

## Current Status of the Endangered Ganges River Dolphin (*Platanista Gangetica*), the Aquatic Megafauna In the Brahmaputra River System

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### Abstract

The Ganges River Dolphin (*Platanista gangetica*) is the most charismatic aquatic species inhabiting rivers of India, Bangladesh, and Nepal. It is an endangered species that occurs both in the Brahmaputra and Barak river systems in Assam (India). In the Brahmaputra river system, the occurrence of 'hihu' is primarily confirmed in the mainstream Brahmaputra, the Kulsi river of Kamrup district, and the Subansiri river of Lakhimpur district. The dolphins inhabit river confluences or tributary junctions followed by river meanderings with the prevalence of eddy counter-currents and prey-fish abundance. Of late, it has been observed that river dolphin population has declined at an alarming rate due to the potential threats including poaching for dolphin oil, by-catch, overfishing, net entanglements, sand mining, habitat destruction through aquatic pollution, construction of dams, and lack of awareness. The species is left only in certain pockets of the Brahmaputra River. Thus, there is an urgent need for the conservation of this endangered species in its natural habitats. Effective protection of this endangered aquatic megafauna requires elimination and management of the potential threats. This review provides an overview of the distribution and population status, ecology, and management strategies and recommendation to increase awareness for its long-term conservation.



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### Introduction

#### Background


The Ganges River Dolphin (*Platanista gangetica*), the most charismatic<sup>1</sup> freshwater cetacean species inhabiting the rivers of India, Bangladesh, and Nepal.<sup>2,3</sup> William Roxburgh first described it in 1801.<sup>3</sup> In Assam (India), it inhabits both the Brahmaputra

and Barak watercourse systems.<sup>3</sup> The species is commonly known as 'Hihu' in Assamese is categorised as an endangered species by the International Union for Conservation of Nature (IUCN) Red List.<sup>3,4,5,6</sup> Due to its steep population decline globally, its status has been upgraded from vulnerable to endangered.<sup>3</sup> It is also known as the

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South Asian river dolphin.<sup>7</sup> Globally, out of the 39 species of river dolphins living in oceans, different rivers, and estuaries, only four species inhabit the large rivers.<sup>8</sup> The dolphins face considerable threats due to lack of proper action adopted in time, thus leaving the future of the remaining dolphins in grave danger.<sup>9</sup> Due to limitations in survey methods, accurate estimation of the present overall population of River dolphins is lacking.<sup>3</sup> However, as per estimation by Sinha and Kannan (2014), the population of river dolphins is to be at least 3500 individuals globally.<sup>2</sup> This species of river dolphin is considered ecologically important due to its key role as an indicator of a healthy river ecosystem.

8. Freshwater ecosystems harbour wide variety of fauna including both vertebrates and invertebrates. In India, diversity of freshwater fishes in the River Ganga and Brahmaputra makes them favourable habitats for river dolphin and others.<sup>10</sup> However, the dolphin population has been extirpated from several small rivers with a considerable decline in the upstream distribution range.<sup>3</sup> Considerable threats have been posed on the survival of this species.<sup>4</sup> Factors that are recognized as the reasons for its population decline include poaching for dolphin oil, accidental net entanglement during fishing, habitat destruction due to partition of river systems, hydroelectric power plants, hydrosphere contamination, declining river bed depth due to water extraction and siltation, and due to many human-made interventions such as sand mining.<sup>3</sup> The Government of India declared the Ganges River Dolphin as the National Aquatic Animal in 2009.<sup>2</sup> Barak, the second largest river of northeast India is also home to the Ganges river dolphin since time immemorial.<sup>11</sup> Conservation and management of a species require a proper understanding of its habitat and ecology. Hence, it is necessary to frequently review the Ganges river dolphin's population status to know the trends and factors accelerating its population decline.<sup>12</sup> Due to increasing threats, there is a projected decline in its population size.<sup>4</sup> The rivers of southern Assam are facing a sharp decline in River dolphin population. The Brahmaputra River is less degraded than the Ganges, which makes it a home for the sub-species. The entire distributional range was abundant in dolphins in the nineteenth century. However, there is a steep decline in its range and abundance in the last 100 years.<sup>13</sup> Fragmentation of river bodies by the construction of dams has disrupted the natural course of a river system that directly impacts the

extent and population of river dolphins because the changes in the habitation of a species by changing river morphology affects their habitat suitability while changes in flow regulation limit their distribution.<sup>10,14</sup> Recent studies have revealed the gradual decline in dolphin population and its disappearance from the river systems.<sup>3</sup> Furthermore, despite its importance in the riverine ecosystem, very little information is available on the factors driving the local extinction of the river dolphins as very little research has been focussed on this particular aquatic megafauna of the Brahmaputra River system in Assam, India, as compared to the Ganges River system. Therefore, the present review aims to deal with the ecology, habitat, population distribution, threats, and suggestion of management strategies of River dolphins to increase awareness for its long-term conservation.

### **The Brahmaputra River System**

The River Brahmaputra is about 2,880 km long runs through Tibet, Arunachal Pradesh and Bangladesh is known by different names in the respective places.<sup>13,15</sup> In Assam, it is a primary habitat for the gangetic river dolphin in India. Its occurrence is confirmed in the mainstream Brahmaputra, the Kulsi river, and the Subansiri river.<sup>15</sup> The River Kulsi lies in the Kamrup district of Western Assam. It originates from Meghalaya, enters the Kamrup district at Umkiam, and finally pours into the Brahmaputra at Nagarbera. Subansiri, the largest branch of the Brahmaputra River, originates in the Purum peak in Tibet. It then enters Arunachal Pradesh in India, traverses 191 km, and finally enters Assam near Garukamukh in Lakhimpur district.<sup>13</sup>

### **The Ganges River Dolphin in the Brahmaputra River System**

#### **Biology**

The River dolphin or hihu, an endemic fauna of the Indian subcontinent belonging to the order Cetacea and family Platinistidae.<sup>7,8</sup> They have a prolonged, slender snout, round and short body with wide flippers.<sup>8</sup> Teeth are long, narrow, and curved in the young ones, while square, bony and flat disks in mature adults are visible in both jaws even when the mouth is closed.<sup>7</sup> Chocolate brown calves at birth become grey-brown adults with smooth and hairless skin. They have tiny eyes just above the mouth and are usually considered blind as they lack a crystalline lens. Females are generally larger than males. They

reproduce once every two to three years to only one calf. The River dolphin has to surface every 30-120 seconds as it cannot breathe underwater for long. Their body length ranges from 1.5-2.5 m, weighing about 70-90kg.<sup>8</sup> The gestation period in the River dolphin lasts for almost a year, with birthing seasons mainly from December to January and March to May.<sup>7</sup> The young ones start feeding on small prey at about one or two months.<sup>7,16</sup> The River dolphins are involved in activities like making circles and chasing fish.<sup>13</sup> Generally, river dolphins roam alone or in small groups of two to three in shallow areas or tributary junctions. They swim almost constantly, often on their sides.<sup>17</sup> The mother and the calves of river dolphins usually roam together.<sup>7</sup>

#### **Distribution and Population Status**

The Ganges river dolphin is confirmed in the mainstream Brahmaputra, the Kulsi river of Kamrup district, and the Subansiri river in the Lakhimpur district. The pioneer survey on the occurrence of this cetacean species in the Brahmaputra river system was conducted by Mohan *et al.* (1997) in 1992-1993, where they encountered 266 dolphins in the entire river, followed by two more surveys in 1997 and 2002.<sup>15</sup> Out of the 250 dolphins in the entire Brahmaputra river system, about 197 were reported from the Brahmaputra mainstream, 27 from the Kulsi river, and 26 from the Subansiri river. Moreover, they recorded 14 dead dolphins during the survey. There is an estimated population decline of 26% over the 12 years with projected future population declines.<sup>15</sup> Another extensive study conducted in 2007 estimated 264 dolphins with a record of 212 in the mainstream Brahmaputra, 29 in the Kulsi river, 23 in the Subansiri.<sup>13</sup>

#### **Habitat and Ecology of the Ganges River Dolphin**

Usually, the river dolphin inhabit the mainstream river<sup>8</sup> but are primarily encountered in water with reduced flow and having high prey availability. During warmer conditions, they migrate towards upstream with higher water levels, while during colder conditions towards downstream with lower water levels.<sup>4</sup> In a riverine ecosystem, this species is a top predator feeding on different fishes, shrimps and catfishes as well.<sup>2,7</sup> Hydraulic features of the rivers, such as channel depth and other physical factors also have significant roles in their habitat preference.<sup>10</sup> They are primarily inhabit the counter-current pools and sharp meanders, sand bars, river bends, etc.<sup>4,8</sup>

In the Brahmaputra river most of the dolphins prefer river confluences or tributary junctions followed by river meanderings. In contrast, in the Kulsi and the Subansiri, most dolphins were sighted in river meanderings.<sup>15</sup> Dolphin spends sometime above water to breathe.<sup>13</sup> River dolphins use echolocation for navigation and foraging purposes.<sup>3</sup>

#### **Conservation Status**

The Ganges River Dolphin holds its position at the top of the aquatic food chain whose presence indicates excellent biodiversity in the riverine ecosystems and is vital in maintaining a healthy and balanced ecosystem.<sup>8</sup> Degradation of a freshwater ecosystem is often indicated by the use of some diligently picked up indicators that provide warning signals about significant changes in the ecosystem. They are ideal candidates for ecological indicators

Moreover, it is also considered as a flagship species for conservation initiatives of freshwater ecosystems by the World Wildlife Fund for Nature (WWF);<sup>8</sup> however, in the past few decades, its status has become a matter of grave danger.<sup>18</sup> In India, the Ganges river dolphin is protected under Schedule I of the Wildlife Protection Act (1972). Moreover, it is incorporated in Appendix I of the Convention on International Trade in Endangered Species (CITES) and Appendix II of the Convention on Migratory Species (CMS).<sup>2,3</sup>

#### **Threats**

Several factors are responsible to drive the Ganges river dolphins to extinction. The major factors responsible for the population decline of this species include poaching for dolphin oil, accidental killing due to net entanglements during fishing, shortage of food due to over fishing, changes in the river course, heavy siltation, habitat fragmentation, hydroelectric power plants, sand mining, disturbances due to natural calamities, mortality due to diseases and other factors, polluted water due to agricultural activities and release of untreated industrial effluents to rivers.<sup>2,7,15,19</sup>

#### **Poaching for Dolphin Oil**

A specific reason for dolphin killing is its oil which is used as a fish attractant.<sup>4</sup> Dolphin oil is used for bait fishing and several medicinal purposes such as rheumatism, nervous and respiratory disorders.<sup>19</sup> The use of this oil as bait is an age-old practice in

India to capture catfishes in rivers. The high demand of dolphin oil has caused the random hunting of dolphins in the River Brahmaputra, resulting in a drastic decline in its population.<sup>1,15</sup> However, the meat is not cherished by the people because of its somewhat 'repelling odour'.<sup>20</sup> It is estimated that in the Brahmaputra River system from Dhubri to Goalpara, almost 100 boats are engaged in fishing used dolphin oil as bait.<sup>19,21</sup> A very high market value of dolphin oil ranging from 600 INR to 1000 INR (8.05 USD-13.42 USD) accelerates the tendency of the village fisherman to kill the dolphins.<sup>15</sup> Moreover, the dolphin killing areas are so distant that legitimate action against such crime becomes insurmountable.<sup>10</sup> If the mortality of river dolphins continues at this present rate, the population will not survive for more than 40 years.<sup>20</sup>

**By-catch or killing by accidental net entanglements**  
Another serious threat to the conservation of this cetacean species is by-catch or accidental entanglements in various fishing gears.<sup>22</sup> By-catch is identified as the biggest threat to the river dolphins of the Brahmaputra valley.<sup>10</sup> Moreover, an investigation has revealed that although net fish entanglements of river dolphins were intentional rather than accidental. As the dolphins migrate into the tributaries during the high flood seasons, the local fisherman blocks the tributary mouths to catch the dolphins.<sup>13</sup> Dolphins that become entangled in the fishnets 'by accident' are killed by the fisherman to extract the oil from the blubber of the entangled remains as bait instead of reporting the event to the respective wildlife authorities as they fear of being punished under the wildlife laws.<sup>1,22</sup>

### **Habitat Degradation**

The fundamentals of a suitable habitat required by all freshwater cetaceans include ample flow in water with good quality to support proper physical health, vigour, and potential for efficient foraging. However, they face great competition for food and freshwater with humans.<sup>4</sup> The major human-made modifications to the river flow system are dams and barrages.<sup>10</sup> The construction of the dam in the Subansiri River can be a grave danger for the dolphins of this river<sup>15,23</sup> thus changing the ecology of the river and affecting the river dolphins.<sup>15</sup> Barriers limit the distributional range of the River dolphins. It creates small, local subpopulations, thus reducing the evolutionary potential. It restricts the gene flow

among the river dolphins, increasing inbreeding and loss of genetic diversity, finally driving them towards extinction.<sup>14</sup> In a one-year survey from 2007-2008, disastrous implications for the River dolphins were noticed due to a seismic survey along the river bed to inspect for oil.<sup>13</sup> In the River Kulsi, sand mining has been reported as the greatest threat to the dolphin.<sup>13</sup> However, more in-depth studies are required to recognize the consequences of sand mining on dolphins.<sup>13</sup> During the survey in 1993, 60 dead dolphins were encountered in the Brahmaputra river system.<sup>13</sup> Additional factors contributing to habitat destruction include the discharge of untreated industrial effluents directly into the rivers, thus causing aquatic pollution and disturbing the dolphin habitats.<sup>15</sup> Furthermore, deforestation has resulted in the silation of the river beds, thus lowering its depth and counter-currents, thereby destroying suitable habitats of the dolphins.<sup>3,15</sup>

### **Overfishing**

Intense fishing by the local communities near the suitable dolphin habitats by the extensive use of different types of gill nets (Bagarimara Jal, mosquito net, borjal) has also directly affected the dolphin population through shortage of food<sup>15</sup> because they serve as a top predator feeding on various fishes like catfishes that are also the targets of fishermen.<sup>2</sup>

### **Management Strategies**

River dolphin conservation in Assam dates back to 1992-93.<sup>15</sup> Increasing human disturbances and other threats are severe, having long-lasting impacts. If not monitored and reduced, such threats may lead to population crashes and species extinctions like the Baiji or the Yangtze river dolphin.<sup>19, 24</sup> A multifaceted approach is required as a single solution will not facilitate the recovery of this endangered species. Lack of awareness is another limitation in its conservation;<sup>8</sup> therefore it requires the involvement of the local communities residing near the dolphin habitats. No conservation step is successful without their participation which is possible through increasing awareness level and capacity building for monitoring dolphins and their habitats.<sup>15</sup> However, due to increasing awareness by the local people, the population decline of River dolphins has reduced in the Kukurmara area near the Kulsi river. It has also become a site for dolphin observation.<sup>13</sup> The State Fishery Laws in Assam have banned fishing from 1<sup>st</sup> April to 15<sup>th</sup> July using

very small-sized gill nets to prevent accidental dolphin mortality and other fish fauna, which in turn affects the dolphins through shortage of food.<sup>15</sup> There is a need for a robust collaborative initiative among the wildlife and forest departments, fishing communities, conservationists, scientists, local communities for effective governance.<sup>22</sup> For a long-term conservation of the species, Wakid (2007) recommended and attempted to initiate a project by involving the concerned collaborators of Assam to participate in the river dolphin conservation policies. The idea is to circulate the conservation status of this species and initiate collaborative conservation efforts by organizing regional training camps for the local communities residing near important dolphin habitats.

#### **Conservation Recommendations**

For raising effective conservation initiative awareness of the Ganges River dolphin in the Brahmaputra River system, the following recommendations are made-

#### **Public Awareness**

Awareness should be raised regarding the value, importance, and benefits of river dolphin conservation. At the local level, education materials and campaigns focusing on river dolphin conservation should be developed and aided in the local language. Awareness programs should be strengthened in areas where river dolphins occur. Their value and importance for conservation should be explained to the local people. Interactive sessions should be held by respecting their local values, perceptions, and traditions.<sup>25</sup>

#### **Enforcement of Law**

The Forest Department should regulate or restrict fishing and sand mining at the possible habitats of the dolphins during the peak breeding seasons. Local people near the dolphin habitats should be involved in dolphin conservation strategies by organizing more awareness camps. River poisoning for mass fishing should be prohibited.

#### **Ecotourism as an Alternative Livelihood**

The establishment of ecotourism as an alternative to fishing as a livelihood will reduce the pressure on

the fish population.<sup>18</sup> River dolphin watching program can provide employment for local people, that in turn will also protect this endangered species in their local habitats. This will also generate public awareness and research opportunities as well. Moreover, the profits from such programs can be invested in local conservation and social development projects.<sup>25</sup>

#### **Research and Monitoring**

Periodic monitoring of the dolphin population should be carried out by launching a 'Project Dolphin' at the National level. Also, the level of aquatic pollution should be frequently monitored. There should be a team of local conservation-oriented volunteers to report any illegal activity at the river stretch to take immediate actions against them.<sup>18</sup> Efforts should be made to acquire funds from different firms to conduct detailed surveys to access the threats to the river dolphins.

#### **Conclusion**

The endangered Ganges river dolphin was once the most commonly sighted species in the Brahmaputra; however, unfortunately, now it is left with rare sightings in the mainstream Brahmaputra and its tributaries. Several anthropogenic causes such as poaching for dolphin oil, by-catch, over fishing, net entanglements, and sand mining has driven the species nearly to local extinction. In addition, factors such as habitat destruction through aquatic pollution and construction of dams have contributed towards their rapid population decline and has left the species only in certain pockets of the Brahmaputra River while most of its major tributaries are devoid of any dolphin population.<sup>15,19</sup> However, the proximate cause for their population decline is mostly poaching and by-catches. Due to steep decline in its population, there is an urgent need for the conservation of this endangered species in its natural habitats. Unless the concerned authorities take immediate and proper steps, this species will extirpate from the local habitats in the foreseeable future, and the motto behind declaring it as the national aquatic animal will not be served to the desired extent.

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**Conflict of Interest**

The authors declare no conflict of interest.

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