Journal of Advanced Laboratory Research in Biology
E-ISSN: 0976-7614
Volume 9, Issue 1, 2018
PP 15-20
https://e-journal.sospublication.co.in

Research Article

Population Dynamics of Helminth Parasites in Fresh Water Fishes *Channa punctatus* and *Heteropneustes fossilis* in Moradabad, U.P., India

Shalini Roy[1] and Neelam Kumari[2*]

[1,2*]*Department of Zoology, Hindu college, Moradabad-244001, U.P., India.*

Abstract: In the present report two types of fish *Channa punctatus* (Bloch) and *Heteropneustes fossilis* (Bloch) were examined to explore the status of helminthic infection in fishes from various water bodies of Moradabad district. The Acanthocephalans, Nematodes and Trematode parasites were detected from gastrointestinal tract and body cavity of host during the study period from January 2017 to March 2017. Intestine was found to be highly infected site in the host fish *Channa punctatus* while in *Heteropneustes fossilis*, trematodes were localized in skin muscles only and the highest prevalence (70%) of all the parasites was observed in the month of February 2017, however highest abundance (0.89), highest intensity (1.34) and highest index of infection (0.61) was recorded in the month of March 2017 along with the highest loss in body weight (0.153kg.) along with highest mortality.

Keywords: Gastrointestinal Tract (GIT), Trematode, Helminthic Infection, Mortality.

1. Introduction

Helminths are commonly found in both wild and cultured fishes. Endoparasitic helminths with indirect life cycles involve one or more host. Even in host-parasite systems, the host does not remain indifferent to the presence of parasites. Deardorff (1991) reported that zoonotic infections (infections of animals that also infect man) are being caused by eating raw or under-cooked aquatic food including fishes. There are various modes in which pathogenic effects of parasites on hosts manifest themselves. The parasitic infections are sometimes very fatal and can cause high mortalities reported by Ahmed (1994). According to Luque and Poulin (2004), closely related host species are likely to harbour similar number of parasite species, because these were inherited from a recent common ancestor.

The occurrence of trematode parasites found in Murrells was reported by Reddy *et al.*, (2006). Bhure *et al.*, (2007) studied population dynamics of helminths in freshwater fishes. Fish, the poor man's protein, being low in cholesterol, forms an important source of diet and are easily accessible to the humans. Incidence and intensity of parasites in relation to age or length of the host are found to vary as reported by Geetarani *et al*., (2010). Parasites are good colonizers and expand their ranges by movements of infected animals. If fish cannot be sacrificed, examination of fresh feces may provide information on parasitic burden in the gastrointestinal tract described by Dahiya *et al.*, (2011).

Gupta and Gupta (2014) summarized that young fish are generally more susceptible to the tail region which is most prone to metacercarial infection and should, therefore, be avoided for human consumption. Gupta *et al.*, (2015) also suggested that acanthocephalans are an injurious group of parasites, frequently found in the gut of fresh water Channidae fishes. Parasitic disease is the single most important factor threatening the fishery industry worldwide, particularly in the tropics reported by Schmidt and Roberts (2000). Parasites of fishes are directly associated with human health and in India, there is a general problem under-reporting of fish parasites due to lack of awareness or interest. Several helminth parasites can be transmitted to humans and domestic animals only through fish and remain a subject matter of major public health concern suggested by Chai *et al*., (2005).

2. Material and Methods

Study sites are river Ramganga of Moradabad and pond Deverkhera of Chandausi. The fishes of species *C. punctatus* and *H. fossilis* were collected from Ramganga river district Moradabad in winter season from January 2017 to March 2017. Samples were transferred to departmental laboratory aquarium.

*Corresponding Author: Neelam Kumari 0000-0001-6640-4700.
E-mail: neelamgautam441@gmail.com.
Phone No.:

Before sacrifice, the standard length and weight of fish was measured by the scale in centimetres and weighed individually by the help of weighing balance. Total number of alive and dead fishes was also recorded regularly to check the mortality of host fishes.

Fig. 1. Moradabad Ramganga river fish collection sites.

To observe the helminth parasites fishes were opened up vertically and the entire digestive system was removed and placed in a Petri dish with physiological saline. The external and internal organs were thoroughly examined for parasitic load. The parasites were mainly found in the gastrointestinal tract. The GIT specifically stomach and intestine was removed carefully and kept separately in Petri dish. All the parasites recovered from the different organs of gastrointestinal tract were preserved in 70% alcohol. They were cleaned and kept in small vials for the study of their morphology for identification with the help of light microscope Olympus BX43. The parasites number and place of their attachment were also recorded. Trematode cysts from the muscle were teased manually to release metacercariae, which were fixed in hot alcohol-formal-acetate (AFA) and preserved in 70% ethyl alcohol. Cestodes from the intestinal tract were treated in 0.1% sodium chloride (saline) to relax them, fixed in hot AFA and preserved in 70% ethyl alcohol. Cestodes were stained with aqueous aceto-carmine solution as described by Khalil (1991). Analysis of Prevalence, Abundance and Mean density, Index of infection were determined by following the formula proposed by Margolis *et al*., (1982).

$$\textbf{Prevalence } \% = \frac{\text{Total no. of infected fishes}}{\text{Total no. of host examined}} \text{ x } 100 \quad (1)$$

$$\textbf{Abundance} = \frac{\text{Total no. of parasites recovered}}{\text{Total no. of host examined}} \quad (2)$$

$$\textbf{Intensity} = \frac{\text{Total no. of parasites collected}}{\text{Total no. of infected host examined}} \quad (3)$$

$$\textbf{Index of infection} = \frac{\text{No. of host infected x No. of parasites collected}}{(\text{Total host examined})^2} \quad (4)$$

The loss due to mortality was estimated according to the following the formula of Sahoo *et al.*, (2013).

$$\textbf{Loss due to mortality (kg)} = \text{Average weight of fish x Mortality (in no.)} \quad (5)$$

3. Results and discussion

Out of 143 freshwater fishes of both genus, 78 fishes were parasitized by helminth parasites. In the present investigation, besides 98 parasites various eggs and larva of trematode was also collected and parasites was identified as *Pallisentis* (Acanthocephala), *Clinostomum, Euclinostomum, Diplostomum* (trematodes) and nematodes. Table 1 and Table 2 shows the parasitic influence of collection sites and infection sites of hosts and helminthic infestation in the month of January 2017 to March 2017.

Table 1. Parasitic influence of collection site and infection site in hosts.

Fish Host	Collection Site	Infection Site	No.of Parasites
C. punctatus	Ramganga river Moradabad	Liver	25
H. fossilis	Deverkhera pond Chandausi	Skin	27
C. punctatus	Gagan river Moradabad	Intestine	38
		Stomach	08
TOTAL			**98**

Table 2. Month-wise data of helminthic infestation in host fishes.

Fish Host	Month of Study	No. of Fish Examined	No. of Infected Fish	No. of Parasites Collected
Channa punctatus	January 2017	55	18	20
Heteropneustes fossilis	February 2017	40	28	35
Channa punctatus	March 2017	48	32	43
Total		143	78	98

It is clear from Fig. 2 that Gagan river of Moradabad was observed much infectious site than the other sites studied and the intestine was reported as highly infected organ of host fishes (Fig. 3).

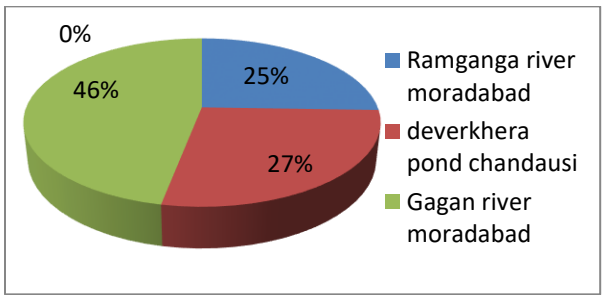

Fig. 2. Collection site wise infectivity of parasites.

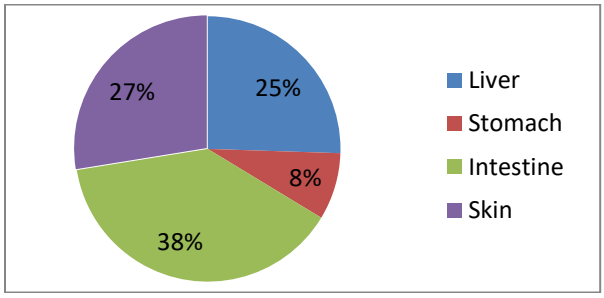

Fig. 3. Host site wise infectivity of parasites.

From the two host genera examined *H. fossilis* was found to be highly infected with trematode parasites and *C. punctatus* was found to be highly infected with Acanthocephala. *Pallisentis* (Acanthocephala) was recovered from the intestine which is found embedded in it with the help of its mouth spines as shown in Fig. 4(d). Trematode parasites i.e. *Clinostomum* and *Euclinostomum* were found penetrated in the host liver as shown in Fig. 4 (b).

Besides these sites, various other helminth parasites along with their stages of life cycle are also recovered from skin muscles of *H. fossilis* and GIT of *C. punctatus* as represented in Fig. 5.

Fig. 4(a). GI tract of dissected fish. 4(b). Trematode attached to liver. 4(c). Trematodes out of cyst. 4(d). Acanthocephala embedded in intestine.

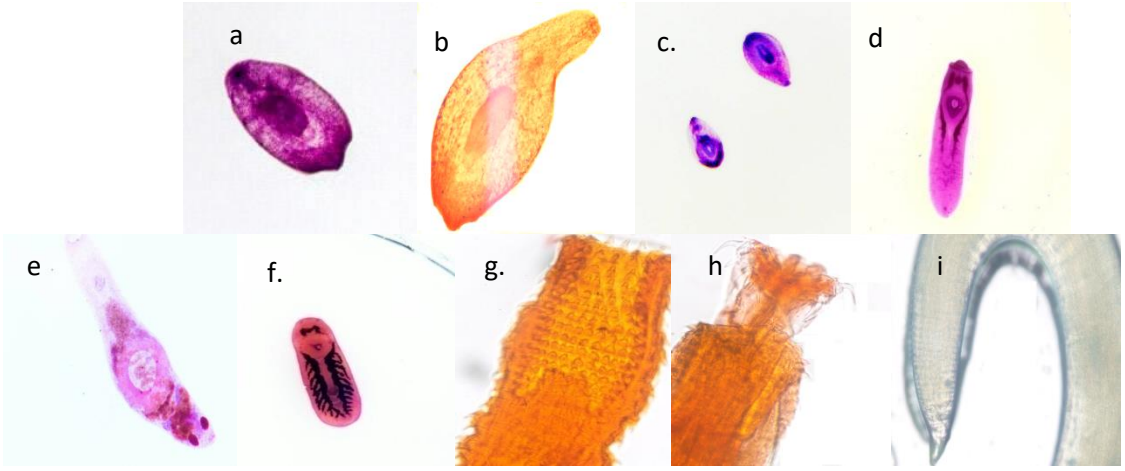

Fig. 5. Different stages of helminth parasites recovered from host fishes.
(a, b, c), *Diplostomum* sp. and its Metacercaria (d) *Clinostomum* sp. (e) Metacercaria of Trematode (f) *Euclinostomum* sp. (g, h) *Pallisentis* (Acanthocephalans) and (i) Nematode.

From all over parasitic burden 27 trematode parasites namely *Diplostomum* have been reported only from skin of *H. fossilis*, and from rest of load from another host fish genera, 25 trematodes i.e. 10 *Clinostomum* and 15 *Euclinostomum* from liver 32 acanthocephalans i.e. *Pallisentis* and 14 nematodes from stomach and intestine have been reported in *C. punctatus* as shown in Fig. 6.

It is clear from Table 3, that prevalence and index of infection was observed at its highest value *i.e.* 70% and 0.61 respectively, in month of February 2017 as shown in Fig. 7, while abundance and intensity were recorded at its peak *i.e.* 0.89 and 1.34 respectively in the month of March 2017 of the studied period represented in Fig. 8.

Table 3. Population dynamics of helminth parasites.

Month of study	Prevalence %	Abundance	Intensity	Index
January 2017	32.72	0.36	1.11	0.11
February 2017	70.00	0.87	1.25	0.61
March 2017	66.66	0.89	1.34	0.59

In our findings (Table 4) highest mortality along with maximum total loss in body weight *i.e.* 0.153 kg was observed in the month of March 17, represented in Fig. 9.

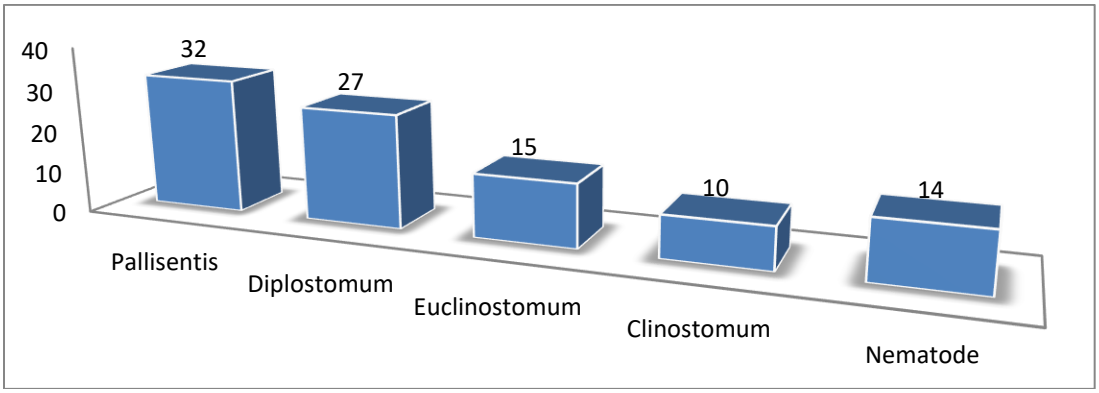

Fig. 6. Occurrence of different types of helminth parasites.

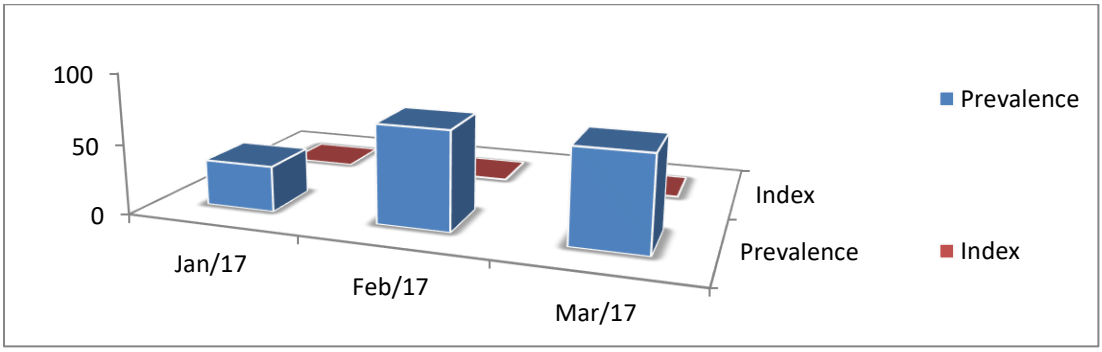

Fig.7. Graph showing the prevalence and index of infection in host fishes.

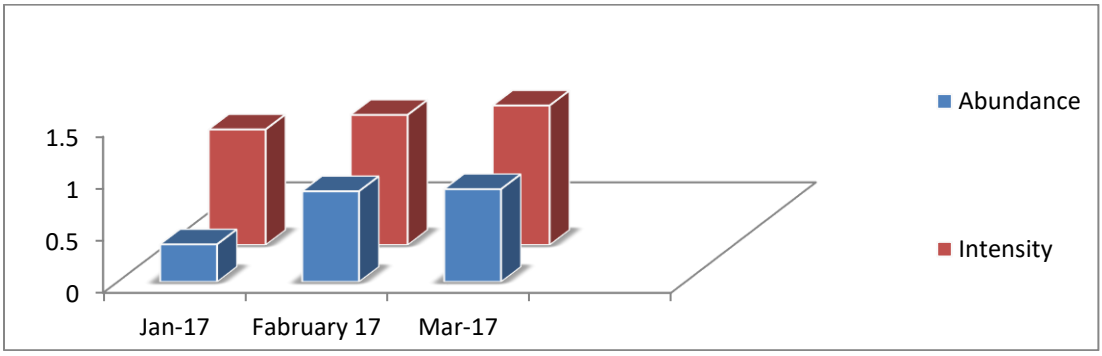

Fig. 8. Graph showing the abundance and intensity of infection in host fishes.

Table 4. Month-wise loss of fishes due to mortality of host fishes.

Month	Total Fish	Average Weight of Fish (Gms.)	Mortality	Total Loss (Kg.)
January 17	55	19	05	0.095
February 17	40	22	03	0.066
March 17	48	17	09	0.153

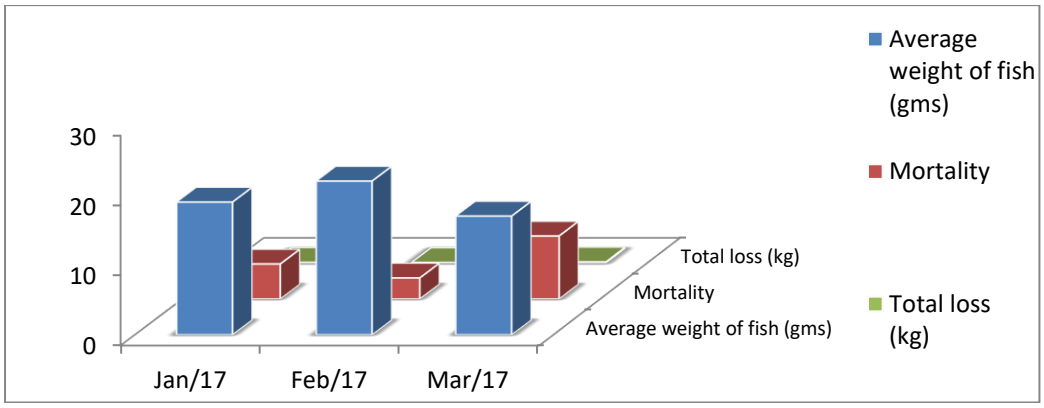

Fig. 9. Graph showing month wise loss in body weight of fishes.

Body of edible fishes is an environment to the parasites. Due to parasitic diseases, the growth of fishes decreases and almost ceases. In our result, we have also found numerous parasites in edible fishes which cause problem. Khurshid and Ahmad (2014) studied the average loss due to reduction in growth per day and observed the injured fishes carry heavy parasitic infection. Das and Goswami (2014) reported that each helminths parasite species prefer to live in a definite zone of the microhabitats, though some can migrate to the other organs, which are normally not their usual site of infection.

Devi *et al.*, (2015) have studied that many parasite species are host specific to at least some degree and are capable of infecting one or only a limited number of host species. Rukhsana *et al*., (2008) reported that due to several factors these fishes are declining in number at a very fast rate from last few years. Chowdhury and Hossain (2015) also observed that parasitic infestation has harmful influence for fish health that affects the normal growth of the fishes and mortalities as effect of the helminth parasites in terms of loss of body weight and mortality was also reported in our study. Fish frequently serve as intermediate or transport hosts for larval parasites. Wide spectrum of helminths infections is transmitted to humans by contamination of food and water as reported by Panda and Dash (2016).

Man acquires the effectively eating poorly cooked or raw fish and metacercaria duplicates adults in the intestine as reported by Deardorff (1991). Ajit and Yuvraj (2015) reported that fish health maintenance programs require many elements, including examination and monitoring of fish pathogens. Some of these parasites cause diseases to fish, affecting their health and reproduction, making them fall easy prey to predators and some infect man. Wali *et al.*, (2016) also reported that fish carrying heavy parasitic burden are extremely lethargic just because of parasites might also alter the physiological as well as reproductive functions of hosts.

4. Conclusion

Our study has shown that freshwater fishes from Moradabad district harbour a heavy burden of helminthic infection. We reported numerous parasites in edible fishes which cause problem when infected fish are brought for eating purposes. It is important to examine the other fish species available because they may function either as carrier hosts or reservoir hosts. Presently, the country ranks second in the world in total fish production, therefore if we are not aware of mortality due to parasitic infection and risk to public health, it may cause of serious loss in fish production and may be dangerous for human health also.

Acknowledgment

I am grateful for the encouragement given by my guide Dr. Shalini Roy. It gives me immense pleasure and privilege to acknowledge my deepest sense of gratitude towards all those who helped me in the successful execution of this Research work. Finally, yet importantly, I would like to express my heartfelt thanks to my beloved parents for their blessings and support of this Research work

References

[1]. Ahmed, M.S. (1994). Trypanosomiasis in common carp, *Cyprinus carpio* L. Ph.D. thesis,

Zoological Institute, Catholic University Leuven, Belgium, 12.

[2]. Ajit, K., Yuvraj, B. (2015). Biodiversity and prevalence of Helminth parasites of Girna Dam Fishes. *Int. J. of Life Science*, Special Issue, A3:42-48.

[3]. Bhure, D.B., Jadahv, B.V., Pathan, D.M., Padwal, N. (2007). Population index of trematode parasites in freshwater fishes from Aurangabad. *Proc.* 16th All India ZSI conference, *Fisheries and Fish Toxicology*, *20:* 217-219.

[4]. Chai, J.Y., Murrel, K.D., Lymbery, A.J. (2005). Fish-borne parasitic zoonoses: status and issues. *Int. J. Parasitol.*, 35:1233-1254.

[5]. Chowdhury, S.Z., Hossain, M.M. (2015). Isolation and characterization of internal parasites in snakehead. *International Journal of Fisheries and Aquatic Studies*, 2(4): 17-22.

[6]. Dahiya, T., Verma, R., Saini, V.P. (2011). An Introduction to fish health management. In: Fish Disease Health and Management. Agrotech Publishing Academy, Udaipur, 1:9-41.

[7]. Das, D., Goswami, M.M. (2014). Distribution of Helminth parasites in different Organs and their seasonal rate of infestation in three Freshwater Fishes of Goalpara, Assam, India, Research *Journal of Animal, Veterinary and Fishery Sciences*, 2(9): 13-17.

[8]. Deardorff, T. (1991). Epidemiology of marine fish-borne parasitic zoonoses. *Asia J. Trop. Med. Public wealth*, 22:146-149.

[9]. Devi, N.U., Singh, N.R., Kar, D. (2015). Studies on Fish Affected with Epizootic Ulceric Syndrome with Special Emphasis on Parasitic Infestation-A Project Report, *Biological Forum – An International Journal*, 7(1): 155-164.

[10]. Geetarani, B., Shomorendra, M., Vishweshwari, A., Devashish, K., Jha, A.N. (2010). Helminthic infection in relation to the host length and sex in some freshwater fishes, *Anabas testudineus* (Bloch) and *Channa gachua* (Ham.). *Biospectra*., 5 (2), 233-236.

[11]. Gupta, N., Gupta, D.K. (2014). Zoonotic infections: An emerging issue for public health. Modern parasitology, Narendra public house Delhi. 1.1-12.

[12]. Gupta, R., Maurya, R., Saxena, A.M. (2015). Two new species of genus *Pallisentis* Van cleave, 1928 (Acanthocephala: Quadrigyridae) from the intestine of *Channa puntatus* (Bloch, 1973) from the river Gomti at Lucknow, India. *Iran J. Parasitol.*, 10(1): 116-121.

[13]. Khalil, L.F. (1991). Techniques for identification and investigative helminthology: Techniques for processing platyhelminths and acanthocephalans, in *Helminthology manual*, edited by LF. Khalil. London: International Institute of Parasitology.

[14]. Khurshid, I., Ahmad, F. (2014). Population dynamics of parasites as an evaluation metric to assess the trophic quality of freshwater bodies: A case study showing relationship of infection level of helminths in *Schizothorax* spp. of River Sindh, Kashmir. *Int. J. of Fisheries and Aquatic Studies*, 2(2): 206-209.

[15]. Luque, J.L., Poulin, R. (2004). Use of fish as intermediate hosts by helminth parasites: A comparative analysis. *Acta Parasitologica*, 49(4): 353–361.

[16]. Margolis, L., Esch, G.W., Holmer, J.C., Kuris, A.M., Schad, G.A. (1982). The use of ecological terms in parasitology, (Report of an Ad Hoc Committee of the American Society of Parasitology). *J. Parasitol*., 68: 131-133.

[17]. Panda, S., Dash, G. (2016). Isolation and identification of helminth parasitic eggs having zoonotic potency from sewage-fed pond sediments. *Int. J. of Adv. Research in Biological Sciences*, 3(6): 283-291.

[18]. Reddy, L., Benarjee, B., Rajender, G., Bixapathi, V. (2006). Histopathological and histochemical abnormalities induced by *Euclinostomum heterostomum* in the liver of freshwater fish, *Channa punctatus*. *J. Aqua Biolife*, 21(2): 263-267.

[19]. Rukhsana, A., Chishti, M.Z., Fayaz, A.R., Bilal, A.B., Firdousa, A. **(**2008**).** Comparative Studies on Helminth Parasites of Declined Fish *Schizothorax esocinus* from two Water Bodies. *4th JK Science Congress*, 194.

[20]. Sahoo, P.K., Mohanty, J., Garnayak, J.S.K., Mohanty, B.R., Banya, K.P. (2013). Estimation of loss due to argulosis in carp culture ponds in India. *Indian J. Fish*, 60(2): 99-102.

[21]. Schmidt, G.D., Roberts, L.S. (2000). *Foundations of parasitology, 6th ed*. McGraw Hill International Editions, Singapore, 750.

[22]. Wali, A., Balkhi, M.H., Darzi, M.M., Maqbool, R., Shah, F., Bhat, B.A., and Wani, N. (2016). Histopathological alterations and distribution of *Adenoscolex oreini* in intestines and their seasonal rate of infestation in three freshwater fishes of Kashmir. *Int. J. of Fisheries and Aquatic Studies*, 4(3): 532-537.