

Seasonal variations in prevalence and intensity of gill lice, *Ergasilus*, a crustacean parasite on freshwater fishes of Balrampur, U.P.

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Abstract

Gill lice, *Ergasilus*, are common freshwater parasites that attach to the gill filaments of their host fish. They feed on blood and tissue of the gills causing extensive damage by reducing blood flow and surface area for oxygen exchange. The aim of the present investigation was to investigate the prevalence and mean intensity of gill lice on economically important freshwater fish *Channa punctata* (Bloch). In this context, the prevalence and mean intensity of *Ergasilus* with respect to fish sexes, length of fish and season were evaluated statistically. The overall prevalence, mean intensity and density of *Ergasilus* infection for freshwater snake headed fish, *Channa punctata* (Bloch) were 53.64%, 4.71% and 2.53%, respectively. The prevalence, mean intensity and density of *Ergasilus* infection were higher in small sized fishes followed by larger and medium sized fishes. The prevalence of infection was higher in female in comparison to male but the mean intensity and density of infection were higher in male than female. The highest prevalence of *Ergasilus* infection were recorded in spring followed by autumn, winter and summer season. The mean intensity and density of *Ergasilus* infection were recorded in spring followed by autumn, winter and summer season.

Keywords: *Ergasilus*, copepods, parasites, prevalence, intensity, density

Introduction

Several crustaceans are parasitic to fish and have caused losses in wild fishes and aquaculture hosts. Recently parasitic crustaceans are increasingly serious problems in cultured freshwater fish and wild populations also. Most parasitic crustacean of freshwater fish are ecto-parasites and can be seen with the naked eye as they attach to the gills, body and fins of the host (Klinger and Floyd, 2002) [6]. Copepods are very important component of aquatic ecosystems because they are the source of food for small fish, intermediate hosts of fish parasites or fish parasites themselves, and act as vectors of disease. Copepods are the most common crustacean fish parasites, and male parasitic copepods die after copulation in the preadult stages; thus, those seen attached to fish are usually mature females with conspicuous paired egg sacs at the posterior end. Most commonly reported and important species infesting freshwater fishes belong to the Copepoda such as *Ergasilus*, *Lernaea* and *Branchiura* (Taylor *et al.*, 2006) [13].

Gill lice, *Ergasilus*, belonging to the class Crustacea of phylum Arthropoda, are common ectoparasitic cyclopoid copepods are found in many freshwater bodies and adversely affect fish production. The genus *Ergasilus* includes more than 80 species, commonly found in marine and freshwater habitats in many parts of the world (Kabata 1985) [5]. *Ergasilus* has a flat, oval body that is almost completely covered by the carapace. The compound eyes are prominent, and the mouth parts and first pair of antennae are modified to form a hook, spiny proboscis with suckers. Its feeding activity severely damage the gills and their heavy infestations can be commonly seen in warm weather. They are sexually dimorphic, with females being parasitic and the males free-living. Although *Ergasilus* spp. can be very harmful to the host and damage the gills as a result of their attachment and

feeding activity. It is a host-specific ectoparasite that infects many species of freshwater fishes (Roberts, 1970) [12].

As their name suggests, gill lice attach themselves to the gill filaments of fish and feed on their host's blood and tissue (Ojha and Hughes 2001) [8] causing extensive damage by reducing blood flow and surface area for oxygen exchange. In severe infections, the large gills can be eroded and respiration severely impaired (Kabata 1970) [4]. High prevalence of its infections can disturb the health of host fishes and due to asphyxia sometimes death also occurs (Dezfuli 2003) [2]. Gills parasites of the genera *Ergasilus* in many high infestations can cause great damage to the fish population in fish ponds and cage farming systems (Dimovska. and Stojanovski, 2022) [3]. Its heavy infestation on cultured and wild fish can cause serious health problems, mortalities, and significant economic loss (Yalim *et al.*, 2023) [14].

Parasites can act as sensitive and early indicators of deterioration in water quality of ponds, lakes, streams or rivers. In a polluted aquatic environment, the prevalence and intensity of parasites can be an indicator of water quality of a waterbody (Prakash *et al.*, 2024) [11]. Because levels of water pollution can directly or indirectly affect aquatic ectoparasites through the activities of their intermediate host, ectoparasites in direct contact with water may be more sensitive to pollutants, reducing their survival and reproductive rates (Dimovska and Stojanovski, 2022; Prakash *et al.*, 2024) [3, 11]. In particular, fish ectoparasites reflect changes in the environment, as poor water quality either increases the parasite's food supply or weakens the fish's immune system and ability to fight parasites (Bhuthimethee, *et al.* 2005) [1].

Parasites can cause significant diseases in wild and cultured fish populations but the effect of diseases on wild fish is less known than that of cultured fish populations (Yalim *et al.*, 2023) [14]. Studies on parasitic diseases of fishes particularly

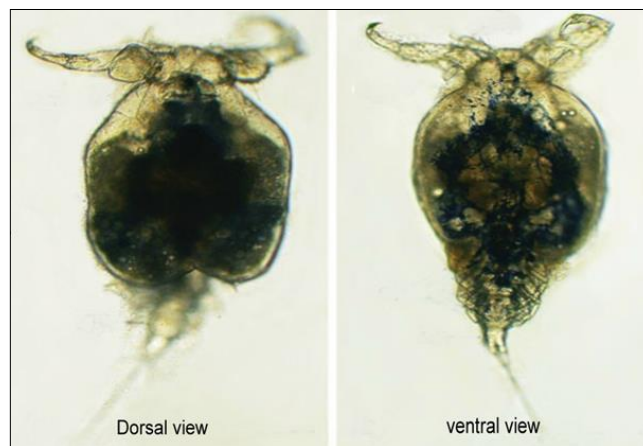
in this tarai region of eastern Uttar Pradesh are fragmentary (Prakash and Verma, 2017) [9]. Identification of parasitic fauna in wild fish and their monitoring studies are important to prevent the spreading of parasitic infections from wild fish to cultured fish. Thus, proper fish health management is necessary to stop the economic loss and maintain the current fish production. Therefore, the infestation level of *Ergasilus* in economically important fish species *Channa punctata* was evaluated in relation to sex, size and season.

Materials and Methods

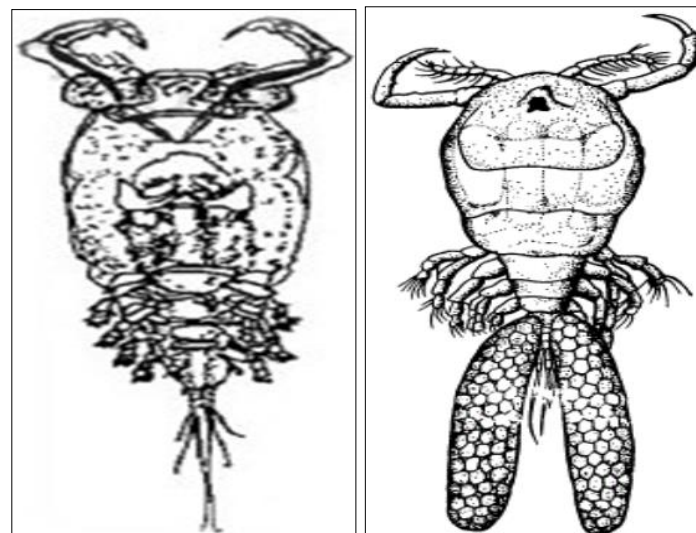
For evaluating the infestation level of copepod parasite, *Ergasilus* sp., 110 live freshwater snake headed fish *Channa punctata* (Bloch) of different size were collected between March, 2023 to February, 2024 from polluted lotic waterbody, Sawan River (locally called as Swan nallaha), a small tributary of river Rapti at Balrampur during different seasons i.e. Spring, Summer, Autumn and Winter and after collection transferred alive to the laboratory. In the

laboratory, the collected live fishes were measured in total length and divided into three categories viz., small (6.5-8.0 cm), medium (8.0 – 9.5cm) and large (above 9.5 cm) categories then clinical examination of these collected live fishes was done. The collected fishes were also separated sex wise with the examination of gonads.

For investing and collecting the gill lice, the external surface such as scales, fins, skin and fin base of freshly collected *Channa punctata* were examined carefully with the help of magnifying lensed. The scrapping of the skin was done by a scalpel to collect the mucus in a petri dish for microscopic examination. All collected fish were dissected and the gills were removed from the branchial cavity of freshly collected *Channa punctata* to examined the presence of gill lice under the light microscope. The gill filaments were examined carefully with the help of magnifying lensed and gill lice were collected by a hairbrush and identified according to Kabata (1970, 1985) [4, 5]. The number of parasite samples and infected fish samples were counted.



Ergasilus



Ergasilus: Young Female

Ergasilus: Adult Female

The prevalence, mean intensity and density or abundance of parasite infestation for host fish, *Channa punctata* were calculated according to formula given by Margolis *et al.* (1982) [7].

$$\text{Prevalence \%} = \frac{\text{Total no. of infected fishes}}{\text{Total no. of fish examined}} \times 100$$

$$\text{Intensity of Infection} = \frac{\text{Total no. of parasites collected}}{\text{Total no. of infected fish examined}}$$

$$\text{Density of Infection} = \frac{\text{Total no. of parasites collected}}{\text{Total no. of fish examined}}$$

Results and Discussion

All the collected parasitic copepods, *Ergasilus* has 2 branched legs, well developed antenna with single claw and 6 segmented antennules. 4th leg has 2 segmented exopod and 3 segmented endopod (Kabata, 1985; Yalim *et al.*, 2023) ^[5].

^[14]. In the present study the parasite *Ergasilus* was mainly found on the gills and few present on the fins of *Channa punctata*. Presence of this ectoparasite on gills and fins of indigenous and exotic carps was also reported by (Prakash *et al.*, 2021; Dimovska and Stojanovski, 2022) ^[10, 3].

Table 1: Population dynamics of *Ergasilus* sp. according to length of fish, *Channa punctata*

Length Group of Host Fish	No. of Host Fish	No. of infected Host fish	Total number of <i>Ergasilus</i> removed from Gill	Prevalence (%)	Mean Intensity of infection	Density of Parasite
Small	26	15	84	57.69	5.60	3.23
Medium	52	27	111	51.92	4.11	2.13
Large	32	17	83	53.13	4.88	2.59
Total	110	59	278	53.64	4.71	2.53

Table 2: Population dynamics of *Ergasilus* sp. according to Sex of fish, *Channa punctata*

Sex of Host Fish	No. of Host Fish	No. of infected Host fish	Total number of <i>Ergasilus</i> removed from Gill	Prevalence (%)	Mean Intensity of infection	Density of Parasite
Male	27	13	75	48.15	5.76	2.78
Female	59	35	131	59.32	3.74	2.22
Unidentified	24	11	71	45.83	6.45	2.96

Table 3: Population dynamics of *Ergasilus* sp. according to Season in fish, *Channa punctata*

Season	No. of Host Fish	No. of infected Host fish	Total number of <i>Ergasilus</i> removed from Gill	Prevalence (%)	Mean Intensity of infection	Density of Parasite
Spring	23	22	131	95.65	5.95	5.70
Summer	29	8	23	27.59	2.88	0.79
Autumn	25	13	59	52.00	4.54	2.36
Winter	33	16	65	48.48	4.06	1.97

In the present study total 59 fishes were infected by *Ergasilus* sp. The overall prevalence, mean intensity and density were 53.64%, 4.71 and 2.53, respectively (Table 1). All size group fishes were infested with *Ergasilus* (Table 1). The prevalence (57.69 %), mean intensity (5.60) and density (3.23) were highest in small sized fishes followed by large sized (prevalence 53.13%, mean intensity 4.88 and density 2.59) and medium sized fishes (prevalence 51.92%, mean intensity 4.11 and density 2.13) (Table 1). Although small sized host fishes were highly infected with parasite than other medium and large sized host fishes but there were no statistically significant differences in the prevalence (P=0.64), mean intensity (P=0.36) and density (0.39) of parasite among the size group. Dimovska and Stojanovski (2022) ^[3] found 1.461% prevalence and 2.357 mean intensity of *Ergasilus* on gills and 1.879% prevalence and 38.274 mean intensity on fins of common carp. Yalim *et al.*, (2023) ^[14] found 60.20% prevalence and 15.95 mean intensity of *Ergasilus* on gills of grey mullet, *Chelon labrosus*.

The levels of infestation in male, female and sexually unidentified *Channa punctata* showed differences (Table 2). The prevalence of *Ergasilus* for *Channa punctata* female (59.32%) was higher than male (48.15 %) and sexually unidentified fish sample (45.83 %) whereas mean intensity and density or abundance were higher in unidentified fish sample (6.45, 2.96) and male (5.76, 2.78) than that for female (3.74, 2.22) (Table 2). Yalim *et al.*, (2023) ^[14] found 92.00% prevalence and 16.78 mean intensity of *Ergasilus* in male grey mullet; 48.3% prevalence and 13.61 mean intensity of *Ergasilus* in female grey mullet and 55.0% prevalence and 21.0 mean intensity in unidentified sex of grey mullet, *Chelon labrosus*.

In the present investigation the level of infestation of *Ergasilus* showed a marked seasonal variation. The highest prevalence, mean intensity and density were observed in spring season followed by autumn, winter and minimum in summer seasons (Table 3). Yalim *et al.*, (2023) ^[14] found highest prevalence and mean intensity of *Ergasilus* was recorded in spring followed by winter, autumn and summer seasons.

The results of the present study showed that the infestation level of *Ergasilus* sp. was significantly altered in relation to seasons and sex of the host fish, but there was no effect on the fish size. It is important to carry out such studies continuously in the natural environment as well as in the waterbodies used for the purpose of fish culture in order to prevent epizootic outbreaks. Thus, it can be concluded that studies on the parasitic copepods on the fishes inhabiting in natural waterbodies could be beneficial to prevent the effects of parasites on cultured fish.

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