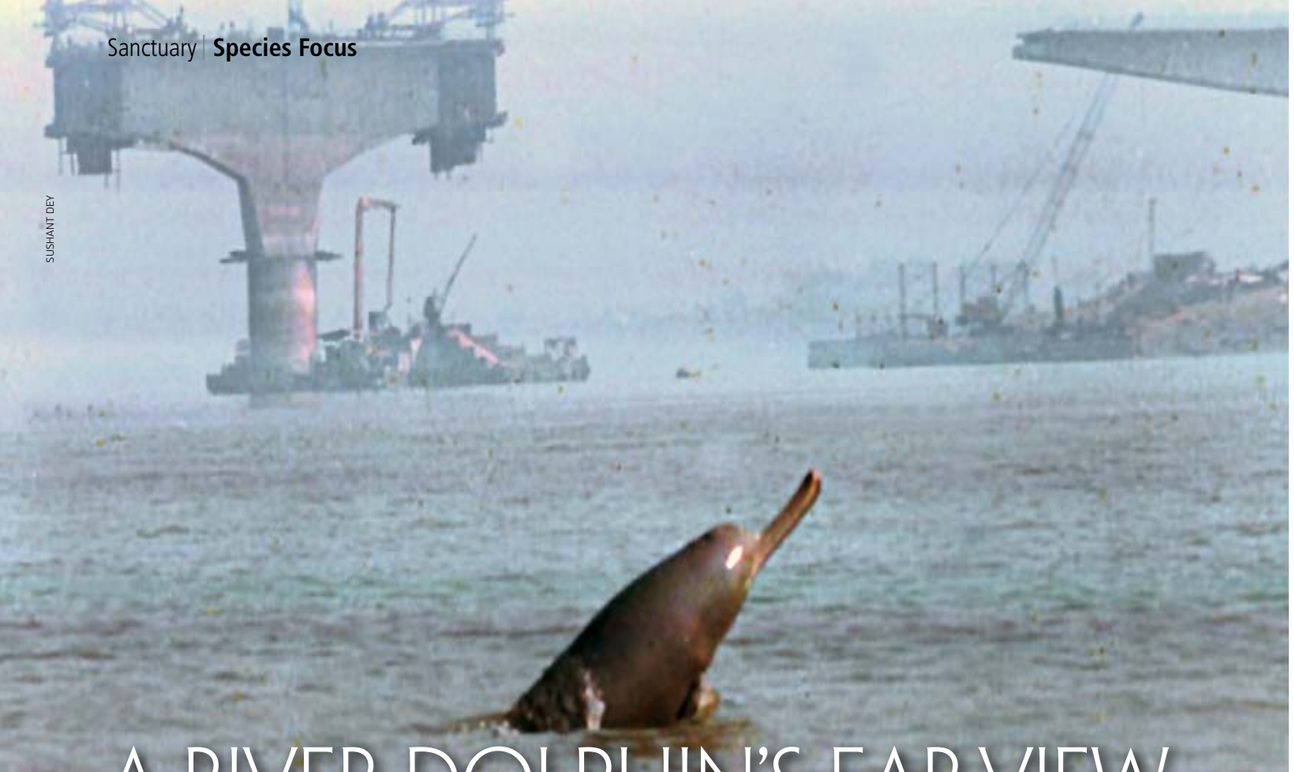


SUSHANT DEY

A RIVER DOLPHIN'S EAR-VIEW OF INDIA'S WATERWAYS DEVELOPMENT PLANS

By Nachiket Kelkar

A river dolphin took a tired lunge before diving into the Hooghly river next to a noisy, mammoth, crowded vessel ferrying passengers on National Waterway No. 1 (NW-1) in Kolkata. Its tail stood up stiff, flicking wildly, straight out of the water before it dived down headfirst. Such a dive indicates acute distress in dolphins. It heaved, surfacing after seven minutes, a longer interval than normal. How could we know what had happened? The dolphin is a difficult cetacean to study; in the murky waters it inhabits, it is impossible to see the animal underwater. Just a few glimpses of surface activity are usually visible. Although it has evolved to be effectively blind in the sediment-laden Indus-Ganga-Brahmaputra river systems, it can 'see' using high frequency echolocation clicks. Two bony crests in front of the skull help focus the click trains it emits from its larynx. The dolphin clicks and listens all the time. The river dolphin's 'ear-view' refers to understanding the potential impacts of waterways on river biodiversity from a sensory perspective, keeping an ear to the water.

SYSTEMATIC DEGRADATION

To begin finding answers, we must zoom out and travel upstream to the Farakka Barrage. Completed in 1975, this barrage was meant to halt and divert the waters of the Ganga (flowing into Bangladesh) through a feeder canal and navigation lock to flush out accumulated silt that was threatening the viability of the Kolkata port. The Farakka feeder canal was a key link of NW-1 on the Ganga, designated in 1982. The NW-1 runs for 1,620 km. from Allahabad in Uttar Pradesh to the Haldia port downstream of Kolkata. Of course, the Farakka Barrage failed to meet its objective, with the Kolkata port's condition not improving and sediment-dredging costs continuing to accumulate. The current state of Farakka's navigation lock reveals that no lessons were learnt (See Box 1: *India's National Waterways Act* of 2016).

India's regime of water mismanagement is based on extraction of river flows for irrigation, urban supply, and power production through dams, hydropower projects, barrages, and

A river dolphin surfaces near a bridge-construction site on the Ganges river.

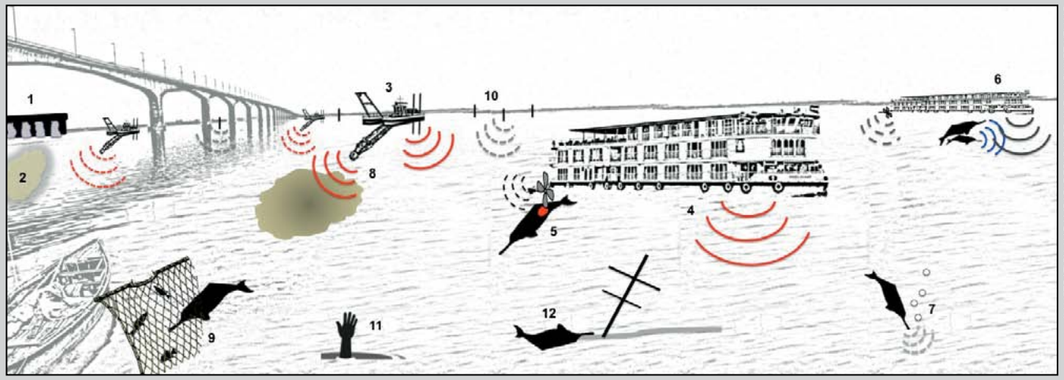


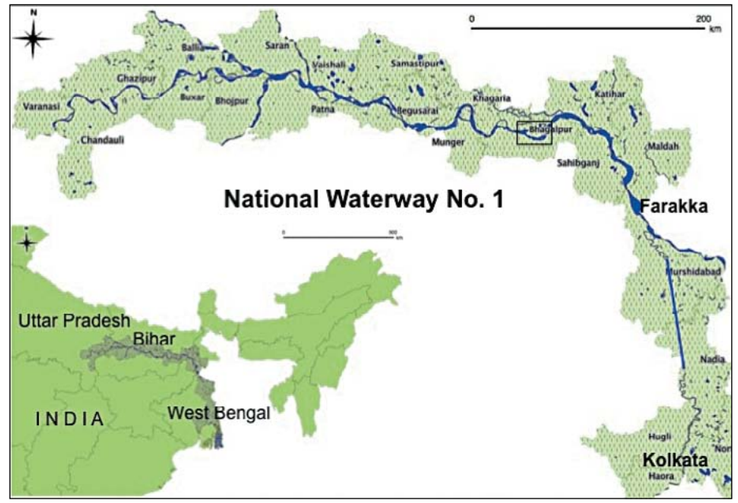
ILLUSTRATION: KADAMBARI DESHPANDE AND NACHIKET KELKAR

AN ILLUSTRATION OF THE POTENTIAL IMPACTS OF WATERWAYS DEVELOPMENT ON THE GANGA:

1. Barrages reduce flow regimes; 2. Reduction of flows for bridge construction; 3. Cutter suction dredging; 4. Large vessel traffic; 5. Propeller hits and injury to dolphins; 6. Masking of echolocation sounds emitted by dolphins, and evasive movement away from vessels; 7. Deeper diving by dolphins, 8. Sediment dislodging and disturbance by dredging; 9. Risk of entanglement in gillnets following evasive movement from vessel movement; 10. Water pumping and noise levels due to irrigation; 11. Risk to human life from modified channel depths; and 12. mortality of dolphins from accumulated chronic stress.

canals. As a result, most of our rivers run waterless in the dry season or flow as sewers carrying polluted water. Adding the burden of national waterways on these rivers seems to be the proverbial last nail in the coffins of both dolphins and rivers. That most of the 106 new proposed waterways are dry for most months of the year merely underscores how ridiculous the proposed scale of waterways expansion is.

River dolphins would have shared space with river vessels for a long time in the past, as river navigation was common and flourishing in the Gangetic basin until the 19th century, at which time the development of railway networks diminished its importance. But this navigation was based on sail and oar, and in rivers with unbound flows. Today, our waterways are predicated upon dredging rivers, muting their naturally pulsed flow regimes, and blocking their flow at will to run large motorised ships... all interventions that seriously damage river ecology. In NW-1 on the Ganga, for instance, the dredging requirement is about five million cubic metres of sediment per year, to maintain river channels to be 45 metres wide and three metres deep. Dredging is noisy work and causes heavy disturbance from removal and in-river dumping of bottom sediment. Sediment deposits in shallower sections downriver reduce dolphin habitats and pushes animals



towards potentially risky areas. With these events now becoming regular, the distressed dolphin in the Hooghly river is an indicator of what lies ahead.

PROPOSED WATERWAYS

It is evident that in the current scheme of things, dolphins, other aquatic biodiversity, local fisherfolk and farmers might soon be left with no means available to survive. Over 90 per cent of the Gangetic dolphin population distribution in India overlaps with the extent of the proposed waterways. This list includes existing waterways on the Ganga (1,620 km.), Brahmaputra (891 km.), the Bengal Delta and Sundarbans (>200 km.), the Barak river and tributaries in Assam and Bengal (>400 km.), and the Ghaghra (340 km.), Gandak (300 km.), Kosi (236 km.), Chambal (402 km.), Beas (191 km.), and Mahananda (81 km.). Of these, the Barak, Ghaghra, Gandak, and Kosi waterways are to be expedited. In Bihar, the surviving 1,200-1,500

AN OVERVIEW OF INDIA'S INLAND 'NATIONAL WATERWAYS' DEVELOPMENT PLANS

The National Waterways Act, passed unopposed in 2016, identified 111 river stretches along a total length >18,240 km. across India to convert to inland waterways. The main purposes are 1. transport of coal for thermal power plants, bulk and oversized cargo, hazardous wastes, mineral oil, industrial machinery, automobiles; 2. tourism, and 3. passenger movement. The reasons touted for this are that waterways are cost-effective and eco-friendly, as compared to roads and railways that have greater congestion, infrastructural costs and carbon footprint. Waterway development is planned in conjunction with river interlinking and more barrages. Until this happens, the plan is pivoted on mechanised dredging of river bottom sediment to maintain minimum depths for ship passage.

MAYUKH DEY

VBREC, BHAGALPUR

ABOVE *Mechanised dredging of river-bottom sediment is done for passage of large cruise ships such as these that ferry tourists on the Ganga.*
TOP *A cutter-suction dredger of the Inland Waterways Authority of India (IWAI) operating in the Vikramshila Dolphin Sanctuary, Bihar.*

dolphins are highly vulnerable to dredging and navigation impacts. Vessels of the Inland Waterways Authority of India have been regularly dredging inside the Vikramshila Gangetic Dolphin Sanctuary in Bihar – possibly without environmental or wildlife clearances. 'Unprotected' reaches of the Ganga and its tributaries also hold viable dolphin populations, but environmental impact assessments for the NW-1 wrongly assume that mitigation measures apply only to Protected Areas such as Vikramshila.

"Imagine that a two-third of the tiger population in India is living along a 1,600 km. long and one kilometre wide stretch of forest, and then a highway goes along – that is what the situation of NW-1's dolphins is getting to," explains Dr. Rashid Raza, who heads the Ganga basin part of the River Dolphin Species Recovery Programme at the Wildlife Institute of India. These dolphins are already endangered due to decline in river depth at the hands of dams/barrages, mortality in fishing nets, and hunting. Now waterways, in combination with existing risks, will impair dolphin stress-tolerance, prey capture ability, and hearing. Understanding such factors in noisy, busy watercourses is critical. We need to go beyond mere population assessments and distribution mapping, into the arena of behavioural studies on acoustics and stress (Box 2).

Subhasis Dey, a researcher working with fishing communities in the Ganga for nearly 20 years, believes that along with dolphins, dredging and water traffic will be bad for fisheries too. "Many fisherfolk still depend entirely on river fisheries for subsistence," he argues, "and benthic fishes dominate the catch. Dredging could destroy breeding grounds of substrate-dwelling benthic fishes and shrimps, which still support an impoverished fishery. Benthic fishes also dominate dolphin prey." Fishermen Banke Mahaldar and Sankar Suhni from Bhagalpur say that dredging will seriously impact their livelihoods. Parmod, a local boatman who ferries people across the river in an old country boat every day, finds the big ships useful because they put 'deep-water markers' in the river that help him navigate safely, but quickly adds, "the ships are not meant for us... they are for the coal plants." About 20 people have died at the Bhagalpur ghat because of deep dredging in the river. The NW-1 also has plans for 'ro-ro' (roll-on roll-off) ferries that will at least in part replace local boat-based economies, on which thousands of people like Parmod depend. These responses raise the disturbing question of whether the waterways plans are indifferent to the marginalised people and species that will bear their real impact.

Dr. Sunil Choudhary, who heads the dolphin conservation programme at the Bhagalpur University, caustically comments, "The waterways plan completes the list of threats to the Ganga. This is all that was remaining."

What can be done to remove or reduce these potentially devastating impacts?

Well, efforts at multiple levels have sparked some discussion on mitigation measures. A letter from the International Union for Conservation of Nature (IUCN) to the Union Minister of Environment, Forest and Climate Change communicated the serious international concern about the endangered dolphins and other river wildlife to the government. Over time, the concerns of the Inland Waterways Authority of India (IWAI) and the World Bank have also led to discussions, and an independent study is likely to begin soon. Mitigation measures have been proposed in the draft Cumulative Impact Assessment Report on NW-1, but even these are not based on any field research. Most measures deal with improving technology: the upkeep of dredging equipment, minimising pollution from ships, reduction in noise-levels, and fitting propeller-guards, but there is no clarity on what exactly these measures will achieve. Some are outright bizarre, such as using deterrents to drive animals away from dredging sites, but where these animals are supposed to go has not been thought through. The proposed measures are clearly inadequate and piecemeal. The fact that intensive waterways development on the Yangtze river caused severe mortality of a large population of the now-extinct Chinese river dolphin must not be forgotten. The moot point is whether we can maintain some waterways transport without dredging and without damaging river ecology.

PRELIMINARY OBSERVATIONS SUGGEST SEVERE DREDGING IMPACTS ON RIVER DOLPHINS

Our research team has been conducting systematic field observations on the responses of Ganges river dolphins *Platanista gangetica gangetica* to dredging and boat traffic in the Ganga river at Barari, Bhagalpur, using a combination of dive-time recording and acoustic studies. Dolphins moved away from a hotspot (preferred area) in May 2014, where they were regularly seen, until dredging started. During dredging and ship/barge passage, surfacing (breaths per minute) of dolphins showed suppression to frequencies three times lower than in their absence. Possibly by the masking of echolocation clicks by dredging sound levels, dolphin acoustic activity decreased, and evasive behaviour increased. Reports of dolphin mortality from boat-propeller hits, and from entanglement in gillnets during an intensive dredging period in 2016 await confirmation, but hint at strong direct and indirect impacts.

SUSHANT DEY

A dead dolphin calf on the banks of the Ganga river. Dolphin calves are already vulnerable to multiple risks, and one fears that dredging might worsen their fate.

Rethinking water-management approaches based on ecological flow regimes on a basin scale is imperative, not the 'band-aid' local measures we currently see. Downscaling ship traffic and goods transport is vital, and involves compromises on industrial and infrastructural targets. Unless environmental sensitivity on the part of government and industry emerges, the environmental and social costs of India's proposed waterways development could outweigh the benefits.

The river dolphin's 'ear-view' should remind us of voices that India would irreversibly lose in the Faustian waterways bargain. Suresh Babu, a 80-year-old fisherman based at Barari, fondly narrates stories of the deep sound that the Ganga made as it flowed alongside his village. That sound meant that the uninterrupted river had its own voice, an expression of how alive it was. Scientists recording dolphin clicks in the Ganga until recently used to comment on the absence of human noises, and the silence that they could record in the river!

Part of the river's wonderful soundscape are the fine-tuned echolocation clicks of dolphins, the musical snaps, pops, grunts, pectoral spine-clucks, stridulations of fishes and shrimps, the trills of plovers and pratincoles, the whistling breeze, and the chirps of otters playing on sand banks. With the imposition of river waterways, vessel traffic, cargo tonnage, and coal-carrying ships on this ecosystem, these voices will be masked and forgotten in the white noise. The waterways threat needs much more attention and engagement than exists at present, if we want our river biodiversity to be protected for posterity. ➸