FINAL REPORT

Title:

Abundance survey for Indus river dolphin

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Abstract

The Indus river dolphin is a global priority freshwater cetacean, endemic to the Indus River system. The habitat of the subspecies has been reduced to one fifth of its historical range, primarily due to water infrastructure development, which caused shortage of water due to diversion for irrigation and also caused habitat fragmentation and degradation. The Indus river dolphin faces a number of additional challenges such as losses caused by entanglements in fishing nets and strandings in irrigation canals. Present study was conducted to determine population status of the Indus river dolphin in March-April 2017 and 2018 covering four subpopulations of the species between Jinnah-Sukkur barrages following boat counts using mark and recapture techniques. The results show an increase in the abundance in the lower reaches of the Indus River, with the current estimates of 1987, comprised of the three subpopulations extending between Chashma-Sukkur barrages. Whereas the northern most subpopulation between Jinnah-Chashma has been extirpated, as no dolphin was recorded during the survey. The population abundance surveys suggest that the population is increasing, with approximately 1,200 individuals estimated in 2001, 1550-1750 in 2006 and 1,452 in 2011. Research and conservation priorities need to strengthen efforts to rescue dolphins from canals, continued population monitoring, an assessment of fisheries caused mortalities and reduce such losses, while improving protected area management and promoting sustainable fishing practices with alternate livelihoods for local communities.

Introduction:

The endangered Indus River dolphin (*Platanista gangetica minor*) or blind dolphin is an obligate freshwater cetacean, it is endemic to the Indus River system (Braulik, 2006a) . Locally known as *Bhulan,* the species does not have any know predators, expect for humans which have brought disastrous impacts on the subspecies and its habitat (Pilleri, 1980).

The Indus dolphin persists in five subpopulations in the Indus River's mainstem, each separated by irrigation barrages. A small isolated population of 6-7 individuals of the Indus River dolphin also exists in the Beas River, India. The entire Indus subspecies is estimated to number approximately 1,452 individuals according to a comprehensive population assessment conducted in 2011 (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 the river between Guddu and Sukkur barrages; in the lower reaches of the Indus Basin, a legally protected areas the Indus Dolphin Game Reserve. This river stretch is also a Ramsar wetland, which also raises its profile internationally.

Indus dolphin faces a host of threats, 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. Like all other dolphin species, intensive and mostly unregulated fishing practice in the

core dolphin habitats especially those that host the highest dolphin abundances (between Taunsa and Sukkur Barrages in the Indus River) is a persistent conservation challenge as animals occasionally die in fishing gear (Braulik et al., 2015; Reeves et al., 1997). An increase in intensification of fishing has caused a large increase in fishing induced mortalities of dolphins in the last five years.

Indus river dolphin population assessment is a critical component of the conservation efforts of this endemic species and provides an opportunity to determine the population status, areas which hosts the highest population concentration for future conservation planning. Data collected through these surveys also provide basis to determine population trends of this species and select the priority region to initiate conservation actions and investigation of the intensification of the associated anthropogenic pressures on this species.

Main objectives:

The research was aimed to assess population of the endemic and endangered Indus river dolphin (*Plantanista gangetica minor*) which will guide future conservation measures. Following were the key objectives of the research;

- Assess the current status of the Indus River dolphin in Pakistan
- Build capacity of local wildlife experts and relevant stakeholders on the dolphin census techniques and data analysis

Methods

Study area.

The study area was 822 Km of river, covering the majority of the current distribution range of the Indus River dolphin, starting from the upper reaches of the Indus River and covering the four largest dolphin sub-populations: Jinnah-Chashma, Chashma-Taunsa, Taunsa-Guddu and Guddu-Sukkur Barrages.

Survey Training

A day long hand-on training covering key aspects of dolphin survey techniques was organised for a 22-member core survey team including team of WWF-Pakistan, representatives of wildlife departments, Zoological Survey of Pakistan and researcher involved in the survey. Dr Gill Braulik led the session which covered survey and data recording methods followed by a practical session. One mock survey exercise was also arranged in the field prior to the initiation of the survey to minimise the observer bias.

Field surveys

Surveys were conducted in the peak low water season (March-April) when dolphins are most concentrated and easiest to count matching with the timing used during the previous assessments (Braulik et al., 2012a; Braulik, 2006a). The survey methods use was based on those described by Smith and Reeves (2000) and adapted by Braulik (2006) and Braulik et al (2012) for previous Indus dolphin abundance estimation studies. (Braulik et al., 2012a; Braulik, 2006a)

Direct counts were calculated for each river section based on the sum of best estimates of group size for each boat. Abundance was estimated by comparing the location of sightings from the duplicate

survey data from the tandem vessels following Braulik et al 2012. (Braulik et al., 2012a; Braulik, 2006a). Abundance for each of the sub-populations was estimated separately using mark-recapture methods for closed population in a Huggins Conditional-likelihood model (Huggins 1998). We used program MARK to conduct this analysis following Braulik et al. 2012 (Braulik et al., 2012a; Braulik, 2006a).

Results

The current study was undertaken with the support of IWC and the Marine Conservation Action Fund. The core area of the species distribution from Chashma to Sukkur barrages was covered with the support of the IWC funding, MCAF provided support for the involvement of Dr Gill Braulik to conduct training for the survey team and help in data analysis. MCAF grant also helped in covering the Jinnah – Chashma river dolphin where two dolphins had been reported in 2001 and one in 2006.

The results included data collected from the four subpopulations of dolphins: Jinnah-Chashma, Chashma-Taunsa, Taunsa-Guddu and Guddu-Sukkur. No dolphin was sighted in the river section between Jinnah-Chashma barrages, therefore the study carries abundance estimates for three river sub-sections i.e. Chashma-Taunsa, Taunsa-Guddu and Guddu-Sukkur .

A total of 1,816 dolphins were sighted during the assessment present in three sub-populations. This is based on the sum of the estimated best (B) group size estimation of the forwards moving vessel following Braulik 2006. The total low estimates and high estimated counts of dolphins were 1758 and 2030, respectively. A summary of the survey results for each of the surveyed sub-population of the Indus River Dolphin is included in Table 1. The dolphin encounter rate (dolphins/linear km of river) increased dramatically as the survey proceeded downstream with the highest encounter rates between Guddu and Sukkur barrages (Aishaa et al., 2017).

Table 1: Summary results of the Indus River dolphin population assessment

River section	Abundance (counts)	Distance surveyed (km)	Dolphins/ km	Mean group size	% of population
Chashma-Taunsa	170	293.1	0.58	2.8	9
Taunsa-Guddu	571	353.3	1.62	3.0	32
Guddu-Sukkur	1075	161.6	6.65	7.1	59
Total	1816	808	-	-	100

Total abundance estimates of the three sub-populations of the Indus river dolphin was 1987 based on the mark-recapture based analysis which indicates a substantial increase in the population since 2001 (Figure 1).

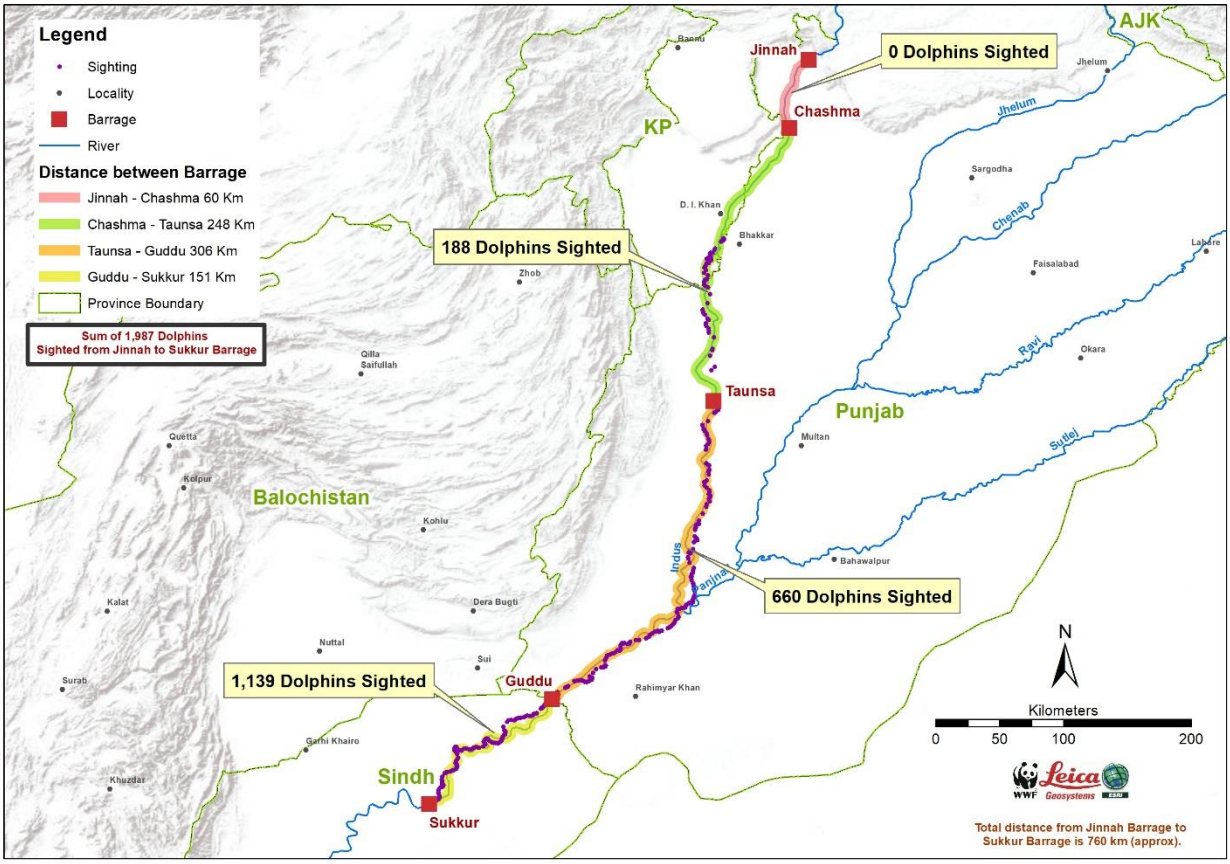

Figure 1. Map indicating abundance estimates of Indus river dolphin in the four sub-populations distributed between 1) Jinnah-Chashma 2) Chashma-Taunsa 3) Taunsa-Guddu and 4) Guddu-Sukkur barrages

Table 2.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[a]		–1140[a]	1200	(G. Braulik et al., 2012b)
2006	DC	1	82	44[b]	1279	4[b]	1410		(G. Braulik et al., 2012b)
	MR-TV	-	101 (CV = 44.1%)	52 [b] (CV = 14.9%)	1289 (CV = 33.4%)	-	1447 (CV = 57.2%)	1550-1750	(G. Braulik et al., 2012b)
2011[c]	DC	-	87	465[c]	570[d] 726[e]	34[c]	1312	-	(Noureen, 2013)
	MR-TV	-	96 (CV = 19.02%)	-	701 (CV = 9.63%) 857[e]	-	797 (CV = 21.3%)	1452	(Noureen, 2013)

2017-2018	MR	0	188 (CV=0.08)	660 (CV=0.06)	1139 (0.08)	-	1987

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 surveyed sections (Gill T. Braulik et al., 2015).

Communication of results to scientific and public stakeholders.

A workshop was organised nationally to share the final results of the surveys, this included representatives of provincial wildlife departments, Ministry of Climate Change, researchers, media and other important key stakeholders. The event aimed to sharing preliminary findings of the research with the boarder stakeholder's groups and also emphasizing the need of coordinated actions to eliminate persistent threats which Indus dolphin faces. A working paper carrying key finding of the research was also presented to the Scientific Committee of the IWC. Two blogs were also published by the Marine Conservation Action Fund. A research publication carrying detailed outcome of the research is also in process.

Discussion

The population assessment and monitoring of the Indus river dolphin is a critical component of the conservation work and provides an opportunity to determine the population status in the river stretch which hosts the highest population density. These data also provide basis to determine population trends which have been monitored regularly since 2001 using the same survey techniques. The population trends monitoring also helps in assessing the impact of conservation work and recording on going anthropogenic pressures on this species.

The survey results consistently indicate that the population of this endangered species has been steadily rising since at least the year 2001 and probably since the 1970s when hunting was banned (Braulik et al., 2012a). The last sub-population surveyed between Guddu-Sukkur barrages, which historically hosted the highest population of the Indus River dolphin also indicated a similar significant increase in the population. The Indus dolphin habitat on the other hand is on a continuous decline, the historic distribution range of Indus dolphin was 3,400 Km in 1870 which was reported to reduce to about 1,000 Km according to the assessment conducted in 2001 by Brualik 2006 (Braulik, 2006b). There is already about 10 Indus dolphin sub-population have been extirpated during the past one century (Reeves et al. 1991). No dolphin was sighted at the farthest upstream population of the Indus dolphin between Jinnah-Chashma barrages during this study, earlier assessment conducted in 2001 and 2006 recorded two and one dolphins in this stretch respectively (Braulik et al., 2012a; Braulik, 2006b). This limits the current Indus dolphin range in Pakistan to three sub-populations which may increase their vulnerability drastically (Braulik, 2017). The small population of less than 35 individuals exists between Sukkur and Kotri barrages and is vulnerable because of low flows and extensive, unregulated fishing activities. This population is disconnected from the rest because of extremely low flows downstream Sukkur barrage (Khan et al, 2011). The study did not include subpopulation between Sukkur-Kotri barrages hence the latest population status is not available. This section of the river is over 450 km long and could not covered within the budget of this project. There is a need to investigate the current status of this small, isolated population, which

Conclusions

Results of the survey suggested a significant increase in the population of the Indus River dolphin. The ongoing conservation work including community mobilisation, alternative livelihoods, translocation of stranded dolphins from irrigation canals, awareness and involvement of community base watchers have all contributed to the increase in numbers. This conservation work has been going on for the last two decades which has helped in the securing the population.

Acknowledgments

The survey team would like to extend appreciation to the Small Cetacean Fund of the International Whaling Commission (IWC) which provided financial support to conduct this important research. The Marine Conservation Action Fund also provided additional support to facilitate additional surveying costs during 2017 and later in 2018 for surveying upper reaches of the Indus River (Jinnah – Chashma river stretch). The Provincial Wildlife Departments, Irrigation Departments, Ministry of Climate Change, Irrigation Departments of Punjab and Sindh facilitated the expedition.

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Please provide 3 colour images for the website

Aisha, Hamera, Gill Barulik, Uzma Khan, Aimee Leslie, and Rab Nawaz. "Indus River Dolphin (Platanista gangetica minor)-an update on the current population assessment and conservation challenges." IWC (International Whaling Commission) 10 (2017).

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Summary report carrying preliminary results of the Indus river dolphin survey published by WWF-Pakistan: Signs of Hope for the endemic and endangered Bhulan - Comprehensive population assessment of the Indus River dolphin (*Platanista gangetica minor*) in the Indus River - 2017

https://wwfint.awsassets.panda.org/downloads/ird_population_assessment_summary_wwfpak_2017.pdf

A blog post co-authored by Hamera Aisha and Dr Gill Braulik published on the website of s Marine Conservation Action Fund (MCAF): Population Study of Indus River Dolphin

https://www.andersoncabotcenterforoceanlife.org/blog/determining-population-status-endangered-indus-river-dolphin/

A blog post covering the survey and conservation efforts for the Indus River Dolphin

https://wwf.medium.com/saving-indus-river-dolphins-pakistan-ff1bb290aef

a few links to notable media coverage of the population assessment survey in the local and international forums in also mentioned below;

https://nation.com.pk/13-Dec-2017/report-on-indus-river-dolphin-launched

https://www.dawn.com/news/1376234

https://www.worldwildlife.org/stories/indus-river-dolphin-numbers-on-the-rise-with-the-help-of-local-communities

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http://www.technologyreview.pk/population-indus-river-dolphins-increasing-threats-still-remain-wwf/

Pictures

All are credited to: WWF-Pakistan

Figure 2Indus river dolphin survey team