

Criterion - 7

Institutional Values and Best Practices

NAAC- SSR (2nd Cycle)



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7.3.1(8)

Exploration of helminthes parasites and fish diversity



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Article

Gastrointestinal Nematodes and Protozoa in Small and Large Ruminants from Rural Agro-Climatic Regions of Northern India

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Abstract: Gastrointestinal nematode parasites and gastrointestinal protozoan parasites are considered detrimental to the livestock population and manifest production-limiting effects. Small and large ruminants (cattle, buffalo, goats, and sheep) are important components of the rural economy of northern India. However, the epidemiology of gastrointestinal parasites in this agro-climatic region has not been studied extensively. In this study, the prevalence of gastrointestinal parasites was determined in 163 animals, including cattle ($n = 86$), buffalo ($n = 11$), goats ($n = 48$), and sheep ($n = 18$) from 26 sampling sites by copro-parasitological analysis. The prevalence values of 94.47% and 66.87% were recorded for the nematodes and protozoa, respectively. The group-wise prevalence of gastrointestinal nematode parasites was 95.3%, 90.9%, 93.7%, and 94.4% in cattle, buffalo, goats, and sheep, respectively, whereas for gastrointestinal protozoan parasites, the respective values were 70.9%, 54.5%, 60.4%, and 72.2%. Copromicroscopy revealed ten genera of nematodes—*Ascaris*, *Capillaria*, *Cooperia*, *Haemonchus*, *Nematodirus*, *Oesophagostomum*, *Ostertagia*, *Strongyloides*, *Trichostrongylus*, *Trichuris*, and one protozoan genus—*Eimeria*. The prevalence of *Trichostrongylus* spp. was highest in buffaloes, whereas in cattle, *Ascaris* spp. were predominant. In both goats and sheep, *Haemonchus contortus* was found to be predominant. The highest prevalence of gastrointestinal parasites was recorded in the rainy season. These findings indicate the prevalence of gastrointestinal parasites in the ruminant population in this region and necessitate the implementation of preventive and control strategies for effective animal health management.

Keywords: helminth parasites; ruminants; livestock; gastrointestinal nematode parasites; gastrointestinal protozoan parasites

1. Introduction

Livestock farming remains the backbone of the rural economy in India [1–3]. It is recognized as the most important sub-sector of Indian agriculture and supports the basic needs and income of rural households in most parts of the country especially of northern hilly states [2,4–7]. According to the 20th Livestock Census 2019 report, the total livestock population in India is 536.76 million, of which 95.78% are from rural areas of the country [8]. The total number of cattle, buffaloes, goats, and sheep is 193.46 million, 109.85 million, 148.88 million, and 74.26 million which represent 36.04%, 20.47%, 27.74% and 13.83% of the total livestock population, respectively [8]. In Himachal Pradesh, the total livestock population is 4.41 million and constitutes an essential component of the livelihood of the rural population [8].



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Prevalence of antibiotic-resistant Gram-negative bacteria having extended-spectrum β -lactamase phenotypes in polluted irrigation-purpose wastewaters from Indian agro-ecosystems

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Antibiotic resistance in bacteria has emerged as a serious public health threat worldwide. Aquatic environments including irrigation-purpose wastewaters facilitate the emergence and transmission of antibiotic-resistant bacteria and antibiotic resistance genes leading to detrimental effects on human health and environment sustainability. Considering the paramount threat of ever-increasing antibiotic resistance to human health, there is an urgent need for continuous environmental monitoring of antibiotic-resistant bacteria and antibiotic resistance genes in wastewater being used for irrigation in Indian agro-ecosystems. In this study, the prevalence of antibiotic resistance in Gram-negative bacteria isolated from irrigation-purpose wastewater samples from Sirmour and Solan districts of Himachal Pradesh was determined. Bacterial isolates of genera *Escherichia*, *Enterobacter*, *Hafnia*, *Shigella*, *Citrobacter*, and *Klebsiella* obtained from 11 different geographical locations were found to exhibit resistance against ampicillin, amoxycylav, cefotaxime, co-trimoxazole, tobramycin, cefpodoxime and ceftazidime. However, all the isolates were sensitive to aminoglycoside antibiotic gentamicin. *Enterobacter* spp. and *Escherichia coli* showed predominance among all the isolates. Multidrug-resistance phenotype was observed with isolate AUK-06 (*Enterobacter* sp.) which exhibited resistant to five antibiotics. Isolate AUK-02 and AUK-09, both *E. coli* strains showed resistant phenotypes to four antibiotics each. Phenotypic detection revealed that six isolates were positive for extended-spectrum β -lactamases which includes two isolates from *Enterobacter* spp. and *E. coli* each and one each from *Shigella* sp. and *Citrobacter* sp. Overall, the findings revealed the occurrence of antibiotic resistant and ESBL-positive bacterial isolates in wastewaters utilized for irrigation purpose in the study area and necessitate continuous monitoring and precautionary interventions. The outcomes of the study would be of significant clinical, epidemiological, and agro-environmental importance in designing effective wastewater management and environmental pollution control strategies.

**STUDIES ON FISH DIVERSITY IN THE GIRI RIVER OF
HIMACHAL PRADESH**

THESIS

**SUBMITTED TO THE ETERNAL UNIVERSITY, BARU SAHIB
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF**

**MASTER OF SCIENCE
IN
ZOOLOGY
BY**

**DHARA SARSWATI
(BS17MSZ002)**



**AKAL COLLEGE OF BASIC SCIENCES
ETERNAL UNIVERSITY
BARU SAHIB, HIMACHAL PRADESH-173101(INDIA)**

NOVEMBER, 2019



CERTIFICATE – II

We, the undersigned, members of Research Degree Committee of Miss. Dhara Sarswati (Regn. No. BS17MSZ002) a candidate for the degree of **Master of Science** with major **Zoology** agree that the thesis entitled “**Studies on fish diversity in the Giri River of Himachal Pradesh**” may be submitted in partial fulfillment of the requirements for the degree.

Neelam
08/11/19

(Dr. Neelam Thakur)
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Department of Zoology
(Akai College of Basic Sciences)

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ABSTRACT

Name: Dhara Sarswati
Semester & Year of admission: Fourth semester, 2017
Subject: Zoology
Department: Zoology
Thesis Title: Studies on fish diversity in the Giri River of Himachal Pradesh
Major Advisor: Dr. Neelam Thakur

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Specialization: Zoology

Abstract

The present study entitled "Studies on fish diversity in the Giri River of Himachal Pradesh" was conducted from 2018-19 in the Department of Zoology, Eternal University, Baru Sahib. The fish samples were collected from four different sites- Gaura, Giripul, Kheri and Vyas of Giri River (H.P.). In total, 55 fish samples were collected from 4 different sites and 9 different species of fishes belonging to 8 genera, 3 families and 3 orders were recorded. These recorded 9 species were *Tor putitora*, *Acanthocobitis botia*, *Barilius bendelisis*, *Channa gachua*, *Mastacembelus armatus*, *Pethia conchonius*, *Schizothorax plegiostomus*, *Opsarius canarensis* and *Schizothorax progastus*. Among all *S. plegiostomus* was recorded as the most prevalent fish in all the sites surveyed with prevalence as 16.36% followed by *Barilius bendelisis* and *Mastacembelus armatus* with prevalence as 12.72%. Morphological identification of collected fishes was done using various parameters such as total body length (TL), standard length (SL), caudal fin length (CFL), pectoral fin length (PFL), pelvic fin length (PFL), dorsal fin length (DFL), body diameter (BD), anal fin length (AFL) and body weight. For molecular characterization DNA was obtained from the fins of fishes with the help of TENS buffer. The Cytochrome oxidase subunit I gene (COI) was amplified in the positive DNA samples using primers- Fish F1, Fish F2, Fish R1 and Fish R2 (forward and reverse). The amplified PCR product was sent to Genei Bangalore for sequencing. Phylogenetic profiling of the obtained sequences was done using maximum likelihood tree that has been rooted after an alignment of sequences based on the region of Fish using Mega 4.0.2 version software and phylogenetic tree was constructed. The physiochemical parameters were also calculated experimentally. Water pH (7.63 -7.91), temperature (28.33-29.54°C), biological oxygen demand (5.40-16.80 mg/l), dissolved oxygen (4.25-5.08 mg/l) and water hardness (216-260 mg/l) was calculated for two consecutive years viz. 2018-19. Muscle sample of *M. armatus* was recorded with 2.54 ± 0.33 (mean \pm standard deviations) muscle total lipid content (MTLC) which revealed that *M. armatus* was low-fat fishes. Another fish muscle sample showed that *S. plegiostomus* was medium fat fish with 5.09 ± 0.73 (mean \pm standard deviations) MTLC. The fatty acids of muscles of *M. armatus* and *S. plegiostomus* are generally composed of saturated fatty acid (SFAs), monounsaturated fatty acid (MUFAs) and polyunsaturated fatty acid (PUFAs). There is first time report of three species of fishes from Himachal Pradesh i.e. *S. plegiostomus*, *O. canarensis* and *S. progastus*. The species *M. armatus* was also first time reported in Sirmour region, earlier there were reports from Solan, Una and Chamba. Endangered state fish i.e. *Tor putitora* was also recorded.

Keywords- Giri River, Fish diversity, Physiochemical parameters, Identification, Fatty acid profile.

Neelam
08/11/19

Dr. Neelam Thakur



Dhara Sarswati



Plate.1. *Barilius bendelisis* (Hailton's barila)
a) Dorsal view; b) Ventral view & c) Left lateral view



Plate.2. *Schizothorax plegiostomus* (Snow trout)
a) Right lateral view; b) Dorsal view; c) Ventral view & d) Left lateral view

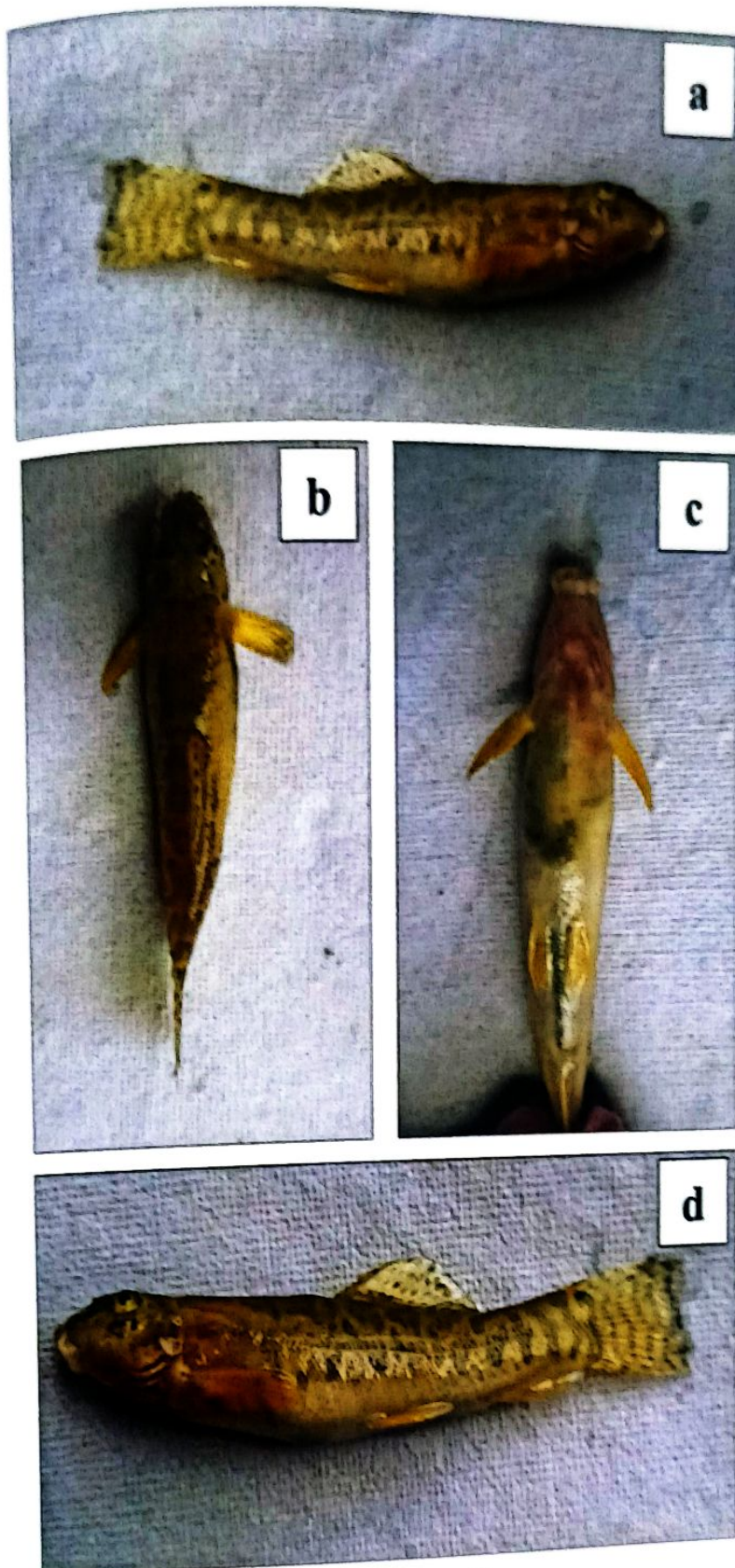


Plate. 3. *Acanthocobitis botia* (Botia loach)
a) Right lateral view; b) Dorsal view; c) Ventral side & d) Left lateral view



Plate.4. *Opsarius canarensis* (Jerdon's baril)
a) Right lateral view; b) Dorsal view; c) Ventral view & d) Left lateral view



Plate.5. *Pethia conchoni* (Rosy barb)
a) Right lateral view; b) Dorsal view; c) Ventral side
& d) Left lateral view



Plate.6. *Mastacembelus armatus* (Tire-track spiny eel)
a) Right lateral view & b) Dorsal view



Plate.7. *Channa gachua* (Dwarf snake headed fish)
a) Right lateral view; b) Dorsal view; c) Ventral side & d) Left lateral view

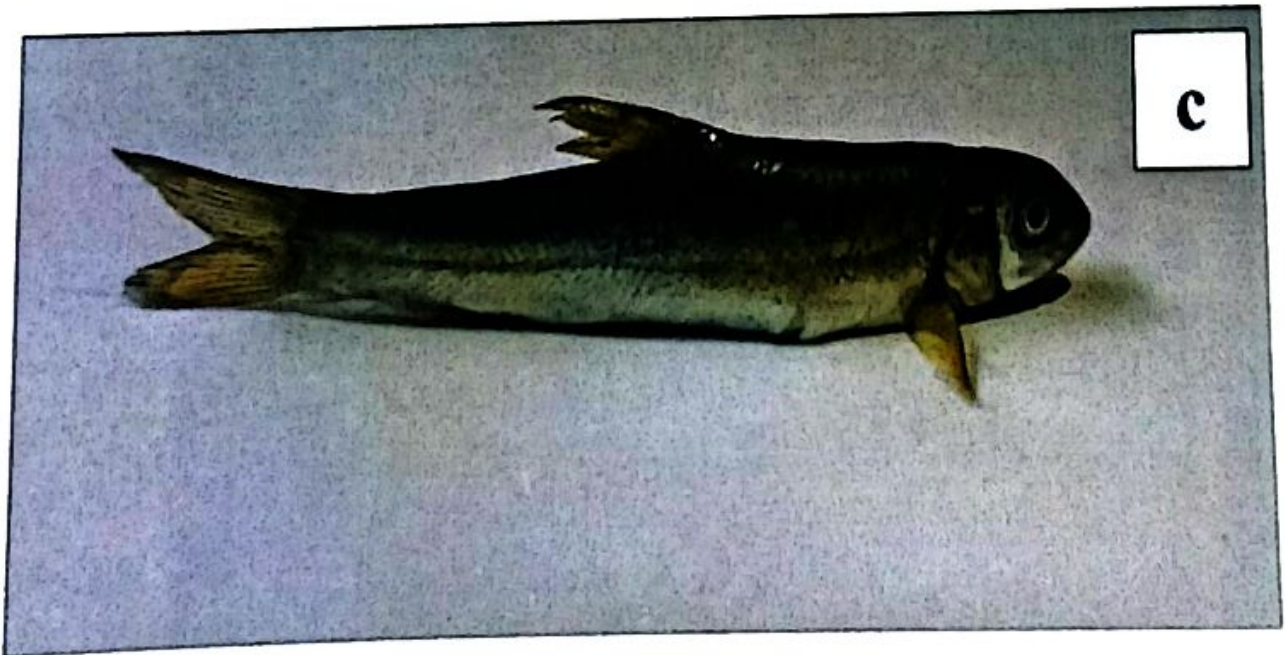
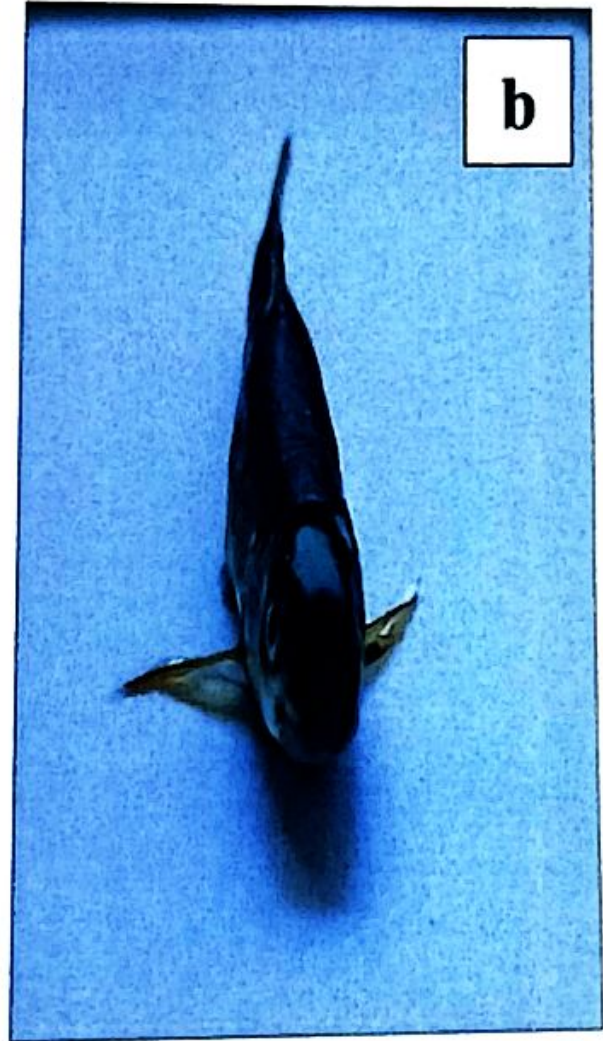
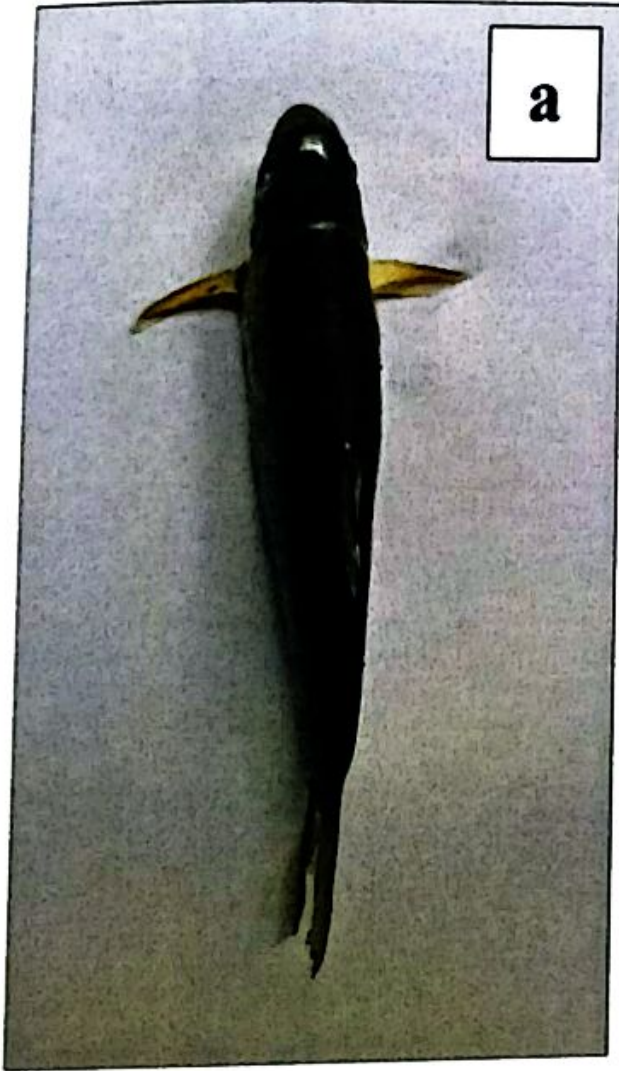


Plate. 8. *Schizothorax progastus* (Dinnawah snow trout)
a) Right lateral view; b) Dorsal view & c) Ventral side



Plate. 9. *Tor putitora* (Putitor Mahseer)

a) Right lateral view; b) Dorsal view; c) Ventral view & d) Left lateral view