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# Prevalence and Infestation Rate of Intestinal Acanthocephalan Parasite *Pallisentis nagpurensis* in Fresh Water Fish, Channa striatus

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**ABSTRACT**

Endoparasitic infestations of intestine by acanthocephalans are very common in the fish *Channa striatus* that seriously impairs the fish health, growth and survival which in turn results in economic loss. Heavy infestation by these parasites interrupts the normal growth of the fishes. The need for research in this aspect is that the fish farmers will be able to predict any acanthocephalan fish parasitic infestation in their fish farm and also to undertake initiatives in order to prevent these parasitic infections. The study deals with the investigation of Acanthocephalan parasitic infestation in *Channa striatus* collected from different water bodies of Mavelikara Municipality, Alappuzha district, Kerala. All the fishes collected during the study period were found to be infected with the Acanthocephalan parasite, *Pallisentis nagpurensis.* The analysis revealed that the males exhibited a slightly higher values of prevalence (77.67%) and mean intensity (1.26) compared to females (Prevalence-72.62%, Mean intensity-1.24). The relative density recorded maximum value in female (0.91).

***Key words:*** *Prevalence, Parasite, Identification, Pallisentis nagpurensis, Channastriatus*

## Introduction

*Channa striatus* belonging to the family Channidae is one of the prominent species of inland fisheries of Indian Subcontinent has significant economic importance because of its food value. Pharyngeal diverticula, the accessory respiratory organ, help the air breathing *Channa striatus* to live without water for a long time. The fish spends most of its time at the bed of the river or pond feeding on copepods and due to this food habit; it can act as a host for many parasites. Freshwater fish, *Channa striatus*is commonly found to be infected with the intestinal parasite *Pallisentis nagpurensis*. The occurrence of *Pallisentis nagpurensis* have been reported by Bhalerao, 1931, for the first time (Bhalerao, 1931). The infestation of acanthocephalan parasites belonging to Pallisentis Genus in various fresh water fishes has been reported (Cleave,1828; Bhalerao, 1931 Sarkar, 1956; Agarwal, 1958). The intestinal infestation by *Pallisentis sp.* is recorded in different species of *Channa striatus* inhabiting fresh waters. (Bashirullah, 1973; Kundu and Gurelli, 2020). Acanthocephalans have preference for a region of attachment in the alimentary canal of fish (Moravec, 2000). Fish infected with a high concentration of acanthocephalans have a deep penetration of their intestinal wall without displaying any indications of illness or consequences (Taraschewski, 2000; Gupta *et al.*, 2015). The proboscises of acanthocephalans have a variety of shapes ranging from spherical to cylindrical (Bush *et al.*, 2001). *Channa striatus* from a Kepala Batas rice

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field in Peninsular Malaysia has a significant acanthocephalan parasite infection (Ravi and Yahaya, 2015). *Pallisentis nagpurensis* brought severe histopathological changes like disruption of mucosa and submucosa, thickened lamina propria, damage of epithelial cells and clumped mucosa folds in the intestine of *Channa striatus.* It will also result in a reduction of absorptive capacity, slowed gut motility, and perhaps intestinal perforation. As a result, it has an impact on the host fish's overall health and growth (Reddy and Banerjee, 2015). The morphological and molecular phylogenetic analysis of the parasite in *Channa striatus* is reported by Rana and Kaur (2021).

Eventhough there are many studies on the life cycle of Acanthocephalan parasites belonging to Genus Pallisentis, the present study attempts a redescription of the identification and measure of disease frequency i.e., Prevalence, Mean Intensity and Relative Density of infectionof *Pallisentis nagpurensis* in *Channa striatus.* The study was performed at different regions of Mavelikara Municipality in the Alappuzha district of Kerala, India

## Materials and Methods

*Channa striatus* were collected randomly from different water bodies of Mavelikara municipality, Alappuzha district during January 2019 to December, 2019. The collected fish samples were transferred to laboratory for further examination. The fish samples were taken in live condition, and examined immediately for parasitological study using compound microscope. After the fish had been anaesthetized, presence of endoparasite was examined via dissection of fish intestine and direct observation under a microscope. Acanthocephalan parasite, *Pallisentis nagpurensis* were seen with the fecal matter in the intestine. Parasites were removed by using a brush, washed and were press fixed by using 10% formalin. Parasites were examined under a compound microscope and microphotographs were taken using LEICA DFC 295 camera. Measurements of the parasites were taken from the photo micrographic images of the parasites under study. It is done with the help of the scales given in the microscopic images. All the measurements are taken in millimeter (mm). The analysis of parasitic infestation for finding the prevalence, relative density and mean intensity were carried out by using the standard formulae.

## Results

### Identification of the parasite

It was observed that the average length of the acanthocephalan parasite obtained from *Channa striatus* as 10.3 mm and average width as 0.5 mm (Table 1). The average length of proboscis was obtained as 0.32 mm and width as 0.25 mm (Table 1), armed with 4 circles of 8-10 hooks each. Collar spines were arranged in 12-14 circles and body spines were arranged in 30-63 rings of 8- 14 spines each. The length of male posterior end with copulatorybursa is 1.59 mm and width is n0.22 mm (Table 1). Copulatory bursa has a length of 0.18 mm and width of 0.23 mm (Table 1). Cement gland was long, cylindrical, syncy-

**Table 1.** Summarizing the morphological data of *Pallisentis nagpurensis* in comparison to the diagnosis after Bhalerao, 1933 (Bhattacharya, 2007).

| Characters | | *Pallisentis nagpurensis* (Current study) | | *Pallisentis nagpurensis* (Bhalerao, 1933) | |
|---|---|---|---|---|---|
| | | Avg. length (mm) | Avg. breadth (mm) | Length (range) (mm) | Breadth (range) (mm) |
| Body | | 10.3 | 0.5 | 2.4-19.00 | 0.43-0.9 |
| Proboscis | | 0.32 | 0.25 | 0.35 | 0.3 |
| Proboscis hooks | | 4 circles of 8-10 hooks each | | 4 circles of 8-10 hooks each | |
| Collar spines | | 12-14 circles | | 12-14 circles | |
| Body spines | | 30-63 rings of 8-14 spines each | | 30-63 rings of 8-14 spines each. | |
| Male posterior end with copulatory bursa | | 1.59 | 0.22 | - | - |
| Copulatory bursa | | 0.18 | 0.23 | - | - |
| Cement gland | | 20-30 nuclei | 20-30 nuclei | | |
| Testis | T1 | 0.79 | 0.19 | 0.63-1.82 | 0.16-0.37 |
| | T2 | 0.71 | 0.22 | 0.49-1.28 | 0.17-0.36 |
| Eggs | | 0.109 | 0.096 | 0.116-0.214 | 0.083-0.115 |

tial with 20-30 nuclei. Two unequal testes were present which were cylindrical and contiguous. Length of first testis (T1) was obtained as 0.79 mm and width was obtained as 0.19 mm while the length and breadth of the second testis (T2) were obtained as 0.71 mm and 0.22 mm respectively (Table

**Isolated parasites and its different body parts seen under LEICA DFC 295 Camera Microscope**

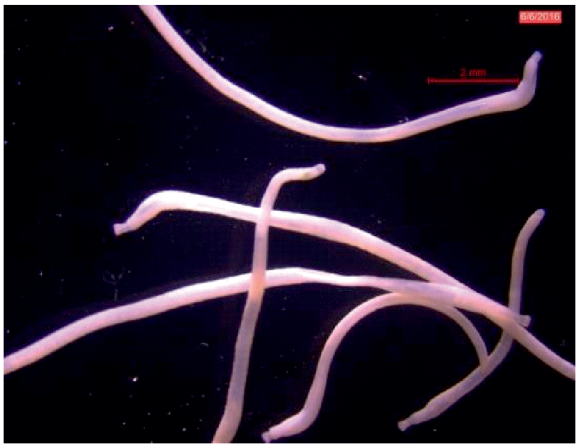


**Figure 1**

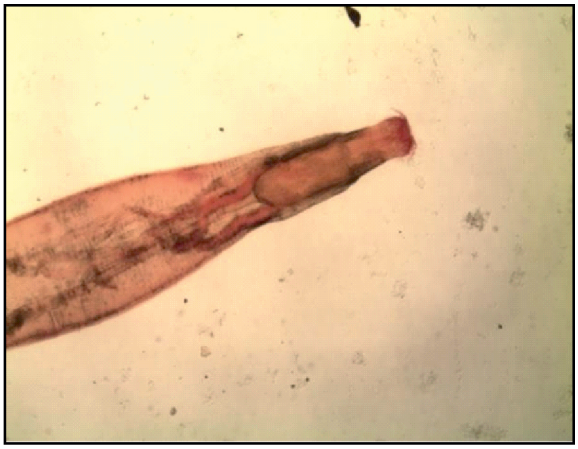


**Figure 2**

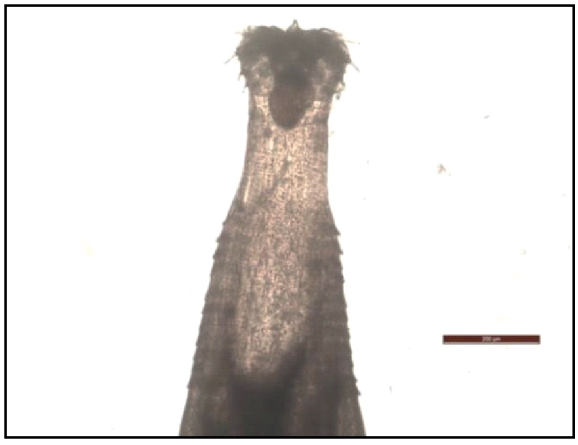
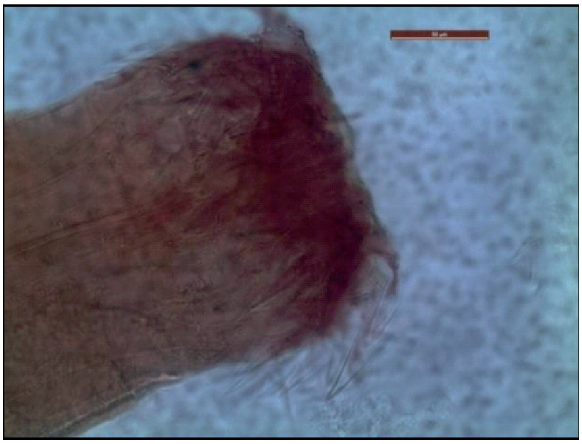


**Figure 3**



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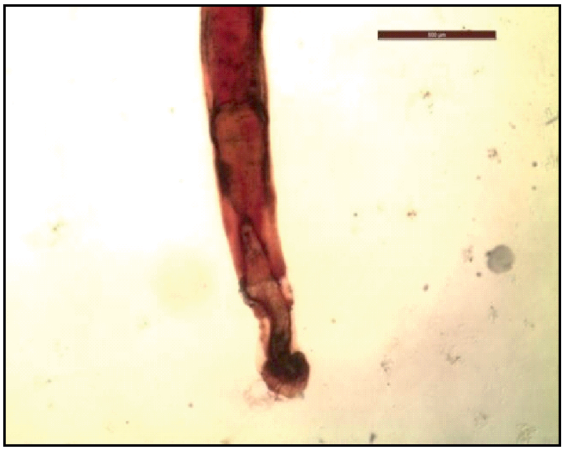

**Figure 5**

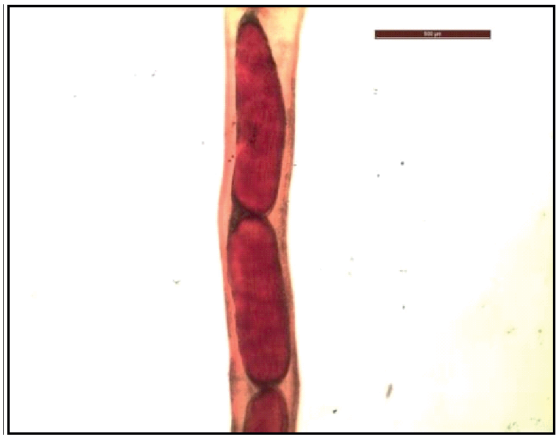

**Figure 6**

1). Numerous eggs were present with an average length and width of 0.109 mm and 0.096 mm respectively (Table 1).

*Pallisentis nagpurensis* belonging to the Phylum Acanthocephala is a spiny headed (Figure 1-7) parasite which is seen infected to the intestine of host. It is a whitish colored parasite but some were blood red in color when isolated from the host fish. It pierces into the intestine of the host with its hooks. The trunk of the parasite is slender, elongate (small-medium in length), with an anterior set of collar spines and a posterior set of trunk spines separated by a region devoid of spines (Figure 3). The collar spines are arranged in a few closely set of circles while circles of trunk spines are more widely spaced and may extent to posterior end of males or females. It has a retractile proboscis (Figure 2-4) on the anterior region. Proboscis is short, globular with 4 circles of 8-10 hooks eachand the size of these hooks decreased with each row. The anterior rows of hooks were larger than others. The collar spines were arranged in 12-14 closely set rings near anterior extremity; posterior to this collar of spines is an unspined zone which is followed by widely spaced rings of trunk spinesarranged in 30-63 rings of 8-14 spines each. Proboscis receptacle is single-walled with a large cerebral ganglion near its base. A long, slender and coiledleminisci with unequal size is present. It is also characterized by the presence of a large cluster of cement glands which arelong, cylindrical and syncytial with 20-30 nuclei. It is a dioecious organism, i.e., Male and Female parasites are separate. Females are usually larger than Maleorganism. Acopulatorybursa (Figure 5) can be seen on the posterior end of adult male parasite. Microscopic images reveal the presence of testis in Males (Figure 6) and eggs in Females (Figure 7). Testes are ovoid-cylindrical and contiguous (Figure6).

**Measures of disease frequency**

The total number of parasites, Prevalence, mean intensity and relative density of Acanthocephalan, *Pallisentis nagpurensis* recovered from the intestine of the host fish, *Channa striatus* is given in Table 2. An

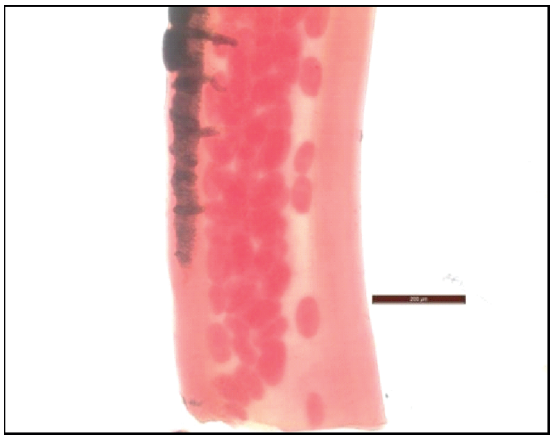

**Figure 6**

overall prevalence of 72.62% (females) and 77.67% (males) was observed (Table 2). On the other hand males exhibited a slightly higher value of mean intensity (1.26) compared to females (1.24).

The analysis revealed that there is no considerable difference in the mean intensity values between male (1.26) and female (1.24). The mean intensity of the parasite was found to be maximum (1.50) in males during October and November (Fig. 9). The mean intensity recorded the minimum value (0.50) in males during March (Fig. 10). The relative density of infection for the whole sample also showed a very slight deviation among the male (0.90) and female (0.91) population (Table 2). The relative density was maximum (1.50) in males during June and minimum (0.29) in females (Fig. 11).

## Discussion

In the present study, it was observed that *Channa striatus* was infected by the acanthocephalan parasite *Pallisentis nagpurensis*. The parasitic specific measurements are similar to the diagnosis reported for *Pallisentis nagpurensis* (Bhattacharya, 2007); hence the acanthocephalan parasite obtained from the fish *Channa striatus* is confirmed as *Pallisentis nagpurensis.* It is important to note that the measurements of different organs may vary according to size of male andfemale.

**Table 2.** Prevalence, Mean Intensity, Relative Density of *Pallisentis nagpurensis* on Channa striatus.

| Parasite | No. of fishes examined | No. of fishes infested | Prevalence | Mean intensity | Relative density |
|---|---|---|---|---|---|
| Female | 88 | 63 | 72.62 | 1.24 | 0.91 |
| Male | 36 | 28 | 77.67 | 1.26 | 0.90 |

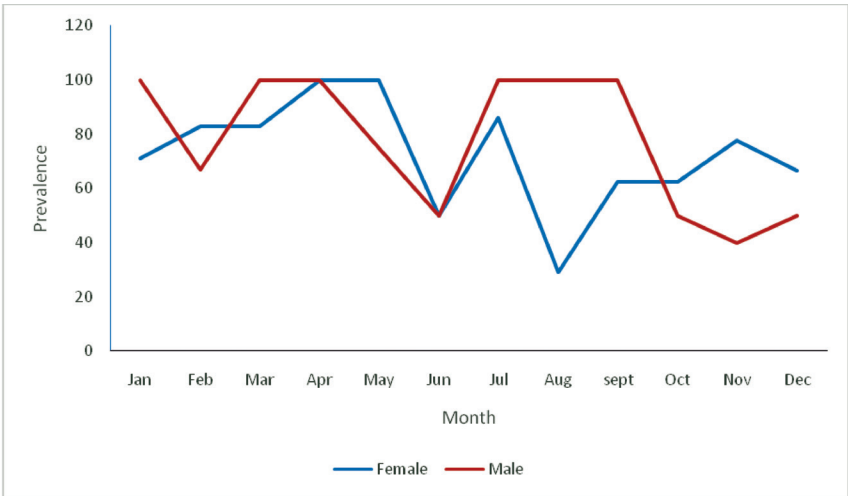


**Fig. 8.** Monthly Variation in Prevalence of infection of *Pallisentis nagpurensis* on *Channa striatus*

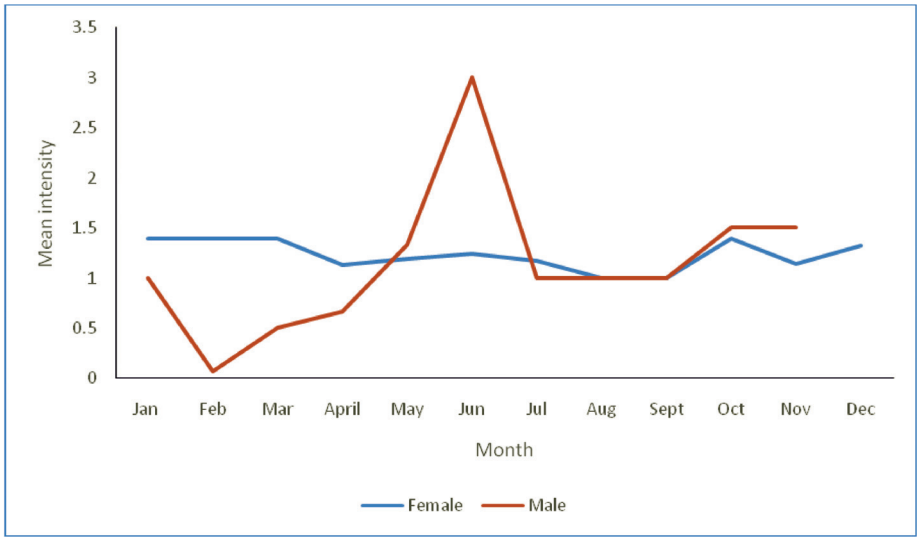


**Fig. 9.** Monthly Variation in Mean intensity of infection of Pallisentis nagpurensis on *Channa striatus*

The morphological features of the parasite observed during the present study (Table 1) was similar to that of the diagnosis by Bhalerao, 1931 and hence confirmed it as *Pallisentis nagpurensis*. *Pallisentis nagpurensis* obtained from the intestine ofthe fish *Channa striatus* is a thorny headed, whitish worm with a wrinkled body. Proboscis is the anterior most structure which is cylindrical in shape and it bears rows of spines that help the worm to attach to the gut of the host. The protonephridia serve as the excretory organ, consisting of flame bulbs and collecting tubules. The nervous system mainly consists of a ganglion to proboscis sheath and of nerves that connect the ganglion to other organs and tissues of the body. Sense organs are found in the proboscis and in the male reproductive organs. Similar morphological features for *Pallisentis nagpurensis* are previously reported (Crompton and Nickol, 1985; Reddy and Banerjee, 2015). Male reproductive organs consist of a pair of testes, one behind the other and a common sperm duct formed by the union of a duct from each testis. There was a cluster of large cement glands. Female reproductive organs consisted of an ovary fragmented into ovarian balls that lie in the ligament sac. As per the above similarities observed from different studies and morphological data, the acanthoceph-

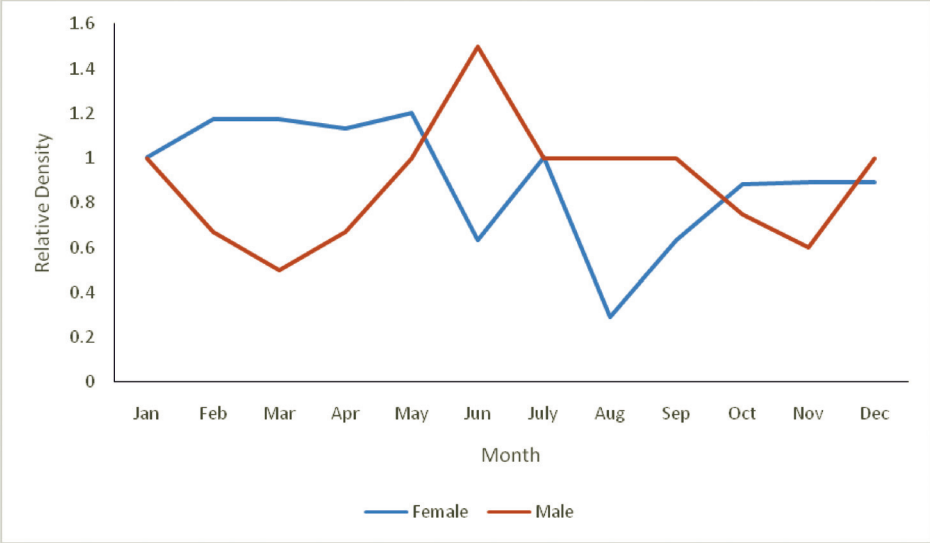


**Fig. 10.** *Monthly Variation in relative density of infection of Pallisentisnagpurensis on Channastriatus*

alan parasite collected from the host fish, C*hanna striatus* is identified as *Pallisentis nagpurensis.*

The study recorded a prevalance of 72.62% in females and 77.67% in males. The prevalence obtained in the present study is comparable to the findings of Amin *et al*. (2004).

The present finding is in agreement with the studies of Steinauer and Font (2003) who stated that the abundance and prevalence of parasitic infestations peaked during summer. High prevalence values for *Pallisentis nagpurensis* infection has been identified in fresh water fishes Bhanu *et al.,* 1993; Hossain *et al.,* 1994; Akhter *et al.*, 1997, Chandra *et al.*, 1997; Vinatha, 2012)]. The high rate of infection during summer may be due to the alteration in the physical and chemical conditions of habitat during summer. The alterations in the levels of factors like temperature, pH and dissolved oxygen may influence the level of infection. The presence of the acanthocephalan parasite *Pallisentis nagpurensis*is of great concern for health of the host fish *Channa striatus* and also from a public health point of view.

## Conclusion

In this study, we have isolated and identified an injurious acanthocephalan parasite *Pallisentis nagpurensis* in the fresh water fish *Channa striatus* from the water bodies of Mavelikkara Municipality, Alappuzha district of Kerala. Moreover we obtained a higher Prevalence rate in malescompared to females. Mean Intensity was also slightly higher in males in comparison to females with a value of 1.24 and 1.26 respectively. Relative density of parasitic infestation in *Channa striatus* was 0.91 for females was and 0.90 in males.

### Conflict ofinterest

The authors declare no conflict of interest.

### Data Availability

All data generated or analysed during this study are included in this published article. Data will be shared on request.

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