

Platanista gangetica (Roxburgh, 1801)

English: South Asian river dolphin, Ganges river dolphin, susu (*P. g. gangetica*) and Indus river dolphin, bhulan (*P. g. minor*)

German: Ganges-Delphin, Indus-Delphin

Spanish: Delfín del río Ganges, Delfín del río Indus

French: Plataniste du Gange, Plataniste de l'Indus

Family Platanistidae

1. Description

The body of the South Asian river dolphin is subtle and robust, attenuating behind the dorsal fin to a narrow tail stock. The colouration is grey all over and becomes blotchy with age. The snout is long and widens at the tip, resembling a forceps. In females, the snout is generally longer and may curve upwards and to one side. The eyes are extremely small, resembling pinhole openings slightly above the mouth. The dorsal fin is a low triangular hump. The broad flippers have a crenellated margin, with visible hand and arm bones. The flukes are also broad. Males are smaller than females, with 210 and 250 cm, respectively (Smith, 2002). Body mass can reach at least 85 kg (Jefferson et al. 2008).

2. Distribution

<http://www.iucnredlist.org/apps/redlist/details/41758/0/rangemap>

Current main distribution of P. gangetica in the Indus and Chenab Rivers and the Ganges-Brahmaputra river system (Smith and Braulik, 2008; © IUCN)

The Indus and Ganges populations were long regarded as identical until Pilleri and Gihl (1971) divided them into two species, but Kasuya (1972) reduced the two taxa to subspecies of a single species. This is supported by the results of Yang and Zhou (1999), who found that the difference between cytochrome-b sequences of Ganges and Indus river dolphins was very small. According to Rice (1998, and refs. therein) even up until historical times there was probably sporadic faunal exchange between the Indus and Ganges drainages by way of head-stream capture on the low Indo-Gangetic plains, between the Sutlej (Indus) and Yamuna (Ganges) rivers.

Susus and bhulans live exclusively in freshwater. One conservative current view is that there are two disjunct subspecies, but this view is controversial (Jefferson et al. 2008) and further research is needed to establish the true relationship between these two populations:

P. g. minor Owen, 1853: formerly ranged in the Indus River and its tributaries, the Jhelum, Chenab, Ravi, and Sutlej rivers, of Pakistan and India, from tidal limits to the foothills (Rice, 1998). The range is now limited to the mainstream in areas located between barrages (Reeves and Chaudry, 1998). A small population has recently been discovered in a 60 km stretch of the River Beas in Punjab, northern India in 2008 (WWF, 2009)

P. g. gangetica: Formerly distributed throughout the Ganges-Brahmaputra river system of India, Bangladesh, Nepal, and possibly Sikkim and Bhutan, below an elevation of about 250

m. In the Ganges valley it ranges into most of the major affluents, including some of their tributaries: the Son, Yamuna, Sind, Chain-bal, Rainganga, Gumti, Ghaghara, Rapti, Gandak, Baginati, Ghugri, Kosi, Kankai, and Atrai rivers. In the Brahmaputra valley it also ranges into many of the major tributaries: the Tista, Gadadhar, Champamat, Manas, Bhareli, Ranga, Dihang, Dibang, Lohit, Disang, Dikho, and Kapili rivers. Downstream it ranges through most of the larger tributaries between the Hugh and Meghna rivers, as far as the tidal limits at the mouths of the Ganges. Also reported from the Fenny, Karnafuli, and perhaps the Sangu, rivers to the southeast of the mouths of the Ganges (Rice, 1998). Ganges River dolphins live not only in the main channels, but also during the flood season, in seasonal tributaries, and the flooded lowlands (Jefferson et al. 1993). The distribution is said to be restricted only by the lack of water and by rocky barriers (Reyes, 1991).

3. Population size

Indus: A survey conducted in 2001 (Choudhary et al. 2006) covered 1.375 km of the Indus River main channel, 136 km of Indus River secondary channels, and 24 km of the Panjnad River, a tributary of the Indus. The resulting abundance estimate was 965 dolphins. Dolphins occurred in five subpopulations separated by irrigation barrages. The three largest subpopulations were estimated between Chashma and Taunsa Barrages (84 dolphins; 0.28/km), Taunsa and Guddu Barrages (259 dolphins; 0.74/km) and Guddu and Sukkur Barrages (602 dolphins; 3.60/km). Reasons suggested for the high encounter rate between Guddu and Sukkur Barrages include high carrying capacity, low levels of anthropogenic threat, effective conservation, and augmentation of the subpopulation by downstream migration of dolphins from upstream (Choudhary et al. 2006). A few scattered individuals may still occur upstream of the Chasma barrage in the Indus (Smith, 2000 and refs. therein).

In 2008, a small population of 10-15 dolphins has been discovered in India, in a 60 km stretch of the River Beas (WWF, 2009). This lies in the drainage of the Indus, but upstream of a lake formed by Beas Dam, in the Indian state of Himachal Pradesh. The population is separated from conspecifics of the main population occurring downstream in Pakistan by the Beas Dam and further downstream by yet another barrage (Bill Perrin, pers. comm. 2010).

Low numbers may also occur downstream of the Trimmu, Sidhnai, and Pandjnad barrages in the Chenab, Ravi, and Sutlej rivers, respectively (Smith, 2000 and refs. therein).

Extrapolation of encounter rates to unsurveyed channels and application of a correction factor to account for missed dolphins indicates that the metapopulation may number approximately 1,200 individuals (Choudhary et al. 2006). This compares well to the latest survey conducted in Pakistan by WWF–Pakistan and the Ministry of Environment, estimating the minimum population of Indus River dolphins at 1,341 animals (WWF, 2009).

Current estimates are higher than those from 1996: in the Sindh Dolphin Reserve between the Guddu and Sukkur barrages 458 individuals were counted in 1996, between Taunsa and Guddu barrages 143 individuals; between the Chasma and Taunsa barrages 39 individuals (Smith, 2000, and refs. therein). Reeves (1998, in Smith, 2000) interpreted the counts reported in 1996 to indicate a total of approximately 600-700 individuals for the subspecies as a whole, about half the current estimate.

Ganges: A recent survey conducted by WWF-India and its partners in the entire distribution range in the Ganges and Brahmaputra river system – around 6,000 km - identified fewer than 2,000 individuals in India (WWF, 2009). This count compares well with the estimate of

Mohan et al. (1997). In mangrove channels of the Sundarbans Delta in Bangladesh, data analysis using two different models resulted in 196 individuals (CV = 12.7%) and 225 individuals (CV = 12.6%), respectively (Smith et al. 2006). In the past there were fewer than 100 dolphins in Nepal, with the group of about 20 in the Karnali River above Chisapani being the largest single concentration (Jones, 1982; Reeves and Brownell, 1989).

Two detailed accounts have recently been published: In the Brahmaputra River between the Assam–Arunachal Pradesh border to the India– Bangladesh border (856 km) a population assessment conducted in 2005 yielded an estimate of 197 animals. Encounter rate was low with 0.23 dolphins per km (Wakid, 2009). This is less than 50% of a former estimate of 400 between South Salmara and Sadiya (Mohan et al. 1997). In the Vikramshila Gangetic Dolphin Sanctuary, a ca. 60 km long segment of the middle Ganges River in Bihar, India, the mean number of dolphins recorded between 2001 and 2003 during upstream surveys was 119.4 (SD 31.8; range 88-174), with an encounter rate of 1.8 dolphins km² (range 1.4-2.8) (Choudhary et al. 2006).

4. Biology and Behaviour

Habitat: This species is exclusively riverine. Relatively high densities of dolphins are found at sites where rivers join or just downstream of shallow stretches, in areas where the current is relatively weak, off the mouths of irrigation canals, and near villages and ferry routes. In the Indus, about 40–45% of the dolphin population is found at junctions of tributaries with the mainstream, at least during the dry season, presumably being attracted to these areas by concentrations of prey (Reeves and Brownell, 1989, and refs. therein).

In the river basins in India, the Ganges river dolphin is present mostly in plains where the rivers run slowly. This seems to be opposite to the habitat observed in Nepal, where the dolphin can be found in relatively clear waters and rapids. In both areas, however, there is a preference for deep waters (Reyes, 1991, and refs. therein). Primary habitats are characterised by an eddy counter-current system in the main river flow caused by a fine sand/silt point bar formed from sediment deposits of a convergent stream branch or tributary. Marginal habitats are characterised by a smaller eddy counter-current system caused by an upstream meander. Dolphins concentrate in locations of high prey availability and reduced flow (Smith 1993).

South Asian river dolphins have been found in water as cold as 8°C and as warm as 33°C (Reeves and Brownell, 1989 and refs. therein). In the Brahmaputra River, the number of dolphins occurring in different depths was found to be significantly different and the highest number was found in depths of 4.1– 6 m (Wakid, 2009). In the Sundarbans mangrove forest of Bangladesh, Ganges River dolphin distribution was conditionally dependent on low salinity, high turbidity, and moderate depth during both low and high freshwater flow. Animals prefer wide sinuous channels with at least two small confluences or one large confluence (Smith et al. 2009).

Schooling: South Asian river dolphins are not usually considered gregarious. In one of the few quantitative studies of group size, it was found that 90% of the groups and 80.4% of the total dolphins observed during the dry season in the Meghna and Jamuna Rivers of Bangladesh were solitary individuals. However, other investigators reported groups of up to 25 individuals near ferryboats in the Indus River, or as many as 25–30 dolphins in a 1-km stretch of river (Reeves and Brownell, 1989, and refs. therein).

Reproduction: Calving apparently can occur at any time of the year, but there may be peaks in December to January and March to May. Newborn calves have been observed mainly in April and May. Calves are weaned within one year of birth (Jefferson et al. 2008). Gestation lasts 10.5 months (Reidenberg and Laitman, 2009).

Food: South Asian river dolphins feed on several species of fish, invertebrates, and possibly turtles and birds. They do much of their feeding at or near the bottom, echolocating and swimming on one side (Reeves and Brownell, 1989; Jefferson et al. 1993). The long beak is possibly an adaptation for extracting prey from crevasses or buried in soft sediment.

5. Migration

The marked seasonal changes in distribution and density over much of its range are due, at least in large part, to fluctuations in water levels. During the dry season from October to April, many dolphins leave the tributaries of the Ganges-Brahmaputra systems and congregate in the main channels, only to return to the tributaries the following rainy season. They may become isolated in pools and river branches during the dry season (Reeves and Brownell, 1989).

Observations in Nepal show that susus move in and out of tributaries of the Gandaki, Koshi, and Karnali systems during high water seasons, probably spending lower-water seasons in deep pools of the tributaries. In the main rivers, a decrease in abundance during the summer would confirm a seasonal pattern of migration (Shrestha, 1989, in Reyes, 1991).

6. Threats

Direct catch: Oil extracted from blubber of the Ganges River dolphin is used as a fish attractant in India and Bangladesh. This oil fishery is associated with the mortality of hundreds of dolphins every year. Whereas the hunting of river dolphins is now banned in Pakistan, poaching presumably still occurs occasionally (IWC, 2000). Although deliberate killing is believed to have declined in most areas, it presumably still occurs in the middle Ganges near Patna, India, in the Kaini-Kushiyara River of Bangladesh, and in the upper reaches of the Brahmaputra River in Assam, India (Mohan et al. 1997). In Assam, they are also killed for their meat (IWC, 2000). Fish oil was repeatedly suggested as a substitute for susu oil (Mohan and Kunhi, 1996; Bairagi, 1999) and shown to have a better attractant effect on target species (Sinha, 2002).

Incidental catch:

Indus: Incidents of accidental killing and observations of dolphin carcasses and products are documented in Reeves et al. (1991) and Reeves and Chaudhry (1998). Little detailed information is available, but the level of take is not thought to be high, even though the Indus river dolphin is vulnerable to gillnets. Permanent losses from the population also occur when animals swim into irrigation channels. Since 1992 there have been reports of one or two dolphins becoming trapped in these channels annually, but then were recorded in the winter of 1999/2000 (IWC, 2000).

Ganges: Accidental killing is a severe problem for Ganges River dolphins throughout most of their range. The primary cause is believed to be entanglement in fishing gear, most often nylon gillnets. Ganges River dolphins may be particularly vulnerable to entanglement in gillnets because their preferred habitat is often in the same location as primary fishing

grounds. No rigorous estimates of dolphin mortality have been published but the problem of accidental killing is expected to worsen as the demand for fish and for fishing employment increases (IWC, 2000 and refs. therein; Mansur et al. 2008). Dolphins may also become entangled in long-line fishing gear very similar to the rolling hooks used in the Yangtze River that have been cited as among the primary factors contributing to the probable extinction of the baiji (*Lipotes vexillifer*) (Mansur et al. 2008).

Gill net encounter rate in the Ganges River is significantly different in different stretches of the river with maximum encounter rate recorded from Goalpara to Dhubri. Accidental killing through gill net and poaching of dolphin for oil are the most dangerous threats to the survival of these dolphins. Close monitoring of dolphins and their habitats involving local communities are required for long term conservation of the species in the Brahmaputra River (Choudhary et al. 2006).

Deliberate killing: It has been suggested that some fishermen see Ganges river dolphins as rivals that scare away the fish or tear the fish from the nets. For this reason, the fishermen would scare the dolphins into the nets to kill them. This, however, is unlikely because the high cost in repairing the nets would not be compensated by selling the entire dolphin or its products (Reyes, 1991 and refs. therein).

Pollution:

Indus: Pollution may be affecting the viability of the species, especially considering the decline in the flushing effect of moving water above barrages. Mercury and arsenic concentrations sampled from fish above the Guddu Barrage were high. Massive fish kills have apparently become common from industrial pollution in urban areas and the use of pesticides in the irrigated crops grown along the riverbank (IWC, 2000 and refs. therein).

Ganges: Pollution by fertilisers, pesticides, and industrial and domestic effluents is dramatic in the Ganges River: about 1.15 million metric tons of chemical fertilisers and about 2,600 tons of pesticides were dumped annually to the river system. Industrial effluents are also a source of increasing pollution in Nepal. 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 analysed 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. Discharge of untreated domestic sewage was one of the major sources. 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 (IWC, 2000).

Habitat degradation:

Indus: According to the Scientific Committee of the IWC (2000) the dramatic decline in the range of the species, from the historical distribution of approximately 3,500km of river length to a range of less than 700km of river length (Reeves et al. 1991) occurred presumably after the mainstem and major tributaries were segmented by three main barrages completed at Sukkur in 1932, at Kotri in 1955, and at Guddu in 1969. The greatly reduced volume of water, particularly downstream of Sukkur Barrage, caused the dolphins' dry-season range to shrink. Subpopulations on either side of barrages are now isolated and thus are more vulnerable to extirpation by hunting or environmental change (Reeves and Brownell, 1989). Due to water abstraction, the Indus river becomes virtually dry in several places in the low-water season, especially downstream of the Sukkur Barrage, thereby eliminating suitable habitat in the lower reaches. The greatest threat to the survival of the Indus bhulan is probably the continuing decline in water supply due to the construction of new diversion structures (e.g. Ghazi-Gariala (Barotha) Dam in the upper Indus) and from increasing extraction from aquifers. Increasing human populations and both industrial and agricultural development in the area immediately surrounding this dolphin's range will inevitably lead to even greater habitat loss or damage (IWC, 2000).

Ganges:

For Nepal, Smith et al. (1996) and Sinha et al (2000) warn that in the Karnali and Narayani river basins aquatic species are threatened with local extinction from the effects of habitat degradation, segregation of breeding groups by downstream barrages, incidental catches during fishing operations and declines in prey fish populations. There has been a dramatic decline in the extent of occurrence of Ganges susus, as well as in the quality of their habitat, especially in the Ganges river basin (IWC, 2000). This decline has been related to the construction, since the late 1950's, of an extensive network of barrages. The species is severely fragmented and additional barrages continue to be built (e.g. Kanpur barrage on the Ganges mainstem). Construction of dams for hydroelectric development and irrigation in the Ganges system has divided dolphin populations into small isolated subpopulations, preventing migrations and reducing food availability. The population above the Kaptai dam in the Karnaphuli River disappeared over a period of 6 or 7 years after the completion of the dam. The diversion of water for irrigation caused high fluctuations in the water flow, reducing suitable habitats for the dolphins.

Similar effects are expected with dolphin populations in the Karnali River in Nepal, in addition to erosion of banks and changes in river beds, as a result of deforestation and mining. Heavy river traffic is increasing drastically in both India and Nepal, and this may result in habitat restriction and changes in feeding behaviour (Reyes, 1991 and refs. therein). The population of the Padma River system was said to be "fast declining" due to the construction of the Farakka Barrage (Reeves and Brownell, 1989). Mohan et al. (1998) observed a land-locked susu population in the Kulsri river, a southern tributary of the Brahmaputra. Its number has come down from 24 animals in 1992 to 12 in 1995. Large scale sand extraction and operation of fishing gear hazardous to the dolphins were the main causes for the decline.

In addition to fragmenting dolphin populations, dams and barrages degrade downstream habitat and create reservoirs with high sedimentation and altered assemblages of fish and invertebrate species (IWC,2000). Luxuriant growth of macrophytes and excessive siltation have eliminated suitable habitat immediately above the Farakka-Barrage. The insufficiency of water release downstream of the barrage has eliminated dry-season habitat for more than 300 km, or until the Ganges (Padma)-Brahmaputra confluence (Smith et al.,1998) and resulted in salt water intruding an additional 160 km into the Sundarbans Delta, further decreasing the

amount of suitable habitat for this obligate freshwater species. Consequently, in Bangladesh Susu's are also threatened from the effects of dams, large embankment schemes, dredging, fisheries bycatch, directed hunting, and water pollution (Smith et al. 1998).

Other sources of habitat degradation include dredging (Smith et al. 1998) and the removal of stones, sand (Mohan et al. 1998), and woody debris (Smith, 1993). These activities threaten the ecological integrity of the riverine environments, especially in small tributaries where suitable habitat is more confined and therefore more vulnerable to local sources of degradation. Suitable habitat is also threatened by water abstraction from surface pumps and tube wells, especially in the Ganges where the mean dry-season water depth has been dramatically reduced in recent years. The long-term implications of the reduction of dry-season flows in the Ganges are catastrophic for the survival of susus. New projects that divert dry-season flow, such as the Kanpur barrage in the upper Ganges, continue to be constructed (IWC, 2000, and refs. therein).

7. Remarks

Range states (Smith and Braulik, 2008):
Bangladesh; India; Nepal; Pakistan

P. gangetica is listed in Appendix I of CITES and the subspecies *P. gangetica gangetica* is listed in Appendix II of CMS. The IUCN considers the species as “Endangered” (Smith and Braulik, 2008). This is based on the diversity of ongoing threats, the fragmentation of the populations, the small size of the populations and the ongoing decrease in numbers.

A small subpopulation of the subspecies *P. g. minor* was recently also found in India, but exchange with the main populations in Pakistan is hampered by a series of dams and barrages. The conservation of this isolated population in India should be a matter of priority.

The World Wide Fund for Nature (WWF) considers *P. gangetica* as one of the most endangered small cetaceans world wide (WWF, 2009).

8. Sources

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