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Wildlife Institute of India

ECOLOGICAL SNAPSHOT OF SELECT RIVERS IN THE GANGA BASIN

This document is an output of the project "Planning and Management for Aquatic species Conservation and Maintenance of Ecosystem Services of Ganga River Basin for a Clean Ganga" sponsored by the National Mission for Clean Ganga, Ministry of Jal Shakti, Government of India, New Delhi.

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PREFACE

India, a country with diverse geographical, latitudinal and altitudinal variations, hosts a wide array of species. The rich species assemblage has earned India the status of a megadiverse country. Among the various ecosystem types found in India, the freshwater ecosystems, comprising an intricate network of rivers and associated wetlands, are critical for the survival of both terrestrial and aquatic species. These freshwater ecosystems are also essential for the well-being of millions of Indians. Among the freshwater ecosystems of the country, the Ganga River basin deserves a special mention, as it occupies approximately 26.3% of India's landmass and is spread over 11 states. The intricate network of tributaries in the basin flows through five biogeographic zones across North India, significantly contributing to the Ganga River's flow and biodiversity value.

Ganga River and its tributaries are home to several species of conservation significance, including Gangetic dolphin, three species of otters, three crocodilians, and numerous species of waterbirds and fishes. However, the distribution and occurrence of these species within the Ganga River basin are not fully documented or understood. To address this knowledge gap, the Wildlife Institute of India (WII) under the Biodiversity Conservation and Ganga Rejuvenation Project funded by the National Mission for Clean Ganga (NMCG), Ministry of Jal Shakti, undertook the task of documenting the aquatic biodiversity of select rivers of the Ganga River basin, viz. Yamuna, Chambal, Gomti, Son, Ramganga, Ghaghra, Gandak, Kosi, Ajay, Damodar and Rupnarayan. Surveys were conducted to record aquatic biodiversity and evaluate habitat conditions. This document gives a brief insight into the key findings of the rapid biodiversity assessments conducted in 11 rivers of the Ganga River basin.

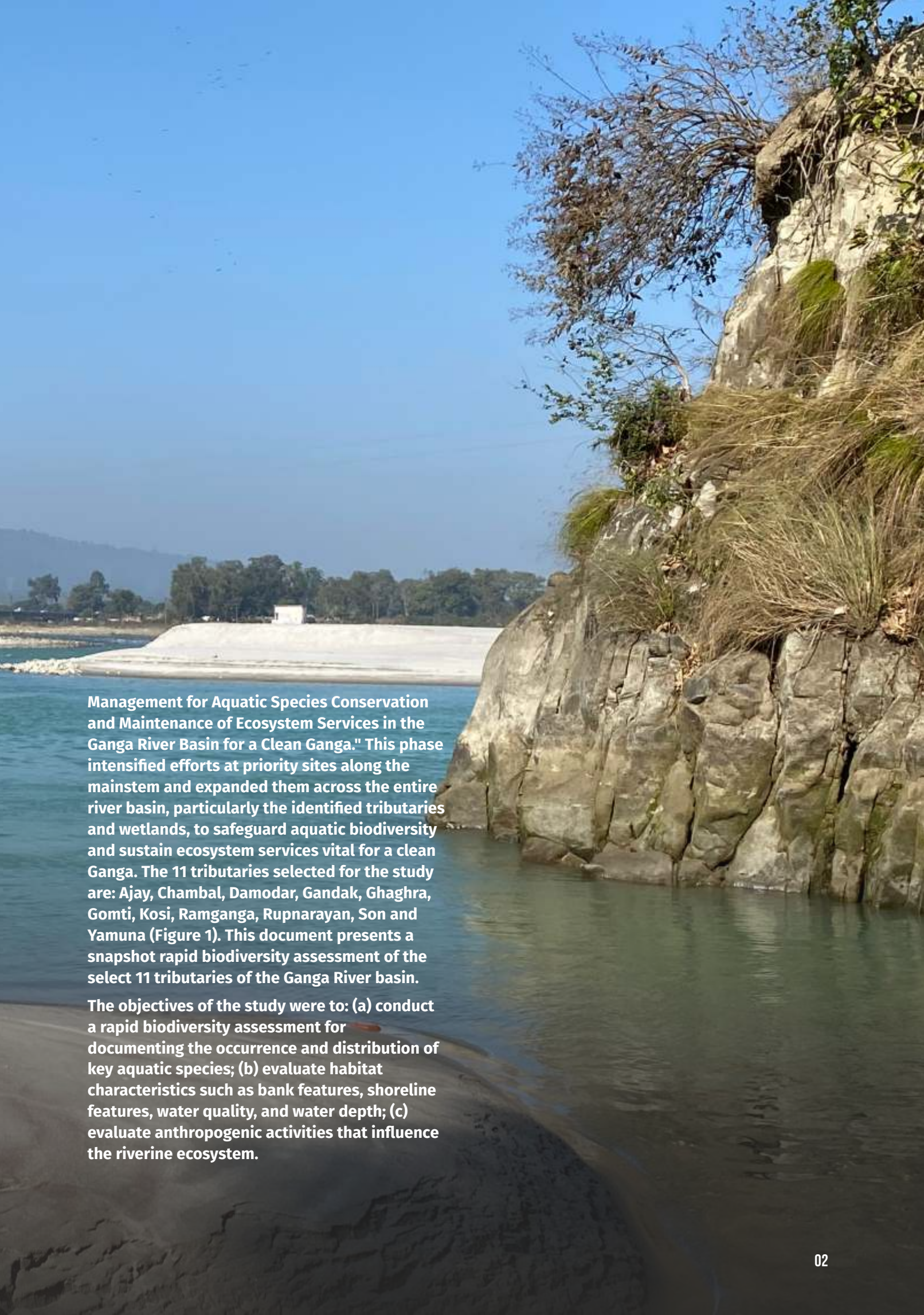
Ruchi Badola
Syed Ainul Hussain

INTRODUCTION

Recognizing the fundamental importance of freshwater systems, governments worldwide have enacted legislation and policies aimed at protecting river ecosystems from detrimental human activities (Craig et al., 2017). In India, multiple legislative frameworks and national programmes have been established to safeguard the health of rivers. India's first comprehensive river restoration initiative, the Ganga Action Plan (GAP), was launched in 1985. The action plan was primarily unidirectional and focused on improving water quality through structural and engineering measures, without adequately considering the complex socio-ecological dimensions essential for effective river restoration. Moreover, community engagement and local stakeholder perspectives were insufficiently incorporated into early restoration initiatives (Bhargava, 1992).In sync with the global and national approaches to biodiversity conservation, river restoration initiatives have evolved to become more inclusive and holistic.

Recognizing the complex interplay of the socio-ecological systems and the need to move beyond the engineering measures, the Namami Gange programme was initiated, and National Mission for Clean Ganga (NMCG), an autonomous body within the Ministry of Jal Shakti, was established to oversee and implement integrated restoration initiatives. This initiative under the NMCG marks a significant move toward integrated river conservation planning that addresses the biodiversity aspect along with community engagement. In 2016, the ecological assessment and community engagement aspects were entrusted to Wildlife Institute of India (WII) under the "Biodiversity Conservation and Ganga Rejuvenation" project. The project primarily focused on implementing conservation activities along the mainstem of the Ganga River. Phase I of the project began in 2016 and concluded in 2019.

The systematic approach of Phase I was recognized as a successful model for river conservation. Following the completion of Phase I, which focused primarily on conservation activities along the mainstem of the Ganga River, Phase II was launched in 2020 under the project, "Planning and



Management for Aquatic Species Conservation and Maintenance of Ecosystem Services in the Ganga River Basin for a Clean Ganga." This phase intensified efforts at priority sites along the mainstem and expanded them across the entire river basin, particularly the identified tributaries and wetlands, to safeguard aquatic biodiversity and sustain ecosystem services vital for a clean Ganga. The 11 tributaries selected for the study are: Ajay, Chambal, Damodar, Gandak, Ghaghra, Gomti, Kosi, Ramganga, Rupnarayan, Son and Yamuna (Figure 1). This document presents a snapshot rapid biodiversity assessment of the select 11 tributaries of the Ganga River basin.

The objectives of the study were to: (a) conduct a rapid biodiversity assessment for documenting the occurrence and distribution of key aquatic species; (b) evaluate habitat characteristics such as bank features, shoreline features, water quality, and water depth; (c) evaluate anthropogenic activities that influence the riverine ecosystem.

METHODOLOGY

Each of the identified rivers was divided into 5 km segments referred to as Biodiversity Evaluation Unit (BEU) in ArcGIS 10.2 (ESRI, Redlands, USA) (Figure 1). Within each BEU, species presence and associated, hydro-morphological and anthropogenic variables were collected through boat-based surveys. Sites that were non-navigable by boats were accessed by vehicle and surveyed on foot.

The surveys were conducted during the post-monsoon season (November to March) in daylight using an inflatable rubber (25 hp)/country boat. The speed of the boat was maintained at 6–8 km/hr. Observers equipped with binoculars (NIKON 8 × 42) GPS (GARMIN e- Trex 30), depth sounder (HONDEX PS7), and range finder (HAWKE Endurance LRF-1000), were stationed at the front of the boat to observe sightings of Gangetic dolphins, crocodiles, turtles, waterbirds and associated habitat variables. River morphology data such as channel type, bank characteristics, water temperature and depth, were recorded at the starting point of each BEU.

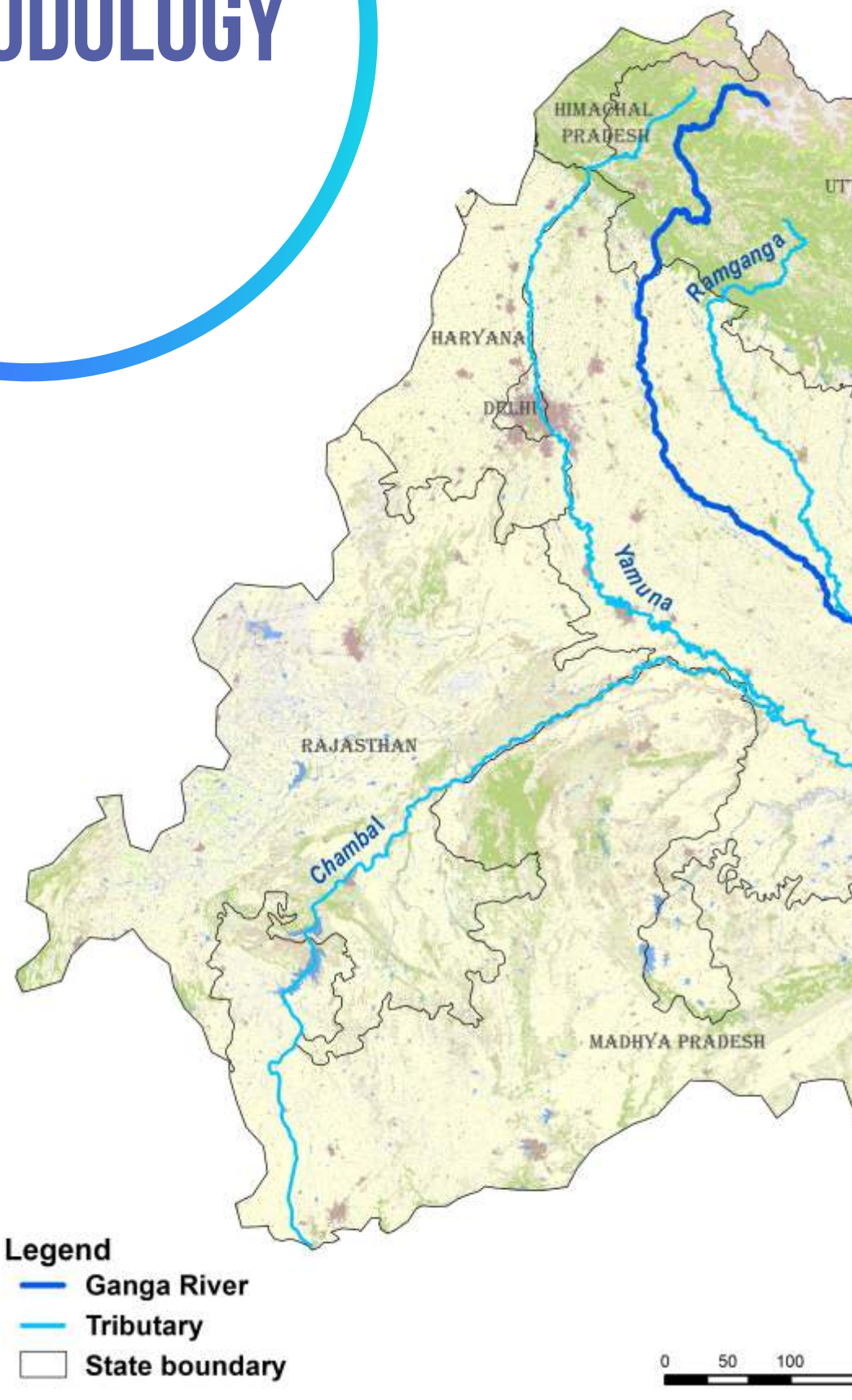


Figure 1: Map showing surveyed rivers in the Ganga River Basin

YAMUNA

Yamuna River, one of the largest tributaries of the Ganga, holds socio-cultural and ecological importance at regional and global scales. The River traverses different landscapes across Uttarakhand, Haryana, National Capital Territory of Delhi, and Uttar Pradesh, where variations in geography, climate, soil conditions, and rainfall contribute to distinct forest types along its course. From its origin at Yamuntori, the river travels 1435 km and joins the Ganga River at Prayagraj in Uttar Pradesh.

The literature review and rapid biodiversity assessment highlight that, though key aquatic faunal species such as Gangetic dolphin, smooth-coated otter and gharial continue to exist in the Yamuna River, their distribution range has reduced significantly in the past few decades. Along with these, at least nine species of turtles and several fish species including the Endangered golden mahseer and snow trout are also present in the River. Ecological studies have revealed that the River's biodiversity value is on a decline largely due to rapid deterioration of water and habitat quality, inadequate flow, loss of fisheries, increased pollution and significant changes in biotic communities. The conservation priority species were found to be distributed mainly in the lower stretch of Yamuna River from Pachnada, Jalaun district to Prayagraj. During the first, post-monsoon biodiversity assessment, in Uttar Pradesh a total of 53 sightings of Gangetic dolphins were recorded in the lower stretch of the river. Most of these sightings were in wide straight single channels, where main river width was 360.47 ± 14.45 (SE) meters. During the first post-monsoon rapid biodiversity assessment, 82 individuals of gharials were sighted whereas in second post-monsoon rapid biodiversity assessment, 47 individuals were recorded, in the lower stretch of the Yamuna River. Hence, the stretch between Yamuna-Chambal confluence at Bareh in Etawah to Ganga-Yamuna confluence at Prayagraj is considered to be of high biodiversity value and should be prioritized for conservation.

In the Upper Himalayan zone, infrastructure development for tourism, ongoing hydro-electric power projects and riverbed mining activities need to be regulated to maintain the River's hydrological and ecological integrity. In the middle zone of the river, diversion of water for irrigation and other purposes, extensive illegal sand mining, chemical intensive farming, industrial waste disposal and presence of feral dogs near water-bird habitat are some major threats. The lower zone of the river is heavily polluted with highly reduced flow until its confluence with the Chambal River at Bareh in Etawah district of Uttar Pradesh. Sand mining and fishing remain major threats in this stretch. These threats should be addressed in with the engagement of various important stakeholders and beneficiaries, and the strategies should be location specific. It is also necessary to focus on the restoration and conservation of natural habitats and creation of more protected areas along the river to provide suitable breeding grounds for the threatened species.

CHAMBAL

Chambal River is approximately 965 km long and is the largest tributary of Yamuna River, which plays a vital role in reviving both Yamuna and Ganga rivers. Chambal River originates and flows through Madhya Pradesh, Rajasthan and Uttar Pradesh. The river is home to a remarkable assemblage of highly threatened riverine fauna, including gharials, muggers, smooth-coated otters, nine species freshwater turtles, Indian skimmers, Gangetic dolphins, sarus cranes, black-bellied terns and black-necked storks, among others. However, riparian agriculture practices, illegal sand mining along the river, and intensive fishing pose significant threats to the river's ecosystem. Additionally, natural flow and depth of the river are affected by upstream storage dams, further risking its ecological balance.

Taking these factors into consideration, a rapid biodiversity assessment survey was conducted during February and March 2020 along the Chambal River. The

survey was conducted in the Upper middle zone, Lower middle zone, and Lower zone. The Upper middle zone extends from Kota Barrage to Banas-Chambal confluence, the lower middle zone from Banas-Chambal confluence to Basaidang and the Lower zone from Basaidang to Chambal-Yamuna confluence. The primary objectives of the survey were- (a) Biodiversity assessment in terms of the number of individuals and size classes of conservation priority species, (b) Evaluation of habitat characteristics concerning bank features, shoreline features, water quality, and water depth and (c) Evaluation of anthropogenic activities that influence the river ecosystem.

During the current study period, 75 sightings of Gangetic dolphins were documented, the dolphin sightings were restricted to the Lower zone of the River. No otter presence (direct and indirect evidence) was recorded during the survey. A total of 1,879 individuals of gharial, encompassing all the size classes, were recorded; adult individuals constituted the largest percentage of the sightings. Although the gharials were recorded throughout the National Chambal Sanctuary (NCS), encounter rate (individuals sighted per km of river) was highest in the Lower zone (6.3/km) as compared to the Lower middle zone (1.54/km) and the Upper middle zone (2.58/km). During the survey we encountered a total of 617 muggers of all size classes. The encounter rate of mugger was found to be maximum in the Upper middle zone (2.08/km), followed by the Lower zone (1.58/km) and Lower middle zone (1.07/km). Overall, the abundance and distribution of the aquatic species were found to be higher in the Lower zone as compared to Upper and Middle zones. These differences may mainly be attributed to key habitat features such as the presence of large sandbanks, adequate water depth and riverine islands in the lower stretch of the river. Habitat quality in the lower zone, which also recorded highest encounter for the Gangetic dolphin, mugger, and gharial.

The present survey reveals the importance of the Upper Vindhyan middle zone, Lower Vindhyan middle zone, and Lower zone as per the abundance and diversity of the animals. Therefore, these zones need proper conservation strategies to manage the wildlife. The study also calls for extending the monitoring and population estimation efforts in the Upper Vindhyan and Lower Vindhyan zone for a comprehensive understanding of the wildlife status in the entire stretch of the river.

GOMTI

Gomti River, an interfluve river of the middle Ganga plain, traverses the Upper Gangetic Plain Biogeographic Zone (7A). Originating from the rain-fed natural depression of Gomat Taal (Fulhar Jheel) in Madhotanda village, Pilibhit district, Uttar Pradesh, the river flows for 930 km through Shahjahanpur, Kheri, Hardoi, Sitapur, Lucknow, Barabanki, Sultanpur, and Jaunpur districts, ultimately merging with the Ganga River at Kaithi in Varanasi district. The Gomti basin, elongated and aligned parallel to the Himalayan front, forms part of the northern Indo-Gangetic foreland basin. Gomti River is a perennial groundwater-fed river in the central part of the Gangetic Plain. While traversing across Uttar Pradesh, Gomati drains an area of over 30,000 sq.km area within the Ghaghra–Ganga interfluve region.

During the survey of the middle and lower stretches of the Gomti River, 1102 individuals of water birds from 9 orders, 14 families and 31 species were recorded. Eleven adult individuals of the mugger were sighted. A total of 51 Individual of turtles belonging to five species, viz., *Hardella thurjii, Lissemys punctata, Nilssonia gangetica, Pangshura tecta* and *Pangshura tentoria* during the survey. These sightings were recorded from Madhotanda, Shahjahanpur, Lucknow and Sultanpur, and in the stretch from Pilibhit to Sultanpur. Agriculture, fishing, and free-ranging dogs were the most common threats observed during the survey.

SON

Son River is the second-largest right bank tributary of the Ganga River. It originates at an elevation of 600m amsl near Amarkantak in Madhya Pradesh and joins the Ganga River after traversing a distance of 785 km at Haldi Chhapra village in Bihar. During its course, it passes, through Madhya Pradesh, Uttar Pradesh, Jharkhand and Bihar. A 161 km stretch of the Son River, along with a 23 km stretch of Banas River and 26 km stretch of Gopad River was declared as the Son Gharial Wildlife Sanctuary (SGWS) in 1981. 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 the Endangered Indian skimmer, Near Threatened great thick-knee, oriental darter 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 SGWS. 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 0.2 m to 3.2 m (average = 1.29 + 0.06), and the width ranged from 45 to 1230 m (average = 384 + 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 SGWS owing to effective patrolling and law enforcement by the forest department. A stretch of 125 km from Chopan to Tilouthu (Uttar Pradesh to Bihar) 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 threaten 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.

RAMGANGA

Ramganga River (Western Ramganga) is a spring-fed river originating from the Dudhatoli range of the western Himalaya in Pauri District of Uttarakhand. The river passes through the West Himalayas (2B) and Upper Gangetic Plains (7A) biogeographic provinces in Uttarakhand and Uttar Pradesh, covering a distance of 680 km. The river is a lifeline of Jim Corbett National Park and provides refuge to the Vulnerable smooth-coated otter, Critically Endangered gharial and Endangered golden mahseer.

A boat-based rapid biodiversity assessment of approximately 530 km strech of the river, from Kalagarh to the Ganga confluence was undertaken. A total of 90 species of waterbirds belonging to 23 families and 13 orders were recorded during this study. Lesser flamingo, a Near Threatened bird, was recorded for the first time from the area. A population of Indian skimmer, 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 mugger was recorded near Kalagarh. Seven species of turtles, i.e., two soft-shell (family Trionychidae) and five 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 sighted during the present study.

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 causing habitat fragmentation and degradation by creating longitudinal barriers.

Two high biodiversity stretches were identified in the Ramganga River i.e. Govindpur, Bareilly District to Hazratpur, Budaun District (55 km) and Allaganj, Shahjahanpur District to Shyampur, Hardoi District (40 km). These stretches support 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 passes through the most densely populated landscape of the country. Such overpopulated areas impose unsustainable demand on their riverine resources and services. This study identified a few anthropogenic activities as a threat to the ecological integrity of the river in the middle and lower stretches, 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 caused by the sewage, solid waste and discharge from Moradabad.

The Corbett National Park in the upper stretch of the river provides refuge to 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 stretches 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 the respective administrative authorities to deal with sewage, solid waste and industrial effluent discharge 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 emergent situations.

GHAGHRA

Ghaghra, is a transboundary tributary of the Ganga River. The river originates in the Tibetan plateau near Lake Mansarovar. It then flows southward from Nepal as the Karnali River. Moving further southward across the Shivalik hills, it splits into two branches, Girwa on the left and Kauralia on the right merges to form the main channel of the Ghaghra. The Ghaghra, with its average annual flow of about 2,991 m^3/s (105,600 cu ft/s), is the largest tributary of the Ganga River by discharge. Travelling a distance of about 615 km in the southeast direction, through Uttar Pradesh and Bihar, the river joins the Ganga River at Revelganj, Saran district, Bihar. It is home to many charismatic riverine fauna, including Gangetic dolphin, gharial, mugger, smooth-coated otter, freshwater turtles and water birds. However, the river is subject to a wide range of pressures, including physical modification, flow alteration, point source and diffuse pollution, and sand mining. A rapid biodiversity assessment was conducted on the Indian side of the River from Kailashpuri dam, Bahraich, to its confluence with the Ganga River at Revelganj, Saran, between December 2020 and January 2021. During the study, a total of 338 individuals of Gangetic dolphins were recorded in the 615 km stretch of the River. Gangetic dolphin sightings occurred throughout the River with an encounter rate of 0.54 ± 0.08. Two direct sightings of smooth-coated otter were also recorded during the study. A total of 406 individuals of gharial, including nine adults, were recorded with an encounter rate of 0.66±0.14. All gharial sightings occurred from Kailashpuri Dam, Bahraich to Tanda, Ambedkar Nagar. A total of 4,534 individuals of freshwater turtles belonging to the *Pangshura* genus and the *Nilssonia gangetica* species were recorded. These sightings were frequently observed till Faizabad, Uttar Pradesh, with an encounter rate of 7.37 ± 3.76. The abundance and distribution of species were maximum in the Lower middle zone, followed by Upper middle and Lower zones.

The major threat was the flow alteration at Girija Barrage, which causes lateral erosion and erodes nesting sites, including riverine islands and sandbanks. A minimum flow should be maintained in the lean and monsoon seasons. Apart from this, all three zones have various issues viz., riverbed farming, sand mining, unsustainable fishing, feral dogs and open drains that intensify in the Lower zone due to the high dependency of the local community. These threats need to be addressed with site-specific conservation strategies developed with the support of an array of stakeholders for sustainable management of natural resources and conservation of aquatic life.

GANDAK

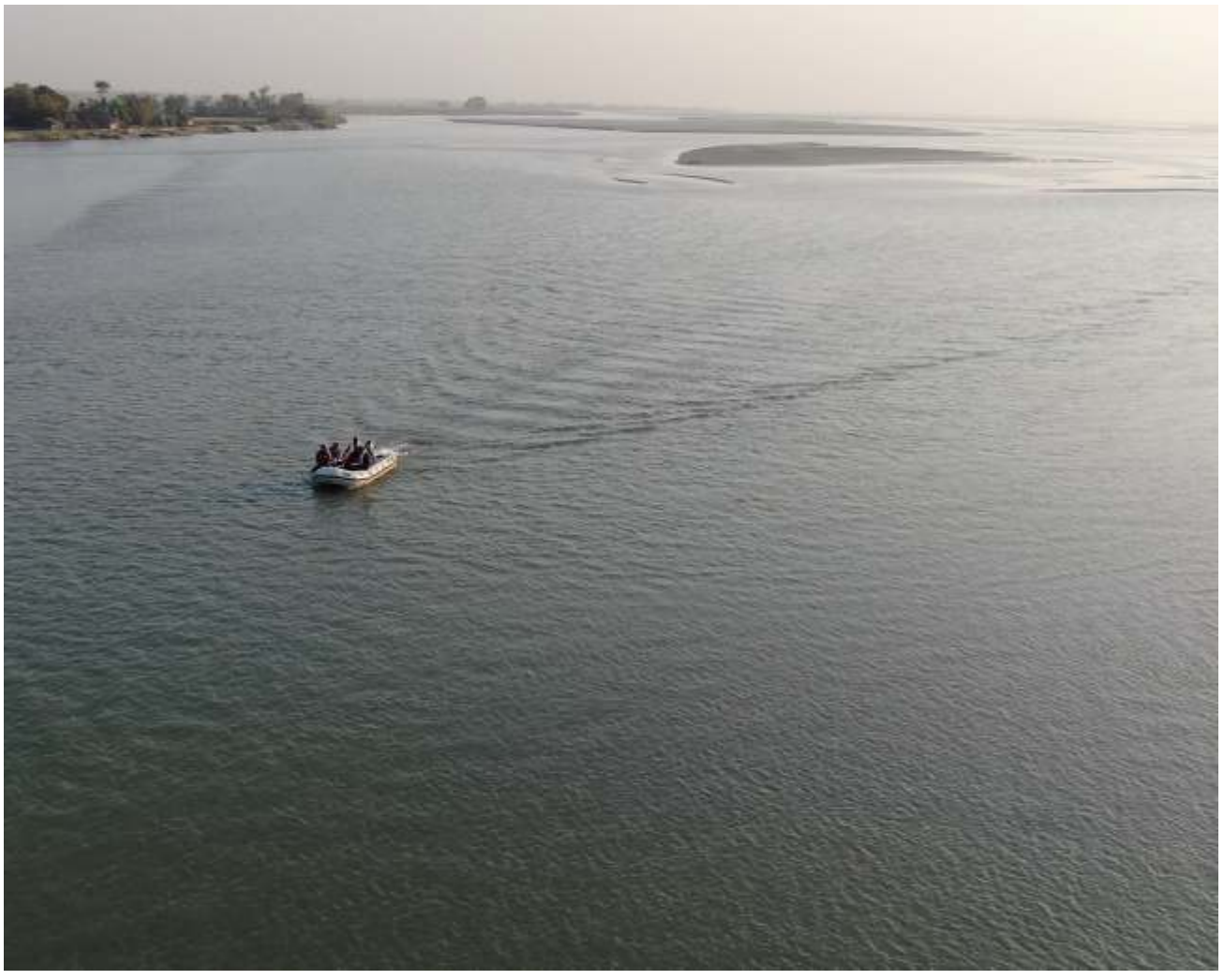
Gandak, a transboundary tributary of the Ganga River, harbours an array of wildlife. The river originates at an elevation of 7,620 m above mean sea level (asl), to the north of Dhaulagiri Mountain in Tibet, near the Nepal border. After flowing through Tibet, it crosses Nepal, where it is also known as Narayani, before entering the Indian territory. In India, it flows through West Champaran, East Champaran, Muzaffarpur, Gopalganj, Siwan, Saran and Vaishali districts of Bihar and Gorakhpur and Deoria districts of Uttar Pradesh before joining the Ganga at Hajipur in Bihar, covering a course of 295 km. Due to steep slope and loose soil in the upper catchment, Gandak carries a lot of silt and other deposits to the Indian side, resulting in a continuous shifting course river. Gandak River is also supports several threatened aquatic species, including Gangetic dolphin, gharial, mugger, smooth-coated otter, freshwater turtles and waterbirds. This thriving ecosystem is subject to an array of anthropogenic pressures such as physical modification, flow alteration, pollution and sand mining. Considering these, a rapid biodiversity assessment was conducted from Valmikinagar (West Champaran district, Bihar) to Hajipur (Vaishali district, Bihar), extending to the confluence with the mainstem Ganga. The assessment was carried out in the post-monsoon seasons of 2019–2020 and 2020–2021, covering a total stretch of 295 km. During the 2019-2020 biodiversity assessment, 152 individuals of Gangetic dolphins were recorded, with an encounter rate of 0.47±0.07. Sixty-four percent of all sightings were recorded in the Lower zone. During the second survey conducted in 2020-21, individuals of Gangetic dolphins were recorded with an encounter rate of 0.39±0.07 along the stretch from Lavkush ghat, Valmikinagar, West Champaran to Hajipur, Vaishali.

A total of 192 gharials, including five adult males, were recorded from Lavkush ghat, Valmikinagar to Hajipur, Vaishali with an encounter rate of 0.59±0.13 in the year 2019-2020. In 2020-21 along the same stretch 206 individuals were recorded, including 9 adult males, with an encounter rate of 0.63±0.14. In 2019-2020, 987 individuals of freshwater turtles were recorded along the same stretch with an encounter rate of 3.04±0.87. During the second assessment in 2020-2021, 643 individuals were recorded with an encounter rate of 1.98±0.64. A nesting site of *Morenia petersi* upstream of Dhanha Bridge in the West Champaran district of Bihar, was also reported during the rapid biodiversity assessment. The study identified a 115 km stretch from Dhanha, West Champaran to Dhekhwah, East Champaran districts with high biodiversity value, with good presence of riverine islands and sandbanks. The major threats identified include flow alteration by the Gandak Barrage at the Indo-Nepal border, habitat alteration and unsustainable resources. Other threats in the river include riverbed farming, sand mining, unsustainable fishing, feral dogs and open drains along river banks with proximity to human settlements. These threats need to be addressed with site-specific conservation strategies developed with the support of an array of stakeholders for sustainable management of natural resources and conservation of aquatic life.

KOSI

Kosi River is a major left bank tributary of the Ganga River and constitutes approx. 1.32% of the Ganga River basin in India. Kosi River is known for recurrent floods within the region, which develop ecotones that act as a transition zone between terrestrial and aquatic ecosystems. This riverine ecosystem is deeply influenced by annual precipitation, Himalayan glacial inputs, sedimentation rate, and sediment connectivity. Recurrent flooding and sedimentation lead to avulsions of active channels and constant shifting of the river course, forming one of the biggest alluvial fans in the world, extending up to 15,000 sq.km. The Kosi River flows through eight districts of Bihar and is a lifeline to more than 21 million people. The biodiversity of this river system is unique, as it flows through three distinct biogeographic zones, with the Indian stretch lying within the Lower Gangetic Plain (7B) biogeographic province. The river represents a unique assemblage of biodiversity within the region, ranging from faunal diversity of more than 340 bird species, Gangetic dolphin, gharial and mugger, more than 12 turtle species, and floral diversity ranging from tropical moist deciduous forests to tropical dry deciduous forests. However, this diverse and unique habitat is under constant pressure due to natural and anthropogenic drivers.

The survey was carried out between Piprahi and Kursela, Bihar, India, covering a stretch of 235 km in the Middle and Lower zones. During the survey, 48 species of water-associated avifauna (1923 sightings), 180 sightings of Gangetic dolphins, and 326 sightings of turtles belonging to *Pangshura spp*. were recorded. Based on preliminary findings, two river stretches (Baluaha to Usraha and Usraha to Pratapnagar) with high biodiversity value along the surveyed stretch of the Kosi River were identified for future monitoring. The anthropogenic influences score was almost similar in the Middle and Lower Zones of the Kosi River. Extensive riverbed agriculture, human settlements, and fishing activities were extensive throughout the study area.



AJAY

Ajay River, one of the major right-bank tributaries of the Bhagirathi/Hooghly River, flows through the states of Jharkhand, Bihar and West Bengal. The river passes through two distinct biogeographic zones, namely Deccan Peninsula (6B) and Gangetic Plain (7B). The natural flow of the river has been altered due to the construction of barrages, extensive sand mining and the extraction of water for agriculture and industrial purposes. Besides, during the dry season, when the availability of water is reduced significantly in the river, it becomes unfit for navigation.

Considering these factors a vehicle and boat-based rapid biodiversity survey was conducted from December 2020 to January 2021 in the Ajay River to assess its ecological status and identify areas for effective conservation planning and future monitoring. A stretch of 285 km of the Ajay River between Chakai village in Jamui district, Bihar and its confluence with the Bhagirathi/Hoogly River at Katwa in Bardhaman district, West Bengal was surveyed.

A large part of the Ajay River basin is mainly under cultivation (68%) followed by small urban settlements (16%), with an average human density of 863 individuals per sq.km. A total of 489 individuals representing 25 waterbird species belonging to 8 orders and 9 families were recorded during the rapid biodiversity assessment. Of the total recorded species, two waterbird species were of global conservation significance as each one of them are listed as Vulnerable and Near Threatened in the IUCN Red List of Threatened Species. The present study did not encounter indicator species, such as the Gangetic dolphin, otter, gharial and mugger in the Ajay River. The entire study area was generally shallow (< 1 m in depth) with limited water flow during the post-monsoon season. Channel width ranged from 40 to 260 m (average = 140.31 ± 69 m), and channel depth was between 0.3 to 3.3 m (average = 0.93 ± 0.76)m. The banks of surveyed river segments were either loamy or rocky and characterised by trees, shrub and grasses. Approximately 60% and 50% of the substrate on the left and right banks, respectively, consisted of loamy soil. About 80% of both banks were found to be partially covered with vegetation. The study stretch between Chakdaha and Katwa in the Lower zone of the Ajay River was found to be suitable for waterbirds, as the average channel depth of the stretch is comparatively higher than the overall average depth of the river (<1 m). Besides, the confluence of Ajay River and Hooghly River at Katwa in the Lower zone allows the mixing of nutrients, thereby enhancing species diversity along this stretch. . Representative bird species of this stretch include River Lapwing (*Vanellus duvacelli*), Ruddy Shelduck (*Tadorna ferruginea*), Pied Kingfisher (*Ceryle rudis*) and Marsh Sandpiper (*Tringa stagnatilis*).

A detailed study is required understand about the geomorphological characteristics of the river, like channel morphology, flow regime, water quality and anthropogenic factors which influence the survival of the aquatic species in the Ajay River.

DAMODAR

Damodar River basin lies largely in the Deccan Peninsula (6B) biogeographic zone, with a small portion extending into the Gangetic Plain (7B). It spans a catchment area of 23,370.98 km² and experiences a humid, subtropical monsoon climate with erratic and uneven rainfall distribution across the basin. The basin comprises a tropical moist deciduous forest interspersed with tropical dry deciduous vegetation, and supports over 850 plant species. The faunal diversity includes approximately 55 species of mammals, 17 species of reptiles, and 222 species of birds. However, this rich biodiversity is under constant pressure due to anthropogenic influences, as open-cast mining and sand mining in the upper and middle stretches of the river cause severe degradation.

The water quality in this stretch is deteriorating due to the direct influx of untreated industrial effluents. This ecosystem has a unique mosaic of habitats that supports distinct biodiversity and provides essential ecosystem services.

A vehicle-cum-boat-based rapid biodiversity survey was conducted in December 2020. The present study documented 44 species of waterbirds, including one species each listed as Vulnerable and Near Threatened in the IUCN Red List of Threatened Species. We also recorded 90 species of riparian vegetation on both banks of the surveyed stretch of the river. The anthropogenic influence were higher in the lower zone than the middle zone of the river. The intensity of ferry activity, and fishing riverbed agriculture, water extraction, and livestock grazing, were higher in the lower zone.

RUPNARAYAN

Rupnarayan River with its network of second-order tributaries, including the Dwarakeswar, Silabati, and Kangsabati rivers, is a major right-bank tributary of the Hooghly River. The river is characterised by high siltation and is influenced by tides. It joins the Hooghly River near Geonkhali, Purba Medinipur district, West Bengal. The basin of the Rupnarayan River is characterised by rock types ranging from Archean, Proterozoic, metamorphic, to sedimentary. The soil in the upper reaches is predominantly lateritic soil and clay laterites, whereas the lower reaches have younger and newer alluvial soils. This basin has a typical tropical monsoon with an average rainfall of 1320 mm to 1630 mm. The drainage system of the Rupnarayan River consists of several perennial and non-perennial rivers. From the downstream of Dwarakeswar and Silabati confluence, the Rupnarayan River is influenced by semi-diurnal tides and gradually becomes wider towards the Hooghly River confluence. It flows through three western districts and four southern districts of West Bengal. The river basin falls in two biogeographic zones, viz., Lower Gangetic Plain- (7B) and the Deccan Peninsula (Chhota Nagpur Plateau- 6B). The forest type of the basin is classified as 'Northern tropical dry deciduous' forest. Critically Endangered northern river terrapin and gharial, historically abundant in the Rupnarayan River basin, are now locally extinct.

The rapid biodiversity assessment was conducted during December 2020. A total of 54 Gangetic dolphins were sighted, which were restricted to the lower stretch of the River. The upper and middle stretches were not deemed suitable for Gangetic dolphins to survive due to low depth and inadequate flow. Twenty-eight species of water and water-associated birds were recorded, including nine species of winter migrants. The anthropogenic stressors were similar across the upper, middle and lower stretches of the River. Extensive unscientific fishing activity, riverbed agriculture, and extraction of water from the river were the major anthropogenic activities observed.

CONCLUSION

The document provides preliminary findings of rapid biodiversity assessment of select rivers in the Ganga basin. The assessment offers insights into the ecological status and conservation needs of these rivers and reveal that these rivers continue to support populations of priority aquatic fauna, including the Gangetic dolphin, gharial, mugger, freshwater turtles, and waterbirds. The distribution and abundance of these species remain uneven and highly influenced by habitat conditions, flow regimes, and anthropogenic pressures. The lower stretches of most surveyed rivers are characterized by low species richness and the absence of key indicator species which is primarily attributed to altered hydrology, pollution, habitat degradation, and intensive human use.

In future, studies on ecotoxicological aspect and identification of priority stretches based on indicator species approach will be conducted. These efforts will be critical to guide the restoration of ecological flows, protection of critical habitats, and regulation of anthropogenic pressures. Additionally, strengthening community-based conservation initiatives and capacity-building of local stakeholders will be essential for sustaining and enhancing the ecological integrity of these river systems.

ECOLOGICAL SNAPSHOT OF SELECT RIVERS IN THE GANGA BASIN

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