

RAMGANGA RIVER

Ecological status and trends



नमो
गंगे



भारतीय वन्यजीव संस्थान
Wildlife Institute of India



ASSESSMENT OF THE
ECOLOGICAL STATUS OF
RAMGANGA RIVER
FOR CONSERVATION
PLANNING

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Wildlife Institute of India, Dehra Dun

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RAMGANGA RIVER

Ecological status and trends

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Preface

India being a megadiverse country, hosts a wide number of landscapes and ecosystems. A vital component of these are their riverine networks, which are in themselves a complete ecosystem. The nation's Ganga River is an internationally revered and recognised river that has been and continues to be a haven for a variety of animals and birds, making it an extremely important area with regard to biodiversity conservation. A number of tributaries make up the mighty Ganga River, of which the Ramganga River is also a part. They also provide essential provisioning and regulating ecosystem services. The Wildlife Institute of India through the Biodiversity Conservation and Ganga Rejuvenation Project and National Mission for Clean Ganga funded by the Ministry of Water Resources, River Development and Ganga Rejuvenation has been working towards the conservation of Ramganga River, along with all the other tributaries of Ganga River, so as to strengthen concerted efforts for restoration of its biodiversity value. For a complete scientific assessment of Ramganga River, robust information on the diversity, abundance and distribution of aquatic vertebrate fauna of Ramganga River, their major threats and the various drivers of these threats causing decline in their populations and habitat is collated in the present report.

As a part of the National Mission for Clean Ganga (NMCG), in the first phase, detailed biodiversity profiling of the Ganga River was carried out and subsequently the importance of its tributaries like the Ramganga River in supporting biodiversity was realized. With this in mind, in phase II the project "Planning and Management for Aquatic Species Conservation and Maintenance of Ecosystem Services in the Ganga River Basin for a Clean Ganga" was envisaged to prepare a holistic restoration plan for the Ramganga River through the support and involvement of stakeholders of all the Ramganga states. The Wildlife Institute of India through the Biodiversity Conservation and Ganga Rejuvenation Project and this report attempts to compile biodiversity of Ramganga River through literature review and Rapid Biodiversity Assessment. This report aims to develop a thorough knowledge base for the priority species of Ranganga River, aid in biological restoration, and assist policy planners and managers to judiciously use water from the Ramganga River, in view of the needs of the aquatic species therein.

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EXECUTIVE SUMMARY

Ramganga River (Western Ramganga) is a spring-fed river originating from the Dudhatoli range of western Himalaya in Pauri District of Uttarakhand. The river passes through West Himalayas (2B) and Upper Gangetic Plains (7A) biogeographic provinces in Uttarakhand and Uttar Pradesh covering a distance of 596 km. The river is a lifeline of Jim Corbett National Park and provides refuge to the Vulnerable smooth-coated otter *Lutrogale perspicillata*, Critically Endangered gharial *Gavialis gangeticus* and Endangered golden mahseer *Tor putitora*.

A boat-based rapid biodiversity assessment of around 450 km of the river from Kalagarh to Ganga confluence was done. A total of 90 species of waterbirds belonging to 23 families and 13 orders were recorded during this study. Lesser flamingo *Phoeniconaias minor*, a Near Threatened bird was recorded for the first time from the area. A population of Indian skimmer *Rynchops albicollis*, an Endangered island nesting bird was also seen during this study. The reptilian fauna of the river is represented by gharial, mugger and turtles. A single mugger *Crocodylus palustris* was recorded near Kalagarh. Among turtles, a total of seven species i.e., two soft-shell (family Trionychidae) and five species of hard-shell turtles (family Geoemydidae) were recorded. The river has a good population of gharial within the reaches of Corbett National Park. However, no Gangetic dolphin, otter and gharial was reported during the present study from Kalagarh to Ganga confluence.

The depth of the river ranged between 0.3 m and 5 m (average = 1.19 ± 0.07) and the width ranged from 18 to 220 m (average = 94 ± 4.21). Extensive water abstractions from the Kalagarh dam and Harewali barrage are causing significant depletion in the discharge of the river. Such diversions are creating habitat fragmentation and degradation by creating longitudinal barriers.

Rapid biodiversity assessment of the river provided in-depth information about the biodiversity values, habitat availability, and extent of anthropogenic pressure, and thus resulted in the selection of two high biodiversity stretches in the Ramganga River i.e., Govindpur, District Bareilly to Hazratpur, District Budaun (55 km) and Allaganj, District Shahjahanpur to Shyampur, District Hardoi (40 km). These stretches are supporting species of conservation significance and need priority in conservation initiatives to ensure their role as a refuge for the endangered fauna of the river.

The river is passing through the most densely populated landscape of the country. Such overpopulated areas impose unsustainable demand on its riverine resources and services. This study identified few anthropogenic activities as a threat to the ecological integrity of the river in the middle and lower stretch i.e., extensive water abstraction from the Kalagarh dam and Harewali Barrage, riverbed farming, unsustainable fishing and sand mining. The ecological integrity of the river is further threatened by large scale water quality deterioration by the sewage and solid waste discharge from Moradabad.

The Corbett National Park in the upper stretch of the river is providing a refuge to the endangered aquatic fauna like the smooth-coated otter, gharial and golden mahseer. Middle and lower stretches are devoid of any protected area; therefore, conservation priority should be given to the high biodiversity stretches. Identified threats in the middle and lower stretch should be dealt with accordingly. Organic farming along the banks of the river should be promoted. Unsustainable fishing and sand mining practices should be banned. Therefore, restricted fishing with traditional methods and sand mining in certain pockets may only be allowed. Initiatives should be taken by respective administrative authorities to deal with sewage and solid waste coming from Moradabad.

The capacity of frontline staff of the forest department, local communities and other stakeholders should be built to rescue aquatic animals like turtles and mugger in situations of emergency.

1. INTRODUCTION

1.1 Course of the River

The Ramganga River (also referred to as the Western Ramganga) is a spring-fed river and it is the first major north bank tributary of the Ganga River (WWF India, 2019). It originates at Diwali Khal village (79.2938E, 30.1023N) at an elevation of 2,926 m asl in the lower Himalaya in Pauri Garhwal district of Uttarakhand (CWC, 2012). The total length of the river is 596 km with a catchment area of 32,493 km², which is 3.77% of the total Ganga basin (NIH, 1999). After its origin, the river descends through the Corbett Tiger Reserve and emerges from the hills at Kalagarh near the border of the Uttarakhand state (WWF India, 2019). At Kalagarh, a storage dam is constructed across the river to generate 198 MW of energy, and it also diverts water for irrigation (NIH, 1999).

During its course, the river passes through Pauri Garhwal, Chamoli, Almora and Nainital districts of Uttarakhand and Bijnor, Moradabad, Rampur, Bareilly, Budaun, Shahjahanpur, Hardoi and Farrukhabad districts of Uttar Pradesh and finally merges with river Ganga near Kannauj. Major tributaries of the Ramganga River are Mandal, Khoh, East Baigul, Gaagan, Aril, Kosi, Binao, Gagas, Nair, Badangad, Sona, Dhara, Baneilli, Pili, Phika, Dehla, West Baigul (Mishra et al., 2018, WWF India, 2019). Two barrages at Harewali and Bareilly are constructed to divert water from the Ramganga River into the Ramganga feeder canal and Budaun irrigation project canal, respectively (IDUP, 2019).

The Ramganga River may be divided into three zones (Figure 1.1), namely the Himalaya zone (Diwali Khal to Kalagarh Dam), the middle zone (Kalagarh Dam to Khoh River confluence) and the lower zone (Khoh River confluence to Ganga confluence). This zonation is based on variations in geology, geomorphology and soil type of the river.

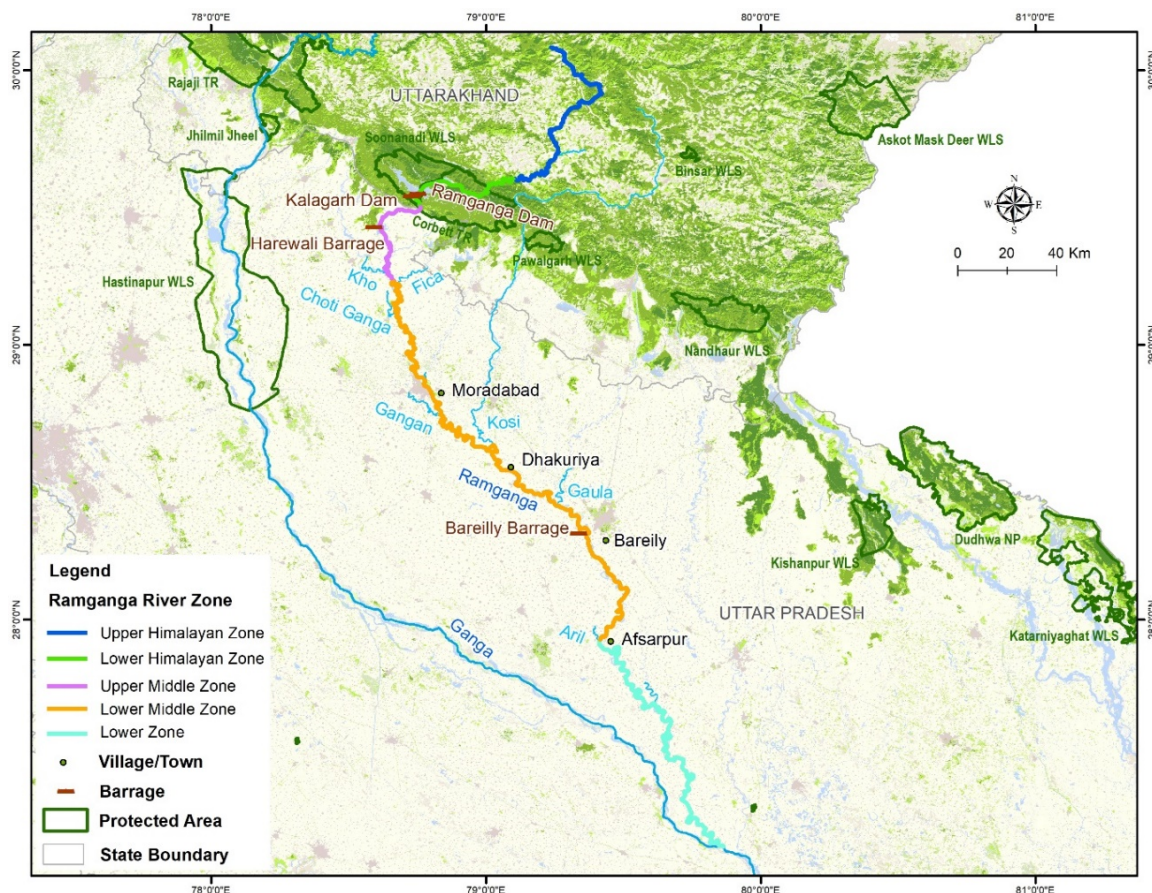


Figure 1.1 Course of the Ramganga River

1.2 Geology, Geomorphology and Soil

After its origin, the river passes through the inner and lesser Himalayan litho-tectonic zone. It flows through the sub-Himalaya before its confluence with the Ganga River in the Kannauj district. The drainage in the upper region of the basin shows dendritic, subparallel, trellis and radial patterns, however, in the Siwalik and the lower region parallel and trellis patterns are common. Ramganga basin in Garhwal Himalaya shows a remarkable variation in the degree of the slope with 64% area under gentle to moderate slope (0°-20°) and 22% steep (>30°) including 4% escarpment (Asthana et al., 2015).

From its origin in the Himalayas to its confluence with the Ganga River, Ramganga shows a degree of variation in its watershed features ranging from steep mountains to deep and narrow Himalayan valleys and finally a vast alluvial plain (Mishra et al., 2018). The Ramganga sub-basin is covered with alluvial soils, that provide good recharge and water holding capacity (Surinaidu et al., 2017).

1.3 Climate

The large variation in altitude across the basin results in diverse climatic conditions ranging from Temperate montane in the upper reaches to Humid Subtropical in the plains. The plain area in the Ramganga shows a variation in winter temperature from 5° to 25° and during summer temperature between 20° to 40° Celsius (WWF India, 2019). Average annual rainfall in the basin ranges between 575 mm and 1400 mm per year (Surinaidu et al. 2017). The basin receives 90% of the rainfall during the south west monsoon (July to September), with the upper reaches of the basin up to Kalimati and Gairsain also receiving some snowfall during the winter season (Asthana et al. 2015).

1.4 Biogeography, Flora and Fauna

The river passes through two biogeographic zones: the Himalayas and Gangetic Plains. The upper stretch of the Ramganga River from origin to Marchula passes through the West Himalaya province (2B) of the Himalaya biogeographic zone while Upper Gangetic Plains (7A) province of the Gangetic Plain biogeographic zone covers the stretch from Marchula to Ganga confluence (Rodgers et al., 2000). Based on Champion and Seth (1968), the upper stretch of the river basin area falls under Himalayan Moist Temperate Forest (*Quercus incana*, *Quercus dilatata*), Western mixed coniferous forest - *Picea-Cedrus-Abies pindrow* type, Moist temperate deciduous forest (*Aesculus indica*, *Acer spp.*) and Subtropical Pine Forest type (Chir pine-*Pinus roxburghii*) (Champion & Seth, 1968; Bahuguna et al., 2016). Major faunal species of this province include Himalayan black bear *Ursus thibetanus* and Goral *Naemorhedus goral* (Suri and Tak, 2010), Smooth-coated otter *Lutrogale perspicillata*, and Eurasian otter (*Lutra lutra*) (Hussain, 2002; Nawab & Hussain, 2012), and golden mahseer *Tor putitora* (Nautiyal et al., 2013).

The Upper Gangetic Plain (7B) province covers 6.3% of the total geographical area of the country (Goyal & Arora, 2009). The major forest types of this zone are Tropical Dry deciduous forest (*Dalbergia sissoo*, *Acacia nilotica* and *Madhuca indica*, *Shorea robusta*, *Albizia procera*, *Terminalia tomentosa*) and Tropical Moist Deciduous Forest (*Shorea robusta*, *Tectona grandis*, *Terminalia arjuna*, *Acacia catechu*, *Anogeissus pendula*, *Acacia arabica*, *Aegle marmelos*, *Prosopis spicigera*, *Acacia catechu*, *Nyctanthes arbortristis*) (Champion & Seth, 1968). Representative terrestrial fauna of the zone includes chital (*Axis axis*) and Sambar (*Rusa unicolor*) (Rodgers et al., 2000), and the representative aquatic fauna is the Gangetic dolphin (*Platanista gangetica*), smooth-coated otter (*L. perspicillata*), gharial (*Gavialis gangeticus*) and mugger (*Crocodylus palustris*) (Rodgers et al., 2000). Representative avifauna from the zone include Sarus crane (*Antigone antigone*), and Indian skimmer (*Rynchops albicollis*). The forests in the foothills are particularly important for the Asian elephant (*Elephas maximus*) and Tiger (*Panthera tigris*) conservation. Corbett Tiger Reserve is an important protected area in the basin.

1.5 Demography and Land use and Land cover changes

The Ramganga basin is spread over 15 districts of Uttarakhand and Uttar Pradesh states (Table 1.1). The basin is home to a population of around 18.6 million people with a population density ranging from 49 to 1284 persons/km². The parts of the basin within the Uttarakhand are comparatively less densely populated than Uttar Pradesh with an average population density of 250 persons/km² and 869.29 persons/km² respectively (Census of India, 2011).

The raster images of the year 2005-06 and 2015-16 were used to generate the six broad categories of land use land cover changes over ten years in the districts along the Ramganga river. A maximum decrease of 9.30% was recorded in fallow land, wherein the area under agriculture shows an increase of 8.53 percent. The built-up area also increased by 0.66 percent (Figures 1.2 & 1.3).

Table 1.1 Average population density in the districts of the Ramganga basin (source: Census of India, 2011)

State	District	Average Population density (person/km ²)
Uttarakhand	Chamoli	49
	Pauri Garhwal	129
	Almora	198
	Nainital	225
	Udham Singh Nagar	649
Uttar Pradesh	Bijnor	807
	Moradabad	1284
	Rampur	987
	Pilibhit	551
	Bareilly	1080
	Jyotiba Phule Nagar	818
	Sambhal	904.9
	Budaun	712
	Shahjahanpur	685
	Farrukhabad	864

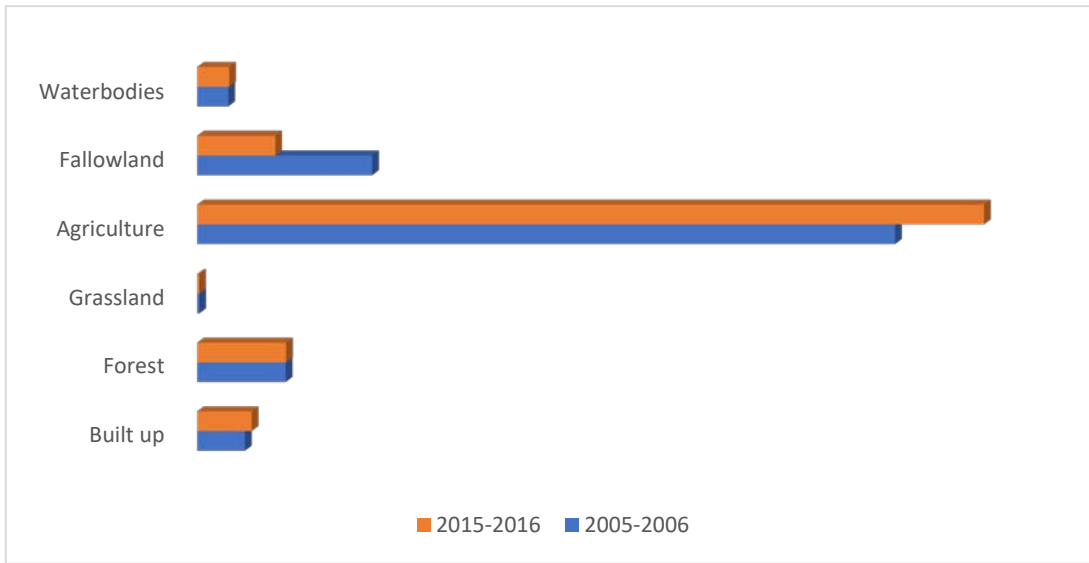


Figure 1.2 Change in Land use Land cover along Ramganga River

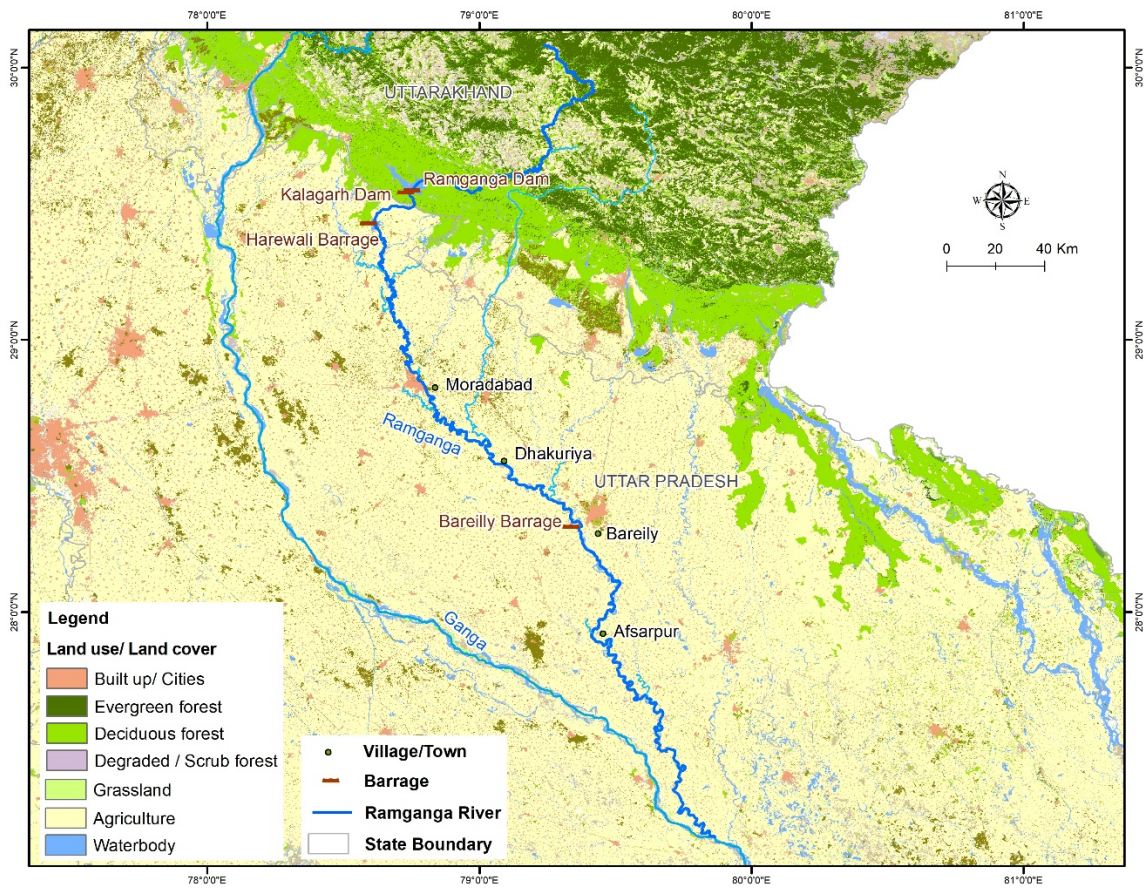


Figure 1.3 Land use Land cover in Ramganga River basin

2. STATUS OF AQUALIFE IN THE RAMGANGA RIVER

The Ramganga River supports 102 fish species, including the endangered golden mahseer (Atkore et al., 2011; Tare, 2012; Pandey & Upadhyay, 2016; Das et al., 2020). Eurasian otter, smooth-coated otter, gharial and mugger are the representative aquatic species found in the Ramganga River (Table 2.1). Intensive studies on otters, birds, gharial and fish have been conducted in the river. However, the information on these is from few selected locations along the river, comprehensive information on distribution, abundance and conservation issues from the entire length of the river is lacking. To overcome this and to obtain conservation baseline data, the current rapid biodiversity assessment was undertaken along the Ramganga River.

Table 2.1 Representative aquatic fauna from two biogeographic zones of the Ramganga River

Class	Representative species	IUCN status	CITES	IWPA status
Himalaya (West Himalaya – 2B)				
Mammalia	Eurasian otter	Near Threatened	Appendix I	Schedule I
Reptilia	Gharial	Critically Endangered	Appendix I	Schedule I
Actinopterygii	Golden mahseer	Endangered	Not listed	Not listed
Gangetic Plain (Upper Gangetic Plain – 7A)				
Mammalia	Gangetic dolphin	Endangered	Appendix I	Schedule I
	Smooth-coated otter	Vulnerable	Appendix II	Schedule II
Aves	Sarus crane	Vulnerable	Appendix II	Schedule IV
Reptilia	Gharial	Critically Endangered	Appendix I	Schedule I

2.1 Methodological Framework

The status of the important aquatic vertebrates was assessed from an extensive literature review followed by a rapid biodiversity assessment of the Ramganga River. The literature on historical and recent abundance and distribution of the key fauna of the river and the possible threats to its survival was reviewed thoroughly and was incorporated with results of rapid biodiversity assessment of the Ramganga River. The rapid biodiversity assessment was carried out during December 2020, covering a distance of around 450 km, from Kalagarh to Kusumkhor in Uttar Pradesh. Data for avian diversity was collected using the total count method (Urfi et al., 2005) and the visual encounter survey method was used for turtles, where all the basking turtles along banks and islands were recorded (Gray et. al., 2013).

The data on the status and distribution of species, their relative abundance, threats to their survival and habitat variables including channel depth were collected during rapid biodiversity assessment and were integrated to identify the high biodiversity stretches of the river.

Annexures I to IV list the species of the Ramganga River based on previous studies and the present study. The lesser flamingo (*Phoeniconaias minor*) (Annexure II) was recorded for the first time during this study (Gangaiamaran et al., 2021). The following sections describe the status of key aquatic species of the Ramganga River.

2.2 Mammals

Three mammalian species are known to occur in the Ramganga River, the Gangetic dolphin and two species of otters namely Smooth-coated otter (*Lutrogale perspicillata*) and Eurasian otter (*Lutra lutra*) (Annexure I).

Gangetic dolphin (*Platanista gangetica*)

Anecdotal sightings of Gangetic dolphin are reported from Dabri village in Farrukhabad during the flood season (WWF India, 2019). However, during the present survey, dolphins were not sighted in the river.

Otters

Smooth-coated otter and Eurasian otter are reported to occur in the upper and middle zones of Ramganga River up to Kalagarh Dam (Hussain, 2002; Nawab & Hussain 2012). Otters were not sighted during the present survey from Kalagarh to Kusumkhor.

2.3 Avifauna

Studies on waterbirds indicate that the Ramganga basin supports about 78 species (Bhattacharjee & Bargali, 2012). During the present survey, we recorded a total of 90 species of waterbirds and wetland-dependent birds belonging to 23 families and 13 orders. Anatidae was the most dominant, with 15.38% individuals, followed by Scolopacidae (14.29%) and Ardeidae (9.89%). Only 1.10% of individuals were reported from family Gruidae, Glareolidae and Phoenicopteridae (Figure 1.4) (Appendix II). The bird taxonomy and nomenclature follow Grimmett et al. (2016). Information on bird diets for classification into diet guilds was compiled from Ali & Ripley (1983).

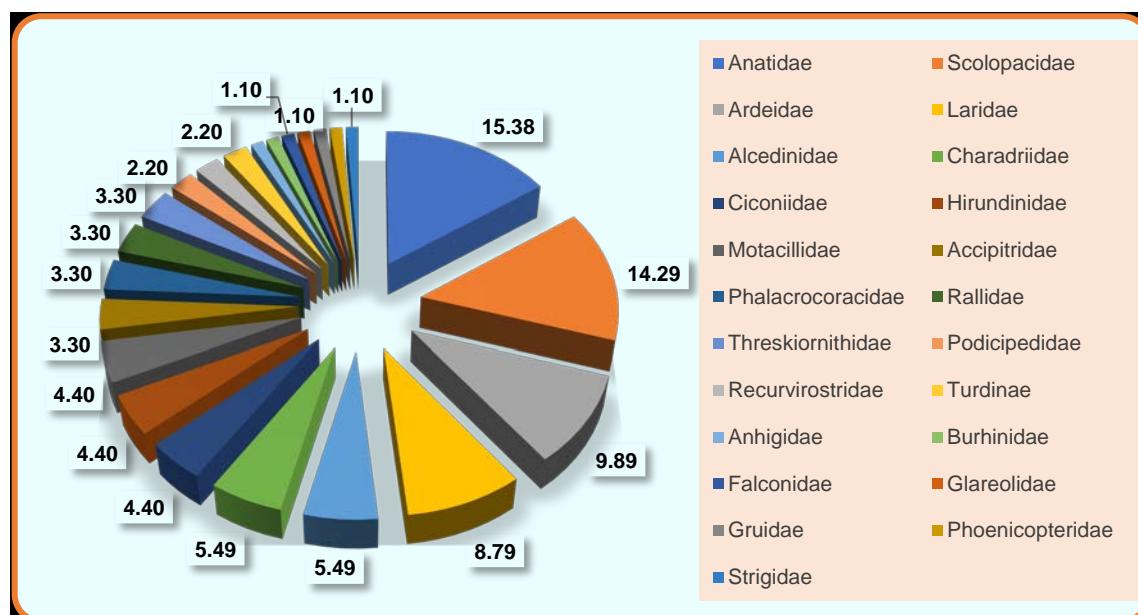


Figure 1.4 Family wise abundance (%) of waterbirds in Ramganga River

Of the total waterbird species recorded from Ramganga River, 3.3% are listed endangered (EN), 4.4% are Vulnerable (VU), 11.0% are near threatened (NT) and the remaining 81.3% species are listed as Least concern (LC) (Appendix II) as per IUCN Red List (Figure 1.5) (BirdLife International, 2020).

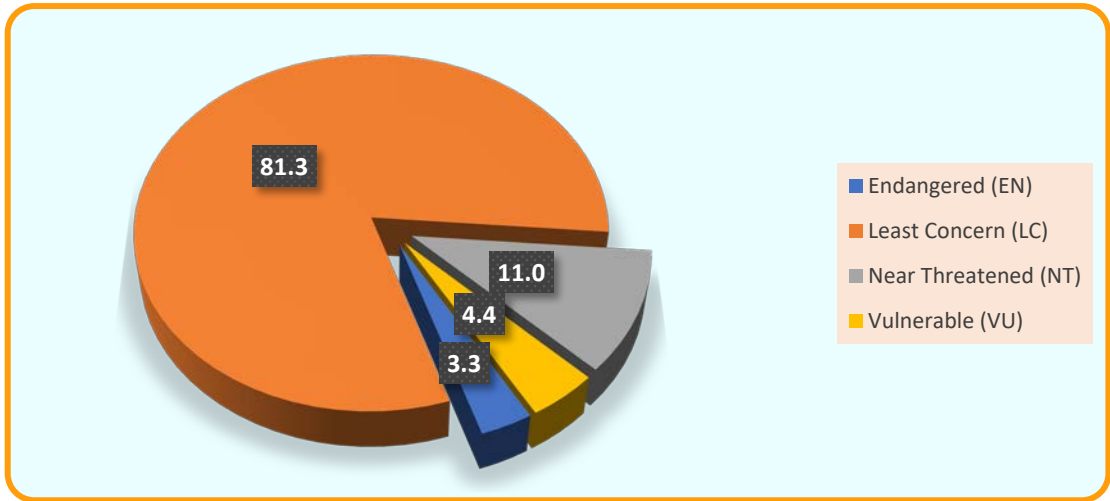


Figure 1.5 IUCN Red List status of waterbirds (% species) of Ramganga River

Out of total recorded waterbird species, 45.55% species were resident and 8.89% were resident with local migration. About 16.67% of species were residents with winter influx, and only 28.89% were winter migrants (Figure 1.6) (Appendix II) (Kumar et al., 2005).

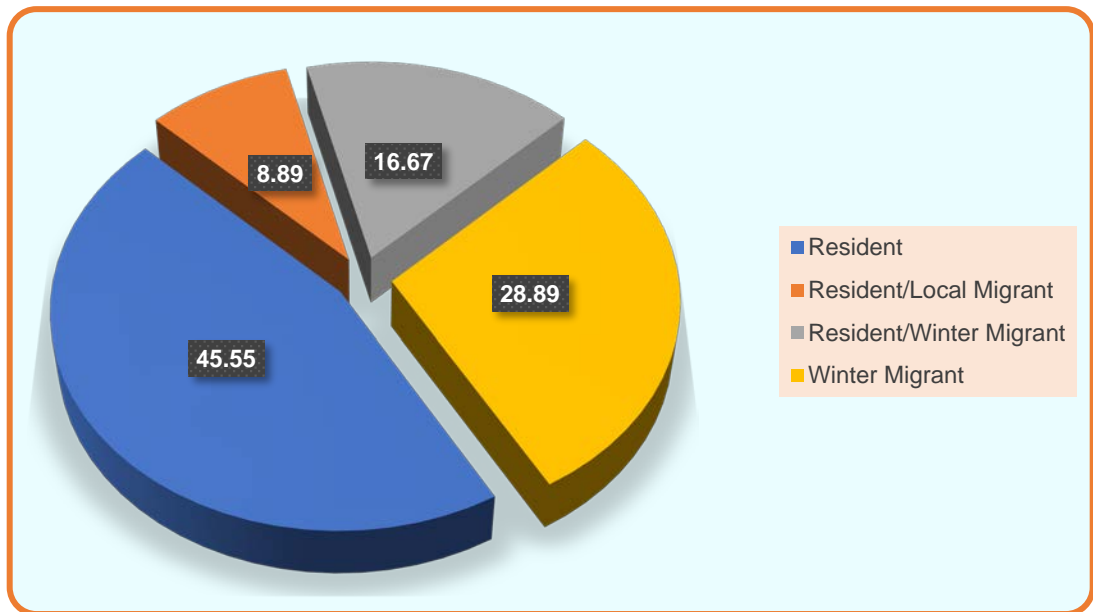


Figure 1.6 Residential status of waterbirds (% species) of Ramganga River

The majority of the species (40.00%) recorded were carnivores, followed by 27.78% piscivores, 15.56% omnivores and 11.11% were insectivores. The least represented feeding guild was herbivores, with only 5.55% species (Figure 1.7).

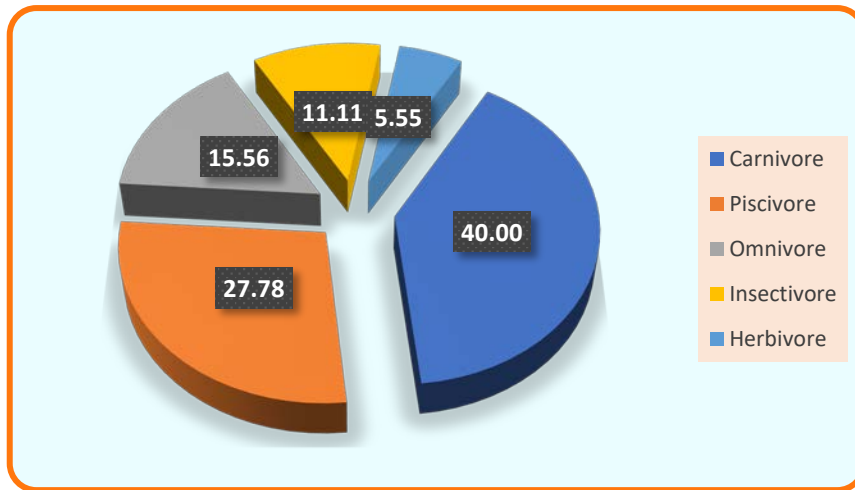


Figure 1.7 Waterbirds and wetland-dependent species (%) under different feeding guilds

During the rapid biodiversity assessment individuals of black-bellied tern (*Sterna acuticauda*), Indian skimmer (*Rynchops albicollis*), sarus crane (*Antigone antigone*), river tern (*Sterna aurantia*), river lapwing (*Vanellus duvaucelii*), painted stork (*Mycteria leucocephala*), great thick-knee (*Esacus recurvirostris*), and little pratincole (*Glareo lactea*) were observed (Figure 1.8).

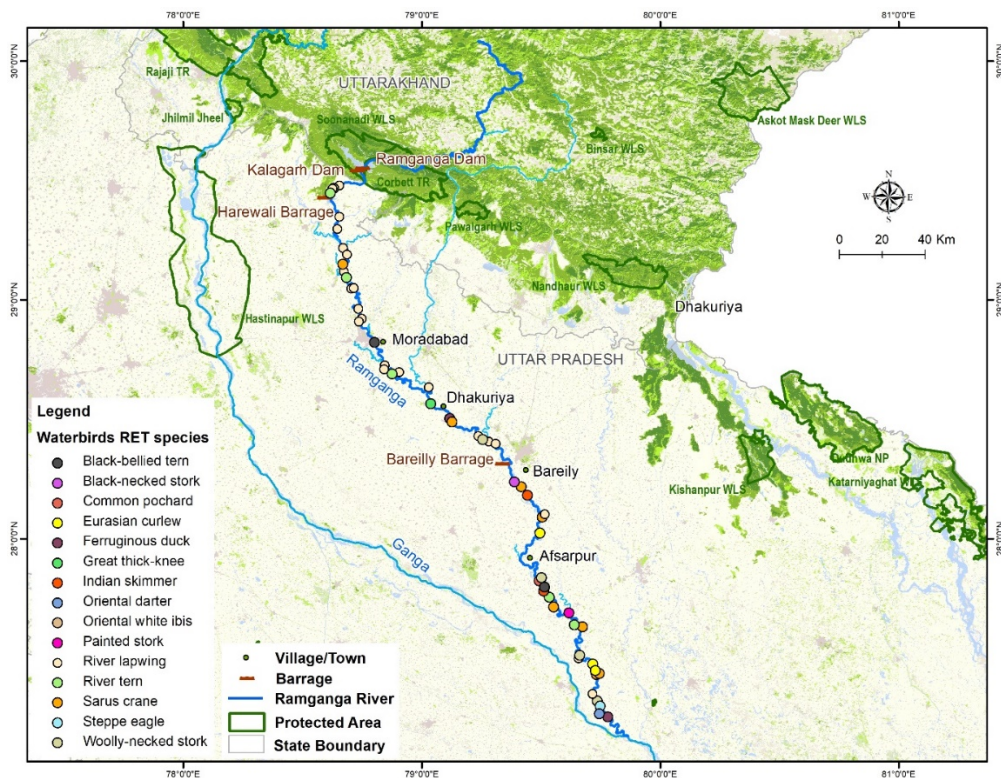


Figure 1.8 Distribution of Rare, Endemic or Threatened (RET) species of waterbirds

2.4 Reptiles

Crocodylian

Mugger and gharial are the two species of crocodylians reported from the river. The Ramganga along with other Indian rivers, viz. Ghaghara, Gandak, Kosi and Girwa formerly supported a large population of gharial (Whitaker, 1979). The most suitable gharial habitat in the Ramganga river was inundated due to the establishment of the Kalagarh Reservoir (Whitaker, 1979). Between 1985 and 1994, a total of 257 individuals of gharial were released in the Corbett National Park, which has led to the establishment of a gharial population in the area (Chowfin & Leslie, 2016). Thus, the presence of gharial in Ramganga River is now restricted to the stretch falling within Corbett Tiger Reserve, where they breed in the lentic habitat (Chowfin & Leslie, 2016). Gharial was not reported during the present survey between Kalagarh to Kusumkhor.

The mugger is a widely distributed species and occasional sightings are reported from the Ramganga River (WWF India, 2019). A single mugger was sighted near Kalagarh during the present survey of the river.

Turtles

Of the thirteen species of freshwater turtles reported from the Ganga basin, eight species are reported to occur in the Ramganga (WWF India, 2019 & Tare, 2012). During the current survey, seven species were encountered along the Ramganga River namely three-striped roofed turtle (*Batagur dhongoka*), Black Pond turtle (*Geoclemys hamiltonii*), Indian roofed turtle (*Pangshura tecta*), Indian tent turtle (*Pangshura tentoria*), Brown roofed turtle (*Pangshura smithii*), Indian softshell turtle (*Nilssonina gangetica*), and Indian Flapshell turtle (*Lissemys punctata*) (Figure 1.9).

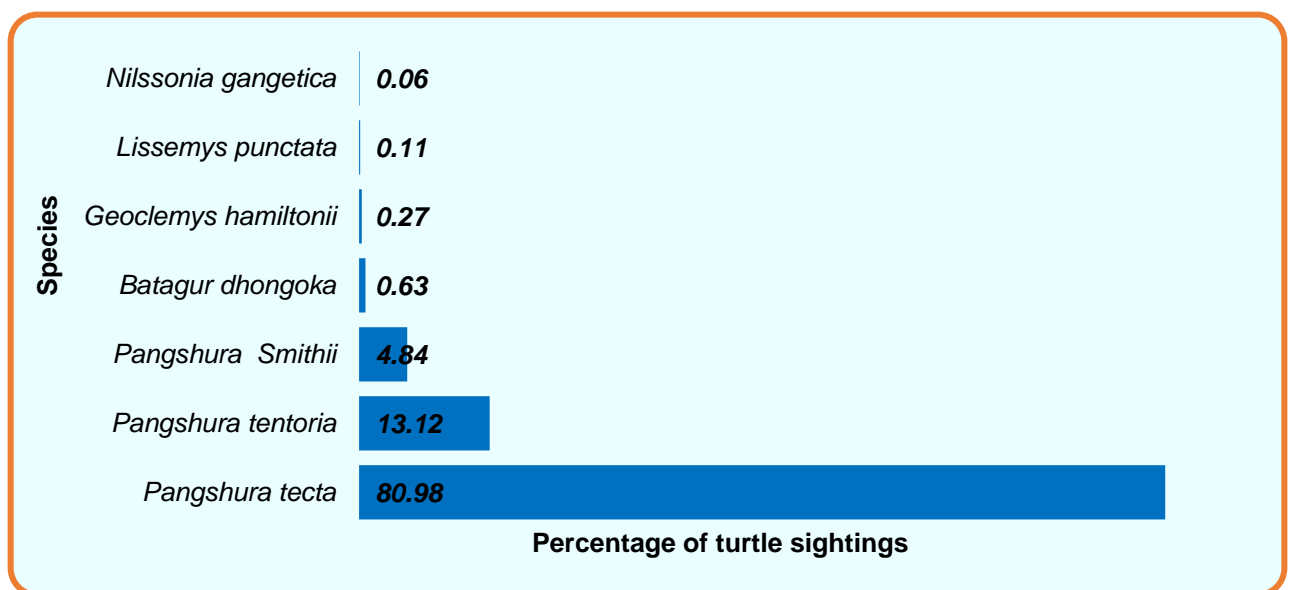


Figure 1.9 Species wise abundance of turtles in Ramganga River

2.5 Amphibians

Mehta (2008) reported a total of ten amphibian species (9 genera, 3 families) from the Corbett Tiger Reserve. Amphibians were not observed during this study. Extensive studies are needed to assess the population status of these species in the Ramganga River.

2.6 Fish

Pathak and Alam (2010) reported 49 fish species, whereas Atkore *et al.* (2011) reported 46 fish species from the Himalayan zone of the river. The most recent study reported 92 fish species representing 64 genera from the Ramganga River (Das *et al.*, 2020).

2.7 Depth Regime

Habitat-defining variables including water depth were determined along the entire length of the river. The thematic diagram shows the depth profile of the Ramganga River from Kalagarh to Kusumkhor during the winter season (Figures 1.10 & 1.11). In this stretch of the river, depth ranged between 0.3 m to 5.0 m with an average of 1.20 ± 0.07 m.

Ramganga River is a tributary with a high pollution load and low flow owing to water abstractions from Kalagarh and Harewali barrage, which renders the river almost dry. The filling of the Bareilly barrage will ultimately grim the low flow situation of the river.

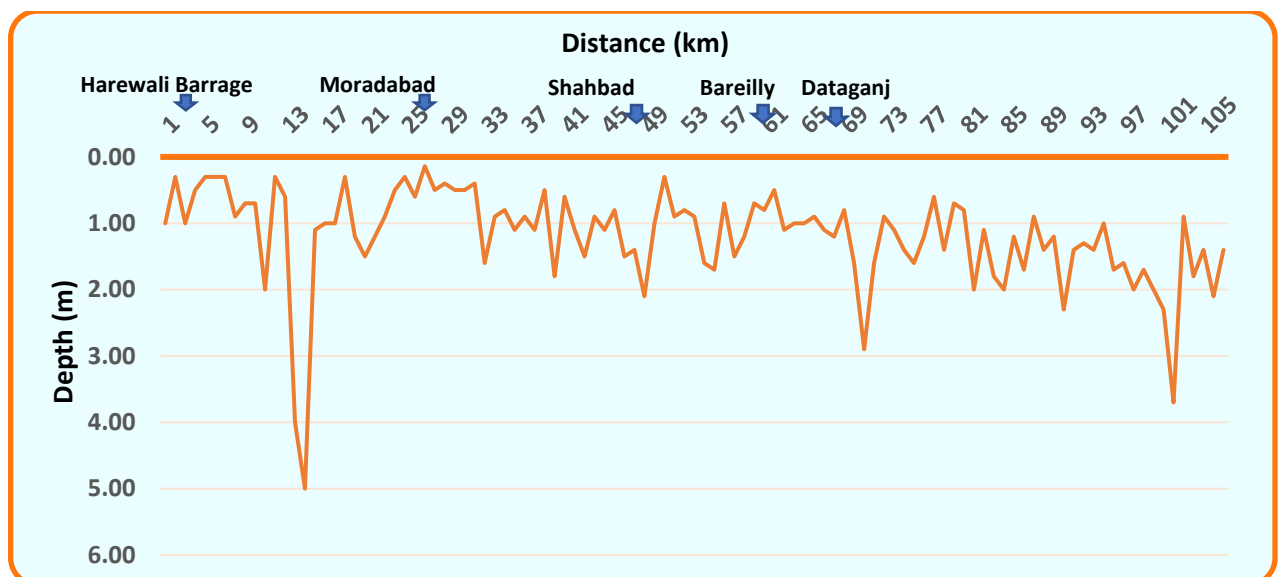


Figure 1.10 Depth profile of Ramganga River from Kalagarh to Kusumkhor

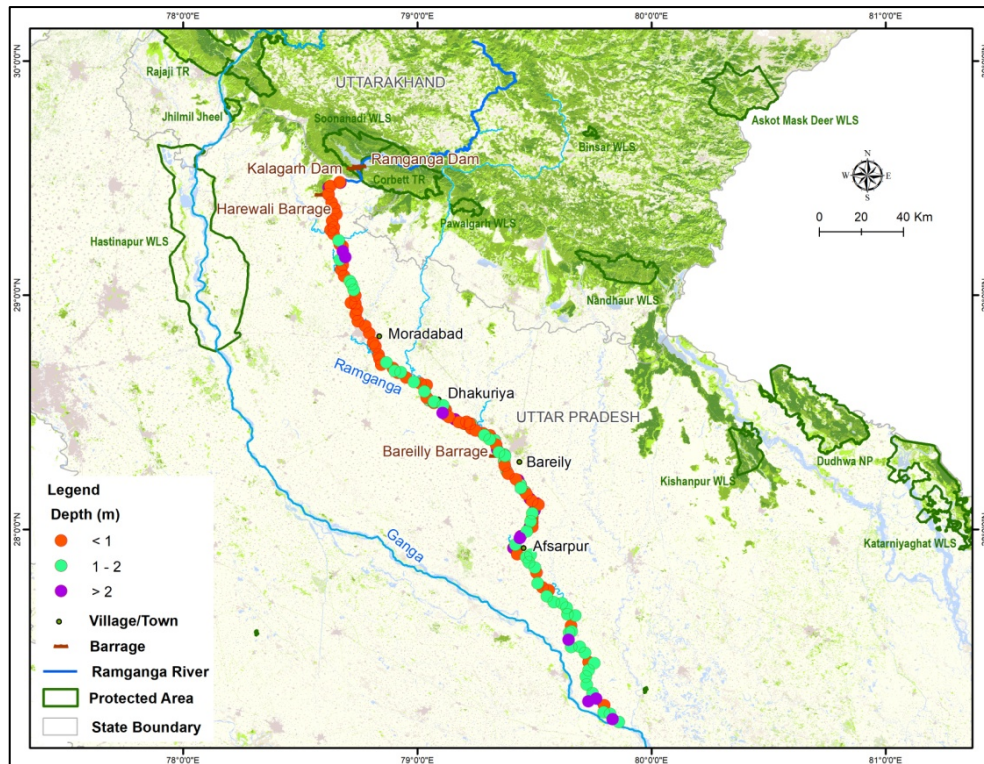


Figure 1.11 Depth regime of Ramganga River

2.8 River Stretches with High Biodiversity Value

Two high biodiversity stretches covering around 16% (95 km) of the total river length were identified based on species encounter rate, habitat quality and the extent of anthropogenic activities.

Stretch I: Govindpur to Hazratpur

This is a 55 km stretch between Govindpur in District Bareilly to Hazratpur in District Budaun. This stretch in the middle zone of the river is characterized by frequent meanders and shallow river depth with intermittent deep pools.

Biodiversity value and ecological significances

This stretch supports 37 species of waterbirds including the Near Threatened river lapwing and river tern. Two species of turtles were recorded from this stretch.

Stretch II: Allaganj to Shyampur

This is a 40 km stretch between Allaganj in Shahjahanpur and Shyampur in Hardoi. This stretch in the lower zone of the river is characterized by frequent meanders and small sandy islands.

Biodiversity value and ecological significances

This stretch supports 32 species of waterbirds including Endangered black-bellied tern. Six species of turtles were recorded from this stretch.

In both of these stretches, local communities are dependent on the river for their livelihood, ranging from agriculture to fishing.

3. THREATS TO THE BIODIVERSITY OF THE RAMGANGA RIVER

3.1 Upper zone of Ramganga (Himalaya zone)

This stretch is passing through the ecologically sensitive and fragile Himalayas. The stretch serves as a habitat for the rich biodiversity of the region including vulnerable species, for example, smooth-coated otter (Gupta et al., 2019).

Located amidst the Himalayan Mountain range, this zone of the river is highly sensitive and ecologically fragile. The zone is high in biodiversity value hosting habitats for species of conservation significance such as smooth-coated otters (Gupta et al., 2019), golden mahseer (WWF India, 2019) and gharial (Chowfin & Leslie, 2016). The human population density is low compared to the middle and lower stretches. A total of 20 potential hydroelectric sites has been identified in this stretch. These projects may pose a significant risk to connectivity along the Ramganga River (WWF India, 2019).

3.2 Middle zone of Ramganga

This zone is characterized by a shallow river depth with frequent meandering. This zone holds a good population of residential and migratory waterbirds. A good population of turtles was also recorded in the zone. Water abstraction from the Kalagarh and Harewali Barrage has reduced the flow of the Ramganga River to less than 10% of the natural flow regime in the non-monsoon months, resulting in disruption of the horizontal and longitudinal connectivity between habitats for the priority species. Bank feature alteration due to agriculture has disrupted the lateral connectivity of the river. Extensive sandbar cultivation has rendered the habitat unsuitable for use as nesting sites by turtles and island-nesting birds. Presence of two Class I cities, viz. Moradabad and Bareilly in this zone add to the wastewater discharge in the river (Khan et al., 2016).

3.3 Lower zone of Ramganga

The lower zone of the river is almost similar to the middle zone in biodiversity values, anthropogenic pressure and habitat features. Alteration of the bank features due to agricultural practices has disrupted the geomorphological features of the river. Indiscriminate use of pesticides and fertilizers in the agriculture fields along the river is further adding to the nutrient and toxic chemical load of the river.



4. CONSERVATION IMPLICATIONS

The Ramganga River passes through the high biodiversity Himalayan region and the human-dominated landscapes of the Upper Gangetic plains. The river flows through the Corbett National Park, which harbours the diverse floral and faunal species assemblages, as it lies within the transition of the Himalayas and the Gangetic Plains and thus has elements of both biogeographic regions. Based on the rapid biodiversity assessment and extensive review of the secondary literature, the following points have been suggested to conserve the unique aquatic biodiversity of the Ramganga river.

Stretch-specific Implications

- ◆ The Corbett National Park provides shelter to the major aquatic species of the Ramganga River including smooth-coated otter, gharial and the golden mahseer. Any disturbance to the flow of the river in upstream should be avoided to preserve the rich aquatic biodiversity.
- ◆ The middle and lower zones of the river are facing severe challenges due to flow alteration. An efficient irrigation canal network and promotion of drought-tolerant traditional food crops would help to address the growing water demand for irrigation.
- ◆ The use of pesticides and fertilizers is prevalent in the agriculture fields, which drains into the river and adds to the nutrient and toxic chemical load. Promotion of organic and traditional farming practices should be encouraged throughout the Ramganga river.
- ◆ Industrial and domestic discharges are also a major cause of concern in the middle and lower zone. Addressing these through technical interventions is needed.

Species restoration

- ◆ A stretch of around 40 km passing through the Corbett National Park harbours keystone aquatic fauna. The distribution of smooth-coated otters and gharial is restricted only to this stretch in the river.
- ◆ Turtles are highly sensitive to anthropogenic alterations and are therefore conservation-dependent species. However, their habitats in the Ramganga River are not protected after the Kalagarh dam and are susceptible to regular human disturbances. Bank alteration and riverbed agriculture have resulted in competitive use of sandy banks and loss of basking and nesting sites, threatening the survival of turtles. Therefore, aligning conservation initiatives with local livelihoods is a prerequisite. Awareness and sensitization programmes, rescue and rehabilitation measures for aquatic species in distress are required.
- ◆ Resident waterbirds such as little pratincole and river lapwing use sandy islands for nesting, hence these habitats need to be protected.

Emergent situations

Incidental mortalities of the turtles by entanglement in fishing nets, poaching and a lack of concerted efforts to address these issues are major concerns. To be prepared for such a situation in the future, rescue protocols involving stakeholders as well as a network of rescue & rehabilitation centres need to be established along the river. For the long-term success of this operation, it is important to build the capacity of the frontline staff of the forest department, local communities and other stakeholders along the Ramganga River so that they can successfully carry out rescue operations of priority aquatic species.

Way forward

- ◆ Planning for ecological restoration of an ecosystem starts with exploring its historical and present-day conditions, for which a literature review and rapid biodiversity assessment were carried out. These also helped identify areas with high biodiversity values.
- ◆ The water quality of the Ramganga River has been severely degraded due to domestic, industrial and agricultural sources, which has been compounded by an altered low water flow regime due to water diversion projects. These may lead to long-lasting impacts on the river geomorphology and nutrient/chemical regime.
- ◆ The impact of climate change is exacerbating threats in the form of unpredictable flow regimes and changes in both upstream and downstream distribution range of species. The restoration process should thus take into account the externalities caused by climate change, using future scenario modelling techniques to make climate change projections and evaluate their impacts on species and habitats.
- ◆ Planning river restoration is not only a conservation issue but also a social one owing to the high dependence of the dense human population living along the banks of the Ramganga river.



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ANNEXURE I

Mammalian species of the Ramganga River

Family	Common Name	Scientific Name	IUCN Status	IWPA status	Previous study	Present study	Biogeographic province (2B, 7A)
Mustelidae	Eurasian otter	<i>Lutra lutra</i>	Near Threatened	Schedule I	1,2,3,4		7A
	Smooth-coated otter	<i>Lutrogale perspicillata</i>	Vulnerable	Schedule II	1,2,3,4		7A

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ANNEXURE II

Waterbirds and water associated bird species of the Ramganga River

Family	Common Name	Scientific Name	IUCN Status	IWPA status	Present study	Biogeographic province (2B, 7A)
Anatidae	Bar-headed Goose	<i>Anser indicus</i>	LC	Schedule IV	+	7A
	Greylag Goose	<i>Anser anser</i>	LC	Schedule IV	+	7A
	Greater White-fronted Goose	<i>Anser albifrons</i>	LC	Schedule IV	+	7A
	Common Shelduck	<i>Tadorna tadorna</i>	LC	Schedule IV	+	7A
	Ruddy Shelduck	<i>Tadorna ferruginea</i>	LC	Schedule IV	+	7A
	Red-crested Pochard	<i>Netta rufina</i>	LC	Schedule IV	+	7A
	Common Pochard	<i>Aythya ferina</i>	VU	Schedule IV	+	7A
	Ferruginous Duck	<i>Aythya nyroca</i>	NT	Schedule IV	+	7A
	Northern Shoveler	<i>Spatula clypeata</i>	LC	Schedule IV	+	7A
	Gadwall	<i>Mareca strepera</i>	LC	Schedule IV	+	7A
	Eurasian Wigeon	<i>Mareca penelope</i>	LC	Schedule IV	+	7A
	Indian Spot-billed Duck	<i>Anas poecilorhyncha</i>	LC	Schedule IV	+	7A
	Northern Pintail	<i>Anas acuta</i>	LC	Schedule IV	+	7A
	Common Teal	<i>Anas crecca</i>	LC	Schedule IV	+	7A
Podicipedidae	Little Grebe	<i>Tachybaptus ruficollis</i>	LC	Schedule IV	+	7A
	Great Crested Grebe	<i>Podiceps cristatus</i>	LC	Schedule IV	+	7A
Phoenicopteridae	Lesser Flamingo	<i>Phoeniconaias minor</i>	NT	Schedule IV	+	7A
Rallidae	White-breasted Waterhen	<i>Amaurornis phoenicurus</i>	LC	Schedule IV	+	7A

	Common Coot	<i>Fulica atra</i>	LC	Schedule IV	+	7A
	Brown Crake	<i>Amaurornis akool</i>	LC	Schedule IV	+	7A
Gruidae	Sarus Crane	<i>Antigone antigone</i>	VU	Schedule IV	+	7A
Ciconiidae	Painted Stork	<i>Mycteria leucocephala</i>	NT	Schedule IV	+	7A
	Asian Openbill	<i>Anastomus oscitans</i>	LC	Schedule IV	+	7A
	Asian Woollyneck	<i>Ciconia episcopus</i>	NT	Schedule IV	+	7A
	Black-necked Stork	<i>Ephippiorhynchus asiaticus</i>	NT	Schedule IV	+	7A
Threskiornithidae	Eurasian Spoonbill	<i>Platalea leucorodia</i>	LC	Schedule I	+	7A
	Black-headed Ibis	<i>Threskiornis melanocephalus</i>	NT	Schedule IV	+	7A
	Red-naped Ibis	<i>Pseudibis papillosa</i>	LC	Schedule IV	+	7A
Ardeidae	Black-Crowned Night-heron	<i>Nycticorax nycticorax</i>	LC	Schedule IV	+	7A
	Green-backed Heron	<i>Butorides striata</i>	LC	Schedule IV	+	7A
	Indian Pond-heron	<i>Ardeola grayii</i>	LC	Schedule IV	+	7A
	Cattle Egret	<i>Bubulcus ibis</i>	LC	Schedule IV	+	7A
	Grey Heron	<i>Ardea cinerea</i>	LC	Schedule IV	+	7A
	Purple Heron	<i>Ardea purpurea</i>	LC	Schedule IV	+	7A
	Great White Egret	<i>Ardea alba</i>	LC	Schedule IV	+	7A
	Intermediate Egret	<i>Ardea intermedia</i>	LC	Schedule IV	+	7A
	Little Egret	<i>Egretta garzetta</i>	LC	Schedule IV	+	7A
Phalacrocoracidae	Little Cormorant	<i>Microcarbo niger</i>	LC	Schedule IV	+	7A
	Great Cormorant	<i>Phalacrocorax carbo</i>	LC	Schedule IV	+	7A
	Indian Cormorant	<i>Phalacrocorax fuscicollis</i>	LC	Schedule IV	+	7A
Anhingidae	Oriental Darter	<i>Anhinga melanogaster</i>	NT	Schedule IV	+	7A
Burhinidae	Great Thick-knee	<i>Esacus recurvirostris</i>	NT	Schedule IV	+	7A
Recurvirostridae	Pied Avocet	<i>Recurvirostra avosetta</i>	LC	Schedule IV	+	7A
	Black-winged Stilt	<i>Himantopus himantopus</i>	LC	Schedule IV	+	7A
Charadriidae	Little Ringed Plover	<i>Charadrius dubius</i>	LC	Schedule IV	+	7A
	Lesser Sandplover	<i>Charadrius mongolus</i>	LC	Schedule IV	+	7A

	Kentish Plover	<i>Charadrius alexandrinus</i>	LC	Schedule IV	+	7A
	River Lapwing	<i>Vanellus duvaucelii</i>	NT	Schedule IV	+	7A
	Red-wattled Lapwing	<i>Vanellus indicus</i>	LC	Schedule IV	+	7A
Scolopacidae	Eurasian Curlew	<i>Numenius arquata</i>	NT	Schedule IV	+	7A
	Ruff	<i>Calidris pugnax</i>	LC	Schedule IV	+	7A
	Temminck's Stint	<i>Calidris temminckii</i>	LC	Schedule IV	+	7A
	Dunlin	<i>Calidris alpina</i>	LC	Schedule IV	+	7A
	Little Stint	<i>Calidris minuta</i>	LC	Schedule IV	+	7A
	Common Snipe	<i>Gallinago gallinago</i>	LC	Schedule IV	+	7A
	Common Sandpiper	<i>Actitis hypoleucos</i>	LC	Schedule IV	+	7A
	Green Sandpiper	<i>Tringa ochropus</i>	LC	Schedule IV	+	7A
	Spotted Redshank	<i>Tringa erythropus</i>	LC	Schedule IV	+	7A
	Common Greenshank	<i>Tringa nebularia</i>	LC	Schedule IV	+	7A
	Common Redshank	<i>Tringa totanus</i>	LC	Schedule IV	+	7A
	Wood Sandpiper	<i>Tringa glareola</i>	LC	Schedule IV	+	7A
	Marsh Sandpiper	<i>Tringa stagnatilis</i>	LC	Schedule IV	+	7A
	Glareolidae	Little Pratincole	<i>Glareo lalactea</i>	LC	Not listed	+
Laridae	Indian Skimmer	<i>Rynchops albicollis</i>	EN	Not listed	+	7A
	Black-headed Gull	<i>Larus ridibundus</i>	LC	Schedule IV	+	7A
	Pallas's Gull	<i>Larus ichthyaetus</i>	LC	Schedule IV	+	7A
	Little Tern	<i>Sterna albifrons</i>	LC	Not listed	+	7A
	Common Gull-billed Tern	<i>Gelochelidon nilotica</i>	LC	Not listed	+	7A
	Whiskered Tern	<i>Chlidonias hybrida</i>	LC	Schedule IV	+	7A
	River Tern	<i>Sterna aurantia</i>	VU	Not listed	+	7A
	Black-bellied Tern	<i>Sterna acuticauda</i>	EN	Not listed	+	7A
Strigidae	Brown Fish-owl	<i>Ketupa zeylonensis</i>	LC	Schedule IV	+	7A
Accipitridae	Steppe Eagle	<i>Aquila nipalensis</i>	EN	Schedule I	+	7A
	Brahminy Kite	<i>Haliastur indus</i>	LC	Schedule I	+	7A
Alcedinidae	Pied Kingfisher	<i>Ceryle rudis</i>	LC	Schedule IV	+	7A

	Stork-billed Kingfisher	<i>Pelargopsis capensis</i>	LC	Schedule IV	+	7A
	White-breasted Kingfisher	<i>Halcyon smyrnensis</i>	LC	Schedule IV	+	7A
	Common Kingfisher	<i>Alcedo atthis</i>	LC	Schedule IV	+	7A
	Crested Kingfisher	<i>Megaceryle lugubris</i>	LC	Schedule IV	+	2B
Falconidae	Peregrine Falcon	<i>Falco peregrinus</i>	LC	Schedule I	+	7A
Hirundinidae	Red-rumped Swallow	<i>Cecropis daurica</i>	LC	Not listed	+	2B
	Barn Swallow	<i>Hirundo rustica</i>	LC	Not listed	+	7A
	Wire-tailed Swallow	<i>Hirundo smithii</i>	LC	Not listed	+	2B
	Asian Plain Martin	<i>Riparia chinensis</i>	LC	Not listed	+	7A
Muscicapidae	White-capped Redstart	<i>Phoenicurus leucocephalus</i>	LC	Schedule IV	+	2B
	Plumbeous Water-redstart	<i>Phoenicurus fuliginosus</i>	LC	Schedule IV	+	2B
Motacillidae	White Wagtail	<i>Motacilla alba</i>	LC	Schedule IV	+	7A
	Citrine Wagtail	<i>Motacilla citreola</i>	LC	Schedule IV	+	7A
	Western Yellow Wagtail	<i>Motacilla flava</i>	LC	Schedule IV	+	7A
	White-browed Wagtail	<i>Motacilla maderaspatensis</i>	LC	Schedule IV	+	7A

ANNEXURE III

Crocodylian species of the Ramganga River

Family	Common Name	Scientific Name	IUCN Status	IWPA status	Previous study	Present study	Biogeographic province (2B, 7A)
Crocodylidae	Mugger	<i>Crocodylus palustris</i>	Vulnerable	Schedule I	1,2,3	+	7A
Gavialidae	Gharial	<i>Gavialis gangeticus</i>	Critically Endangered	Schedule I	3,4,5		7A

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ANNEXURE IV

Turtle species of the Ramganga River

Family	Common Name	Scientific Name	IUCN Status	IWPA status	Previous study	Present study	Biogeographic province (2B, 7A)
Geoemydidae	Three-striped roofed turtle	<i>Batagur dhongoka</i>	CR	Not listed		+	7A
	Spotted pond turtle	<i>Geoclemys hamiltonii</i>	EN	Not listed	2	+	7A
	Indian black turtle	<i>Melanochelys trijuga</i>	NT	Not listed	1		7A
	Tricarinate hill turtle	<i>Melanochelys tricarinata</i>	VU	Schedule I	1		7A
	Brown roofed turtle	<i>Pangshura smithii</i>	NT	Not listed	2	+	7A
	Indian roofed turtle	<i>Pangshura tecta</i>	LC	Schedule I	2	+	7A
	Indian tent turtle	<i>Panshura tentoria</i>	LC	Not listed	2	+	7A
Trionychidae	Indian softshell turtle	<i>Nilssonia gangetica</i>	VU	Schedule I	2	+	7A
	Indian flapshell turtle	<i>Lissemys punctata</i>	LC	Schedule I	1,2	+	7A

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ANNEXURE V

Fish species of the Ramganga River

Family	Common Name	Scientific Name	IUCN Status	IWPA status	Previous study	Present study	Biogeographic province (2B, 7A)
Cyprinidae	Common carp	<i>Cyprinus carpio</i> (Linnaeus, 1758)	VU			a	
	Stone roller	<i>Tariqilabeo latius</i> (Hamilton, 1822)	LC			a, b, c	
		<i>Labeo dyocheilus</i> (McClelland, 1839)	LC			a, b, c	
	Pangusia labeo	<i>Labeo pangusia</i> (Hamilton, 1822)	NT			a	
	Karnataka labeo, Orange-fin labeo	<i>Labeo calbasu</i> (Hamilton, 1822)	LC			a, b, c	
	Kuria labeo	<i>Labeo gonius</i> (Hamilton, 1822)	LC			a	
	Rohu	<i>Labeo rohita</i> (Hamilton, 1822)	LC			a, c	
	Boggut labeo	<i>Labeo boggut</i> (Sykes, 1839)	LC			a	
	Boga labeo	<i>Labeo boga</i> (Hamilton, 1822)	LC			a	
	Minor carp, Bata, Bata labeo	<i>Labeo bata</i> (Hamilton, 1822)	LC			a	
	Angra labeo	<i>Labeo angra</i> (Hamilton, 1822)	LC			a	
	Kalabans	<i>Bangana dero</i> (Hamilton, 1822)	LC			a, b, c, d	
	Reba carp	<i>Cirrhinus reba</i> (Hamilton, 1822)	LC			a	
	Mrigal, Mirka	<i>Cirrhinus mrigala</i> (Hamilton, 1822)	LC			a	
	Grass carp	<i>Ctenopharyngodon idella</i> (Valenciennes, 1844)	EO			a	
	Silver carp	<i>Hypophthalmichthys molitrix</i> (Valenciennes, 1844)	EO			a,	
	Golden Mahseer	<i>Tor putitora</i> (Hamilton, 1822)	EN			a, b, c, d	
	Dark mahseer	<i>Naziritor chelynooides</i> (McClelland, 1839)	VU			b, c	
	Silver Mahseer	<i>Tor tor</i> (Hamilton, 1822)	NT			a, b, c, d	
	Putitor mahseer	<i>Tor mosal</i> (Hamilton- Buchanan)	NT			a, b, c	

	Dinnawah snowtrout	<i>Schizothorax progastus</i> (McClelland, 1839)	LC			b, c	
		<i>Schizothorax plagiostomus</i> Heckel, 1838	NE			c, d	
	Alwan snowtrout	<i>Schizothorax richardsonii</i> (Gray, 1832)	VU			a, b, c, d	
	Mullya garra	<i>Garra mullya</i> (Sykes, 1839)	LC			a	
	Sucker head	<i>Garra gotyla</i> (Gray 1830)	LC			a, b, c, d	
	Sucker head	<i>Garra lamta</i> (Hamilton, 1822)	LC			a, b, c	
	Sucker fish	<i>Garra annandalei</i> (Hora, 1921)	LC			a	
	Spotfin swamp barb, Pool barb, Stigma barb	<i>Puntius sophore</i> (Hamilton, 1822)	LC			a, b, c	
	Greenstripe barb	<i>Puntius vittatus</i> (Day, 1865)	LC			b, c	
	Rosy barb, Red barb	<i>Pethia conchonius</i> (Hamilton, 1822)	LC			a, c	
	Ticto barb, Firefin barb, Tic-tac-toe barb, Two-spot barb	<i>Pethia ticto</i> (Hamilton, 1822)	LC			a, b, c	
	Gila khani, Cotio	<i>Osteobrama cotio</i> (Hamilton, 1822)	LC			a	
	Catla	<i>Labeo catla</i> (Hamilton, 1822)	LC			a, b, c	
	Chaguni, Lal puti	<i>Chagunius chagunio</i> (Hamilton, 1822)	LC			a, b c	
Danionidae	Silver hatchet, Chela	<i>Chela cachius</i> (Hamilton, 1822)	LC			a	
	Indian hatchetfish	<i>Laubuca laubuca</i> (Hamilton, 1822)	LC			a	
	Sind Danio	<i>Devario devario</i> (Hamilton, 1822)	LC			a	
	Morar, Ray-finned fish	<i>Cabdio morar</i> (Hamilton, 1822)	LC			a	
		<i>Osparius gatensis</i> (Valenciennes, 1844)	LC			a	
	Vagra baril	<i>Barilius vagra</i> (Hamilton, 1822)	LC			a, b, c, d	
	Hamilton's barila, Dudhnea, Gheur	<i>Osparius bendelisis</i> (Hamilton, 1807)	LC			a, b, c, d	
	Barna baril	<i>Osparius barna</i> (Hamilton, 1822)	LC			a, b, c	
	Barred baril	<i>Barilius barila</i> (Hamilton, 1822)	LC			a, b,c	
	Shacra baril	<i>Osparius shacra</i> (Hamilton, 1822)	LC			a, b, c	

	Mola carplet, Pale carplet	<i>Amblypharyngodon mola</i> (Hamilton, 1822)	LC			a	
		<i>Salmophasiap phulo</i> (Hamilton, 1822)	LC			a	
	Indian trout	<i>Raiamas bola</i> (Hamilton, 1822)	LC			a, b, c	
	Gora-chela	<i>Securicula gora</i> (Hamilton, 1822)	LC			a	
	Large razorbelly minnow	<i>Salmophasia bacaila</i> (Hamilton, 1822)	LC			a	
Xenocypridae		<i>Hypophthalmichthys nobilis</i> (Richardson, 1845)	DD			a	
Psilorhynchidae	Balitora minnow	<i>Psilorhynchus balitora</i> (Hamilton, 1822)	LC			a	
Cobitidae	Peppered loach, Guntea loach, Scavenger loach	<i>Lepidocephalichthys guntea</i> (Hamilton, 1822)	LC			a, b, c	
Botiidae	Y-loach	<i>Botia lohachata</i> (Chaudhuri, 1912)	NE			a	
		<i>Botia almorhae</i> Gray 1831	LC			c, d	
		<i>Botia rostrata</i> (Günther, 1868)	VU			b, c	
Nemacheilidae	Mottled loach	<i>Paracanthocobitis botia</i> (Hamilton, 1822)	LC			a, b	
	Creek loach	<i>Schistura montana</i> (McClelland, 1838)	NE			a, c, d	
		<i>Schistura rupecula</i> (McClelland 183)				c, d	
		<i>Nemacheilus corica</i> (Hamilton 1822)	LC			c	
		<i>Aborichthys elongates</i> (Hora, 1921)	LC			a	
Clupeidae	Indian river shad	<i>Gudusia chapra</i> (Hamilton, 1822)	LC			a	
Engraulidae	Gangetic anchovy, Gangetic hairfin anchovy	<i>Setipinna phasa</i> (Hamilton, 1822)	LC			a	
Notopteridae	Bronze featherback	<i>Notopterus notopterus</i> (Pallas, 1769)	LC			a	
Siluridae	Parhin, Helicopter catfish	<i>Wallago attu</i> (Bloch & Schneider, 1801)	NT			a	
	Pabdah catfish	<i>Ompok pabda</i> (Hamilton, 1822)	NT			a	
		<i>Sisor rabdophorus</i> (Hamilton, 1822)	LC			a	

Bagridae	Giant river-catfish	<i>Sperata seenghala</i> (Sykes, 1839)	LC			a	
	Long-whiskered Catfish	<i>Sperata aor</i> (Hamilton, 1822)	LC			a	
	Striped dwarf catfish	<i>Mystus vittatus</i> (Bloch, 1794)	LC			a	
	Gangetic mystus	<i>Mystus cavasius</i> (Hamilton, 1822)	LC			a	
	Tengara mystus	<i>Mystus tengara</i> (Hamilton, 1822)	LC			a	
	Day's mystus	<i>Mystus bleekeri</i> (Day, 1877)	LC			a	
	Rita	<i>Rita rita</i> (Hamilton, 1822)	LC			a	
Erethistidae		<i>Erethistes pusillus</i> (Müller & Troschel, 1849)	LC			a	
Belonidae	Freshwater garfish	<i>Xenentodon cancila</i> (Hamilton, 1822)	LC			a, b, c	
Sisoridae	Telchitta	<i>Glyptothorax telchitta</i> (Hamilton, 1822)	LC			a, b, c	
		<i>Gogangra viridescens</i> (Hamilton, 1822)	LC			a	
	River cat	<i>Glyptothorax pectinopterus</i> (McClelland, 1842)	LC			a, b, c, d	
	Indian gagata	<i>Gagata cenia</i> (Hamilton, 1822)	LC			a	
	Sucker throat catfish	<i>Pseudecheneis sulcata</i> (McClelland, 1842)	Lc			c	
	Goonch	<i>Bagarius bagarius</i> (Hamilton, 1822)	NT			a, c	
Ambassidae	Elongate glass perchlet	<i>Chanda nama</i> (Hamilton, 1822)	LC			a	
	Indian glassy fish	<i>Parambassis ranga</i> (Hamilton, 1822)	LC			a	
Nandidae	Gangetic leaf fish	<i>Nandus nandus</i> (Hamilton, 1822)	LC			a	
Osphronemidae	Banded gourami, Giant gourami, Striped gourami	<i>Trichogaster fasciata</i> (Bloch & Schneider, 1801)	LC			a	
Channidae	Bull's eye snakehead, Great snakehead	<i>Channa marulius</i> (Hamilton, 1822)	LC			a	
	Snakehead murrel, Shoal	<i>Channa striata</i> (Bloch, 1793)	LC			a	
		<i>Channa gachua</i> (Hamilton, 1822)	LC			b, c	

	Spotted snakehead, Goro	<i>Channa punctata</i> (Bloch, 1793)	LC			a, b, c	
Gobiidae	Bareye Goby, Belay	<i>Glossogobius giuris</i> (Hamilton, 1822)	LC			a, b	
Mastacembelidae	Spiny eel	<i>Mastacembelus armatus</i> (Lacepede, 1800)	LC			a, b, c, d	
	Barred spiny eel or Indian spiny eel	<i>Macrognathus pancalus</i> (Hamilton, 1822)	LC			a	
Clariidae	Clarias catfish	<i>Clarias batrachus</i> (Linnaeus, 1758)	LC			a	
Heteropneustidae	Stinging catfish	<i>Heteropneustes fossilis</i> (Bloch, 1794)	LC			a	
Ailiidae	Kocha garua	<i>Clupisoma garua</i> (Hamilton, 1822)	LC			a	
	Gangetic ailia	<i>Ailia colia</i> (Hamilton, 1822)	NT			a	
		<i>Ailiichthys punctata</i> (Day, 1872)	DD			a	
Schilbeidae	Murius vacha	<i>Eutropiichthys murius</i> (Hamilton, 1822)	LC			a	
	Vacha, tunti	<i>Eutropiichthys vacha</i> (Hamilton, 1822)	LC			a	
	Indian potasi	<i>Pachypterus atherinoides</i> (Bloch, 1794)	LC			a	
Mugilidae	Yellowtail mullet	<i>Minimugil cascasia</i> (Hamilton, 1822)	LC			a	
Balitoridae	Prashad loach	<i>Homalopteroides rupicola</i> (Prashad & Mukerji, 1929)	NE			b, c	

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