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An ecological analysis of acanthocephalan parasites of *Channa punctatus* of river Gomti, Lucknow, Uttar Pradesh, India

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Abstract
Freshwater fish *Channa punctatus* is the common shelter for various species of helminth parasites, abundantly found in river Gomti, Lucknow. Helminth group is one of the major group of fish parasites about 20,000 to 30,000 helminth species have been reported worldwide. Infection of these parasites may result in poor growth, postpone sexual maturity and mortality of fishes, cause human and animal diseases. In this paper, we have reported the annual fluctuation in prevalence, mean intensity and relative density pattern of the Acanthocephalan parasites infection in *Channa punctatus* of river Gomti, Lucknow during January 2015 to December 2015.

Keywords: freshwater fishes, helminth, intensity, prevalence, infection

1. Introduction
Channa punctatus (Family: Channidae) is one of the most common freshwater fish (Ahmed A.T. 1981) [1] in India and has a great demand in the market because of its relatively low cost and high availability. These are the best sources of protein and high nutritive value (Nimbalkar and Deolalikar 2015) [2]. Most of the freshwater fishes carry heavy infection of helminth parasites (Khalil 1971) [3]. These parasites damage the health of fishes by including the variable intensity of infection depending upon the quality of environmental condition, therefore degradation in food value of fish and may be the result of mortality (Yamaguti 1958) [4]. Parasite disease process great problems in the culture and captive maintenance of freshwater fishes. Many helminthes are zoonotic they can transmit between animals and people (Gürtler *et al.,* 2010) [5]. While there is an extensive range of helminth parasites of freshwater fishes, only a few species are capable of infecting humans. The Alimentary canal of fishes is the most favorable for the establishment and growth of many helminth parasites induce morphological changes in the host tissues and thereby causing alternation to the normal intestinal physiology (Castro 1992) [6]. Parasites are the important group of pathogens, which occur at various stages of development in fishes. The parasites invade various tissues and organ of fish, including skin, gills, eye, kidney, liver-intestine, spleen, heart and brain. Parasites are metabolically dependent on their host mainly for their nutritional requirements (Marcogliese 2004) [7]. Moreover, parasites may also regulate host population dynamics and influence community structure (Vignon and Sasal 2010) [8]. These parasites use the fish for their shelter and food and destruct more or less each and every organ resulting in pathogenic effects (Lilley *et al.,* 1992) [9]. Parasites interfere with the nutrition, metabolism and secretory function of the alimentary canal, damaged the nervous system and even upset the normal reproduction of the hosts (Rahman *et al.,* 1998a) [10]. The distribution of helminth of the same host and their incidence and intensity of infestation varies from one place to another (Rahman and Saidin 2014) [11]. *Channa punctatus* is infected by many parasites like trematode, nematode, cestodes and acanthocephalan. Acanthocephalan are helminth parasites that use arthropods and vertebrates as the intermediate host to complete their life cycles. These helminthes lack alimentary tract and are characterized by the presence of a proboscis armed with secured hooks a syncytial epidermis and a lacunas system with circulatory channels that promotes direct absorption of nutrients through the body wall (Amin 1985) [12]. Acanthocephalan is frequently seen in the intestine of freshwater fish *Channa punctatus* and other vertebrates. The affected fish intestine was irreversible mechanical damage caused by the attachment of the armed proboscis affects the architecture of the intestinal tissue leading to pathological changes (Sanil *et al*., 2010) [13]. Damage to the intestinal villi, a formation of the granular tissues and capsule formation associated with host immune response which seriously affect the digestive and absorptive and efficiency of the animals (Al Ghamdi 2013 [14]. The parasitic infection is greatly influenced by the season, (Singh 2006) [15] which basically interferes with the ecology and physiology of the fish (Margolis 1982) [16].

2. Materials and Methods
2.1 Sampling of fish and parasites
Annual surveys of Acanthocephalan parasites of *Channa punctatus* of river Gomti (26°51'30" North 80°56'14" East), Lucknow were made during January 2015 to December 2015. Fishes were collected and transported the laboratory in alive condition. The collected Fishes were sacrificed, dissected and thorough examination of the alimentary canal. Acanthocephalan parasites were recovered and kept in normal saline. Acanthocephalan parasites were kept in the refrigerator before

fixing for the complete eversion of proboscis. Parasites were flattened under the slight pressure of the cover-glass. The parasites were fixed in A.F.A. and stored in 70% ethanol for 24 to 48 hours. The parasites were stained with Aceto-alum carmine. Dehydrated through a graded series of alcohol, cleared in Xylol and mounted in Canada balsam or DPX and identified.

2.2 Ecological and Statistical Analysis

The prevalence, mean intensity and relative density of Acanthocephalan parasite were calculated according to Bush *et al*, (1997) and Margolis *et al*, (1982) [16].

$$\text{Prevalence} = \frac{\text{Total No. of Hosts Infected X 100}}{\text{Total No. of Hosts Examined}}$$

$$\text{Mean Intensity} = \frac{\text{Total No. of Infected Hosts examined}}{\text{Total No. of Hosts Examined}}$$

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3. Results and Discussion

During the present study, a total of 264 parasites were collected from 411 fish host. Table 1 shows that the ecological study, the % prevalence of Acanthocephalan parasites was higher in April (85.71) and lower in December (33.33) which are given in Fig.2. And the highest mean intensity of Acanthocephalan parasites was in April (0.85) and the lowest in December (0.33) given in Fig.3. The highest relative density of Acanthocephalan parasites was observed in April (1.80) and the lowest in June (0.20) given in Fig.4. On the seasonal point of view (Table 2) the highest seasonal variation prevalence % of Acanthocephalan parasites was in summer (67.22) and lowest in winter (38.75) which are given in Fig.5. While the highest seasonal variation mean intensity % of Acanthocephalan parasites was in summer season (0.67) while lowest in winter season (0.38) given in Fig.6. However, the highest relative density of Acanthocephalan parasites was in summer season (0.72) and lowest in autumn season (0.50) which are given in Fig.7.

Fig 1: *Channa punctatus*

Table 1: Monthly variation in prevalence %, mean intensity and relative density of acanthocephalan parasites of *Channa punctatus* in the year 2015.

Month of Collection	No. of Hosts		No. of Acanthocephalans obtained	Prevalence	Mean Intensity	Relative Density
	Examined	Infected				
January	47	17	33	36.17	0.36	0.70
February	15	8	16	53.33	0.53	1.06
March	26	13	11	50.00	0.50	0.42
April	21	18	38	85.71	0.85	1.80
May	72	49	37	68.05	0.68	0.51
June	54	31	11	57.40	0.57	0.20
July	17	13	29	76.47	0.76	1.70
August	14	10.	17	71.42	0.71	1.21
September	15	9	8	60.00	0.60	0.53
October	25	14	9	56.00	0.56	0.36
November	87	50	47	57.47	0.57	0.54
December	18	6	8	33.33	0.33	0.44

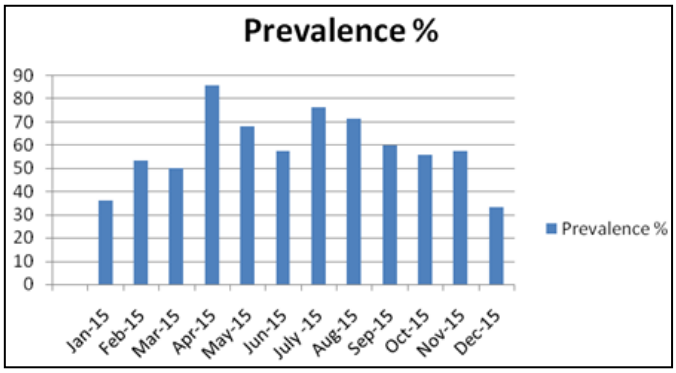

Fig 2: Graph showing monthly prevalence % of acanthocephalan parasites in *Channa punctatus*

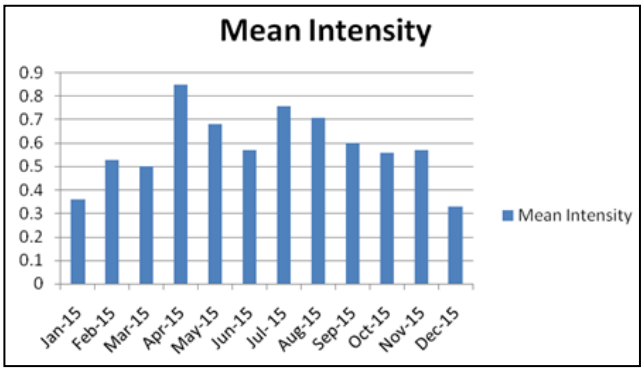

Fig 3: Graph showing monthly mean intensity of acanthocephalan parasites in *Channa punctatus.*

Table 2: Seasonal variation in prevalence %, mean intensity and relative density of acanthocephalan parasites of *Channa punctatus*

Season	No. of Hosts		No. of Acanthocephalan Recovered	Prevalence	Mean Intensity	Relative Density
	Examined	Infected				
Summer	119	80	86	67.22	0.67	0.72
Rainy	85	54	57	63.52	0.63	0.67
Autumn	127	73	64	57.48	0.57	0.50
Winter	80	31	57	38.75	0.38	0.71

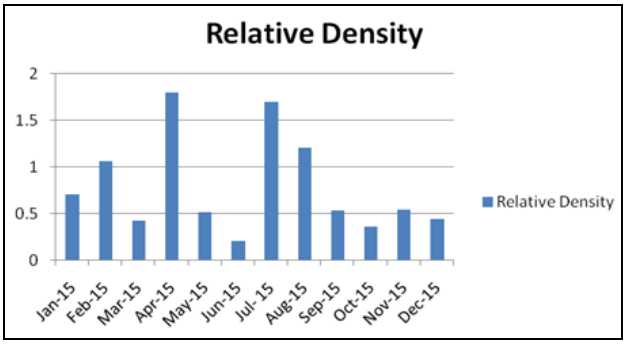

Fig 4: Graph showing monthly relative density of acanthocephalan parasites in *Channa punctatus*

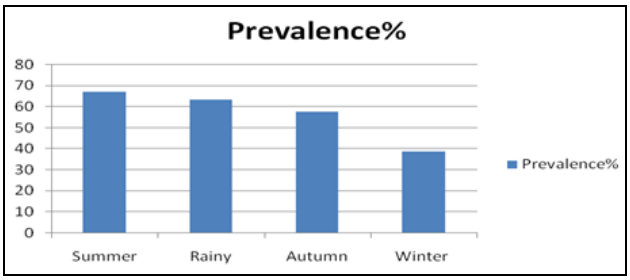

Fig 5: Graph showing seasonal variation in prevalence % of acanthocephalan parasites in *Channa punctatus.*

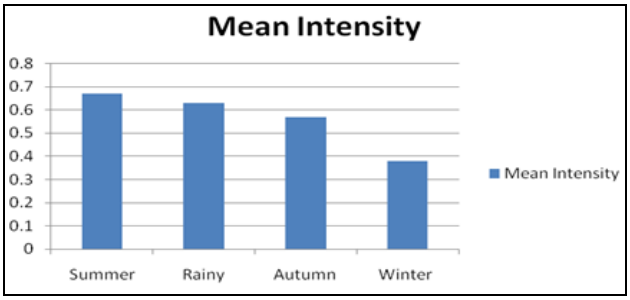

Fig 6: Graph showing seasonal variation in mean intensity of acanthocephalan parasites in *Channa punctatus.*

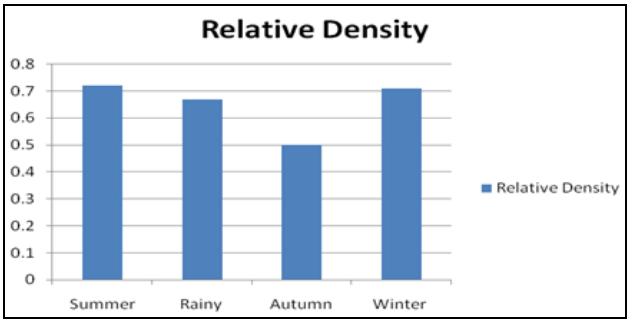

Fig 7: Graph showing seasonal variation in relative density of acanthocephalan parasites in *Channa punctatus.*

4. Conclusion

The present study can be concluded that the infestations of acanthocephalan parasites in *Channa punctatus* differed according to month, season and physicochemical parameters of water bodies. The prevalence and intensity depends on many factors like type of parasite, host's feeding habits, the present study also supports the role of temperature in controlling the parasitic fauna either directly or indirectly. Factors responsible for causing variation in parasites infectivity due to seasonal variations and sex debatable. Changing in the fish feeding behaviour and the annual temperature regime have been considered as the possible factors responsible for the seasonal incidence and the intensity pattern of parasites (Eure, 1976). Thus aquatic organisms respond directly to environmental changes in their biological environment as their metabolic processes are influenced by temperature, pH and dissolved O2 levels. Thus seasonal occurrence of acanthocephalan parasites occurs due to ecological conditions like availability of intermediate hosts, life cycle of the parasites and age of the hosts.

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