

Environmental Impact on Freshwater Ecosystem: A Case Study of Gangetic Dolphin

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Abstract: Gangetic Dolphin once found in teeming numbers in the Ganges and its tributaries is now fighting a battle for survival. It is the most threatened cetacean and among the world's most threatened mammals. The Government of India has declared Gangetic Dolphin as the National Aquatic Animal but threats in the form of poaching, rising pollution in the rivers and obstruction in the flow of rivers due to the construction of a series of dams, barrages etc. still exist. Dolphins keep a watch on the state of freshwater. The worrying decline in the population of Gangetic Dolphins (*Platanista Gangetica*) signals a decline in freshwater for all. Captive breeding is not possible for Gangetic Dolphins so concerted efforts should be made not only to reduce river pollution and to ensure adequate river flow to maintain health of the Ganges and its tributaries but also to involve people in the conservation efforts by making them stakeholders in the conservation campaign.

Keywords: Gangetic dolphin, Threatened mammal, Poaching, River pollution, Conservation efforts.

I. INTRODUCTION

Mother of all rivers in India, the Ganga is unable to sustain the only population of freshwater dolphins found in the country. The dolphins living a pathetic life in the Ganga are fighting a losing battle for their survival. The Ganges river dolphin, known locally as the 'susu', was once common throughout many of the rivers in India, Nepal and Bangladesh. It has disappeared from much of its former habitat over the last 100 years and its future is uncertain.

Dolphins have probably lived in the Gangetic basin from time immemorial, perhaps since the origin of the river, and are mentioned in mythological literature and folklore, including the Mahabharata, which refers to them as the Vahana (carrier) of the legendary Ganga. In the 3rd Century BC, Ashoka the Great, the emperor of the Mauryan Empire, issued a decree not to hunt or kill 'Ganga - Puptaka', as the Gangetic dolphins were known at that time.

Centuries later, the Gangetic dolphin was also recorded in an illustration that formed part of the Babur namah, an indication of its prominence during the early 16th century A.D.

However, the status now is desperate as their total numbers have dwindled to less than 2000 in the entire range, which includes Nepal and Bangladesh. The last dolphin in the Yamuna River near Delhi was sighted in 1967. This has led to its being declared a protected species under the Wildlife Protection Act of 1972. The World Conservation Union (IUCN) too declared the Gangetic dolphin (*Platanista gangetica*) an endangered species in 1996. The other three freshwater dolphins across the world-Indus River Dolphin (*Platanista minor*), Amazon River Dolphin (*Inia geoffrensis*) and Yangtze River Dolphin (*Lipoptes vexillifer*) also have the same status. In 2006, dolphins became extinct in the Yangtze river in China (now, surviving only in captivity and semi-natural reserves). It was a major jolt to wildlife lovers across the globe. One should not be surprised if the same happens to the Gangetic dolphin.

II. RESEARCH METHODOLOGY

The researcher has adopted the doctrinal method of research. The researcher made use of a large number of sources available to her such as articles and journals and various websites.

III. OBJECTIVES

The objectives of the present study are:

- To study the threats being faced by the Gangetic Dolphin which is fighting for its survival.
- To assess the conservation methods being taken up by the Government to increase the numbers of the Gangetic Dolphin.

Gangetic dolphins have not been given priority like the terrestrial wildlife of India such as tigers, lions and rhinos. No thorough on-going study has been made about its population, biology and behaviour and major threats and sheer negligence of this animal has led to the heavy toll of their population in Indian rivers.

The Gangetic dolphin commonly known as Susu, is a member of the zoological order Cetacea - which includes whales, dolphins and porpoises. Though it got scientific documentation and nomenclature in 1801 from William Roxburgh, a Scottish botanist and first superintendent of the Calcutta Botanical Garden, it was also mentioned as "Khuk- abi" in Babarnama during the Mughal period, when the rural folk used to burn dolphin oil for lighting their homes. The older generation of fishermen community still regard Susu as the vahan (carrier) of the Ganga - which is their source of livelihood.

A. Physical characteristics

The Ganges River Dolphin grows to a length of 5 to 8 feet and can weigh up to 90 Kg. It has a long snout, big flippers and a stocky but streamlined body. It was believed to be blind, and reliant purely on echolocation, however its eyes have been found to provide some vision. The Ganges River Dolphin is a good swimmer and maneuvers its way through the murky water with its tail and flippers. Though resembling a fish morphologically, the Gangetic dolphin is in fact a mammal. The dolphin respire through lungs and emerges above the water surface to inhale air through a blow-hole on its melon, the head. Inhaling and exhaling produces a typical sound of "Soooooossss", which is the basis for its vernacular names.

It emerges from water every 20-40 seconds, but sometimes it remains underwater for 6-7 minutes. It is blind, due to the absence of lens in their eyes, but it captures prey and has a strong sense of feel through its strong echo locational powers. It emits an ultrasonic sound which reaches the prey. The dolphin then registers this image in its mind and subsequently catches hold of its prey. When it breaks through the water surface, for fraction of seconds, the observer generally sees the dorsal fin. Shooting these dolphins in water is very tough for photographers.

B. Habitat

The Ganges River dolphin favors deep pools, eddy counter-currents located downstream of the convergence of rivers and of sharp meanders, and upstream and downstream of mid-channel Islands. It prefers to stay in water with a temperature between 8 and 33 deg Celsius. It shares its habitat with crocodiles, freshwater turtles and wetland birds, many of which are fish eaters and are potential competitors with dolphins.

The distribution range of the Ganges River Dolphins in India covers seven states namely, Assam, Uttar Pradesh, Madhya Pradesh, Rajasthan, Bihar, Jharkhand and West Bengal. The Upper Ganga River (in Uttar Pradesh), Chambal River (Madhya Pradesh and Uttar Pradesh), Ghaghra and Gandak Rivers (Bihar and Uttar Pradesh), Ganga River, from Varanasi to Patna (Uttar Pradesh and Bihar), Sone and Kosi rivers (Bihar), Brahmaputra from Sadia (foothills of Arunachal Pradesh) upto Dhubri (on the Bangladesh Border) and Kulsi River, a tributary of the Brahmaputra river, form ideal habitats for the Ganges River Dolphin.

C. Social Structure

In the 19th century, Ganges River dolphins were once found in 'large schools' close to urban centres along the river. Nowadays, groups are considerably smaller, and individuals may also be found alone. The average size of a number of groups surveyed recently in the Ganges River system was two individuals.

D. Life Cycle

The calves are chocolate brown at birth and becomes greyish brown in adulthood with a smooth and hairless skin. Females are larger than males. The maximum size of a female is 2.67m and of a male 2.12 m. Females attain sexual maturity at an age of 10-12 years, while the males mature earlier when they are about 10 years of age. The average life expectancy is 25 years. The oldest male animal on record was about 28 years old.

E. Breeding

The gestation lasts from 9 to 11 months, and one calf is usually born, once every 2 to 3 years. There is no specific birth period, although females usually give birth from October to March, with a peak in December and January at the onset of the dry season.

F. Diet

The diet includes a variety of fish and invertebrates, namely prawns, clams, catfish, freshwater sharks, mahseers (except in India), gobies and carp. Ganges River dolphins normally chase surface dweller fishes and grovel mud dweller fishes in shallow water with the help of their long snout. They cannot chew and usually swallow their prey.

G. Threats

Once present in tens of thousands of numbers, the Ganges River Dolphin has dwindled abysmally to less than 2000 during the last century. It is the most threatened cetacean and among the world's most threatened mammals. It is listed as an endangered species in the IUCN Red Book and as a Flagship Species by WWF.

The survival of the Ganges River dolphin is threatened by:

a) Accidental killing through entanglement in fishing gear, most often nylon gill nets:

Although gill net entangling of dolphins has been referred to as accidental killing, it has been observed that most of the killings through this process are intentional. It has also been observed that most of the dolphins are killed during pre-monsoon and monsoon seasons. During high flood season, dolphins locally migrate through the tributaries. When the water recedes, the dolphins return to the mainstream of the river. During that time, local fishermen use gill nets mainly near the confluence area to capture dolphins. In fact, dolphin poaching is rampant in the Ganga. The Patna High Court has taken cognizance of the situation and initiated proceedings to save this elusive creature.

(b) Direct harvest, generally for dolphin oil used as a fish attractant and for medicinal purposes;

One of the main reasons for killing of dolphin is for its oil. The thick layer of fat below its skin is valued. Fishermen extract oil from the fat and use it as attractant for catfish, which has a good market value. The oil, which is mixed with fish bait, is sold at a rate of Rs. 100-300 per kg. Use of dolphin oil in fishing is practised in Bihar, West Bengal and Assam.

(c) Water development projects (e.g. water extraction and the construction of barrages, high dams, and embankments);

While poaching for oil, fishing and accidental entanglement in nets are important concerns, there is evidence that dam and barrage construction is one of the biggest threats to the dolphin across its entire range. A 2006 WWF Nepal report points out, for instance, that "Barrages on the Mahakali River (Sarda in India) at Banbasa on the India-Nepal border in 1928, and at Sardanagar in 1974 about 160 km into Indian Territory, have resulted in the extinction of dolphins from the Mahakali river.

Dams and barrages not only fragment dolphin populations, they also degrade downstream habitat, create reservoirs with high sedimentation and change the fish and invertebrate species found in the waters. Dam construction and operation cause major changes in the flow regime, sediment load, and water quality of rivers. Dams eliminate many of the dynamic attributes of downstream waters and block the flow-through of sediment essential to the formation of islands and sandbars. Downstream flows are normally not allowed to overflow riverbanks onto adjacent floodplains. As a result, fish production decreases dramatically. Natural fluctuations in flow, temperature, and detritus loading, which provide optimal conditions for a large number of aquatic organisms, are suppressed by dams, and the number of ecological niches available for supporting diverse communities of riverine biota is reduced. Luxuriant growth of macrophytes and excessive siltation have, for example, eliminated suitable habitat immediately above the Farakka Barrage and reduction in water availability downstream of the barrage has eliminated dry-season habitat for more than 300 km.

More than 168 large dams, for instance, have been planned in the Brahmaputra river basin alone, with little realization that this will change the entire up and down stream ecological systems and adversely impact the dolphin. It is precisely these kinds of developments that are working as a noose around our rivers and the diverse life found in them.

(d) Increasing levels of chemical pollution, such as from industrial discharges and the use of pesticides;

Pollution by fertilizers, pesticides, and industrial and domestic effluents is dramatic in the Ganges River. About 1.15 million metric tons of chemical fertilizers and about 2,600 tons of pesticides are dumped annually to the river system. The effects of pollutants may be considered deleterious to dolphin populations (Reyes, 1991, and refs. therein; Subramanian et al. 1999). Senthilkumar et al. (1999) determined concentrations of polychlorinated biphenyls (PCBs), hexachlorocyclohexane (HCH), chlordane compounds, and hexachlorobenzene (HCB) in river dolphin blubber and prey fishes collected during 1993 through 1996. Comparison of organochlorine concentrations with values reported for samples analyzed during 1988 through 1992 suggested that the contamination by these compounds has increased in the river and persists (Kumari et al. 2002). Kannan et al. (1997) determined concentrations of butyltin compounds in dolphin, fish, invertebrates and sediment collected from the River Ganges. Total level in dolphin tissues was up to 2,000-ng/g wet wt, which was about 5-10 times higher than in their diet. The biomagnification factor for butyltins in river dolphin from its food was in the range 0.2-7.5. Butyltin concentrations in Ganges river organisms were higher than those reported for several persistent organochlorine compounds. Though no specific investigations have been made to determine the effects of these toxicants on the physiology of these dolphins, it can be assumed to affect reproductive physiology and other vital systems.

River dolphins may be particularly vulnerable to industrial pollution because their habitat in counter-current pools downstream of confluences and sharp meanders often places them in close proximity to point sources in major urban areas (e.g. Allahabad, Varanasi, Patna, Calcutta, and Dhaka). Furthermore, the capacity of rivers to dilute pollutants has been drastically reduced in many areas because of upstream water abstraction.

(e) Increasing levels of other forms of pollution, such as municipal sewage discharge and noise from vessel traffic:

There are some 30 cities, 70 towns, and thousands of villages along the banks of the Ganga. Nearly all of the sewage from these population centres – over 1.3 billion litres per day – passes directly into the river, along with thousands of animal carcasses, mainly cattle. Similar is the fate of all the rivers in India. This has adversely impacted the rich freshwater fauna including the Ganges dolphin which is at the apex of the food chain in freshwater ecosystem.

(f) Over exploitation of prey, mainly due to the widespread use of non-selective fishing gear during fish breeding migrations and early juvenile growth.

H. Conservation Challenges

Dolphins keep watch on the state of freshwater. The worrying decline in the population of Gangetic dolphins (*Platanista gangetica*) signals a decline in freshwater for all.

In October 2004, dolphins joined the ranks of species such as great apes and tigers and were listed as a species endangered by trade on Appendix I of CITES (The Convention on International trade in Endangered Species of Wild Fauna and Flora).

The Gangetic dolphins have also been declared as the National Aquatic Animal of India. This decision was taken in the first meeting of the National Ganga River Basin Authority (NGRBA) chaired by Prime Minister Dr. Manmohan Singh on Monday, 5th October, 09. Listed by IUCN as 'endangered' and placed in Schedule-I of the Wildlife (Protection) Act, 1972, the Ganges River Dolphin enjoys high levels of legal protection both nationally and internationally. Under the Wildlife Protection Act of 1972, anyone found guilty of killing or possessing any part of the aquatic animal protected under Schedule I of the act can be imprisoned for a period of one to six years and fined not less than Rs 6,000. Yet its numbers continue to decline. This is because the penalty imposed under the law is incommensurate with the gravity of the crime.

IV. CONCLUSION

The absence of a coordinated conservation plan, lack of awareness and continuing anthropogenic pressure, are posing an incessant threat to the existing dolphin population. During January-April 2001, about 25-30 dolphins were killed incidentally by fishermen near the Ganga and Gandak river confluence at Patna, which resulted into stern action by the Patna High Court to ensure protection and conservation of Gangetic dolphins in Bihar. Intervention of the court resulted in development of management and research plans by the environment and forestry department of Bihar. But these plans await proper implementation.

The Vikramshila Biodiversity Research and Education Centre (VBREC), led by Dr. Sunil Chaudhary, together with the Whale and Dolphin Conservation Society (WDCS), the Environmental Biology Laboratory of Patna University, and T.M. Bhagalpur University, has initiated a project to improve the conservation value of Vikramshila Gangetic Dolphin Sanctuary (VGDS). Vikramshila Gangetic Dolphin Sanctuary is located in Bhagalpur District of Bihar. The sanctuary is a 50 km stretch of the Ganges River from Sultanganj to Kahalgaon. Designated in 1991, it is the only protected area for the endangered Gangetic dolphins in Asia. Of late, COVID-19 lockdown has proved to be a blessing for the species. The sightings of the Gangetic Dolphins have increased due to the lack of human activity on the Ganga during the ongoing novel coronavirus disease lockdown in the VGDS. Dr. Sunil Chaudhary said that dolphins were being spotted at places where they had not been seen due to human activities.

Conserving dolphins means:

- Sewerage will need to be adequately treated and rubbish disposed of thoughtfully instead of dumped in the rivers.
- The rivers will be clean enough to draw on for water supplies (drinking water may need additional treatment).
- River banks will be replanted with trees that enhance the environment, reduce erosion of farm lands, and provide food and fibres for people.
- There will be enough fish in the rivers to support people and dolphins.
- Enough water will flow down the rivers to reduce the intrusion of saltwater from the sea.

Floods will be managed more naturally to reduce risk to people, trigger fish breeding, and restore floodplain habitats and flood recession agriculture.

Since captive breeding is not possible in case of the Gangetic dolphin, more river stretches must be set aside for them. In fact, small protected areas cannot serve the purpose, as the dolphins migrate significantly across long distances. But until such time, this playful creature from the murky depths, is headed towards doom.

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