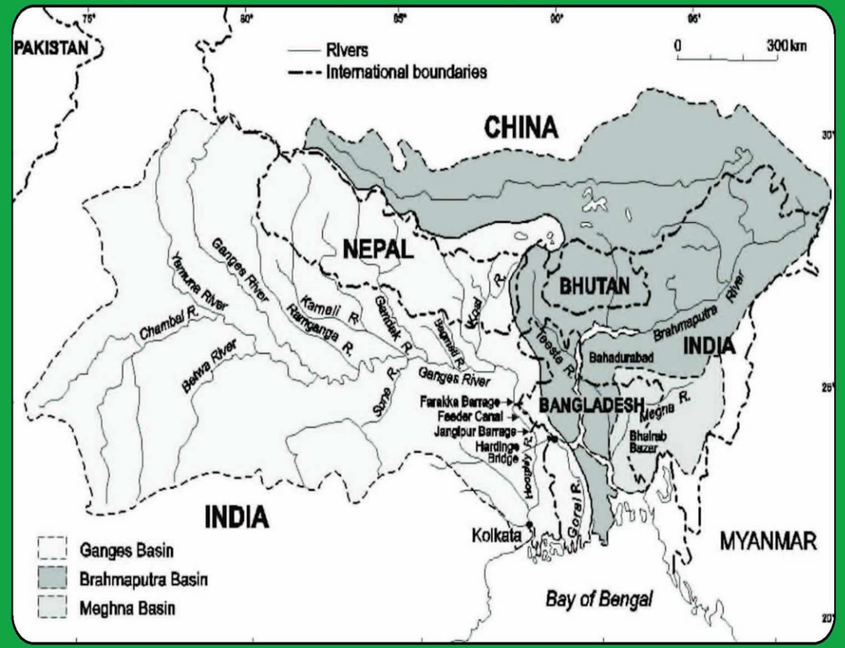
Ganges- Brahmaputra- Meghna River Basin



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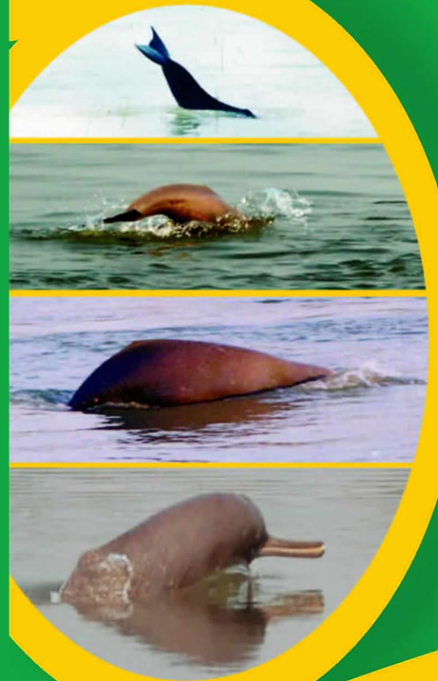
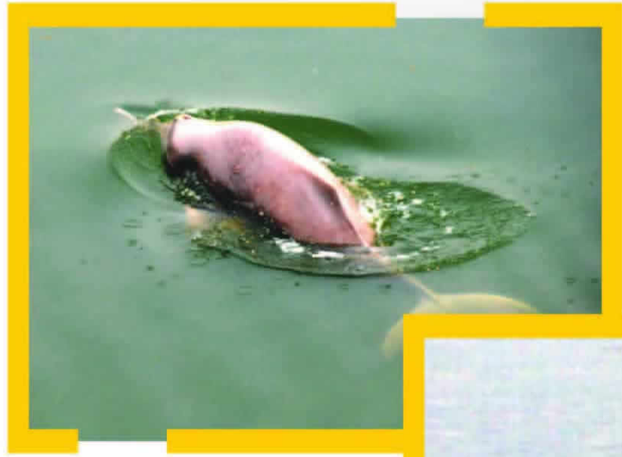


THE GANGETIC DOLPHIN

R. K. Sinha

Surfacing of
Gangetic Dolphin in
Natural Habitat



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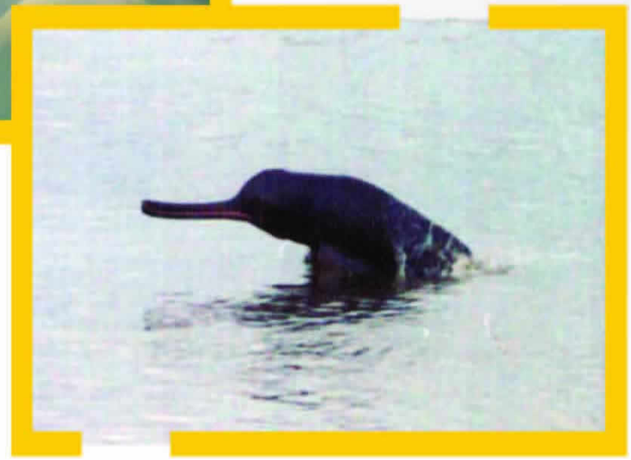

The Gangetic Dolphin

R. K. Sinha

Chief Minister
Bihar

PATNA

FOREWORD

FOREWORD

It is Bihar's pride that it is home to more than half the population of the Gangetic river dolphin which has been declared as the National Aquatic Animal of India. The Gangetic dolphin is one of the last three surviving obligate river dolphins in the world. Only about 3200 Gangetic dolphins are surviving in Ganga-Brahmaputra-Meghna river systems in India, Nepal and Bangladesh; almost half of this population is in Bihar. The animal is competing hard with humans for freshwater and fishes on which they forage.

The Gangetic dolphin is indicator of health of our rivers just like Tiger is of our forests. Riverine and freshwater biodiversity is increasingly threatened by unsustainable development. The River Ganga is losing its ecological integrity due to declining flow and high pollution. The dolphin population in the rivers indicates their good health and biodiversity. This book contains scientific information on the Gangetic dolphins, their habitat, their importance, various threats they are facing and what we should do to save them from extinction.

Prof. R. K. Sinha has been engaged in scientific researches and conservation efforts to save this charismatic mega-fauna of our rivers since more than three decades. The survival of this dolphin is an index of the success of our efforts to save the biodiversity of our rivers. I hope this publication, written in a lucid manner and aptly illustrated, will help people to realize their natural aquatic heritage symbolized by the Gangetic dolphin. All lovers of nature will find in this book one more example of the wonders of nature.

(Nitish Kumar)

About the Author

Dr. R. K. Sinha, popularly known as 'Dolphin Man of India' is a Professor of Zoology in Patna University, Patna. He has a long experience of over 35 years of teaching, and research on various aspects of ecology and biodiversity of the River Ganga system, however, he is best known for his pioneer researches and conservation efforts to save the Gangetic dolphin, *Platanista gangetica gangetica*. He has surveyed dolphins and other aquatic fauna in the entire length of the Ganga and many of its tributaries in India and Nepal.

Dr. Sinha has been associated with several conservation organizations of India and abroad and his works have been recognized globally. His scientific researches and conservation efforts to save the Gangetic dolphin in particular and biodiversity of the Ganga in general brought the international laurels of being decorated with The Order of the Golden Ark by His Royal Highness Prince Bernhard of the Netherlands in 1999. He has the distinction of being Chairman of the Asian River Dolphin Committee under the aegis of the Cetacean Specialist Group of International Union for Conservation of Nature (IUCN), Fellow of Linnean Society of London, recipient of Swarna Jayanti Puraskar of the National Academy of Sciences, India, and Member of Cetacean Specialist Group of Species Survival Commission of IUCN. Dr. Sinha has to his credit over one hundred research papers in journals of national and international repute, about three dozens of technical reports, one guide book on the Ganges River dolphin and Conservation Action Plan for Gangetic dolphin for Government of India.

Acknowledgements

I am very grateful to Sri Nitish Kumar, Honourable Chief Minister of Bihar, for his constant support and encouragement for my pioneer work on the conservation of the Gangetic dolphin. On my request he played an instrumental role in declaring the Gangetic dolphin as National Aquatic Animal of India by Honourable Prime Minister of India on October 5, 2009.

A serious need for a book on the Gangetic dolphin in a very simple language easily understandable to common mass was being felt from time to time to create awareness about the dolphin among them. I was encouraged by numerous colleagues and friends, especially, Sri Dipak Kumar Singh, Secretary, Department of Environment and Forests, Government of Bihar who suggested to come out with the book. I am thankful to wildlife officials of Government of Bihar, especially Sri B. N. Jha, PCCF, Sri B. A. Khan, Additional PCCF cum Chief Wildlife Warden, Dr. D. K. Shukla, Additional PCCF, Development, Sri S. S. Choudhary CCF and Chief Executive Officer, Bihar Forests and Wildlife Conservation Society, for supporting research and conservation activities for saving the Gangetic dolphins in Bihar.

I am thankful to Prof. K. Prasad of Department of Geology, Patna University, Dr. Gopal Sharma, Scientist C, Zoological Survey of India, stationed at Gangetic Plains Regional Center at Patna and Dr. Samir Kumar Sinha, Manager and Regional Head of Bihar and Eastern Uttar Pradesh, Wildlife Trust of India for their constant support in research and conservation efforts to save the Gangetic dolphin and for their help in illustrating the book with photographs.

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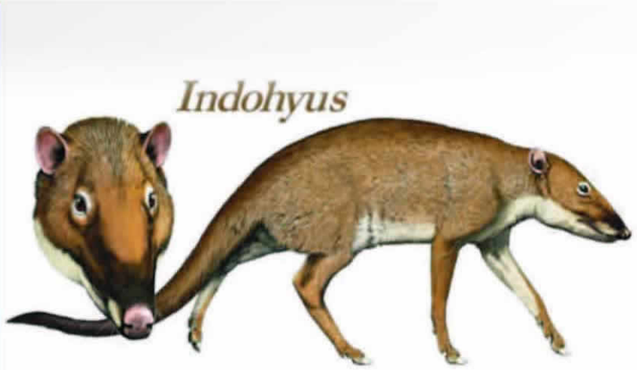
Introduction

1.1. Taxonomic position : The Gangetic dolphin, *Platanista gangetica gangetica*, commonly known as susu belong to Order Cetacea of Class Mammalia. Cetaceans include whale, dolphin and porpoises. There are three sub-orders in Cetacea: Archeoceti (extinct whales), Mysticeti (Toothless or Baleen whales); and Odontoceti (Toothed whales).The Mysticeti have two external blowholes (nostrils) whereas the Odontoceti have one.

There are 14 species of baleen whales and 74 species of odontocetes. The Blue Whale, a mysticetes, is the largest animal ever to have lived on earth. It is larger than any of the known dinosaurs. Blue Whale having a length of 110 ft long and weighing about 190 tonnes has been recorded. It needs so much food that, in terms of weight, it could eat a fully- grown African elephant every day. A man could hold a party for a dozen friends inside its mouth. It is so large, in fact, that it stretches the imagination and boggles the mind.

Dolphins are toothed whales but not all toothed whales are dolphins. Altogether there are 88 species of cetaceans, out of which 41 species are dolphins. The majority of the world's dolphins live in saltwater habitats but some are obligate freshwater species i.e they can survive only in freshwater. The three obligate riverine dolphins are: (*i*) the blind river dolphin, (*Platanista*



gangetica) inhabiting the Ganges, Brahmaputra and Meghna river systems in India, Nepal and Bangladesh; and in the Indus river system in Pakistan and India; (*ii*) the Yangtze river dolphin, or "baiji" (*Lipotes vexillifer*), which inhabited the lower and middle reaches of the Yangtze river in China, which is now extinct, and (*iii*) the Amazon river dolphin, or "boto" (*Inia geoffrensis*), which is largely distributed in northern South America in the Orinoco and Amazon river systems, and the upper Rio Madeira drainage. The fourth species classified as a river dolphin is the La Plata dolphin, or "franciscana" (*Pontoporia blainvillei*) which is found in estuaries and coastal waters of eastern South America from South Brazil to Argentina.

Porpoises are any of several gregarious toothed whales of the genus *Phocaena* and related genera, of oceanic waters, characteristically having a blunt snout and a triangular dorsal fin.

1.2. Origin of Cetacea and river dolphins

The cetaceans originated from Raoellid artiodactyles (a hoofed mammal with even number of toes like ox), *Indohyus,* about 50 million years ago in south Asia. *Indohyus* was a small, stocky artiodactyl. All fossils of *Indohyus* were collected at a middle Eocene bone bed extending for about 50 m at the locality Sindkhatudi in the Kalakot region of Kashmir on the Indian side of the Line of Control (Thewissen et al 2007).

Origin of River Dolphins

The ancestors of the four extant river dolphin taxa were inhabitants of Miocene epicontinental seas. The Middle Miocene was a time of globally high sea levels. As sea levels fell during late Miocene and Pliocene, these archaic odontocetes survived in river systems.

The Indo-Gangetic plain of the Indian subcontinent, the Amazon and Parana River basins of South America, and the Yangtze River basin of China are vast geomorphic systems whose fluvio-deltaic regions were penetrated deeply by marine waters during high sea-level stands. The shallow estuarine regions created by the mixing of riverine and marine waters probably supported diverse food resources, particularly for aquatic animals able to tolerate wide range of salinity between fresh and saltwater systems.

Indian mythology and the Gangetic dolphin

1. In Bhagwat-Gita's Chapter 10, Verse 31, Lord Krishna says "Among purifier I am the wind: I am Rama among the warriors: the shark among fish: Ganges among the rivers. In the German version "shark" is translated as the dolphin.
2. In the mythological story of the Origin of the Ganges: The Ganges, daughter of heaven, after her birth cried "now show me the way, Bhagirata!". And a great procession began to wind through the land of India: in front went Bhagirata in his robes of penance, and after him came the river with her myriads of fishes, turtles, frogs and leaping dolphins – all creatures that live in the rushing mighty stream. The Ganges dolphin has also been treated as messenger of Lord Shiva.
3. In Hindu iconography, the Ganga dolphin is the vehicle of Goddess Ganga.

Goddess Mother Ganga on her *'vahana'* Gangetic Dolphin

Though the Ganges river dolphin has been mentioned in many ancient and mythological Indian literature, it was discovered to the scientific world in the year 1801 by William Roxburgh in *Asiatick researches*, Vol. III, in Calcutta. Roxburgh was a famous botanist who worked in Botanical Garden, Calcutta between 1793 and 1797, and again from 1799 to 1805. He had ample opportunity to observe the dolphin in the Hooghli river from his house in the botanical garden. Dr. Roxburgh named the dolphin *Delphinus gangetica*. In 1828 Rene Lesson adopted a genus based on the Bengali name 'Susuk' and described the species as *Susu platanista*. However, Johann Wagler adapted *Platanista* as a genus in 1830, which formed the basis of its present Latin name *Platanista gangetica*.

Native / Common names of the Gangetic Dolphin, Platanista gangetica gangetica

Languages	Names (s)
Hindi	sous, susa, sunsar, sus, susu, soonse, soosoo, soosa, souns
Bengali	susuk, sishuk, shushuk, shishumachh, susak, shishuk
Sanskrit	sisumar, sunsar
Assamese	hiho, seho, huh, shihu, xihu
Regions	
Sylhet and Cachar	huh, hugh, huhh, hooh
Assam	hihoo, hiho, seho, sihoo, sehoo, shuhu, siho
West Bengal & Bangladesh	shushuk, shishuk, susuk
Nepal	suongsu, swongsu

All these terms appear to be imitations of the sound made by the dolphin in respiration (Anderson 1879).

Sources : Anderson (1879), Murray (1884), Sterndale (1884), Blanford (1891), Prater (1965), Kasuya and Haque (1972) ,Haque (1982) and Jones (1982).

The four genera of toothed cetaceans, i.e., the baiji, *Lipotes vexillifer*; the susu, *Platanista gangetica*, the boto, *Inia geoffrensis*, and the franciscana, *Pontoporia blainvillei*, comprise the peculiar and poorly known 'river dolphins'. The river dolphins occur only in two continents: Asia and South America. The baijii, *Lipotes vexillifer*, the Yangtze River Dolphin, was endemic to China. It was declared functionally/effectively extinct in December 2006. The two populations of *Platanista gangetica* have been isolated for a considerable time. *P. gangetica minor* is confined to the Indus drainage in Pakistan. However, a couple of this species were sighted in the Sutlej River in Punjab in India in 2008. *P.g. gangetica* occurs in the Ganges, Brahmaputra, Meghna, Karnaphuli, and Sangu drainage system of India, Bangladesh and Nepal. The boto, *Inia geoffrensis*, has an extraordinarily wide distribution. It can be found in the entire Amazon River and its tributaries, small rivers and lakes, throughout the Orinoco river basin. It occurs in six countries of South America: Bolivia, Brazil, Colombia, Ecuador, Peru, and Venezuela. The franciscana, *Pontoporia blainvillei*, is the only one of the four river dolphin species living in the marine environment in coastal marine waters of eastern South America.

Finless Porpoise

Tucuxi

Irrawaddy dolphin

Other Freshwater Dolphins and Porpoises: Besides seawater and obligate freshwater, few cetaceans are facultative which live both in seawater and freshwater.

Yangtze River finless porpoises (*Neophocaena phocaenoides*), a population of finless porpoise found exclusively in the Yangtze, now identified as a separate subspecies from the population found in the Indian ocean and South China Sea and the population.

Freshwater Tucuxi (*Sotalia fluviatilis*), a small dolphin which is found as far as 2,500 km upstream in the Amazon River system and 250 km upstream in the Orinoco River and coastal marine waters in South America.

Irrawaddy dolphin (*Orcaella brevirostris*), are patchily distributed in primarily estuarine, tropical, and subtropical waters of the Indo-Pacific, from north eastern India east to Philippines and south to northern Australia. Freshwater populations occur in three river systems: the Mekong River of Laos, Cambodia, and Vietnam, the Mahakam River of Indonesia and the Ayeyarwady River (formerly Irrawaddy) in Myanmar (formerly Burma). It is also found in estuarine waterways of the Sundarbans mangrove forest and in the lower reaches of the River Hooghli (the estuarine zone of the Ganga). In addition, freshwater populations also occur in brackish water environments in two lagoons or lakes: Chilika Lake in Odisha, India, and Songkhla lake in Thailand.

Distribution and status of the Gangetic dolphins

Anderson (1879) presented the range of distribution of Platanista in the Ganges River between longitudes 77° and 89°E from Sagar Island at the confluence of the Ganges in Bay of Bengal to as far up as the rivers were navigable near the foothill of Himalayas. In the Brahmaputra River, he stated that Platanista was present "throughout all the main rivers, as far eastwards as longitude 95° E by latitude 27°30'N, frequenting also all its larger streams." Outside the Ganges-Brahmaputra-Meghna River systems, susus were present in the Karnaphuli River and possibly the Sangu River in eastern Bangladesh.

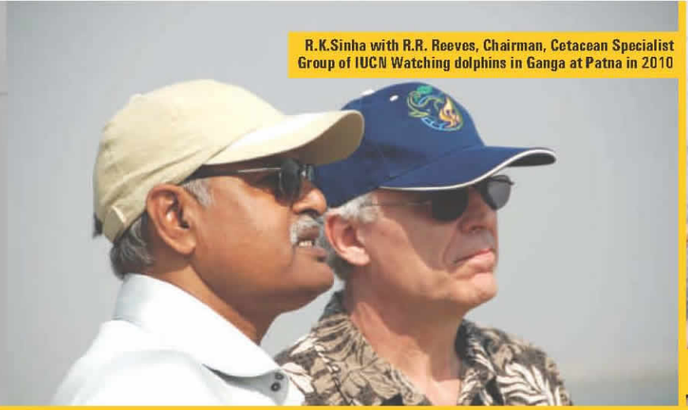
Currently, the distribution range of the Gangetic dolphin has shrunk both in the main channel of the River Ganga and most of the tributaries due to insufficiency of water, and construction of dams and barrages, etc.

3.1. Status of the Gangetic dolphin in the entire distribution range: A total of more than 3250 dolphins have been sighted in its distribution range in India, Nepal and Bangladesh; details of which are in Table 1.

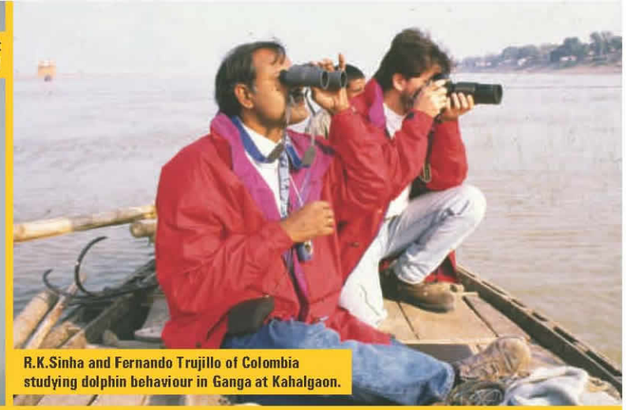
Table 1: Estimated population of the Gangetic dolphins

Location	Number of individuals	Source
The River Ganges and tributaries	2203	Sinha et al (2000, and 2010). Pers. comm. Behera,S. K.
The River Brahmaputra and tributaries	567	Wakid (2009). Pers. comm. Wakid. A.
Rivers and Sundarbans area in Bangladesh	450	Smith et al (2006, 2009)
River Karnali and tributaries like River Mohana; and River Koshi in Nepal	> 50	pers. comm. Bhojraj Shreshtha
Total	3270	

Hon'ble Chief Minister Sri Nitish Kumar, in the International Conference on Ganga in Patna University



R.K.Sinha with R.R. Reeves, Chairman, Cetacean Specialist Group of IUCN Watching dolphins in Ganga at Patna in 2010



R.K.Sinha and Fernando Trujillo of Colombia studying dolphin behaviour in Ganga at Kahalgaon.

3.2. Current status of the Gangetic dolphin in Bihar: It is estimated that almost half of the dolphin population in Indian territory resides in the rivers in Bihar. Altogether we sighted 825 dolphins in the main channel of the Ganga, from Chausa near Buxar to Sahibganj (525km) during our continuous upstream survey in October-November 2012.

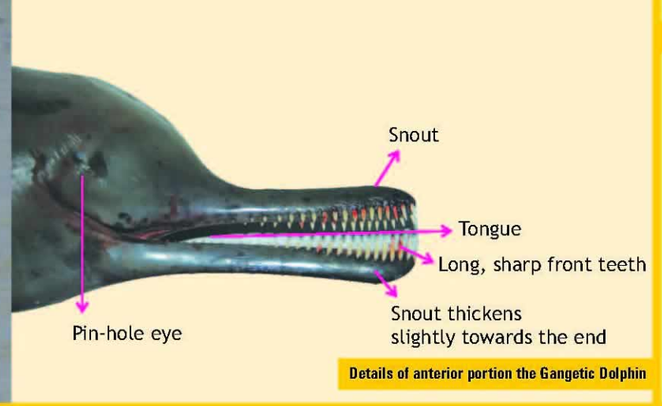
Our continuous survey in the River Kosi could not be completed during 2001 due to unavoidable reason. However, we could conduct surveys in discrete segments of the river wherever the same was possible. Continuous upstream survey was conducted in the River Gandak in 2011.

There is a need for scientific and systematic continuous surveys in the unsurveyed rivers of Bihar. The unsurveyed rivers include Mahananda in the Indian territory, Mechi from Indo-Nepal border to its confluence with Mahananda, Burhi Gandak, Bagmati, Kamala, Balan and other smaller tributaries of the River Kosi, Gandak and Mahananda. Continuous surveys should be conducted in the River Kosi from Birpur Barrage to its confluence with the Ganga at Kursela. As two dolphins were rescued in March this year from a very small River Donk in Kishanganj District, regular surveys must be conducted in small rivers and rivulets especially in North Bihar.

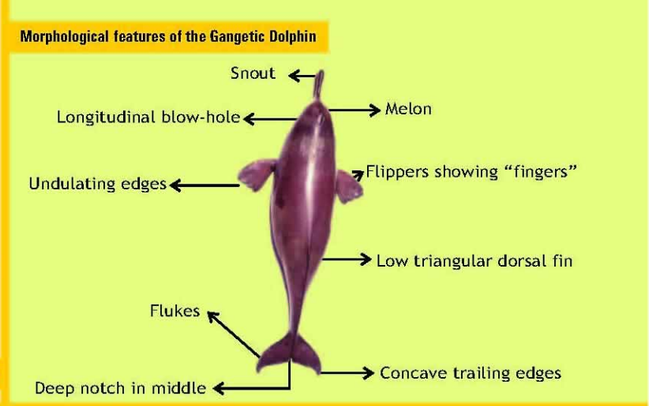
Estimated population of the Gangetic dolphin in Bihar

Location	Number of individuals	Source
The River Ganges, Chausa to Sahibganj (525 km)	825	Our own survey in October-November, 2012
The River Gandak, Gandak Barrage to confluence with Ganga at Patna (320 km)	269	Pers. Comm. Gopal Sharma (2011)
The River Kosi, Birpur Barrage to Kursela; discrete surveys (200km)	85	Sinha and Sharma (2003)
River Pannar, Lohandra, and Bhalua rivers of Araria District	35	Pers. comm. Sudan Sahay (September 2013)
Total	1214	

Morphology



Details of anterior portion the Gangetic Dolphin



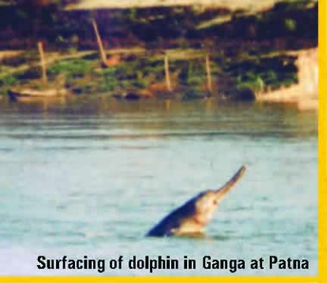
The morphological features of Gangetic dolphin are fully suitable for aquatic life. The shape of body is streamlined. The body is deep brown colour, stocky in the middle and has a narrow tail stalk at the end of which is the caudal fin called fluke which has concave trailing edges and a deep notch in the center. Unlike fish's caudal fin which moves laterally, the fluke of dolphin pumps up and down to drive the dolphin through water. A very small ridge like triangular dorsal fin is located exactly at the 2/3rd length from the anterior tip. The fore-limbs are modified into the pectoral fins or flippers which are crenulated and used for swimming. The Gangetic dolphin has slightly wedge-shaped head. The front part of the head is called melon. Above the head is a longitudinal nostril called blow-hole which makes it possible for the dolphin to breathe the moment it breaks the water surface. As the cervical vertebrae are unfused, the neck is flexible.

At the time of birth the length of newly borne baby is 70 -90 cm and it weighs 4-7.5 kg. Adult female (2.5-2.7m) is longer than adult male (2.1 – 2.2m). It is difficult to distinguish between the sexes when it surfaces. The male's sexual organs are tucked inside a slit half way between the navel and the anus, while the female's vagina is further back, close to the anus; on either side of the vagina are two small slits which hide the nipples. Though these dolphins are mammal but they do not have hair on their body. They have a

thick layer of fatty tissue, called blubber, below their skin which helps in maintaining their body temperature.

The Gangetic dolphins have a long snout which widens at the tip. It is a typical characteristic of all the river dolphins. The lower jaw is relatively longer than the upper one. Altogether in both the jaws there are about 140 prehensile teeth; the front teeth are longer, sharp and are visible even when the mouth is closed. With increasing age, the free ends of the teeth become worn to flat or rounded surfaces. The snout of adult female is longer than that of male; and may up-curved to one side. The eyes opening are just like tiny pin-holes located slightly above the mouth. The eye ball is vestigial and lacks crystalline lens making the animal practically blind, though remnant of retina is present. Practically invisible ear; tiny pin-holes are located behind the eyes, show the openings to the inner ears. There is no pinna in cetaceans.

Primitive characters: Platanista gangetica bears some of the very primitive characters not known in other cetaceans, viz. presence of ceacum at the junction of small and large intestine (Anderson 1879); position of testis is much more dorsal compared to other marine cetaceans (testes are extra-peritoneal in terrestrial mammals), and subcutaneous muscle between two layers of blubber (Sinha et al 2010).

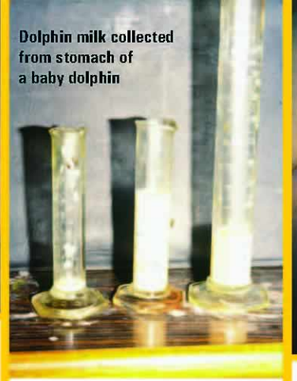


Surfacing of dolphin in Ganga at Patna

Surfacing dolphin showing its flipper

Small size fishes collected from stomach of a dead dolphin

Male genital aperture of the Gangetic dolphin



Dolphin milk collected from stomach of a baby dolphin

Female genital aperture and slits hiding nipples on both side

Behaviour And Social Life

The Gangetic dolphin does not live in groups, but more than one may be observed at the same time in a comparatively small portion of a deep segment of river. Most of the time calf accompanies the mother. While rising to breathe, it may either simply expose the upper surface of its head, sufficiently to bring its blowhole above water, or, more commonly it plunges out of water upwards, forwards, and downwards, first exhibiting its long snout, followed by two-thirds of its back. At such times it emits a short, blowing sound, 'soons' by which it was named along the rivers in its distribution range. In quiet segment of rivers occasionally it leaps altogether out of the water with the tail curved downwards.

5.1. Surfacing behavior and dive times: Gangetic dolphin showed great diversity in surfacing pattern depending upon several environmental factors and age-class. The adults and sub-adults were found to have different types of surfacing in different day-hours. The dolphins were observed following or aggregating in and around the drift fishing nets in shallow zones most probably to steal or catch entangled / escaped fish from the fishing nets. Dive-time of the Ganges dolphins ranged from 10 to 465 seconds. The mean dive-time of adult is 129 seconds whereas that of young ones is 59 seconds.

5.2. Feeding: It feeds during the day as well as in the night for which dolphins frequently move close to the river banks as well as mouth of streams. Also they seek their food on the muddy bottom of the river. They feed upon small size (about 10cm) fish, freshwater shrimps, snails and immature aquatic insects. The Gangetic dolphins are not selective feeders, especially regarding fish species, but they are selective in the size of fish. They exhibit active foraging behavior in morning (7 to 10 AM) and afternoon (3 to 5 PM). We observed dolphins chasing surface dweller fishes like *Rhinomugil corsula* or *Aruari* in local parlance. Occasionally we observed the dolphins chasing and biting large size fish but they do not feed upon them. On some occasions we noticed that the dolphins drive school of smaller fishes to a particular area for community feeding.

5.3. Reproduction: Sexual maturity both in male and female is attained at about ten years of age (Kasuya 1972, Harrison 1972). Gestation period is 8 to 9 months. Usually it gives birth to only one at a time, although it is stated that sometimes they produce twins Breeding takes place round the year but maximum birth takes place between October and January, and March to May. We sighted 4-5 newly born babies, few weeks old, in Ganga at Buxar on November 9, 2012. Also we sighted 8-10 such babies in Ganga in the second and third week of February of 2010 and 2012 at Patna.

5.4. Habitat Preference: Preferred habitats of the dolphin in rivers are: downstream of shallow places, in narrow places , narrow and deep sections of river, in deep locations where the current is weak, in deep water pools off the mouths of irrigation canals, near villages and ferry crossings, downstream of bridge pilings, downstream of sand bars and sharp meanders, near bathing ghats and cremation ghats (Sinha 1997, Kelkar et al 2010).

Translocation of Gangetic Dolphin by Araria Forest Division led by DFO Shri Ranbir Singh with Technical assistance from Dr Gopal Sharma

Dispersal, Rescue And Translocation

It has been reported that dolphins move downstream in the winter season when river discharge is low, and that as the flood waters rise in the monsoon season, dolphins move upstream including the smaller tributaries. During the flood, many dolphins enter into the smaller tributaries and most of them return to the main channel of the large rivers after the flood. However, some individuals stay back in pools of the tributaries during the dry season and become vulnerable. Usually, such individuals are killed by the local fishermen. In March 2013 two such dolphins were successfully rescued from the River Donk and translocated to the Mahananda in Kishanganj District of Bihar. Efforts to rescue such individuals are important to conserve the dolphins and resources / infrastructure should be made available for this purpose.

Our team members releasing a dolphin, rescued from a fisherman, in Ganga at Patna

Threats

The Gangetic dolphins face many threats – directed killings, incidental capture by fishermen (by-catch), habitat destruction, depletion of food resources, chemical and noise pollution, over-fishing and climate change. They are facing extinction due to various developmental activities in the river systems including water development projects, pollution, unsustainable exploitation and competing demands of the river water by multiple stakeholders. The Ganges dolphins are already locally extinct in many of their historical distribution ranges and were listed as "endangered" in the 2004 IUCN Red List due to a reduction in its historical range and projected declines in population size due to increasing threats (Smith et al. 2004).

7.1. Direct catch: Deliberate killing of the Gangetic dolphins using harpoons, fishing nets and several indigenous methods in Bihar was rampant up to mid-1990s, but currently it is believed to have declined in most areas. However, some individuals are still taken each year and their oil and meat are used as liniment, as an aphrodisiac and as bait for catfish.


A fisherman harpooning a dolphin in Ganga


Young dolphin entangled in nylon gill net


Ploughing floodplain at Patna


Kosi Barrage at Birpur

7.2. Incidental catch: Accidental killing is a serious problem for Gangetic dolphins throughout their distribution range. The primary cause is believed to be entanglement in fishing gear, most often nylon gill nets, mainly because their preferred habitat is often in the same location as primary fishing grounds. Many times fishermen try to avoid entanglements because dolphins may damage their nets but they are happy if a dolphin gets entangled and drowned in their net since they fetch a good money by selling the dolphin oil

7.3. Habitat degradation due to water development works

Construction of dams and barrages for hydroelectric development and irrigation in the Ganges system has fragmented the population of the dolphins, preventing their dispersal leading to segregation of populations and a narrowed gene pool in which dolphins can breed, and reducing food availability. Also such constructions drastically alter its habitat by converting the running water system in rivers to stagnant water system in the same river. For example,

dolphin population disappeared from the main stem of the Ganga above the Middle Ganga Barrage at Bijnor (about 100 km downstream Haridwar) after 12 years of its construction. Dolphins in Nepal are almost extinct in Mahakali, Narayani and Sapta Kosi rivers due to construction of barrages at their heads at India-Nepal border. Luxuriant growth of acquatic plants and excessive siltation resulting in formation of large sand bar have eliminated dolphin's habitat immediately above the Farakka Barrage.

Construction of embankments in its distribution range in India and Bangladesh has drastically affected the river ecosystem where overflow and flooding are important cycles in the movements and spawning of flood plain dependent fishes, leading to scarcity of food for dolphins.

Excess abstraction of the river water for irrigation has completely destroyed habitat in rivers like Sone in Bihar and Sarda in Uttar Pradesh where no more dolphins survive. Even in the main stem of the Ganga, between Narora and


Industrial effluent being discharged into Ganga


Lift irrigation plant at Mirzapur, UP


Farmers spraying pesticides on crops on the bank of Ganga at Fatuha, Patrna


Surfacing Gangetic Dolphin and sail boat in the background

Allahabad the water level has declined to a great extent and the river has more domestic and industrial effluents than the river water. The dolphin's habitat has almost been eroded in this stretch. Similarly the Yamuna – the largest tributary of the Ganga – turns into a stinking drain downstream of New Delhi, and has no dolphin for a stretch of 250 km downstream until the Chambal River joins the Yamuna , giving it a new lease of life. Dolphins need deep water in association with complex hydro-geo-morphology in rivers.

Pollution: Pollution by fertilizers, pesticides, and industrial as well as domestic effluents is dramatic in the Ganges River; about 1.5 million metric tons of chemical fertilizers and about 21000 tons of technical grade pesticides are dumped annually to the Ganges-Brahamaputra river system in India in 2002-2003 (Source: www.ncipm.org.in /asps/pesticides.asp). Concentrations of polychlorinated biphenyls (PCBs), hexachlorocyclohexane (HCH), chlordane compounds, and hexachlorobenzene (HCB) found in blubber, muscle, kidney, liver and prey collected from stomach of the dolphins from 1993 through 1996 from the River Ganga in and around Patna, India were evaluated. (Kannan et al.

1993, 1994, 1997, and Senthilkumar et al. 1999). The DDT content in blubber of a female Gangetic dolphin was found to be 1.2 million times more compared to DDT content in the river water. As the organochlorine pesticides like DDT are soluble in fat (lipophilic), they get accumulated in fatty tissue, blubber, of the dolphin which might be affecting the vital organs of the dolphin.

Impacts of river traffic: The river Ganga has been declared as the Waterway No. 1 by the Inland Waterways Authority of India. Cargo ships transport goods from Haldia / Kolkata to Patna regularly, occasionally up to Varanasi. Large numbers of mechanized boats operate in the river in Bihar for various purposes. Many times dolphins collides with these vessels and die. Underwater noise generated by such mechanized vessels is also a matter of serious concern as it interferes with for the dolphin's routine activities including foraging which depends on echo-location. In Bihar, till about 20 years ago almost all boats in Ganga were either sail driven or oar-driven which were dolphin friendly.

R.K.Sinha educating NCC cadets at Patna to create awareness.

Protection Of Gangetic Dolphin In Ancient India : Ashokan Decree

India has been pioneer in conserving wildlife. The world's first recorded conservation measures, especially for wildlife were enacted in India during 3rd Century B.C. One of the greatest emperors, Ashoka – the Great, who reigned from 274 to 232 B.C. stressed the sanctity of animal life. Some of his decrees engraved in stone have survived today in the 5th Pillar Edict.

The Beloved of Gods, the King Priyadarsani (Emperor Ashoka) spoke thus: When I had been consecrated for twenty-six years, forbid the killing of the following species of animals, namely: Parrots, *Mynas,* red-headed ducks, ruddy geese, wild ducks, *nandi-mukhas* , pigeons, bats, ants, tortoises, boneless fish, *vedaveyakas, puputaka* of the Ganges (Gangetic dolphin), skate, porcupines, squirrels, deer, lizards, domesticated animals, rhinoceroses, white pigeons, domestic pigeons, and all quadrupeds which are of no utility and are not eaten. She goats, ewes, and sows which are with young or are giving suck are not to be killed, neither are their young up to the age of six months. Capons must not be made. Chaff which contains living things must not be set on fire. Forests must not be burned in order to kill living things or without any good reason. An animal must not be fed with another animal (Thapar 1997).

Recent Initiatives To Protect The Gangetic Dolphin

The Government of India provided legal protection to the Gangetic River dolphin by including it in Schedule I of the Wildlife (Protection) Act 1972. Killing and poaching of any animal included in the Schedule I of the Act are cognizable offence, and the offender may be fined up to Rs. 2 5000 and or seven year imprisonment.

The IUCN categorized the Ganges dolphin as "Endangered" in 1996 (Smith et al. 2004). The species was included in Appendix I of the CITES (Convention on the International Trade on Endangered Species of Flora and Fauna); and in Appendix II of the CMS (Convention on Migratory Species).

In the face of a lot of skepticism about the feasibility of such a project, the Government of India initiated a research and conservation project on the Ganges River dolphin in the Ganges system in early 1991. The author of this book was the Principal Investigator of the project. On the grand success of the project, the government continued support to the project which ended in 2007.

Based on reports of killings of dolphins published in local dailies, Hon'ble Patna High Court took *suo moto* cognizance of the matter and issued notices to the state and central governments. The proceedings of the Patna High Court (CWJC No. 5628 of 2001) in

Fishing, small size fish prey of Gangetic dolphin in Ganga at Patna

World Bank President Mr. Robert Zoelik and Sri Jairam Ramesh, Union Minister of Environment and Forests, Govt of India with Prof. R. K. Sinha on Ganga cruise at Patna to watch the dolphin

2001 sensitized the government officials for conservation of the dolphin (Sinha 2002).

Honourable Prime Minister declared Ganges River dolphin as the National Aquatic Animal of India on October 5, 2009 and the formal notification was issued on May 10, 2010. Sri Nitish Kumar, Hon'ble Chief Minister of Bihar played a pivotal role in getting the Gangetic dolphin status of the National Aquatic Animal. Thus, India became the first country to adopt the river dolphin as its National Aquatic Animal. A separate Conservation Action Plan (CAP) for the Ganges dolphin was prepared for the Government of India (Sinha et al. 2010). The CAP includes protection and restoration of habitat, community participation, capacity building, periodic status surveys and monitoring, establishing protected areas, education awareness, minimizing incidental catches, rescue and rehabilitation, and research and development programs.

At the initiative of Bihar Government and support of the Planning Commission of India a National Dolphin Research Center is being set up at Patna as an institutional support for the long-term conservation of the dolphin. The State Government of Bihar designated October 5 as "Dolphin Day' and celebrated the first 'Dolphin Day' on October 5, 2012 to help create awareness among the general public besides, annual monitoring of government activities to save the dolphins.

Conservation

Sri Nitish Kumar, Honble Chief Minister, Bihar addressing in a National workshop on Gangetic Dolphin at Patna

WHY CONSERVE GANGETIC DOLPHIN?

The Ganges River dolphin, *Platanista gangetica gangetica*, is one of the world's most endangered mammals and there is an urgent need to establish conservation priorities. The Gangetic dolphins are intrinsically tied to our cultural history. It has been a legendry creature of our country and appeared in several mythological literature, historical texts, viz. Vth Pillar Edict of Ashoka; and illustrated in the miniatures of the *Babar-Nama*. It is our natural aquatic heritage, and at the same time one of the most charismatic megafauna of the Indian sub-continent.It is an endemic fauna of our river systems. Just like tiger in the forests, the Gangetic Dolphin is at the apex of the food-chain in river ecosystem. AsIndia has adopted this animal as National Aquatic Animal. It is our prime duty to save and conserve the Gangetic dolphin. If we save the Gangetic dolphin, we will be saving the rivers.

Awareness compaign during Chhath Festival at Patna.

Translocation of Rescued dolphin by R.K.Sinha

Sri Ranvir Singh, DFO, Araria Forest Division, receiving letter of appreciation from Sri Nitish Kumar, Hon'ble Chief Minster, Bihar

Dr. Gopal Sharma receiving letter of appreciation from Sri Nitish Kumar, Hon'ble Chief Minister, Bihar

HOW TO CONSERVE THE GANGETIC DOLPHIN

Stop dolphin killing: We must ensure that no dolphin is killed either intentionally or accidentally. A complicating factor is that their small size makes the carcasses easy to handle, transport, process and conceal from management authorities. Use of dolphin oil as fish lure is a crime under the provisions of the Wildlife (Protection) Act, 1972.An alternative in the form of oil extracted from fish scrap has been developed and efforts must be made to popularize its use through extension programs.

Rescue and translocation: We need to be watchful especially in smaller rivers in low water season, and if we find any such stranded dolphin, the concerned local authority must be informed immediately so that it can be translocated to a safer habitat.

Protected areas: There is only one protected area for the Gangetic dolphins in India; the Vikramshila Gangetic Dolphin Sanctuary (VGDS). The VGDS extends for length of about 60 km the Ganga between Sultanganj and Kahalgaon. A major challenge in VGDS is to convince the local fishermen and other stakeholders that conservation measures can benefit them and thus deserve their support.

Water development projects: It is not possible to halt water development activities in our rivers; but our goal should be to manage such activities in ways that will minimize the harm to Gangetic dolphins.

Habitat protection: It is important to maintain pollution free environmental flow in our rivers so that the dolphin and other aquatic fauna can survive in the rivers. Besides government initiatives, cooperation of common mass is very important in keeping our rivers pollution free.

Education and awareness: We must create awareness about importance of the Gangetic dolphin among different sections of our society through education using mass media of communication, both, print and electronic

Gopal Sharma interacting with foreign tourists to make them aware about Gangetic dolphin on a river cruise.

R. K. Sinha interacting with fishermen to protect dolphin on a sandbar in Ganga.

media, outreach programs, seminar, symposia, inclusion of the dolphin in the schools and colleges wildlife syllabus. It is very important to closely interact with the fishermen to educate and create awareness among them to save the dolphin.

Education and awareness programme are being organised in villages of fishermen, among school and college students, during various festivals like Chhath, using mass media of communication, both print and electronic, and delivering of lectures in seminar/ workshops/ symposia/ conferences. This needs to be sustained and made more vigorous.

Gangetic dolphin poster

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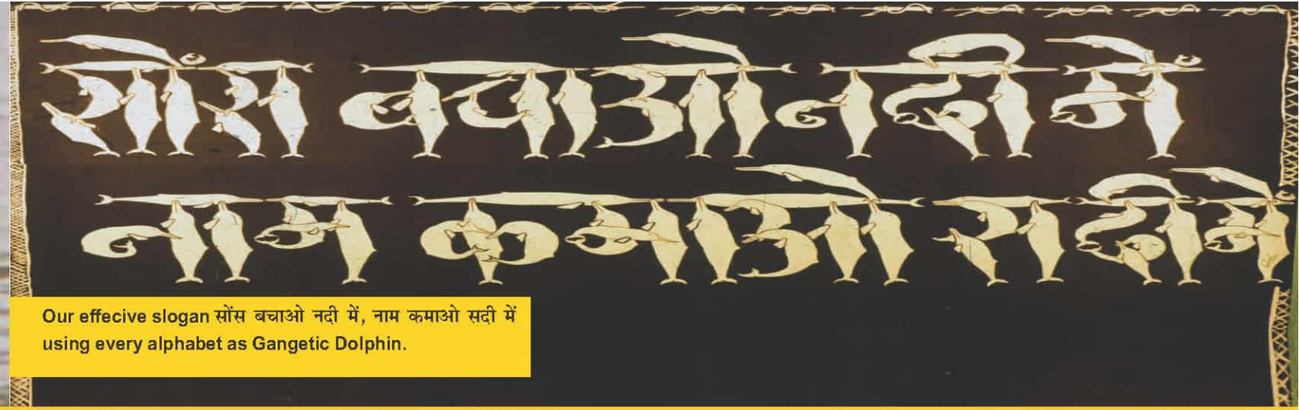

Our effecive slogan सोंस बचाओ नदी में, नाम कमाओ सदी में using every alphabet as Gangetic Dolphin.

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Gopal Sharma recording length of a dolphin carcass

Surfacing Gangetic Dolphin

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