

ORIGINAL ARTICLE

Investigations of Parasitic Infection in Gastrointestinal Tract of *Channa punctatus* Bloch from Meerut District of Uttar Pradesh, India

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ABSTRACT

The present investigation deals with occurrence of parasitic helminths *Lytocestus* sp. Cohn (Cestoda: Caryophyllidea) and *Contracaecum* sp. Railliet and Henry (Nematoda: Anisakidae) in the gastrointestinal tract of the freshwater spotted snakehead fish, *Channa punctatus* Bloch (Anabantiformes: Channidae). The host fish samples were collected from the Pond of Kharkhoda village of district Meerut, Uttar Pradesh during July to December 2024. The parasitic study was conducted in the Department of Zoology, Keral Verma Subharti College of Science, Swami Vivekanand Subharti University, Meerut, Uttar Pradesh, India. The recovered parasitic helminthes from the gastrointestinal tract of host fish was taxonomically identified through morphological characters using light microscope with the help of key the cestodes and nematodes of vertebrates. During the study comparatively higher infection prevalence (IP) of *Lytocestus* sp. (30.5%) were recorded than the *Contracaecum* sp. (19.4%). On contrary the average mean intensity of (MI) of recovered anisakids were noticed to higher (2.14) than the caryophyllids (1.63). Our study aimed to provide a comprehensive understanding of these parasitic infections for fish health, societal benefits and sustainable aquaculture management.

Keywords: *Channa punctatus*, Gastrointestinal tract, Parasitic helminthes, *Lytocestus* sp., *Contracaecum* sp.

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INTRODUCTION

In recent times, there has been a tremendous increase in the development of fish farming and culture due to increase need for animal protein [1]. According to the Food and Agriculture Organization of the United Nations, nowadays, aquaculture makes a major contribution to human nutrition [2]. *Channa punctatus* Bloch (Anabantiformes: Channidae) commonly referred to as the spotted Murrell or spotted snakehead, is a popular type of freshwater fish that lives in various aquatic environments across India, including the Meerut region of Uttar Pradesh, India. *C. punctatus* has been gaining importance not only as the most common staple food fish but also as an aquarium fish [3]. Moreover, a variety of causes, mainly parasitic illnesses, pose a significant threat to the sustainability and health of *C. punctatus* populations. Parasites and parasitic diseases are the most serious alimiting factors in aquaculture because of the increased density of cultured fish populations in restricted bodies of water and the ease by which pathogens can be transmitted from one fish to another [4]. It is essential to recognize the diversity, bioecological transmission dynamics and implications of the parasites that infect *Channa punctatus* so as to understand freshwater ecosystem dynamics and develop suitable management methods. As a result, the goal of this research is to fill this knowledge gap by carefully investigating the parasites linked to *C. punctatus*, with an emphasis on the Meerut region of Uttar Pradesh, India.

Nematodes and cestodes are of prime importance in fish hatcheries [5]. *C. punctatus* can become weaker due to parasitic diseases, which increases their susceptibility to illness, morbidity, predators, and environmental stressors. The market and nutritional value of these edible fish are impacted because it is known that they are infected with a variety of cestode (tapeworms) and nematode (roundworms) parasites that lead to health problems such as significant body mass loss, nodules or masses in the skin or muscle, growth inhibition, abnormal swimming, weakness, or death. Affected individuals would display unusual conduct, less eating activity, and slower growth rates, poor nutrition, altered organ function, and digestive issues which would eventually affect the viability of both aquaculture operations and wild populations. The *C. punctatus* are more prone to infection of parasitic helminthes because of its heterogeneity in habitat, and dietary preferences. Thus, these behavioral and physiological patterns among hosts seem to be important determinants of helminth community structure in teleosts [6-9]. Intraspecific comparisons using different ecotype of a host species occupying the same natural habitat (water source), suppose to offer more precise information about impacts of the trophic niche on the helminth community structure [10]. The review of literature reflected that the infections of tapeworms (*Bothriocephalus* sp. and *Proteocephalus* sp.) and nematodes (*Camallanus* sp. and *Contracaecum* sp.) have been reported from intestine of the fish hosts leading to malnutrition, emaciation, digestive and immune ailments and ultimately the qualitative and quantitative productivity of aquaculture. The population dynamics and life cycle of the parasitic infracommunities are significantly influenced by the hosts intrinsic factors and extrinsic environmental factors including climatic conditions [11-16]. Furthermore, the eating of contaminated fish can expose humans to health concerns as some parasite species act as intermediary hosts for viruses with zoonotic potential. By focusing on the gastrointestinal tract as a main organ impacted by numerous parasitic species, this research study seeks to close knowledge gaps about parasitic infections in *C. punctatus*.

MATERIALS AND METHODS

Present work is carried out from July to December 2025. During this investigation total 36 fishes (*Channa punctatus*) screened for the parasitic investigation collected from the Pond of Kharkhoda village of district Meerut, Uttar Pradesh, India through netting and angling methods. The gastrointestinal tract of the collected host fish was observed carefully for the examination of helminth parasites. The intestinal tract was stretched out and teased longitudinally, flushed with saline and gut contents were carefully examined. All the petridish in general were examined separately for the presence of helminth parasites with the help of binocular light microscope. After repeated washings with normal water, the saline was drawn off with the help of a dropper [17]. Thereafter the separated parasites were washed in saline to remove the adhering extraneous particles. All the recovered helminth parasites were further examined under light microscope reveal internal and external structures for the primary identification of the group of parasites (cestodes, nematodes, etc.). The parasites (cestodes and nematodes) were processed for light microscopy [18]. The slides were observed under trinocular microscope for morphotaxonomic status and microphotographs were captured. The recovered parasitic helminthes from the gastrointestinal tract of host fish was taxonomically identified through morphological characters using light microscope with the help of key to the cestodes and nematodes of vertebrates [19, 20]. Infection prevalence (IP%) and mean intensity (MI) were enumerated using standard statistical formulae to reflect the pattern of infectivity in the selected host model.

RESULTS AND DISCUSSION

There were total 36 (18 males and 18 females) spotted snakehead fish *C. punctatus* screened during the six months study (July to December 2024). During the parasitic observations, two groups of helminthes parasites (caryophyllid cestodes and anisakid nematodes) were recorded. There were 30.5% and 19.4% of total infection prevalence (IP%) by caryophyllids and anisakids were enumerated respectively during the investigation. The average mean intensity (MI) of the caryophyllids and anisakids in the host fish *C. punctatus* were evaluated 1.63 and 2.14 respectively.

The generic identification of the recovered cestode specimens was carried out based on the elongated, dorso-ventrally flat unsegmented body, characterized by a bluntly tapering anterior end and an undifferentiated, smooth, unarmed scolex followed by a short neck. The unsegmented body of cestodes was distinguishable into an outer cortical zone, containing dispersed vitellaria, and an inner medullary zone, housing reproductive organs such as the testes and ovary helped in the classification of the worms within the family Lytocestidae. Additionally, the absence of post-ovarian yolk glands, the presence of a thick layer of accompanying cells surrounding the uterine coil, and the enclosure of the ejaculatory duct

within a dense parenchymatous bulb further validated the identification of the recovered specimens as belonging to the genus *Lytocestus* Cohn (Caryophyllidea: Lytocestiidae) [19, 21] (Fig. 1).

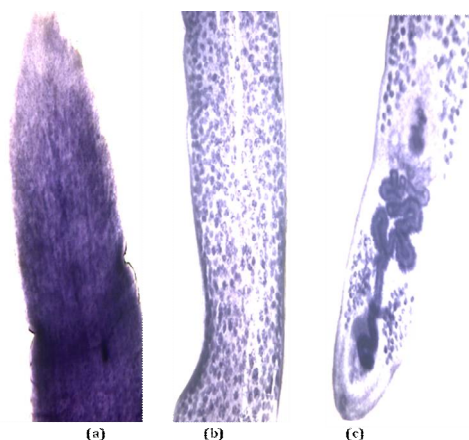


Fig. 1: *Lytocestus* sp. isolated from gastrointestinal tract of *C. punctatus* (figures not to scale bar). (a) bluntly tapering anterior end with an undifferentiated, smooth, unarmed scolex, (b) elongated, dorso-ventrally flat unsegmented body, (c) posterior end containing dispersed vitellaria, and an inner medullary zone housing reproductive organ.

The generic identification of the recovered roundworms was based on the presence of two oppositely-directed caecae associated to the digestive system, excretory pore at the anterior extremity. These two striking characters noticed to be unique and differentiating feature in the recovered roundworms that make the isolated roundworms different from the other anisakids. Furthermore, the presence of interlabia, labia, paired spicules and conical tail with papillae in males, rounded egg with smooth shell and conical tail without papillae in females validated the identification of the recovered specimens as belonging to the genus *Contracaecum* Railliet and Henry [20, 22] (Fig. 2). The members of genus *Contracaecum* Railliet and Henry are parasitic round worms with potential zoonotic significance belonging to the family Anisakidae.

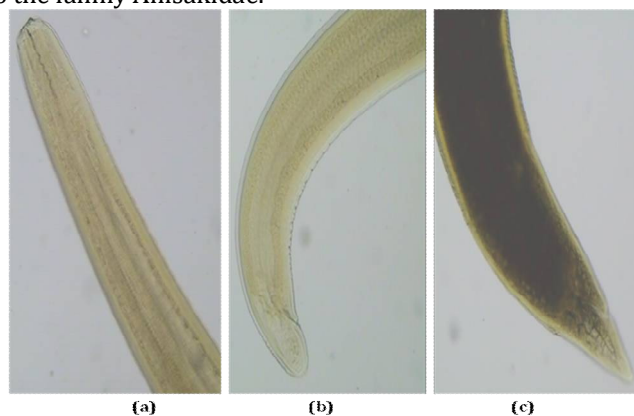


Fig. 2: *Contracaecum* sp. isolated from gastrointestinal tract of *C. punctatus* (figures not to scale bar). (a) anterior end with two oppositely-directed caecae and excretory pore, (b) posterior end male with papillated conical tail, (c) post equatoarial body and tail with conical spike.

The parasites in consideration show heterogeneous prevalence and severity levels in different water bodies within the Meerut region, indicating complex relationships that are affected by different environmental factors, including temperature, habitat structure, and water quality. The parasitic fauna, its composition, the incidence and intensity of infestations it produces, are largely determined by the host's mode of life and type of food [23, 24]. Thus fishes were infected with large number of parasites in late winter to end of summer months, as ecological factors are favorable in these months [25]. The results of this study shed important light on the complex relationships between parasites, host species, and environmental variables, with wider implications for the preservation of freshwater biodiversity and ecosystem management in the Meerut region.

CONCLUSION

The functioning of aquatic ecosystems and the well-being of the host species observed to be seriously threatened by parasitic diseases in aquatic creatures. In the Meerut region, *C. punctatus* has parasitic ailments in its gastrointestinal tract and two types of parasitic helminthes (cestodes, *Lytocestus sp.* and nematodes *Contracaecum sp.*) were isolated during the study period. Considering the possible effects on fish health, growth rates, and total production, parasite diseases have a substantial impact on *C. punctatus* populations. Effective management of fisheries and ecosystem conservation in the Meerut region depend on an understanding the transmission pattern and population dynamics of parasites along with the epidemiology of parasitic diseases. This research further support the development of evidence-based solutions to reduce the effects of parasites, vector-borne diseases and enhance the resilience and long-term health of *C. punctatus* populations by clarifying their prevalence, diversity, and impact. As a concluding remark authors proposed that this research will be helpful in planning and execution of sustainable management strategies keep in view a balance between human requirements and the preservation of aquatic ecosystems and the biodiversity they support.

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CONFLICT OF INTEREST

The authors claim no conflicts of interest because none financial support was received from any government, non-government agency or organization to conduct this research work.

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