6.67	02	2	0.04
Rainy	45	04	8.88	09	2.25	0.2
Autumn	45	15	33.33	44	2.93	0.977

It was observed that 34.44% of the hosts were infected with the nematode *Eustrongylides* sp with highest infection in the month of May while *E.heterostomum* infestation was recorded maximum during the month of July.The parasites *Eustrongylides* sp and *E.heterostomum* followed a seasonal pattern varying significantly with temperature and dissolved oxygen of the water. Heavy infection of hosts by *Eustrongylides* sp infection was recorded in the summer months ie March – May when the temperature of the water ranges from 30-35^{0}C,thus there was a positive correlation with temperature and the occurrence of infection ($P<0.01$).Prevalence and intensity of infestation in fishes by the nematode were higher in summer season which was in agreement with the studies of Steinauer and Font [29] who stated that abundance and prevalence peaked during summer. Almost similar findings were also noticed by Banu *et al.* [30], Hossain *et al.* [31],Akhter *et al.* [32], Chandra *et al.* [33].Occurrence of infection also shows a high significance ($P<0.01$) with dissolved O_2 concentration of water i.e rate of infection becomes high at low level of dissolved O_2 was supported by the results of the study recorded in the month of July as observed in hosts infected by *E. hererostomum*.pH values of the water bodies ranged between 7.6- 8 during summer seasons whereas during winter it was between 7.30-7.60. Bhure *et al.* [34] reported high incidence (51.78%), intensity (1.18%) and density (0.613%) of *Rhabdocona* sp in summer followed by winter and rainy season.Bagherpour *et al.* [35] reported the highest prevalence by trematodes in spring and the lowest during autumn. *P. allahabadii* infestation was higher during autumn with peak infection incidence in the month of October when water temperature drops thus fall in water temperature reduces immune response in fishes making them more vulnerable to parasites. Thereafter the infection declined gradually during the winter season and finally disappearing during the summer period.Prevalence was again observed in the month of July ie rainy season.These results shows parity with the findings of Malhotra and Banerjee [36].In contrast studies on population dynamics *Pallisentis* sp by Gupta *et al.* [37] reported absence of infection in the month of October while highest prevalence was reported in the months from February to March (100%) both in male and female hosts of *C. punctatus* .Sudden retardation in the infectivity was

recorded and it was minimum during June (7.14% in males) and in May (14.28%) in females. Jha *et al*. [38] reported highest prevalence in the month of September while intensity of infection was highest in August of *P. ophiocephali* collected from *C. punctatus*. Sinha *et al*. [39] recorded higher prevalence of *Pallisentis pandei* during rainy seasons. Kim *et al*. [40] observed that abundance of *P. gotoi* sharply increased in November then declined gradually to May.Thus it can be concluded that during winter months sudden decline in water temperature suppress the immune system in fishes and making them more vulnerable to disease agent. Chubb[41] emphasized that water temperature acts directly on the helminths or indirectly through the host behaviour, especially altering feeding behaviour and metabolism, while a contrasting view was put forwarded by Jha *et al*. [38] stating that water temperature does not play any significant role in the seasonal occurrence of helminth parasites.

Table 4-Physicochemical parameters of collected water from fish farms .

Month	**Temperature(^{0}C)**	**pH**	**Dissoloved Oxygen (ppm)**
January 2013	22	7.6	7.8
February	25	7.9	7.5
March	30	8	7.1
April	32	7.8	6.3
May	35	7.6	4.5
June	31	7.2	5.4
July	29	6.8	5.8
August	30	6.2	6
September	28	5.8	6.2
October	27	6.9	6.3
November	25	7.3	5
December	20	7.8	5.9

The present study was conducted to determine the population biology and prevalence of helminth parasites in *Channa punctatus* of Nadia district in West Bengal. The infestations differed according to month, season and physicochemical parameters of water bodies of the fish farms. The prevalence and intensity depends on many factors like type of parasite, host's feeding habits, the water body the fish inhabits, presence of intermediate hosts such as oligochaetes ,snails and fish-eating birds. Many parasites uses fish as intermediate host for completing their life cycle of which nematodes and trematodes are a common group, which generally infest the fish either in adult or in larval condition. Increase in parasitic infestation occurs in as a result of elevated temperatures along with organic enrichment of the water bodies caused by pollution, agricultural runoff, indiscriminate use of antibiotics which causes increase in density of intermediate hosts.Thus low metabolic activity along with suppression of natural immune system of fishes has made them susceptible to a wide range of parasites and diseases.Thus aquatic organisms respond directly to environmental changes in their biological environment as their metabolic processes are influenced by temperature, pH and dissolved O_2 levels. From the data of prevalence and intensity of infection of helminth parasites studied, it can be concluded that water temperature have clear cut impact on the occurrence of helminth parasites. Thus seasonal occurrence of helminth parasites occurs due to ecological conditions like availability of intermediate hosts, life cycle of the parasites and age of the hosts and the established database would allow precise diagnosis for implementation of treatment or preventive measures which are indispensable in fish farming industry.

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