

## Fish Diversity and Conservation Perspectives of Gandak River, India

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### **Abstract**

Study of 10 km stretch of Gandak River in Uttar Pradesh revealed the ichthyofaunal diversity, assemblage structure, distribution pattern, threat status, ornamental and commercially important fishes. In all 54 fish species were recorded of many commercially important fishes. Among these species 45% belong to lower risk near threatened (LRnt), 26% vulnerable (VU), 11% lower risk least concern (LRlc), 11% not evaluated (NE) and 7% endangered (EN) category. Cyprinidae 33% were most important followed by Bagridae (11%), Channidae (9%), Tetradontidae (5%).

**Key words:** Fish diversity, Endangered species, Conservation status, Gandak River

### **Introduction**

Gandak River is one of the major tributaries of Ganges fed by perpetual snow of the Himalayas. It harbors rich diversified fauna of many commercially important fishes. It is also known as Gandaki and Narayani River. The river traverses about 300 km and flows through Bihar. The catchment area of the river is 7620 km<sup>2</sup> in the Gangetic plain of Uttar Pradesh (only small area of river) and Bihar states and joins the Ganges near Hajipur in Bihar.

In India 2500 fish species have been reported, of which 930 (40%) are freshwater inhabitants (Bhat, 2000). David (1963) conducted intensive survey of upper stretch (185 km) of the Gandak River between 161 km above and 24 km below the Bhaisalotan barrage. This survey is considered as the pioneer work. A fisheries survey of upper head water of Gandak river was conducted by David (1963). Many workers worked on fish species richness of the different aquatic systems in India but only a few reports are from the Gandak River system. Menon

(1974) has listed 141 species, belonging to 72 genera, 30 families and 11 orders from Ganga River system. However, in view of non-availability of records on fish diversity in Gandak River between Chhitauni Bagaha Rail Bridge to Chhitauni Ghat of Uttar Pradesh, the present study was undertaken for the first time to examine the fish diversity of Gandak River system in Eastern Uttar Pradesh.

India is one of the mega biodiversity hotspots in the world and occupies the ninth position in terms of freshwater mega biodiversity (Mittermeier *et al.*, 1997). Biodiversity conservation is one of the major issues throughout the world and aquatic environments are serious threats to both diversity and ecosystem stability and therefore, it is necessary to protect and develop research and systematic conservation planning to protect freshwater biodiversity (Lakra *et al.*, 2010). Various methods and strategies have been proposed by many workers (Cowx, 1998; Lakra *et al.*, 2006).

In present study, ichthyofaunal diversity of Gandak River has been documented. The conservation status of the fishes has also been evaluated.

## Materials and methods

### *Study area and sampling sites*

The Gandak River, a key tributary of the Ganga River system in eastern India has been selected for this study. It is endowed with rich aquatic biodiversity of flora and fauna. The study was conducted to achieve the objective covering a 10 km stretch from Chhitauni Bagaha Rail Bridge 27°8'25.53"N and 83°59'21.49"E (about 3 km away from the Valmiki National Park and Tiger Reserve to Chhitauni Ghat 27°5'29.33"N and 84°0'13.06"E of Gandak River at an elevation of 81 m msl.

### *Data collection*

Field surveys were conducted during November 2010 to October 2011. Fish samples were collected from two sites within 10 km river stretch of Gandak River viz., Site 1- Chhitauni Bagaha Rail Bridge and Site 2- Chhitauni Ghat (Fig. 1).

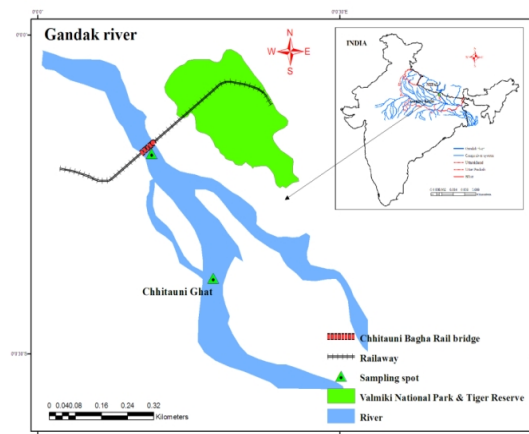


Figure 1. Gandak River showing sampling sites.

Fish collection was made with the help of local fisherman and the catches of fishers. The fishing was done by using different mesh size gill net, cast net, trap and angling. After the collection of fish, the sampled specimens were immediately preserved in 10% formalin for identification. Before preservation photograph was taken with the help of Nikon digital camera. The identification was made with the help of taxonomic references (Jhingran, 1975; Linderberg, 1976; Day, 1978; Srivastava, 1986; Talwar and Jhingran, 1991; Jayaram, 1999; Das *et al.*, 2010). The conservation status of fishes based on conservation assessment and management plan for freshwater fishes of India (Molur and Walker, 1998).

## Results and discussion

Comprehensive records on the fisheries of river Gandak are scanty. River is the major source of fisheries and contributes significantly to the inland capture fish production. But during last few decades the riverine system witnessed clear alterations due to enormous human interventions in the form of water abstraction, dam construction, sedimentation and illogical fishing. These have discerningly adverse effect on natural fish production, which showed constant declining trends.

The evaluation of conservation status of the fishes and the results of the present study revealed that 45% of the fishes belong to lower risk near threatened (LRnt), 26% vulnerable (VU), 11% lower risk least concern (LRlc), 11% not evaluated (NE), and 7% endangered (EN) category (Fig. 2).

In the present study in all 54 fish species were recorded belonging to 18

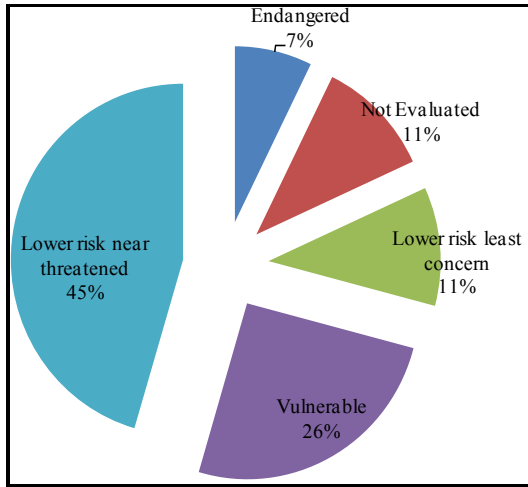


Figure 2. Conservation status of fish fauna of Gandak River.

of fish species (37) was recorded from the spot II and the minimum number (34) from spot I (Tab. 1). During the course of investigation maximum number of species belonged to family Cyprinidae (18) followed by Bagridae (6) and Channidae (5). The family Schilbeidae, Tetraodontidae and Cobitidae represented (3) species each. Notopteridae, Siluridae, Ambassidae and Mastacembelidae represented 2 species each family. Families Sisoridae, Claridae, Heteropneustidae, Belonidae, Belontidae, Nandidae, Gobiidae and Anabantidae were represented by only 1 species each.

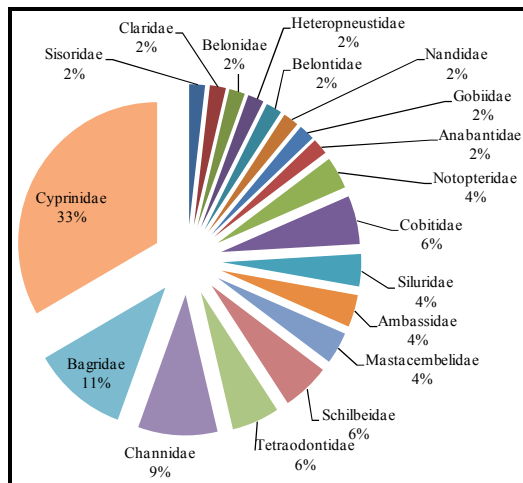


Figure 3. Family-wise percentage composition of fishes of Gandak River.

families from 10 km stretch of river Gandak. Taxonomic position, vernacular name, conservation status and spot of collection of the individual fish species assorted according to family are listed in table 1. Previously, David (1963) listed 113 fish species in the Gandak River at upper stretch, 161 km above and 24 km below the Bhaisalota barrage. The maximum number



Figure 4. A haul of *Puntius sophore*

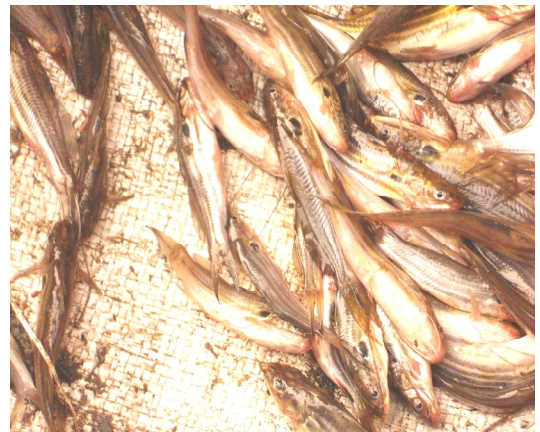


Figure 5. A haul of *Mystus tengra*

**Table 1.** Fishes collected from Gandak River, based on Molur and Walker (1998). Taxonomic status adapted from Talwar and Jhingran (1991).

Family/Species	Vernacular name	Commercial value	Conservation status	Spot I	Spot II
<b>Notopteridae</b>					
1. <i>Notopterus chitala</i> (Hamilton-Buchanan)	Moya	F, O	EN	+	+
2. <i>Notopterus notopterus</i> (Pallas)	Patra	F, O	LRnt	-	+
<b>Cyprinidae</b>					
3. <i>Aspidoparia morar</i> (Hamilton-Buchanan)	Chippuah	F, O	LRnt	+	+
4. <i>Catla catla</i> (Hamilton-Buchanan)	Bhakur	F	VU	+	-
5. <i>Chela cachius</i> (Hamilton-Buchanan)	Chalhawa	F, O	NE	-	+
6. <i>Chela labuca</i> (Hamilton-Buchanan)	Chalhwa	F, O	LRlc	+	+
7. <i>Cirrhinus mrigala</i> (Hamilton-Buchanan)	Nain	F	LRnt	-	+
8. <i>Cirrhinus rebe</i> (Hamilton-Buchanan)	Rewa	F	VU	-	+
9. <i>Cyprinus carpio</i> (Linnaeus)	China rahu	F	NE	+	+
10. <i>Labeo bata</i> (Hamilton-Buchanan)	Bata	F, O	LRnt	+	-
11. <i>Labeo boga</i> (Hamilton-Buchanan)	Bhagan	F, O	LRnt		
12. <i>Labeo calbasu</i> (Hamilton-Buchanan)	Karaunchar	F, O	LRnt	+	+
13. <i>Labeo gonius</i> (Hamilton-Buchanan)	Kursha	F	LRnt	+	+
14. <i>Labeo rohita</i> (Hamilton-Buchanan)	Rohu	F	LRnt	-	+
15. <i>Osteobrama cotio</i> (Hamilton-Buchanan)	Gardi	F, O	LRnt	+	+
16. <i>Puntius chola</i> (Hamilton-Buchanan)	Sidhari	F, O	VU		
17. <i>Puntius conconius</i> (Hamilton-Buchanan)	Sidhari	F, O	VU		
18. <i>Puntius sarana</i> (Hamilton-Buchanan)	Sidhari	F, O	VU		
19. <i>Puntius sophore</i> (Hamilton-Buchanan)	Sidhari	F, O	LRnt	+	-
20. <i>Puntius ticto</i> (Hamilton-Buchanan)	Sidhari	F, O	LRnt	+	-
<b>Cobitidae</b>					
21. <i>Botia dario</i> (Hamilton-Buchanan)	Baggha	F, O	LRnt	+	+
22. <i>Botia lohachata</i> (Chaudhuri)		F, O	EN		
23. <i>Lepidocephalus guntea</i>	Nakati	F, O	NE	-	+
<b>Bagridae</b>					
24. <i>Mystus bleekeri</i> (Hamilton-Buchanan)	Tengara	F, O	VU	-	+
25. <i>Mystus cavasius</i> (Hamilton-Buchanan)	Sutahawa Tengara	F, O	LRnt	+	-
26. <i>Mystus tengara</i> (Hamilton-Buchanan)	Tengara	F, O	LRlc	+	-
27. <i>Mystus vittatus</i> (Bloch)	Tengara	F, O	VU	+	+
28. <i>Sperata aor</i> (Hamilton-Buchanan)	Dariai Tengara	F	LRlc	+	+
29. <i>Sperata seenghala</i> (Sykes)	Tengra	F	LRlc	-	+
<b>Siluridae</b>					
30. <i>Ompok bimaculatus</i> (Bloch)	Jalkapoor	F, O	EN	+	+
31. <i>Wallago attu</i> (Schneider)	Barari	F, O	LRnt	-	+
<b>Schilbeidae</b>					
32. <i>Aila coila</i> (Hamilton-Buchanan)	Patasi	F, O	VU	-	+
33. <i>Clupisoma garua</i> (Hamilton-Buchanan)	Baikari	F, O	VU	-	+
34. <i>Eutropiichthys vacha</i> (Hamilton-Buchanan)	Banjhoo	F, O	EN	-	+
<b>Sisoridae</b>					
35. <i>Bagarius bagarius</i> (Hamilton-Buchanan)	Gonchita	F	VU	+	+
<b>Clariidae</b>					
36. <i>Clarias batrachus</i> (Linnaeus)	Mangur	F, O	VU	-	+
<b>Heteropneustidae</b>					
37. <i>Heteropneustes fossilis</i> (Bloch)	Singhi	F, O	VU	+	+
<b>Belontiidae</b>					

38. <i>Xenentodon cancila</i> (Hamilton-Buchanan)	Kauwa	F, O	LRnt	+	+
<b>Ambassidae</b>					
39. <i>Chanda nama</i> (Hamilton-Buchanan)	Chanda	F, O	LRlc	-	+
40. <i>Parambassis lala</i> (Hamilton)	Chanari	F, O	NE	+	+
<b>Nandidae</b>					
41. <i>Nandus nandus</i> (Hamilton-Buchanan)	Dhalae	F, O	LRnt	+	+
<b>Gobiidae</b>					
42. <i>Glossogobius giuris</i> (Hamilton-Buchanan)	Bulla	F, O	LRnt	+	-
<b>Anabantidae</b>					
43. <i>Anabas testudineus</i> (Bloch)	Sumha	F, O	VU	+	+
<b>Belontiidae</b>					
44. <i>Colisa faciatius</i> (Schneider)	Khosti	F, O	LRnt	+	-
<b>Channidae</b>					
45. <i>Channa gachua</i> (Hamilton)	Changa	F	NE	+	+
46. <i>Channa marulius</i> (Hamilton-Buchanan)	Saur	F	LRnt	+	-
47. <i>Channa striata</i> (Bloch)	Soura	F	LRnt	+	+
48. <i>Channa orientalis</i> (Bloch and Schneider)	Changa	F, O	VU	+	+
49. <i>Channa punctatus</i> (Bloch)	Girae	F	LRnt	+	-
<b>Mastacembelidae</b>					
50. <i>Mastacembelus armatus</i> (Lacepede)	Baam	F, O	LRlc	+	+
51. <i>Macrognaathus pancalus</i> (Hamilton-Buch.)	Patya (Nakati)	F, O	NE	+	-
<b>Tetraodontidae</b>					
52. <i>Tetradon cutcutia</i> (Hamilton-Buchanan)	Galphulani	F, O	LRnt	+	-
53. <i>Tetradon fluviatilis</i> (Hamilton)	Beng macharia	F, O	LRnt	+	+
54. <i>Monopterusuchia</i> (Hamilton-Buchanan)	Anhaya Baam	F, O	LRnt	-	+

(VU = Vulnerable, EN = Endangered, LRnt = Lower risk near threatened, LRlc = Lower risk least concern, NE = Not evaluated, F = Food fish, O = Ornamental fish, Spot I = Chhiatauni Bagaha Rail Bridge, Spot II = Chhitauni Ghat)

Cyprinidae contributed highest of 33% fish species (Fig. 3), among which, *Cabdio morar* (Chepua) and *Puntius* sp. (Sidhari) were the most abundant forms (Fig. 4), *Labeo rohita* (Rohu), *Catla catla* (Bhukur) and *Cirrhinus mrigala* (Nain) were not found in good number but *Labeo bata*, *Labeo boga* and *Labeo calbasu* occurred in good quantity. *Mystus* sp. was recorded in abundance with the occurrence all the year round (Fig. 5).

David (1963) recorded availability of *Hilsa ilisha* from close to Bettiah but in the present study, it was not recorded in this stretch. Exotic fishes like *Cyprinus carpio* was also recorded from the river but their number of catch was negligible. It is a sad commentary that the Indian Major Carps

have declined sharply in the last one decade while forage and catfishes are increasing drastically in the river. Fishers catch on an average about 5-6 kg of fish daily dominated by miscellaneous and cat fishes.

According to fishers assumption, the fish catch of the river has declined during last two decades, may be due to climate fluctuation, indiscriminate fishing of brood stock in the spawning ground and use of smaller mesh size of fishing net.

Apart from Indian Major Carps (*Labeo rohita*, *Catla catla*, *Cirrhinus mrigala*), *Chitala chitala*, *Notopterus notopterus*, *Ompok pabda*, *O. bimaculatus*, *Labeo bata*, *L. calbasu*, *Cirrhinus reba*, *Channa marulius*, *Bagarius bagarius*, and *Clupisoma garua* were the other commercially



*Labeo rohita*



*Puntius sophore*



*Catla catla*



*Parambassis ranga*



*Chanda nama*



*Puntius conchoni*



*Labeo calbasu*



*Sperata seenghala*



*Cirrhinus mrigala*



*Ompok bimaculatus*



*Cirrhinus reba*



*Wallago attu*

**Plate 1.** Important fishes of Gandak River.



*Eutropiichthys vacha*



*Mystus bleekeri*



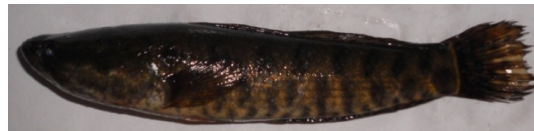
*Notopterus notopterus*



*Nandus nandus*



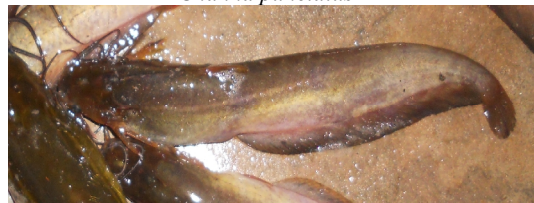
*Channa striatus*



*Channa punctatus*



*Channa orientalis*



*Heteropneustes fossilis*



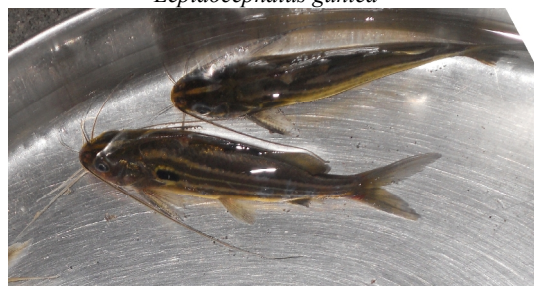
*Xenentodon cancila*



*Lepidocephalus guntea*



*Colisa facitata*



*Mystus tengra*

**Plate 2.** Important fishes of Gandak River.

important species of the collection (Pls 1 and 2).

A good number of ornamental fishes were also recorded during the present investigation. Due to lack of proper knowledge of the value and marketing of ornamental fishes among the fishers, these are sold at a very low price. Most of the fish catch is sold by fishers on spot to brokers and brokers finally sale it in local fish markets at higher rates.

#### Conclusion and recommendations

- Indiscriminate fishing has been observed during the entire study period, which has resulted in tremendous decrease of major carps.
- Fish sanctuary needs to be established to preserve fish stocks and indigenous brood fishes.
- Fishery regulation should be strictly followed to protect fish species and enhance the fish production especially Indian major carps. Indian major carps are high priced fishes, but their stocks are declining. To conserve the Indian major carp less than 2 cm mesh size nets should be totally banned specially during the breeding season.
- Awareness campaigns should be conducted among the fishers with regard to the value of ornamental fish species and obtain higher price.
- As reported by various fishermen the decline in fish catch was due to indiscriminate fishing, usage of fine nets, siltation, changing land use pattern and flood. This has resulted and forced many of them to migrate and change their profession.

Thus, awareness programmes among fishers, strict ban on illegal monsoon fishing and usage of small mesh nets besides the protection of breeding grounds of com-

mercially important fish species are some of the management measures, which would protect and conserve the precious fish diversity of the system.

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