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# Indus River Dolphin (*Platanista gangetica minor*) - an update on the current population assessment and conservation challenges

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## Abstract

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This update summarizes the status and key challenges which the Indus River dolphin is facing in its current distribution range in the Indus River, Pakistan. The Indus dolphin is a global priority species of freshwater cetacean, endemic to the Indus River in Pakistan. Its habitat has been reduced to one fifth of its historical range, primarily due to shortage of water and construction of barrages across the Indus River which have led to habitat fragmentation and degradation. Indus River dolphins become stranded in irrigation canals particularly during the low-flow season. During canal closure the canal gates are closed which leads to reduced water levels, creating small pools in which dolphins are trapped. Without rescue they generally die. An increase in intensification of fishing has caused a large increase in fishing induced mortalities of dolphins in the last five years. WWF-Pakistan has been associated with the conservation of this species since 1999. Surveys to estimate abundance suggest that the population may well be increasing, with approximately 1,200 individuals estimated in 2001 rising to 1550-1750 in 2006 and 1,452 in 2011. A fourth comprehensive population assessment which was conducted during March-April 2017 and the preliminary population estimate is between 1800-1900 individuals. Research and conservation priorities need to strengthen efforts to rescue dolphins from canals, continued population monitoring, an assessment of fisheries mortalities to reduce fishing related mortalities, together with community based in-situ conservation.

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## Introduction

The Indus River dolphin (*Platanista gangetica minor*) or blind dolphin is an obligate freshwater cetacean, endemic to the Indus River in Pakistan (Braulik *et al.* 2015a). The Indus River dolphin is classified as Endangered on the IUCN Red List of threatened species due to an 80% decline in its distribution range and a habitat severely fragmented by dams and depleted by water diversions (Braulik *et al.* 2015a). It is the second most endangered obligate freshwater dolphin species in the world, the first being the ‘functionally extinct’ Yangtze River dolphin. It is also listed in the Appendix I of CITES and legally protected under all wildlife protection legislations of Pakistan.

The blind dolphin belongs to one of the most ancient families of cetaceans diverged about 29 million years ago which is about 22 million years before modern dolphins arose (Xiong *et al.* 2009). It has reduced eyes and poor vision. Indus dolphins are generally seen alone or in small groups of two to three individuals. They are occasionally seen in larger aggregations of about 20-30 individuals (Braulik *et al.* 2015b).

Indus dolphins persist in five subpopulations on the Indus mainstem, each separated by irrigation barrages. A small isolated population of 18-35 individuals of the Indus River dolphin also exists in Bear River, India (Khan 2016). The entire species is estimated to number approximately 1452 individuals (Noureen 2015). The largest concentration of Indus River dolphins (estimated as 701 (CV = 9.63%)) individuals in 2011) is

found in a 200 Km stretch of river between Guddu (N 28 25.276 E 69 42.432) and Sukkur (N 27 41.033 E 68 51.271) barrages; in the lower reaches of the Indus Basin (Figure 1). Sindh Wildlife Department declared a 200 km long stretch of the river, between Guddu and Sukkur barrage as the ‘Indus Dolphin Reserve’ in 1974. The Indus Dolphin Reserve was also designated as a Ramsar Site in May 2001 due to presence of a wide spectrum of threatened wetlands associated biodiversity, including the Indus River dolphin, hog deer, Indian smooth-coated otter, freshwater turtles (e.g. Indian Narrow-headed Softshell Turtle, Indian flap-shell Turtle) and a number of species of fish, amphibians, freshwater crustaceans and aquatic macro-invertebrates. It also serves as wintering ground for a number of migratory birds.

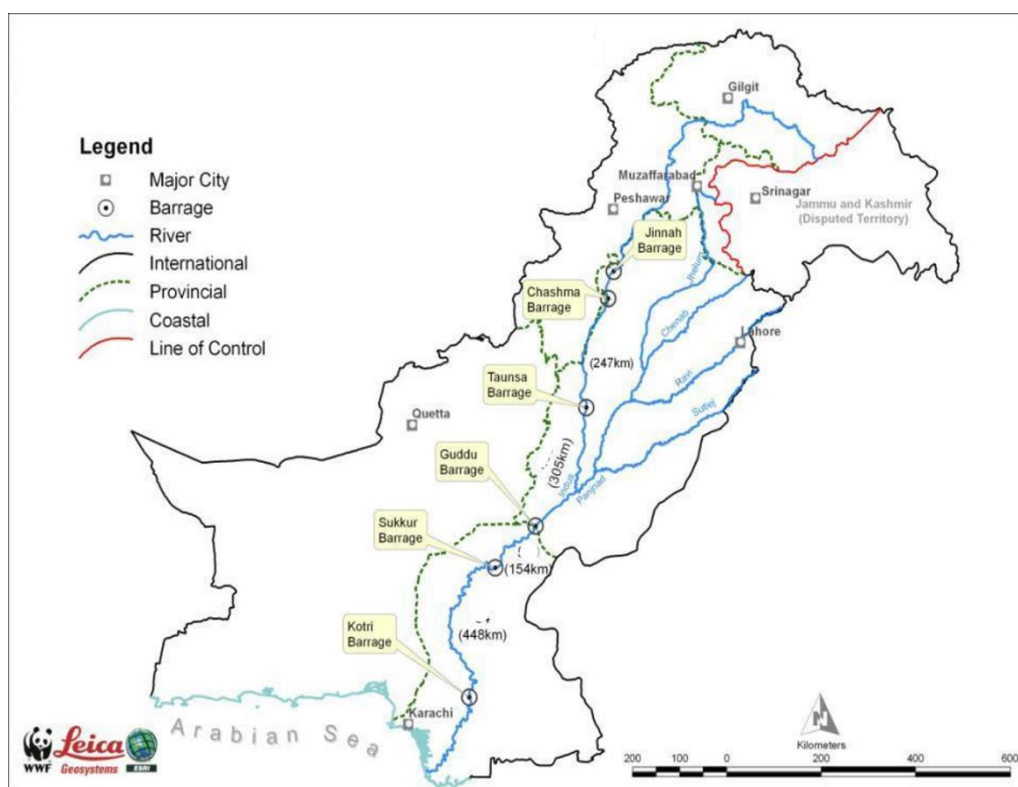


Figure 1. Current population distribution range of the Indus River dolphin covering a 100 Km long stretch of the Indus River from Jinnah to Kotri Barrages

Table 1. Summarised description of estimates of abundance of the Indus River dolphin subpopulation and metapopulation with associated survey techniques methods during the last 12 years (adopted from Braulik et al. 2015)

Year	Method	Jinnah-Chashma	Chashma-Taunsa	Taunsa-Guddu	Guddu-Sukkur	Sukkur-Kotri	Total	Meta-population estimation	Reference
2001	DC	2	84	259	602	18	965		(Braulik, 2006)
					–775 <sup>a</sup>		–1140 <sup>a</sup>	1200	(Braulik et al. 2012)
	DC	1	82	44 <sup>b</sup>	1279	4 <sup>b</sup>	1410		(Braulik et al. 2012)

2006	MR-TV	-	101 (CV = 44.1%)	52 <sup>b</sup> (CV = 14.9%)	1289 (CV = 33.4%)	-	1447 (CV = 57.2%)	1550-1750	(Braulik <i>et al.</i> 2012)
2011 <sup>c</sup>	DC	-	87	465 <sup>c</sup>	570 <sup>d</sup>	34 <sup>c</sup>	1312	-	(Noureen 2013)
	MR-TV	-	96 (CV = 19.02%)	-	726 <sup>e</sup> 701 (CV = 9.63%) 857 <sup>e</sup>	-	797 (CV = 21.3%)	1452	(Noureen 2013)

DC=Direct Count; MR-TV=Mark-recapture on data from tandem vessels; a=count was revised upwards to account for animals in 33.3 km that was not surveyed; b=entire section was not surveyed due to security concerns; c= Sukkur-Kotri was surveyed in 2010, and Taunsa-Guddu in 2012. These two counts were added to the rest of the 2011 survey data so that the 2011 meta population abundance estimate is combination of the three d =33.8 km of the Indus downstream of Guddu Barrage and a 31.8 km side channel were not surveyed; e = dolphin count includes sighting rates extrapolated from adjacent river sections to account for unsurveyed sections (Braulik *et al.* 2015b).

## 2. Key threats to survival of Indus River dolphin

### 2.1 Stranding in canals

The barrages across the Indus River hold the running water and divert it into an extensive network of irrigation canals emerging from each barrage to fulfil the need of water for agriculture. Indus dolphins tend to move to the irrigation canals through the flow regulator gates adjusted to the barrages throughout the year. When closed for canal maintenance, dolphins are stranded due to the sudden water shortage in the canals (Khan *et al.* 2010 Braulik *et al.* 2014b).

A dolphin rescue program has been in place since 1992 jointly led by WWF-Pakistan and Sindh Wildlife Department to rescue any stranded dolphin from canals and safely release them back into the main river channel. Out of total 147 dolphins reported trapped in canals, between 1992 to 2017, 130 have been rescued successfully and released back to the river while 1 died during rescue. Thirty-three dolphins died because they could not be rescued. There is however little information about the post release survival rate of the rescued individuals (Braulik *et al.* 2015b).

Additionally, WWF-Pakistan and Sindh Wildlife Department have established a dolphin monitoring network in collaboration with relevant stakeholders and local communities to monitor the Indus River as well as its adjacent canals and tributaries to rescue any stranded dolphins. The monitoring teams of this network have conducted over 100 monitoring surveys since 2015 to stop illegal fishing and to rescue stranded dolphins with 12 successful rescues during 2016. Additionally, a 24-hour phone helpline has been initiated to report any incidence of a stranded River dolphin; so far 71 calls have been received reporting sightings of dolphins in irrigation canals and the main River channel leading to one successful rescue of a stranded dolphin during 2016.

### 2.2 Fishing net entanglement

Fishing gear induced mortalities as an outcome to the accidental entanglement in fishing gears is one of the key threats to most of the cetaceans (Reeves, Wang & Leatherwood 1997). Intensive fishing in the core habitat of Indus dolphin is one of the key threats, which increases probability of dolphin entanglement into fishing nets and hence their mortalities particularly when they move to the irrigation canals. These shallow canals with narrow dimensions are considered a priority for fishing. Severity of fishing induced mortalities has been a major concern between Guddu and Sukkur Barrages in the Indus River, the area which hosts the highest population and concentration of this species (Braulik *et al.* 2015bKhan, 1947). Fishing intensity is higher towards the side channels in comparison to the main channel being warm and having higher fish densities (Braulik *et al.* 2015b). Historically the fishing system in this region was through a fish contract system through which the government auctioned rights. The fishing rights were purchased by powerful fisher contracts which allowed local fishers to fish on the strict condition that they surrendered about 75% of their catches to the contractor. The contract system was replaced by a fishing licensing scheme in 2007 through which every local/indigenous fisher could buy a fishing license (Braulik *et al.* 2015aBraulik *et al.* 2015b). This system however has also increased the number of unskilled fishers in the River which contributed to increase dolphin mortalities (Braulik *et al.* 2015bWaqas, Malik & Khokhar 2012).

A significant increase in illegal fishing practices was observed between Guddu and Sukkur barrages after the massive and destructive flood in 2010; in addition, the altered fishing system in the Sindh province considerably increased the number of fishing licenses approved and amplified the impact of harmful fishing practices on the Indus River dolphin. The mortality rate of the Indus River dolphin reached the highest in 2011; a total of 45 dolphins were reported dead, most of which were discovered when fishing was at its maximum (Waqas, Malik & Khokhar 2012). Although there has been a substantial decrease in the incidences of dolphin mortalities since that time, these incidences have not been controlled completely. Less frequent incidences of dolphin mortalities as an outcome to the entanglements in the fishing gears also report from the Indus River section between Taunsa and Guudu barrage which hosts the second largest population (Noureen 2013). Absence of community awareness on dolphins in that river section, has contributed to accelerate incidences of dolphin mortalities in the recent past. For example three dolphins including a calf were killed and buried by the fishers presumably after the get entangled in the fishing net at Ghazi Ghat near Taunsa Barrage during January 2016.

### **2.3 Hunting**

Indigenous communities such as *Kehal* people residing along the Indus River in Sindh and Punjab provinces were known to be involved in hunting and killing of dolphins in the past for meat and to extract oil for medicinal use and lightening purpose (Anderson 1879,Braulik *et al.* 2015,Braulik 2006Braulik *et al.*

2015b). Legal protection of dolphins under all wildlife protection legislations as well as establishment of Indus dolphin Game Reserve in Sindh in the 1970s, a legally protected area between Guddu and Sukkur barrages has contributed to halt dolphin hunting (Bhatti and Pilleri, 1982 in (Braulik 2006)). There is no evidence that hunting of dolphins continues after the introduction of legal protection of the species.

## **2.4 Habitat fragmentation and degradation**

Habitat fragmentation and degradation are amongst the prime threats which Indus River dolphin faces due to network of irrigation barrages constructed on the Indus River and extraction of water (Braulik *et al.* 2015a). Over the decades, the range of the Indus dolphin has been reduced to one fifth of its historical range, primarily due to shortage of water due to water extraction at barrages. The water shortage has arisen mainly as a result of agricultural demands and extensive irrigation system in Pakistan. In addition, due to the construction of numerous dams and barrages across the Indus River, the Indus dolphin population has been fragmented into sub-populations. Furthermore, this has also contributed to extirpation of sub-populations from the upstream reaches of the River (Braulik *et al.* 2014a).

Braulik *et al.* 2012 conducted an extensive study to understand the underlying causes of the range decline of the Indus River dolphin. Amongst the seven potential factors which contributed to the range decline and extirpation of sub-populations in the upper reaches of the Indus River, low discharge of the river during the dry season was the main contributor to its range decline. In addition to this, rapid industrialization has significantly contributed to increased surface water pollution in the country, as over 90% of the industrial and domestic effluents make their way to the river untreated. The situation with the Indus tributaries which pass through the major industrial lands is most severe and they carry even higher loads of pollutants than the main Indus River itself (Braulik *et al.* 2014a). Lack of periodic and proper mechanisms of the water quality assessment of the river further intensifies the problem to identify those sections of the river which carry higher loads of waste. Traces of commonly used pesticides such as DDT, Cypermethrin, Deltamethrin and Endosulfan, have been found in the tissue of dolphins which died in Sukkur in 2011 (WWF-Pakistan 2011).

## **3. Current population assessment of the Indus River dolphin 2017: - an update**

Estimating population of Indus River dolphin at an interval of five years is of great importance to evaluate the effectiveness of conservation management initiatives. A dolphin population assessment following the same methodology has been carried out every 5 years since 2001. This has been the key indicator to determine the population trend of this species and health of its habitat in order to adapt our species management initiatives accordingly. WWF-Pakistan so far conducted three comprehensive surveys in 2001, 2006 and in 2011 (Braulik *et al.* 2012 Braulik 2006) Noureen 2013). The comprehensive survey covering

the distribution range of Indus River dolphin also provides a unique opportunity for the provincial wildlife departments to learn standard techniques for dolphin population estimation, using methods applied by Dr. Gill Braulik. The fourth comprehensive survey was conducted from 20<sup>th</sup> March 2017 till 13<sup>th</sup> April 2017 covering the three sections of the river with the largest number of dolphins (Chashma to Sukkur barrages) as part of the Project funded by the International Whaling Commission (IWC). Additional funding was also obtained from the Marine Conservation Action Fund (MCAF) to cover additional surveying costs, and also allowed for Dr. Gill Braulik to physically visit Pakistan and provide invaluable training on dolphin survey methods for the team prior to the survey, field-based training at the start of the survey, etc.

The survey was planned for the peak low water season when dolphins are most concentrated and easiest to count. Data was recorded by three forward facing and one rear facing observer watching from viewing platforms in two oar-powered boats that travelled downstream in tandem. The tandem vessels were separated by 1.5 km. The 'detection location' of each group was recorded and the 'exact location' when the boat reached the exact point of the group was also recorded. Animals of less of 1 m length were recorded as calves. Survey effort was recorded, along with wind state. Group size was recorded with a best, high and low estimate of numbers. Direct counts were calculated for the sum of best estimates of group size for each boat. In the future abundance will be estimated by comparing the location of sightings from the duplicate survey data from the tandem vessels. All sighted dolphin groups will be considered to be 'captured' and they will then be classified as duplicates or 'matches' if they were seen by both survey vessels, or unique if they were 'missed' by one boat. Sightings will be classified as matches based on the distance between their 'exact' geographic positions combined with any group movement direction noted in the field. Using GIS and recent satellite images the distance between dolphin groups will be measured along the centre of the river channel, and a frequency distribution of the distance between the exact geographic positions of potentially matched dolphin groups generated (Braulik *et al.* 2012 Braulik 2006).

Prior to conducting the survey, a hands-on training course on dolphin survey techniques was organised for the representatives of wildlife departments and other team members participating in survey. The training was led by Dr. Gill Braulik. Methods and data recording sheets with practical session were conducted. Dr. Braulik also trained the team during the survey for five days.

The survey incorporated a study on potential threats to dolphins observed including fishing boats, ferry crossings, deployed fishing gear, pollutant discharges, bank-side towns etc. These data will be processed to look at the level of threat present in each river section and how these are correlated with dolphin distribution. The survey results are being analysed but the direct counts suggest an increase in the population of the species with approximately 1800-1900 individuals in the surveyed section of the River. Direct counts of the three subpopulations surveyed were between Chashma and Taunsa Barrages (170-180 dolphins),

Taunsa and Guddu Barrages (571-600) and Guddu and Sukkur Barrages (1075-1150). These are the preliminary results and should be carefully interpreted as the final results after analysis are likely to change slightly.

#### **4. Conservation recommendations and suggestions**

##### **4.1 Strengthen dolphin rescue and monitoring work**

Rescuing stranded dolphins from the irrigation canals is essential to conserving this dolphin population during the low flow period particularly in the Indus Dolphin Game reserve between Guddu and Sukkur Barrages. Rescuing stranded dolphins needs standard protocols to be followed and equipment including a sound proof vehicle. Capacity building of the officials of wildlife departments and provision of proper equipment in safe handling and translocation of rescued dolphins to the main river channel requires continued support. Monitoring the movement of dolphins in canals in low-flow and flood seasons is also important for timely reporting of the stranded dolphins.

Data on the proximal causes of Indus dolphin mortalities throughout its existing distribution range in Pakistan are scarce, yet critical to demonstrate a link between gradual extirpation of the sub-populations of this species (Braulik *et al.* 2015b). Strengthening and scaling-up the dolphin monitoring network to the entire distribution range of the dolphin would help to collect systematic data of mortalities and associated factors with the involvement of relevant authorities. Establishment of a national stranding network to report to such incidences could an important step (Braulik *et al.* 2015b). Engagement of local communities guards in the areas covering major subpopulations of the Indus River to monitor canals for stranded dolphins, collect information regarding stranding or mortality from communities, record fishing gear used by communities along the river stretch could also experiment.

##### **4.2 Experimenting with technologies to acoustics deterrents as a mean to prevent dolphins entering irrigation canals**

Stranding in canals is a persistent problem and losses of dolphins are inevitable because some animals swim into irrigation canals where they cannot be rescued because of security concerns and absence of staff. It is important to experiment with various options that can help to control the number of dolphins entering irrigation canals. Deployment of various exclusion devices, such as pingers, at the gates of the irrigation canals to test different frequencies that can help to reduce the number of stranding by comparing with the data of stranding in the past could be made one of the future research priority.

##### **4.3 Revising in the provincial Fisheries Legislation to enhance protection coverage for dolphins**



Freshwater fishing is one of the major sources of livelihood for riverine communities. Increase in the incidences of illicit fishing activities are directly proportional to the fishing gear induced mortalities in dolphins, hence revision in the existing provincial fisheries legislations to control illegal fishing is critical (Braulik *et al.* 2015b)(Noureen 2013). The fisheries legislation in Sindh Province was amended in 2007 to ensure equal benefits of fishing to all local communities dependent on fisheries for their subsistence. According to the revised legislation, the contract system was replaced by the licensing to individual fishermen. This step was appreciated by local people as they were allowed to fish by paying a small amount, Pak Rupees 150 only (1.5 USD), for a license. However, from an environmental point of view, this has resulted in increased incidents of illegal fishing practices, such as pesticide poisoning and overnight netting across the river. These illegal fishing practices have direct impacts on the survival of Indus River dolphin population in Sindh Province. While the Punjab Fisheries legislation has not been revised. These legislation need revision to protect fish population, improve clauses of permissible gear, enhance penalties, etc. Enhanced community participation in dolphin monitoring and rescue programmes through capacity building and awareness raising could be a value addition to further strengthen in-situ conservation initiatives.

#### **4.4 Translocations of dolphins from the high density areas to low density areas**

It is evident that the dolphin populations are slowly extirpated mainly from the upstream regions of the Indus River (Braulik *et al.* 2014a). There has been a lot discussed in Pakistan on the possibility of translocating Indus River dolphins from the high density areas, to a subpopulation with low abundance. This is considered important to encourage genetic heterogeneity in these small populations, reduce the risk of their loss as a result of unforeseen catastrophes, increasing the speed of population recovery, population settlement time, etc. This however would not be an easy task as there are a number of factors that need to be taken care of beforehand. For instance, population holding capacity of proposed translocation sites, assessment of water quality, socio-economic dynamics to assess level of anthropogenic pressures, availability of sufficient prey, habitat structure, and other associated factors,. Transferring and capturing of dolphins from the wild is another critical and risky aspect as dolphins are very sensitive to such stresses with a high probability of mortality during capture and translocation if cautions are not taken into accounts. It would be useful to conduct an exploratory study in the future which could determine all the aforementioned factors after which we shall be ascertain that if it would be a useful solution to translocate dolphins to the less populated areas (Braulik 2012) (Braulik *et al.* 2015b).

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