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**CONCERTED ACTION FOR
THE GANGES RIVER DOLPHIN (*Platanista gangetica gangetica*)¹**

Adopted by the Conference of the Parties at its 13th Meeting (Gandhinagar, February 2020)

(i). Proponent:

Government of India.

Summary

The South Asian River Dolphin, *Platanista gangetica* spread across rivers in India, Pakistan, Bangladesh and Nepal. The nominate subspecies *Platanista gangetica gangetica* is listed on Appendix I and II of CMS. Trans-boundary populations exist between India-Bangladesh and India-Nepal. The Government of India's Ministry of Environment, Forest and Climate Change (MoEFCC) prepared a conservation action plan for the period 2010- 2020, and multiple institutions (including NGOs and universities) are working towards the conservation of the species in the country. Bangladesh has initiated a UNDP-funded programme in the Sundarbans for the conservation of dolphins, and WCS-Bangladesh has been involved in long-term conservation efforts for the species. Nepal has small remnant populations and both the government and NGOs are involved in conserving river dolphins through community engagement programs.

The estimated population size of South Asian River Dolphins (of all age-classes) is 5,500-6,000: of Ganges River Dolphins (*P. g. gangetica*) about 3,500-4,000 (with data gaps), and of Indus River Dolphins (*P. g. minor*) about 2,000 (Sinha & Kannan 2014, Braulik et al. 2015, 2018; Braulik & Smith 2017). Given the fragmentation of our rivers due to physical barriers, many of the sub-populations have shrunk and become isolated. Other than sub-populations for which long-term data and detailed studies exist (e.g. Braulik et al. 2014, 2015; Kelkar 2015; Smith et al. 2009, Choudhury et al. 2019), small and isolated sub-populations must be given priority for Concerted Actions.

In this Concerted Action document, we focus on actions needed for securing the connectivity of the riverine habitat within range countries and in trans-boundary regions (Nepal, Bangladesh and India). As a result, the document primarily discusses potential interventions to better manage ecological water demand and conduct research on migration and dispersal of Ganges River Dolphins, *P. g. gangetica*. This can help find ways of maintaining ecological flows in rivers regulated by dams, barrages, and other barriers to connectivity.

(ii). Target species/population(s) and their status in CMS Appendices:

Target Species/Population: Ganges River Dolphin, *Platanista gangetica gangetica*

Potential target (sub-) populations for CMS Concerted Action:

1. Bangladesh-India: Sundarbans, Brahmaputra/Jumna sector in India and Bangladesh, Barak/Meghna

¹ The geographical designations employed in this document do not imply the expression of any opinion whatsoever on the part of the CMS Secretariat (or the United Nations Environment Programme) concerning the legal status of any country, territory, or area, or concerning the delimitation of its frontiers or boundaries. The responsibility for the contents of the document rests exclusively with its author.

2. Nepal-India: Populations in the Karnali (Ghaghra), Narayani (Gandak), and Sapta-Koshi (Kosi) rivers.
3. India: Populations in Bijnor and Narora Barrages in Uttar Pradesh, Chausa to Rajmahal (Bihar-Jharkhand) in the Ganga River, Farakka Feeder Canal, Hooghly River (Kolkata to Kakdwip), Kosi, Gandak Rivers (Bihar), Chambal and Yamuna rivers (Uttar Pradesh), and Ghaghra River and Ghaghra-Sharada canal network (Uttar Pradesh).
Brahmaputra-Arunachal Pradesh-Assam border to Borijan, Dhansiri to Orang National Park, Goalpara to India-Bangladesh border and beyond; Subansiri and Kulsi rivers (Assam).
4. Bangladesh: Populations in the Karnaphuli-Sangu basin in south-east Bangladesh, and the Jumna, Ganga, Padma river channels, tributaries and distributaries.
5. Nepal: Karnali and Sapt-Koshi rivers

CMS Appendix: *Platanista gangetica gangetica* (Ganges sub-species) is listed in Appendix I and II of CMS.

(iii). Geographical range:

The Ganges River Dolphin occurs in most large alluvial and perennial rivers of the Ganga-Brahmaputra-Meghna (GBM) and the Karnaphuli-Sangu (KS) basins in India, Nepal, and Bangladesh, and the Sundarbans Delta in India and Bangladesh (Braulik & Smith 2017). An isolated population was reported in the Budhabalanga River in Orissa, India (Ura et al. 2007). The distribution of Ganges River Dolphins is restricted by the unavailability of water (in some tributaries of the Ganga, e.g. Son), or rocky barriers in channels with steep gradients (Nepal rivers), or heavy pollutant loads (upstream of Kanpur Barrage, and the Yamuna River), and salinity (if greater than 10 ppt in its tidal-estuarine range) (Braulik & Smith 2017). Small populations are also present in a few 'artificial' habitats, such as the Farakka Feeder Canal and Ghaghara-Sharada Link Canal (India), and the Karnaphuli-Sangu Feeder Canal (Bangladesh) (Sinha 2000, Smith et al. 2001, Prajapati 2018). The north-westernmost reaches of the Ganges River Dolphin's distribution range have seen significant declines due to construction of dams and barrages over the last six decades (Braulik & Smith 2017). These regions include the Yamuna River, the Ganga River from Haridwar to Bijnor, and from Narora to Kanpur, the Ramganga River, and some tributaries of the Yamuna and Ganga rivers (Behera et al. 2014). Even in regions that are not water-stressed (e.g. Bangladesh), water availability for Ganges dolphin conservation has been a strongly limiting factor (Smith et al. 1998).

Many new surveys have been conducted since the last detailed IUCN Red List assessment of both subspecies between 2008 and 2012. In 2018-19, new assessments are on the anvil and will provide updated information from the latest survey data.

Potential target (sub-) populations for CMS concerted action in India and Nepal:

1. Populations in rivers of Nepal and along the India-Nepal border, in the Karnali (Ghaghra), Narayani (Gandak), and Koshi (Kosi) Rivers (50-60 animals persisting at low numbers; Smith et al. 1994, Paudel et al. 2015). These populations are important to protect, as their seasonal movements and local migration is dependent on trans-boundary water management issues (Shah & Paudel 2016).
2. Population of dolphins in Brahmaputra-Jumna as well as Barak-Meghna in India and Bangladesh need special attention. There is a large population on the Indian side of the Brahmaputra, whereas the Jumna River stretch (Bangladesh side) needs to be assessed for the status of river dolphins (Qureshi et al. 2018).
3. Populations in Bijnor and Narora Barrages in Uttar Pradesh, Chausa to Rajmahal (Bihar-Jharkhand) in the Ganga river, Farakka Feeder Canal, Hooghly river (Kolkata to Kakdwip), the Kosi and Gandak Rivers (Bihar), Chambal and Yamuna rivers (Uttar Pradesh), and Ghaghra river and Ghaghra-Sharada canal network (Uttar Pradesh). (Sinha et al. 2000, 2010a, Sinha & Kannan 2014, Prajapati 2018, Qureshi et al. 2018).

4. In the Brahmaputra, Arunachal Pradesh-Assam border to Borijan, Dhansiri to Orang National Park, Goalpara to India-Bangladesh border and beyond; Subansiri and Kulsi Rivers (Assam) (Qureshi et al. 2018).
5. The population of Ganges River Dolphins (40-60 individuals) between the Bijnor and Narora barrages in Uttar Pradesh, India, is a disconnected, isolated population, with no upstream populations, and no viable populations downstream till the Kanpur Barrage (Behera et al. 2014).
6. Populations in feeder and link canals might exhibit constrained migratory behaviour and seasonal movements to hydrological operations and need focused studies and water allocation plans for maintaining persistence and avoiding risk of stranding. (e.g. Farakka Feeder Canal, Ghaghara-Sharada Link Canal) (Sinha 2000, Qureshi et al. 2018, Prajapati 2018).
7. Ganges River Dolphins in the Karnaphuli-Sangu basin in SE Bangladesh (Ahmed 2000, Smith et al. 2001, Richman 2014) are also isolated from the larger populations in the Ganga-Brahmaputra delta and the Sundarbans. However, some connectivity may be due to the high freshwater influx into the Bay of Bengal, and river dolphins might migrate and disperse along the coasts of Bangladesh and India into the K-S basin. Intensive river flow diversion by upstream dams and barrages might have a significant impact on coastal dispersal of the species in the future. Ganges dolphins usually occur in rivers, tidal rivers, and estuaries where salinity is less than 10-12 ppt (Smith et al. 2009, Mitra & Roy Chowdhury 2018). Higher salinity may impede along-coastline movements of dolphins in the deltaic region and the Sundarbans tidal rivers.
8. India has the largest population of Ganges River Dolphins. The largest connected sub-populations reside in the Brahmaputra (877; SD 19) and Ganga (Allahabad to Farakka). Of this stretch, the ones between Chausa and Farakka on the Ganga and between Farakka Feeder Canal and Kakdwip stretch on the Hooghly together hold an estimated population of 1,573 animals (SD 43) (Qureshi et al. 2018). The population in the upstream Uttar Pradesh part of the Ganga (Kanpur to Allahabad to Chausa-Buxar) is not included here.

Confirmed Range States:

INDIA: Bihar, Assam, Uttar Pradesh, West Bengal, Jharkhand, Madhya Pradesh, Rajasthan, Orissa, Tripura states (in state-wise decreasing order of abundance)

NEPAL: Western, Central, and Eastern Nepal

BANGLADESH: All states

(iv). Activities and Expected Outcomes:

Ganges River Dolphin Concerted Action Plan: Priority Activities and Outcomes		
Activity	Expected Outcome	Indicators
Addressing knowledge gaps		
1. Assess Ecological water flow to identify flows that can maintain longitudinal connectivity in rivers for movement, dispersal, and optimal space use by river dolphins.	Guidelines for barrage and dam reservoir operations, towards ecologically tuned management of water releases to maintain downstream as well as upstream habitat connectivity and depth for river dolphins to persist and carry out vital functions.	River dolphin habitats, in intensively regulated rivers, often become limited to deep pools which get cut off from each other in the dry season (e.g. Ganga River downstream of Farakka and Narora barrages, and its tributaries such as the Chambal, Rapti, Mahananda, Kosi etc.)
2. Assess the impacts of trans-boundary water sharing agreements and treaties between Nepal, India, and Bangladesh on upstream and downstream river dolphin populations and habitat.	Identification of ideal operating procedures by barrages on the Indo-Nepal and Indo-Bangladesh borders, specific to their local contexts.	Although barrage operations are more or less similar, their impacts on upstream and downstream populations have been mixed. Indicators will be about how upstream and downstream populations can be revived from their current status.
3. To formulate a standard protocol for responding to stranded live and dead dolphins, and associated data collection and monitoring.	Stranded dolphins not only need urgent help and attention, but can also provide important data for genetic analyses, health assessments, and cause of stranding. Hence developing a unified set of guidelines is proposed.	A map showing the relative risk of dolphin stranding in relation to barrage and canal operations, fishing impacts, etc. can be developed as an indicator.
4. To carry out genetic studies on populations across the range to identify the extent of population structure in relation to fragmentation and loss of habitat.	Analysis of population structure among isolated populations, due to natural and anthropogenic barriers to movement and genetic mixing can reveal the “hard boundaries” (difficult barriers to overcome) and “soft boundaries” (barriers to movement possible to overcome by meeting ecological flow guidelines).	High population structure among sub-populations in the same river (separated by barriers) would indicate impacts of anthropogenic isolation. Extent of structuring can be compared with structure that would be naturally expected (e.g. among distant sub-populations not likely to meet naturally).
5. “Remote sensing” studies, i.e. using environmental DNA, UAVs, and stable isotopes to detect movement of dolphins into canals, floodplain wetlands, and other marginal habitats.	Such non-invasive studies might be good alternatives to telemetry, for knowing more about events of canal stranding, inability to move through barrages, seasonal habitat use (during the flood period), etc.	Impacts of marginal habitats on river dolphin persistence, body condition, health, etc.
6. Facilitating telemetry studies to understand movement patterns of South Asian river dolphins, in different contexts.	Empirical data will become available about extent of migration, dispersal, and ability to negotiate manmade river barriers, and avoidance of specific disturbances and threats in its riverine and estuarine habitats.	Toosy et al. (2009) had tagged a male Indus Dolphin in Pakistan. The dolphin moved upstream and downstream of the Sukkur barrage in the monsoon. Similar data can be obtained in different rivers with different barriers to connectivity, and its effects on dolphin health / survival.

Ganges River Dolphin Concerted Action Plan: Priority Activities and Outcomes		
Activity	Expected Outcome	Indicators
Information sharing and awareness raising		
1. Awareness, public consultations and information generation with regard to development projects. This is critical to make the public aware of the potentially damaging impacts of massive river flow diversion schemes such as river interlinking, or from major interventions that might affect river flow (e.g. underwater noise pollution from inland waterways and dredging).	Mobilization of greater public support to the cause of river dolphin conservation, public debates, and mass campaigns against ecologically damaging, large-scale water transfers or development projects that can further endanger <i>Platanista</i> .	Government responsiveness and agreement to carefully investigate the ecological consequences of river interlinking and waterways development projects.
2. Annual meeting of scientists from all range states to assess trends in population size and threat impacts, using standardized methods	Sharing of information and conservation strategies that can facilitate mutual learning from success and failure stories.	A report on the complementarities and divergences between scientific research and conservation implementation experiences across regions.
Capacity-building and development and implementation of mitigation strategies		
1. Capacity-building of forest and wildlife officials, researchers, conservationists, and NGO representatives is important in the following areas: a) impacts of river flow regulation on Ganges River Dolphins, b) ecological flow assessments and prescriptions, c) underwater noise and pollution effects, and d) population connectivity, dispersal, and stranding into marginal habitats.	Improved maintenance of ecological flows for river dolphins by modifying barrage operations, mitigating impacts of underwater noise and reducing vessel traffic, and related interventions need to be government priorities.	Development of adaptive management strategies and guidelines for operation of water infrastructure, and their implementation.
2. Capacity-building and empowerment of fishing communities, to adopt fishing practices to avoid accidental mortality of dolphins in entangling gears.	Measurable reduction in bycatch rates of river dolphins.	Adoption of fishing practices that are least likely to cause dolphin bycatch or mortality, while maintaining productive and sustainable yields.

ANTICIPATED OUTPUTS

- The CMS Concerted Action Plan for *Platanista*, with a view to safeguard population connectivity, migratory corridors and dispersal routes of the species**, can be a very important guiding framework that can direct and enable range countries to coordinate actions towards ecological flow management of regulated rivers at regional, sub-national, and national scales. Ensuring compliance of governments to undertake research and implementation of ecological flow guidelines for all major riverine habitats of the dolphin’s range can be a first step to curb habitat loss for the species.
- The action points proposed in this document stress on the need for reconsideration of mega river development projects such as interlinking of rivers, and inland waterways** (along with dredging), given their potentially serious impacts on river dolphin health, welfare, population persistence, and movement (Kelkar 2017). Industrial development of waterways in the Yangtze River was responsible for a major initial decline of the now-extinct Chinese River Dolphin or Baiji (*Lipotes vexillifer*), due to a high frequency of propeller hits. Zhou & Li (1989) reported Chinese River Dolphins to be constantly disturbed by underwater noise from vessels,

which perhaps forced their constant movement over large distances. Emerging studies of waterway impacts on Ganges river dolphins also report significant negative impacts of a similar nature (Dey 2018).

3. Apart from ecological flow regulations and guidelines, the Concerted Actions listed involved the **advancement of scientific research on river dolphin movement ecology in a range of contexts, strengthening rescue response and release efforts** with due monitoring of the fates of rehabilitated dolphins, and spreading awareness and information through networks of people, and citizen science initiatives. For the successful implementation of these activities, better communication and exchange about practical realities, between government officials and scientists/conservationists is essential.
4. **Filling scientific knowledge gaps** has a major bearing on the success of programmes and their implementation. Hence, concerted action must help facilitate research on hydrological impacts of water development on river dolphins, their movement ecology, habitat loss, and associated threats. Numerous studies have documented field observations from visual and acoustic studies on *Platanista* movements, feeding behaviours, and social behaviours, both from the wild and through captive studies (e.g. Pilleri 1970, Kasuya & Haque 1972, Haque et al. 1977, Reeves & Brownell 1989, Sasaki-Yamamoto et al. 2013, Lal Mohan & Kelkar 2015, Kelkar et al. 2018, Sutaria et al. in press). However, the findings of these studies need to be contextualized with respect to specific scenarios (river flow regulation, loss of connectivity, occurrence in artificial / marginal habitats, etc.) that might affect movements and dispersal.

(v). Associated Benefits:

Securing near-natural flow regimes in regulated rivers across the range of *Platanista* will also benefit other endangered riverine wildlife, notably, gharial crocodiles (Critically Endangered as per IUCN), species of freshwater turtles, otters, fishes, and aquatic birds (e.g. Indian Skimmer). Not only that, improving ecological flows in rivers across seasons can enable the development of riverine capture fisheries significantly.

The South Asian River Dolphin is India's National Aquatic Animal and also has the highest level of protection by law, in all its range countries. The Indus River Dolphin has recently been declared the State Animal of Punjab (India) as well. The species bears an emblematic identity and precarious status, which can both be enabling factors for improving dialogue between India and its neighboring nations on contentious issues of transboundary water management for ecological needs. Species conservation priorities, in the case of *Platanista*, are inseparable from water policy, legislation, and geopolitics in South Asia. As a result, some of the emerging threats to the species can be converted into opportunities for serious conservation action. This is possible by prioritizing conservation agendas within the framework of bilateral water infrastructure projects, including waterways. To emphasize, concerted action for this species might play a small but important role in the improvement of geopolitical relations in the Indian subcontinent.

(vi). Timeframe

Timeline					
Activity	Year 1 (2020)	2021	2022	Expected milestone achieved	CMS reporting points
Addressing knowledge gaps					
Ecological flow assessments	Collation of hydrological, water quality, temperature, and geomorphology data for all major barrages, dams, and river level gauging stations	Hydrological analyses and inference about context-specific ecological flow needs	Formulating guidelines for ecological and adaptive management of flows	Barrages to improvise and adopt guidelines and enable e-flow provisions	Impact assessments of e-flow regimes on river dolphins
Transboundary water management scenarios and agreements between range countries	Initiation of joint studies	International and inter-state dialogue and deliberation	Formulating new guidelines to ensure ecological flows while optimizing water allocations	Revised clauses of water sharing agreements with ecological flow targets included	Impacts of modified water sharing plans on river dolphin population connectivity
Standard protocol on stranding response, data collection, and monitoring	Setting up an expert panel to draft the protocol	Testing the protocol and creating a central database to record stranding response events	Transferring protocols to government agencies in charge of rescue and rehabilitation of Platanista in their jurisdiction	Improving success of rehabilitation efforts and making them fruitful for scientific data collection and monitoring of fates of rescued animals.	Periodic review of rescue and rehabilitation success across regions
Genetic studies on river dolphin population structure	Finalizing study design and compilation of sample genetic data from all available sources, to be done in a research lab with demonstrated experience in conservation genetics studies	Continuing collection of genetic data according to study design, and in relation to data collection objectives of stranding response protocol	Publishing results on hard and soft barriers to river dolphin population connectivity in an international journal.	Genetic studies can inform assessments of ecological flows and identifying potential ESUs (evolutionarily significant units) if any, with specific conservation measures	Results from genetic studies (2022)

Timeline					
Activity	Year 1 (2020)	2021	2022	Expected milestone achieved	CMS reporting points
Remote-sensing studies with miscellaneous non-invasive methods to detect river dolphin use of marginal and artificial habitats	Small-scale studies to be facilitated	Results from studies of e-DNA, UAVs, etc.	-	New knowledge on how river dolphins might use marginal and manmade habitats, and how such situations can be best managed	Study results.
Recommending and facilitating collaborative telemetry studies within and across range countries	Collaboration with international experts, monitoring and permission processes	Beginning telemetry studies on animals across regions	Results of telemetry data and movement patterns	Exact details on dispersal and migration behavior in different contexts	Based on data, planning measures to ensure no barriers to movement
Information sharing and awareness raising					
Citizen science networks and rescue-release efforts	Building citizen science networks and databases, capacity-building for rescue-release efforts	Initiating monitoring studies of rescued animals (based on the knowledge gaps above)	Continuing work from 2020-2021	Consolidation of citizen science reporting and data, study results	Updated knowledge on rates of rescue-release from canals and other manmade habitats, dolphin mortality rates, etc.
Awareness building about damaging impacts of large-scale water development and inter-basin transfer projects, waterways, etc.	Education and awareness programs to be continued at different levels			Government response about rethinking of ecological damages caused by major water development and infrastructure projects	Follow-ups with concerned governments by CMS
Annual meeting of scientists from all range states	Meeting 1	Meeting 2	Meeting 3	Ultimate outcome is to bring together the best possible research and conservation efforts across the region, and find best practices for implementing concerted action	Reports of all meetings and cumulative progress

Timeline					
Activity	Year 1 (2020)	2021	2022	Expected milestone achieved	CMS reporting points
Capacity-building and development and implementation of mitigation strategies					
Capacity-building of government officials, researchers, conservationists and civil society organizations working on river conservation	Workshops and outreach sessions on river dolphins and river biodiversity conservation	Workshops on water management policies and ecological flow management	Continued from 2020-2021 work	Sensitization of different levels of policy makers and officials	Adaptive management strategies for e-flow maintenance while optimizing water allocation needs across other sectors
Capacity-building and empowerment of fisher folk	Obtaining estimates of bycatch and other sources of dolphin mortality from fisheries interaction (existing status)	Identifying avenues and concerns for capacity building and empowerment of fishing communities through workshops and outreach sessions	Working with communities to help them adopt gears without dolphin mortality risk, while allowing optimal fish catch returns. Monitoring bycatch rates and examine the impacts of using such gears	Measurable reduction in bycatch and other mortality from fishery interactions	Identifying incentives to support the adoption of fishing practices likely to cause least impact to dolphin populations

(vii). Relationship to Other CMS Actions:

The *Platanista* Concerted Action will be linked to a number of recent CMS initiatives including:

- Resolution 8.22 (Adverse Human Induced Impacts on Cetaceans)
- Reviewing Concerted Action for *Platanista gangetica*
- Strategic Plan for Migratory Species 2015-2023 (e.g. Targets 5-10, 12 and 15)
- Resolution 10.03 (The Role of Ecological Networks in the Conservation of Migratory Species) and Resolution 11.25 (Advancing Ecological Networks to Address the Needs of Migratory Species)
- Resolution 10.14 (Bycatch of CMS-listed Species in Gillnet Fisheries)
- Resolution 10.15 (Global Programme of Work for Cetaceans)
- Resolution 10.23 (Species Marked for Concerted Actions 2012-14)
- Resolution 10.19 (Migratory Species Conservation in the Light of Climate Change) and Resolution 11.26 (Programme of Work on Climate Change and Migratory Species)
- Resolution 10.24 (Further Steps to Abate Underwater Noise Pollution for the Protection of Cetaceans and Other Migratory Species)
- Resolution 11.10 (Synergies and Partnerships).

The case for action

(viii). Conservation Priority:

A general assessment of the current population trend is that the major population is stable with decline in certain stretches and tributaries (~20 per cent for Ganges River Dolphins, and 80 per cent for Indus River Dolphins), and population declines have also likely been substantial (over 50 per cent from historical estimates), in the last six to seven decades, which correspond with the large-scale construction of dams and barrages in the Indian subcontinent (Anderson 1879, Jones 1982, Reeves & Smith 1999, Braulik & Smith 2017, Kelkar et al. in review.).

The Ganges River Dolphin has become extinct from the westernmost parts of its range, and from minor tributaries of the Ganga and Yamuna Rivers (e.g. Son, Ken, Sind, etc.; Sinha & Sharma 2003, Sinha et al. 2000, 2010b). In the case of Ganges River Dolphins, range-wide estimates are not available, but the process of estimation is underway (Qureshi et al. 2018). In addition to the assessed stretches having major populations (Brahmaputra and Ganga (Chausa to Farakka)), other rivers also hold significant populations (Kulsi 37-40, Subansiri 48-54, Roopnarayan 25 (Qureshi et al. 2018); Kosi has around 350 animals (Dey et al. in prep.), Gandak between 150 and 200 animals (Bihar Forest Dept. 2018), Ghaghra (>200-250 animals, Basu et al. 2012), and Chambal (80-90 animals, Singh et al. 2014). Vessel-based surveys and acoustic monitoring using ATags did not detect any Ganges River Dolphins in the Indian part of Sundarbans, i.e. in the Sundarbans Tiger reserve in 2016-2018 (Irrawaddy Dolphins and Finless Porpoises were sighted). A reasonable and conservative estimate across its range in India, Nepal, and Bangladesh would lie between 3,500 to 4,000 animals, for want of data for un-surveyed rivers, mostly in Bangladesh. Populations in some areas and stretches of rivers show declines (e.g. Ganga River between Kanpur and Narora Barrages, Yamuna, Gandak etc.). Numerous barrages have fragmented Ganges river dolphin populations. Populations in Nepal are also probably disconnected from downstream populations in India due to barrages along the India-Nepal border (Paudel et al. 2015). The largest connected populations occur in the Brahmaputra river basin, and the Ganga and tributaries joining it between Kanpur and Farakka in India (Wakid 2009, Sinha et al. 2010a, b; Sinha & Kannan 2014, Qureshi et al. 2018). The Farakka Barrage is a major barrier to population connectivity on the Ganga, between India and Bangladesh (Sinha 2000, Gain & Giupponi 2014). Apart from large-scale habitat loss and fragmentation, local impacts on populations from fishery interactions (bycatch in entangling gillnets, hunting and poaching for oil and flesh), and water pollution are major threats that have continued unabated in most parts of the species range (Smith & Smith 1998, Reeves et al. 2000, Sinha et al.

2010a,b; Braulik & Smith 2017). Bycatch risks might also be correlated with poor flow availability (Khanal et al. 2016), as is likely with pollutant concentrations and exposure (Sinha & Kannan 2014).

Across the Indian subcontinent, diversion and regulation of river flows for irrigation, urban water use, and power generation, are intensifying. Impacts of flow regulation are usually cumulative (from hydropower projects in headstream catchments and tributaries, to large barrages in the plains). These are expected to result in continuing habitat loss and population disconnectivity. Emerging threats to the species in India, are the proposed commercial development of inland waterways along 111 rivers in the country, and inter-linking schemes (Kelkar 2017). The scale of both impending projects is likely to severely aggravate the existing threats to Ganges dolphin populations.

In all range countries, several regional, national, and international meetings and discussions have taken place over the last three decades (e.g. CMS 1991, Reeves et al. 2000, Sinha et al. 2010a, Krebs et al. 2010). However, current on ground efforts are limited. Conservation issues facing the species are complex and suggestions on paper often do not translate into specific, locally suited conservation actions. Often, in conservation plans that exist, many actionable suggestions appear simplistic for the scale and nature of local, culturally embedded, and complicated issues (Choudhary et al. 2015).

One outcome of conservation interventions (especially education and outreach programs) has been the possible reduction in targeted killing of *Platanista* (e.g. Choudhary et al. 2006, 2015). However, bycatch mortality in fishing gears remains a significant threat. Bycatch mortality is also difficult to estimate from monitoring data, due to the clandestine and opportunistic utilization of dolphin products (mainly blubber and oil as bait to catch a catfish species) by fishermen.

Overall, the outlook for conservation of South Asian river dolphins, while not overtly depressing yet, is also not encouraging in any manner unless actions are taken immediately. The continuity of numerous threats over the last thirty years (threats listed in the COP3 minutes: CMS 1991) is testimony to the urgency of taking meaningful steps towards effective conservation. Conservation priority is high, given the unceasing trend of intensive water development in the Indian subcontinent on the one hand, and recurring, monotonic declines in the ecological productivity and water quality of rivers of the Ganga and associated basins.

(ix). Relevance:

Conservation of Ganges River Dolphins and their habitat is clearly of relevance to the Convention given the transboundary nature of their distribution and water-sharing agreements. The Concerted Action between Range States that are members of the CMS will strengthen the conservation incentives for the species at the global level.

Given recent developments in discussing and addressing threats to *Platanista* at the regional, national, and international levels, by range countries as well as global and local conservation agencies this Concerted Action Plan is of relevance. **This Concerted Action Plan identifies important knowledge gaps to monitor river dolphin persistence; manages flow in regulated river basins to sustain habitats; develop strategies for mitigation of specific sources of mortality that are likely to impact local populations severely; and prioritizes outreach and capacity-building efforts to secure the connectivity of river dolphin habitats and populations.**

(x). Absence of Better Remedies:

Given that the pertinent threats to *Platanista* throughout its range are related to water-flow management, fisheries and habitat management, some conservation strategies work at a very local level but others cannot succeed without collaborative and concerted action.

River Dolphin population declines have been regarded as indicators of degrading river health conditions (Turvey et al. 2012, Gomez-Salazar et al. 2013). While Ganges River Dolphins appear fairly resilient to the numerous human impacts such as siltation, vehicular traffic, natural changes in river morphology that they have been facing over the past six decades (Kelkar et al. 2010, Smith &

Reeves 2012). Though the species has persisted in its historical range, substantial range reductions and nontrivial population declines have taken place.

Notwithstanding this observation, new pressures on water resources and the increasing, intensifying water demands of over a billion people in the subcontinent are sure to reach a threshold of tolerance for the species (e.g. Choudhury et al. 2019). Plans to interlink India's rivers and to develop commercial waterways across India, Bangladesh, and Nepal, might just be the proverbial final straw for *Platanista* (Kelkar 2017, Dey 2018).

Within the present and near-future scenarios, improving river flow management regimes is therefore critical for securing river dolphin habitats and populations (Choudhary et al. 2012, Braulik et al. 2014, Kelkar 2015). The CMS Concerted Action, with its primary objective linked to safeguarding migratory species, is thus well suited to focus on improving water allocations for ecological needs, while optimizing allocations to sustain human demands (primarily irrigation, urban use, and industry).

While basin-scale flow management is critical, local threats to dolphins can be mitigated only through the inclusion of local communities and stakeholders in river conservation. Fishery interactions form a major source of dolphin mortality from both targeted and accidental killing of the species (the latter in entangling gillnets). At the same time, the majority of fishing peoples across the Indian subcontinent live along the margins of society, and are extremely impoverished, their livelihoods fraught with uncertainty and conflict over declining river fish resources (Choudhary et al. 2015). In this context, working towards inclusive and socially just approaches is a difficult but non-negotiable engagement for conservation programmes (Kelkar 2015) across the range states.

The populations identified in this document offer both cause for concern and ideal opportunities as systems to investigate in depth. For, knowledge about their persistence as small populations alongside the above threats can offer potential insights for conservation, which conventional interventions have not offered.

In future scenarios where populations are likely to get increasingly isolated and reduced in size, captive breeding or translocation strategies have been recently discussed. Braulik et al. (2018) discussed the possibilities for captive breeding of *Platanista* as a back-up measure for arresting population declines and having captive animals for study, rehabilitation, and repopulation, if required. These authors concluded that captive breeding and management was not an immediate priority given that the species was generally persisting at stable densities, in spite of overall gradual declines (in the Ganges Dolphin case). For Indus dolphins, captive facilities might help monitor health and body condition of dolphins rescued from irrigation canals, prior to release and tracking (a frequent occurrence in the Indus canals of Punjab and Sindh, Pakistan; Javed & Khan 2005). Based on the general conditions and technical capacity of zoos or captive facilities or wildlife veterinary training in the four range countries, the outlook for captive breeding, maintenance, or translocation of animals to new habitats is discouraging at present (Braulik et al. 2018).

(xi). Readiness and Feasibility:

At present, there are multiple calls for concerted action and coordination of research and conservation across the range countries. Two important recent efforts toward this aim have been the formation of a South Asian River Dolphin Task Team under the International Whaling Commission (IWC) and the Global River Dolphin Initiative by the World Wildlife Fund (WWF). The Government of India has made recent large-scale funding investments for cleaning the Ganga river as well as rejuvenating aquatic biodiversity and conducting conservation assessments in the Ganga and Brahmaputra. Recently, UNDP funding has been granted for conservation of aquatic biodiversity in the Bangladesh Sundarbans. The concerted action efforts under the Convention on Migratory Species can thus align with these numerous positive initiatives. Thus, there are clear indications of strong intent for collaboration, and the feasibility of joint projects or actions in the near future is expected to be high. Further, the governments of range countries have in place high-priority recovery plans / management plans / conservation action plans (details elsewhere in this document), whose objectives are generally aligned with the foci of these global initiatives. The main challenge, of

course, is to identify how to align the objectives of these parallel processes towards on-ground implementation of conservation recommendations.

(xii). Likelihood of Success:

Table 1 Current status of South Asian River Dolphins Key Ecological Attributes/Indicators (WWF KEA)

KEA	Indicator	Current status	Rationale/Justification
Population size	Number of dolphins in study area	GOOD	The known population size for Ganges dolphins ranges between 3,500 and 4,000, with new survey data coming in or still wanting. General trends point to a minor overall decline, but in many stretches stable population sizes are reported.
	Number of dolphin encounters per day during dedicated surveys	FAIR	Highly variable across river stretches. Densities might range from 0.1 to over 3 dolphins per km for Ganges Dolphins.
	Number of dead dolphins per year	POOR	Significant reductions from the numbers reported by Mohan et al. (1989) in the CMS report on South Asian river dolphins (CMS 1991). It is difficult to estimate the number of dead dolphins per year across the entire range, although a number in the lower hundreds is likely.
Population stability	Population trend	FAIR	Stable in most reaches, for Ganges dolphins, and increase for Indus dolphins is observed. Declines of Ganges dolphins due to fishing-related mortality and other disturbances led to recent extinctions from smaller rivers (e.g. Barak River, Assam, India: Mazumder et al. 2014, Choudhury et al. 2019), or steep declines (Gandak, Yamuna, Ganga between Narora and Kanpur barrages).
Population structure	Age class and sex ratios	FAIR-GOOD	No data available, but major changes unlikely, except for calf mortality and reductions in reported numbers of neonates and calves.
Reproductive success	# of calves observed	FAIR	Decline in number of calves reported from the Bhagalpur region of Bihar, where some of the highest densities of dolphins have been recorded. Multiple calf deaths in 2015-16 corresponded with a severe ENSO-linked drought, after which a clear decline in calf numbers has been evident. Calf numbers might be in decline in other stretches also (Kelkar, N., unpublished).
Injuries / Health	# of new scars from fisheries/vessel interaction	--	Some scattered evidence exists (e.g. Paudel, pers. comm.) from many rivers across the range, but difficult to quantify or assign status. Not enough data available.
	Presence/absence of lesions (TSD)	--	No data available
Extent of critical habitat	% of effectively protected critical habitat	POOR	Protected areas in which the species occurs are the river dolphin sanctuaries around deep pools in the Bangladesh Sundarbans, and a few protected areas in India (Vikramshila Gangetic Dolphin Sanctuary, Bihar; Beas Conservation Reserve, Punjab; Hastinapur Wildlife Sanctuary (WLS) and Katarniaghat WLS Uttar Pradesh; National Chambal Sanctuary (Rajasthan-Madhya Pradesh-UP); Kaziranga National Park and Orang National Park (Assam); Sundarbans Tiger Reserve (West Bengal), and Nepal (Bardia National Park, Koshi

KEA	Indicator	Current status	Rationale/Justification
			Tappu Sanctuary) (Reeves et al. 2000, Krebs et al. 2010, Braulik & Smith 2017). Protection is mostly incidental in most of these areas, with poor enforcement against dolphin hunting or bycatch in most of them. Overall, the extent of effective protected areas would not be more than 5% of the range of Ganges dolphins. However, protection might have proven effective in the National Chambal Sanctuary and Hastinapur WLS (India), Kaziranga National Park and Orang National Park (Assam); Sundarbans Tiger Reserve (West Bengal), and local river dolphin sanctuaries in Bangladesh (Singh et al. 2014, Smith et al. 2009, Behera et al. 2014, Braulik et al. 2018).
Habitat condition	Abundance, quality and trend of food sources	FAIR	In terms of fish or shrimp prey abundance, a general decline in fisheries catches is observed, however, whether it actually affects Ganges Dolphins at the current levels of abundance, is debatable. So relative prey abundance / availability for dolphins might not be the main problem. However, the quality of fish prey available might be reducing, mainly due to pollution and environmental change. Studies have shown significant bioaccumulation of heavy metals, organochlorine and organophosphate residues, and other contaminants in dolphin blubber (e.g. Kannan et al. 1997, Senthikumar et al. 1999, Sinha & Kannan 2014). Further, the feeding modes of dolphins might involve specific risks from fishing interactions (e.g. bycatch mortality due to accidental entanglement in gillnets) (Kelkar et al. 2018).
	% of ports with vessel speed controls	POOR	No port in the Ganges Dolphin's range seems to have guidelines for vessel speed controls. Any speed control, if in practice, may only be incidental.
	# of ship strikes	FAIR Not available, but possibly regular events	Mallick (2016) found 5-7 dolphins having died due to propeller hits in the Hooghly River, West Bengal (a busy shipping lane). Incidents of mortality due to propeller hits have also been reported from the waterways of Bangladesh, and at Patna and Bhagalpur (Bihar) (miscellaneous news reports; Sinha et al. 2010a).
	# of bycaught dolphins	FAIR No clear estimates, but regular events	Kelkar (2015) estimated bycatch takes of dolphins to be around 6-12 per year in a population of about 200 dolphins in the Vikramshila Gangetic Dolphin Sanctuary. Almost all accidental takes were linked to the use of large-meshed gillnets floated downriver in multiple passes for fishing.
Habitat connectivity	Ability to access critical habitats	FAIR	The species' habitat in most rivers across its range is fragmented by barrages and dams. Barricading nets and gears used in side-channels of rivers might prevent dolphin movements during the flood season.

(xiii). Magnitude of Likely Impact:

Impact is anticipated from trans-boundary agreements within and between range-states on the priority issues of water sharing and providing ecological flow regimes. Recently, India, Nepal, and Bangladesh have been working on bilateral memoranda of understanding and agreements on water sharing and development projects, such as national and international inland waterways (The Hindu 2018). It may be possible to utilize similar agreements by emphasizing the importance of maintaining ecological flows, population connectivity, and river-floodplain habitat integrity upstream and downstream of water development infrastructure projects being planned by both countries. Thus, in terms of securing habitats and dispersal corridors for Ganges Dolphins, conservation efforts will have to ensure that their recommendations are integrated with implementation of these projects.

For the Indus River Dolphin population in India's Punjab, recent discussions have involved the Government of Punjab to explore the prospect of translocating Indus dolphins from Pakistan to India to augment the small population in the Beas River (Deccan Herald 2019). However, after recent border conflicts and volatile relations between the countries over the issues of terrorism, disputed territories, etc., discussions on zoological exchanges did not continue and are unlikely to be discussed in the near future on priority basis.

(xiv). Cost Effectiveness:

India has had a Conservation Action Plan (2010-2020) for river dolphins (Sinha et al. 2010a), which has not yet been operationalized fully. India's National Water Policy (2012) included the management of ecological flows in all regulated rivers as an important priority. However, the provision of ecological flows, or the presence of guidelines to facilitate e-flows, has been very limited, if any.

At present, two major projects with a core focus being the recovery of *Platanista gangetica* are being supported by India's Ministry of Water Resources, River Development & Ganga Rejuvenation and Ministry of Environment, Forests, and Climate Change. These include the National Mission for Clean Ganga's biodiversity documentation project (WII-GACMC 2017) and the Compensatory Afforestation Management and Action Plan (CAMPA)-funded Species Recovery Program for Ganges River Dolphins (Qureshi et al. 2018). Both are well-endowed projects helmed by scientists from the Wildlife Institute of India, a governmental organization. This is an encouraging development. The outputs of both projects need to carry strong recommendations for the conservation of the species to other governmental agencies mandated with "river development". This is crucial in order to identify mitigation and avoidance strategies to halt the social and ecological impacts of large-scale water development projects, which have been long-term preoccupations of the Indian government. Achieving this is difficult, but any progress would mark the primary criterion for the cost-effectiveness of these projects.

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