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Ichthyofaunal Diversity of Rapti River flowing through Shravasti and Balrampur Districts of Uttar Pradesh (India)

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Abstract:
A systematic survey of Rapti River was conducted once in a month for a period of one year from August 2018 to July 2019 from ten collection sites of Shravasti and Balrampur districts. Its main aim was to find out ichthyo-faunal diversity and their conservation status. The results of the present study revealed the occurrence of 46 species belonging to 30 genera 19 families and 9 orders. The family Cyprinidae were dominated by 13 species followed by Bagridae (6 species); Ophiocephalidae (4 species); Siluridae (3 species); Schileidae, Clariidae, Gobiidae, Notopteridae and Mastacembeleidae each with two species; Saccobranchidae, Chacidae, Ophiocephalidae, Gobiidae, Anabantidae, Nandidae, Osphronemidae, Ambassidae, Clupeidae, Eugraulidae, Belonidae and Tetradontidae each with one species. The fishes in these areas are under threat due to anthropogenic activities such as overfishing and pollution hence authors strongly recommend practical conservation action plan to prevent the species from extinction.

Keywords: Conservation Status, Diversity, Family, Fishes, Rapti River.

INTRODUCTION

Fish is a valuable source of protein and occupied a significant position in the socio-economical fabric of South Asian countries (Jayaram, 2010). These are the only major group of vertebrates having much impact on human civilization from ancient time to date. It is one of good and cheapest source of food for economic as well as high class people so it is of utmost importance to study the distribution and availability of fish from freshwater rivers, lakes, reservoirs, wetlands and ponds. Fish constitutes almost half of the total number of vertebrates in the world and live in almost all conceivable aquatic habitats (Verma and Prakash, 2020a). Out of 30,900 species of vertebrates, about 22,000 living fish species have been recorded (Jayaram, 2010). Out of these 22,000 fish species recorded, 2500 (11%) species are found in India (Nagma and Khan, 2013).

India is one of the mega biodiversity countries in the world and occupies the 9th position in terms of freshwater mega biodiversity (Shinde *et al*., 2009). India is endowed with vast freshwater consisting 45,000 km of rivers, 26,334 km of canals, 2.36 million hectares of ponds and tanks, 2.05 million hectares of reservoirs and 5,82,86,000 hectares of wetlands (Bhakta and Bandyopadhyay, 2008; Kumar *et al*., 2015). The river water is useful both for sustainable and unsustainable agriculture. The unsustainable agriculture has multiple effects and disturbs the ecological balance (Verma, 2017a &

2018a). These water bodies have rich and diversified fish fauna characterized by many rare and endemic fish species. The fresh water of India is utilized for irrigation or urban-industrial water supply or hydro power generation or discharging of sewage and industrial waste or the capture of edible fishes.

In India, there are 2500 fish species, of which, 930 live in freshwater and 1570 are marine (Kar, 2003). The ichyhyofauna of the northeastern region of India has elements of the Indo-Gangetic region; and to some extent of the Myanmarese and south-Chinese regions (Yadava and Chandra, 1994). This bewildering ichthyodiversity of this region has been attracting many ichthyologists both front India and abroad. Concomitantly, the northeastern region of India was identified as a biodiversity hotspot by the World Conservation Monitoring Centre (WCMC, 1998). Due to irrational fishing practices, environmental aberrations like reduction in water volume, increased sedimentation, water abstraction and pollution over the years this diversity is declining and even few species have been lost from the freshwater ecosystem of India and some have come under endemic, endangered and threatened category (Bhakta and Bandyopadhyay, 2008). Biodiversity and wetland loss due to increased anthropogenic activities are not good sign for humans (Kumbhar and Mhaske, 2020).

River ecosystems (rivers capes) encompass ecological, social and economic processes (ecosystem functions) that interconnect organisms (ecosystem structure) including humans and helpful in maintaining the biodiversity. The biodiversity has different levels and values (Verma 2016a). The genetic diversity acts as a buffer for biodiversity (Verma, 2017b). The biodiversity helps in maintaining the ecological balance. There is a necessity of ecological balance for widespread biodiversity (Verma 2017c) and the biodiversity loss has ecological impact (Kumar and Verma, 2017). The ecological balance is an indispensable need for human survival (Verma 2018b). The climate change has a huge impact on biodiversity (Prakash and Srivastava, 2019) and farmers' practices (Mandal and Singh, 2020).

A review of literature revealed that many researchers have studied the taxonomy, biodiversity and distribution of freshwater fishes from various rivers of India. Some notable examples include David (1963) from Godavari and Krishna river, Menon (1992) from Himalayan rivers, Jayaram (2010) from Cauvery river, Jadhav *et al., (*2011) from Koyana river, Kharat *et al*., (2012) from Krishna river, Venugopalan (2012) from Mahe river, Sheikh (2014) from Pranhita river and so on.

Moreover, Prakash *et al.,* (2015,) and Prakash and Verma (2015, 2016), Verma and Prakash (2016) performed the limnological and ichthyological studies of Alwara Lake of district Kaushambi (U.P.) while Verma (2016b, 2017d, 2017e, 2018c, 2019a, 2019b, 2019c, 2020a, 2020b, 2020c), Sugumaran *et al.,* (2020), Bhagde *et al.,* (2020) and Prakash (2020a, 2020b) studied the limnological parameters as well as biodiversity and conservation status of fishes in the various lentic fresh water bodies of Uttar Pradesh and other parts of country. Verma and Prakash (2017a, 2017b, 2018, 2020b), Verma (2018d, 2020d) and Prakash and Verma (2017, 2019a, 2019b) studied the various fresh water bodies to understand the distribution and conservation status of fishes, vertebrates, other chordates and angiosperms. As far as Rapti River is concerned, Prakash *et al.,* (2020) for the first time surveyed it at Balrampur to explore the different fish fauna.

The present survey was conducted once in a month for a period of one year from August 2018 to July 2019 from ten collection sites of Shravasti and Balrampur districts to find out the ichthyo-faunal diversity and their conservation status.

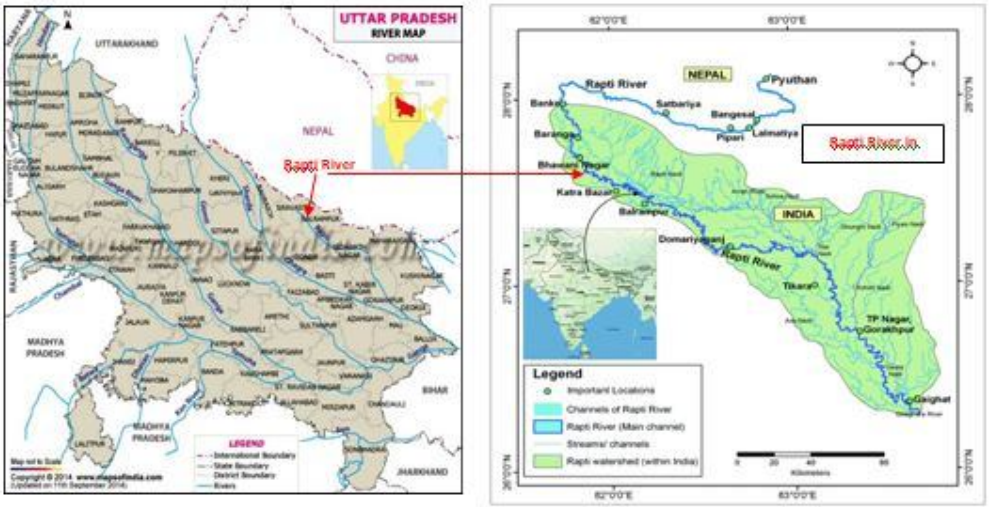
MATERIALS AND METHODS

Details of the study area, sampling sites, methods of collection of samples, preservation of fish specimen is as follows:

Study area: The study area, Balrampur ($27^0 25' 48''$N to $27^0 43' 08''$ N, altitude and $82^0 18' 48''$ E to $82^0 30' 18''$ E longitude) and Shravasti ($27^0 59' 78''$N to $27^0 70' 208''$ N, altitude and $81^0 93' 40''$ E to $81^0 95' 35''$ E longitude) districts are situated in North Terai region of U.P. adjacent to Indo-Nepal

border. Rapti is the main river traversing in this area and plays a vital role in the topography and causes serious flood havoc in the monsoon season.

The Rapti River originates in the Siwalik Himalaya of Nepal at an elevation of 3600m. After flowing through Nepal for 152 km, it enters in India through Chanda Pargana, east of the Kundwa village of Shravasti district of Eastern Uttar Pradesh. It flows in a very sinuous course with shallow depth and causes heavy flooding in the districts of Eastern Uttar Pradesh. It flows through the districts of Shravasti, Balrampur, Siddharthnagar, Maharajganj, Sant Kabir Nagar and Gorakhpur (Map) and joins the Ghaghara on its left bank near Barhaj town of Deoria district. The total length of the river is 566 km.



Map of U.P. Showing Flow of Rapti River

Sampling Sites: A systematic survey of Rapti River was conducted during August 2018 to July 2019 from ten collection sites of Shravasti and Balrampur districts. To study the ichthyofauna, fish samples were collected from four sites *namely* Jhunjhuniya Ghat, Shishuara Ghat, Raji Ghat and Andhrapurva Ghat from Shravasti district and six sites *namely* Kodhari Ghat, Mathura Ghat, Sisai Ghat, Mirzapur Ghat, Khamaria Ghat and Pipra Ghat from Balrampur district.

The Rapti River: Odessey from Nepal to India

Shishuara Ghat, Shravasti

Jhunjhuniya Ghat, Shravasti

Sisai Ghat, Balrampur

Mirzapur Ghat, Balrampur

Kodhari Ghat, Balrampur

Preservation and Labeling of Fish specimen: The collected fish specimens were preserved 10% formaldehyde solution at the sampling site. Small fish specimens (less than 10cm) were preserved directly without incision or opening of visceral cavity. But larger specimens were preserved with incision on belly. The preserved specimens were stored in the plastic containers. Every sample was individually labeled and details of site, date and time of collection and other related information of specimen were recorded. Colours of the specimen were also recorded before preservation.

Identification of fish specimen: Identification of fish specimens was done up to species level while identifying its natural colour, pattern of scales, fins, mouth pattern, identification marks like black or red spots, bloch on operculum, paired and unpaired fins and body parts with the help of standard literature by Datta Munshi and Srivastava (1988), Day (1989), Menon (1992), Srivastava (1998) and Jayaram (2010). The fresh fishes were mainly used for colour and identifying marks while preserved specimen for studying morphometric and meristic characteristics.

RESULTS AND DISCUSSION

The ichthyofaunal diversity of collected and identified fish species from different sites of Rapti River along with conservation status are shown in table1.

Table1: Ichthyofauna of Rapti River flowing through Shravasti and Balrampur district.

S.N.	Fish Species	Common Name/ Local Name	Availability In River	Conservation status
Order- Cypriniformes; Family- Cyprinidae (Minnows and Carps)				
1.	*Catla catla* (Hamiliton)	Bhakur	Rare	LC
2.	*Labeo rohita* (Hamiliton)	Rohita	Rare	LC
3.	*Labeo calbasu* (Hamiliton)	Karaunchh	Rare	LC
4.	*Labeo bata* (Hamiliton)	Bata	Common	LC
5.	*Labeo dero* (Hamiliton)	Gargi	Common	LC
6.	*Labeo gonius* (Hamiliton)	Kuria / Gonius	Rare	LC
7.	*Cirrhinus mrigala* (Hamiliton)	Naini	Rare	LC
8.	*Cirrhinus reba* (Hamiliton)	Reba	Common	LC
9.	*Cyprinus carpio* (Linnaeus)	Common carp	Rare	VU
10.	*Puntius sarana* (Hamiliton)	Sarana	Common	LC
11	*Puntius ticto* (Hamiliton)	Two spot barb	Moderate	LC
12.	*Danio devario* (Hamiliton)	Pataki	Very Rare	LC
13.	*Amblypharyongodon mola* (Hamiliton)	Mola carplet	Very Rare	LC
Order- Siluriformes; Family- Bagridae				
14.	*Mystus seenghala* (Sykes)	Tengara	Rare	LC
15.	*Mystus cavasious* (Hamiliton)	Tengara	Common	LC
16.	*Mystus vittatus* (Bloch)	Tengara	Common	LC
17.	*Mystus tengara* (Hamiliton)	Tengara	Common	LC
18.	*Mystus aor* (Hamiliton)	Tengara	Common	LC
19.	*Rita rita* (Hamiliton)	Rita	Rare	LC
Order- Siluriformes; Family- Siluridae				
20.	*Wallago attu* (Schneider)	Pardni	Common	LC
21.	*Ompak pabda* (Hamiliton)	Pabdah catfish	Common	NT
22.	*Ompak bimaculatus* (Bloch)	Butter catfish	Rare	NT
Order- Siluriformes; Family- Schilbeidae				
23.	*Pangasius pangasius* (Hamiliton)	Pangas catfish	Rare	LC
24.	*Ailia coila* (Hamiliton)	Gangetic ailia	Rare	NT
Order- Siluriformes; Family- Clariidae				
25.	*Bagarius bagarius* (Linnaeus)	Goonch	Very Rare	NT
26.	*Clarias batrachus* (Linnaeus)	Mangur	Moderate	LC
Order- Siluriformes; Family- Saccobranchidae				
27.	*Heteropneustes fossilis* (Bloch)	Singhi	Moderate	LC
Order- Siluriformes; Family- Chacidae				
28.	*Chaca chaca* (Hamiliton)	Angler catfish	Very Rare	LC
Order- Ophiocephaliformes; Family- Ophiocephalidae (Snake headed fish)				
29.	*Channa punctatus* (Bloch)	Saura	Common	NE
30.	*Channa marulius* (Hamiliton)	Saura	Moderate	LC
31.	*Channa striatus* (Bloch)	Saura	Common	LC
32.	*Channa gachua* (Hamiliton)	Saura	Rare	LC
Order-Perciformes; Family- Gobiidae (Gobies)				
33	*Glossogobius giuris* (Hamiliton)	Balia / Bhalia	Rare	LC
34.	*Badis badis* (Hamiliton)	Blue Perch	Rare	LC
Order-Perciformes; Family- Anabantidae (Climbing Perch)				
35.	*Anabas testudenius* (Bloch)	Kawai	Moderate	LC

Order-Perciformes; Family- Nandidae (Leaffish)				
36.	*Nandus nandus* (Hamiliton)	Gangetic leaffish	Rare	LC
Order-Perciformes; Family- Osphronemidae (Gourami fish)				
37.	*Colisa fasciatus* (Bloch)	Rainbow gourami	Moderate	NE
Order-Perciformes; Family- Ambassidae (Glassfishes)				
38.	*Chanda nama* (Hamiliton)	Chanda	Moderate	NE
Order -Osteoglossiformes ; Family- Notopteridae (Featherbacks / Knifefishes)				
39.	*Notopterus notopterus* (Pallas)	Patara / Pholi	Common	LC
40.	*Notopterus chitala* (Hamiliton)	Chitala	Moderate	NT
Order -Clupeiformes ; Family-Clupeidae (Herrings)				
41.	*Gudusia chapra* (Hamiliton)	Suhia / Suiya	Rare	LC
Order -Clupeiformes ; Family- Engraulidae (Forage fish)				
42.	*Setipinna phasa* (Hamiliton)	Phasia	Rare	LC
Order - Beloniformes; Family- Belonidae (Needle fish)				
43.	*Xenentodon cancila* (Hamiliton)	Kauwa machhali	Moderate	LC
Order -Synbranchiformes ; Family- Mastacembeleidae (Spiny eels)				
44.	*Mastacembelus armatus* (Lacepede)	Bam	Rare	LC
45.	*Mastacembelus aculeatus* (Bloch)	Bam	Very Rare	EN
Order -Tetraodontiformes; Family- Tetraodontidae (Puffer fish)				
46.	*Tetraodon cutcutia* (Hamiliton)	Kutkutia	Very Rare	EN

In the present study total 46 fish species were collected from ten sampling sites belonging to 30 genera, 19 families and 9 orders. The Rapti river ecosystem supports diverse stock of carps, catfishes, perches, featherbacks, gobies, eels, puffers and so on. Status of fish species of the Rapti River is given in table1. *Danio devario, Amblypharyongodon mola, Tetraodon cutcutia, Mastacembelus aculeatus Chaca chaca* and *Bagarius bagarius* are very rare and found in upper part of river. The middle and lower parts are chiefly inhabited by mixed group of fishes like carps, catfishes, perches, snakeheads, feather backs and eels. Out of 46 species, very rare (6), rare (18) moderate (9) and common (13) were observed. Among these, *Cirrhinus reba, Labeo bata, Labeo dera, Puntius sarana., Mystus* spp*., Notopterus notopterus* and *Channa* spp. were frequently observed while some species of carps and catfishes were seen moderately and rare also.

Fish species composition when grouped into families reveal that Cyprinidae captures the major share (28.26%) followed by family Bagridae (13.04%), Ophiocephalidae (8.70%), Siluridae (6.52%), Schileidae(4.35%), Clariidae (4.35%), Gobiidae (4.35%), Notopteridae (4.35%), Mastacembeleidae (4.35%) and each of remaining 10 families comprises 2.17% . Besides native fishes, exotic fish, *Cyprinus carpio* was also present in this river. *Catla catla, Labeo rohita, Cyprinus carpio, Ompok pabda* are rare and have been recorded during rainy season. *Puntius tictio* has been recorded during spring season. There may be a possibility that these fishes might have entered in river from fish pond of these areas during rainfall. Most of these species have high market value and preferred by the people. However, they are caught only from the wild and have not yet been cultured with some exception.

On the basis of rate of decline, population size, area of geographic distribution and degree of population, distribution fragmentation etc., IUCN (International Union for Conservation of Nature) Red List (2020) classified the species into nine groups including EN (Endangered), VU (Vulnerable), NT (near threatened), LC (least concern) and NE (not evaluated). During survey, a total of 46 species of fishes belonging to 30 genera, 19 families and 9 orders were identified. As per latest version of IUCN Red List, out of 46 species of fishes identified, 2 species comes under EN (endangered), 1 species under UV (vulnerable), 5 under NT (near threatened), 35 under LC (least concern) and 3 species are NE (not evaluated) so far. Considerable attention should be paid to conserve fish species comes under EN and NT categories.

It is suggested that the fishery authorities should investigate and practice the proper exploitation and management of this fishery resources according to ecological principles. Fishing during breeding season is serious threat and should be banned. Illegal fishing methods and fishing of small sized

fishes should be monitored regularly. Thus, it should be the duty of each and every one to play an important role to conserve fish diversity as this plays and handover the valuable biodiversity in the healthy condition to the future generation.

The fishes in these areas are under threat due to anthropogenic activities such as overfishing and pollution hence authors strongly recommend practical conservation action plan to prevent the species from extinction. The authors also recommend for regular cleaning of the river and protection of the fish seeds such as eggs, spawn, fry and fingerlings as well as small sized fishes.

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