

# COMPARATIVE STUDY OF HELMINTHIC DEMOGRAPHY OF *CHANNA PUNCTATUS* COLLECTED FROM VARIOUS AQUATIC ECO-REGIONS OF WESTERN U.P.

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## Abstract

The study of ecological parasitology is focused on the comparative account of the helminthic demography by calculated the frequency index and concentration index of fishes in various water bodies of Moradabad and Sambhal district. *Channa punctatus* from four different aquatic eco-regions of western U.P i.e River Ramganga, Gagan, Dhela, and pond Deverkhera were investigated to know the demography of helminthic parasites, are exist in the host body and their ecological study in various parameters. In the two years of the study period from Jan 2017 to December 2018, the total numbers of 1174 fishes and 964 helminthes parasites were examined from all the aquatic ecosystems.

In the year 2017, we identified the collection site of Ramganga river has the highest helminthic diversity with high-frequency index 72.28% of group Acanthocephala while in 2018 it was identified also in the same eco-region i.e river Ramganga with frequency index 73.60% as well as in all over two years of research liver was found highly infected fish organ amongst all. The concentration index was found on peak point from the infected fish of Dhela river in both the years 1.55% and 1.48% respectively and in the case of the infected organ, the intestine concentration index was recorded highest 0.34% followed by body cavity 0.33%.

In this report, we analyzed that the result also highlighted a matrix related to presence-absence data of helminthic fauna in various water bodies and different fish organs. Class cestodes of helminthes parasites were neither found at any collection site nor in any host organ site. One or more helminthes parasites were found in a single host and found broadly distributed in some localities.

**Keywords:** Helminthic demography, frequency index, concentration index, eco-regions.

## Introduction

Fishes have influenced systematically various helminth parasites and diseases that can affect fish body condition weight i.e length fertility and fitness. Various types of helminth parasites and diseases reduce the immunity of fish and increase mortality. According to Biu and Akorede, (2013) the rates of helminthic infestation vary with the region, and various factors such as the presence of an intermediate host, endemicity

as well as the sensitivity of a definitive host, are responsible for the highest limit for the rate of infection. Various studies on helminth fauna have been reported previously on large scale by many workers (Marcogliese, 2005; Hetch and Endermann, 2007; Barber, 2004; Khan, 2009).

Abba *et al.* (2018) reported that helminthes are one of the significant groups of fish parasites that cause serious decreasing fish productivity. The condition factor of fishes is greatly influenced by the environmental factors of the aquatic ecosystem. Kalse (2014) reported during investigations on population dynamics of nematode parasite in *Mastacembellus armalus* that parasitization of fishes depends on the environmental factors. Verma *et. al.* (2018) concluded that helminthic infestation in edible fishes causing poor growth, high mortality rate, delay sexual maturity, and animal to human diseases. Climatic conditions play an important role in considering helminthes seasonal fluctuations and parasitic infectivity (Chandra and Gupta, 2007).

Parasitic load and disease is a good indicator of fish health and body conditions. So, According to Lagrue and Poulin, (2015) fishes having in better situations harbor minimum parasitic richness. Various parameters such as Seasonal variations, gender-specific, and host-length specific parasitic load indicated that ecological and morphological factors play an important role in parasitic infestation Roy and Kumari, (2020).

Yadav (2017), also reported the highest infestation of acanthocephalan parasites than the other classes in the comparative study of helminthes parasites of some freshwater fishes of eastern Nepal. Heavy helminthic load seems to be more common in fishes originated from wild sources. However former studies are not updated to ensure the various factors of helminthic influence in the district Moradabad and Sambhal.

### **Materials and Methods:**

The freshwater snakehead *C. punctatus* were collected from different localities of Moradabad and Sambhal district, during the study period from January 2017 to December 2018. Study zones were Ramganga River, Gangan river, Dhela river, and Deverkhera pond. During two years of investigation 1,174 specimens of *C. punctatus* were collected for further study of the host-parasite relationships. Fish specimens are dissected out and examined for infection. Parasites were removed in a physiological saline (0.75% NaCl). All parts of the host were examined sincerely under a stereomicroscope. Parasites were collected from different infection

sites of the infected fishes and fixed with AFA solution (10 ml formalin, 85 ml alcohol, and 05 ml acetic acid.) as mentioned in the methodology of Mayer and Olsen (1975) and Madhvi *et al.* (2007).

The external and internal organs were thoroughly examined for the parasitic fauna. The parasite community was mainly observed in the gastrointestinal tract. Specifically the stomach and intestine of the GIT were removed carefully and kept separately in a Petri-dish. All the parasites species separated from the distinct organs of the gastrointestinal parts were quickly protected in 70% alcohol. They were cleared simultaneously kept in scientific vials for their morphological review as well as identification with the help of a light microscope Olympus BX43.

**Frequency index** is concluded as “the percentage of affected host per sample and ‘concentration index’ as the number of worms per infected host” (Margolis *et. al.*, 1982) was calculated for each eco-region and host organ. We calculated these values to find out the impact of various eco-parameters such as infectivity of host parasites in different collection sites and host organ specificity of helminthic population.

## Results and discussion

Various classes of helminth parasites such as nematodes, trematodes, and acanthocephalan (spiny-headed worms) were found abundantly in the gastrointestinal tract of hosts from all the above aquatic ecosystems. In the Checklist of helminth-fauna observed in 2017, Ramganga river was found as having a high-frequency index 72.28% (Table 1) in parasitic demography while lowest in Dhela river with a 57.97% Frequency index as well as the highest concentration index 1.55%. In the year 2018 frequency index recorded the highest also in Ramganga river 73.60% (Table 2) whereas the concentration index was found highest 1.48% in the Dhela river in terms of the host-parasite population. A total number of 964 parasites were isolated from the internal organs of 1174 fishes in which 765 fishes were recorded infected ones as described in table 3. Therefore in both the years of observations and amongst the sampling sites, the river Ramganga was recorded as the aquatic eco-region having the highest frequency of helminthic assemblage 72.94 (fig. 1) followed by Deverkhera pond whereas the lowest frequency of the same was found in the Dhela river.

We investigated in our report that in both the years' host organ-wise concentration the index was observed highest in intestine 0.34 (fig.2) followed by the body cavity whereas the lowest was recorded in the stomach. The same helminthes diversity may infect the various hosts and their organs, as well as some hosts, harbor single parasite species.

In the case of a present-absent matrix of helminthes population, we observed that none of the cestode parasites was found in any host collected from different water bodies as mentioned below in table 1-3. The intestine of the host has exhibited the highest infestation (263 parasites) amongst the examined host organs while the lowest infestation (217 parasites) was calculated in the stomach of the host characterized also in table 3.

In our observations acanthocephalan burden in the gastrointestinal tract was recorded from all hosts, a similar type of findings was calculated by Tweb and Ahmad (1981) in their work on helminthic infection in freshwater fishes of Bangladesh. These results are contradictory with the findings of Kundu and Bhuiyan (2016) who explained the nematodes population was the most dominant group of helminthes in their research on the abundance of helminthes parasites in *C. striatus* from Punarbhaba and Atrai rivers of Bangladesh. In this part of the work, the helminthes species richness (HSR) was found in river Ramganga indications of the highest polluted site similar to our previous findings (Roy and kumari, 2020) published in the work on seasonal variation of helminthic infestation concerning length and gender of fish hosts in two districts of western U.P.

Host and parasites cooperation is unique with the different factors which affect the water bodies and besides give important signs of contamination. Frequency index of helminthes parasites reported varying from site to site such helminthes demographic fluctuations already recognized by Verma et al (2018) and Chandra and Gupta (2007) in their work on an ecological analysis of acanthocephalan parasites of *Channa punctatus* of river Gomti, Lucknow, Uttar Pradesh India, habitat preference and seasonal fluctuations in the helmintho-fauna of amphibian hosts of Rohilkhand zone, India respectively.

Table 1. Frequency index and concentration index with site preference helminthic demography in year 2017.

Ramganga	166	120	148	72.28	1.23	31	-	55	62
Gagan	119	69	90	57.98	1.30	29	-	41	20
Dhela	138	80	124	57.97	1.55	25	-	45	54
Deverkhera	176	118	134	67.04	1.13	20	-	50	64
TOTAL	599	387	496			105		191	200

Table 2. Frequency index and concentration index with site preference helminthic demography in year 2018.

Ramganga	197	145	158	73.60	1.08	27	-	56	75	72.94
Gagan	99	59	80	59.59	1.35	21	-	37	22	58.98
Dhela	106	60	89	56.60	1.48	17	-	49	23	57.28
Deverkhera	173	114	141	65.89	1.23	24	-	36	81	66.46
TOTAL	575	378	468			89		178	201	

Table 3. host organ infestation concentration index in both years.

Body cavity			148+106 =254	0.33	48+20 =68	-	52+46 =98	48+40 =88
liver			136+94 =230	0.30	10+12 =22	-	77+62 =139	49+20 =69
stomach	575+ =117	387+ =765	107+110 =217	0.28	32+23 =55	-	30+25 =55	45+62 =107
Intestine	4		105+158 =263	0.34	34+15 =49	-	32+45 =77	58+79 =137
Total			964		194		369	401

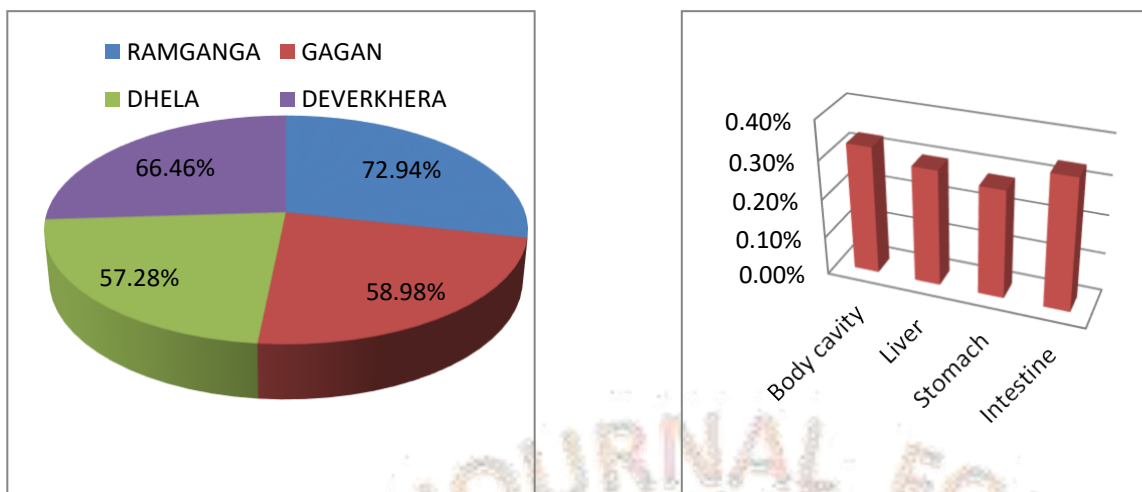


Fig. 1 Two years frequency of Helminth assemblage in aquatic eco-regions. Fig.2. Two years data of host organ wise concentration index of Helminth parasites.

### Conclusion

Our examination has indicated that freshwater host fishes from the western U.P region harbor a substantial weight of helminthic disease. We revealed various parasites in consumable fishes which cause an issue when infested fish are brought for eating purposes. It is essential to analyze the other fish species acquirable that they may work either as bearer hosts or carrier host. We don't know about fish mortality and hazard to human health because of parasitic contamination, it might reason for genuine misfortune in fish culture and might be harmful to human wellbeing moreover.

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## References

- Abba A.M, Abdulhamid Y., Omenesa R.L., and Mudassir I. (2018). Impact of helminth parasites on length-weight ratio and condition factor of fishes in Ajiwa and Jibia reservoirs, Katsina state, Nigeria. 1(2): 1-6.
- Barber, I. (2004). Parasites grow larger in faster-growing fish hosts. *International Journals for Parasitology* 35: 137-143.
- Biu A. A. and Akorede G. J. (2013). Prevalence of Endoparasites of *Clarias gariepinus* (Burchell, 1822) in Maiduguri, Nigeria. *Nigerian Journal of Fisheries and Aquaculture*, 1(1): 1-6.
- Chandra P. and Gupta N. (2007). Habitat preference and seasonal fluctuations in the helmintho-fauna of amphibian hosts of Rohilkhand zone, India. 21(1): 69-78.
- Hecht, T., and Endermann, F. (2007). The impact of parasites, infections, and diseases on the development of aquaculture in Sub-Saharan Africa. *Journal of Applied Ichthyology* 14: 3 - 4.
- Kalse A: 2014 Population dynamics of nematode parasites in *Mastacembellus armatus* from Parola region. *Biosci. Biotech. Res. Comm.* 7(1): 37-41.
- Khan, R. A. (2009). Parasites causing disease in wild and cultured fish in Newfoundland. *Icelandic Agricultural Sciences* 22: 29-35.
- Kundu S. and Bhuiyan I. (2016). The abundance of helminth parasites in *Channa striatus* (BLOCH, 1793) from Punarbabha and Atrai rivers. *Dhaka Univ. J. Biol. Sci.* 25(1): 39-46.
- Lagrange and Poulin (2015). Measuring fish body conditions with or without parasites: Does it matter? *Journal of fish biology*. 5(7): 1-12.
- Madhvi R., Vijaylakshmi C., and Shyamsundari K: Collection staining and identification of different helminth parasites. A manual of the workshop on fish- parasite, taxonomy Capacity Building. Andhra University press (2007).
- Marcogliese., D. J. (2005). Parasites of the superorganism: Are they indicators of ecosystem health? *International Journal for Parasitology* 82: 389-399.
- 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.

Meyer, M. C, and Olsen, O.W. 1975. Essentials of parasitology. 2nd ed.Wm.C. Brown Co. Iowa 1-303.

Roy S. and Kumari N. (2020). Seasonal Variation Of Helminthic Infestation Concerning Length And Gender Of Fish Hosts In Two Districts Of Western U.P. Int. Jour. Of Sc. Res. and Tech. 9(1): 1851-1855.

Tweb A. and Ahmad A. (1981). helminthic infection in freshwater fishes of Bangladesh. Fish pathology. 15(3/4):229-236.

Verma S.K., Yadav S., and Saxena A.M. (2018). An ecological analysis of acanthocephalan parasites of *Channa punctatus* of river Gomti, Lucknow, Uttar Pradesh, India. 3 (2): 01-04.

Yadav S.N. (2017). Study of helminth parasites of some freshwater fishes. Int. J. Of Zoology studies. 2(2): 50-52.

