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Original Article

Study of Different Ectoparasites from Labeo Rohita Collected from the Local Markets of Dera Ismail Khan, KPK, Pakistan

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Abstract

The research in hand was aimed at studying different ectoparasites from *Labeo Rohita* collected from local markets of Dera Ismail Khan, KPK, Pakistan. To assess the prevalence of ectoparasites on rohu (Labeo Rohita) fish. 30 freshwater rohu specimens were gathered from various locations in Dera Ismail Khan, KPK, Pakistan, between the months of December 2023 and May 2024. The ectoparasite status of 30 fish species was assessed. 18 fish out of thirty were Lernaea infected. Lernaea had a total prevalence of 26.66 percent. In the group of fish weighing 1000–1200 grams, the prevalence of Lernaea was 37.5%, but in the group weighing 100–300 grams, it was 16.66%. In the fish length group of 66-85 cm, Lernaea was most common (33.33%), whereas in the 25-45 cm group, it was least common (14.28%). In addition, Lernaea varied with the seasons; in January, it was at its highest (33.33%), while in March and April, it was at its lowest (20%) and nonexistent (0%). The results showed that the prevalence of infection was higher in rohu (*Labeo Rohita*) fish that were both heavier and longer than in fish that were both lighter and shorter. This may be because parasites have a larger surface area to anchor and hide on larger fish. The study will significantly contribute to the theory and practice both as it has far reached results, though the study was conducted only in one city due to time and financial constraints, however, in the future, researchers could conduct it at large scale from the Khyber Pakhtunkhwa province to get generalizability of the results. Further, it is suggested that it may be replicated in varying environments of other provinces of the country too.

Keywords: Different Ectoparasites, Fishes, Labeo Rohita, Lernaea Infections, Parasitology.

Introduction

Fish is a crucial and diversified resource that plays a significant part in the economy of many countries. It is a staple diet in several nations (Qian *et al.,* 2023). Pakistan possesses a very diverse fish population, including of both indigenous and non-native species, with a total of over 190 officially recognized species (Chatha, Naz, Mansouri, & Nawaz, 2023). The aquatic animals occupied many types of aquatic environments, with fish being a prominent component (Khan *et al.,* 2022).

The primary requirement in aquaculture is to cultivate robust fish populations. Parasitic infections in fish greatly disrupt aquaculture operations and hinder its financial growth (Shinn *et al.,* 2023). *Labeo Rohita* (Hamilton) is a diurnal fish species that is indigenous to rivers, streams, and canals in Bangladesh, India, Pakistan, Nepal, and Myanmar. Additionally, it can be present in lakes, oxbow lakes, ponds, ditches, and analogous aquatic environments. This species of carp mostly resides in the central region of the aquatic environment and generally occupies vertical space. This organism's food mostly comprises crustaceans and insect larvae in their early developmental phases. The nutritional composition of Rohu mostly comprises algae (35%), higher plants (20%), protozoans (23%), crustaceans (15%), and small amounts of silt and sand (7%) (Easmin, Habib, Akter, & Majumder, 2018).The fertility of the fish ranges from 226,000 to 2,800,000, depending on the size of the fish and the weight of its ovaries. Another study showed that the average fecundity ranged from 200,000 to 300,000 eggs per kilogram of body weight (Dwivedi, Tripathi, Singh, & Tripathi, 2016).The breeding of this species does not occur in ponds, but rather in river systems, namely during the monsoon season from April to September. Except by hypophysation, to which it exhibits rapid responsiveness(Peddinti, Thummala, Khateef, & Vankara, 2021).

Artificial breeding produces most of the cultivated individuals in hatcheries. In addition, the seeds are gathered from rivers that are uncultivated. Due of its higher development rate, wild fish growers prefer seed to hatchery-produced seeds. It takes only one year for it to reach a weight of 900 g when cultured in a pond (Kumar, 2016). The highest documented age was 10 years, with a total body length of 200 cm and a weight of 45 kg (Ashokan, Mundaganur, & Mundaganur, 2013). Rohu is a bottom feeder that eats mostly dead plants and other organic debris. In the research region, this fish is accessible. Does not appear on the IUCN Red List (Zare-Shahraki *et al.,* 2022). Sangli, Maharashtra is home to fish breeders who mostly employ this species for their aquariums. When parasites take over a culture, it can severely affect the output.

Hoffman found that parasite infection was associated with poor fish health (Zare-Shahraki *et al.,* 2022). When the temperature, host physiology, and water quality of the river or pond are just right, the parasites proliferate (Rastiannasab, Afsharmanesh, Rahimi, & Sharifian, 2016). Some studies have shown the effects of fish parasites on fish (Bhuiyan, Akther, & Musa, 2007). It has been documented that helminth parasites may be found in *L. rohita* by (Shomorendra, Jha, & Pankaj Kumar, 2007). There are also documented incidences of helminths in *L. rohita* in India (Langer & Ahmad, 2017). Langer and Ahmad reported identical incidents in Pakistan (Langer & Ahmad, 2017).

Materials and Methods

Fish samples were gathered for the current investigation from Dera Ismail Khan by visiting the adjacent marketplaces. Fish samples were analyzed in the Zoology Laboratory of the Chemical & Life Sciences Department of QUIS Dera Ismail Khan. The research spanned six months, starting in December 2023 and ending in May 2024. 30 specimens of Labeo rohita were collected. The study used two methodologies for identifying ectoparasites. Direct examination of Ectoparasites: The ectoparasites were examined directly using forceps or the unaided eye.

Batool *et al.* reported the technique in their study (Batool, Latif, & Sarwar, 2022). By using a magnifying lens, fish were reportedly spotted near their eyes, gills, ns, and tail region. A meter ruler and thread were used to measure the lengths in centimeters, and an electronic weighing balance was used to measure each fish's weight in grams. Forceps were utilized to extract the parasites from the fish's body and then placed into beakers containing a fixative solution (10% formalin). The parasites that were gathered were subsequently examined in the Parasitology laboratory of QUIST Dera Ismail Khan. The parasites were sprayed with water to get rid of the fixative.

The bodies of the parasites were maintained translucent and visible by soaking them in 10% potassium hydroxide. Water was sprayed on the parasites to get rid of the potassium hydroxide. Parasites were dehydrated in 30%, 50%, and 70% alcohol for 10 minutes after washing. Using 90% and 100% alcohol, the parasites were dyed for five minutes and then allowed to dry for ten minutes. After being attached to Canada balsam, the ectoparasites were examined under a microscope. Ectoparasites examined using scraping technique: The scraping technique is employed to examine ectoparasites.

A description of the scraping method's technique was provided. This method involved using a scalpel blade to scrape the fish's skin from head to tail. After separating the epidermal cells from the mucus, the scrape was mixed with 3 ml of 0.9% saline solution and mixed on Petri plates using a mounted pin for stirring. Scraping smears were applied to freshly cleaned slides. The existence and identity of parasites were next examined on these slides using a light microscope set to 40x magnification. The Zhou *et al.* formula was used to determine the prevalence of ectoparasites (Zhou *et al.*, 2019).

$$\text{Prevalence}(\%) = \frac{(\text{Number of Diseased Fish})}{(\text{Total Fish})} \times 100$$

Results and Findings

Figure 1

The Ratio of Infected to Non-Infected Individuals

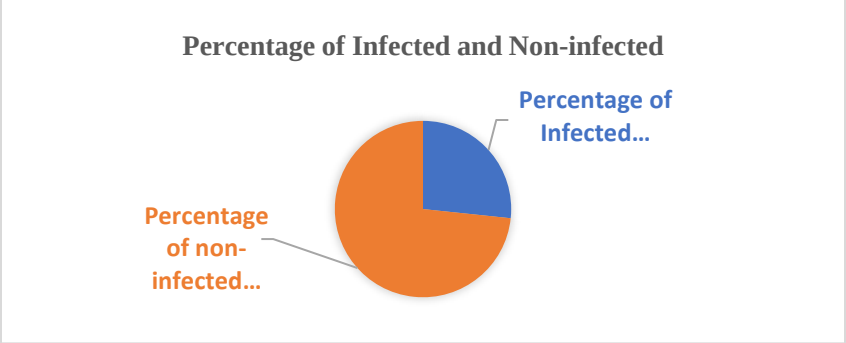

Figure 1 shows that out of 30 Rahu (Labeo rohita) fish, eight had Lernaea infections, for a total prevalence of 26.66 percent. The amount of ectoparasites carried by fish is positively correlated with their length and weight, according to the present study. This is likely due to the larger surface area available on larger fish, which provides more opportunities for ectoparasites to attach themselves securely. The lernaea parasite has the greatest occurrence rate (37.5%) in fish weighing between 1600 and 2000 grams (Table 1).

Table 1

Lernaea Ectoparasite Prevalence Based on Body Weight (G)

Weight of Fish (g)	Fish Samples Observed	Fish Infected n (%)
100-500g	6	1 (16.66)
600-1000	8	2 (25)
1100-1500	8	2 (25)
1600-2000	8	3 (37.5)

The length prevalence of Lernaea was found to be highest (33.33%) in the 36-45cm length group of fish and lowest (14.28%) in the 15-25cm length group. Therefore, it was determined that the parasitic burden rises as fish length and weight increase (Table 2).

Table 2
Lernaea Ectoparasite Prevalence Based on Body Length (Cm)

Length of fish in (cm)	Fish samples observed	Fish Infected n (%)
15-25cm	12	1 (14.28)
26-35cm	11	3 (27.3)
36-45cm	7	4 (33.33)

During the examination, it was observed that Lernaea displayed seasonal variations, with the highest occurrence in January (33.33%) and the lowest in spring and summer (20% in March and 0% in April) (Table 3).

Table 3
Month-Wise Prevalence of Lernaea Ectoparasites in Labeo Rohita

Seasonal Sampling	Fish Samples Observed	Fish Infected n (%)
December	7	2 (28.5)
January	9	3 (33.3)
February	7	2 (28.5)
March	5	1 (20)
April	2	0 (0)

Discussion and Conclusions

The purpose of this research was to assess the ectoparasites in Rohu (Labeo rohita). The findings revealed that out of the thirty fish tested, eight had Lernaea infections, for a total infection frequency of 26.66 percent. The overall prevalence of ectoparasites was determined to be 17.59% by Tassawar *et al*., therefore this number was similar to their figure (Tasawar, Zafar, Lashari, & Hayat, 2009). All freshwater fish typically have parasites. The prevalence and severity of the parasite are determined by several factors, including the parasite's life cycle, host, feeding patterns, and the physical properties of the fish's aquatic environment. There has to be an intermediate host for this to work as well (Hussain, 2022). The freshwater fish of the Indus River, Dera Ismail Khan, were discovered to have several parasites. There were 109 fish of seven species inspected; in March, 38 fish of 4 species were examined, in April 27 fish of 3 species, and in May, 44 fish of 3 species were studied. Seven in March, six in April, and thirteen in May brought the total number of affected fish to twenty-five. Infection rates ranged from 18.42% in March to 29.54 % in May. In all, 22.93% were involved. Many factors influence the frequency of parasites in fish, including the place of sampling, the research region, the time of year, the weather, the amount of the sample, the population size, and other variables. Consequently, parasite transmission in fish differs among developing and wealthy countries. The temperature-related infection rate rose with the passing of each month. Consistent with earlier research, the current results demonstrate that parasite infection is more prevalent in fish living in warm water at higher temperatures. L. rohita was the most common kind of sick fish (Tayyab *et al.*, 2017). Diseases spread when people do not have access to clean water and food. Kir et al. found that leishmaniasis has caused increasing financial losses throughout several epizootics, affecting some of the world's most valuable fish species (Kir, 2007). To larger fish, Lernaea parasites pose a significant threat because of their size, feeding method, and maturity. The eyes of fish can be damaged by these lernaea parasites, leading to blindness. Lernea also slowed gas exchange and spread bacterial infection in fish by causing epithelial development, which slowed gas exchange, and finally, gill retardation. When these parasites infect fish, they can harm their internal organs and, in the worst-case scenario, kill them Shafiq, Abbas, Hafeez-Ur-Rehman *et al*. 2023). Further study about the prevalence of ectoparasites on Rahu in different regions of Pakistan will be highly valuable. Overcrowding in ponds is bad for fish health. Additionally, make sure the water is always clean. Fish merchants should be aware of the hazards resulting from unhealthy fish. A fish anti-parasitic medication including potassium permanganate, iodine, ferrous sulfate, and copper sulfate can effectively eliminate parasites from fish (Naz *et al.*, 2023). In this study, we found that ectoparasites in Labeo rohita varied in frequency according to both size and the

time of year. Labeo rohita is more likely to be infested by ectoparasites as it becomes larger. Ectoparasites were more common in bigger Labeo rohita throughout the winter, according to the study.

Limitations and Directions for Future Research

The results showed that the prevalence of infection was higher in rohu (*Labeo rohita*) fish that were both heavier and longer than in fish that were both lighter and shorter. This may be because parasites have a larger surface area to anchor and hide on larger fish. The study will significantly contribute to the theory and practice both as it has far reached results, though the study was conducted only in one city due to time and financial constraints, however, in the future, researchers could conduct it at large scale from the Khyber Pakhtunkhwa province to get generalizability of the results. Further, it is suggested that it may be replicated in varying environments of other provinces of the country too.

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Declaration of Interest

The authors declared that there is no clash of interest.

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