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Exploration of native and exotic fish germplasm in middle stretch of Ramganga River, Uttar Pradesh

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Abstract

The present study was carried out from March 2014 to February 2016 at Bareilly district, Uttar Pradesh to explore the ichthyofaunal diversity of the middle stretch of the Ramganga River. A total of 58 fish species belonging to 9 families and 7 orders. According to the IUCN status, 5 species are endangered, 15 vulnerable, 16 low risk, 6 least concern, 10 not evaluated and 6 exotic. The Cyprinidae family with 21 representative species was found to be dominant (36%) in the present study followed by Bagridae with 6 species (10%) and Siluridae with 4 species (7%). Our study result reveals that the river supports considerable diversity of the fishes and is important for conservation as some fish fauna is threatened being either vulnerable or endangered. However strategies such as sustainable harvesting, control of growth of exotic species, check on water pollution and regulation of destructive fishing methods are suggested for conservation of the native and endemic fish species of the river.

Keywords: Ramganga, Ichthyofaunal diversity, indigenous fishes, exotic fishes, relative abundance

1. Introduction

Rivers covers different types of climatic zones, landscapes, bio-geographical regions and conserves wide range of floral and faunal diversity. Biodiversity is essential for stabilization of ecosystem and protection of overall environmental quality [1]. The rivers in India harbor one of the richest ichthyofaunal diversity of the world [2]. Riverine fish communities show seasonal variation in the species composition and in their relative abundance, this may be because of constant fluctuations in environmental factors [3]. The freshwater biodiversity has declined faster than either terrestrial or marine biodiversity over the past 30 years [4]. This is because of increasing pressure from anthropogenic activities, rapid industrialization, habitat degradation, over exploitation and invasion of exotic fishes [5-8].

Ramganga River originates from the hills of Garhwal (Uttarakhand) and merges into Ganga at Kannauj (Uttar Pradesh) after covering a distance of about 480 km [9]. The whole stretch of Ramganga River is divided into upper temperate and lower sub-tropical zone. In India, except for major rivers detailed taxonomical information of freshwater flora and fauna is unknown [10] or limited. Present study aims to study the status of fish diversity and there conservation status in mid-stretch of the Ramganga River. Studies of freshwater fishes in the Indian subcontinent have been limited to scattered works on commercial fisheries and even these studies have been largely restricted to some of major river systems like Ganges and the Yamuna. The present study is aimed to assess current status of fish biodiversity and threat in Ramganga River. The findings from the study will benefit the planning and management of fish community structure and conservation of natural resources.

2. Materials and Methods

2.1 Study area

The present study was carried out at Bareilly district of Uttar Pradesh. The sampling stations selected were Meerapur, Fatehganj on upstream and Saniya, C. B. Ganj on downstream. Active and regular local fishermen were regularly visited for fish sampling on monthly basis from March 2014- February, 2015. Different gears used to catch the fishes were cast net, gill net and drag net. Fishes were brought to the laboratory and were immediately photographed and specimens were labeled and fixed in the formalin solution in separate jars.

Smaller fishes were directly placed in the formalin solution while larger fishes were given an incision on the abdomen before they were fixed. Sample fish specimens were identified as per Talwar and Jhingran ^[11], Jayaram KC ^[12] and Nath and Dey ^[13].

2.2 Conservation status

The conservation status was identified as per IUCN ^[14] and fishes were categorized as endangered (EN), vulnerable (VU), low risk (LR), least concern (LC) and not evaluated (NE) species.

2.3 Data analysis

Relative species abundance is a component of biodiversity and refers to how common or rare a species is relative to other species in a defined location or community. Relative

abundance is the percent composition of an organism of a particular kind relative to the total number of organisms in the area.

RA was calculated as = $\frac{\text{Number of individuals of a species}}{\text{Total number of individuals of all the species}} \times 100$

3. Results and Discussion

In the present study 58 fish species comprising 19 families and 7 orders were recorded (Table 1) whereas, Atkore *et al.* ^[10] also reported that 43 fish species belonging to eight families and five orders were recorded from Ramganga. Pathak and Alam ^[15] reported twenty six fish species from nine families in Ramganga River.

Table 1: Diversity of fish species with IUCN Status and relative abundance (RA).

Sl. No.	Order	Family	Fish spp.	Purpose	IUCN Status	RA (%)
1.	Cypriniformes	Cyprinidae	<i>Labeo rohita</i>	Food	LR	2.31
2.			<i>L. bata</i>	Food and Sports	LR	5.72
3.			<i>L. gonius</i>	Food	LR	1.11
4.			<i>L. dyocheilus</i>	Food	LC	0.51
5.			<i>L. calbasu</i>	Food and sport	LR	1.36
6.			<i>Puntius ticto</i>	Ornamental and Sports	LC	6.49
7.			<i>P. sarana</i>	Food and Ornamental	VU	2.82
8.			<i>P. chola</i>	Ornamental	VU	1.36
9.			<i>P. sophore</i>	Ornamental	LC	1.96
10.			<i>P. conchonius</i>	Ornamental	VU	0.94
11.			<i>Cirrhinus mrigala</i>	Food	LR	1.45
12.			<i>C. reba</i>	Food	VU	0.76
13.			<i>Catla catla</i>	Food	VU	1.03
14.			<i>Tor putitora</i>	Sport	EN	0.42
15.			<i>Cyprinus carpio*</i>	Food	NA	3.50
16.			<i>Hypophthalmichthys molitrix*</i>	Food	NA	1.28
17.			<i>Aristichthys nobilis*</i>	Food	NA	0.77
18.			<i>Ctenopharyngodon idella*</i>	Food	NA	0.85
19.			<i>Osteobrama cotio</i>	Food	LC	5.81
20.			<i>Aspidoparia morar</i>	Food and Ornamental	LR	1.70
21.			<i>Salmostoma bacaila</i>	Food	LR	6.92
22.	Beloniformes	Belonidae	<i>Xenentodon cancila</i>	Food and Ornamental	LR	1.02
23.	Siluriformes	Bagridae	<i>Sperata aor</i>	Food and Sport	VU	1.79
24.			<i>Sperata seenghala</i>	Food and Sport	NE	1.03
25.			<i>Mystus cavasius</i>	Food	LR	1.79
26.			<i>M. vittatus</i>	Food	VU	0.94
27.			<i>M. tengra</i>	Food	NE	1.11
28.			<i>Rita rita</i>	Food	LR	0.68
29.		Pangasiidae	<i>Pangasius pangasius</i>	Food	VU	0.60
30.		Clariidae	<i>Clarias batrachus</i>	Food	VU	1.02
31.			<i>Clarias gariepinus*</i>	Food	NA	0.77
32.		Heteropneustidae	<i>Heteropneustes fossilis</i>	Food	VU	1.36
33.		Siluridae	<i>Wallago attu</i>	Food	LR	1.28
34.			<i>Silonia silondia</i>	Food and Sport	VU	0.51
35.			<i>Ompak bimaculatus</i>	Food and Ornamental	EN	1.88
36.			<i>Ompak pabda</i>	Food and Ornamental	EN	0.77
37.		Sisoridae	<i>Gagata cenia</i>	Food and Ornamental	NE	0.60
38.			<i>Sisor rhabdophorus</i>	Ornamental	EN	0.25
39.			<i>Bagarius bagarius</i>	Food	VU	1.11
40.	Perciformes	Channidae	<i>Channa punctatus</i>	Food	LR	2.05
41.			<i>C. striatus</i>	Food	LR	1.96
42.			<i>C. marulius</i>	Food	LR	1.53
43.		Ambassidae	<i>Ambassis nama</i>	Food and Ornamental	NE	2.65
44.			<i>Ambassis raga</i>	Food and Ornamental	NE	3.07
45.		Cichlidae	<i>Oreochromis niloticus*</i>	Food	NA	1.02
46.		Anabantidae	<i>Anabas testudineus</i>	Food	VU	1.36
47.			<i>Colisa lalius</i>	Food and Ornamental	NE	1.11
48.		Mugilidae	<i>Rhinomugil corsula</i>	Food	VU	1.02
49.		Badidae	<i>Badis badis</i>	Ornamental	NE	1.71

50.	Synbranchiformes	Mastacembelidae	<i>Mastacembelus armatus</i>	Food	NE	1.11
51.			<i>Macragnathus aculeatus</i>	Food	NE	1.11
52.			<i>Mastacembelus pancalus</i>	Food	LR	1.02
53.		Amphipnoidae	<i>Amphipnous cuchia</i>	Food	LR	1.02
54.	Clupeiformes	Engraulidae	<i>Setipinna phasa</i>	Food	NE	1.79
55.		Clupeidae	<i>Goniolosa manmina</i>	Food	VU	1.02
56.			<i>Gadusia chapra</i>	Food	LC	6.15
57.	Osteoglossiformes	Notopteridae	<i>Chitala chitala</i>	Food	EN	0.50
58.			<i>Notopterus notopterus</i>	Food	LC	0.94

The fish diversity of India is represented by the presence of about 120 commercially important fish species of which 60 species are widely distributed in most of the water bodies [16]. We identified a total of 58 species during the study period inclusive of commercially important and small size fish species. Commercially important fishes recorded were *Catla catla*, *Labeo rohita*, *L. bata*, *L. gonius*, *L. calbasu*, *Cirrhinus mrigala*, *Tor putitora*. *Cyprinus carpio*, *Hypophthalmichthys molitrix* and *Ctenopharyngodon idella* *Aristichthys nobilis*, *Clarias batrachus*, *Heteropneustes fossilis*, *Channa spp*, *Wallago sp*, *Mystus sp*, *Rita*, *Sperata*, *Ompak*, *Setipinna* *Rhinomugil* and many small indigenous fishes like *Ambassis*, *Puntius*, *Xenentodon* and *Amphipnous* were recorded. The

catch composition (Fig.1) shows that the Cyprinidae family was found to be the most dominant group comprising of 36% with 21 species. Bagridae family represented 10% of total fish species composition. The important genus recorded from this family were *Sperata aor*, *S. seenghala* and *Mystus spp*. Family Siluridae accounted 7% to total fish species composition and important genus were *Wallago attu*, *Silonia silondia*, *Ompak bimaculatus* and *O. pabda*. Rest families Notopteridae, Clupeidae, Engraulidae, Beloniformes, Belonidae, Mastacembelidae, Badidae, Mugilidae, Anabantidae, Cichlidae, Ambassidae, Channidae, Sisoridae, Siluridae, Heteropneustidae, Clariidae, Pangasiidae, Bagridae, Amphipnoidae contribute 5-2% of total catch.

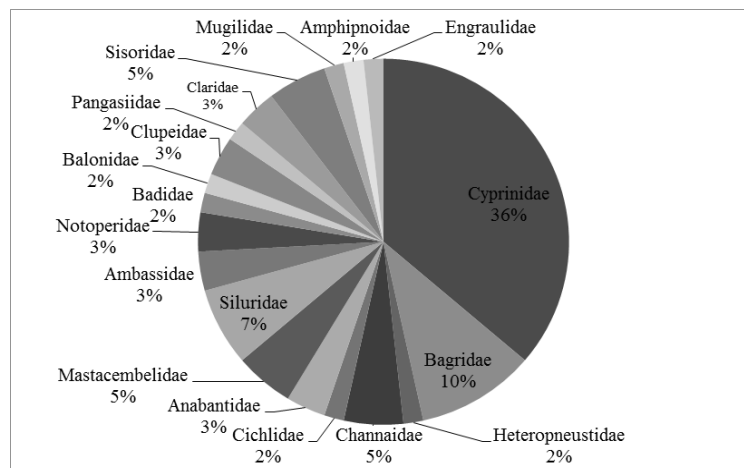


Fig 1: Catch composition as per family of fishes in Ramganga

Among three Indian major carps, RA of *Catla catla*, *Labeo rohita*, *Cirrhinus mrigala* was 1.03%, 2.31% and 1.45% respectively. For exotic major carps the RA values were 1.28, 0.85 and 3.50 for *Hypophthalmichthys molitrix* *Ctenopharyngodon idella* and *Cyprinus carpio* respectively. This shows that relatively *Cyprinus carpio* is the most dominant fish species among the major carps. It may be due to its capacity to survive in different tropical and temperate climatic conditions and its capability to breed in nature. *Ctenopharyngodon idella*, *Hypophthalmichthys molitrix*, *Oreochromis mossambicus*, *Clarias gariepinus* and *Cyprinus carpio* have been reported in the tributaries of Ganga basin [17]. The occurrence of *C. carpio* have been also reported from other rivers as Jhelum, Mahanadi, Ganga and Yamuna Rivers [18, 19]. The RA for food fishes *L. bata*, *Osteobrama cotio*, *Salmostata bacaila* and *Gadusia chapra* were above 5.0 indicating their abundance in the study area. The RA of other food fishes belonging to order *Siluriformes*, *Perciformes*, *Synbranchiformes*, *Clupiformes* were ranging between 0.51 for *L. dyochelius* to 3.07 for *Ambassis ranga* indicating their varied presence. The RA of five endangered species recorded were *Chitala chitala* (0.50%), *Tor putitora* (0.42%), *Ompak pabda* (0.77%), *Sisor rhabdophorus* (0.25%) and *Ompak bimaculatus* (1.88%) indicating their relatively decreasing

population in the Ramganga River. The RA of *Cyprinus carpio* (3.50%) and presence of *Oreochromis niloticus* (RA=1.02%), *Clarias gariepinus* (RA=0.77%), *Aristichthys nobilis* (RA=0.77%) indicate that the population of these exotic fishes is increasing. Sarkar *et al.* [20] reported that the higher relative abundance and distribution of exotic species indicate a threat to the other local species due to their establishment in the River. It is evident from the above study that alien fish species like *Clarias gariepinus*, *Oreochromis niloticus* introduced deliberately or inadvertently are now appearing in natural aquatic bodies [21]. Since alien fishes are dominant in characters and aggressive in behaviour, they have the potential to extirpate the local fish species. *Clarias gariepinus* is a highly predatory and may prove far more inimical to the other small indigenous species. Presence of *Clarias gariepinus* in rivers like Ganga, Yamuna, Sutlej and Godavari is a serious concern to the ichthyologists [22]. The relative abundance of common carp is also high comparative to many other indigenous species that may result in decreased catch of locally important species particularly Indian major carps [23]. The riverine resources of the country are currently experiencing an alarming decline in fish biodiversity due to several environmental factors in general and invasion of many relatively new alien species in particular [24, 25].

Ecological conservation status of fresh water fishes of India have been assessed as per the criteria of IUCN 2011, under five categories as endangered (EN), vulnerable (VU), low risk (LR), least concern (LC), not evaluated (NE) and another separate group that is exotic fishes. The conservation status of river Ramganga shows that 9% fish species are endangered, 26% are vulnerable, 28% low risk, 10% least concern, 17% have not been evaluated and 10% fishes are of exotic origin (Fig. 2). The species, *Ompok pabda*, *Wallago attu*, *Ailia coila*,

Chitala chitala and *Bagarius bagarius* have been declared near threatened^[14]. This status is given mainly as a result of overexploitation and habitat degradation in case of *Ompok pabda*, *Wallago attu*, *Ailia coila*. Significant decline of population due to pollution and overharvesting has occurred in case of *Chitala chitala*. The population of *Bagarius bagarius* has declined due to heavy harvesting of species as food fish, degradation of their breeding ground.

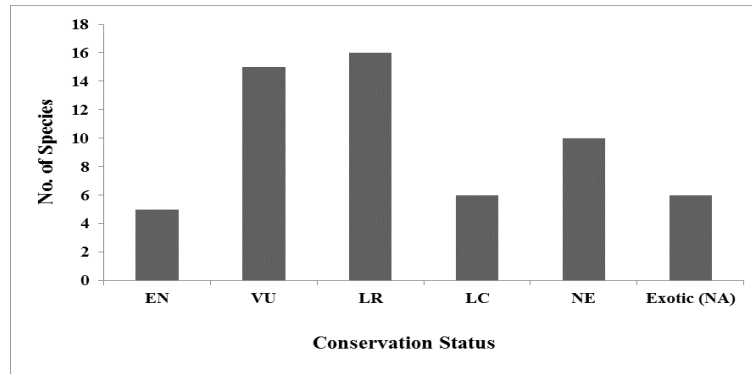


Fig 2: Distribution of fishes as per IUCN status

4. Conclusion

On the basis of the above results, the present finding suggests that Cyprinidae, Bagridae and Siluridae fishes dominates the catch. The presence of some of the exotic fishes introduced legally have encouraging results in aquaculture system but species like *Oreochromis niloticus*, *Clarias gariepinus* and *Aristichthys nobilis* in natural waters may cause significant and unwanted effects on indigenous fish biodiversity. The present study would be useful as baseline data for any future assessment of the relative abundance of native and exotic fish fauna comparatively.

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