

## Research Article

# Trichodinid Parasites on the Gills of *Channa punctatus* from the Wild and Cultured Environments in Sylhet, Bangladesh

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Two trichodinid parasites, *Trichodina cyprinocola* and *Trichodina pediculus*, were acknowledged in the gills during a sampling preparation of thirty fish *Channa punctatus* from the wild and cultured environments. However, *Trichodina pediculus* was recorded only in one farmed fish. From a total of 33 parasites, 26.67% were encountered in wild and 46.67% in cultured fish. The overall incidence of infection by *Trichodina cyprinocola* was 33.33% whilst *Trichodina pediculus* was only 3.33%. Records from statistical analysis as well affirmed that fish host from the cultured environment constituted the highest rate of intensity ( $3.43 \pm 1.4$ ), density ( $1.6 \pm 2.0$ ), and infection index ( $11.2 \pm 13.95$ ) values. Both trichodinid species are identified based on the study in their unique denticles structure. Relatively large size of adhesive disc with tiny curved denticles and elongated denticle rays are the exceptional denticle morphology observed in *Trichodina pediculus* and compact association of sickle denticles with round tangent point alongside short vigorous upright rays evaluated the *Trichodina cyprinocola*.

## 1. Introduction

Snake headed fish are abundantly found in all the freshwater habitats of Bangladesh and they are less catch in river or running water but good catch in flood plains. Five snake headed fish such as *Channa punctatus*, *C. striatus*, *C. marulius*, *C. barca*, and *C. orientalis* are known in Bangladesh but they are becoming scarce during the recent years. *Channa punctatus* is one of the popular snake headed fish in Bangladesh with highly developed parental care. It has good commercial value due to its diversified diet menu. *Channa punctatus* is the most popular fish species in Sylhet but their abundance is reducing due to overexploitation, environmental stress, and disease outbreaks [1]. Most parasitic diseases occur due to unfavorable conditions, such as poor water quality. Previous studies on *Channa punctatus* have been done in biological field, mainly in the breeding program of this fish [2], and in histopathology of diseased fish [3, 4]. Helminth parasites in *C. striatus* and *C. marulius* are listed [5] and some other researches were done on the snake headed fishes with different parasites [6–8].

Protozoan parasites such as *Ichthyobodo*, *Chilodonella*, *Ichthyophthirius*, and *Trichodina* are most common in fish species [9–12]. Study of protozoan parasites is scant in

Bangladesh, and a little knowledge about the distribution, prevalence, parasitic intensity, pathogenic effects, and control of most of the diseases in natural population of freshwater fish is studied in Sylhet region. Trichodinids are one of the important ectoparasite protozoa that are typically found on the gills, skin, and fins of fishes described as chalice shaped with homocentric layers of cilia and a circle of coordinating cytoskeletal denticles [13–15]. About 300 nominal *Trichodina* species have been reported from different environments [16–19], but their geographic distribution and diversity in Bangladesh, particularly in Sylhet region, are still largely unknown. Due to high economic importance of *C. punctatus* in Bangladesh the present work was undertaken to investigate the trichodinid parasites in *C. punctatus* with different habitat of varying water quality in Sylhet. The major objectives of the present study were to observe the trichodinid parasites on the gills of *C. punctatus* from the wild and cultured ecosystems and to find out the prevalence and mean intensity of infestation of trichodinid parasites in *Channa punctatus*.

## 2. Materials and Methods

**2.1. Study Location and Fish Sampling.** Thirty young fish *C. punctatus* were sampled in live condition from wild and

cultured environments where 15 individuals were selected for each environment for observing trichodinid parasites on gills. Open water fish were collected in live condition from local fish market and closed water fish were harvested by fishing net from different cultured farms of Sylhet. Single fish was collected and examined in daily basis. Collected fish was transferred to the Animal Biotechnology Laboratory (ABL) of the Department of Genetic Engineering and Biotechnology (GEB) at Shahjalal University of Science and Technology (SUST), Sylhet, Bangladesh, and *C. punctatus* was identified according to the morphometric characteristics [20].

**2.2. Working Procedure.** The gills of collected fish were examined immediately for trichodinid study. A fine pair of scissors was used to cut operculums from both sides to reveal the opercular cavity. Firstly, a clean spatula was drawn to lift off the slime from both sides of gills of each individual and spread on a clean dry glass slide evenly to air-dry and the slime sample was observed under microscope. Then, the whole gill filaments were dissected using fine scissors and impression smears of gills were prepared. Later, three to four drops of the preparation were placed onto clean glass slides and left to dry. Soon after, the air-dried slides with trichodinid parasites were impregnated with a 2% solution of silver nitrate for 6 to 8 minutes known as Klein's dry silver impregnation technique [21]. Finally, the prepared slides were settled under the compound microscope and visualized by 4x, 10x, and 40x lenses for comprehensive morphological details of the trichodinid parasites [22–26]. The numbers of observed parasites were counted for statistical analysis and microscopic photographs were made for identification of trichodinid species with the help of high megapixel digital camera (Hitachi HDC-1296E).

**2.3. Statistical Measurements.** To persuade the incidence, intensity, density, and index of this study following subsequent formulae were undertaken to fulfill the analysis [27]:

$$\text{Incidence of infection} = \frac{\text{Infected host} \times 100}{\text{Total host examined}},$$

$$\begin{aligned} \text{Intensity of infection} \\ = \frac{\text{No. of parasites collected in a sample}}{\text{No. of infected host}}, \end{aligned}$$

$$\begin{aligned} \text{Density of infection} \\ = \frac{\text{No. of parasites collected in a sample}}{\text{Total host examined}}, \end{aligned}$$

$$\begin{aligned} \text{Index of infection} \\ = \frac{\text{No. of host infected} \times \text{No. of parasites collected}}{\text{Total host examined}}. \end{aligned} \quad (1)$$

### 3. Results

**3.1. Identification of Trichodina Species.** Two trichodinid species, *Trichodina pediculus* [28] and *Trichodina cyprinocola*

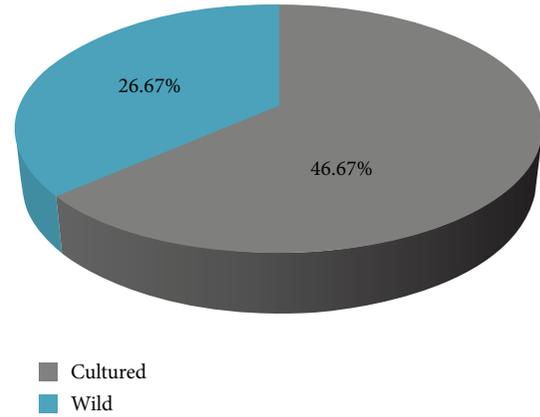


FIGURE 1: Incidence of trichodinid parasites in *Channa punctatus*.

[26], were identified in this study. *Trichodina cyprinocola* was noticed in both cultured and wild host while *T. pediculus* was found only in cultured fish. This is the first record of *T. cyprinocola* in *C. punctatus* in Bangladesh. Both trichodinid species are identified based on the study in their unique denticles structure.

**3.2. Parasitic Status of Fish.** In this study, a total of 33 trichodinid parasites were found including 32 of the species *T. cyprinocola* and only one were found *T. pediculus*. Only one individual of the species *T. pediculus* was observed in cultured fish and this species was not observed in experimental wild fish. Nine individuals of parasite *T. cyprinocola* were recorded from wild fish and 23 individuals were found from cultured fish (Table 1).

**3.3. Trichodinid Infestation.** The analysis of incidence, intensity, density, and parasitic index of two trichodinid gill parasites was carried out from the fish, *C. punctatus* (Tables 1 and 2). The overall incidence of infection of two trichodinid parasite species in *C. punctatus* was found higher 46.67% in fish from cultured environment where in wild environment it was recorded relatively low as 26.67% (Figure 1). Consequently, cultured environment fish as well pointed out maximum values for intensity ( $3.43 \pm 1.4$ ), density ( $1.6 \pm 2.0$ ), and index ( $11.2 \pm 13.95$ ) whilst minimum statistics ( $2.25 \pm 0.5$ ,  $0.6 \pm 1.06$ , and  $2.4 \pm 4.22$ , resp.) were directed to wild environment fish (Table 2).

### 4. Discussion

Several studies on fish parasites have been done in Sylhet but there is not any specific research in *C. punctatus*. Therefore, this is the first specific account of trichodinid parasites on the gills of *C. punctatus* in Sylhet and two trichodinid parasites *T. cyprinocola* and *T. pediculus* were found. Trichodinid parasite, *T. pediculus*, was also recorded from the gills of the major carp, *Cirrhinus mrigala* (Hamilton) in Bangladesh [29]. Other trichodinids, such as *T. cirratus*, *T. colisee*, *T.*

TABLE 1: Trichodinid parasites of *Channa punctatus*.

Trichodinid species	Number of observed parasites		Total infected host	Total parasites counted	Incidence of infection (%)
	Wild fish	Cultured fish			
<i>Trichodina pediculus</i>	0	1	1	1	3.33
<i>Trichodina cyprinocola</i>	9	23	10	32	33.33

TABLE 2: Intensity, density, and index of *Trichodina* species in *Channa punctatus*.

Environments	Host examined	Infected host	Parasites found	Intensity	Density	Index
Wild	15	4	9	2.25 ± 0.5	0.6 ± 1.06	2.4 ± 4.22
Cultured	15	7	24	3.43 ± 1.4	1.6 ± 2.0	11.2 ± 13.95

*glossogobius*, *T. oreochromis*, and *T. sylhetensis* were reported from some Bangladeshi fish but not in *C. punctatus* [30, 31].

In the present parasitic surveillance, the highest incidence of infection by trichodinids in *C. punctatus* was calculated as 46.67% in the cultured fish whereas in the wild fish the infestation was found to be lowest (26.67%). A comparative study of the common protozoan parasites encountered on the gills of the wild *Clarias gariepinus* constituted the highest parasite load (40.54%) compared to the fish sampled from the cultured environment (38.86%) [32]. Abo-Esa investigated the ectoparasitic protozoan in *Clarias gariepinus* and revealed an average infection of 20% with *Trichodina* sp. [33]. The recorded data for intensity of infection by trichodinid parasites in wild and cultured fish were  $2.25 \pm 0.5$  and  $3.43 \pm 1.4$ , respectively. Additionally, high level of density ( $1.6 \pm 2.0$ ) and index ( $11.2 \pm 13.95$ ) rate by trichodinid parasites was observed in the cultured fish. From the site sampling comparison it was strongly supported that the parasitic infestation is a leading event of the cultural environment fish, which is in agreement with the findings of Miah et al. [34].

*Trichodina pediculus*, firstly reported by Ehrenberg [28], is a widely distributed species occurring not only in *Hydra*, but also in tadpoles and various species of fish [28, 35–37]. Regarding the overall morphology of the adhesive disc, *T. cyprinocola* was similar to two known species, *T. gulshae* [38] and *T. heterodontata* [38, 39]. *T. cyprinocola* possesses close body size and sickle-shaped blade similar to *T. gulshae*. Several unique characteristics of *T. cyprinocola* are distinguishable from *T. gulshae*. Firstly, with respect to the denticle morphology, in *T. cyprinocola*, apophysis of blade is present but not distinct, blade connection is strong, and ray is very robust, short, and not inclining forward or backward whereas, in *T. gulshae*, apophysis of blade is more prominent, blade connection is relatively thinner, and the ray is much more slender and slanted in anterior direction. Subsequently, *T. cyprinocola* is a parasite from the cultured cyprinid fish *C. carpio*, whereas *T. gulshae* was isolated from the siluriform fish *Mystus cavasius*. In the present study, relatively large size of adhesive disc with tiny curved denticles and elongated denticle rays are the exceptional denticle morphology observed in *T. pediculus*. Evenly, compact association of sickle denticles with round tangent point alongside short vigorous upright rays evaluated the *T. cyprinocola*. On the basis of overall denticles shape, the present species resembles more closely *T. heterodontata* [39]. Though, *T. cyprinocola* was also different

from *T. heterodontata* in several aspects, as the adhesive disc of *T. heterodontata* was significantly larger than that of *T. cyprinocola* with a greater number of radial pins per denticle. With reference to the morphology of denticles, *T. cyprinocola* possesses much broader sickle-blades with sharp tangent point; its distal blade surface is significantly higher than the round tangent point, unlike that of *T. heterodontata*.

## 5. Conclusions

*Channa punctatus* was mostly infected by different parasites whereas protozoan is the most common parasite which infects the gills. Not being exception, two species of protozoan trichodinid were found in this observation. These parasites were not listed in any previous parasitic studies of *C. punctatus* in Bangladesh.

## Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

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