

Research Article

## Current Status of Ganges River Dolphin (*Platanista gangetica*) in Halda River, Chittagong, Bangladesh

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### ABSTRACT

Population density of the Ganges River Dolphin *Platanista gangetica* was studied in the Halda River from July to September 2019 and February to April 2022 using the direct count method. The study was conducted from Sattar Khal and ended at Karnaphully confluence which covers almost 22 kilometers of area. A total of 6 boat-based surveys, 3 trips in 2019 and 3 in 2022 were conducted for making the dolphin estimates within the study area and a total of 112 dolphins were recorded in 2019 and 162 dolphins were recorded in 2022 which indicates an increase in the dolphin population in the Halda River. In 2019 the highest monthly count was in July of a total of 137 dolphins and in 2022 the highest monthly count was in February of a total of 167 dolphins with best-high-low estimates were 29-27-25 and 43-41-45 in July 2019 and February 2022 respectively in the river from the Chayar Char area. The density rate in the entire Halda River was 1.38/km and 2.00/km in 2019 and 2022 respectively. But in the study area, the density of the population was 5.09/km and 7.37/km respectively. These rates are fairly high when compared with any other areas of dolphin distribution in Bangladesh.

**Key Words:** Halda River Dolphin, *Platanista gangetica*, Chittagong, Bangladesh.

### INTRODUCTION

In Bangladesh, River Dolphin (*Platanista gangetica*) is known as Shushuk or sometimes locally called Sishu, or Hungmaach (Smith *et al.*, 1998), found in the River Halda and Karnaphulli in Chittagong. It is also available in most of the areas of the Brahmaputra, Ganges and Meghna river systems in India, Bangladesh, and Nepal (Smith *et al.*, 1998; Sinha *et al.*, 2000). Manipulation of river flows from dams, habitat destruction, alterations in nutrient fluxes and sediment; pollution of rivers from boat traffic, urbanization and agriculture, deliberate illegal hunting, and over-exploitation of fisheries are the causes of habitat destruction of this species in South Asia (Bannerjee 1999, Dudgeon 2000a, 2000b, 2005; Gergel *et al.* 2002, Manel *et al.* 2000, Payne and Temple 1996). In Bangladesh, *Platanista gangetica* is classified as endangered species because of the numerous manmade and natural constraints to its survival, such as boat traffic, water pollution, and reduction of water flow during the dry season (IUCN Bangladesh, 2000), and as threats continue to increase populations are believed to be declining (Reeves and Leatherwood 1994a). Dolphin habitats are degraded by dams and other artificial obstructions as they reduce hydrologic and physiographic complexity that has a significant role in making rivers appropriate for dolphins (Reeves and Leatherwood 1994b).

Halda is the third main river of Chittagong after Sangu and Karnaphuli with unique features and in Bangladesh, Indian major carps spawn naturally in this river (Kabir *et al.* 2013, Kibria *et al.* 2009). Being a major tributary of the river Karnaphuli it originates from the badnatali hill ranges in the Chattogram hill tracts and enters the Chattogram district through Fatikchhari Upazila. After flowing about 88 km

through the Rouzan, Hathazari, and Fatickchari of Chattogram districts it coalesced with the river Karnaphuli at Kalurghat, which ends into the Bay of Bengal after streaming about 20 km. From the mouth of the Halda River, tidal influence reaches about 40 km upstream (Sharanika, 2020; Alam *et al.*, 2013).

Reeves and Leatherwood (1994a) emphasized understanding the biotic and physical conditions of the river that make the habitat suitable for dolphins. The purpose of this paper is to present data about the dolphin population of the Halda River as emphatic information on the status of dolphins in the Halda River is lacking.

### MATERIALS AND METHODS

#### Study area:

Initially, we conducted a rapid inspection of the Halda River to familiarize ourselves with the area to be studied for dolphin survey by direct field visits. The study was conducted from Sattar Khal (upper Halda) and ended at Karnaphully confluence (lower Halda) which covers almost 22 kilometers of area. Special focus was given to 18 spots of Halda River most of which are known as Kum (deeper part of the river) as most of the dolphins wander around there. The width of the river varies between 150 and 350m. The average depth of the study area was 6m, but in the Kum area, it varied from the lowest depth of 11.60m to the highest depth of 19.70m.

#### Data collection:

Data were collected by conducting visual surveys for counting the number of dolphins in the river Halda using local motorized and oar-powered boats from July to September 2019 and from February to April 2022. We conducted the survey during low tide, when the river was more constrained and the dolphins are more concentrated in a relatively small space and as

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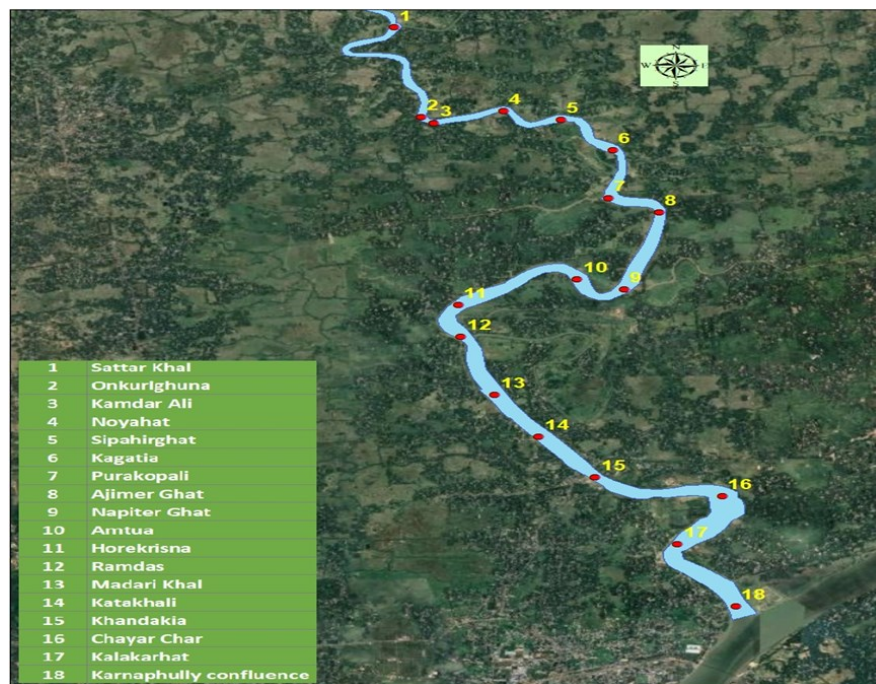
**Figure 1.** Global distribution of the Ganges River Dolphin (Rashid *et al.* 2015)

a result, they are easier to be seen. We used direct count method to estimate the dolphin population (Smith *et al.* 1994, Sinha and Sharma 2003).

These surveys were conducted once per month. A total of 3 surveys in each year were conducted using speed boat and country boat covering an average of 22 km of the river in each survey. We started our survey around 9.30 am and completed around 5.30 pm. Boats maintained a constant speed range of 5-7 km/h. But in Kum area (deeper part of the river) we stopped the boat in the middle and four observers searched for dolphins very carefully, as most of the dolphin are seen in km

area. When dolphins were sighted in any Kum area, we remained there for approximately 10 min before recording best, high, and low estimates of the number of animals. As quiescent behavior, long dive times and unpredictable movements made a single count unreliable, we counted each Kum area for three times to get the most accurate data.

Two observers were instructed to observe left forward and right forward side of bow and other two were instructed to search left forward and right forward side from the rear part of the boat maintaining close contact with the data recorder to avoid double counting.



**Figure 2.** Map of Halda River (study area pointed by the red circle).

The eye height of observers was 2.0-2.5 m above the water surface.

The dolphins were counted when they came back to the surface for taking oxygen, taking care to avoid repetition or missing them. For this, approximate length of the body, intervals between surfacing, beak length (adult female have longer beak), and distance between surfacing dolphins were given due consideration. For example, if 3 dolphins surfaced at the same time, they were counted as 3; if 5 dolphins surfaced at the same time, they were counted as 5. If 2 dolphins were spotted at one place and another 3 were spotted at a distance of about 30 m within a second, the number can be counted as 5. If an adult and a calf were spotted at different times, they were counted as 2 (Mohan *et al.* 1998).

The best-high-low estimate of the number of Dolphins in group was recorded to reflect confidence in accuracy of estimates. The high estimate reflects the maximum count and the low estimate reflects the minimum count.

The best estimate reflects the accuracy of count of observer.

## RESULTS

A total of 6 boat-based surveys, 3 trips in 2019 and 3 in 2022 were conducted for making the dolphin estimates within the study area which took about 65 hours in the study area. This study recorded a total of 19 sightings during the study period and the best-high-low estimates were 29-27-25 and 43-41-45 in July 2019 and February 2022 respectively in the River from the Chayar Char area. Instead of the choosing whole stretch of the River (app. 81 km), the stretch from Karnaphully confluence (22°24'30"N 91°53'28"E) to Sattar Khal (22°31'10"N 91°50'55"E) in Halda River (22 km) was chosen for estimating the density and encounter rate during the study period. This is because of the absence of any dolphins from Sattar Khal to upper Halda throughout the year. Therefore, this stretch is the place within the study area where dolphins are usually found.

**Table 1. Distribution of Dolphins in different sites by direct counting.**

Serial	Place Name	GPS Coordinate	Observed in 2019				Observed in 2022			
			Jul	Aug	Sep	Average	Feb	Mar	Apr	Average
1	Sattar Khal	22°31'10"N 91°50'55"E	14	8	14	12	11	8	10	9.67
2	Onkurighuna	22°30'08"N 91°51'07"E	0	0	0	0	2	2	2	2
3	Kamdar Ali	22°30'04"N 91°51'13"E	8	7	3	6	4	3	2	3
4	Noyahat	22°30'12"N 91°51'44"E	12	3	6	7	7	3	7	5.67
5	Sipahirghat	22°30'06"N 91°52'10"E	0	0	0	0	6	7	5	6
6	Kagatia	22°29'45"N 91°52'33"E	13	7	12	10.67	7	8	9	8
7	Purakopali	22°29'12"N 91°52'31"E	8	7	10	8.33	8	5	7	6.67
8	Ajimer Ghat	22°29'02"N 91°52'54"E	0	0	0	0	5	4	3	4
9	Napiter Ghat	22°28'09"N 91°52'38"E	9	6	3	6	9	7	5	7
10	Amtua	22°28'16"N 91°52'17"E	0	0	0	0	6	7	6	6.33
11	Horekrisna	22°27'58"N 91°51'24"E	0	0	0	0	5	7	4	5.33
12	Ramdas	22°27'36"N 91°51'25"E	16	18	4	12.67	8	10	12	10
13	Madari Khal	22°26'56"N 91°51'40"E	3	7	8	6	0	0	0	0
14	Katakhali	22°26'27"N 91°52'00"E	10	11	6	9	3	2	2	2.33
15	Khandakia	22°25'59"N 91°52'25"E	5	2	10	5.67	8	9	11	9.33
16	Chayar Char	22°25'46"N 91°53'22"E	27	20	14	20.33	43	41	39	41
17	Kalakarhat	22°25'13"N 91°53'02"E	0	0	0	0	25	26	29	26.67
18	Karnaphully confluence	22°24'30"N 91°53'28"E	12	6	6	8	10	9	9	9.33
Total			137	102	96	±112	167	158	162	±162

**Table 2.** Density and encounter rate of the dolphin of the present study and other studies carried out in Bangladesh and other countries.

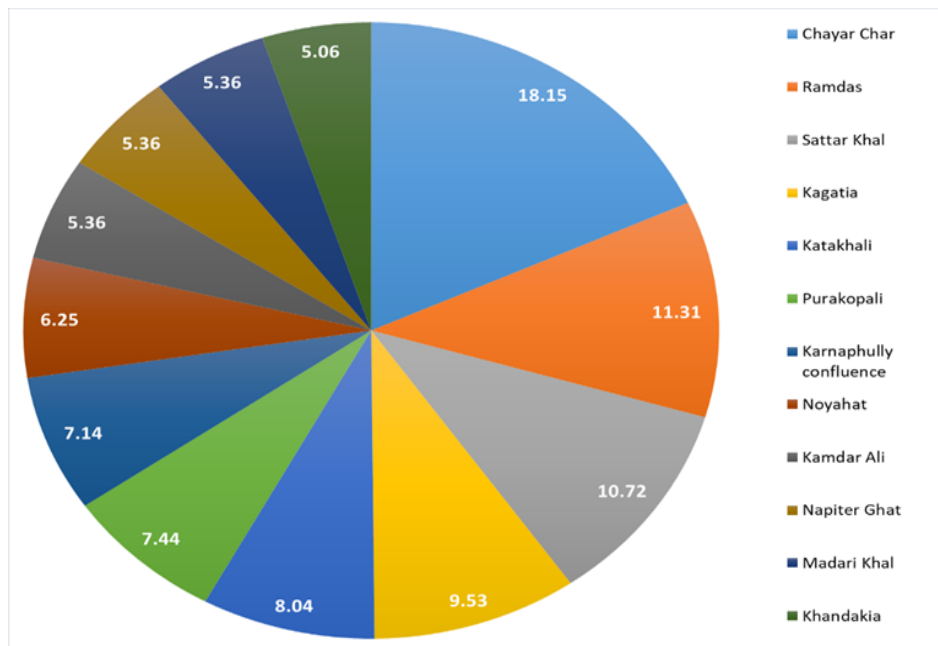
Location	Dolphin Density/km	References
Buriganga River, Bangladesh (Southern part)	0.25/km	Alam and Sarkar 2012
Buriganga River, Bangladesh (Northern part)	0.38/km	Alam <i>et al.</i> , 2015
Sunderbans, Bangladesh	0.66/km	Smith <i>et al.</i> , 2006
Lower Sangu River, Bangladesh	1.36/km	Smith <i>et al.</i> , 2001
Karnaphuli-Sangu complex	0.76/km	Smith <i>et al.</i> , 2001
middle reaches of the Ganges	0.81/km	(Sinha <i>et al.</i> , 2000)
middle reaches of the Jamuna (Brahmaputra)	0.24/km	Smith <i>et al.</i> (1998)
Kalni-Kushiyara River	0.30/km	Smith <i>et al.</i> (1998)
Padma River: Sengram – Dhalar Char, Pabna, Bangladesh	0.54/km	Rashid <i>et al.</i> 2015
Jamuna River: Dhalar Char – Nagdemra, Pabna, Bangladesh	0.78/km	Rashid <i>et al.</i> 2015
Brahmaputra, Assam, India	0.23/km	Wakid, 2009
Vikramshila Gangetic Dolphin Sanctuary, Bihar, India	1.80/km	Choudhary <i>et al.</i> , 2006
Ganges mainstem, between Manihari ghat and Buxar	1.50/km	Sinha <i>et al.</i> , 2000
Downstream between Kahalgaon and Manihari [near Katihar], India	3.40/km	Sinha <i>et al.</i> , 2000
Chambal River, India	0.27/km	Sharma <i>et al.</i> , 1995
Bhagirati River, India	0.37/km	Sinha, 1997
Northern Indian River in summer, Florida	0.49/km	Durden 2005
Southern Indian River in summer, Florida	0.29/km	Durden 2005
Halda River	1.38/km	Present Study (2019)
Halda River	2.00/km	Present Study (2022)

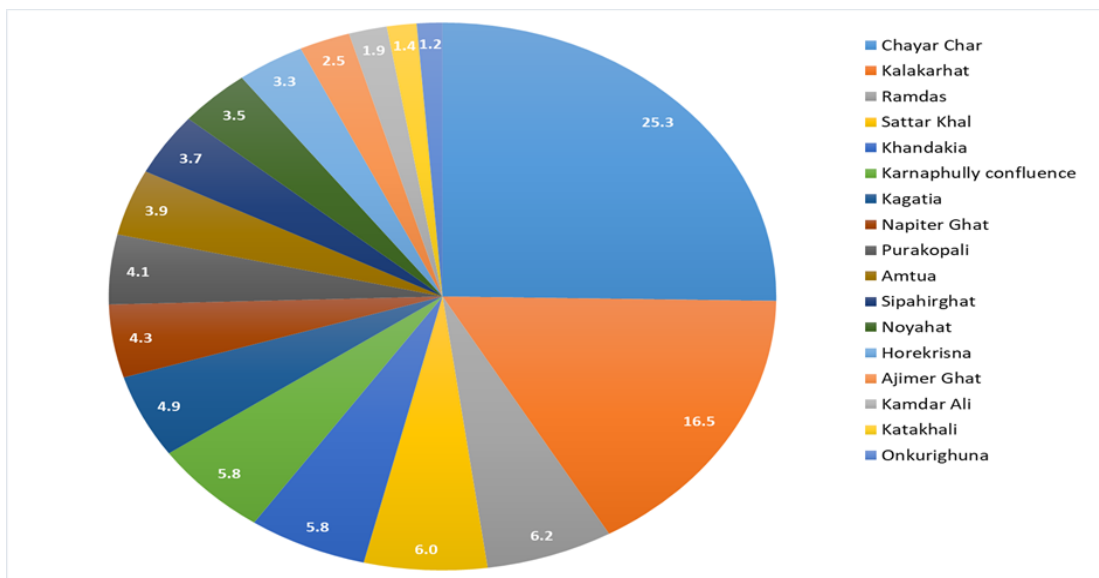
Most of the dolphins were found in the Kum area. Distribution of dolphins in different sites of Halda River is shown in (table-1, figure-2, figure-3 and figure-4).

The highest density of dolphins in the Halda River was observed in the month of February 2022 (2.06/km) and the lowest density of dolphins was observed in the month of September 2019 (1.19/km). The mean density of the dolphins in the Halda River was 1.38/km and 2.00/km in 2019 and 2022 respectively (table-2).

Different studies were conducted on dolphins throughout the world. The mean density of the dolphins

in the Buriganga River, Bangladesh (Southern part) was 0.25/km (Alam and Sarkar 2012) and Buriganga River, Bangladesh (Northern part) was 0.38/km (Alam *et al.*, 2015). A survey in Sunderbans, Bangladesh recorded 0.66 dolphins per kilometer (Smith *et al.*, 2006). Lower Sangu River, Bangladesh and Karnaphuli-Sangu complex has 1.36 and 0.76 dolphins per kilometer respectively (Smith *et al.*, 2001). Sinha *et al.*, (2000) conducted a downstream survey on the Vikramshila Gangetic Dolphin Sanctuary in the middle reaches of the Ganges mainstream which covered 60.3 km and recorded 0.81 dolphins per km. Encounter rates have been reported as

**Figure 3.** Distribution of Dolphins by percent in different sites in 2019



**Figure 4.** Distribution of Dolphins by percent in different sites in 2022

low as 0.24 dolphins per km in the middle reaches of the Jamuna (Brahmaputra) River (89.6 km) and 0.30 dolphins per km in the Kalni-Kushiyara River (113.0 km) by Smith *et al.* (1998). The mean density of the dolphins in the Padma River: Sengram – Dhalar Char, Pabna, Bangladesh and Jamuna River: Dhalar Char – Nagdemra, Pabna, Bangladesh was 0.54/km and 0.78/km respectively (Rashid *et al.* 2015). The encounter rate in Brahmaputra, Assam, India was 0.23/km (Wakid, 2009) and in Vikramshila Gangetic Dolphin Sanctuary, Bihar, India was 1.80/km (Choudhary *et al.*, 2006). In the Ganges mainstream, between Manihari ghat and Buxar mean density was 1.50/km and in Downstream between Kahalgaon and Manihari (near Katihar), India was 3.40/km (Sinha *et al.*, 2000). The encounter rate in Chambal River, India was 0.27/km (Sharma *et al.*, 1995) and in Bhagirati River, India was 0.37/km (Sinha, 1997). Durden (2005) conducted a survey in the Northern Indian River in summer, Florida, and Southern Indian River in summer, Florida, where density was 0.49/km and 0.29/km respectively.

## DISCUSSION

Based on direct counting of the Dolphin in Halda River, the 22 km segment from Karnaphully confluence to Sattar Khal has been identified as the hotspot for dolphins. In the present study, the highest encounter rate of dolphins in the Halda River was in the month of February 2022 (2.06/km) and the lowest density of dolphins was observed in the month of September 2019 (1.19/km). The average density of the dolphins in the Halda River was 1.38/km and 2.00/km in 2019 and 2022 respectively. The results show that the density and encounter rate of the dolphin population of the Halda River has increased from 2019 to 2022. Further research should be done to know more about the dolphin population of the Halda River. The density and encounter rate of the dolphin population of the Halda River is more than in any other river in Bangladesh. Though the Halda River is about 81 kilometers in length, dolphins are found in only about 22 kilometers of the stretch from Karnaphully confluence to Sattarghat where the encounter rate was 5.09/km in 2019 and 7.37/km in 2022. This is due to all of the Kums being found within this area and most of oxygen.

## Threats to the Ganges river dolphin population:

The construction of dams and barrages on large rivers and their tributaries has fragmented the habitats of dolphins. Besides this, Illegal Fishing, Hunting, Excessive Vessel Traffic, and lack of awareness have been identified as major threats to the River Dolphin. The cause of the decline of Ganges River dolphins in large rivers of Bangladesh and their tributaries are can be categorized as given below.

### Illegal Fishing and Hunting in Gillnets:

Under the Protection and Conservation of Fish Act of 1950, all sorts of fishing are banned in the Halda River (from the Halda River mouth to Nazirhat which covers a 40 km segment), but illegal fishing is done regularly during the day and night, especially near the two ends of the restricted area. Like all cetaceans, dolphins are vulnerable to accidental entanglement in monofilament gillnets, as they often entangle with the net and die in suffocation. According to local Fishermen, accidental entanglements in monofilament gillnets are their primary source of dolphin oil. They believe that oils extracted from dolphins have the power to heal pain if it is applied externally and often the meat is used as bait to attract prawns, big fishes, and crabs (Khan, 2019; Smith *et al.* 2001; Motwani & Srivastava, 1961).

### Dams, barrages and embankments:

Water development projects such as dams, barrages, and embankments have negative consequences on the habitat, abundance, and population structure of dolphin species throughout its range. Dams and barrages are physical barriers that sequester dolphins into small fragments of the river (Chaudhary, 2007; Braulik, and Smith, 2017). Perhaps, the range of river dolphins will continue to collapse as subpopulations are vanished due to habitat loss related to large engineering structures (dams, barrages, and embankments), increasing water demands, and long-term climate changes (Chaudhary *et al.* 2012, Smith *et al.* 2010, Braulik *et al.* 2014).

### Habitat loss and degradation:

The increasing human population imposes pressure on forest resources on the riverbank. Illegal and over-collection of thatch, wood, grass, and other aquatic resources and grazing cattle along the river banks cause erosion in the area.

Consequently, the aquatic habitat is altered with the heavy load of siltation. (Chaudhary, 2007). Habitat degradation is also caused as a result of sand extraction which causes silting of the dolphin habitat, killing bottom fauna, which in turn lowers the productivity of the river by blocking the sunlight and reducing photosynthesis. This ecological downfall has negative consequences on the fish production on which dolphins depend for food (Mohan *et al.* 1998).

#### **Pollutions:**

In South Asian rivers pollution is increasing for industrialization and the spread of intensive agricultural activities done by irrigation with river water. Because of upstream water withdrawal, impoundment, and diversion, the ability of these rivers to dilute pollutants (DDT, arsenic, industrial effluents) and salinity has drastically been reduced (Braulik, and Smith, 2017). Significant DDT concentrations are found in fish from the gut of dolphins, showed their exposure to DDT through the food they consumed (Kumar *et al.* 1999). Pesticides and industrial chemicals contained Organo-chlorines that can be bioaccumulated over the lifetime of individuals and can be transferred from one generation to the next across the placenta, to levels that are disastrous for the long-term survival of the dolphin population (O'Shea *et al.*, 1999).

#### **Excessive Vessel Traffic:**

As the economy of Bangladesh is improving, the size of the port and the number of mechanized vessels is likely to be increased. During calving and nursing periods, dolphins' ability to evade boats is compromised, and collide with large and small vessels in the congested Chittagong Port, which may be a source of dolphin mortality. Excessive Vessel Traffic is another direct threat to dolphins as dolphins accidentally got hit by the moving vessel propeller and die instantly or suffer from injuries. Following several deaths of dolphins in the Halda River from October 2017 to February 2018, the movement of the mechanized vessel was banned for the period March to July, but still many large cargo vessels move through the river throughout the year to carry sands dredged from the river and construction material (Smith *et al.* 2001, Khan, 2019).

#### **Water Withdrawal:**

Chittagong Water Supply and Sewerage Authority (CWASA) of Bangladesh is supplying water to the Chittagong city dwellers drawn from the Halda River and groundwater source. Along with this, the abstraction of water for irrigation and watering the tea gardens lessen the water current in the river and increase saline water intrusion from the sea. In the dry season, the problem is so serious that the dolphin population is unable to live in the major part of the upper part of the river where they used to live before the abstraction of water (Zuthi *et al.* 2009, Khan, 2019).

#### **Lack of Awareness:**

Lack of awareness at the local level is one of the most important constraints to the conservation of the river dolphin population. Local people are not well informed about the importance of dolphins and for this reason, they do not hesitate to kill dolphins accidentally or deliberately.

## **CONCLUSION**

The Ganges river dolphin *Platanista gangetica* is the only aquatic mammal found in the Halda River. It is important not only because it is endangered, but also because it is a reliable indicator of the health of the Halda river, in fact, the whole river ecosystem. It is clear that anthropogenic stresses like the construction of dams and barrages, illegal fishing and gillnets, aquatic pollution and water abstraction for city dwellers and irrigation are some major threat to the dolphin population. The habitat of dolphins in the Halda river is not protected. To control the vessel traffic according to the prescribed vessel traffic laws and rules of Bangladesh, regular patrolling and establishing patrol posts along the river are necessary. Regular based scientific research should be done to follow adaptive management and to understand the management impact. The Government should provide funding for conducting research and monitoring and the management practices should be adopted as prescribed on the basis of research and monitoring reports (Khan, 2019). Under the Wildlife (Preservation and Security) Act 2012, the Government of Bangladesh has declared three dolphin sanctuaries in the Padma and Jamuna Rivers named Nazirganj Wildlife (Dolphin) Sanctuary, Shilanda-Nagdemra Wildlife (Dolphin) Sanctuary, and Nagarbari-Mohanganj Wildlife (Dolphin) Sanctuary which covers 146.00, 24.17 and 408.98 ha of area respectively (Rashid *et al.* 2015). Like these sanctuaries, the Government of Bangladesh should declare Halda Wildlife (Dolphin) sanctuary from Karnafully confluence to Peshkarhat (about 30 km) to protect Ganges river dolphins. Local people should be informed about the value, importance, and benefits of the conservation of the river dolphins as soon as possible.

#### **Author Contribution Statement:**

Md. Manzoorul Kibria was the chief instructor of fieldwork. M. A. Habib Siam wrote the manuscript text. J. K. Owaresat and A.R. Khan prepared the figures (1-4). Abdullah Al Asek and S. M. A. Nahian collected the data in 2019. All of the authors were present during the field survey. All authors reviewed the manuscript.

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#### **Conflict of Interest:**

The authors declare no conflict of interest.

#### **Data Availability:**

The authors confirm that the data supporting the findings of this study are documented in the table within this article.

#### **Ethics Approval statement:**

In this study, no human or animal subjects were included and ethics approval statement is not applicable.

#### **Consent to Participate Statement:**

In this study, no human subjects participated, and consent to participate is not applicable.

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