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continued on the back inside cover

Cover: A bag worm with its beautiful heap of junk. Acrylics on 300 GSM paper by Dupati Poojitha based on a picture by Sanjay Molur.

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COMMUNICATION

A checklist of fishes of Haiderpur wetland, western Uttar Pradesh, India

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Abstract: River-associated floodplains and wetlands provide natural spawning and nursery grounds for many freshwater fishes. Haiderpur wetland is one of such important river-associated wetlands of the Ganga River located in Bijnor District of western Uttar Pradesh. Considering its ecological significance, an inventory of fish species inhabiting in the Haiderpur wetland was carried out between June and July 2020. A total of 57 species of fishes belonging to 44 genera, 10 orders, and 27 families were recorded. Three exotic species, namely, *Hypothalmichthys molitrix*, *Oreochromis niloticus*, and *Ctenopharyngodon idella*, were recorded from the wetland. Based on the fish record, a checklist of the fish species of the Haiderpur wetland is being prepared and presented herewith with updated information on the current valid names, vernacular names, and IUCN Red List status.

Keywords: Exotic species, fish diversity, freshwater, floodplains, Ganga River, ichthyofauna, river associated, spawning, threatened fish, vernacular.

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Competing interests: The authors declare no competing interests.

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Author contributions: RR surveyed the study site and collected samples, identification and JAJ and SAH supervised the work and interpreted taxonomic information gathered by the RR.

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INTRODUCTION

Wetlands are amidst the most productive ecosystems on the Earth and provide many vital services to human society (Ghermandi et al. 2010; Brink et al. 2012). Wetlands also play a valuable role as breeding grounds for a wide variety of species of fish and other invertebrates. In any wetland, fish typically represent a significant biological part, playing a critical role in energy flow between lower and higher trophic levels and control energy and nutrient-flow via predation. It also serves as a valuable fishery resource for the local community residing around the wetlands.

In India, the Gangetic plain has many large-sized natural and man-made wetlands, which are connected with the Ganga River during the monsoon months and serve as flood buffering systems. In addition to that, they form a natural reserve for maintaining fish genetic resources. Haiderpur wetland is one of those wetlands located in the floodplain region of the Upper Ganga basin in western Uttar Pradesh. The wetland is ecologically important since it provides refugia habitats to many freshwater organisms, including fishes and is hydrologically different because of slow-moving water creates favorable conditions for many lentic organisms. This wetland is a trove in terms of fish species and supports the livelihood of many people living around the wetland. Even though it is a well-known aquatic habitat, there is no comprehensive information on the Ichthyofauna species associated with this wetland. Thus, an intensive survey was carried out from June 2020 to July 2020 to prepare the fish checklist in this wetland. A checklist of fish species residing in this wetland and their current conservation status is presented in this communication. We also provide site-specific catch per unit efforts so that this information can be used as a baseline for future fish conservation efforts in the region.

MATERIALS AND METHODS

Study Area

Haiderpur wetland is a man-made wetland that came into existence in 1984 after the construction of Madhya Ganga barrage on the mighty Ganga River and it falls in Muzaffarnagar District and also part of Hastinapur Wildlife Sanctuary (HWS) of western Uttar Pradesh (Image 1). It lies in the Upper Gangetic Plains biogeographic zone (7A) of India in the state of Uttar Pradesh (Rodgers & Panwar 1988). This wetland comprises of 3,000 acres and adjoining 1,532 ha of the forest area of different blocks of Haiderpur, Nizampur, Jedhpur, Gorsiwal, Kasampur, Eashqwala, and Nawalpur. It includes various deep upstream reservoirs of Madhya Ganga Barrage, associated shallow flooded land, stretches of river Ganga and its tributary, river Solani. Six sampling locations were fixed randomly depending on the accessibility for exploring fish diversity in the wetland (Image 1). GPS coordinates of sampling sites and the mean depth of sampling points are given in Table 1.

The population composition of wetland areas comprises of Bengali fisherman community and gurjars primarily engaged in fishing for their livelihoods.

Fish Sampling

Our sampling sites are situated mostly in the southern part of the Wetland because of accessibility and other practical constraints. Importantly, our sites are well-distributed in the space to represent the wetland well. Fish sampling was conducted in the selected sampling points using 180 m long mono-filamentous gill nets of various mesh sizes measuring (0.5 inch, 1 inch, 2 inch, 3 inch, 4 inch, 5 inch, 10 inch and 12 inch). Cast net and trap nets were also used. An average of 4 net/hours was given continuously for 10 days from 0600 h to 0800 h, and 1600 h to 1800 h, and each site was sampled twice, once in the morning and then in the evening during the monsoon months (July 2020). Constant fishing efforts using all the six different gill nets for equal duration were maintained throughout the sampling period. Different types of fishing gears used are given in Image 2.

After the sampling, fishes were collected, and they were photographed using a digital SLR Camera -Nikon D5300. Colour, colour patterns, spots/blotches, stripes, and other characteristics of the fishes were noted in the field. Some of the unidentified fishes were preserved in a 10% formalin solution for species confirmation. All specimens were deposited in the National Repository Museum of Wildlife Institute of India, Dehradun. The species were identified in the laboratory using the taxonomic keys of Talwar & Jhingaran (1991), Jayaram (2010), and Bleher (2018). Valid species and valid nomenclatural names were adopted as per the Catalogue of Fishes of the California Academy of Sciences (Frickie et al. 2018). The current conservation status of fishes was accessed from IUCN Red List data (IUCN 2021). A checklist of fishes recorded in the Haiderpur wetland is presented in Table 2. Catch per unit efforts (CPUE) was calculated as the number of captured fishes per hour in all applied gill nets.

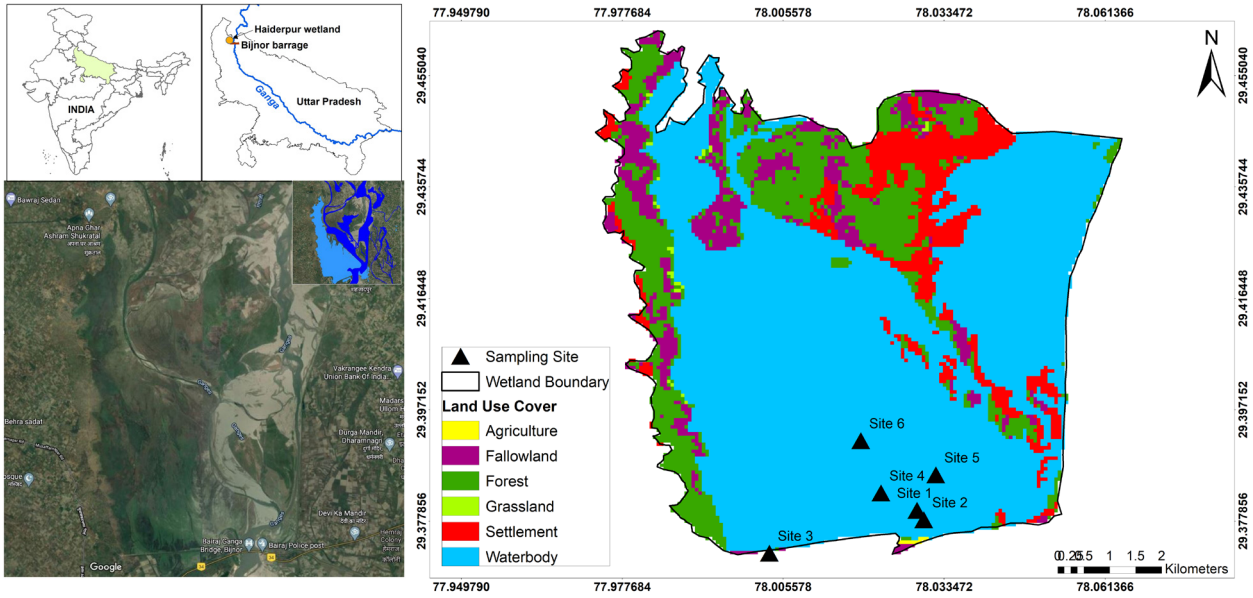

Image 1. Study area and fish sampling sites.

Table 1. Details of fish sampling locations in Haiderpur wetland, western Uttar Pradesh.

	Site	GPS coordinates		Mean depth (m)
		Latitude (N)	Longitude (E)	
1	Site 1	29.3797	78.0287	2.9
2	Site 2	29.3781	78.0299	3.4
3	Site 3	29.3723	78.0031	2.1
4	Site 4	29.3827	78.0225	1.8
5	Site 5	29.3858	78.0320	1.5
6	Site 6	29.3918	78.0190	3.2

RESULTS

The present study revealed that 57 species of fishes belonging to 44 genera, 10 orders, and 27 families inhabit in Haiderpur wetland. Cyprinidae was the most abundant family with 13 species, followed by Bagridae with five species (Images 4–60). The checklist presented in this study represents the most updated list of freshwater fishes from the Haiderpur wetland compared to the earlier studies conducted in the entire Bijnor district. Prior to this study, only the presence of 36 fishes from the Bijnor District has been reported by (Khan et al. 2013). The present study includes economically important fish species like *Wallago attu*, *Chitala chitala*, *Notopterus notopterus*, *Bagarius bagarius*. The other significant findings of the study reveal that many species like *Labeo bata*, *Wallago attu*, *Notopterus notopterus*, *Ophicthys cuchia* are of high ecological significance since it is valued remedy in oriental medicine (Ray 1988). The study, however, has also been able to detect the presence of some of the exotic species of fishes such as *Cyprinus carpio*, *Hypothalmichthys molitrix*, *Ctenopharyngodon idella*, and *Oreochromis niloticus*, which are disturbing the habitat for the native fish species by competing in terms of food, space and tolerant extreme conditions. Haiderpur wetland inhabits nearly half of the freshwater fish species reported from the main Ganga River. Recent studies revealed that main course of Ganga River inhabits 117 species of native freshwater species (Dwivedi et al. 2019).

Haiderpur wetland, like any other wetland has an almost entirely tropical climate 29° N surrounded by the human settlements. In the process of rapid urbanisation, various species are going under mass extinction from their native habitats (Mckinney 2002). Among 57 species of fishes recorded from Haiderpur wetland, only three species, namely, *Chitala chitala*, *Ompok pabda*, and *Bagarius bagarius*, were found to be in 'Near Threatened' category of IUCN Red List 2021, whereas three were exotic species, and only one species namely, *Clarias magur* was found to be in IUCN Red List 'Endangered' category and the remaining 50 fish species were in IUCN Red List 'Least Concern' category. Habitat degradation and anthropogenic pressure like cultivation of water chestnut and use of chemicals by farmers have seriously affected the fish fauna of the entire Haiderpur wetland. During the survey, various types of invasive

Image 2. Different types of fishing gears used for fish sampling in the Haiderpur wetland, western Uttar Pradesh. © Rahul Rana.

weeds, e.g., *Pontederia*, *Pistia*, *Hydrilla* spp., and *Potamogeton*, have adversely affected the wetland by encroaching and disturbing the fish habitat (Image 3).

Wallago attu and *Chitala chitala* which thrives well and hides in the submerged aquatic vegetation and Haiderpur wetland, therefore, provides the suitable habitat. *Bagarius bagarius* are amongst some of the indicator species depicting the pristine habitat of the wetland serving as the breeding grounds and sustaining large fish population. On the other hand, few areas are under stress due to the effluent and sewage discharge compelling only species like *Trichogaster fasciata* and *T. lalia* surviving in those areas. For long-term monitoring and conservation of wetlands and sustaining aquatic species curbing the challenges in wetland conservation will play a key role in maintaining a healthy ecosystem for the fish population.

Relative Abundance

Relative abundance showed abundance of small-sized indigenous species in the study area. The most abundant species as per relative abundance was *Amblypharyngodon mola* having relative abundance of 0.30, followed by *Puntius sophore* 0.16, *Trichogaster lalius* 0.15, and *Trichogaster fasciatus* 0.13.

Table 2. Site wise catch per unit effort values.

	Site no.	Mean CPUE (fish/h)
1	S1	4
2	S2	15.25
3	S3	83
4	S4	14
5	S5	5.5
6	S6	114.5

Catch per unit efforts

CPUE was observed maximum at site-6 – 114.55 and minimum at site-1 – 4.

Family wise representation (pie chart) of individual species at each site is presented in Figure 1.

DISCUSSION

Haiderpur wetland is a variegated wetland of swampy vegetation and tall grasses. Floodplain wetlands are

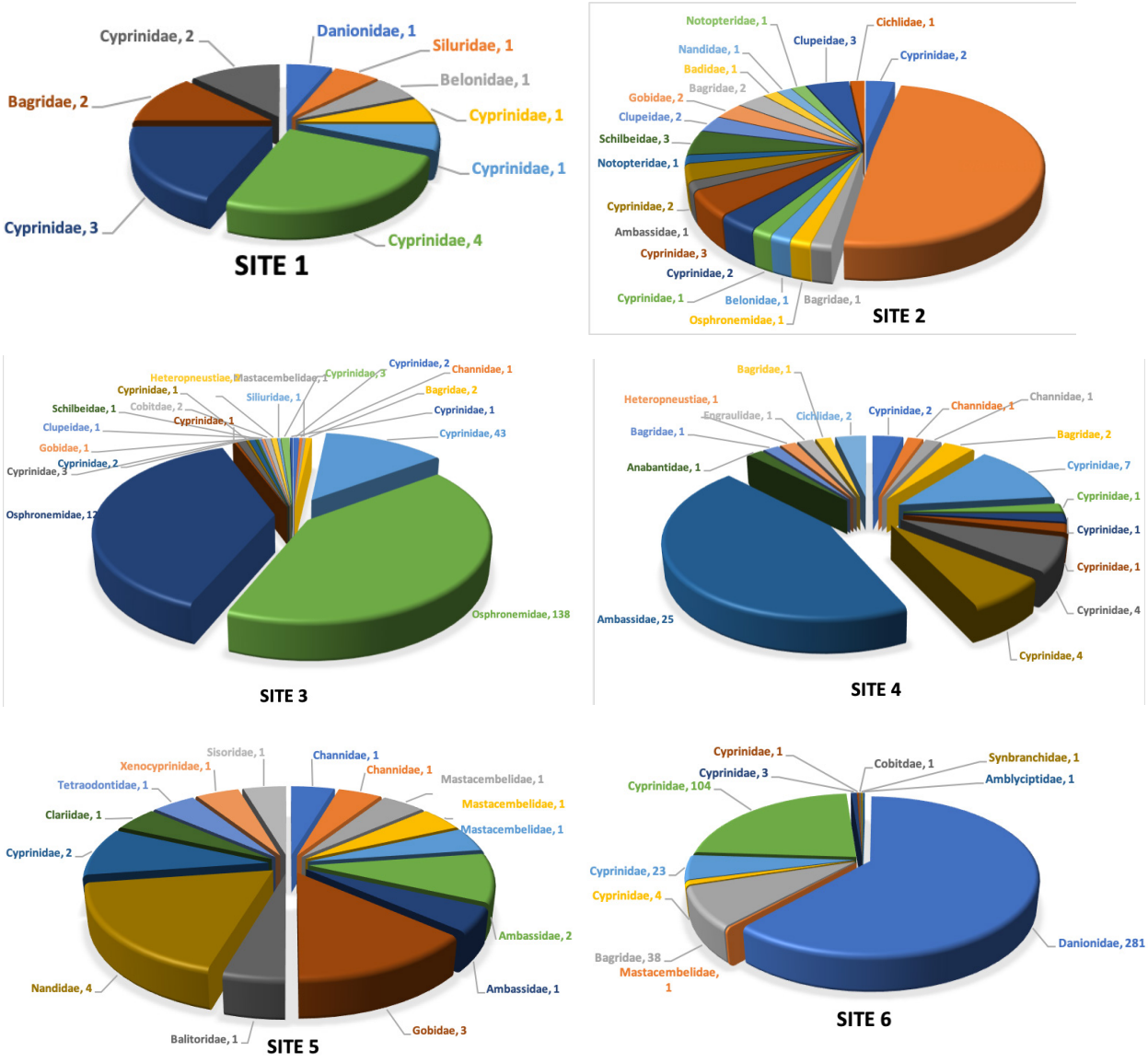

Figure 1. Family wise representation (pie chart) of individuals species at each site.

one of the most productive and species-rich lacustrine ecosystems (Kingsford et al. 2016). It also forms an important site for the conservation of water birds and swamp deer. Previous studies conducted in Banganga wetland (Sivakumar 2017), recorded presence of 40 fish species during the survey whereas Khan et al. (2013) reported presence of only 36 fish species from the entire Bijnor District. Therefore, the present study carried out in the Haiderpur wetland reveals the unexplored diversity which is a first of its kind since it has not been assessed in terms of fish diversity earlier. No previous studies have been conducted explicitly in the Haiderpur wetland.

This distinctive hydrological system and having a variety of submerged aquatic vegetation provides suitable breeding grounds and habitat for fish populations an ichthyological baseline inventory of Red Listed species of the wetland and for biodiversity conservation point of view. It also provides unreported and unexplored diversity of fish species and scope for trend analysis of the population of these fish species in the future. It is imperative that the sites, where threatened species are recorded should be monitored regularly for future. On the other hand local anthropogenic pressures like seasonal cultivation of water chestnut by locals and use of chemicals in the crops gets washed off directly into the wetland, grazing of cattle during the dry spell are other local disturbances affecting the wetland. Merging

Table 3. Checklist of fish species of Haiderpur wetland.

	English name	Species	Authority	Vernacular name	IUCN Red List
I. ORDER OSTEOGLOSSIFORMES					
1. Family Notopteridae					
1	Bronze Featherback	*Notopterus notopterus*	(Pallas, 1769)	Pholi	LC
2	Clown Knifefish	*Chitala chitala*	(Hamilton, 1822)	Chital	NT
2.Family Clupeidae					
3	Indian River Shad	*Gudusia chapra*	(Hamilton, 1822)	Suiya	LC
II. ORDER CYPRINIFORMES					
3. Family Cobitidae					
4	Guntia Loach	*Lepidocephalichthys guntea*	(Hamilton, 1822)	Guntea	LC
4. Family Nemacheilidae					
5	Mottled Loach	*Paracanthocobitis botia*	(Hamilton, 1822)	Chitai	LC
5. Family Cyprinidae					
6	Mrigal Carp	*Cirrhinus mrigala*	(Hamilton, 1822)	Mrigal	LC
7	Reba Carp	*Cirrhinus reba*	(Hamilton, 1822)	Rewah	LC
8	Common Carp	*Cyprinus carpio*	(Linnaeus, 1758)	-	Exotic
9	Bata	*Labeo bata*	(Hamilton, 1822)	Bhagan	LC
10	Orangefin Labeo	*Labeo calbasu*	(Hamilton, 1822)	Kalbons	LC
11	Kuria Labeo	*Labeo gonius*	(Hamilton, 1822)	Khursa	LC
12	Roho Labeo	*Labeo rohita*	(Hamilton, 1822)	Rohu	LC
13	-	*Labeo dyocheilus*	(McClleland, 1839)	Kali	LC
14	Rosy Barb	*Pethia conchonius*	(Hamilton, 1822)	Pothi	LC
15	Ticto Barb	*Pethia ticto*	(Hamilton, 1822)	Pothia	LC
16	Pool barb	*Puntius sophore*	(Hamilton, 1822)	Pottiah	LC
17	Stone Roller	*Tariqilabeo latius*	(Hamilton, 1822)	Kala bata	LC
18		*Osteobrama cotio*	(Hamilton, 1822)	Cotio	LC
6. Family Danionidae					
19	Mola Carplet	*Amblypharyngodon mola*	(Hamilton, 1822)	Mola	LC
20	Morari	*Cabdio morar*	(Hamilton, 1822)	Morari	LC
21	Slender Rasbora	*Rasbora daniconius*	(Hamilton, 1822)	Rasbora	LC
22	Large Razorbelly Minnow	*Salmostoma bacaila*	(Hamilton, 1822)	Chela	LC
7. Family Xenocyprinidae					
23	Grass Carp	*Ctenopharyngodon idella*	(Valenciennces, 1844)	Carp	Exotic
24	Silver Carp	*Hypothalmichthys molitrix*	(Valenciennes, 1844)	Silver	Exotic
III. ORDER SILURIFORMES					
8. Family Bagridae					
25	Gangetic Mystus	*Mystus cavasius*	(Hamilton, 1822)	Kavasi	LC
26	Tengara Catfish	*Mystus tengara*	(Hamilton, 1822)	Tengara	LC
27	Rita	*Rita rita*	(Hamilton, 1822)	Rita	LC
28	Long Whiskered Catfish	*Sperata aor*	(Hamilton, 1822)	-	LC
29	Giant River-Catfish	*Sperata lamarrii*	(Sykes, 1839)	Seenghala	LC
9. Family Siluridae					
30	Pabdah Catfish	*Ompok pabda*	(Hamilton, 1822)	Pabda	NT
31	Wallago	*Wallago attu*	(Bloch & Schneider, 1801)	Parhin	VU
10.Family Amblyciptidae					
32	Biting Catfish	*Amblyceps mangois*	(Hamilton, 1822)	-	LC
11. Family Sisoridae					
33	Goonch	*Bagarius bagarius*	(Hamilton, 1822)	Goonch	NT

	English name	Species	Authority	Vernacular name	IUCN Red List
12.Family Erethistidae					
34	Giant Moth Catfish	*Erethistes pussilus*	(Muller & Troschel, 1849)	-	LC
13.Family Clariidae					
35	Magur	*Clarias magur*	(Hamilton, 1822)	-	EN
14. Family Heteropneustidae					
36	Stinging Catfish	*Heteropneustes fossilis*	(Bloch, 1794)	Singhi	LC
15. Family Schilbidae					
37	Garua Bachcha	*Clupisoma garua*	(Hamilton, 1822)	Garua	LC
38	Vacha, Tunti	*Eutropiichthys vacha*	(Hamilton, 1822)	Bachwa	LC
IV. ORDER SYNBRANCHIFORMES					
16. Family Mastacembelidae					
39	Lesser Spiny Eel	*Macrognathus aral*	(Bloch & Schneider, 1801)	Aral	LC
40	Barred Spiny Eel	*Macrognathus pancalus*	(Hamilton, 1822)	Baim	LC
41	Zig-zag Eel	*Mastacembelus armatus*	(Lacepede, 1800)	Baam	LC
17. Family Synbranchidae					
42	Cuchia	*Ophicthys cuchia*	(Hamilton, 1822)	Kuchia	LC
V. ORDER ANABANTIFORMES					
18. Family Anabantidae					
43	Climbing Perch	*Anabas testudineus*	(Bloch, 1792)	Kawai	LC
19. Family Osphronemidae					
44	Dwarf Gourami	*Trichogaster lalius*	(Hamilton, 1822)	Khosti	LC
45	Banded Gourami	*Trichogaster fasciata*	(Bloch & Schneider, 1801)	Gourami	LC
20. Family Channidae					
46	Dwarf Snakehead	*Channa gachua*	(Hamilton, 1822)	Bothua	LC
47	Great Snakehead	*Channa marulius*	(Hamilton, 1822)	Pumuri	LC
48	Spotted Snakehead	*Channa punctata*	(Bloch, 1793)	Phool-dhok	LC
49	Striped Snakehead	*Channa striata*	(Bloch, 1793)	Soura	LC
21. Family Nandidae					
50	Gangetic Leaffish	*Nandus nandus*	(Hamilton, 1822)	Debari	LC
22. Family Badidae					
51	Badis	*Badis badis*	(Hamilton, 1822)	Badis	LC
VI. ORDER GOBIFORMES					
23. Family Gobiidae					
52	Tank Goby	*Glossogobius giuris*	(Hamilton, 1822)	Tank goby	LC
VII. ORDER CICHLIFORMES					
24. Family Cichlidae					
53	Nile Tilapia	*Oreochromis niloticus*	(Linnaeus, 1758)	Tilapia	Exotic
VIII. ORDER BELONIFORMES					
25. Family Belonidae					
54	Freshwater Garfish	*Xenentodon cancila*	(Hamilton, 1822)	Kauwa	LC
IX. ORDER TETRAODONTIFORMES					
26. Family Tetraodontidae					
55	Ocellated Pufferfish	*Leiodon cutcutia*	(Hamilton, 1822)	Pufferfish	LC
X. ORDER PERCIFORMES					
27. Family Ambassidae					
56	Elongate Glass-perchlet	*Chanda nama*	(Hamilton, 1822)	Chanda	LC
57	Highfin Glassy-perchlet	*Parambassis lala*	(Hamilton, 1822)	Lala	LC

LC—Least Concern | EN—Endangered | VU—Vulnerable | NT—Near Threatened.

Image 3. Aquatic vegetation showing *Pontederia crassipes* with *Euryale ferox* in Haiderpur wetland, western Uttar Pradesh. © Rahul Rana.

of the domestic effluents during floods directly into the wetland adds to the threats. Educational tours and tourism activities also provide revenue generation which can be utilised for more upgradation of the wetland and awareness of aquatic flora and fauna residing in the wetland.

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Image 4–13. 4—*Notopterus notopterus* | 5—*Chitala chitala* | 6—*Gudusia chapra* | 7—*Lepidocephalichthys guntea* | 8—*Paracanthocobitis botia* | 9—*Cirrhinus mrigala* | 10—*Cirrhinus reba* | 11—*Cyprinus carpio* | 12—*Labeo bata* | 13—*Labeo calbasu*. © Rahul Rana.

Image 14-23. 14—*Labeo gonius* | 15—*Labeo rohita* | 16—*Labeo dyocheilus* | 17—*Pethia conchonius* | 18—*Pethia ticto* | 19—*Puntius sophore* | 20—*Tariquilabeo latius* | 21—*Osteobrama cotio* | 22—*Amblypharyngodon mola* | 23—*Cabdio morar.* © Rahul Rana.

Image 24-33. 24—*Rasbora daniconius* | 25—*Salmostoma bacaila* | 26—*Ctenopharyngodon idella* | 27—*Hypothalmicthys molitrix* | 28—*Mystus cavasius* | 29—*Mystus vittatus* | 30—*Rita rita* | 31—*Sperata aor* 32—*Sperata lamarrii* | 33—*Ompok pabda*. © Rahul Rana.

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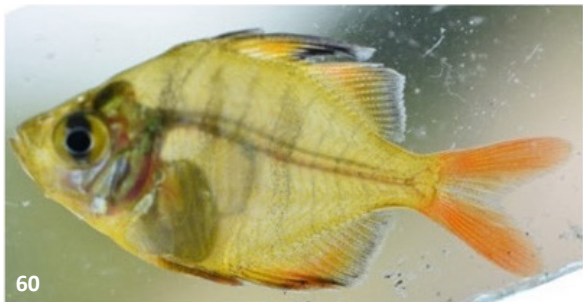
Image 44-53. 44—*Mastacembelus armatus* | 45—*Opichthys cuchia* | 46—*Anabas testudineus* | 47—*Trichogaster lalia* | 48—*Trichogaster fasciata* | 49—*Channa gachua* | 50—*Channa marulius* | 51—*Channa punctata* | 52—*Channa striata* | 53—*Nandus nandus.* © Rahul Rana.



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