A SHORT TERM EXPEDITION OF RIVER GANGA. PART -II: RANDOM CENSUS OF GANGETIC DOLPHIN (Platanista gangetica gangetica) BETWEEN VARANASI AND FARAKKA WITH BRIEF NOTES ON THEIR AMBIENT ENVIRONMENTAL CONDITIONS - AROUND SELECTED LOCATIONS

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Gangetic Dolphin Platanista gangetica gangetica once in abundance in the Gangetic region right from Haridwar to Bay of Bengal is now an animal under endangered category of IUCN. To assess its present status of population, with special reference to the ongoing project of commercial navigation through the NW-1 stretch between Varanasi to Farakka, a random field study was undertaken during the month of June 2018, as an extension of our earlier field survey of June 2015 and September 2015 between Varanasi to Farakka stretch, to study the eco-biology of river between Varanasi (Allahabad too in 2015) and Farakka (upto Haldia during 2015). It was found that between this stretch of our study Ganga river region around Patna had the highest numbers of Dolphins (81 encounters in a stretch of 10 km), while Ghazipur area for the same distance of 10 km did not show any Dolphin (zero number of encounters), during our survey. Patna area was followed by Kahalgaon (37 encounters), Farakka (29 encounters), Sahibganj (17 encounters), Varanasi (9 encounters), Bhagalpur (7 encounters) and Buxar (5 encounters). However, in view of having a mobile / gregarious mode of living, these values can not be treated as sort of fixed population for the Dolphins. The data would be highly fluctuating for any number of observations even during the same date, but for different times of day, specially during early morning, peak noon and afternoon times well before sunset. Our observations and as per accounts of local riparian fishermen at each station, the timings of maximum numbers of Dolphins differed.

Key words: Platanista gangetica, Ganga, Riparian fishermen, Population density

The Ganga starts at 4,000 meters above sea level in Gangotri, Uttarkashi District, Uttarakahand, India from the southern inclines of the Himalayan range. The river Ganga flows through the Shivalik slopes and enters the plains at Haridwar. From Haridwar, it flows southwards wending more than a few hundred kilometers in the Indo-Gangetic fields in Uttar Pradesh, Bihar and West Bengal, eventually to join the Bay of Bengal. It's way is around 2,525 Km long, and its basin is spread over around 86,1404 square km region, draining around one fourth zone of the nation. No other river on the planet is so firmly related to a nation as the Ganga with India. Approximately half of the Population of India lives along the Gangetic catchment areas (Mistra, 2011). The basin is home for the five types of freshwater cetaceans including the endangered Ganges river Dolphin River dolphins occurring in Asia and southern America are amongst the world's most threatened mammal species (Kreb & Budiono 2005). The Ganges river dolphin (Platanista gangetica gangetica), generally known as 'Susu' is dispersed along the Ganges, Brahamputra, Karnaphuli-Sangu and Meghna river system and their tributaries, from the lower regions of the Himalaya in India, Bangladesh, Nepal and Bhutan. It has been declared as the National Aquatic creature of India and an imperiled freshwater cetacean species. The species is morphologically and systematically unique and being the only blind cetacean, is reliant on echolocation for movement, sensory recognition and feeding. The subspecies is situated at the top of food chain in the freshwater biological community and plays a crucial function in maintaining its ecological balance. However its status has become a matter of grave worry for the past few decades, and its population has declined significantly. The population of this animal, one time dispersed richly from tidal zone to lower regions of the Himalayas, has declined and there has been considerable reduction in abundance where the animal still occur. River and related freshwater ecosystems in the Indian subcontinent are under risk due to a large range of intensive human use and developmental activities. Smith (1993) categorized Ganga basin and its tributaries as main habitat of susu. Different studies have proposed the water depth, channel width and depth, direction and velocity of flow, geographically complexities, and substrate types affecting dolphin habitat use (Sinha et al., 2000; Choudhary et al., 2000, Behera et al., 2013 and Joshi et al., 2018). Apart from myriads of eco-environmental factors, the population dynamics and diversity of its prey are other important factors, which affect population size and habitat selection of the Gangetic Dolphins, has been pointed out by Sinha (2006). In this study we found the present status of Dolphin species its occurrence in the river
system of Ganga between the stretch of Varanasi to Farakka.

MATERIALS AND METHODS

Stretch between Varanasi to Farakka was surveyed during this study. Study stations were selected on account of their vulnerability in view of the developing / developed cargo stations for Inland waterways Authority of India for IW-I. Global positioning system (GPS) was utilized during navigation for recording the locations of sightings around each station and nearby water channels. At each station, observations on dolphins and potential anthropogenic threats were recorded. We conducted surveys in the mainstream of river Ganga between Varanasi to Farraka. Boat based visual surveys was carried out around each stations, and always at least about 3 km. up or down stream of the terminal developing station, which remains a hub of anthropogenic activities, mainly during day hours. Throughout the continuous surveys we used sail/paddle country boat. We used a direct count up method to calculate dolphin abundance. Survey plan followed earlier studies conducted by different authors (Sinha et al., 2000, Wakid, 2005 and Alam et al., 2015). The investigation team comprised of three researchers. An average of 12.0 -15.0 km of the river stretch was covered for each location. We considered a single boat with 2 primary observers and 1 rear observer. Two prime members were positioned at the front of the boat and left and right of a data recorder and constantly searched for dolphins with naked eyes. A third observer worked as data recorder and as well as searched for dolphins when not filling up the data sheets. We avoided double counts by keeping close communication with the primary observers.

RESULTS AND DISCUSSION

This paper very briefly describes the census of Gangetic dolphin between Varanasi and Farakka. Table 1 shows the dolphin sightings in river Ganga around each stations for the month of June 2018. Station wise salient features are discussed here below.

1. Varanasi: At Varanasi during the course of more than 10 km. Beyond Ramnagar and Ghats, we had only 09 encounters of Dolphins, moving across the length of the river, stopping at each encounter and waiting for recurrence of encounter in that area. We slowly moved upward and down ward of the Rajghat as well as major Dasaswamedha ghat looking for Dolphin existence. There were no sightings of Dolphins with in 3 km of Banaras Ghats US or DS. Three encounters were between Ghat area and Ramnagar while other six were beyond 3km of Ramnagar terminal site. It appears there are excessive siltation

Table 1: Dolphin Population as encountered in the present Study [June -2018]

<table>
<thead>
<tr>
<th>Station</th>
<th>Dolphin Sighting</th>
<th>Distance Covered (Km)</th>
<th>Per km (Around each station)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Varanasi</td>
<td>09</td>
<td>10</td>
<td>0.90</td>
</tr>
<tr>
<td>Ghazipur</td>
<td>00</td>
<td>10</td>
<td>0.00</td>
</tr>
<tr>
<td>Buxar</td>
<td>06</td>
<td>08</td>
<td>0.62</td>
</tr>
<tr>
<td>Patna</td>
<td>81</td>
<td>08</td>
<td>8.10</td>
</tr>
<tr>
<td>Bhagalpur</td>
<td>07</td>
<td>08</td>
<td>0.86</td>
</tr>
<tr>
<td>Kahalgaon</td>
<td>37</td>
<td>08</td>
<td>4.50</td>
</tr>
<tr>
<td>Sahibganj</td>
<td>17</td>
<td>10</td>
<td>1.70</td>
</tr>
<tr>
<td>Farraka</td>
<td>29</td>
<td>10</td>
<td>2.90</td>
</tr>
<tr>
<td>TOTAL</td>
<td>185</td>
<td>72</td>
<td>19.58</td>
</tr>
</tbody>
</table>

Average no. of Dolphins: 2.56
2304 Dolphins in Total stretch between Varanasi to Farraka
Average : 2.44 Per Km.

Figure 1: Map Depicting location of Study Sites (Varanasi to Farraka)
and more lowering of water volume in the Ganges in this area, which is further, complicated with the widening of river span at various places and increased meandering of the stream. The size of dolphins, as guessed from sightings, was not as big as compared to dolphins found at Patna. It appears Varanasi city zone area of Ganga is fast turning unsuitable for Dolphins. Rising level of Pollution, lowering water depth, improper dredging, increasing anthropogenic pressures of wide varieties etc. may be responsible for their presence declining in this part of Ganga river. According to fishermen and local people, dolphins are now not seen as often as in the past. These are relatively seen only occasionally, if not rarely in this part of river Ganga. Local fishermen informed that around Varanasi Dolphins are seen more in numbers mostly during mid monsoon to post-monsoon months and early hours of the day.

2. Ghazipur: There was no sighting of Dolphin during our survey at Ghazipur. River showed maximum shallowness, compared to other seven stations observed. At places, the river span has widened and also quickly narrowed. The local fishermen also informed that they do not see Susu any longer at least within 10 to 15 km city stretch of Ghazipures area-that is thus rare, here. May be these are moving across only during high water level or may be preferring night movements for relatively cooler water at nights.

3. Buxar: According to fishermen and local people water is too depleted in this region, therefore, the dolphin are so rare and seen mostly during early hours of the day. The high status of pollution in the river along the city area must be a detracting factor, besides high temperature and low water level. Poor fish harvesting at Buxar is also a factor of low numbers of Dolphin, over here. Though there is a good line of breeding sites for fishes on both sides of the river, except around city areas. But it appears that on account of eutrophication and putrefied water conditions, fish and Dolphins would be avoiding these locations, but for the monsoon season, when the whole of riparian areas would be cleaned up the flooding water and shallow water logged bank areas would provide a good breeding location to fishes.

4. Patna: This region seems a good habitat for Dolphins. According to fishermen they never observed that dolphin in danger due to ships and boats. Dolphins prefer deep water and rely on the population of fishes especially on small sized fishes, and Patna appears, perhaps the best location. This may also be due to freshwater added to Ganga by the rivers from Nepal side, which not only lower the temperature of the river but also add to oxygen contents of the river. This region of Patna also provides an additional route of local migration to major fishes and to Dolphins in to the territory of Nepal, which certainly should be safer territory for all these animals compared to the Indian side, which is far widely polluted and silted. More population of dolphins was observed in mid streams of Ganga above Gai Ghat. According to local people and fishermen dolphin generally appears in higher number during the morning and in evening hours. [This statement is contrary to that of the local fishermen at Farakka, Bhagalpur, and Kahalgaon, where they informed that it is in early morning to forenoon hours or near sunset times, more number of Dolphins are seen. May be again it is due to relatively cooler water in early and later hours of the day.] On the North East side of River Ganga Dolphins were seen plenty while in the left that is the south west side of Ganga river we did not see any Dolphin.

5. Bhagalpur: According to local people and fishermen dolphins are rarely seen in this part of the river, according to them dolphins were abundant in river till a decade back, but have shifted from this region to elsewhere, and their frequency increases only during monsoon months- may be during their movement to up and down side. It appears Dolphins for their reasons have no liking for this place compared to Kahalgaon and Patna. One reason may be the lowering of river depth in this part of the state.

6. Kahalgaon: This area provides a wide and well spread aquatic ecosystem for Dolphins. Since Dolphins prefer deep water for resting and comfort as well as shallow feeding and aeration requirements, Kahalgaon offers both. Kahalgaon also provides wider and safer areas for the young and new born Dolphin calves- which mostly move with their mothers up to 3-4 years. We have observed about 7-11 meter depth at this site. A good number of Dolphins were located around temple site, though also seen even up to 4 km up and down stream as well. Local people informed that Dolphins appear in higher number during monsoon months and that all adults accompanied with their calves are seen more during monsoon and post-monsoon months. They also suggested that probably these breed during pre-monsoon months, though perhaps are breeding round the year, except in lesser numbers during winters.

7. Sahibganj: According fishermen and as we also witnessed there were good numbers of Dolphins between Bijli Ghat and
Samtha Ghat station. Dolphins prefer deep water and rely on the population of fishes especially on small sized fishes, and follow these. Higher numbers of encounters were noted as we moved towards Samtha Ghat, with an increase in depth. It is also that water temperature becomes down with Depth. It is our experience that during these summer months the Dolphin prefers a temperature between 25.0 to 28.0°C, compared to around 30.0-32°C at the surface. This was observed almost all places where we measured the temperature at surface within 15-30 cm depth and at about one meter of depth -where temperature is low, compared at surface. According to local people, Dolphins are seen in higher / highest number during, monsoon period when water level of river was high.

8. Farakka: This region also provides good habitat to Dolphin. We were able to witness a good number of counters of Dolphin, during our boat journey as well while resting on the banks of the canal, near security post and downstream about 3-5 km of the barrage. According to local people population of dolphins seems to have increased, though few others said it has depleted. In Farakka in the last few years. the main food of dolphin is small fishes, and we also observed that small sized fishes are plenty in this region. Dolphin and their calves were also observed in feeder canal. Here too local residents said the Dolphins are seen in higher numbers during pre-forenoon hours and then around evening, before sunset. Again it is perhaps related to avoiding sunshine.

Dolphin Encounter Rates: We recorded that maximum encounter rate of dolphins was 8.10 sightings km⁻¹ at Patna and minimum encounter rate of dolphins was 0.0 sightings km⁻¹ at Ghazipur in Ganga river during the study period, ( for the surveyed 10.0 km stretch at each station). The highest numbers of dolphin sightings in river Ganga was at Patna. While in Ghazipur the temperature of river Ganga was highest in and the volume of water in river Ganga is very low in comparison to all stations due to this the sighting of Dolphin was not seen in this area. After the joining of the Ghaghra, Sone and Gandak rivers rivers in this zone most of the ecological parameters become more favourable to fish fauna as well as for the Gangetic Dolphins, which prefer cooler waters, higher dissolved oxygen, greater depth, wider and deeper river span and richer diversity and fish biomass on the other hand, as has been pointed out in our earlier paper (Joshi et al., 2018). Ganga water had highest amount of DO contents around Patna (7.2 mg/l) as well as lowest water temperature (28.6°C ) higher velocity of 1.2 m/s, higher transparency of 46.0 cm, lower turbidity of 12.0 NTU and relatively higher abundance of fish diversity compared to other seven stations studied during this survey cum expedition (Joshi et al., 2018). These conditions appear favourable for higher numbers of Dolphin encounters in this region.

Status and Distribution: Abundance monitoring of the dolphin Platanista gangetica gangetica, population has been conducted since the early 1990s using direct visual counts from vessels through continuous surveys, surveys in discrete segments or point counts from the river bank (Smith, 1993; Smith et al., 1994; Sinha et al., 2000). Methods were not sufficiently detailed and hence it was not easy to evaluate bias, estimate precision, or reliably detect trends from the data. In addition, different workers used different methods, precluding direct comparison of counts in different stretches of different rivers. According to Sinha et al. (2010), 1985 and 1991 government of India under its Ganga action plan sponsored a research and conservation project to protect the endangered species of Ganga including Susu, the Gangetic dolphin and use this as an indicator species for biomonitoring of river Ganga water quality. A small amount of individuals live in the River Kamaili in Nepal and may be the Sapta Kosi River. Dolphins are present in the Ganga River and its tributaries such as Yamuna, Chambal, Ghaghra, Gandak, Rapti, Narayani and Kosi Rivers (Sinha et al., 2000). Due to increase in a variety of anthropogenic threats, a decrease in its historical range and population size has been recorded (Smith et al., 2006). There is no absolute scientific estimate of range-wise abundance of this sub-species, but it was scheduled as "endangered" (IUCN, 2004). During a survey conducted by WWF-India and its associates in the entire distribution range in the Ganges and Brahmaputra river system-around 6,000 km-identified fewer than 2,000 individuals in India (WWF, 2009). In the Brahmaputra valley it ranges into the major tributaries such as the Tista, Adadhar, Champamat, Manas, Bhareli, Subhansiri, Dihang, Dibang, Lohit, Disang, Dikho and Kulsi rivers. Generally dolphin numbers has been reported greater at confluences of two or more rivers or branches of same river (Sinha 1997). Downstream it ranges through the larger tributaries between the Hugh and Meghna rivers, as far as the tidal limits at the mouth of the Ganga (Rice 1998). Gangetic Dolphins have been extirpated from portions of their upstream
range in Nepal and India, and populations have been fragmented and reduced in numbers where they still occur (Sinha et al., 2000 and Wakid, 2005 and 2009).

CONCLUSION

In Patna area highest numbers of Dolphins were encountered. It appears mainly it is on account of lowest water temperature, good depth, and comfortable DO of river water, due to few large s tributaries joining the river Ganga in this area. Besides this part of river Ganga was found calmer, only next to    Kahalgaon area. In Ghazipur area highest temperature was recorded and the river shallowness was apparent in this part, compared tyo other seven stations studied. On the basis of our field studies and number of dolphins encountered it is estimated that about 2304.0 Dolphins are present in between Varanasi and Farakka. Their highest number being at Patna - 81.0 (Table 1), while lowest number was found at Ghazipur being Zero- not seen. However we take it as a conservative estimate of Dolphins in the Ganga River. Our studies tempt us to go for a possibility of higher numbers of Dolphins, as it is not absolutely possible to have a precise counting of these highly mobile animals that too in any aquatic system of such wide diversity- as that of river Ganga. If our Govt. is indeed very serious for conservation and protection of Dolphins then it would be best to have one more sanctuary in Patna region, close to the confluence of Gandak with Ganga or at the confluence of Son with Ganga. As these locations add high volume of freshwater and would offer wider safety zones to the Dolphins with escape routes and are also lesser polluted and disturbed zones.

REFERENCES