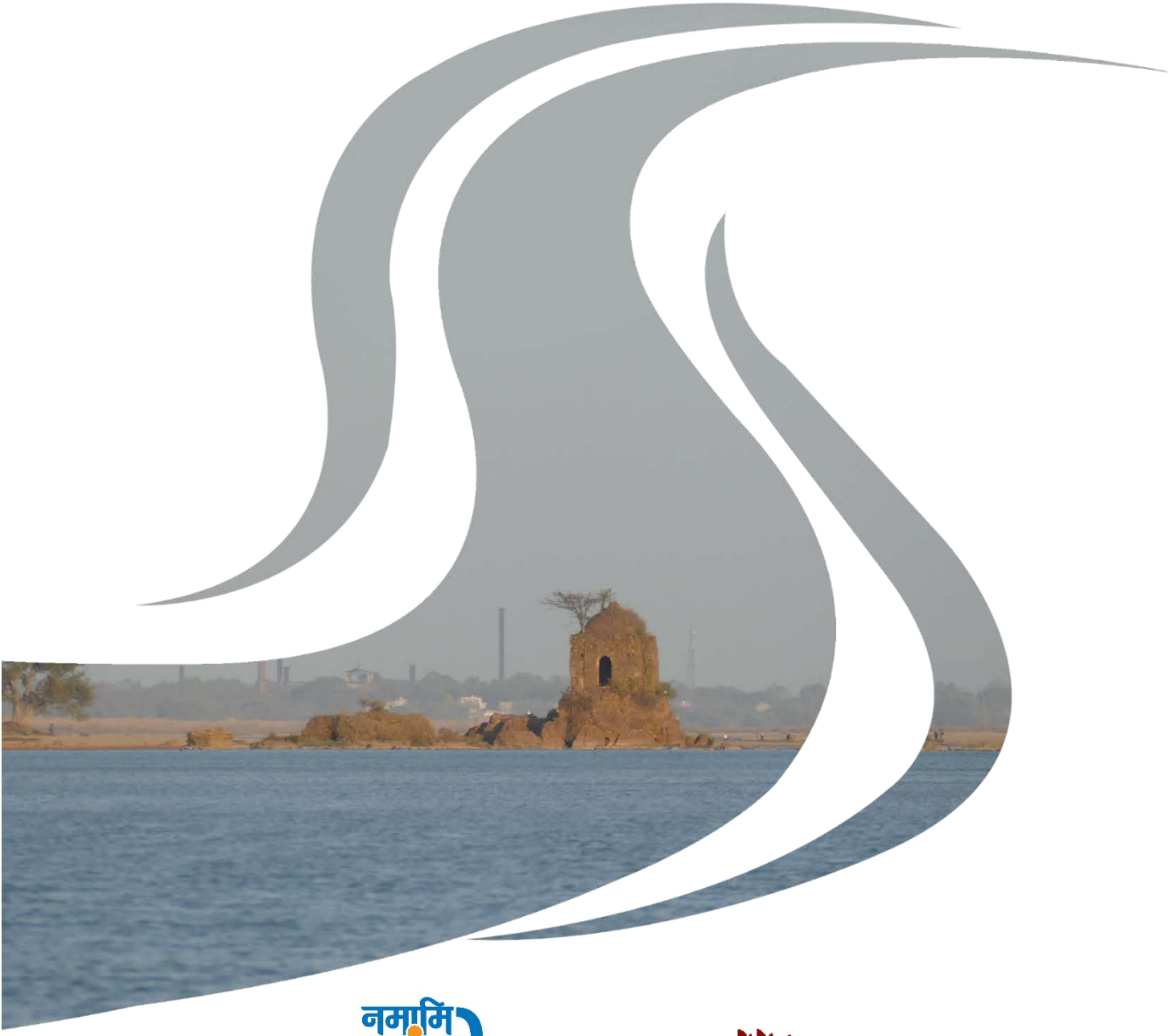
SON RIVER

Ecological status and trends



नमामि गंगे

भारतीय वन्यजीव संस्थान
Wildlife Institute of India

ASSESSMENT OF THE ECOLOGICAL STATUS OF SON RIVER FOR CONSERVATION PLANNING

This document is an output of the project Biodiversity Conservation and Ganga Rejuvenation sponsored by the National Mission for Clean Ganga, Ministry of Jal Shakti, Government of India, New Delhi.

Citation:
WII-GACMC (2022). Son River: Ecological status and trends. Ganga Aqualife Conservation Monitoring Centre, Wildlife Institute of India, Dehra Dun, India. Pp. 33

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Acknowledgements

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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 Son 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 Son 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 Son River, robust information on the diversity, abundance and distribution of aquatic vertebrate fauna of Son 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 Son 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 Son River through the support and involvement of stakeholders of all the Son states. The Wildlife Institute of India through the Biodiversity Conservation and Ganga Rejuvenation Project and this report attempts to compile biodiversity of Son River through literature review and Rapid Biodiversity Assessment. This report aims to develop a thorough knowledge base for the priority species of Son River, aid in biological restoration, and assist policy planners and managers to judiciously use water from the Son River, in view of the needs of the aquatic species therein.

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Executive Summary

The Son River is the second-largest right bank tributary of the Ganga River. It originates at an elevation of 600m near Amarkantak, Madhya Pradesh and joins the Ganga River after covering a distance of 785 km at Haldi Chhapra village in Bihar. During its course, it passes through Madhya Pradesh, Uttar Pradesh, Jharkhand and Bihar states. A 161 km stretch of the River is declared as a Son Gharial Sanctuary (SGS) along-with stretches of Banas and Gopad rivers with an objective to provide a protected habitat to the critically endangered gharial, mugger and turtles.

A boat-based rapid biodiversity assessment from Shikarganj to the Ganga River confluence covering a distance of around 500 km was conducted. A total of 66 waterbird species belonging to 19 families and 12 orders, including near threatened great thick-knee, oriental darter and endangered Indian skimmer were recorded during this study. The reptilian fauna of the River is represented by gharial, mugger and turtles. A total of 29 gharials and 28 mugger individuals were recorded during the survey, of which 28 gharials were observed from SGS. Four species of turtles were also recorded during the present study. However, no Gangetic dolphins and otters were sighted during this study.

Large scale water diversions from the Bansagar dam and Indrapuri barrage have reduced river discharge significantly. The river depth ranged between 0.2m to 3.2 m (average= 1.29 $\pm$ 0.06), and the width ranged from 45 to 1230 m (average = 384 $\pm$ 242.58). Extensive water abstraction has created longitudinal barriers, a major cause of habitat fragmentation and degradation. Anthropogenic activities like sand mining and fishing are restricted to a large extent in the SGS owing to effective patrolling and law enforcement by the forest department.

A stretch of 125 km from Chopan to Tilouthu is comparatively less disturbed as it is adjacent to the Kaimur Wildlife Sanctuary. Extensive water abstraction at Indrapuri Barrage and sand mining in the lower stretch from Tilouthu to Ganga confluence significantly threatens the ecological integrity of the River.

Unsustainable fishing and sand mining practices need to be controlled. Fishing with traditional methods should be promoted. Sand mining should only be allowed in specific stretches.

Capacity building workshops need to be organized for the forest department, local communities, and other stakeholders to rescue aquatic animals like turtles and muggers in emergent situations.

1. Introduction

The Son River is the second largest right bank tributary of the Ganga River, after River Yamuna. It originates near Amarkantak hills of Maikal range in Anuppur district, Madhya Pradesh at an elevation of 600 m. It flows north-northwest through Shahdol district in Madhya Pradesh state before turning sharply eastward where it encounters the southwest-northeast Kaimur plateau of Vindhya ranges. It is an important southern tributary of the Ganga River and flows northwards through Madhya Pradesh, Uttar Pradesh, Jharkhand and Bihar before joining the Ganga River at Haldi-Chhapra village near Maner, upstream of Patna (Sinha et al., 2003). Geologically, the lower valley of the Son River is an extension of the Narmada Valley, and the Kaimur Range is an extension of the Vindhya Range. The major cities situated on Son River are Anuppur, Chopan, Deori, Rohtasgarh, Dehri, Sonbhadra and Bihta. In Bihar, the River forms the border between the Magahi and Bhojpuri speaking regions.

1.1 Course of the River

At its origin, the River passes through the hilly creek range of Amarkantak, gentle terrain of Vindhya Range and the Gangetic plain. The river course can be divided into three major zones - (A) Upper zone, (B) Middle zone and (C) Lower zone, depending upon the geomorphology of the terrain and river channel (Figure 1.1). Zone-wise characteristics of the Son River are given in Table 1.1. The Son River's flow is hindered by Bansagar Dam and Indrapuri Barrage that divert its water for hydroelectric power generation, irrigation and drinking water to nearby cities and other human settlements. At Indarpuri Barrage, actual discharge was only 5.16% of the mean annual rainfall against the estimated minimum discharge of 18.9% required for basic ecosystem functions (Joshi et al., 2014).

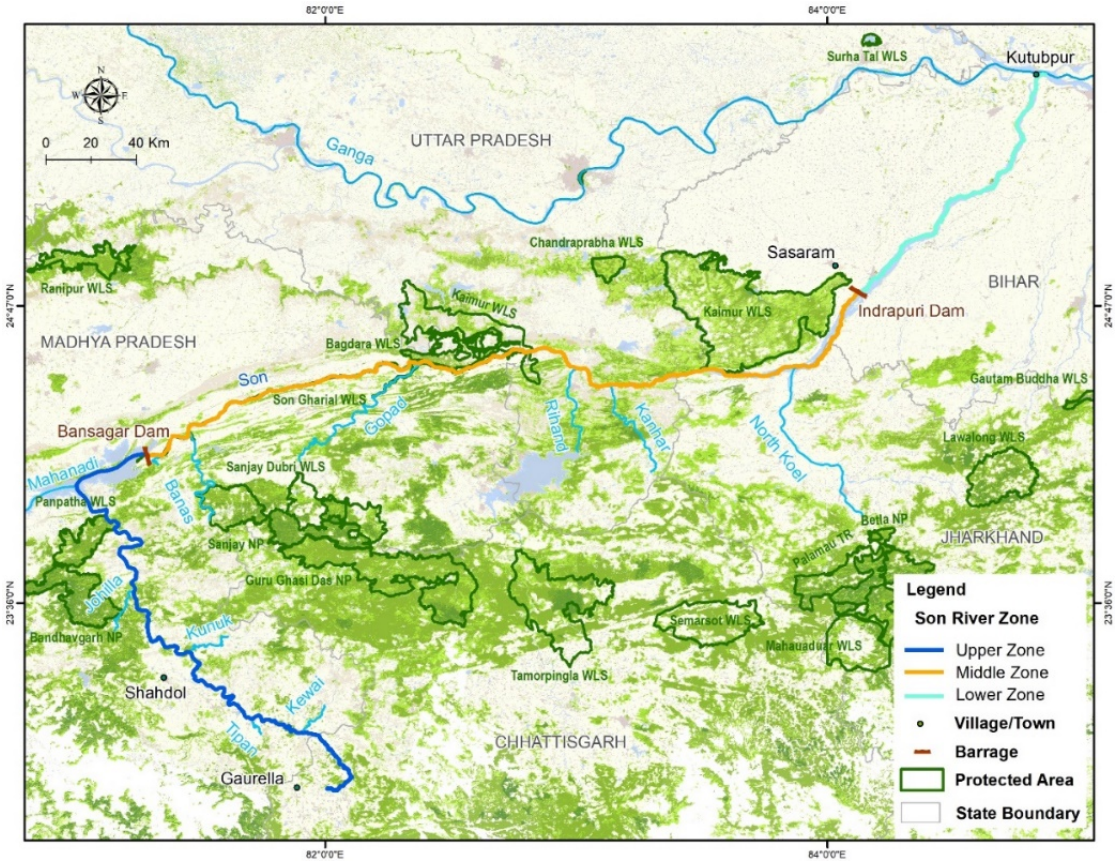

Figure 1.1 Zonation of the Son River

Table 1.1 Zone-wise characteristics of the Son River

Zones	Upper Zone	Middle Zone	Lower Zone
Length (km)	293	369	145
Stretches	Amarkantak – Bansagar Dam	Bansagar Dam- Indrapuri Barrage	Indrapuri Barrage-Confluence
Characteristics	Hilly Creeks, Gorge	Plateau region	Alluvial plains (Gangetic plains)
Dam/ Barrages		Bansagar Dam	Indrapuri Barrage
Protected Areas		Son Gharial Wildlife Sanctuary	

1.2 Drainage and Hydrology

Son is a rain-fed perennial river with an annual discharge of 31,800 m^3/year (Singh, 2007), with a total catchment area of 71,259 km^2 (Rao, 1975). Of the 785 km, 500 km flows through the state of Madhya Pradesh, 83 km through Uttar Pradesh, and the remaining 202 km flows through Jharkhand and Bihar (Rao 1975; India WRIS Project Team 2014). Gopad, Banas, Kanhar, Rihand and North Koel rivers are the major tributaries of the Son River (Maharana & Tripathi, 2018). These tributaries originate from the highlands and flow towards the north to join the Son River. Rihand is the longest and the main tributary of the Son River (Maharana & Tripathi, 2018). Downstream of the Bansagar dam, the Son River is joined by the Banas and Gopad rivers. In Uttar Pradesh, it is joined by the Rihand, Renu and Kanhar tributaries. It enters Bihar near the village Domarkhoha in Rohtas district. North Koel River merges at the Chhota Nagpur Plateau of Jharkhand, after flowing in Bihar for about 35 km. The Indrapuri Barrage was constructed about 65 km downstream of the confluence (North Koel-Son) to divert the river water through Patna Canal on the right side and the Western Canal on the left side, which is further divided into Buxar and Ara Canals. These irrigation canals have converted the entire command area of Jehanabad, Aurangabad, Kaimur, Rohtas, Bhojpur, Buxar and Patna districts of Bihar into a 'Grain Bowl'. This has left almost no water downstream of the barrage to maintain its ecosystem processes as a river.

1.3 Geology and Geomorphology

Throughout its course, the Son River flows across complex peninsular lithological units. The Gondwana and Mahakoshal Group, Central Granitic Complex (CGC), Vindhyan Supergroups, and Quaternary Alluvium are the main lithological units within the Son River basin. The Son River mainly flows through the Gondwana supergroup (sandstones and shales), Semri (sandstone, shale, carbonates) and Kaimur (sandstone, shale, minor carbonates) groups of the Vindhyan supergroup and Quaternary alluvium. Its tributaries Rihand, North Koel and Gopad, drain through Gondwana, Mahakoshal group, Archaean gneiss and Central Granitic Complex (gneisses and granites) (Lakshmanan, 1970; Ray 2006; Ramakrishnan & Vaidyanadhan 2008).

Five formations, viz. the Sihawal, Khunteli, Patpura, Baghor and Khetaunhi, were identified by Williams and Royce (1983). Williams and Clarke (1995) and Williams et al. (2006) studied the late Quaternary sedimentary sequence in the middle Son region. The Sihawal formation consists of alluvial fan and debris-flow gravels in a clay matrix, which is overlain by reworked aeolian clay; Khunteli formation, Patpura formation and Baghor formation consist of alluvial sands, clays and gravels with marked unconformities, and the youngest Khetaunhi formation consists of alluvial sands and clays and forms the lowest terrace in the landscape. The middle Son valley has a rich and long record of hominin occupation from all periods of the Palaeolithic, which is rare for other Indian sites (Jones & Pal 2009).

With quick run-off and ephemeral regimes, the River has a steep gradient of 70–80 cm per km between Rohtasgarh to Dehri (Maharana &Tripathi, 2018). The River flows with an average gradient of 30–50 cm per km after entering the Bihar plains (Sahu et al. 2010). Being wide and shallow, it leaves disconnected pools of water in the remaining parts of the year. The channel of the River at Dehri is very wide (about 5km), but the floodplain is narrow with a width of only 3 to 5 km. At the confluence point with North Koel, the River is about 5 to 8 km wide. Downstream of Daudnagar up to Koelwar the River, however, is moderately incised with bank cliffs of 8–16 m (Sahu et al. 2010). The River was infamous in the past for changing its course. The River has changed its course more than five times as it is traceable from several old beds near its east bank. This tendency was checked at Dehri in modern times with the anicut, and now more so with the Indrapuri Barrage.

In the plains of Bihar, the River shows a braided character in its course up to the Ganga River with many braid channel sandbars. From the study of paleochannels, Sahu et al (2010) indicated that the most dynamic part of the River starts from Daudnagar with nine major avulsions within this reach up to Koelwar (about 90 km of channel length). From the available discharge and gauge height data from Koelwar (between 1961 and 1989), Sahu et al (2010) found evidence of channel incision at an average rate of 2.50cm/year, indicating the river's degrading nature. The Son River flows in a self-created megafan (Geddes, 1960).

1.4 Land use and Land cover changes

The raster images of the districts along the Son River were used to generate the land use and land cover changes over ten years (2005-2006 and 2015-2016). The area was classified into six broad categories viz. Waterbodies, Fallow land, Agriculture, Grassland, Forest and Built-up. The maximum decrease was reported in fallow land (7.30%), whilst the area under agriculture saw an increase of 5.30%. The forest area increased by 1.67% over this period in the basin (Figures 1.2 & 1.3).

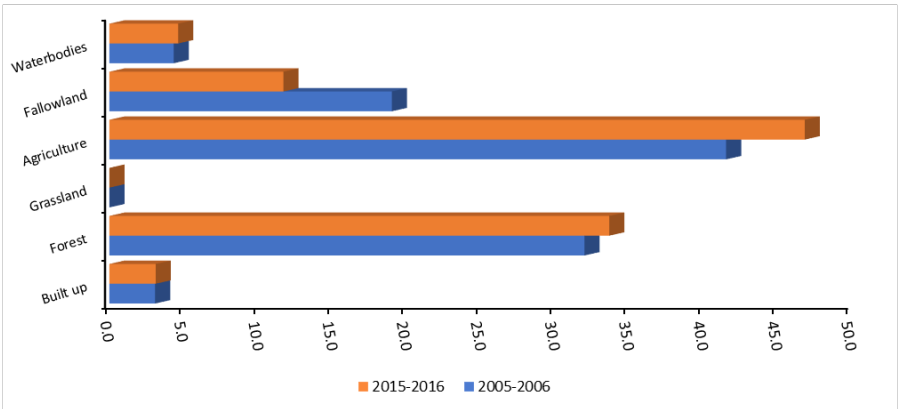

Figure 1.2 Change in Land use Land cover along the Son River

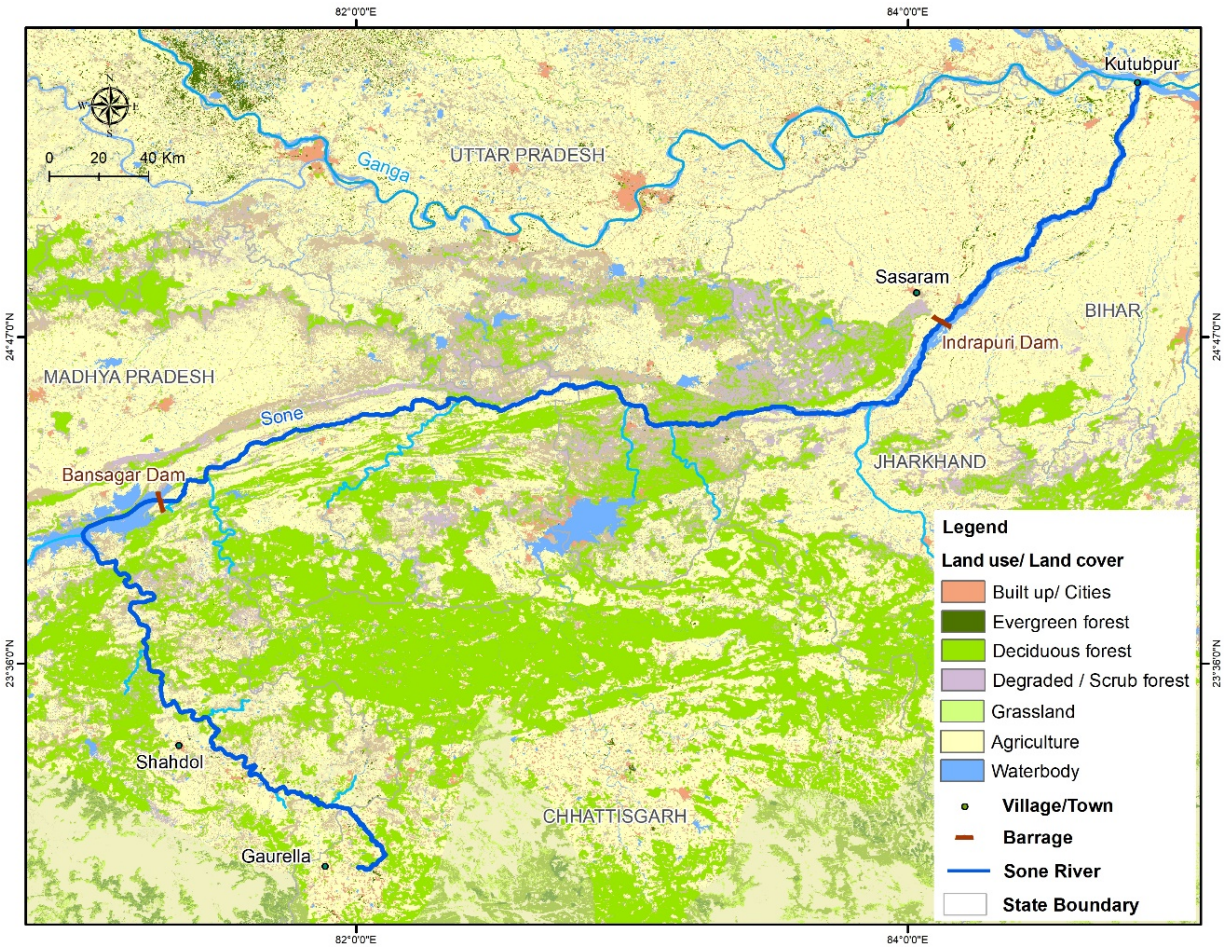

Figure 1.3 Land use Land cover in the Son River basin

1.5 Soil Types

The Son basin has five major groups of soils in the upper reaches of plateau and uplands of Madhya Pradesh, Uttar Pradesh and Bihar, which are red soil, mixed black and red soil, deep medium black soil, lateritic and alluvial soil (Central Ground Water Board 2013 a, b, c; Department of Farmer Welfare and Agriculture Development, ND). In the lower stretch, the alluvial soils of Uttar Pradesh and Bihar vary from sandy, silty loam, to loamy in nature (National Bureau of Soil Survey and Land Use Planning 2003; Central Ground Water Board 2013 c).

1.6 Climate

The Son River basin has a subtropical climate, with a hot dry summer between April and June, followed by monsoon rains between July and September, and cool and relatively dry winter. The average annual temperature in the Son basin varies from 25°C to 27°C in the upper reaches and plains of Uttar Pradesh & Bihar, respectively. The rainfall varies from 100-140mm in Bihar to 900-1300mm in Madhya Pradesh and Uttar Pradesh (Maharana & Tripathi, 2018).

1.7 Biogeography, Flora and Fauna

The Son River falls under two distinct biogeographic zones, namely, the Deccan Peninsula (Central highlands 6A and Chotta Nagpur 6B biogeographic provinces) and the Gangetic plains (Lower Gangetic Plains 7B biogeographic province) (Rodgers & Panwar, 1988). The Son River basin, with the exception of lower zone, is heavily forested with 27.67% forest cover, mainly in the state of Madhya Pradesh (Figure 1.4).

The main forest types here are moist tropical, dry tropical, and broad-leaved subtropical hill forests, major forest forming species in these forests are Sal (*Shorea robusta* and Teak (*Tectona grandis*) with other miscellaneous trees. The Vindhyan forests in the middle stretch consist primarily of scrub. The alluvial plain in the lower stretch mainly comprises scrub and grasses. The major crops grown in the Son River basin include wheat, rice paddy, sorghum, maize, pearl millet, barley, moong bean, urad bean and sugarcane. The gharial (*Gavialis gangeticus*), marsh crocodile (*Crocodylus palustris*), red-crowned roofed turtle (*Batagur kachuga*), narrow-headed soft-shell turtle (*Chitra indica*) and smooth-coated otter (*Lutrogale perspicillata*) are some representative aquatic fauna for the River (Sharma & Sharma, 1997).

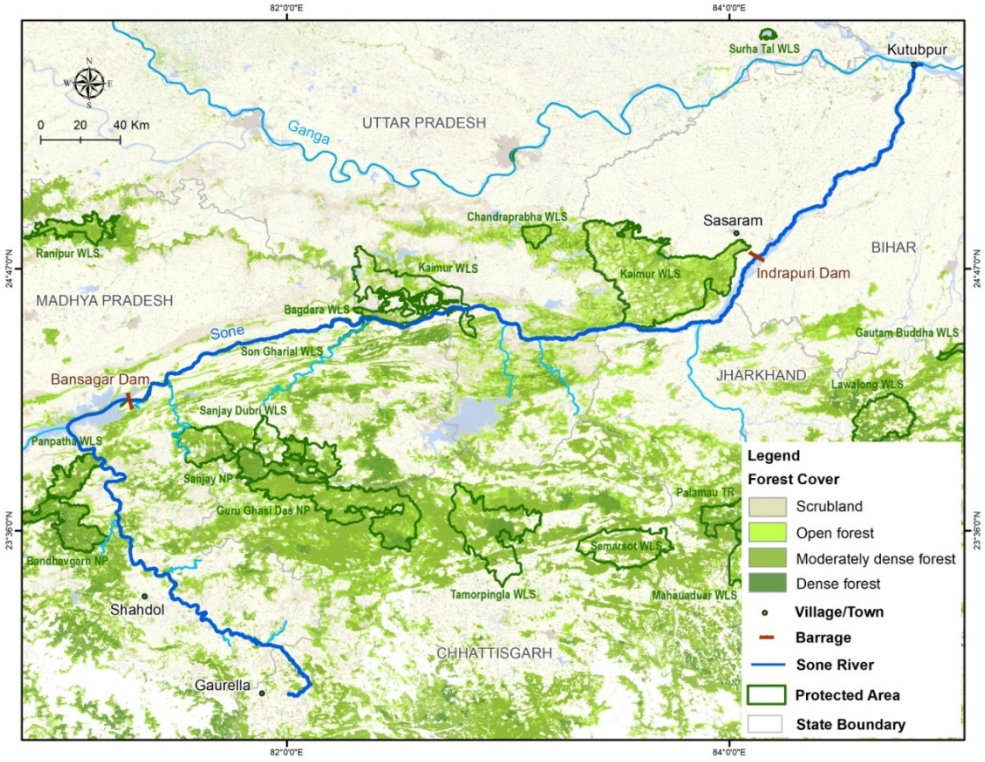

Figure 1.4
Forest cover of the Son Basin

1.8 Demography

The Son River flows through 15 districts in five states viz. Madhya Pradesh, Chhattisgarh, Uttar Pradesh, Jharkhand and Bihar (Table 1.2 & Figure 1.5). About 295.5 million people reside in these districts, of which 49% of the population is in Bihar (Chandramouli, 2011). The aaverage human population density for these districts is 547.7 person/km^2. Bihar has the highest population density, followed by Madhya Pradesh and Jharkhand (Table 1.2). The major cities along or near the Son River are Shahdol in Madhya Pradesh, Sonbhadra in Uttar Pradesh, Dehri and Patna in Bihar (Maharana and Tripathi, 2018).

Table 1.2 Human population in the districts along the Son River (Source: Chandramouli, 2011)

State	District	Population	Population Density person/km^2
Bihar	Arwal	700843	1098
	Aurangabad	2540073	769
	Bhojpur	2728407	1139
	Patna	5838465	1823
	Rohtas	2959918	763
Jharkhand	Garhwa	1322784	323
	Palamu	1939869	442
Chhattisgarh	Bilaspur	2663629	322
Madhya Pradesh	Anuppur	749237	200
	Satna	2228935	297
	Shahdol	1066063	172
	Sidhi	1127033	232
	Singrauli	1178273	208
	Umaria	644758	158
Uttar Pradesh	Sonbhadra	1862559	270

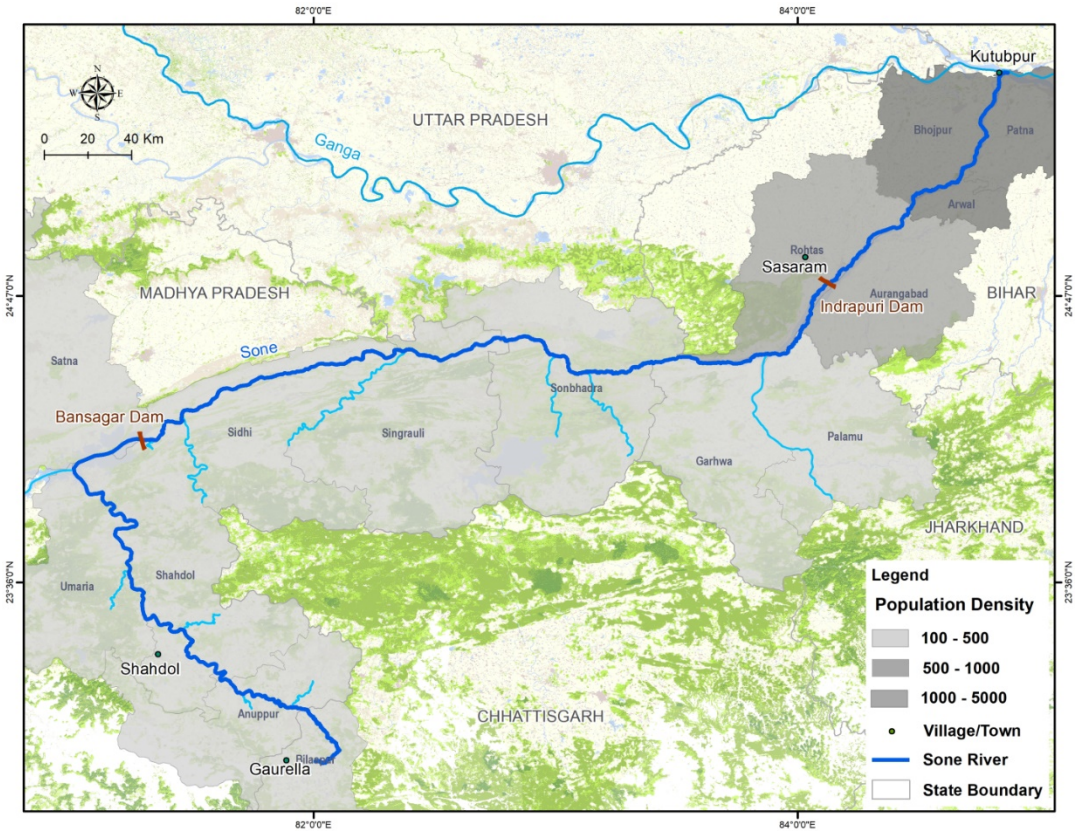

Figure 1.6 Population density along the Son River

2. STATUS OF AQUALIFE IN THE SON RIVER

Rapid biodiversity assessment of the Son River and literature review highlighted the historical presence and current status of species of conservation concern. Key aquatic species such as gharial and mugger are found in the Son River. Along with these, at least seven species of turtles, threatened birds like Indian skimmer (*Rynchops albicollis*) and fish species are present in the River.

2.1 Methodological Framework

To obtain information on the status of the biodiversity, threats and hydrological characteristics of the Son River, a rapid biodiversity assessment of the River was conducted in the post-monsoon season (December and January 2020-2021), which was supplemented by the extensive literature review, to get the historical and recent pattern of the biodiversity distribution along the River. Online search engines and databases like Google Scholar and JSTOR were searched. A boat based rapid biodiversity assessment of 460 km river from Shikarganj to the Ganga-Son confluence was conducted. The information generated from the rapid biodiversity assessment and literature review was used to identify the areas of higher conservation significance along the Son River.

2.2 Mammals

From the literature review, it was found that two aquatic mammals i.e., Gangetic dolphins and smooth-coated otters were present in the Son River. However, no recent studies have reported either the Gangetic dolphin or the smooth-coated otters. These two species were also not sighted during the rapid biodiversity assessment.

2.2.1 Gangetic dolphin (*Platanista gangetica*)

In the 19th century, the Gangetic dolphin was found throughout the Son River (Sharma et al., 2003). Sinha et al. (2000) recorded ten dolphins upstream of Indrapuri barrage in the Son River. In the last few decades, no records were found in the upper and middle zone of the Son River (Sharma et al., 2003). In Uttar Pradesh, construction of the Rihand Dam has reduced the River's flow, which has adversely affected the dolphin population in the Son River. Sharma et al (2003) reported that after construction of the Indrapuri barrage in 1965, dolphin migration stopped and no more dolphins were sighted. They also reported that downstream of Indrapuri barrage the River is shallow with a depth of 50 cm (1.6 feet) at most sites. Choudhary et al. (2012) also reported that barrages have caused drastic flow reduction in the Son River and reported low dolphin encounter rate. During the present survey, dolphins were not sighted throughout the River. However, local fishermen reported dolphin sightings below the barrage during the high floods every year.

2.2.2 Smooth-coated otter (*Lutrogale perspicillata*)

Studies by Sharma and Sharma (1997) and Sharma et al. (2003) have reported the presence of this species, however, since then no confirmed presence has been reported in Son mainstem. The present survey also did not observe any indirect signs/evidence of otters.

2.3 Avifauna

Previous studies on waterbirds of the Son River are limited to the Son Gharial sanctuary. Sharma et al (1997) recorded 81 species of waterbirds from the sanctuary. Bharos (2008) reported fulvous whistling-duck from the sanctuary. Nair and Katdare (2013) recorded 37 individuals of Indian skimmer from the sanctuary. Singh et al. (2015) recorded 24 species, while Dilawar and Sharma (2016) reported 31 waterbirds species and a new breeding location of Indian skimmer, but none of the studies conducted were holistic and provides information for the entire River. The present study is the first assessment of the waterbirds where entire stretch of the Son River is covered. During the present survey, a total of 66 species of waterbirds belonging to 19 families and 12 orders were recorded. Numerically Anatidae was found to be the most dominant family, with 45.13% individuals, followed by Phalacrocoracidae (16.20%) and Ciconiidae (7.85%). The least number of individuals belonged to the family Rallidae (0.06%), Hirundinidae (0.08%) and Falconidae (0.09) (Figure 2.1) (Appendix II). The bird taxonomy and nomenclature follows Grimmett et al. (2016).

Of the total waterbird species recorded from the Son River, 3.03% are Endangered (EN), 4.55% are Vulnerable (Vu), 12.12% are Near threatened (NT) and the remaining 80.3% species are least concern (LC) as per IUCN Red List (Figure 2.2) (Appendix II).

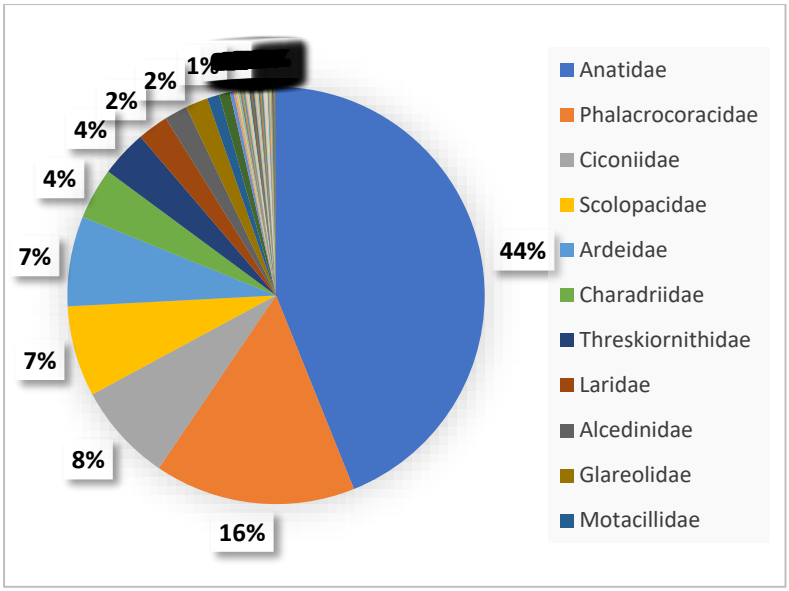

Figure 2.1
Family wise composition of waterbirds in the Son River

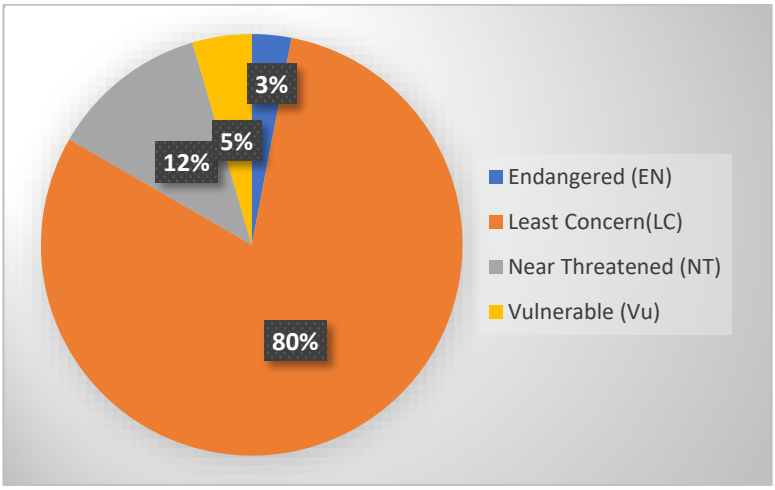

Figure 2.2
IUCN Red List status of waterbirds of Son River

Out of the total recorded waterbird species, 40% were winter migrants, and the remaining 60% were residents (Figure 2.3) (Appendix II) (Kumar et al., 2005).

Majority of the species (23.08%) recorded were insectivore/carnivore, followed by 16.92% carnivore, 13.85% piscivore/carnivore and 13.85% herbivore/carnivore. Least represented feeding guild was omnivore, with only 3.08% species (Figure 2.4). Information on bird diets for classification into diet guilds was compiled from Ali & Ripley (1983).

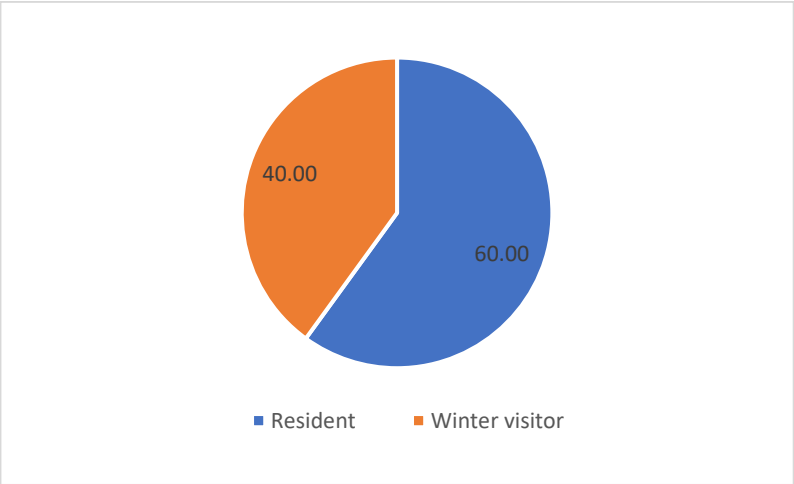

Figure 2.3
Residential status of waterbirds of Son River

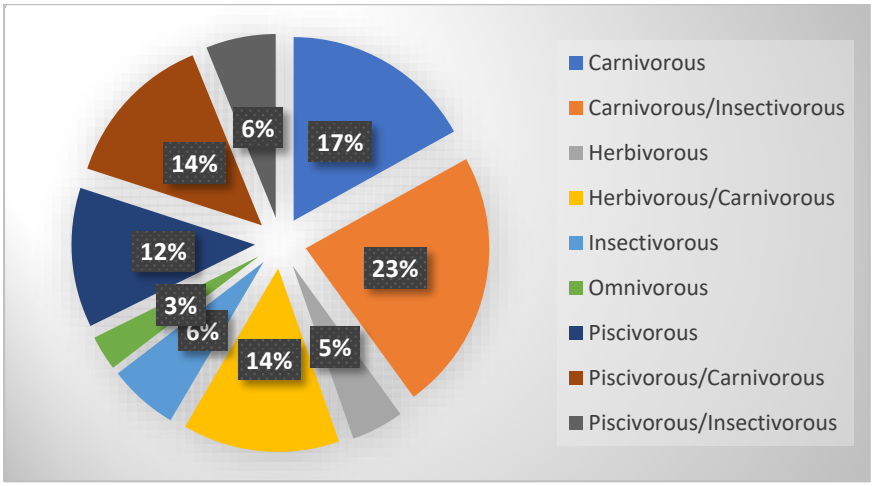

Figure 2.4
Proportional composition of waterbirds under different feeding guilds

2.4 Reptiles

Reptiles of the Son River are represented by two crocodilian species and seven turtle species.

2.4.1 Crocodilians

Of the three crocodilian species present in India, gharial and mugger are reported from the Son River. Their numbers have rapidly declined to just a couple of individuals, and these individuals are restricted to the Son Gharial Wildlife Sanctuary. The human disturbance is a crucial factor for the declining population of crocodilians in the Son River (Khobragade, 2019).

2.4.1.1 Gharial (*Gavialus gangeticus*)

Previous records of gharials in the Son River probably date back to the 16th century memoirs of Mughal Emperor Babur (Babar-nama), which depicts a longirostrine crocodilian, most likely the gharial (Nair and Katdare, 2013). Sharma et al (2010) reported 35, 28, and 14 Gharials individuals in 1996, 2003 and 2010 respectively from the Son River. They also recorded breeding gharials from Jogdeh Ghat. Nair and Katdare (2013) recorded 2 male adult, 7 adult, 1 sub-adult/adult, 9 juveniles and 1 yearling from 8 locations along the Son Gharial Wildlife Sanctuary. A total of 164 gharials were released in the Son Gharial Wildlife Sanctuary between 1981 and 2011 (Sharma et al., 2011). Sharma (2018) recorded 24 Gharials comprising 8 adult females, 7 subadult and 9 juveniles. Andrews (2006) reported three trial nests and one nest in 2006, one nest each in 2007 and 2008. During the present study, a total of 29 individuals were recorded. Most of the gharial (24 individuals) were seen from the 3 km long Jogdah stretch of Son Gharial Sanctuary starting from Sidhi Amiliya Bridge to Ramnagar Khurd. An equal number of individuals were recorded from each age class of adult, sub-adult or juvenile. Only two yearlings were seen during the survey (Figure 2.5)

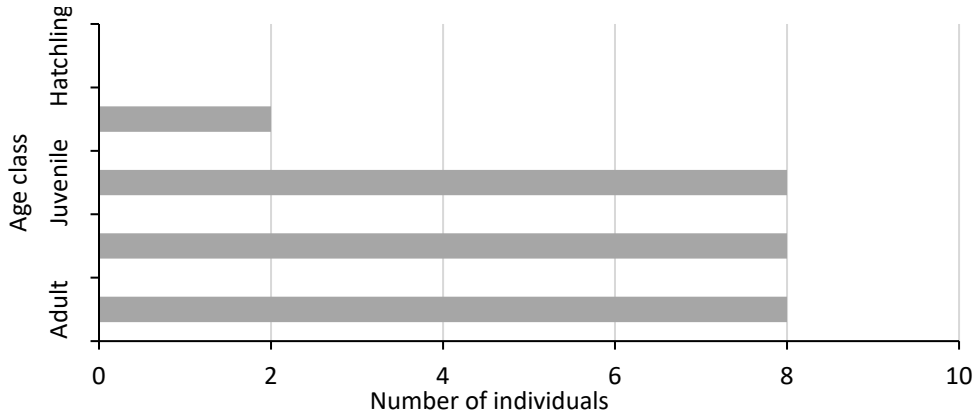

Figure 2.5
Age wise classification of gharial seen in Son River

2.4.1.2 Mugger (*Crocodylus palustris*)

Sharma and Sharma (1997) reported 11 individuals from Shikarganj to Bichhi in Madhya Pradesh. Nair and Katdare (2013) recorded 22 mugger individuals from 8 locations in the Son Gharial Wildlife Sanctuary. Sharma (2018) recorded 19 muggers comprising 08 adults, 7 sub adults, 3 juveniles, and 1 yearling. During the present study, a total of 31 muggers were recorded from the Son River from Shikarganj to the Ganga Son confluence. Out of the total mugger seen most of the individuals were either adult or subadult. Only four juvenile muggers were seen during the survey (Figure 2.6). There are a few records of human-mugger conflict within the sanctuary (Khobragade, 2019).

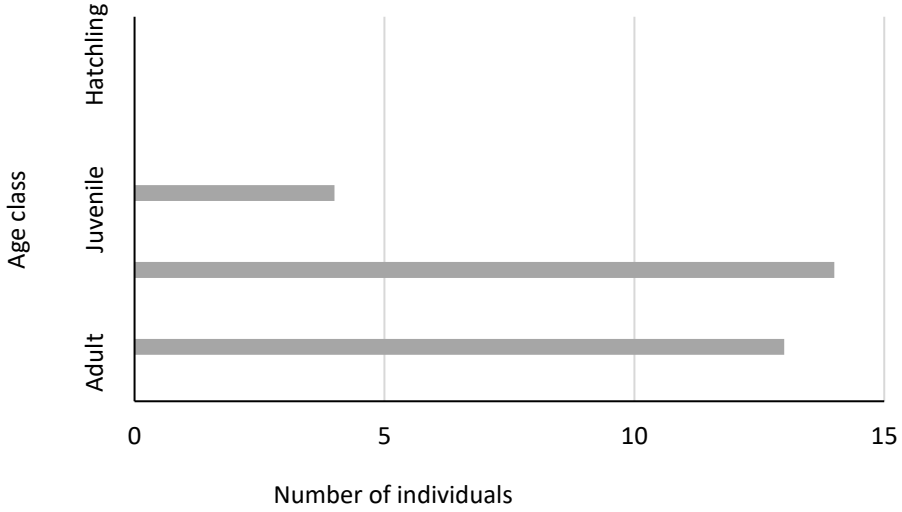

Figure 2.6
Age wise classification of mugger seen in the Son River

2.4.2 Turtles

Sharma et al. (1997) recorded 174 individuals of five turtle species, while Khobragade (2019) reported seven species of turtles from the Son River (Annexure III). These species include the Indian soft-shelled turtle (*Nilssonia gangetica*), narrow-headed soft-shelled turtle (*Chitra Indica*), red-crowned roofed turtle (*Batagur kachuga*), three-striped roofed turtle (*Batagur dhongoka*), Indian tent turtle (*Pangshura tentoria*), Indian flap-shelled turtle (*Lissemys punctata*) and brahminy river turtle (*Hardella thurjii*).

During this study only four species of turtles were encountered along the Son River. These were three-striped roofed turtle, Indian tent turtle, Indian softshell turtle, and narrow-headed soft-shelled turtle (Figure 2.7).

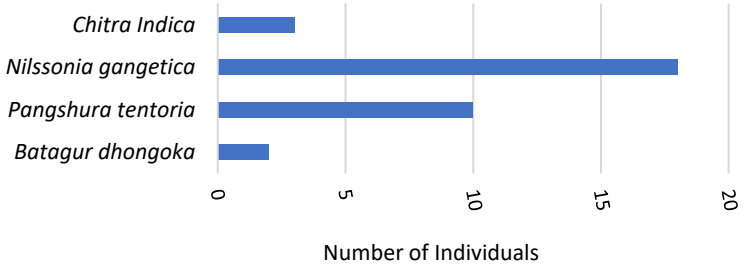

Figure 2.7 Species wise abundance of turtles in Son River

2.5 Amphibians

Information on the amphibian's status in the Son River is scant and not well documented.

2.6 Fish

The earliest study of fish species from the Son River dates back to 1957, when Motwani and David (1957) reported 95 fish species belonging to 10 orders, 29 families and 73 genera. More recently, Joshi et al. (2014) reported 89 fish species belonging to 10 orders, 25 families and 63 genera. Two years later in 2016, Mishra (2016) recorded a total of 43 fish species belonging to 6 orders, 14 families and 31 genera.

Since Son River is the tributary of Ganga River the fish diversity can be considered similar, but for more precise information, intensive experimental fishing is required in the entire stretch of River to assess the current scenario/trend of the fish diversity. The probable fish species present in the Son River is mentioned in annexure IV.

2.7 Depth Regime

Depth, a crucial parameter that defines species distribution, was also measured along the entire length of the River during the rapid assessment. The thematic diagram shows the depth profile of the Son River from Shikarganj to the Ganga Confluence during the winter season (Figures 2.8). Depth of the surveyed river stretch ranged between 0.2 m to 3.2m with an average of 1.29±0.06m.

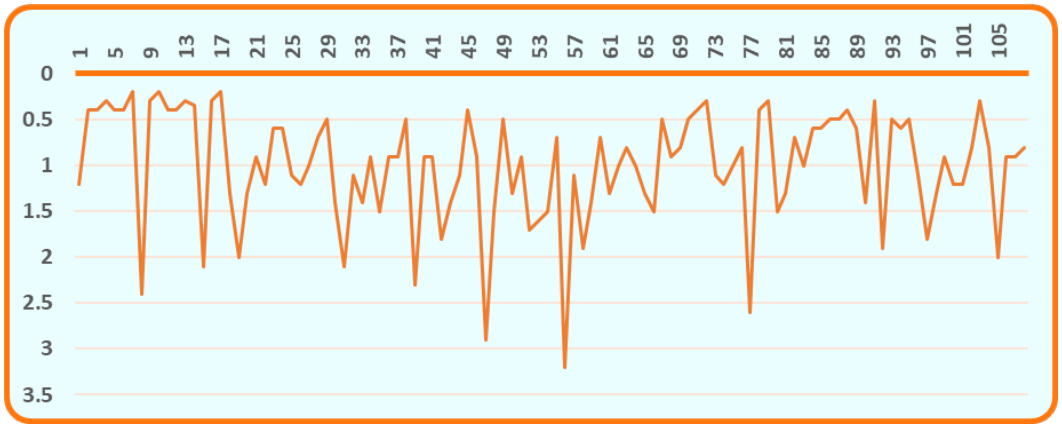

Figure 2.8
Depth profile of Son River from Shikarganj to Son Ganga Confluence

2.8 River Stretches with High Biodiversity Value

A total of 140 km of the stretch of Son River lying within the Son Gharial Sanctuary has high biodiversity assemblage. It is a part of the middle zone of the River and falls within the Deccan Peninsula (6A) biogeographic zone. This stretch supports 55 species of waterbirds and three species of turtles. A total of 28 gharials and 30 muggers were also encountered in this stretch. The stretch was found to be the least disturbed in terms of anthropogenic activities like sand mining and fishing.

3. THREATS TO THE BIODIVERSITY OF SON RIVER

In the upper zone sewage through several drains pollute the Son River, some of these drains are the Ghattan Nalla, Nargadha nalla, Tanki nalla, Gaibudh nalla and Baigha nalla. The barrages in the upper zone have created a physical barrier for aqautic species, including dolphins. The diversion of most of the river water for irrigation and drinking purposes from Bansagar dam and Indrapuri barrage in the middle and lower zones, respectively, reduces the flow of the River drastically afterwards and the River often goes dry during lean season, resulting in siltation in the River affecting the habitat of

gharials, mugger, dolphin and turtles. In the lower zone of the River, abstraction of water for irrigation and other purpose and extensive sand mining are some major threats. Large scale sand mining in the lower stretch in Bihar is a major threat to the river ecosystem (Figure 2.9).

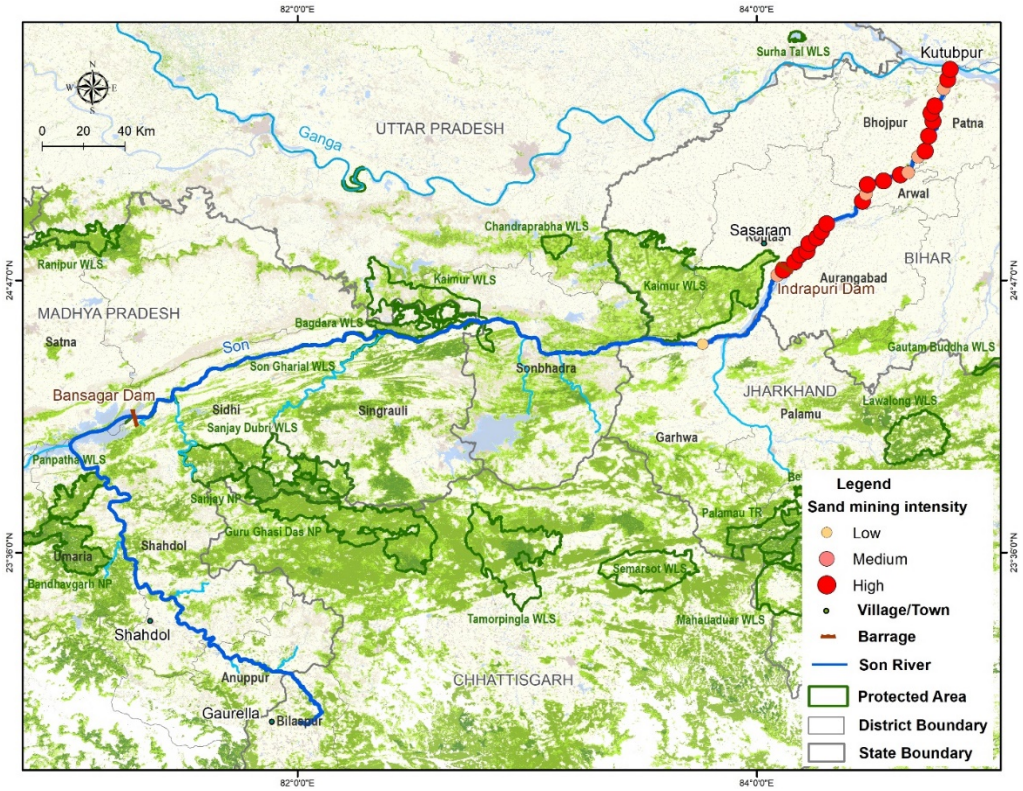

Figure 2.9
Active sand mining along Son River

4. Conservation Implications

The Son River has undergone structural changes because of intensive anthropogenic activities. Upcoming dam projects and riverbed mining activities needs to be regulated to maintain its hydrological and ecological integrity.

- The water quality of the River has been altered due to agricultural run-off consisting of harmful pesticides and fertilizers. Intensive farming, river-bed mining and urban sewage discharge have altered the habitat for nesting bird species. It is necessary to focus on the natural habitats and protected areas along the River which are preferred by the migratory birds.

- Gangetic dolphins and gharial are highly sensitive to anthropogenic habitat alterations. Therefore, they are conservation-dependent species and need active management of the hydrological regime.

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ANNEXURE I

Mammalian species of the Son River

Family	Common Name	Scientific Name	IUCN Status	IWPA Status	Previous studies	Son specific biogeographic zones
Platanistidae	Gangetic dolphin	*Platanista gangetica* (Roxburgh, 1801)	EN	Schedule I	b, c, d	6 A
Mustelidae	Smooth-coated otter	*Lutrogale perspicillata* (I. Geoffroy Saint-Hilaire, 1826)	EN	Schedule II	a, c	6 A

[a]Sharma and Sharma (1997); [b]Sinha et al. (2000); [c] Sharma et al. (2003); [d] Chaudhary et al. (2012);

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ANNEXURE II

Waterbird and water associated bird species of the Son River

Family	Species	Scientific Name	IUCN Status	IWPA Status	Present Study	Previous Studies*	Biogeographic Province/s
Accipitridae	Pallas's Fish-eagle	*Haliaeetus leucoryphus* (Pallas, 1771)	EN	Sch I		a	6 A
	Steppe Eagle	*Aquila nipalensis* (Hodgson, 1833)	EN	Sch I	+		6 A
	Lesser Fish-eagle	*Ichthyophaga humilis* (Muller & Schlegel, 1841)	NT	Sch I	+		6 A
Alcedinidae	Common Kingfisher	*Alcedo atthis* (Linnaeus, 1758)	LC	Sch IV	+	a, e	6 A
	Pied Kingfisher	*Ceryle rudis* (Linnaeus, 1758)	LC	Sch IV	+	a, e	6 A
	White-throated Kingfisher	*Halcyon smyrnensis* (Linnaeus, 1758)	LC	Sch IV	+	a, d, e	6 A
Anatidae	Bar-headed Goose	*Anser indicus* (Latham, 1790)	LC	Sch IV	+	a	6 A
	Common Pochard	*Aythya ferina* (Linnaeus, 1758)	Vu	Sch IV	+	e	6 A
	Common Teal	*Anas crecca* (Linnaeus, 1758)	LC	Sch IV	+	a	6 A
	Cotton Pygmy-goose	*Nettapus coromandelianus* (Gmelin, 1789)	LC	Sch IV		e	6 A
	Gadwall	*Mareca strepera* (Linnaeus, 1758)	LC	Sch IV	+	a	6 A
	Goosander	*Mergus merganser* (Linnaeus, 1758)	LC	Sch IV	+	a, d	6 A
	Greylag Goose	*Anser anser* (Linnaeus, 1758)	LC	Sch IV	+	e	6 A
	Indian Spot-billed Duck	*Anas poecilorhyncha* (Forster, 1781)	LC	Sch IV	+	a, d, e	6 A
	African Comb Duck	*Sarkidiornis melanotos* (Pennant, 1769)	LC	Sch IV	+	a, d, e	6 A
	Fulvous Whistling Duck	*Dendrocygna bicolor* (Vieillot, 1816)	LC	Sch I		a, b	6 A

	Lesser Whistling Duck	*Dendrocygna javanica* (Horsfield, 1821)	LC	Sch IV	+	e	6 A
	Eurasian Wigeon	*Mareca penelope (*Linnaeus, 1758*)*	LC	Sch IV	+		6 A
	Mallard	*Anas platyrhynchos (*Linnaeus, 1758)	LC	Sch IV	+		6 A
	Northern Pintail	*Anas acuta* (Linnaeus, 1758)	LC	Sch IV	+	a	6 A
	Red-crested Pochard	*Netta rufina* (Pallas, 1773)	VU	Sch IV	+	e	6 A
	Ruddy Shelduck	*Tadorna ferruginea* (Pallas, 1764)	LC	Sch IV	+	a, d, e	6 A
Anhingidae	Oriental Darter	*Anhinga melanogaster* (Pennant, 1769)	NT	Sch IV		a	6 A
Ardeidae	Cattle Egret	*Bubulcus ibis* (Linnaeus, 1758)	LC	Sch IV	+	a, e	6 A
	Great White Egret	*Ardea alba* (Linnaeus, 1758)	LC	Sch IV	+	a	6 A
	Grey Heron	*Ardea cinerea* (Linnaeus, 1758)	LC	Sch IV	+	a, d, e	6 A
	Black Bittern	*Ixobrychus flavicollis* (Latham, 1790)	LC	Sch IV	+		6 A
	Black-Crowned Night-heron	*Nycticorax nycticorax* (Linnaeus, 1758)	LC	Sch IV	+		6 A
	Green-backed Heron	*Butorides striata* (Linnaeus, 1758)	LC	Sch IV	+		6 A
	Indian Pond Heron	*Ardeola grayii* (Sykes, 1832)	LC	Sch IV	+	a, d, e	6 A
	Intermediate Egret	*Ardea intermedia* (Wagler, 1829)	LC	Sch IV	+	d,e	6 A
	Little Egret	*Egretta garzetta* (Linnaeus, 1766)	LC	Sch IV	+	a, e	6 A

	Purple Heron	*Ardea purpurea* (Linnaeus, 1766)	LC	Sch IV		d, e	6 A
Burhinidae	Great Thick-knee	*Esacus recurvirostris* (Cuvier, 1829)	NT	Sch IV	+	d, e	6 A
Charadriidae	Kentish Plover	*Charadrius alexandrinus* (Linnaeus, 1758)	LC	Sch IV	+	a	6 A
	Little Ringed Plover	*Charadrius dubius* (Scopoli, 1786)	LC	Sch IV	+	a	6 A
	Red-wattled Lapwing	*Vanellus indicus* (Boddaert, 1783)	LC	Sch IV	+	a, e	6 A
	Yellow-wattled Lapwing	*Vanellus malabaricus* (Boddaert, 1783)	LC	Sch IV		a	6 A
	River Lapwing	*Vanellus duvaucelii (*Lesson, 1826)	NT	Sch IV	+		6A
Ciconiidae	Asian Openbill	*Anastomus oscitans* (Boddaert, 1783)	LC	Sch IV	+	a, d	6 A
	Asian Woollyneck	*Ciconia episcopus* (Boddaert, 1783)	NT	Sch IV	+	a, d	6 A
	Black-necked Stork	*Ephippiorhynchus asiaticus* (Latham, 1790)	NT	Sch IV	+	a, d, e	6 A
	Painted Stork	*Mycteria leucocephala* (Pennant, 1769)	NT	Sch IV	+	a	6 A
	Black Stork	Ciconia nigra (Linnaeus, 1758)	LC	Sch IV	+		6A
Falconidae	Peregrine Falcon	*Falco peregrinus (Tunstall*, 1771)	LC	Sch I	+		6A
Glareolidae	Little Pratincole	*Glareola lactea* (Temminck, 1820)	LC	NL	+	a	6 A
Gruiformes	Sarus Crane	*Antigone antigone* (Linnaeus, 1758)	VU	Sch IV		a	6 A
Hirundinidae	Barn Swallow	*Hirundo rustica* (Linnaeus, 1758)	LC	NL		a	6 A

	Red-rumped Swallow	*Cecropis daurica* (Linnaeus, 1771)	LC	NL	+	a	6 A
	Streak-Throated Swallow	*Petrochelidon fluvicola* (Blyth, 1855)	LC	NL		e	6 A
	Wire-tailed Swallow	*Hirundo smithii* (Leach, 1818)	LC	NL	+	a	6 A
Laridae	Black-bellied Tern	*Sterna acuticauda* (Gray, 1831)	EN	NL	+	a, d	6 A
	Brown-headed Gull	*Larus brunnicephalus* (Jerdon, 1840)	LC	Sch IV		d	6 A
	Pallas's Gull	*Larus ichthyaetus* (Pallas, 1773)	LC	Sch IV	+		
	Indian Skimmer	*Rynchops albicollis* (Swainson, 1838)	EN	NL	+	a, c, e	6 A
	River Tern	*Sterna aurantia* (Gray, 1831)	VU	NL	+	a, d	6 A
Meropidae	Blue-tailed Bee-eater	*Merops philippinus* (Linnaeus, 1766)	LC	NL		a	6 A
Motacillidae	Grey Wagtail	*Motacilla cinerea* (Tunstall, 1771)	LC	Sch IV		a	6 A
	Western Yellow Wagtail	*Motacilla flava (*Linnaeus, 1758)	LC	Sch IV		a	6 A
	White Wagtail	*Motacilla alba* (Linnaeus, 1758)	LC	Sch IV	+	e	6 A
	White-browed Wagtail	*Motacilla maderaspatensis*	LC	Sch IV	+		6A
Pandionidae	Osprey	*Pandion haliaetus* (Linnaeus, 1758)	LC	Sch I	+	g	6 A
Phalacrocoracidae	Great Cormorant	*Phalacrocorax carbo* (Linnaeus, 1758)	LC	Sch IV	+	a, d	6 A
	Indian Cormorant	*Phalacrocorax fuscicollis* (Stephens, 1826)	LC	Sch IV		a, e	6 A

	Little Cormorant	*Microcarbo niger* (Vieillot, 1817)	LC	Sch IV	+	a, d, e	6 A
Podicipedidae	Little Grebe	*Tachybaptaus rufficollis* (Pallas, 1764)	LC	Sch IV	+	e	6 A
Rallidae	Common Coot	*Fulica atra* (Linnaeus, 1758)	LC	Sch IV		a, d, e	6 A
	White-breasted Waterhen	*Amaurornis phoenicurus*	LC	Sch IV	+		
	Common Moorhen	*Gallinula chloropus* (Linnaeus, 1758)	LC	Sch IV	+	e	6 A
Recurvirostridae	Black-winged Stilt	*Himantopus himantopus* (Linnaeus, 1758)	LC	Sch IV	+	a, e	6 A
Scolopacidae	Common Redshank	*Tringa totanus* (Linnaeus, 1758)	LC	Sch IV	+	a	6 A
	Eurasian Curlew	*Numenius arquata* (Linnaus, 1758)	NT	Sch IV	+		6 A
	Temminck's Stint	*Calidris temminckii* (Leisler, 1812)	LC	Sch IV	+		6 A
	Green Sandpiper	*Tringa ochropus* Linnaeus, 1758	LC	Sch IV	+		6 A
	Spotted Redshank	*Tringa erythropus* (Pallas, 1764)	LC	Sch IV	+		6 A
	Common Greenshank	*Tringa nebularia* (Gunnerus, 1767)	LC	Sch IV	+		6 A
	Common Sandpiper	*Actitis hypoleucos* (Linnaeus, 1758)	LC	Sch IV	+	a	6 A
Threskiornithidae	Black-headed Ibis	*Threskiornis melanocephalus* (Latham, 1790)	LC	Sch IV	+	a, d, e	6 A
	Eurasian Spoonbill	*Platalea leucorodia* (Linnaeus, 1758)	LC	Sch I	+	a, d, e	6 A
	Red-naped Ibis	*Pseudibis papillosa* (Temminck, 1824)	LC	Sch IV	+	a, d, e	6 A

[a]Sharma and Sharma (1997); [b]Bharos (2008); [C]Nair & Katdare (2013), [D]Singh *et al.* (2015); [e]Dilawar and Sharma (2016)

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ANNEXURE III

Reptilian species of the Son River

Family	Common Name	Scientific Name	IUCN Status	IWPA Status	Present Sudy	Previous studies	Biogeographic province
Crocodylidae	Mugger	*Crocodylus palustris* (Lesson, 1831)	Vu	Sch I	+	a, c, d, e	6 A
Gavialidae	Gharial	*Gavialis gangeticus* (Gmelin in Linnaeus, 1789)	CR	Sch I	+	a, b, c, d, e	6 A
Geoemyididae	Red-crowned roofed turtle	*Batagur kachuga,* (Gray, 1830)	CR	Sch I		a, e	6 A
	Three-striped roofed turtle	*Batagur dhongoka* (Gray, 1832)	CR	NL	+	a, e	6 A
	Brahminy river turtle	*Hardella thurjii* (Gray, 1831)	VU	NL		e	6 A
	Indian tent turtle	*Pangshura tentoria* (Gray, 1834)	LC	NL	+	a, c, e	6 A
Triyonichidae	Indian narrow-headed softshell turtle	*Chitra indica* (Gray, 1830)	EN	Sch IV	+	a, c, e	6 A
	Indian softshell turtle	*Nilssonia gangetica* (Cuvier, 1825)	VU	Sch I	+	a, c, e	6 A
	Indian flapshell turtle	*Lissemys punctata* (Lacépède, 1788)	LC	Sch I		e	6 A

[a]Sharma and Sharma (1997), [b]Sharma et al. (2011); [c]Nair and Katdare (2013); [d]Sharma et al. (2018), [e]Khobragade, V. (2019)

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ANNEXURE IV

Fish Species of the Son River

Family	Common Name	Scientific Name	IUCN Status	Previous Study
Anguillidae	Indian mottled eel	*Anguilla bengalensis* (Gray, 1831)	NT	a, b
Clupeidae	Indian river shad	*Gudusia chapra* (Hamilton, 1822)	LC	a, b
	Hilsa	*Tenualosa ilisha* (Hamilton, 1822)	LC	a
	Ganges river gizzard shad	*Gonialosa manmina* (Hamilton, 1822)	LC	a, b
Engraulidae	Gangetic anchovy, Gangetic hairfin anchovy	*Setipinna phasa* (Hamilton, 1822)	LC	b
Cyprinidae	Catla	*Labeo catla (Hamilton,1822)*	LC	a, b
	Wild common carp	*Cyprinus carpio (*Linnaeus, 1758)	Vu	b
	Mrigal, Mirka	*Cirrhinus mrigala* (Hamilton, 1822)	LC	a, b
	Reba carp	*Cirrhinus reba* (Hamilton, 1822)	LC	a, b
	Chaguni, Lal puti	*Chagunius chagunio* (Hamilton, 1822)	LC	a, b
	Gila khani, Cotio	*Osteobrama cotio* (Hamilton, 1822)	LC	a, b
	Gangetic latia	*Tariqilabeo latius* (Hamilton, 1822)	LC	a, b
	Rohu	*Labeo rohita* (Hamilton, 1822)	LC	a, b

	Karnataka labeo, Orange-fin labeo	*Labeo calbasu* (Hamilton, 1822)	LC	a, b
	Kuria labeo	*Labeo gonius* (Hamilton, 1822)	LC	a, b
	Angra labeo	*Labeo angra* (Hamilton, 1822)	LC	b
	Boga labeo	*Labeo boga* (Hamilton, 1822)	LC	a, b
	Boggut labeo	*Labeo boggut* (Sykes, 1839)	LC	a, b
	Pangusia labeo	*Labeo pangusia* (Hamilton, 1822)	NT	a, b
	Minor carp, Bata, Bata labeo	*Labeo bata* (Hamilton, 1822)	LC	a, b
	Fringed-lipped, peninsula carp	*Labeo fimbriatus*(Bloch, 1795)	LC	a
	Kalabans	*Bangana dero* (Hamilton, 1822)	LC	a, b
	Mahseer	*Tor tor* (Hamilton, 1822)	NT	a
	Deccan mahseer, Khudree mahseer, Yellow mahseer	*Tor khudree* (Sykes, 1839)	LC	a
	Mullya garra	*Garra mullya* (Sykes, 1839)	LC	a, b
	Gotyla	*Garra gotyla* (Gray, 1830)	LC	a
	Silver carp	*Hypophthalmichthys molitrix* (Valenciennes, 1844)	NT	b
	Spotfin swamp barb, Pool barb, Stigma barb	*Puntius sophore* (Hamilton, 1822)	LC	a, b
	Rosy barb, Red barb	*Pethia conchonius (Hamilton, 1822)*	LC	a, b
	Ticto barb, Firefin barb, Tic-tac-toe barb, Two-spot barb	*Pethia ticto (Hamilton, 1822)*	LC	a, b

	Chola barb, Green barb, Swamp barb	*Puntius chola* (Hamilton, 1822)	LC	a, b
	Olive barb, Peninsular, olive barb	*Systomus sarana* (Hamilton, 1822)	LC	a, b
	Scarlet-banded barb	*Puntius amphibius* (Valenciennes, 1842)	DD	a
Danionidae	Large razorbelly minnow	*Salmostoma bacaila* (Hamilton, 1822)	LC	a, b
	Boopis razorbelly minnow	*Salmostoma boopis* (Day, 1874)	LC	a, b
	Bloch razorbelly minnow	*Salmostoma balookee* (Sykes, 1839)	LC	a
	Silver hatchet, Chela	*Chela cachius* (Hamilton, 1822)	LC	a
	Mola carplet, Pale carplet	*Amblypharyngodon mola* (Hamilton, 1822)	LC	a, b
	Morar, Ray-finned fish	*Cabdio morar* (Hamilton, 1822)	LC	a, b
	Slender barb, Blackline rasbora, Striped rasbora	*Rasbora daniconius (Hamilton, 1822)*	LC	a, b
	Flying barb	*Esomus danrica* (Hamilton, 1822)	LC	a, b
	Zebra fish, Anju	*Danio rerio* (Hamilton, 1822)	LC	a
	Indian hatchetfish	*Laubuca laubuca* (Hamilton, 1822)	LC	a, b
	Indian trout	*Raiamas bola* (Hamilton, 1822)	LC	a, b
	Barred baril	*Barilius barila* (Hamilton, 1822)	LC	a, b
	Hamilton's barila, Dudhnea, Gheur	*Osparius bendelisis* (Hamilton, 1807)	LC	a, b
	Barna baril	*Osparius barna* (Hamilton, 1822)	LC	a, b

	Shacra baril	*Osparius shacra* (Hamilton, 1822)	LC	a, b
	Vagra baril	*Barilius vagra* (Hamilton, 1822)	LC	a
	Gora-chela	*Securicula gora* (Hamilton, 1822)	LC	a, b
Psilorhynchidae	Balitora minnow	*Psilorhynchus balitora* (Hamilton, 1822)	LC	b
Cobitidae	Peppered loach, Guntea loach, Scavenger loach	*Lepidocephalichthys guntea (*Hamilton, 1822)	LC	a, b
Botiidae	Loach	*Pangio pangia* (Hamilton, 1822)	LC	a
	Y-loach	*Botia lohachata* (Chaudhuri, 1912)	NL	b
Nemacheilidae	Mottled loach, Sand loach, Striped loach	*Paracanthocobitis botia (Hamilton, 1822)*	LC	a, b
	Dari	*Schistura scaturigina (*McClelland, 1839)	LC	a, b
	Mura, Murangi	*Schistura denisoni (Day 1867).*	LC	a
	-	*Schistura dayi* (Hora, 1935)	LC	a
Notopteridae	Bronze featherback,Feather back, Grey feather back	*Notopterus notopterus* (Pallas, 1769)	LC	a, b
	Indian featherback, Kandla	*Chitala chitala* (Hamilton, 1822)	NT	a, b
Sisoridae	Devil catfish, Dwarf goonch	*Bagarius bagarius* (Hamilton, 1822)	NT	a, b
	Huddah nangra	*Gogangra viridescens* (Hamilton, 1822)	LC	a, b
	Indian gagata	*Gagata cenia* (Hamilton, 1822)	LC	a, b
	Sisor catfish	*Sisor rabdophorus* (Hamilton, 1822)	LC	a, b

	-	*Glyptothorax stolickae* (Steindachner, 1867)	LC	b
	-	*Glyptothorax annandalei* (Hora, 1923)	LC	a
	Telchitta, Dhal magur	*Glyptothorax telchitta* (Hamilton, 1822)	LC	a
	-	*Glyptothorax indicus* (Talwar, 1991)	LC	a
Erethistidae	-	*Erethistoides montana* (Hora, 1950)	DD	a
	-	*Pseudolaguvia ribeiroi* (Hora, 1921)	LC	a
Siluridae	Parhin, Helicopter catfish	*Wallago attu* (Bloch & Schneider, 1801)	NT	a, b
	Indian butter-catfish	*Ompok bimaculatus* (Bloch, 1794)	NT	a, b
	Pabdah catfish	*Ompok pabda* (Hamilton, 1822)	NT	b
Bagridae	Long-whiskered Catfish	*Sperata aor* (Hamilton, 1822)	LC	a, b
	Giant river-catfish	*Sperata seenghala* (Skyes, 1839)	LC	a, b
	Gangetic mystus	*Mystus cavasius* (Hamilton, 1822)	LC	a, b
	Day's mystus	*Mystus bleekeri (*Day, 1877*)*	LC	b
	Striped dwarf catfish	*Mystus vittatus (*Bloch, 1794*)*	LC	a, b
	Tengara mystus	*Mystus tengara* (Hamilton, 1822)	LC	b
	Rita	*Rita rita* (Hamilton, 1822)	LC	a, b
Claridae	Clarias catfish	*Clarias batrachus* (Linnaeus, 1758)	LC	a, b

	African catfish	*Clarias gariepinus* (Burchell, 1822)	LC	b
Heteropneustidae	Stinging catfish	*Heteropneustes fossilis* (Bloch, 1794)	LC	a, b
Schilbeidae	Garua Bachcha, Guarchcha	*Clupisoma garua* (Hamilton, 1822)	LC	a, b
	Kocha garua	*Clupisoma montanum* Hora, 1937	LC	a
	Vacha, tunti	*Eutropiichthys vacha* (Hamilton, 1822)	LC	a, b
	Murius vacha	*Eutropiichthys murius* (Hamilton, 1822)	LC	a, b
	Garua Bachcha, Guarchcha	*Clupisoma garua* (Hamilton, 1822)	LC	a, b
	Indian potasi	*Pachypterus atherinoides* (Bloch, 1794)	LC	b
	Silond catfish, Silondia vacha, Silong catfish	*Silonia silondia* (Hamilton, 1822)	LC	a, b
Pangasiidae	Pungas, Pongas	*Pangasius pangasius* (Hamilton, 1822)	LC	a, b
Amblyceptidae	Biting catfish, Indian torrent catfish	*Amblyceps mangois* (Hamilton, 1822)	LC	a
Mugilidae	Corsula mullet	*Rhinomugil corsula* (Hamilton, 1822)	LC	a, b
	Yellowtail mullet	*Minimugil cascasia* (Hamilton, 1822)	LC	a, b
Belonidae	Freshwater garfish	*Xenentodon cancila* (Hamilton, 1822)	LC	a, b
Ambassidae	Elongate glass perchlet	*Chanda nama* Hamilton, 1822	LC	a, b
	Indian glassy fish	*Parambassis ranga* (Hamilton, 1822)	LC	a, b
Sciaenidae	Big-eyed jewfish, Coitor croacker, Ganges croaker	*Johnius coitor* (Hamilton, 1822)	LC	a, b

Cichlidae	Tilapia	*Oreochromis niloticus* (Linnaeus, 1758)	NL	b
Osphronemidae	Banded gourami, Giant gourami, Stripled gourami	*Trichogaster fasciata (*Bloch & Schneider, 1801)	LC	a, b
Channidae	Bull's eye snakehead, Great snakehead	*Channa marulius* (Hamilton, 1822)	LC	a, b
	Snakehead murrel, Shoal	*Channa striata (Bloch, 1793)*	LC	a, b
	Spotted snakehead, Goroi	*Channa punctata* (Bloch, 1793)	LC	a, b
	Asiatic snakehead	*Channa orientalis (Bloch & Schneider, 1801)*	NL	a, b
Gobiidae	Bareye Goby, Belay	*Glossogobius giuris* (Hamilton, 1822)	LC	a, b
Tetraodontidae	Ocellated pufferfish	*Leiodon cutcutia* Hamilton, 1822	LC	b
Mastacembelidae	Spiny eel	*Mastacembelus armatus* (Lacepede, 1800)	LC	a, b
	Barred spiny eel or Indian spiny eel	*Macrognathus pancalus* Hamilton, 1822	LC	a, b
	Spiny Eel	*Macrognathus aral* (Bloch & Schneider,1801)	LC	a, b

[a]Motwani and David (1957), [b]Joshi et al. (2014)

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