

## Correlation of water's physico-chemical characteristics and trematode parasites of *Channa punctata* (Bloch) in Awangsoi lake, Manipur, India

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**Abstract:** Infection with trematode parasites can lead to severe change in nutrient content and may result in host mortalities and character of a water body may influence the parasitic fauna. Hence a study was carried out from 2010 to 2011 to find out a correlation of water's physico-chemical characteristics and trematode parasites of *Channa punctata* (Bloch) in Awangsoi Lake, Manipur, India. During the present investigation three species of trematodes were recorded. In the present study there were concurrent infections by two or more parasite species. The percentage of infection was positively correlated with temperature, pH, DO and conductivity in Awangsoi Lake. There was a significant positive correlation ( $r = 0.652$ ;  $p < 0.05$ ) with  $FCO_2$  and a negative correlation with alkalinity. Seasonal variation in the occurrence of these parasites may be attributed to ecological conditions, particularly distribution of intermediate hosts and also the age of the host and the life cycle of the parasite species.

**Keywords:** Awangsoi Lake, *Channa punctata*, Physico-chemical parameters, Trematodes

### INTRODUCTION

The physico-chemical parameters of a water body have been recognized as valuable limiting factors in the biological productivity of water body. Maintenance of a healthy aquatic ecosystem is dependent on physico-chemical parameters of water. The nature of parasitisation of fish population in any confined body of water is affected by a variety of factors. Wisniewski (1958) formulated the concept of the characterization of parasitofauna and further suggested that the character of a water body could be used to influence and determine the parasitic fauna. The nature of parasitisation of fish population in any confined body of water is affected by a variety of biotic and abiotic factors. Some of the abiotic factors are temperature, pH, DO content, alkalinity etc. Gaffar (2007) observed that the effect of temperature on the fishes is an important factor for infestation rate of parasites. Aquatic organisms are affected by pH because most of their metabolic activities are pH dependent (Wang *et al.*, 2002). Unfortunately the knowledge of disease of the fishes, particularly parasites are still less explored in Manipur. Hence, a study on correlation of water's physico-chemical characteristics and trematode parasites of *Channa punctata* (Bloch) in Awangsoi Lake, Manipur has been undertaken.

### MATERIALS AND METHODS

The present study was carried out in Awangsoi Lake of

Manipur which is situated between 24°39'48"N - 24°39'23"N latitude and 93°47'04"E - 93°46'90"E longitude about 24 km. from Imphal. The fish *C. punctata* were routinely collected from the study sites (from 2010-2011) and brought to the laboratory in the polythene bags containing water of the same locality. The external body organs as well as internal body organs were thoroughly examined for the parasites. Mucus and epithelial tissue was scraped from several areas of the body with a scalpel. The mucus material is then transferred to a small drop of water on a slide and covered with a small size coverglass. The scraping was thin enough for proper examination with the microscope. Epithelial scrapings from the fins were made and subjected to microscopic examination. For examination of the gills, each branchial arch was removed and transferred to a petridish with water. The examination was performed under microscope. Branchial filaments were cut off, slightly compressed in a drop of water between slide and coverglass and examined under the microscope. The oral cavity and pharynx were examined macroscopically. The digestive canal was first examined for macroscopic parasites located on the external surface, and then stretched on the dish and carefully opened. The gut content was removed, diluted to some extent with physiological saline and was examined macroscopically and under the microscope. Liver, kidney, gonads and heart were examined externally and also under a compound

microscope. These organs were cut with a scalpel into slices and the section surfaces were examined. Small tissue samples were compressed under coverglass and were examined under a microscope. The parasites collected, upon being fully relaxed, were fixed in AFA (alcohol-formalin-acetic-acid) solution and preserved in 70 % alcohol. To facilitate identification of the worms, the trematodes were stained in Alum carmine, dehydrated in glacial acetic acid, cleaned in methyl salicylate and mounted in Canada balsam (Bylund *et al.*, 1980). The physico-chemical parameters of water were analyzed following APHA (2005).

**RESULTS AND DISCUSSION**

The present study was carried out from February’10-January’11 for seasonal study of parasites with physico-chemical characteristics of water. During the present investigation three species of trematodes have been found namely *Metaclinostomum* sp. Pandey and Baugh, *Genarchopsis goppo* Ozaki and *Allocreadium fasciatusi* Kakaji and there were concurrent infections by two or more parasite species. *Metaclinostomum* sp. was found to be infected in the liver of the fish and *G. goppo* and *A. fasciatusi* were found in the intestine.

The correlation matrix among physico-chemical properties and prevalence (% of infection) is given in Table 1. The seasonal variation of percentage of infection with physico-chemical parameters of water in Awangsoi Lake is indicated in Fig.1. In the present study, the maximum percentage of infection (65.38) was found in November at water temperature 22°C, pH-6.4, DO-6.2 mg/l, FCO<sub>2</sub>-7 mg/l, alkalinity-30 mg/l and conductivity-128 µMho in Awangsoi Lake.

The percentage of infection was positively correlated with temperature, pH, DO and conductivity in Awangsoi Lake. There was a significant positive correlation (r = 0.652; p<0.05) with FCO<sub>2</sub> and a negative correlation with alkalinity.

High significant positive relationship of temperature with FCO<sub>2</sub> (r = 0.610; P<0.05) was found in Awangsoi Lake. Water temperature in Awangsoi showed negative correlation with pH and positive correlation with DO, alkalinity and conductivity. pH showed positive correlations with temperature, DO, FCO<sub>2</sub> and conductivity and negative correlation with alkalinity. DO showed high significant negative correlation (r = -0.624; P<0.05) with alkalinity. It showed positive correlations with temperature, FCO<sub>2</sub> and conductivity and negative correlation with pH.

Ecological factors have been held widely responsible for the occurrence of adult digenetic trematodes quoted from Chubb (1979) and Madhavi (1978). Aquatic organisms are affected by pH because most of their metabolic activities are pH dependent (Wang *et al.*, 2002). Optimal

**Table 1.** Correlation matrix among physico-chemical properties and prevalence (% of infection) of Awangsoi lake from February’10-January’11.

	Prevalence	Temp.(°C)	pH	DO (mg/l)	FCO <sub>2</sub> (mg/l)	Alkalinity (mg/l)	Conductivity (µMho)
Prevalence	1						
Temp.(°C)	0.304498	1					
pH	0.0222	-0.1819	1				
DO (mg/l)	0.45072	0.339855	-0.21235	1			
FCO <sub>2</sub> (mg/l)	0.652862*	0.610576*	-0.08139	0.410186	1		
Alkalinity (mg/l)	-0.45169	0.185626	0.267091	-0.62413*	-0.29191	1	
Conductivity (µMho)	0.127864	0.293771	-0.00203	0.156833	0.149471	-0.06674	1

\*Correlation is significant at the 0.05 level

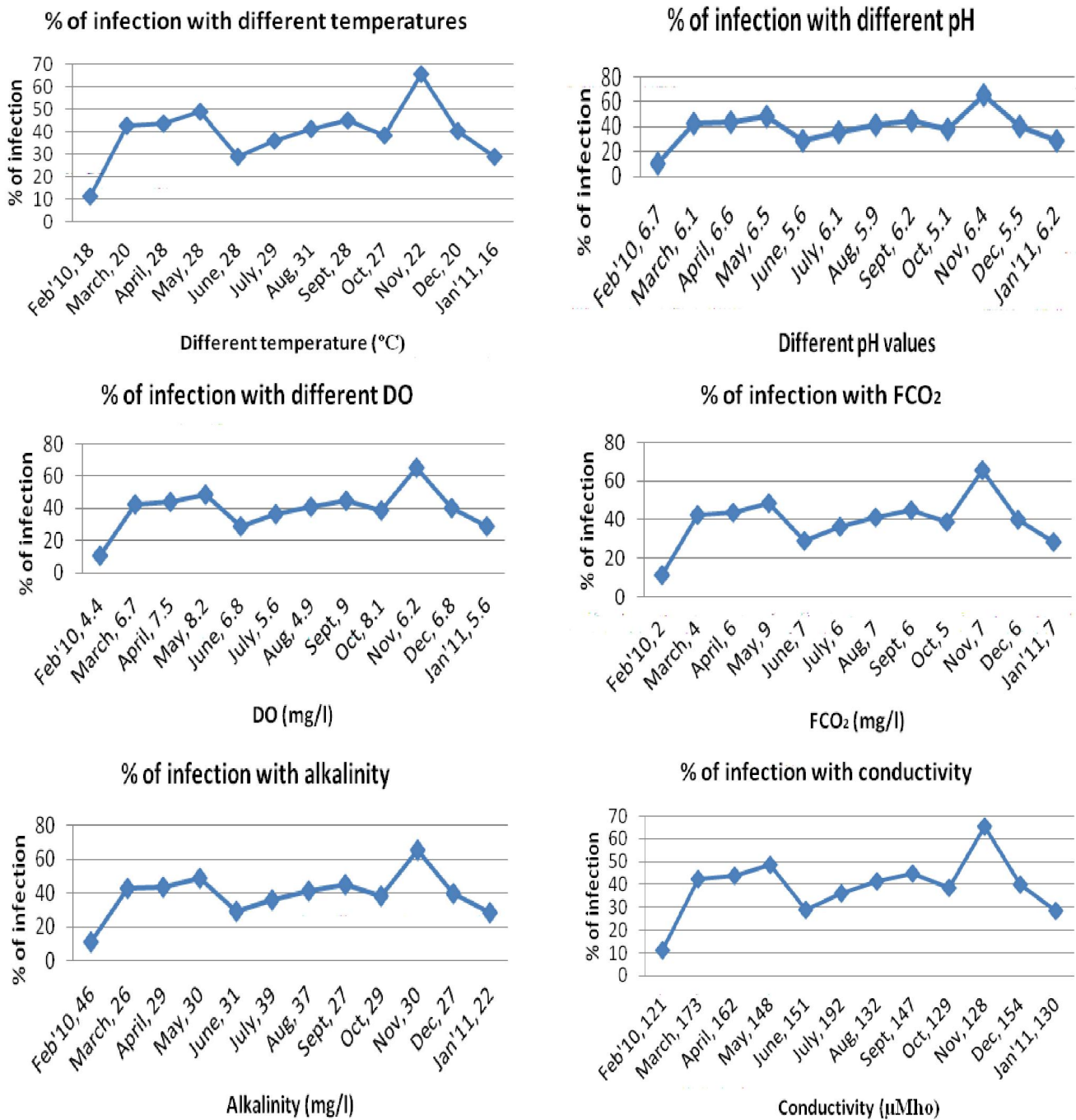


Fig. 1. Seasonal occurrence of parasites with physico-chemical properties in Awangsoi Lake.

pH range for sustainable aquatic life is pH 6.5 - 8.2 (Murdoch *et al.*, 2001). Pawar and Pulle (2005) stated that the pH of water is important for biotic communities because most of the plant and animal species can survive in narrow range of pH from slightly acidic to slightly alkaline condition. In the present study the water of Awangsoi Lake showed slightly acidic condition. Tedila and Fernando (1970) discussed that fish become infected in autumn and incidence peaked late in winter, began to decrease in March dropped to nit in August-September. Gaffar (2007) observed that the effect of temperature on the fishes is an important factor for

infestation rate of parasites. He found high infestation rate in the hot season. The same has also been reported by Bussmann and Ehrich (1979), Amin (1987) and Fatima and Bilqees (1989). Chubb (1982) emphasized that water temperature acts directly on the helminths or indirectly through the host behaviour, especially feeding behaviour and metabolism, while, Jha *et al.* (1992) showed that water temperature did not play an important role in the seasonal occurrence of helminth parasites. During the present study concurrent infections by two or more parasite species were found. The percentage of

infection was positively correlated with temperature, pH, DO and conductivity in Awangsoi Lake. There was a significant positive correlation ( $r = 0.652$ ;  $p < 0.05$ ) with  $\text{FCO}_2$  and a negative correlation with alkalinity. Seasonal variation in the occurrence of these parasites may be attributed to ecological conditions, particularly distribution of intermediate hosts and also the age of the host and the life cycle of the parasite species. The results also give preliminary knowledge of parasitic fauna of fish *C. punctata* from Manipur which was till date less explored. At the same time it will help the scientific community and also pisciculturists to know about the parasite species found to be infected in the fish host.

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