Monitoring the Mortality of Freshwater Cetaceans in the Sundarbans, Bangladesh: Progress, Challenges, and Potential

Rubaiyat Mowgli Mansur, Zahangir Alom, Brian D. Smith and Farhana Akhtar

Wildlife Conservation Society, Bangladesh Cetacean Diversity Project,
House No. 89 (2nd Floor), Road No. 02, Sonadanga R/A (1st phase),
Khulna - 9000, Bangladesh
E-mail: rmansur@wcs.org

ABSTRACT

The Wildlife Conservation Society's Bangladesh Cetacean Diversity Project established a mortality monitoring network among university students, Forest Department staff, NGO partners, fishing communities and local tourism boat operators in the Sundarbans. From February 2007 to December 2013, 40 Ganges River dolphins (*Platanista gangetica gangetica*) and 12 Irrawaddy dolphins (*Orcaella brevirostris*) mortalities were documented from Sundarbans.

Twenty six Ganges River dolphin carcasses were examined and biological samples collected and the causes of death were identified as entanglement in fishing gears for 13 of them, and vessel collision for two, direct killing by villagers for two, with the cause of death unknown for the remaining individuals. Of the dolphins documented as entangled in fishing gear, 10 were in gill nets, two in long lines, and one in a set bag net.

Five Ganges River dolphins were also released alive after entanglement by fishermen. A key challenge is to expand the mortality monitoring network to remote areas of the western Sundarbans and to quantify bycatch rates so that these can be incorporated into population viability analyses for both Ganges River and Irrawaddy dolphins.

Key words: Mortality monitoring, freshwater cetaceans, sundarbans, Ganges river dolphin

INTRODUCTION

Mortality in fishing gear, especially gill nets, is considered among the most severe threats to the "endangered" Ganges River dolphin (*Platanista gangetica gangetica*). This dolphin ranges almost throughout the Ganges-Brahmaputra-Meghna river system of Nepal, India, and Bangladesh, and in the comparatively much smaller Karnaphuli-Sangu river system of southern Bangladesh (Smith et al. 2004). However, information on actual interactions with fisheries is almost entirely lacking in the literature, and information on the perceived threat is based almost exclusively on anecdotal accounts and the observed preference of the species for inhabiting counter-current pools below confluences and meanders where gillnets are most densely deployed (Smith 1993; Smith et al. 1998).

"Vulnerable" Irrawaddy dolphins (*Orcaella brevirostris*) are caught accidentally in fishing nets in almost all areas where they have been studied (Smith et al. 2007; Reeves et al. 2008), including in drift gill nets targeting elasmobranchs in the coastal waters of Bangladesh (Smith et al. 2008) and

bottom-set gill nets targeting crabs in Malampaya Sound, Philippines (Smith et al. 2004). Similar to Ganges River dolphins, when in freshwater or estuarine systems Irrawaddy dolphins also primarily inhabit counter-current pools below confluences and meanders which is also where gill nets are most densely deployed (Smith et al. 2009).

MATERIALS AND METHODS

A dolphin mortality reporting network was established among fishing communities, boatmen, tourism operators, and forest department (FD) guard posts. Posters and stickers with a dedicated phone number for reporting dead or by caught dolphins (Dolphin Hotline) were distributed during activities and community outreach conducted by partner NGOs. When an entanglement was reported we fielded a mortality response team of trained boat operators, university students and FD staff.

A protocol was developed with instructions on examining cetacean carcasses and collecting biological samples. For all cetacean carcasses or body parts, information was collected on the:

1. Location, date and time
2. Species description and identification
3. Photographs of the carcass
4. Condition of the carcass
5. Evidence of the cause of death according to net, hook or propeller marks, contusions, lacerations, or internal haemorrhaging
6. Standard external measurements and tooth counts
7. Determination of sex, and
8. Lactating status of females

The response team collected biological samples from each carcass (Figure 1). A high priority was to obtain a small piece of skin and store it in a numbered vial of preservation fluid (80 per cent ethanol) for genetic analysis.

Figure 1: Members of WCS Bangladesh Mortality Monitoring Team collecting biological sample from an Irrawaddy dolphin carcass

Additional biological samples were also collected. These include: blubber for contaminant analysis (stored frozen), muscle tissue for isotope analysis (stored frozen or dried salted), skull for taxonomic analysis and education (stored dry), and teeth for age determination and isotope analysis (stored dry). All samples were collected with sterilised instruments provided in a cetacean carcass sampling kit.

RESULTS

From February 2007 to December 2013, 90 cetacean mortalities were documented throughout Bangladesh: 33 from newspaper reports, 50 from our dolphin hotline, and seven from direct observations during dedicated fieldwork on cetaceans in the Sundarbans and coastal waters including surveys and ecological investigations.

These included 63 Ganges River dolphins, 16 Irrawaddy dolphins, five finless porpoises (*Neophocaena phocaenoides*), and two Indo-Pacific humpbacked dolphins (*Sousa chinensis*), one Sperm whale (*Physeter macrocephalus*), one False-killer whale (*Pseudorca crassidens*) and two unidentified cetaceans.

Fifty five of these (40 Ganges River dolphins, 12 Irrawaddy dolphins and three finless porpoises) were from Sundarbans and of these, 44 were reported via our dolphin mortality hotline, six from newspaper reports and five from direct observation during field visits (Table 1).

Table 1: Number of Ganges River and Irrawaddy dolphin and Finless Porpoise carcasses documented in the Sundarbans during February 2007 to December 2013 according to direct observations, reports received over our cetacean mortality hotline number and through newspaper reports

How the information was collected	Ganges River dolphin	Irrawaddy dolphin	finless porpoise
Observation	0	3	2
Hotline	35	8	1
Newspaper	5	1	0

Of the Irrawaddy dolphins, three were male sub adults/ adults, two were female including one calf, and the sex was unknown for seven sub adults/ adults. For Ganges River dolphins, seven were male including two calves, 10 were female including one calf, and the sex was unknown for the remaining 23 including two calves. For Finless Porpoises, two were adult male, and the sex was unknown for the remaining one adult individual.

Twenty six Ganges River dolphin carcasses were examined and biological samples collected (e.g. skin, blubber, muscle, liver, teeth, skull and stomach). Based on visible marks on the body and direct reports from fishermen and respondents, the cause of death was identified as entanglement in fishing gear for 13 individuals, vessel collision for two, direct killing for unknown reasons by villagers for two, and the cause of death was unknown for the remaining nine individuals.

Of the dolphins documented as entangled in fishing gear, 10 were in gill nets, one was in a set bag net (an anchored net with a wide mouth which narrows to a cod end) and two were in a long line. Besides these, eight Irrawaddy dolphin carcasses were also examined and biological samples collected.

Similar to Ganges River dolphins, the cause of death was identified as entanglement in fishing gear for five individuals and unknown for the remaining individuals. Of the dolphins documented as entangled in fishing gear, two were in gill nets, one was in a set bag net and two were in unknown gears (Figure 2).

The 10 Ganges River and two Irrawaddy dolphin entanglements in gill nets demonstrate a critical need to reduce or eliminate these nets from priority dolphin habitat. The mortalities from vessel collision are the first recorded in the Sundarbans and demonstrate the value of information we have been collecting on vessel traffic in the wildlife sanctuaries.

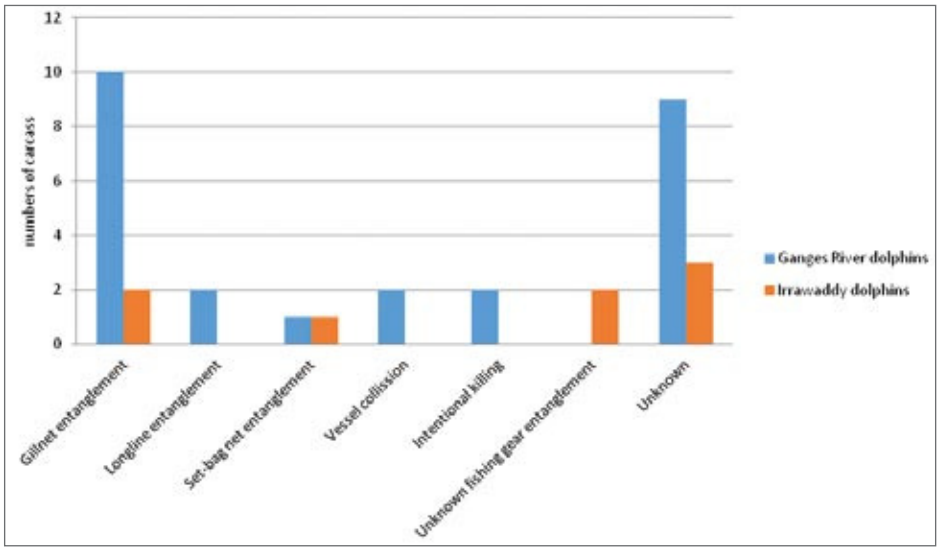

Figure 2: Number of Ganges River and Irrawaddy dolphin mortalities in the Sundarbans and the cause of death based on examination of carcasses and interview with local people

DISCUSSION

Gill nets and, to a lesser extent, set bag nets and long lines are entangling and killing dolphins at rates that are probably unsustainable. The need to reduce or eliminate these fishing gears from priority dolphin habitat (areas where dolphins congregate due to river morphology and abundance of prey) was demonstrated by the entanglements documented by our mortality monitoring network.

The eastern Sundarbans of Bangladesh where our mortality monitoring network is focused and the three wildlife sanctuaries that were recently established for the protection of freshwater dolphins, support a significant portion of the population of Ganges River dolphins.

At this location, their numbers are sufficiently large that early conservation interventions can be effective in preventing their extinction. The eastern Sundarbans supports much lower numbers of Irrawaddy dolphins. This means that in order to conserve this species, protective efforts and mortality monitoring should be extended to the western side of the mangrove forest where Irrawaddy dolphins occur in higher numbers due to more favourable salinity conditions (Smith et al. 2006). Since the beginning of 2011, there has been a dramatic increase in the number of commercial cargo vessels (5.5 vessels day^{-1} in 2010 and 22.3 vessels day^{-1} during 2011) transiting through priority habitat for freshwater dolphins in the eastern Sundarbans of Bangladesh including through the three new wildlife sanctuaries, covering 32 linear kilometres (10.7 square kilometres), established for their protection.

Although in 2011, the Prime Minister of Bangladesh ordered a ban on oil tankers and other cargo vessels transiting through sensitive areas of the Sundarbans, our study on vessel traffic shows that the ban has not been effective and there is a risk of vessel collision with resident cetaceans. This was cited as one of the major factors contributing to the recent extinction of the Yangtze River dolphin or Baiji (*Lipotes vexillifer*) (Chen and Hua 1989; Zhang et al. 2003). Vessel collision was also documented for the first time for Ganges River dolphins in the Sundarbans by our mortality monitoring network.

The best approach for protecting the dolphins and the ecological integrity of the waterways in the wildlife sanctuaries for freshwater dolphins would be to enforce the existing ban on these vessels transiting through them. However, if this is not possible, a “no wake” speed limit (e.g., less than 8 km hr^{-1}) and no dumping regulation should be strictly monitored and enforced.

CONCLUSION

Next steps for the mortality monitoring network are to expand it to remote areas of the western Sundarbans of Bangladesh, where Irrawaddy dolphins occur more frequently (Smith et al. 2006) and to quantify bycatch rates for incorporating into population viability analyses along with rigorous estimates of abundance estimates for both Ganges River and Irrawaddy dolphins.

A high priority is also to analyse tissue samples to investigate population structure and genetic diversity, stomach samples to further investigate prey, blubber and liver samples to investigate contaminants, muscle samples to investigate stable isotopes/ prey, and skulls to compare morphometrics across populations/ subspecies.

ACKNOWLEDGEMENT

This research would not have been possible without the dedicated effort of our student volunteers, field assistants, and local villagers.

We appreciate the help of Rajib Chandra Bhowmick, Alom Sheikh and Md. Sohag for their work on data collection.

Alex Aguilar provided valuable input in preparing the protocol.

Finally, we thank the Forest Department of the Government of the People's Republic of Bangladesh for their great support.

REFERENCES

Chen, P. and Hua, Y. 1989. Distribution, population size and protection of *Lipotes vexillifer*. In *Biology and conservation of the river dolphins,* eds. Perrin, W. F., Jr. Brownell, R. L., Zhou, K., and Liu, J. *Occasional Papers of the IUCN Species Survival Commission* (SSC), No. 3: 81-85. Gland, Switzerland: IUCN.

Mansur, E. F., Smith, B. D., Mowgli, R.M., and Diyan, M.A.A. 2008. Two incidents of fishing gear entanglement of Ganges river dolphins (*Platanista gangetica gangetica*) in waterways of the Sundarbans Mangrove Forest, Bangladesh. *Aquatic Mammals* 34(3): 362-366.

Reeves, R.R., Jefferson, T. A., Karczmarski, L., Laidre, K., O'Corry-Crowe, G., Rojas-Bracho, L., Secchi, E. R., Slooten, E., Smith, B. D., Wang, J. Y., and Zhou, K.. 2008. Orcaella brevirostris. In *IUCN 2013. IUCN Red List of Threatened Species*. Version 2013.2. Retrieved April 2, 2014, from www.iucnredlist.org.

Smith, B. D. 1993. 1990 status and conservation of the Ganges river dolphin (*Platanista gangetica*) in the Karnali River Nepal. *Biological Conservation* 66: 159-169.

Smith, B. D., Haque, A. K. M. A., Hossaion, M. S., and Khan, A.. 1998. River dolphins in Bangladesh: Conservation and the effects of water development. *Environmental Management* 22(3): 323-335.

Smith, B. D., Braulik, G., Strindber, S., Ahmed, B., and Mansur, R. 2006. Abundance of Irrawaddy dolphins (*Orcaella brevirostris*) and Ganges river dolphins (*Platanista gangetica gangetica*) estimated using concurrent counts made by independent teams in waterways of the Sundarbans mangrove forest in Bangladesh. *Marine Mammal Science 22*(3): 527-547.

Smith, B. D., Shore, R. G., and Lopez, A. 2007. Report on the workshop to develop a conservation action plan for freshwater populations of Irrawaddy dolphins. In *Status and Conservation of Freshwater Populations of Irrawaddy Dolphins*, *IUCN Red List of Threatened Species*. eds. Smith, B.D., Shore, R. G., and Lopez, A. 90-113. Gland, Switzerland: IUCN.

Smith, B. D., Ahmed, B., Mansur, R. Mansur, Strindberg, S. 2008. Species occurrence and distributional ecology of nearshore cetaceans in the Bay of Bengal, Bangladesh, with abundance estimates for Irrawaddy dolphins *Orcaella brevirostris* and finless porpoises *Neophocaena phocaenoides. Journal of Cetacean Research and Management* 10(1): 45–58.

Smith, B. D., Braulik, G., Strindberg, S., Mansur, R., Diyan, M. A. A., and Ahmed, B. 2009. Habitat selection of freshwater-dependent cetaceans and the potential effects of declining freshwater flows and sea-level rise in waterways of the Sundarbans mangrove forest. Bangladesh. *Aquatic Conservation: Marine and Freshwater Ecosystems*19(2): 209-225.

Smith, B. D., Diyan, M. A. A., Mansur, R. M., Fahrni-Mansur, E., and Ahmed, B. 2010. Identification and channel characteristics of cetacean 'hotspots' in waterways of the eastern Sundarbans mangrove forest, Bangladesh. *Fauna & Flora International: Oryx* 44(2):241-247.

Smith, B. D., Braulik, G. T., and Sinha, R. 2012.*Platanista gangetica ssp. gangetica*. In *IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2*. Retrieved April 2, 2014, from www.iucnredlist.org.

Zhang, X., Wang, D., Liu, R., Wei, Z., Hua, Y., Wang, Y., Chen, Z., and Wang, L. 2003. The Yangtze river dolphin or Baiji (*Lipotes vexillifer*): population status and conservation issues in the Yangtze river, China. *Aquatic Conservation: Marine and Freshwater Ecosystem*13: 51-64.