

Status of Ganges River dolphins in the five Rivers Parman, Bakra, Kankai, Mechi and Mahananda within Araria Forest Division, Bihar 2019

With notes on other riverine biodiversity



***Submitted to the
Divisional Forest Officer, Araria Forest Division
Department of Environment, Forest and Climate Change, Bihar, India***

By

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**Final Report
2019**



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Acknowledgements

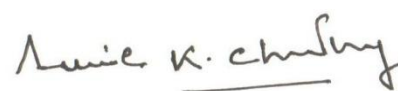
The research team wishes to sincerely thank Mr. Ram Naresh Jha, Divisional Forest Officer, Araria Forest Division, Bihar for awarding the project, 'Survey of 5-rivers, Parman, Bakra, Kankai, Mechi and Mahananda in Mahananda River Basin for estimation of dolphin population and for documentation of other riverine biodiversity' to T. M. Bhagalpur University, Bhagalpur, Bihar. We also thank him for organizing the fund for the survey work and for necessary logistical support to conduct the survey. We thank Mr. Hemchandra Mishra, Range Forest Officer, Araria Range and Mr. Umanath Dubey, Range Forest Officer, Kishanganj Range and associated staffs of the Araria Forest Division for their prompt help and coordination of field logistics throughout the survey.

Mr. Sonesh Kumar of Araria and Md. Shamsheer Khan (Owner and driver of the Maruti Van) made reconnaissance survey of the rivers possible as our team was not acquainted of the courses of the rivers. We owe gratitude to them. Reconnaissance survey of these rivers helped us in knowing about the present status about the rivers, present river course, whether navigable or not and that helped us in determining the suitable methods to be adopted for estimation of dolphin abundance.

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We thank the Head, University Department of Botany, T. M. Bhagalpur University, Bhagalpur for providing institutional support, and lab facilities for this project.

Our thanks are also due to fishers and other local people who provided us relevant information on the dynamic nature of Rivers in Mahananda River Basin and on other river biodiversity.



Project Manager

EXECUTIVE SUMMARY

The Ganges River dolphin *Platanista gangetica gangetica* is an endangered and unique freshwater dolphin found only in the Ganga-Brahmaputra basin across India, Nepal, and Bangladesh. This dolphin species is very unique and is unlike any other dolphin species that exists today, because it is functionally blind. As the Himalayan rivers in the Ganga-Brahmaputra basin carry loads of sediment and are very murky, the river dolphin has lost its eyes naturally in the course of evolution. It navigates and searches for prey using echolocation by emitting ultrasonic click-sounds. This rare and fascinating animal is today highly threatened by multiple factors, of which the availability of water is a primary threat. Dams and barrages that have been built on almost all rivers in the Gangetic basin have heavily altered river flows and reduced the availability of water for riverine wildlife, due to pressures for irrigation and power. Many of the large and perennial Himalayan rivers have barely any water left in them today, without which species like the Ganges river dolphin cannot survive. Apart from poor in-stream flows, river pollution, channelization, embankment constructions, and illegal hunting of dolphins for their oil form the most significant threats to the species (Smith and Smith 1998, Smith and Braulik 2012, Choudhary et al. 2006).

Following serious declines in its distribution and population sizes by the 1980s, the Ganges river dolphin was listed as Endangered as per the International Union for Conservation of Nature (IUCN) and also was enlisted as a Schedule I species in India's Wildlife (Protection) Act (Smith and Braulik 2012). It was also declared the **National Aquatic Animal** of India in 2010. The conservation of Ganges river dolphins today critically hinges on maintaining the overall ecological and social integrity of river systems in the Indian subcontinent as a whole. For this, providing adequate ecologically oriented river flows, especially in the dry season, is critical. However, despite the high level of protection that the dolphin enjoys on paper, much more effort is needed on the ground to save the species from extinction.

Approximate estimates of the overall population of Ganges River dolphins range from 3000 to 4000 animals. However, this is at best an educated guess: an important knowledge gap that still exists is the lack of systematically conducted

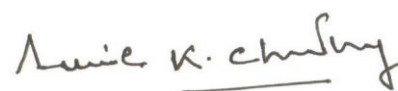
assessments to estimate the population size and distribution of the Ganges river dolphins in many river reaches of northern India. The hydrology and geomorphology of these rivers is highly dynamic, and rivers also change their channel courses very often. As a result, conducting well-designed surveys has been difficult in many areas. One such region is the Mahananda River Basin in Bihar. No report is available about the dolphin abundance in rivers of Mahananda River Basin in Bihar. Hence, the systematic surveys for estimation of population size and abundance of Gangetic dolphins and other riverine biodiversity in rivers of Mahananda River Basin in Bihar are needed.

The Govt. of India has launched two major projects in Bihar on October 5, 2017 through the Implementing Agency, Wildlife Institute of India, Dehradun and Bihar Forest Department. These projects aim to prepare a science-based aquatic species restoration plan for Ganga River by involving multiple stakeholders. Bihar is one of the Range States through which Ganga flows and dolphins are in sizable population in river Ganga in Bihar. Accordingly Bihar Govt. envisaged to take exercise of dolphin population estimation and assessment in Ganga River and its major tributaries in Bihar on annual basis from 2018-19 onwards. Towards this end, it was decided to engage the services of Expert organizations and professionals/scientists for leading and guiding the exercise in a coordinated manner for initial few years till the Field organization of the Bihar Environment and Forest Department acquires the capability and techno-scientific competence to conduct such operations on its own in future on regular basis.

Towards this end, Araria Forest Division awarded the work of survey of 5-rivers - Mahananda, Parman, Bakra, Kankai and Mechi rivers - in Mahananda River Basin in Bihar Kosi, to T. M. Bhagalpur University. The present survey work is in alignment with the objectives of 'Namami Ganga Mission' and includes component of conservation of river biodiversity particularly Ganges river dolphin.

The present report is segmented into four Chapters. **Chapter 1** refers to introduction about the basic information on Ganges river dolphin, present threats being faced by this endangered species and need for conserving this species. The objectives of the present survey in the rivers of Mahananda River Basin have been clearly spelt in this chapter. **Chapter 2** deals with the study area description and the

methods used for the survey of river dolphin and other biodiversity. **Chapter 3** deals with results and discussion on the data generated during the present survey on the assessment of dolphin population and its habitat in 5-rivers (Rivers Mahananda, Parman, Bakra, Kankai and Mechi) under Araria and Kishanganj districts. The results of opportunistic recordings of other biodiversity and of analysis of river water samples for water quality have been also discussed in this chapter. **Chapter 4** refers to recommendations made based upon the findings of the present survey. **Bibliography** used in writing this report has been fully described at the end.

A handwritten signature in black ink, reading "Anil K. Choudhary". The signature is written in a cursive style with a horizontal line underneath the name.

Project Team Leader

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ABBREVIATIONS

DO	Dissolved Oxygen
TDS	Total Dissolved Solid
°C	Degree Centigrade
km	Kilometer
m	Meter
GPS	Global Position System
TMBU	Tilka Manjhi Bhagalpur University

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@ Photo on cover page: Subhasis Dey

Introduction

The Ganges River Dolphin also known as the South Asian River Dolphin *Platanista gangetica gangetica* is an endangered species found in the Ganga-Brahmaputra-Meghna and Karnaphuli-Sangu river system across India, Nepal and Bangladesh. It is one of the five extant freshwater dolphins that live in exclusively freshwater conditions. It has been listed as a Schedule-1 species in India's Wildlife Protection Act 1972 following its decline in population and distribution by 1980s. In 2010, this species was also declared as a National Aquatic Animal of India. The best recent estimates of the population of the Ganges River Dolphin range within 3000-4000 individuals and further detailed studies for estimation of abundance of dolphin population are in progress under the federal government's programme, Recovery & Rehabilitation of Endangered species.

In the state of Bihar the Ganges River Dolphin is found in the rivers, Ganga, Gandak, Kosi and Mahananda. Their distribution and dispersal pattern is almost unknown in the lesser, shallower tributaries of these rivers. In the month of March and April, 2019 surveys were conducted in five rivers within the Araria forest division which include two districts of the state namely Araria and Kishanganj. The surveys were conducted to assess the status of the dolphins in four tributaries of the Mahananda River, each entering Bihar state through Nepal and one survey was even conducted in Mahananda itself.

The Mahananda River is a trans-boundary river that flows through the Indian states of West_Bengal and Bihar, and Bangladesh. The Mahananda is a typical river system consisting of two different streams, one arising from mountainous region of Himalayas in Nepal that traverses through Bihar and falls in the Ganga on the left opposite to Rajmahal in Bihar and is locally named as river Fulahar. The other stream also named as Mahananda rises in downhill in Darjeeling in Bengal and traverses a distance of about 400km through the district

of Darjeeling, West Dinajpur and Malda and enters Bangladesh and ultimately falls in the Ganga near Godagarighat in Bangladesh just opposite to Lalgola in Murshidabad district of Bengal. The total length of the Mahananda is 360 km out of which 324 km are in India and 36 km are in Bangladesh. River Mahananda is an important tributary of the River Ganga. The river is foothill fed, dendritic with moderate drainage to low texture, and the basin is highly elongated. Due to low slope on downstream and variable discharge, the river often exhibits the meandering and braided structure throughout its lower courses. The climate of the river system in Purnea, Kishanganj, Araria, Katihar and West Dinajpur districts is cold from November to February and hot from March to middle of June due to strong westerly wind. With the setting in of the monsoon in the middle of October, the nights become appreciably cooler, though the days remain hot, sometimes longer. The relative humidity varies from 20% to 85%. It is the lowest during April and May and the highest in the months of June to September. The average annual rainfall in Mahananda river system in India is about 2050 mm. About 80% of the rainfall is during the monsoon months. It has a commanding role in regulating overall economy of the catchment area, namely Darjeeling, Uttar Dinajpur and Maldah districts of West Bengal and Kishanganj, Purnia and Katihar districts of Bihar in more than one ways. However, landslides, soil erosion, shifting of bank lines and associated degradational fluvial process have detrimental effect on the hydrological regime of the river. The Mahananda is also hit by siltation and river beds rising, reducing the capacity of the river to hold water. The embankment made along the rivers only complicates the floods as there is no free flow.

The **Mechi River** is also a trans-boundary river flowing through Nepal and India. It is a tributary of the Mahananda_River. The Mechi-Mahananda interfluvium is a transitional area between the hills and the plains and exhibits a wide range of topographical variations. The rivers originating in the hills attain a braiding character and have well developed alluvial fans. There is a proposal to link the Mechi to the [Kosi](#). Kosi–Mechi interlinking is part of River Interlinking Project proposed to [Nepal](#) by India is for providing irrigation facilities in four districts (Araria, Purnea, Kishanganj and Katihar) of Bihar.

The Kankai River is also a trans-boundary river flowing through Nepal and India. The Kankai originates in the Mahabharat-Range in Nepal. It flows through Nepal and then flows through the Indian state of Bihar to join the Mahananda in Kishanganj district. It is a holy river of millions of Hindu Devotees living throughout Nepal. The Kankai is a medium sized rainfed perennial river. The western Kankai carries discharge higher than Mahananda. The area has warm temperate rainy climates with mild winters. Upper part of the basin basically consists of granitic gneiss of Cambro-Ordovician age and the lower part consists of Quaternary rocks. The Kankai is gravelly river with more than 60% gravel of gneiss and remaining other are of different metamorphic and sedimentary rocks. The sediment yield of the river is estimated to be 0.148 million ton/year. The river over-floods during the monsoon. It is really beautiful to view the local fisherman fishing in the river and the children taking bath in heat of sun.

Rivers Parman is the tributary of Mahananda and **Bakra is the tributary of Parman.** River Parman has stable banks and contains quantum of silt. It is quite wide also. Sand and mud mining is a common practice in the River Parman and Bakra. Excessive removal of sand and mud may significantly distort the natural equilibrium of a stream channel and may damage the aquatic habitat.

This report is based on survey of approximately 250km stretch of the rivers including Mahananda, Parman, Bakra, Kankai and Mechi, all part of Mahananda River Basin, flowing through Araria and Kishanganj districts in Bihar. This report provides information on the absence and presence of the dolphins along with information on other biodiversity and anthropogenic activities in the river Parman and river Bakra in the district of Araria and the rivers Kankai, Mechi and Mahananda in the district of Kishanganj. Water quality and plankton sampling were also done in each river. The results of analysis of river waters for some important water quality parameters have been depicted in this chapter. The results of plankton analysis are not included as the analysis is still not complete.

Survey Objectives

- 1.** To estimate the population size and abundance of Ganges river dolphin in the six- rivers In Mahananda Basin within Araria Forest Division, namely Parman, (Araria), Bakra (Araria), Kankai(Kishanganj), Mechi (Kishanganj), Donk (Kishanganj) and Mahananda (Kishanganj),
- 2.** To look at the suitability and availability of river habitats (depth, channel characteristics etc) for the dolphins in the study area,
- 3.** To make an inventory of other riverine biodiversity seen in the study area, and
- 4.** To assess the impacts of existing and future threats to dolphins and other riverine biodiversity.

Chapter: 2

Materials & Methods

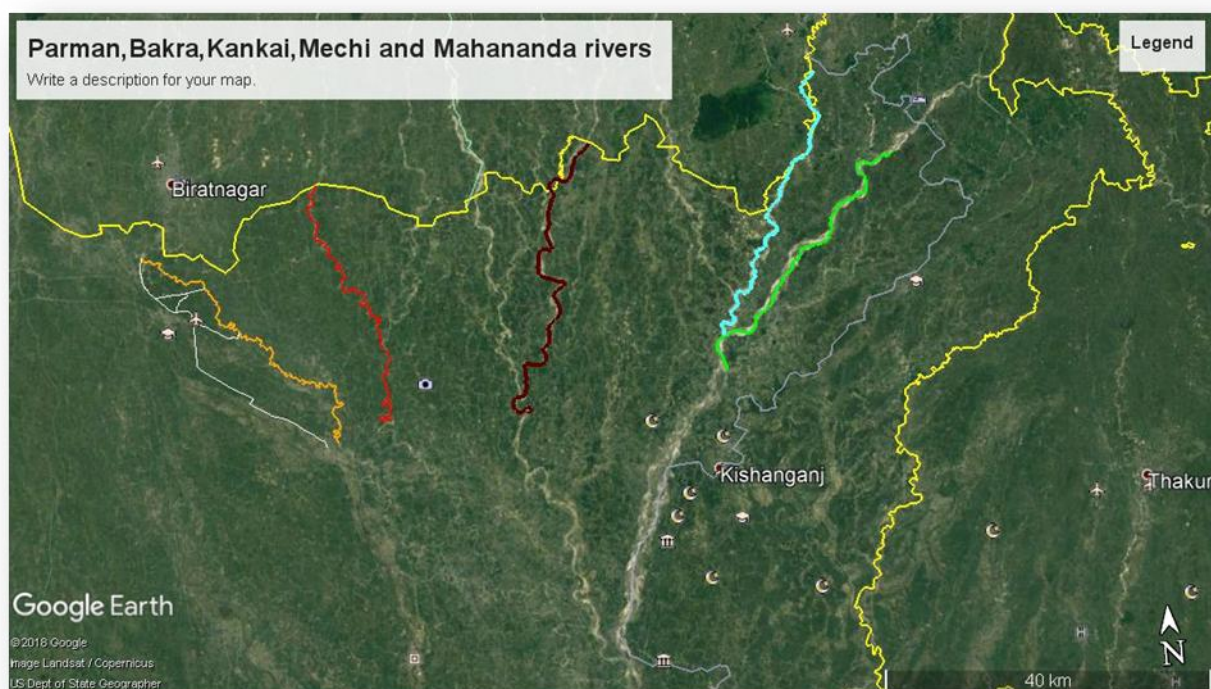
2.1 Study Area

Surveys were conducted in the five rivers from 4th March, 2019 to 14th April, 2019. A total length of approximately 245km was covered during the survey. Reconnaissance survey by motor vehicle was carried out for each river before conducting the boat based surveys. Surveys in all the rivers were conducted mostly on two Kayaks and also on foot as all the rivers had long shallow stretches in which even the Kayaks could not be used. In the river Parman, a total distance of 60km was surveyed from Mirganj (approximately 5.3km downstream of the Indo-Nepal border) to Trishulia Ghat, river Bakra was surveyed from Pirganj (approximately 3.5km downstream of Indo-Nepal border) to Taran Ghat, covering a distance of 56km, river Mahananda was surveyed from Sonapur Ghat to Barakhola Ghat covering a distance of 45km, river Kankai was surveyed for a distance of 44km from Kanchanbari Ghat (approximately 2.3km from Indo-Nepal border) to Chargharia bridge and river Mechi was surveyed for a distance of 35km from Patahmari Ghat (approximately 1.5km from Indo-Nepal border) to Mechi-Mahananda confluence.

The river Mahananda, which is a tributary of the Ganga originates in the state of West Bengal, after flowing for a short distance in the state it enters Bihar in which it flows for approximately 153 km (this time only 29 % of the river in Bihar was surveyed) between which it flows along the borders of the state Bihar and West Bengal for approximately 27 km and then again entering in Bihar and finally it enters West Bengal and merges with the river Ganga opposite to the town of Rajmahal in the state of Jharkhand. Out of the four rivers – Parman, Bakra, Kankai and Mechi, three are tributaries of Mahananda, and Bakra is a tributary of Parman, Mechi is the only river that merges with Mahananda within the range of the Araria Forest Division, the others merge with Mahananda in Purnea district. The month of March and April probably brings about the least amount of

discharge in all the rivers, as the survey team found out that in many stretches it was not even possible to sit on the kayak and row along the channel with the flow, instead team members had to walk midstream for kilometers together until they came upon a point where they could sit on the kayak and row. The getting in and getting out of the kayak was quite frequent, especially in Bakra and Mechi rivers where it had to be done every 5 to 10 minutes. All the rivers except Mahananda were very narrow, with a maximum average width of about 100-150m and minimum average width of 50-60m.

Fig. 1: Five rivers shown on Google Earth map. Orange streak on the left is the Parman river, Red streak is Bakra river, Maroon streak is Kankai river, Blue streak is Mechi river and the Green streak is Mahananda river. Where the colour streak ends is the point where the survey for all the rivers ended as per the forest department plan.



2.2 River dolphin survey

For assessing the population and distribution of dolphins in the five rivers the survey team conducted a boat based survey, as it is done usually in all other rivers where dolphins are found but the boats used in these rivers were kayaks which had the

capacity to carry two persons on each kayak. Two kayaks belonging to the Araria forest division office were used in unison during the surveys keeping and maintaining

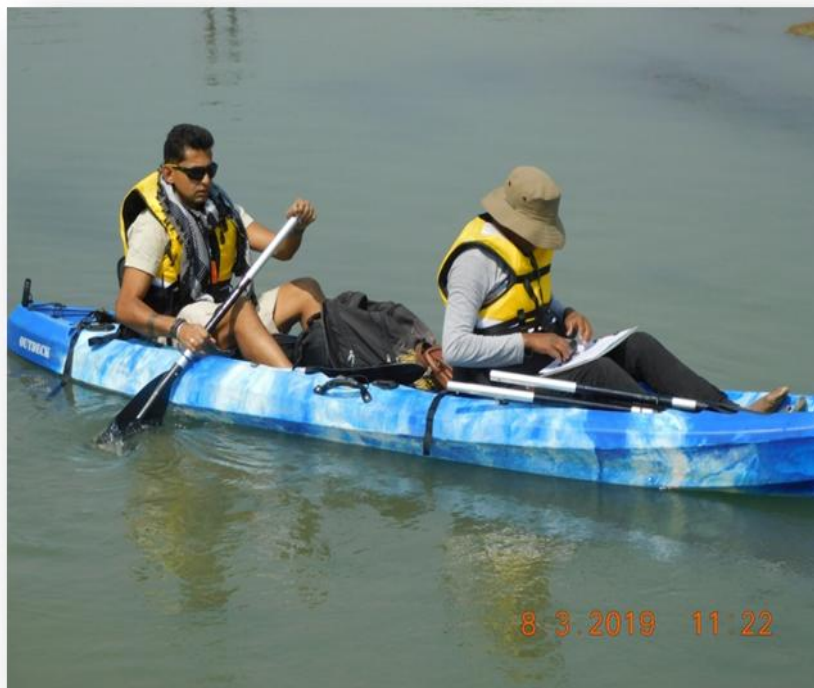


Fig.2: Survey Team using Kayak

a gap of 150-200m between the two kayaks. Out of the two persons in the kayak the person sitting in the front was the data recorder and the person in the backside functioned as the rower and navigator. Whenever a dolphin was sighted the distance from the boat, angle and time of the surfacing was recorded in a data sheet along with the size class (Adult, Sub-adult and calf) and a waypoint was logged in a handheld GPS (Garmin etrex 30x). The reason for keeping a gap distance of 150-200m between the two kayaks was that if the front observers missed surfacing of a dolphin which is in the river but didn't surface during their passing through that area, then the second kayak at the back might have a chance to observe the animal as it surfaces. The average speed of the kayak, while rowing was 4-5km/hr and while wading in the water by survey team members, the wading average speed was 3-4km/hr. In the river Parman where ever we got secondary information (secondary information from local people documented from each river) about the dolphins

presence a particular vicinity, the team used to stop for at least a hour and wait for the animal to surface. Depth in the rivers were preferably recorded every 500m with an handheld Hondex PS-7 LCD digital sounder or at points in the channel where it seemed to have measurable depth, this method was adopted for the shallow rivers like Bakra, Kankai and Mechi and to some extent for Parman and Mahananda too as these two rivers also had shallow stretches in less frequent intervals. Recorder in the front boat recorded dolphins and other biodiversity, and the recorder in the second kayak at the back, primarily recorded anthropogenic activities in and around the river.

2.3 Other biodiversity

Aquatic biodiversity other than the dolphins were recorded by a team member sitting in the front kayak. Birds and fishes were the other animals that were found in and around the rivers and details, such as species, number of individuals, in case of birds, in a flock, distance of a single bird or the flock/fishes in a fishers catch from the survey start point were recorded on a data sheet and their location of sighting was logged in a handheld GPS (Garmin etrex 30x).

The research team also documented fishes during the survey of the rivers, in an opportunistic manner. Whenever a fisher was encountered fishing in the river during the survey, the team documented the catch if the individual had any with him, most of time fishers were encountered with no catch, because most fisher start fishing from midday till late afternoon, so only encounter in late afternoon would have some catch which the team documented.

2.4 Anthropogenic activities

All activities in and along the river channel by people were recorded in a separate data sheet by the recorder on the second kayak, behind the first kayak. Distance of each activity from the survey start point was also noted down in data sheet designed to document human activities.

2.5 Water quality and plankton sampling

Sampling river water for assessment of water quality and hauling plankton net to sample plankton were done at 4-5 points simultaneously in each river. The samplings were done during the reconnaissance survey, at places (Ghats) where the team stopped to assess the river and river floodplain and also to find out suitable place close to the river, where the kayaks could be kept for the night. The sampling of water and plankton was done during the reconnaissance survey as



Fig. 3: Survey Team interacting with local stakeholders in River Parman

It was difficult to stop at 4 - 5 points during the kayak survey because the survey team had fixed destination to reach at the end of the day. Doing the water and Plankton sampling before the boat based dolphin survey gave chance to the team to concentrate on survey for estimation of dolphin abundance and for documentation of other aquatic life in the river. Some of the water variables like ambient and water temperature, Dissolved Oxygen (DO), pH, and conductivity were measured on the spot i.e. at the sampling site, and for analysis of other water parameters, water samples were collected in sampling bottles and transported to Environmental Biology Research Lab of T. M. Bhagalpur University, Bhagalpur. The analyses were done following Standard Methods (APHA, 2005).

Plankton samples were also collected in sampling bottles to be later identified with the help of suitable literature, monographs, keys and photographs.



Fig. 4: Kayak being dragged with the help of local children in non-navigable channel of
River Mechi

Results and Discussion

3.1 Gangetic dolphin

A total of 245 km was covered during the survey of the five rivers in the Araria forest division, in which dolphins were observed and documented in the Mahananda River only. Other rivers were too shallow for the animals to be there during this lean season. Parman had some deep points at intervals where it looked like that the animals could have been present but they were not there as the team stopped near all such deep point for a hour to spot the animal/s but none were seen. Parman was the only river where local people said that the dolphins can still be seen during the time when the team was surveying the river (the team didn't see any animal, even after putting search effort by stopping in all such places where people said they had seen an individual a day or two before our survey) along with the slandered statement documented from local people when asked for, from every other river that was surveyed, that only during the rising water level season (mid June), monsoon season (July to September) and receding water level season (October to January and even sometimes up to February) were the dolphins seen. Local people living along the rivers, particularly along the narrower and shallower once, have very little awareness about the dolphins, as an animal and also as an animal with legal protection in the country. The dolphin is known as *Socho* in the local parlance in Araria and *Shusuk* along the three rivers in Kishanganj.

Mahananda was the only rive where dolphins were seen. A total of 14 animals were recorded in 45km with an encounter rate of 0.31 dolphin/km. The first dolphin, an adult, was seen 8km downstream from the starting point Sonapur. Seven adults, six sub-adults and unclassified (size class) animal were seen during the survey, no calves were observed. In all the other rivers, local people said that the dolphins were seen only during the high water months, from July to February.

Table 1. Details of survey conducted in the five rivers in Mahananda Basin (April, 2019)

SL. No	Rivers	Stretch surveyed (Start point to End point)	Distance covered (km)	Survey mode	Means used to conduct the survey		District and forest range	Forest Division
					Kayak	Wading*		
1	Parman	Mirganj – Trishulia Ghat	60	Downstream Passing	√	√	Araria	Araria
2	Bakra	Pirganj – Taran Ghat	56	Downstream Passing	√	√	Araria	Araria
3	Mahananda	Sonapur Ghat – Behrakola Ghat	45	Downstream Passing	√	√	Kishanganj	Araria
4	Kankai	Kanchanbari – Chargharia Bridge	44	Downstream Passing	√	√	Kishanganj	Araria
5	Mechi	Patahmari Ghat to Mechi-Mahananda confluence	35	Downstream Passing	√	√	Kishanganj	Araria

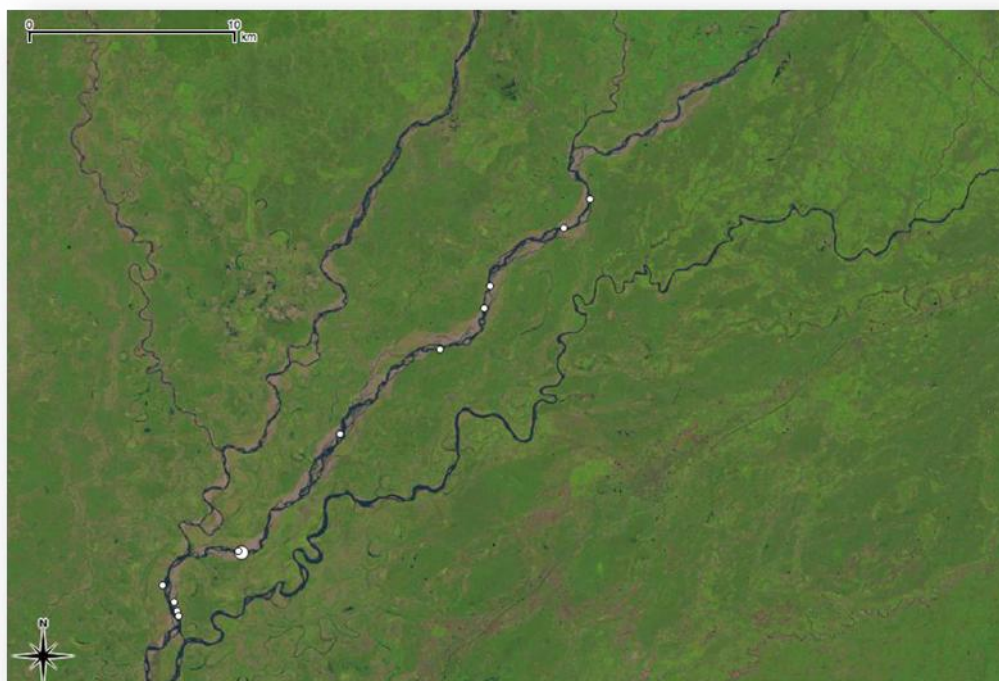
*Channels had to be covered by wading where the water level was too shallow even for the kayaks to be used

Table 2. Summary of dolphin encounters in the five rivers in Mahananda basin (April, 2019)

SL. No	Rivers	Start point and end point for one survey day	Dolphin sighted	Number of dolphins sighted	Size class*	Dolphin encounter rate/km	Dolphin encounter rate/hour
1	Parman	Day1 – Mirganj to Osri Ghat	-	0	-	0	0
		Day 2 – Osri Ghat to Soargaon Ghat	-	0	-		
		Day 3 – Soargaon Ghat to Rampur Ghat	-	0	-		
		Day 4 – Rampur Ghat to Trishulia Ghat	-	0	-		
2	Bakra	Day 1 – Pirganj to Nimua Ghat	-	0	-	0	0
		Day 2 – Nimua Ghat to Ranipool Ghat	-	0	-		
		Day 3 – Ranipool Ghat to Bangora Ghat	-	0	-		
		Day 4 – Bangora Ghat to Taran Ghat	-	0	-		
3	Mahananda	Day 1 – Sonapur Ghat to Bhotathana Ghat	√	5	2 A, 2SA, 1Uncl	0.31	1.40
		Day 2 – Bhotathana Ghat to Rupada Ghat	√	5	4A,1SA		
		Day 3 – Rupada Ghat to Behrakola Ghat	√	4	1A,3SA		
4	Kankai	Day 1 – Kanchanbari Ghat to Matiari Ghat	-	0	-	0	0
		Day 2 – Matiari Ghat to Loucha Ghat	-	0	-		
		Day 3 – Loucha Ghat to Laitor Ghat	-	0	-		
		Day 4 – Laitor Ghat to Chargharia bridge	-	0	-		
5	Mechi	Day I – Patahmari Ghat to Duraghati	-	0	-	0	0
		Day 2 – Duraghati to Karuamani Ghat	-	0	-		
		Day 3 – Karuamani Ghat to Mechi – Mahananda Confluence	-	0	-		

*Size class - A=Adult, SA=Sub-adult. Uncl= Unclassified

Fig. 5: Dolphin sighting points in Mahananda plotted on an USGS Earth Explorer (www.usgs.earthexplorer.gov) map. The river on the top (north) of Mahananda is Mechi and the river below (south) Mahananda is Donk.



3.2 Birds

A total of 57 bird species were recorded during the survey. The avian diversity was the highest in the river Parman with 33 species followed by 32 species in Mechi, 26 species in Bakra, 26 species in Kankai and the least in river Mahananda with only 16 species. Out of the 57 documented species, only four species were under IUCN Red List i.e. both Asian Woollyneck (*Ciconia episcopus*) and Lesser Adjutant (*Leptoptilos javanicus*) as Vulnerable (Vu), River Lapwing (*Vanellus duvaucelii*) and Ferruginous duck (*Aythya nyroca*) as Near Threatened (NT) and Baer's Pochard (*Aythya baeri*) as Critically Endangered (CE). The sighting of Baer's Pochard is quite encouraging and almost rediscovery of the bird species in the River Parman in Bihar State after a gap of 90 years. It was sighted among a flock of Ferruginous ducks. Baer's Pochard is a migratory duck which breeds in southeast Russia and in north and central China. Its' world population is believed to be between 150-700. (www.birdlife.org)

Fig. 6: Baer's Pochard, a *Critically Endangered species* sighted in Parman River (within the red circle) along with Ferruginous ducks



3.3 Fish and Fisheries

Very poor fishing was observed in all the five rivers surveyed by the team in comparison to the mighty rivers like the Ganga, Gandak and Kosi. Fishing is done by wading in the rivers both in Araria and Kishanganj districts, as the channels are too shallow to use fishing boats (dengi), fishers here fish either by spreading one single gill net in the channel, which they keep on putting it in the water for some time and then pulling it out of it to collect the catch, likewise they keep doing it for few hours, secondly some fishers were seen using cast net and some were seen using a gear known as *Singhia* in which the net is tied to 2 to 3 bamboo sticks in a triangular fashion and dipped in the flowing water to trap fishes. All fish catch is collected in a small bamboo basket tied to the waist of fisher.

A total of 22 species of fish were recorded collectively from all the rivers by the team. The fish were recorded whenever a fisher with his catch was encountered during the survey.

Table 3. List of birds recorded during the survey in the five rivers of the Araria Forest Division, Bihar (April, 2019)

S.No.	Species	IUCN Threat Status	Rivers				
			Parman	Bakra	Mahananda	Kankai	Mechi
1	Little Egret (<i>Egretta garzetta</i>)	LC	+	-	+	+	+
2	Intermediate Egret (<i>Mesophoyx intermedia</i>)	LC	+	-	+	-	+
3	Eastern/Western Cattle Egret (<i>Bubulcus ibis</i>)	LC	+	+	-	-	+
4	Great Egret (<i>Ardea alba</i>)	LC	-	-	-	-	-
5	Indian Pond-Heron (<i>Ardea lagrayii</i>)	LC	+	+	+	+	+
6	Striated Heron (Little Green Heron) (<i>Butorides striata</i>)	LC	+	+	-	+	+
7	Ruddy Shelduck (Brahminy Duck) (<i>Tadorna ferruginea</i>)	LC	+	+	+	+	+
8	Eurasian Wigeon (<i>Anas penelope</i>)	LC	-	-	-	-	+
9	Asian Openbill (<i>Anastomus oscitans</i>)	LC	+	+	-	+	+
10	Asian Woollyneck (<i>Ciconia episcopus</i>)	VU	-	+	-	-	-
11	Lesser Adjutant (<i>Leptoptilos javanicus</i>)	VU	+	+	-	+	+
12	Black-shouldered Kite (<i>Elanus aeruleus</i>)	LC	-	-	+	-	+
13	Black Kite (<i>Milvus migrans</i>)	LC	+	+	-	+	+
14	River Lapwing (<i>Vanellus duvaucelii</i>)	NT	+	+	-	+	+
15	Red-wattled Lapwing (<i>Vanellus indicus</i>)	LC	+	+	-	+	-
16	Grey headed lapwing (<i>Vanellus cinereus</i>)	LC	+	-	-	-	-
17	Common Sandpiper (<i>Actitis hypoleucos</i>)	LC	-	+	+	+	+
18	Small Pratincole (<i>Glareola lactea</i>)	LC	-	-	+	-	-
19	Eurasian Collared-Dove (<i>Streptopelia decaocto</i>)	LC	+	+	-	-	-
20	Eurasian Hoopoe (<i>Upupa epops</i>)	LC	+	+	-	-	-
21	White-throated Kingfisher (<i>Halcyon smyrnensis</i>)	LC	+	+	+	+	+
22	Pied Kingfisher (<i>Ceryle rudis</i>)	LC	+	+	-	+	+
23	Blue-tailed Bee-eater (<i>Merops philippinus</i>)	LC	+	-	+	+	+
24	Chestnut-headed Bee-eater (<i>Merops leschenaulti</i>)	LC	+	+	-	-	-

25	Grey-throated Martin (<i>Riparia chinensis</i>)	LC	-	-	-	-	-
26	Common Myna (<i>Acridotheres tristis</i>)	LC	+	-	-	-	-
27	Bank Myna (<i>Acridotheres ginginianus</i>)	LC	-	+	-	-	+
28	Pied Myna (<i>Gracupica contra</i>)	LC	+	+	-	-	-
29	White Wagtail (<i>Motacilla alba</i>)	LC	+	-	-	-	+
30	White-browed Wagtail (<i>Motacilla maderaspatensis</i>)	LC	+	-	-	+	-
31	Bar-headed Goose (<i>Anser indicus</i>)	LC	-	-	-	-	+
32	Anhinga (<i>Anhinga anhinga</i>)	LC	-	-	+	-	-
33	Common Greenshank (<i>Tringa nebularia</i>)	LC	+	+	+	+	+
34	Common Redshank (<i>Tringa tetanus</i>)	LC	+	+	-	-	-
35	White-breasted waterhen (<i>Amaurornis phoenicurus</i>)	LC	+	-	-	-	-
36	Black Drongo (<i>Dicrurus macrocercus</i>)	LC	+	+	-	-	-
37	Grey heron (<i>Ardea cineria</i>)	LC	+	-	+	-	-
39	Lesser whistling duck (<i>Dendrocygna javanica</i>)	LC	-	-	-	-	+
40	Northern Pintail (<i>Anus acuta</i>)	LC	-	-	-	-	+
41	Eurasian Marsh-Harrier (<i>Circus aeruginosus</i>)	LC	-	+	-	-	-
42	Little cormorant (<i>Microcarbo niger</i>)	LC	+	+	+	+	+
43	Little Ringed Plover (<i>Charadrius dubius</i>)	LC	-	+	-	-	-
44	Dusky Crag-Martin (<i>Ptyonoprogne concolor</i>)	LC	+	-	-	+	+
45	Red-naped Ibis (Indian Black Ibis) (<i>Pseudibis papillosa</i>)	LC	-	+	+	+	+
46	Common kingfisher (<i>Alcedo atthis</i>)	LC	-	+	-	+	+
47	Black stork (<i>Ciconia nigra</i>)	LC	-	-	-	-	+
48	Painted snipe (<i>Rostratula benghalensis</i>)	LC	-	-	-	-	+
49	Pallas's Gull (<i>Ichthyaeetus ichthyaeatus</i>)	LC	-	-	-	-	+
50	Pacific Golden Plover(<i>Pluvialis fulva</i>)	LC	-	-	-	-	+
51	Kentish Plover (<i>Charadrius alexandrines</i>)	LC	-	-	-	-	+
52	Northern shoveler (<i>Spatula clypeata</i>)	LC	-	-	-	-	+
53	Gadwall (<i>Mareca strepera</i>)	LC	-	-	-	+	-
54	Eurasian teal (<i>Anus crecca</i>)	LC	+	-	-	-	-

55	Gargeny (<i>Spetula querquedula</i>)	LC	+	-	-	-	-
56	Ferruginous duck (<i>Aythya nyroca</i>)	NT	+	-	-	-	-
57	Baer's Pochard (<i>Aythya baeri</i>)	CE	+	-	-	-	-

*IUCN Threat Categories – LC=Least Concern, NT=Near Threatened, VU=Vulnerable

Table 4. List of fish species recorded during the survey in the five rivers of Mahananda Basin in Bihar (April, 2018)

S. No.	Species	Rivers				
		Parman	Bakra	Mahananda	Kankai	Mechi
1	<i>Mystus cavasius</i>	+	+	-	+	-
2	<i>Puntius sophore</i>	+	+	-	+	-
3	<i>Pethia conchonus</i>	+	+	-	+	-
4	<i>Cabdio morar</i>	+	+	-	-	-
5	<i>Raiamus bola</i>	+	-	+	-	-
6	<i>Pachypterus atherinoides</i>	+	-	-	-	-
7	<i>Bangana ariza</i>	-	+	-	-	-
8	<i>Labeo pangusia</i>	-	+	+	+	-
9	<i>Systemus sarana</i>	+	-	+	-	-
10	<i>Cirrhinus mrigala</i>	-	+	-	-	-
11	<i>Glossogobius giuris</i>	+	+	-	-	-
12	<i>Channa punctata</i>	-	+	-	-	-
13	<i>Wallago attu</i>	-	+	-	-	-
14	<i>Barallius bendelisis</i>	-	+	-	-	+
15	<i>Barallius sp.</i>	-	-	+	-	-
16	<i>Clupisoma garua</i>	-	-	+	-	-
17	<i>Eutropiichthys vacha</i>	-	-	+	-	-
18	<i>Xenentodon cancila</i>	-	-	-	-	+
19	<i>Chagunius chagunio</i>	-	-	-	-	-
20	<i>Bagarius yarrelli</i>	+	-	-	-	-
21	<i>Ompok bimaculatus</i>	+	-	-	-	-
22	<i>Gogangra viridescens</i>	-	-	-	+	-

3.4 River Water Quality

The results obtained from the analysis of physico-chemical variables of river water of all the five-rivers under investigation suggest that the river water quality is relatively fair. pH ranged from 6.2 – 7.9 i.e. slightly acidic to alkaline range with moderate buffering capacity. Dissolved oxygen values in these rivers varied in the range of 7.2 mg/L – 14 mg/L indicating the good health of the rivers. Rivers Mahananda and Mechi were found to be well oxygenated with high values of DO i.e. 12 – 14 mg/L and 8 – 12 mg/L respectively. This is probably due to high volume of water in these two rivers. Conductivity ranged from 83 μ S – 103 μ S in Mahananda, 84 μ S – 102 μ S in Mechi, 107 μ S – 121 μ S in Kankai, 206 – 325 μ S in Bakra and 249 μ S – 305 in Parman river. The conductivity values were higher in Rivers Parman and Bakra compared to other 3-rivers. Electrical conductivity is one of the indicators of dissolved

inorganic ions in the groundwater. The variation in EC is also based on sedimentary structure and composition of rocks. The pure water contains fewer electrolytes and does not conduct electricity. Hence, any rise in the electrical conductivity of water indicates pollution with electrolytes (Eriksson, 1985). The results show a direct relationship between conductivity and total dissolved solid values. Rivers with high conductivity also had high total dissolved solids.

Table 5. Physico-chemical characteristics of Parman River water (April, 2019)

River Parman	Sampling sites				
	Site I Trishulia Ghat	Site II Mahesakol	Site III Sorgaon Ghat	Site IV Osri Ghat	Site V Mirganj
Coordinates	26° 08' 40.93 86° 28' 12.46	26° 12' 56.66 87° 26' 18.57	26° 15' 21.02 87° 23' 38.65	26° 19' 56.40 87° 18' 47.81	26° 22' 25.72 87° 14' 13.29
Time of the day	11:14	12:15	13:39	16:02	17:18
Ambient temperature (°C)	25	26	34	19	19
Water temperature (°C)	24	23.8	24.8	23.6	24.6
pH	6.7	7.1	6.2	6.9	7
Conductivity (µS)	272	250	305	267	249
Dissolved Oxygen	10	7.2	9.2	10	7.2
Total Dissolved Solid	138	127	156	136	126
FCO ₂	120	124	160	146	132

Table 6. Physico-chemical characteristics of Bakra River water (April, 2019)

River Bakra	Sampling sites			
	Site I Pirganj	Site II Gunjan chowk	Site III Bhangora Ghat	Site IV Taran Ghat
Coordinates	26° 24' 53.87 87° 27' 11.26	26° 17' 53.53 86° 30' 32.82	26° 13' 65.10 87° 31' 47.60	26° 08' 59.09 87° 32' 19.25
Time of the day	12:27	14:35	16:14	14:02 (different day)
Ambient temperature (°C)	26	27	27	29
Water temperature (°C)	25.8	25.2	25.5	25.4
pH	7.3	7.5	6.6	7
Conductivity (µS)	244	206	222	325
Dissolved Oxygen	8	9.2	7.2	8
Total Dissolved Solid	124	105	114	179
FCO ₂	160	60	64	160

Table 7. Physico-chemical characteristics of Mahananda River water (April, 2019)

River Mahananda	Sampling sites				
	Site I Behrakola Ghat	Site II Douk-Mahananda confluence	Site III Odra Ghat	Site IV Raipur Ghat	Site V Sonapur Ghat
Coordinates	26° 11' 01.40 87° 57' 29.41	26° 11' 11.14 87° 57' 33.84	26° 11' 57.81 86° 59' 01.68	26° 15' 00.69 88° 00' 49.64	26° 25' 05.28 88° 11' 45.31
Time of the day	10:56	11:57	12:42	13:35	15:07
Ambient temperature (°C)	30	28	30	28	29
Water temperature (°C)	24.6	26.1	29.6	26.0	24.3
pH	7.6	6.9	7.2	7.7	7.8
Conductivity (µS)	NA	96	103	88	83
Dissolved Oxygen	12	11.6	14	14	12.8
Total Dissolved Solid	54	49	53	44	42
FCO ₂	200	120	40	80	60

Table 8. Physico-chemical characteristics of Kankai River water (April, 2019)

River Kankai	Sampling sites		
	Site I Loucha Ghat	Site II Laitor Ghat	Site III Chargharia bridge
Coordinates	26° 16' 23.26 87° 47' 27.01	26° 12' 09.81 87° 42' 31.44	26° 09' 34.19 87° 42' 19.20
Time of the day	11:40	10:32	13:37
Ambient temperature (°C)	NR	NR	NR
Water temperature (°C)	28.9	25.1	27.9
pH	7.2	7.7	7.9
Conductivity (µS)	121	112	107
Dissolved Oxygen	10	9.2	10
Total Dissolved Solid	59	57	55
FCO ₂	30	38	32

Table 9. Physico-chemical characteristics of Mechi River water (April, 2019)

River Mechi	Sampling sites		
Parameters	Site I Duraghati	Site II Patahmari Ghat	Site III Mechi-Mahananda confluence
Coordinates	26° 21' 45.75 88° 01' 53.23	26° 23' 55.71 88° 03' 38.73	26° 13' 37.57 87° 57' 30.80
Time of the day	11:39	13:12	15:50
Ambient temperature (°C)	NR	NR	NR
Water temperature (°C)	31.6	33.7	30.9
pH	8.4	8.3	8.1
Conductivity (µS)	89	84	102
Dissolved Oxygen	11.6	8	12
Total Dissolved Solid	45	42	52
FCO ₂	58	58	24

***Water quality parameters analysed in Environmental Biology Lab of T. M. Bhagalpur University**

Recommendations

- 1. Timing of the survey:** After completing the survey, the team felt that the months of March and April being the leanest of period (peak dry season) resulted in insufficient depth in the rivers which in turn created such a shallow habitat that the dolphins avoided being in river during this season. No future dolphin surveys should be conducted during these months. As it was seen during the survey that the water level was very low and the team had to walk through the mid- channel of the rivers, it was felt that these rivers are not capable to hold water within the channel for long, they tend to lose water rapidly so there is no high water level season exactly. Water level starts receding as soon as the monsoon season is over and so surveys should always be conducted during the water level receding months (post- monsoon) to winter months (mid- October to February) so that a proper population estimation of the dolphins in the rivers can be done.
- 2. Area of survey (extending the surveys in the rivers):** The area (river stretch) surveyed this year is not sufficient to understand the dispersal behavior of the dolphins in the smaller and shallower rivers, as very little portion of the rivers were covered. The portion of the total length of the rivers that was covered within the Araria Forest Division, is much flatter than the mid and lower stretches which are outside the division boundary, such flat and braided condition is seen in all other transboundary (Indo-Nepal) rivers. These flat and braided zones are shallow and are not very suitable for the presence of dolphins in dry seasons, as the rivers flow down from the Himalayan foot hills into the plains alluvial zone, the channel is flat and braided but as it flows more and more downstream, the channel becomes more defined with less braid and more depth. The designated stretches that the team covered this time was more within such flat braided zone within the Araria Forest Division and it seemed that the defined stretches were about to start just behind the boundary of the division. In future surveys should be conducted in full

stretch of the river till its end points, that is the point where rivers like Parman, Bakra and Kankai meet (confluence) Mahananda so that a proper population estimation can be done for understanding the dispersal pattern of the dolphins into these rivers. Mahananda should also be surveyed till its full length in the state of Bihar, again for the same reasons as in the smaller rivers.

- 3. Long term seasonal monitoring and research for river dolphins:** River dolphins should be regularly monitored in all the rivers upto their full length. Long term monitoring and research survey projects should be organized for understanding their population dynamics and dispersal pattern and how they are effected by low water levels in the rivers.
- 4. Long term seasonal monitoring of other biodiversity:** Other biodiversity, like birds, fishes and other riverine organisms should be also monitored along with the dolphins during the surveys.
- 5. Creating awareness among the local people living along the rivers through programs and campaigns:** The one big issue the team came to know during the survey, while talking to people from villages along the rivers was their lack of knowledge and awareness about dolphins and other biodiversity. They have very little idea about the animals of the river and in particularly about the dolphins and about their importance and their legal status in the country. It is strongly suggested that awareness programs and campaigns should be organized by the forest department in all major villages along the rivers to create awareness among the people.



Fig. 7: Research team members with the staff of the Araria Forest Division in Araria along River Parman

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Status of Ganges River dolphins in the five Rivers Parman, Bakra, Kankai, Mechi and Mahananda within Araria Forest Division, Bihar

April, 2019

Sponsored by

Araria Forest Division, Araria, Bihar

PROJECT/SURVEY TEAM

Dr. Sunil K. Choudhary (TMBU, Bhagalpur): Project Team Leader & Coordinator

Mr. Subhasis Dey (TMBU, Bhagalpur): Member, Survey Team

Mr. Amit Kumar (TMBU, Bhagalpur): Member, Survey Team

Mr. Kanhaiya Kumar Das (TMBU, Bhagalpur): Member, Survey Team

Mr. Akshay Kumar: Field Assistant & Member, Survey Team

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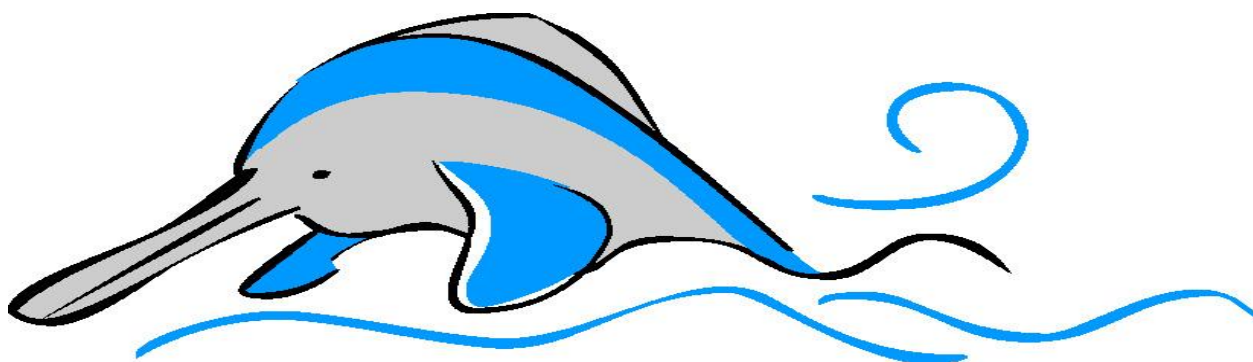
FOREST PERSONNELS IN SURVEY TEAM/HELPED SURVEY TEAM

Mr. Ram Naresh Jha: DFO, Araria Forest Division

Mr. Hemchandra Mishra: Range Forest Officer, Araria Range

Mr. Umanath Dubey: Range Forest Officer, Kishanganj Forest Range

Forest Guards & Other Staff of Araria & Kishanganj Forest Range



Avian diversity

Plate - 1



Lesser Adjutant Stork (River Bakra)



Ruddy shelduck (River Bakra)



Asian Wollyneck (River Bakra)



Asian Wollyneck (River Bakra)



Common kingfisher (River Bakra)



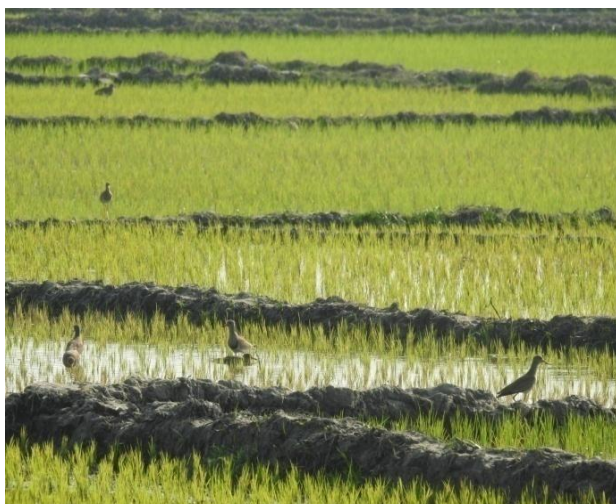
Green Shank and Red Shank (River Bakra)



Asian Openbill (Bakra)



White- browed Wagtail (River Parman)



Grey headed lapwing (Near river Parman)



Common teal (River Parman)



River lapwing (River Parman)



Flock of Red Shank and Green Shank (Parman)



Bank Myna (River Parman)



Ring Dove (River Parman)



Garganey duck and Ferruginous ducks



Baer's Pochard (Parman)



Little egret (River Kankai)



Little Cormorant (River Kankai)



White wagtail (River Bakra)



Pied Kingfisher (River Bakra)



Intermediate egret (River Parman)



Flock of Cattle egret (River Bakra)



Gadwall (River Kankai)



Striated heron (River Kankai)



Blue tailed bee-eater (River Kankai)



Small Pratincole (River Mahananda)



Anhinga (River Mahananda)



Pacific Golden Plover (River Mechi)



Little Ringed Plover (River Mechi)



Painted Snipe (River Mechi)

Fish diversity

Plate-6



Bagarius yerelli (River Parman)



Fishes of River Parman



Puntius sophore (River Bakra)



Labeo pangusia (River Bakra)



Barallius bendelisis (River Bakra)



Mystus cavasius (River Bakra)



Channa punctata(River Bakra)



Glossogobius giuris (RiverBakra)



Puntius sophore (River Bakra)



Wallago attu (River Bakra)



Cirrhinus mrigala (River Bakra)



Pachypterus atherinoides (River Bakra)



Bangana ariza(River Bakra)



Fish of River Kankai



Systemus sarana (River Mahananda)



Eutropiichthys vacha(River Mahananda)



Clupisoma garua (River Mahnanda)



Bangana ariza (RiverMahananda)



Barallius sp.



Fishes of RiverMechi

Human activities

River Parman



Cattle wading



Water abstraction



Water abstraction



Collective Fishing with Gill nets



Trap fishing gear placed across the whole channel



Concrete Bridge



Bamboo bridge



Motor bike on a bamboo bridge



Women crossing the bridge with local produce



Mud mining from the river bank



Fisher fishing with gill net
River Bakra



Young boy crossing the river



Mud mining



Fishing with gill net



Fishing gear known as *Singhia*



Local people fishing with *Singhia* fishing gear



Collective fishing with mosquito net
River Mahananda



Fishing with cast net



Mined gravels on a boat



Gravel mining



Mined gravels



Ore ferry crossing



Lift net



Fisher with gill net

River Kankai



Bamboo bridge



Bamboo bridge



Water abstraction



Mosquito net trap gear across the channel



Gill net fishing



Concrete bridge construction (Loucha Ghat)

River Mechi



Lift net



Gill net fishing



Banana plantation along the river channel



Cucurbit farming on floodplain



Bamboo bridge



Two concrete bridge construction (Duraghati)

Water and Plankton sampling for water quality analysis



Water sampling, Mirganj (River Parman)



Hauling with Plankton net, Mirganj (River Parman)



Trishulia Ghat (River Parman)



Trishulia Ghat (River Parman)



Pirganj (River Bakra)



Pirganj (River Bakra)



Taran Ghat (River Bakra)



Taran Ghat (River Bakra)



Loucha Ghat (River Kankai)



Laitor Ghat (River Kankai)



Patahmari Ghat (River Mechi)



Patahmari Ghat (River Mechi)



Mechi-Mahananda confluence



Mechi- Mahananda confluence

TMBU Survey Team



Blue Boat: Navigator and Survey Team leader – Subhasis Dey

Data recorder: Kanhaiya Kumar Das

Yellow Boat: Navigator and Field Assistant – Akshay Kumar

Data recorder - Amit Kumar