

Keeping rivers alive

NACHIKET KELKAR and JAGDISH KRISHNASWAMY

RIVER dolphins are unique freshwater mammals, found only in South America and South Asia. They are, however, a highly vulnerable and endangered species. Interestingly, state protection to river dolphins perhaps goes back a long way in India. Under Emperor Asoka's conservation *dharma* (3rd century BCE), it was prohibited to hunt or slaughter many riverine species, including the 'Gangaputaka', perhaps the Ganges river dolphin. The attempt behind this form of protection was to define 'proper' or sensitive conduct of people towards wildlife with whom they share resources and spaces. Currently, the endangered Ganges river dolphin, recently declared India's national aquatic animal, lives in human dominated and ecologically severely degraded environments. Its survival in

the murky waters of large floodplain rivers of northern and eastern India hinges on how adept it will be at dodging surmounting troubles.

Boats overloaded with people, bales of hay, cattle, motorbikes and metal trunks noisily dash across the river. Dolphins sense the boats through the opaque gray curtains and swim away from their course. At the next instant, they turn around and surface again. Sensing with their ears, the blind dolphins have successfully evaded an array of finely meshed gill nets. Suddenly there are gunshots in the distance. From the sacred *ghats*, fishermen staging a protest march against the injustice of the fisheries department, run helter-skelter. The above scene is typical of any river stretch of the Ganges system, and well depicts the daily life of an imperilled freshwater cetacean species. Be it inside the river or on the banks, the world of the endangered Ganges river dolphin is a complex, diverse aggregation of social and ecological collisions and conflicts.

Dolphins cannot be seen in isolation from their riverine landscape. Rivers are living organic and dynamic

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entities, with their flow and flood, their feed and seed, worshipped for what they give and by what they can take away. Yet today, they represent one of the largest ecological tragedies of human culture: they are choked, depleted, poisoned and interrupted by dams. The sacred Ganga and her unique biodiversity and ecosystem services have gradually fallen prey to over-exploitation, especially in the modern industrial era. Despite this, the Gangetic basin feeds over 500 million people even today.

Given this mess, how does one save an endangered species and aquatic emblem in India's national river? How can we meet the challenge of reconciling millions of diverse needs with conservation, with people living off, eating from, polluting, and dying in the Ganga? Conservationists argue for 'coexistence' (a much used buzzword today) of wildlife and competing human needs that depend extensively on biodiversity and ecosystem services. The quest for meaningful, achievable coexistence needs both objective scientific criteria and socio-ecological realities informing trade-off decisions for wildlife conservation and human well-being.

A good place to start is the Vikramshila Gangetic Dolphin Sanctuary in Bhagalpur, Bihar, the only existing sanctuary specially designated to protect the Ganges river dolphin. It was notified in 1991 due to the high abundance of river dolphins in the stretch spread across 60 km of the Ganga between the towns of Sultanganj and Kahalgaon. The sanctuary riverscape has a diversity of riverine habitats such as meanders, countercurrent pools, sandbars and even granite outcrops in deep channels. In many reaches, the river course changes year to year, often shifting northward over large distances.

This region is unique in having an almost intact assemblage of India's riverine vertebrate mega fauna that includes dolphins, smooth-coated otters, turtles, the occasional gharial, fish and migratory birds. This makes it a unique aquatic equivalent of well-known reserves of surviving terrestrial mega fauna. That it is not as well known is evidence of the marginality of aquatic ecology and wildlife in both the general public and among ecologists.

But riverine protected areas cannot be fenced by boundaries. They wobble around the central tendency of the river's course and, ever-changing, pose every difficulty of definition: boundaries, rights of usage, management authorities and whose problems take over. Immediately after the declaration of the sanctuary, the fisheries department came into conflict with the directives of the forest department. The latter refused to recognize fishing rights since fishing in a sanctuary is legally forbidden. In turn, the fisheries department refused to 'recognize' the sanctuary and continued to grant leases for fishing. Such inter-departmental conflict hardly mattered, as both authorities, ignorant of each other's priorities, played the blame-game. In effect, they neither managed fisheries nor protected dolphins. The neglect was compounded by the absence of any political will. Vikramshila may well be designated a protected area, but even here there is no respite for the dolphin.

There are thousands of fisher families living here in extremely poor socio-economic conditions, all heavily dependent on the river. It is, therefore, easily understood why, for most of its initial years, the sanctuary existed only on paper. Given a difficult law and order situation, the forest department in charge of the sanctuary

never stepped inside its open boundaries, leave aside monitoring the river stretch, or bringing turtle and dolphin poachers or bird hunters to book. As a result, many fishers regularly hunted the river dolphins for oil from their blubber, used as bait to catch a catfish species.

In 1999, a remarkable civil society initiative led by Sunil Choudhary changed this state of affairs. Through a small group called the Vikramshila Biodiversity Research and Education Centre (VBREC), Sunil launched a mass awareness campaign for fishers in the region. A professor of botany and limnology at the Bhagalpur University, he was drawn to the whole web of complexities about the dolphins' imperilled existence while working on aquatic plants for his PhD. in this stretch. Till then he had not even known that he was working in a river dolphin sanctuary.

Believing that awareness and a sense of pride about the biodiversity of their river was key to obtaining support of local fishers for dolphin conservation, the VBREC worked hard to put a stop to intentional killing of river dolphins in the sanctuary area. The initiative did bear fruit, as their continued presence and persistent monitoring of threats to dolphins and other wildlife, and socio-economic surveys resulted in a great reduction in killing of dolphins in Vikramshila.

In 2001, the Patna High Court directed both the Union and state governments to allocate funds to support river dolphin conservation in Bihar. This mixed bag of events and situations makes Vikramshila a very interesting place for exploring questions about coexistence of river dolphins with these threats in their state of the art form, and with an assurance of relating these threats to actually observed dolphin numbers,

since dolphins are not directly hunted any more.

The feudal *panidari* system prevalent in this region was effectively abolished around the year 1991. Panidari was the riverine counterpart of oppressive *zamindari*, whereby a waterlord owned a segment of the river for which he would receive a large chunk of the catch of the fishers. Needless to say, the *panidars* would harass, beat up, or even kill fishermen and their families who refused to pay the 'fish tax'. But the abolition of panidari also meant that fishing in the river now became a 'free for all'. After the abolition, criminal gangs came in and illegally continued to extort fish catch from these fishermen at gunpoint, killing anyone who refused or defied them.

A fishing mafia ring soon developed seeking a monopoly over fishing areas, often through force and brutality. They used highly destructive fishing practices to capture the smallest of fish in the river to cater to a huge market in northern West Bengal. Mosquito nets and beach-seines were excessively operated in the vicinity of highly productive confluence habitats and in floodplain wetlands marginally connected to the main river channel. These nets set off a long standing conflict between traditional fishermen and the fishing mafia.

Today, criminals and fishing villages spar with and among each other over the issue of ownership and fishing rights for confluence habitats (*kol*) and floodplain wetlands (*dhap*). The problem stems from ambiguous definition: the *dhap* is cut-off from the main river in the dry season and the *kol* may or may not get cut-off. There have been shootouts and murders in villages over fishing territories and rights to fish in these habitats.

Confluence habitats are highly preferred by fishers and river dolphins both, owing to the aggregation of fish in these areas. These netting practices cause the death of large numbers of larval and juvenile fish, reducing fish recruitment to the main river with negative consequences on viability of fish populations. Indiscriminate destruction of fish stocks by criminal/illegal practices, alongside social threats have ousted both traditional fishermen and river dolphins from their preferred foraging/fishing locations. There needs to be strict enforcement in place to ban such destructive fishing practices run by the mafia. But who will control them?

Kahalgaon is the hot seat of the fisherfolk movement against the administration, the fishing mafia and also the sanctuary. Their outcry against the oppression of criminal gangs and mafia is genuine. However, the fishers' own hands are not clean of the muck. The Ganga Mukti Andolan, a locally established movement, is agitating for the denotification of the sanctuary, which it alleges has blocked access of traditional fishers to the river's resources. Communities dependent on protected areas for their livelihoods seek denotification of these areas because of both restricted access and criminalization of their means of livelihood. But in reality, no

We investigated ecological factors and mechanisms behind the unobservable conflict within the sanctuary, by quantitatively measuring the extent and describing the nature of overlap between dolphins and fishermen, competing for space, for fish and, overall, for the river's ecosystem services. We found that there was intense competition for both foraging spaces and for fish prey, aggravated both by fishing practices and landscape level factors, such as flow reduction in tributaries from diversion of water for irrigation.

We estimated that the density of dolphins increased 1.5 times in the main river channel over the dry season, perhaps due to depleted flows of river tributaries through diversions. Spatial and resource overlap between dolphins and fishers was very high, leaving dolphins with little choice. The high overlap has led to increased risk of fatal accidental entanglement of dolphins in gillnets, and also forced dolphins to forage in sub-optimal places, due to loss of prey from preferred areas caused by excessive fishing pressure in more productive river reaches.

We also identified, based on our quantification of overlap and impact of fishing on river dolphins, sites which might be viewed as reference sites or basis for dolphin-fisher coexistence, wherein regulated fishing could actually be continued, but with least harm to local dolphin populations. River dolphins are resilient and flexible fish predators that seem to have tolerated massive changes in fish community structure and stock depletions. Their persistence even in degraded environments may primarily be due to feeding on small fish. But they are still on the threshold of existence.

Conflicting relationships have been shaped by diverse local and landscape-level social dynamics, the complex textures of which cannot enter our statistical models as parameters. In this article we focus on current threats to the conservation of river dolphins and social, economic and historical factors that have affected the riverscape over four decades.

stretch of the sanctuary is without fishermen or fishing activity.

Even after the sanctuary declaration, fishers have continued to fish in whatever way and at whichever magnitude as they liked, with the safety of I-cards issued by the fisheries department that allow fishing anywhere in the Ganga. Incidentally, the very legitimacy of 'traditional fishing rights' is questionable, as the tradition itself has a dubious existence. These so-called 'traditional fishermen' only worked as labourers in the panidari system for several generations.

Even if such a claim for fishing rights, advanced in the name of tradition, is entertained, the negative ecological impacts of existing fishing practices, not just on dolphins but on the fishery itself, are very high. The Andolan's persistent claim is that fishers have always lived in harmony with river dolphins and other wildlife, blaming all illegal killing and poaching on criminals. This is not true. Most fishers continue to kill and eat freshwater turtles, sometimes hunt dolphins for oil, kill the occasional gharial, and consume wild birds. The fisheries department rules specify that fishing with gill nets less than 40 mm in diameter is illegal anywhere in the Ganga's main channel, even if outside the sanctuary. Thus, almost 75% of the existing fishing in the sanctuary is illegal and highly destructive, be it by the mafia or the traditional fishermen.

It is true that these fishers are a highly marginalized people, affected not just by degraded socio-economic factors, but also by ecological destruction. But the sanctuary is not the reason for their marginalization, as they claim. In fact, the protected area has been a worthwhile venture. It stands out as a relatively better place than neighbouring river stretches—in terms of river flows, productivity, and richness of biodiver-

sity. Yet the mesh sizes of fishers keep shrinking year after year, and most of them are already way below the lower limit. Overfishing, pollution, or local factors and inequalities may explain only a tiny fraction of this decline. There have to be larger, landscape level historical reasons for the severely depleted state of the floodplain systems.

The proverbial rug has been pulled from under our feet as successive river engineering projects have had adverse implications for riverine ecosystems. The Farakka Barrage built in 1972 destroyed the commercial hilsa fishery in the upper reaches within which Vikramshila lies. A recent study estimated a reduction of 99% in availability and catch of hilsa since the barrage was built. Today, hilsa can be regarded almost (ecologically/commercially) extinct in this region, playing hardly any ecological function.

Heavy pollutant loads, eutrophication, spawning habitat degradation and overfishing have led to enormous declines in native commercial carp species, and catches gradually being replaced by 'trash' species, predominantly catfish. Average fish sizes available and caught in fishing in these reaches indicate mostly juveniles and small sized adults, which is the most visible indication of ecosystem-level fisheries collapse. Fishermen lift up their empty nets to find only tiny fish caught after over 14 hours of painstaking effort. In addition, upstream dams and the diversion of water for human use might have genetically isolated river dolphin populations within the Ganges basin.

What, then, is the basis for coexistence? The resource base of the Ganga is so degraded that fishermen are scrounging for scraps. Fishing has shifted to smaller and smaller fish sizes, and to shallower areas. Owing

to their evolutionary determined feeding morphology, river dolphins tend to forage in shallow river areas and feed mostly on small, schooling fish. As the fishers are now compelled to target only small fish, resource competition with dolphins has likely intensified over the years. It is evident in the increased cases of accidental entanglement and death of dolphins in small mesh gill nets.

It is really tragic that Bihar, a land of three large fertile floodplains, has to import more than 60% of its fish from pond culture farms in Andhra Pradesh. This unfortunate state of affairs reminds us that strong steps are urgently needed. Fishing will have to be regulated and its intensity controlled, especially in dolphin hotspots. Having said this, we re-emphasize the need to completely curb destructive practices by fishers and mafia alike. Regulated and non-destructive fishing sustained over a long-term could itself lead to restoration of collapsed fish stocks and needs to be a long-term goal for the management of the Ganges basin fisheries. The restoration should lead to improved health, numbers and availability of native commercial carps, and preponderance of larger fish sizes and improved juvenile recruitment. Large-scale restoration would involve measures for protecting hydrological services, flooding regimes, preventing degradation of bank habitats and pollution control.

There have been many episodes of mass exodus of fisher families from the area to work as construction labourers in big cities, both because 'nothing is left to fish', and the perennial threat of criminal gangs. There is a pressing need to examine alternative livelihood options. Commercial gains for fishers via alternative livelihoods need not be antithetical to dolphin conservation, or ecologically sensi-

tive riverfront management. While reducing pressure on the already depleted resource base, these options could also improve the local economy through involvement of fishers' knowledge and enterprise. A good example that has been successful elsewhere is the creation of community based aquaculture or fishing cooperatives. Cooperatives set up by local fisher groups via microcredit initiatives could empower fishers to manage their respective stretches, and at the same time, help the sanctuary authorities in monitoring and regulating illegal, destructive fishing.

Bihar has made recent progress with improved social indicators and reduction in crime rates. The improved social security could help create opportunity for involving fishermen in ecotourism around the Vikramshila Sanctuary, making them important stakeholders in sanctuary management. The proximity to Kolkata offers a good opportunity for such initiatives.

River dolphin tourism has started in a few locations in the Chambal river on a very small scale. Planning ecotourism ventures in Vikramshila would also require assessing their benefits to fishers as against other commercial interests. But these measures can help as they utilize and preserve traditional skills and ecological knowledge for conservation. The National Rural Employment Guarantee Scheme too can be effectively used towards this end.

After the dolphin was declared the national aquatic animal, Bihar has taken some measures, such as the appointment of 'dolphin *mitras* (friends)' from local fishermen who will monitor illegal fishing and intentional killing of dolphins. However, this has the danger of getting reduced to symbolic cash incentives and may not be enough. Nevertheless it can

still inculcate some sense of goodwill about dolphins among local fishers, which can slowly be developed into a means to both conservation and economic gains.

Besides short-term and local measures for saving dolphins, major large changes in current management practices and policy of river systems are necessary. It is impossible for any one NGO or a few sensitized individuals to actually bring these about. Reducing water consumption and pollution by agriculture/urban sectors, cooperative floodplain pondbased fisheries, alternative livelihoods and restoration of fish stocks can enable rivers to sustain biodiversity, local communities and ecosystem services. The current political leadership in Bihar has ushered in many improvements in governance, and can help secure such conservation initiatives. Keeping the river alive in terms of its productivity will ultimately support coexistence of fisheries with river dolphin conservation.

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