UTTAR PRADESH JOURNAL OF ZOOLOGY

39(2): 83-88, 2019
ISSN: 0256-971X (P)

STUDIES ON SEASONAL PREVALENCE, INTENSITY AND ABUNDANCE OF HELMINTH PARASITES OF LIVE FISHES

IVY KUNDU[1*]

[1]Department of Zoology, Krishnagar Government College, Krishnagar, Nadia-741101, West Bengal, India.

AUTHOR'S CONTRIBUTION

The sole author designed, analysed, interpreted and prepared the manuscript.

Received: 19 April 2019
Accepted: 27 June 2019
Published: 08 July 2019

Original Research Article

ABSTRACT

The objective of the investigation encompasses the study of the prevalence of infection, intensity and abundance of endohelminths infecting live fishes. A total of 250 fishes comprising of 60 *Channa punctata*, 60 *Clarias batrachus,* 60 *Heteropneustes fossilis,* 40 *Anabas testudineus* and 30 *Notopterus notopterus* were collected from various districts of West Bengal from December 2018–January 2019. Detection of endohelminths in sampled fishes and various parameters were studied by standard procedures. Helminth parasites recovered included nematode *Eustrongylides* sp., trematode *Euclinostomum heterostomum* and *Clinostomum complanatum* and acanthocephalan *Pallisentis(B.) allahabadii*. The nematodes constituted highest prevalence amongst the parasites recovered, in comparison to trematodes and acanthocephalans. Amongst fishes forty three percentage *C. punctata,* thirty three percentage *C. batrachus,* twenty six percentage of *H. fossilis* were found to be infected by helminth parasites. Prominent infection was not detected in *A. testudineus* and *N. notopterus*. Thus amongst all the host fishes studied, *C. punctata* was found to harbour maximum number of endohelminths infecting various visceral organs which might be caused by the increased pollution level in the water bodies.

Keywords: Helminth; prevalence; abundance; intensity; seasonal variation; infestation; fish.

1. INTRODUCTION

Fishes are widely distributed in various water bodies due to their high productivity rate and for their ability to adapt to various climatic conditions [1]. Parasites compete for food thereby depriving fish of its essential requirements resulting in morbidity and mortality of fishes [2]. Protozoan and helminth parasitic infection in fishes have become a worldwide problem. Heavy infection of parasites in fishes causes death resulting in huge financial losses [3]. Climatic variations are known to cause extensive displacement in species distribution and diversity. Moreover, climate change has resulted in marked paradigm changes in rate of parasite infestation in fishes. The extend of parasitism varies yearly and in between geographical locations depending on the prevailing climatic conditions. The major factors influencing extent of parasitism can be classified as parasite factors which involves epidemiology of the different species, host factors like genetic resistance, age as well as physiological condition of fish and environmental factors covering climate, nutrition, stocking density and management are considered. The present study was aimed for studying prevalence, mean intensity and abundance of helminth parasites infecting live fishes which would address the lack of information on the parasitofauna of fish in water bodies in West Bengal. The confluence of seasonal pattern of variation of parasitic infection and effect of biotic factors may act as an important tool in planning the control of parasites.

**Corresponding author: Email: ivy_kundu@rediffmail.com;*

2. MATERIALS AND METHODS

2.1 Area of Study

Fishes were collected from various fish farms in three districts of West Bengal namely Nadia (23.4710°N, 88.5565°E), Kolkata (22.5726°N, 88.3639°E), North 24 Paraganas (22.6168°N, 88.4029°E) and brought alive in the Parasitology laboratory for examination.

2.2 Collection of Host Fishes

Live host specimen *Channa punctata*, *Clarias batrachus, Heteropneustes fossilis, Anabas testudineus* and *Notopterus notopterus* were randomly sampled and collected from fish farms of three districts (Nadia, Kolkata and North 24 Paraganas) in West Bengal. The collection of hosts was done during the study period of December 2018– January 2019 and a total number of 250 fishes were sampled. Collection site, date of collection and number of host sampled were properly recorded. Specimens were then identified, measured and were kept for three weeks for acclimatization in glass aquaria [4]. Commercial fish food was provided to fishes and water in the aquarium was changed after every 24 hr.

2.3 Examination and Collection of Parasites

Helminth parasites harbouring in the stomach, intestine, body cavities and visceral organs like liver, kidney, swim bladder were carefully collected in normal saline (0.6% NaCl) and processed separately. Collected nematodes were fixed in hot 70% ethanol and then were stored in glass vials containing glycerine alcohol (1:3) and labelled separately for each fish. Light microscopic examination of each nematode was done by clearing in lactophenol for morphological observation and identification. The trematodes were then washed in saline solution and stretched in between the folds of glass slides and cover slips tied with rubber bands or threads which were later fixed in AFA or 70% ethanol. The specimens were then preserved in coupling jars containing 70% ethanol and 5% glycerine. Acanthocephalans collected were kept in distilled water to facilitate complete eversion of the proboscis. Later they were then fixed in AFA fixative and preserved in glycerified 70% alcohol after 24 hours. Relative parameters were measured and identification was performed using selected identification keys [5,6,7,8, 9,10].

2.4 Prevalence, Mean Intensity and Abundance Concepts Used in the Present Study [11]

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

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

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

2.5 Statistical Analysis

The data were analyzed using paired t-test and expressed as Mean ± SD (Standard deviations of the Mean). The statistical package- SPSS-10.0 was applied for the analysis of data and $p < 0.05$ was taken as the level of significance.

3. RESULTS

The prevalence of parasitic infection in fishes were examined annually and the overall observations have been summarised below. Trematode infection was found in three fishes namely *C. punctata*, *C. batrachus, H. fossilis*, nematode infection was found in *C. punctata*, *C. batrachus* while acanthocephalan infection in *C. punctata*. Prominent infection was not observed in *A. testudineus* and *N. notopterus*.

A total of 250 fishes were studied in which 26 (43%) *C. punctata,* 20 (33.33%) *C. batrachus,* 16 (26.16%) *H. fossilis* were found to be infected. A total of sixty fishes of *C. punctata* have been sampled during the research period out of which 26 were found to be infected. Four helminth parasites were reported including one nematode *Eustrongylides* sp., trematode *E. heterostomum* and *C. complanatum* and one acanthocephalan *P(B.) allahabadii*. *Eustrongylides* sp. were collected from abdominal cavity, liver and intestine, *E. heterostomum* from liver, *Clinostomum* from swim bladder, liver and intestine and *P. (B). allahabadii* from intestine of the infected fishes. The prevalence, mean intensity and abundance of the four parasites are showed in Table 1. In *H. fossilis* two helminth parasites belonging to trematoda namely, *E. heterostomum* and *C. complanatum* have been isolated from abdominal cavity, liver and intestine. The prevalence, mean intensity and abundance of the two parasites have been presented in Table 2. In *C. batrachus* three parasites one belonging to nematode *Eustrongylides* sp., and other two belonging to trematode *E. heterostomum* and

Table 1. Showing prevalence, mean intensity and abundance of helminth parasites in *C. punctata*

Month	Parasites	*C. punctata*		
		Prevalence	**Mean intensity**	**Mean abundance**
March-May	*Eustrongylides* sp	73.2	3.2	2.16
	E. heterostomum	54	2.4	1.53
	C. complanatum	41	2.3	1.4
	P. (B) allahabadii	7.5	1.3	0.85
Month	**Parasites**			
June-August	*Eustrongylides* sp	49	2.1	1.7
	E. heterostomum	62	2.5	1.45
	C. complanatum	56	2.9	1.1
	P. (B) allahabadii	11.5	2.1	1.67
Month	**Parasites**			
September-November	*Eustrongylides* sp	34	1.2	0.93
	E. heterostomum	37	1.8	0.85
	C. complanatum	42.3	2.1	1.1
	P. (B) allahabadii	31	1.2	0.88
Month	**Parasites**			
December-February	*Eustrongylides* sp	27	1.1	0.82
	E. heterostomum	23	1.5	0.71
	C. complanatum	33	1.9	0.95
	P. (B) allahabadii	18	1.0	0.78

Table 2. Showing prevalence, mean intensity and abundance of helminth parasites in *H. fossilis*

Month	Parasites	*H. fossilis*		
		Prevalence	**Mean intensity**	**Mean abundance**
March-May	*E. heterostomum*	15	1.0	0.28
	C. complanatum	11	1.0	0.12
Month	**Parasites**			
June-August	*E. heterostomum*	22	1	0.64
	C. complanatum	37	1.2	0.75
Month	**Parasites**			
September-November	*E. heterostomum*	12	1.0	0.15
	C. complanatum	14	1.0	0.18
Month	**Parasites**			
December-February	*E. heterostomum*	5	1.0	0.13
	C. complanatum	11	1.0	0.15

C. complanatum have been isolated from abdominal cavity, liver and intestine. The prevalence, mean intensity and abundance of the three parasites have been showed in Table 3.

4. DISCUSSION

Prevalence and intensity of infestation in *C. batrachus* by larval forms of *Eustrongylides* were found more in rainy season in comparison to other months by Aken'Ova [12]. However many researchers have observed prevalence and intensity of infestation predominantly in the summer seasons by larval forms of *Eustrongylides* in *C. punctata.* [13,14,15,16, 17] which corroborated with the present studies (Table 1).

The prevalence of infestation due to helminth parasites was maximum during pre-monsoon and minimum during monsoon and gradually increases during winter in *A. testudineus*, *C. fasciata* and *T. lalius* respectively has been reported by many scientists [18,19,20].

Pallisentis infection was more during the autumn and subsequently declined gradually in the winter and again increased gradually in the month of July. The result shows parity with the findings of Malhotra and Banerjee [21]. In contrast with the studies on *Pallisentis* by Gupta et al. [22] who reported the absence of infection in the month of October while highest during the period February to March (100%) in *C. punctata*. Jha et al. [23] reported highest

Table 3. Showing prevalence, mean intensity and abundance of helminth parasites in *C. batrachus*

Month	Parasites	*C. batrachus*		
		Prevalence	***Mean Intensity***	***Mean abundance***
March-May	*Eustrongylides* sp	31	1	0.41
	E. heterostomum	12	1	0.32
	C. complanatum	9	1	0.25
Month	**Parasites**			
June-August	*Eustrongylides* sp	15.4	1.5	0.87
	E. heterostomum	14	1.2	0.51
	C. complanatum	18	1.4	0.34
Month	**Parasites**			
September-November	*Eustrongylides* sp	17	1	0.22
	E. heterostomum	5.1	1	0.12
	C. complanatum	12.2	1	0.28
Month	**Parasites**			
December-February	*Eustrongylides* sp	10	1	0.21
	E. heterostomum	4	1	0.11
	C. complanatum	3	1	0.25

prevalence in the month of September while intensity of infection of *Pallisentis* reported from *C. punctata* was highest in August. Abundance of *Pallisentis* increased in November then declined gradually in the month of May was observed by Kim et al. [24]. Sinha et al. [25] recorded higher prevalence of *Pallisentis* during rainy season. Bagherpour et al. [26] reported the highest prevalence in spring and the lowest during autumn due to trematode infection. Hassan et al. [27] observed the highest prevalence (28.33%) was recorded for *Euclinostomum* in summer and lowest during winter in *Tilapia*.

Kaur et al. [28] investigated the prevalence of different helminth parasites of freshwater murrel, *C. punctata* (Bl.). The metaceracial stage of trematode parasite *Euclinostomum* was the dominant species (28%) followed by *Pallisentis* (26.6%) while metaceracia of *Clinostomum* (20.0%) showed least prevalence.The maximum prevalence (33.3%) of *Euclinostomum* was recorded in month of December, while the minimum prevalence (12.5%) was recorded in May. The maximum prevalence (25.0%) of *Pallisentis* was recorded in the month of January while the minimum prevalence (10%) recorded in May. Maximum prevalence (37.5%) of *Clinostomum* was recorded in the month of May while the minimum prevalence (25.0%) was recorded in March.

According to Kumar and Rajlingam [29] the maximum mean intensity was recorded in May (69.23%) and minimum in June (17.64%) in *Euclinostomum* infection in fresh water fish *Catla catla*. The acanthocephalan species, *Pallisentis* were abundant in summer (73.33%) followed by rainy (60%) and winter (55%) in Gangetic leaffish, *Nandus nandus* as stated by Parveen and Sultana [30]. Ejere et al. [31] studied prevalence of helminth parasites in freshwater fishes of the Warri River, Nigeria with nematodes having highest prevalence (23.5%), acanthocephalans (9.4%), trematodes *Clinostomum complanatum* (1.2%), leech, *Pisciola geometra* (2.4%) and crustaceans (1.2%). The highest prevalence (40.74%), intensity (3.63) and abundance (1.48) were observed during June for *Euclinostomum* infection and no infection have been recorded during December in *C. punctata* as stated by Shareef and Abidi [32].

Thus it appears from the present study that *C. punctata* are more prone to both *Eustrongylides* and *Euclinostomum* infection in comparison to *C. batrachus*. *Clinostomum* infection was predominant in *H. fossilis* than in *C. batrachus* while *Pallisentis* infection has been recorded only in *C. punctata* in comparison to other two fishes. Amongst all the host fishes studied, *C. punctata* was found to be infected with maximum number of helminth parasites.

Bello et al. [33] and Simkova et al. [34] proclaimed that an increase in the prevalence of parasitic infections is attributed to the stress of reproductive processes. Intensity of encysted metacercarie probably could potentially contribute to the decline in infections observed in winter, suggesting an association between higher mortality and parasitism intensity [35]. The seasonal pattern, with variable amplitudes of fluctuation in different fish species in different seasons also suggests the presence of a seasonal infection-modifying factor [36].

5. CONCLUSION

Parasite infestation reduces the economic value of fishes and thus major steps should be taken to ameliorate the causes increasing the chances of

parasite invasion. Changes in the prevalence and mean intensity and abundance are caused by various factors and it is difficult to distinguish between the various factors causing of parasitic infection.

ETHICAL APPROVAL

The fishes were collected in fresh condition from different fish farms of West Bengal. Animal ethical care guidelines were followed as the fish were used in the study. It has been informed that as per CPCSEA instruction's protocol for experimentation on fishes, does not require approval.

ACKNOWLEDGEMENT

The author acknowledges Department of Zoology, Krishnagar Govt College, West Bengal for providing infrastructural facilities.

COMPETING INTERESTS

Author has declared that no competing interests exist.

REFERENCES

1. Onwuliri COE, Mgbemena MO. The parasitic fauna of some fresh water fish from Jos Plateau, Nigeria. AJAFH. 1987;2:33-37.
2. Francis Floyd R. Introduction to fish health management. IFAS Extension. Fisheries and Aquatic Sciences Department University of Florida US CIR 921. 2005;1-4.
3. Khalil LF, Polling L. Checklist of the helminth parasites of African freshwater fishes. University of the North, Pietersburg. 1997; 185.
4. Jayaram KC. The freshwater fishes of India: A hand book. Zoological survey of India, Kolkata. 1981;1-475; i-viii.
5. Yamaguti S. Systema helminthum. The digenetic trematodes of vertebrates Part I and II. New York. 1958;I:1141-1143.
6. Kundu I, Bandyopadhyay PK, Mandal DR. Prevalence of helminth parasites infecting *Channa punctatus* Bloch, 1793 from Nadia district of West Bengal. IOSR-JAVS. 2015;8: 41-6.
7. Yamaguti S. Systema Helminthum. Acanthocephala. Interscience Publication: New York. 1971;V.
8. Moravec F. Structure of the cephalic end in the genus *Citharinie*lla Khalil, (Nematoda: Pharyngodonidae) as revealed by SEM, with a key to pharyngodonid genera from fishes. Syst Parasitol. 1994;27:133-137.
9. Anderson RC. Nematode parasites of vertebrates their development and transmission. 2nd Edition, CABI Publishing; 2000.
10. Bhattacharya SB. Handbook on Indian acanthocephala. Zoological Survey of India, Kolkata, India; 2007.
11. Margolis L, Esch GW, Holmes JC, Kuris AM, Scad GA. The use of ecological terms in parasitology (Report of an Ad-hoc committee of the American Society of Parasitology). J Parasitol. 1982;68:131-133. Available:http://dx.doi.org/10.2307/3281335
12. Aken'ova TO. Helminthes Infections of the gills of *Clarias* species in Zaria. Nigerian J Parasitol. 1999;20:113-121.
13. Steinauer ML, Font WF. Seasonal dynamics of the helminth of bluegill (*Lepomis macrochirus*) in a subtropical region. J Parasitol. 2003;89: 324-328.
14. Banu ANH, Hossain MA, Khan MH. Investigation into the occurrence of parasites in carps, catfish and *Tilapia*. Progress Agric. 1993;4:11-16.
15. Hossain MA, Banu ANH, Khan MH. Prevalence of ectoparasite in carp nursery operation of greater Mymensingh. Progress Agric. 1994;5:39- 44.
16. Akhter M, D'Silva, Khatun A. Helminth parasite of *Anabas testudineus* in Bangladesh. Bangladesh J Zool. 1997;25:35-138.
17. Chandra KJ, Islam KZ, Wotten R. Some aspects of association and development of *Lystocestus indicus* Moghe in catfish, *Clarias batrachus*. Bangladesh J Fish Res. 1997;1:31-38.
18. Khanam H, Begum S, Begum A. Seasonal prevalence, intensity and organal distribution of helminth parasites in *Macrognathus aculeatus.* Dhaka Univ J Biol Sci. 2011;20(2): 117-122.
19. Das D, Goswami MM. Distribution of helminth parasites in different organs and their seasonal rate of infestation in three freshwater fishes of Goalpara, Assam, India. Res J Ani Vet Fish Sci. 2014;2(9):13-17.
20. Khurshid I, Ahmad F, Ahmad T. Parasitic distribution in relation to gender, season and length of fish hosts in Shallabugh wetland. Int J Sc Eng Research. 2013;4(4):1083-1091.
21. Malhotra SK, Banerjee S. Population dynamics of acanthocephala in catfishes of Gangetic plains. I Effects of season temperature and age of *Channa punctatus* on *Pallisentis allahabadi* Agarwal, 1958. Indian J Helminthol. 1997;14: 39-44.
22. Gupta N, Singhal P, Gupta DK. Population dynamics of a parasite *Pallisentis* in two

species of fish *Channa punctatus* and *Channa striatus*. J Env Biol. 2012;33:195-199.
23. Jha AN, Sinha P, Mishra TN. Seasonal occurrence of helminth parasites in fishes of Sikandarpur reservoir, Muzzaffarpur (Bihar). Indian J Helminthol. 1992;44(1):1-8.
24. Kim KH, Ahn KJ, Kim CS. Seasonal abundance of *Prosomicrocotyla gotoi* (Monogenea) and *Opecoelus sphaericus* (Digenea) from greenlings *Hexagrammos otakii* in a southern coastal area in Korea. Aquaculture. 2001;192:147-153.
25. Sinha P, Kumar S, Jha V. Studies on the helminth infestation of *Channa punctatus* in and around Patna. Proc Zool Soc India. 2008;7: 79-84.
26. Bagherpour A, Afsharnasab M, Mobedi I, Jalali B, Mesbah M. Prevalence and intensity of internal parasitic helminthes infected Black sole fish, *Brachirus orientalis* (Bloch and Schneider, 1801) in the Persian Gulf. Iran J Fish Sci. 2011;10(4):570-584.
27. Hassan EA, Soliman MFM, Ghobashy AFA. Some factors affecting metacercarial infections in *Tilapia zilli* from Lake Timsah, Ismailia, Egypt. Egypt Acad J Biolog Sci. 2012;4(1):21-28.
28. Kaur R, Borana K, Kaur P, Sharma S, Chauhan R. Occurrence of helminth parasites of freshwater murrel, *Channa punctatus* (Bl.). J Chem Bio Phy Sci. 2012;2(4):3433-3440.
29. Kumar PA, Rajlingam G. Dynamics of a trematode parasite *Euclinostomum laterostomum* in the fresh water fish *Catla catla* of Hyderabad lakes. AJBLS. 2013;1(1): 1-6.
30. Parveen S, Sultana S. Infestation of helminth parasites in gangetic leaffish *Nandus nandus* (Hamilton, 1822). Bangladesh J Zool. 2014; 42(2):183-190.
31. Ejere VC, Aguzie OI, Ivoke N, Ekeh FN, Ezenwaji NE, Onoja US, Eyo JE. Parasito fauna of five freshwater fishes in a Nigerian freshwater ecosystem. Croat J Fish. 2014;72: 17- 24.
32. Shareef PAA, Abidi SMA. Studies on the epidemiology and histopathology of *Euclinostomum heterostomum* (Trematoda; Digenea) infection in *Channa punctata* from North India. Arch Pol Fish. 2015;23:133-140.
33. Bello AR, Fortes E, Bello-Klein A, Bello AA, Llesuy SF, Robaldo RB, Bianchini A. Lipid peroxidation induced by *Clinostomum detruncatum* in muscle of the freshwater fish Rhamdia quelen. Dis. Aquat. Organ. 2000;42: 233–236.
34. Simkova A, Jarkovsky J, Koubkova B, Barus V, Prokes M. Associations between fish reproductive cycle and the dynamics of metazoan parasite infection. Parasitol Res. 2005;95:65–72.
35. Jensen T, Jensen KT, Mouritsen KN. The influence of the trematode *Microphallus claviformis* on two congeneric intermediate host species (Corophium): Infection characteristics and host survival. J Exp Mar Biol Ecol. 1998;227:35–48.
36. Elsheikha HM, Elshazly AM. Host-dependent variations in the seasonal prevalence and intensity of heterophyid encysted metacercariae (Digenea: Heterophyidea) in brackish water fish in Egypt .Vet Parasitol. 2008;153:65–72.