



Studies on prevalence of cestode parasites in fresh water fish, *Channa punctatus* from Meerut (Uttarpradesh) India

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Received: February 16, 2016; Revised received: March 3, 2016; Accepted: March 23, 2016

Abstract: The present investigation deals with the prevalence of three cestode parasites viz. *Lytocestus* sp., *Proteocephalus* sp. and *Gangesia* sp. collected from the intestine of a freshwater fish *Channa punctatus* in different blocks of Meerut region (U.P.) India during June, 2014 to May, 2015. A total of 125 parasites were collected throughout the year. The high incidence of infection of all these species *Lytocestus* sp., *Proteocephalus* sp., *Gangesia* sp. was recorded in summer season (70.83%, 77.27% and 72 % respectively) followed by winter season (63.63%, 57.89% and 52.38% respectively) whereas infection was low in monsoon season (36.84%, 27.78% and 23.52% respectively). The present study clearly indicates that the intensity of infection throughout the year was found highest in summer season followed by winter and lowest in monsoon. Findings show that beginning of the breeding period, feeding habitat, presence of intermediate host and environmental factors are influencing the seasonality of cestode parasitic infection.

Keywords: Prevalence, parasite, cestode, *Channa punctatus*, *Lytocestus*, *Proteocephalus*, *Gangesia*

INTRODUCTION

Often referred to as "rich food for poor people," fish provides essential nourishment, especially quality proteins and fats, vitamins and minerals. People involved in fisheries, aquaculture and fish trade, fish are a source of income. It is man's most important single source of high-quality protein, providing ~16% of the animal protein consumed by the world's population. According to the Food and Agriculture Organization of the United Nations, nowadays, aquaculture makes a major contribution to human nutrition (Chakraborty *et al.*, 2013). Since human utilizes these fishes, it is important that they should be healthy and free of infection. *Channa punctatus* (Bloch) has been gaining importance not only as the most common staple food fish but also as an aquarium fish (Saikia *et al.*, 2012). Although, over the last 10 years, its population has undergone a steady decline due to overexploitation, loss of habitat, pollution as well as destructive fishing. According to IUCN status, it has been listed among the 66 LR-nt fish species in India (Molur and Walker, 1998). The fish is well known for its taste, high nutritive value and medicinal qualities and is recommended as a diet during convalescence (Haniffa *et al.*, 2004). To increase edible fish production, aquaculture is practiced in many parts of the world. However, parasites and diseases are the most serious limiting factors in aquaculture because of the increased density of cultured fish populations in restricted bodies of water and the ease by which pathogens can be transmitted from

one fish to another (Kabata, 1985). These edible fishes are known to harbour a number of cestode parasites which cause deterioration in their health include emaciation (significant loss of body mass), nodules or masses present in skin or muscle, growth inhibition, abnormal swimming and weakness or death, hence their market and nutritive value is affected. Although, small numbers of cestodes may be found in fish without causing significant symptoms. Fish may be final host (containing adult cestodes) or intermediate host (containing larval cestodes). Parasite can have a wide range of impact on the ecology of their hosts in terms of health (Cumming *et al.*, 2015). After acquiring infection, fish may perform certain types of simple or complex behaviour (Barber *et al.*, 2000).

Assessment of infection levels in the host as well as host population provides important information about the success of the parasite life cycle, the severity of its pathogenicity and the effectiveness of host immunity. As fish mostly constitute the final host it is extremely important to achieve early and correct diagnosis of the larval stages of the parasites for successful prevention and elimination of such infections. The current infection rates directly reflect successful parasitic invasion moderated by host defensive response and other behavioural influences such as competition (Bhure and Nanware, 2014). The study of population dynamics can be used as the biological basis of method to regulate population of parasites. Less work has been done on cestodes parasites of *Channa* species from Meerut (UP) region of India. Results of present study,

therefore, are expected to be helpful for future research on piscian cestodes in this region. The present investigation deals with prevalence of three cestodes viz., *Lytocestus sp.*, *Proteocephalus sp.* and *Gangesia sp.* from freshwater fish *Channa punctatus*, collected during annual cycle June, 2014 to May, 2015. Results of present study, therefore, are expected to be helpful for future research on piscian cestodes in this region.

MATERIALS AND METHODS

Study was conducted in different blocks of Meerut region viz: Hastinapur, Parikshitgarh, Sardhana, Sarurpur khurd, Daurala, Rohta, Jani, Rajpura, Macchra, Mawana and Kharkoda, Meerut. In the present study, intestines of *Channa punctatus* were examined for cestode infection during the period of June, 2014 to May, 2015 from Meerut region (U.P.) India, as shown in Fig. 1. Cestodes were collected, preserved in hot 4% formalin, dehydrated in various alcoholic grades, stained with borax carmine, cleared in xylene and mounted in D.P.X. These Cestodes were identified by standard methods (Schmidt, 1986). The Cestodes collected were identified as *Lytocestus sp.*, *Proteocephalus sp.* and *Gangesia sp.* Obtained data was recorded and studied for seasonal variation.

RESULTS AND DISCUSSION

The survey was carried out with 187 freshwater fishes, *Channa punctatus*, from various water bodies of Meerut region. Out of 187 freshwater fishes 104 were infected with cestode, as found in annual cycle from June 2014 to May 2015. Results of present study showing prevalence of piscian cestodes are presented in Table 01. Three species of cestode parasites were recorded viz, *Lytocestus sp.*, *Proteocephalus sp.* and *Gangesia sp.* It was found that, high incidence of infection of all these species were recorded in summer (70.83%, 77.27% and 72 % respectively) followed by winter (63.63% and 57.89% and 52.38% respectively) whereas infection was lowest in monsoon season (36.84%, 27.78% and 23.52% respectively) as shown in Fig 2.

The present results shows high incidence occurs in summer season followed by monsoon season where as low incidence were recorded in winter season. The valuable information pertaining to the influence of season on the cestode parasite was contributed by several workers. Bhure *et al.*, 2010 noticed high prevalence (51.78%) of *Rhabdochona sp.* from carp fish *Labeo rohita* in summer followed by winter and rainy season. High prevalence was recorded with high intensity and index of infection of *Siluro taenia raoii* in summer followed by winter whereas infection was lowest in monsoon (Bhure and Nanware, 2010). Borde and Jawale, 2012 reported high cestodes infection (45.33%) from *Clarias batrachus* in summer season. Jadhav and Bhure, 2006 reported environmental conditions determine the general characters of the parasitic fauna and the health of host fishes. Bhure and Nanware

(2014) also reported high cestodes infection from *Channa punctatus* in summer season. These environmental variables include high temperature, low rainfall, sufficient moisture, water temperature, crowding that are necessary for development of parasite. High prevalence occurs in summer followed by other seasons (Sharma *et al.* 2010). Factors like temperature, humidity and rainfall, feeding habits of host, availability of infective host and parasite maturation are responsible for influencing the parasitic infections (Khan, 2012). The parasitic fauna, its composition, the incidence and intensity of infestations it produces, are largely determined by the host's mode of life and type of food (Kennedy, 1975 and 1976). Thus fishes were infected with large number of parasites in late winter to end of summer months, as ecological factors are favorable in these months (Pennyquick, 1973).

Similarly, plerocercoids of the fish tapeworm, *Proteocephalus ambloplitis*, avoid shedding from the intestine of its host by migrating into parenteral sites as the water temperature declines in winter, a period when feeding is reduced and worms voided because of a lack of nutrients, (Fischer and Freeman 1973). However, the parasites reenter the intestine as the water temperature increases in spring to mature as adult tapeworms. The plerocercoid larva exploits host-derived energy to fuel its own growth from a microscopic larva to ca. 30 mg within ten weeks. Infected fishes (with plerocercoid cestode) apparently mount an immune response against the infection, evinced by the spleens of infected fishes, which increase in size (Taylor and Hoole, 1994). In the periods of high reproductive investment (beginning of the breeding period or forming gonads after breeding), the fish are more susceptible to parasite infection. The cost is paid for reproduction by the fish due to immunosuppression by steroid hormones following the observation that spawning fish were more susceptible to parasite infection and had smaller spleen size in comparison with the resting fish (Viney *et al.*, 2005). Immunity of fish is weakened when investing more extensively in spawning ornamentation, and is more parasitized (Wedekind C 1992).

The increase in cestode infection in spring supports the hypothesis that the parasite life cycle could be synchronized with the beginning of host reproduction, probably induced by increasing fish hormone levels in the spring (Simková *et al.*, 2005). Changes in the fish feeding behavior and annual temperature regime have been considered as the principal factors responsible for the seasonal incidence and intensity pattern of parasites (Eure, 1976).

Conclusion

In the present study, recorded data showed high incidence of infection of all the cestode species in *C. punctatus* in summer followed by winter season where as low in monsoon season. The results suggest that *C.*



Fig 1. Map of Meerut showing 12 blocks from where fishes were collected.

Table 1. Seasonal variation of *Lytocestus sp.*, *Proteocephalus sp.* and *Gangesia sp* in *Channa punctatus* during the period June 2014-Sept 2015.

Parasitic sp.	No. of the host examined	No. of the host infected	Total no. parasites collected	Incidence %
<i>Lytocestus sp.</i>				
Monsoon(June,2014-Sept2014)	19	07	10	36.84%
Winter (Oct 2014- Jan 2015)	22	14	19	63.63 %
Summer,(Feb 2015-May 2015)	24	17	20	70.83 %
<i>Proteocephalus sp.</i>				
Monsoon(June2014- Sept2014)	18	5	9	27.78%
Winter (Oct.,2014- Jan., 2015)	19	11	15	57.89%
Summer,(Feb 2015-May,2015)	22	17	18	77.27%
<i>Gangesia sp</i>				
Monsoon(June2014- Sept2014)	17	4	8	23.52%
Winter (Oct.,2014- Jan., 2015)	21	11	11	52.38%
Summer (Feb.2015-May,2015)		18	15	72.00 %

punctatus fishes are more susceptible to cestodes parasitic infection in periods of higher reproductive investment. The differences in prevalence of incidence of parasitic infection is probably due to the immune function of fish compromised in stressful situation, including those that involve crowding and high temperatures. Climate change in aquatic systems may affect most organisms and their functional roles in the ecosystem. Changes in these roles may be difficult to detect, but examination of parasite communities in fish may provide insight into any structural and functional alterations in the system. Potential consequences of climate change are difficult enough to predict for free-living biological organisms. Given that parasites in aquatic systems depend on both the abiotic conditions of the environment and the distribution and abundance of their hosts for transmission, reproduction, survival, and other basic life-history functions, it is evident that pre-

dicting the implications of climate change for parasites becomes increasingly complex and context dependent. It is likely that the direct impact of temperature change and indirect impact of changes in host biology will have significant ramifications for parasite populations in the aquatic environment.

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