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Current Status of Dolphin in Ganges River India

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The Ganges river dolphin, *Platanista gangetica*, commonly known as susu is an endemic fauna of Indian subcontinent . It is a freshwater dolphin and is distributed in Ganga-Brahmaputra-Meghna and Karnaphuli river systems of India, Nepal, Bhutan and Bangladesh between estuarine zone to foothill of Himalayas. It never enters sea. IUCN has classified this animal as endangered. Over exploitation usually by gill net fishing and habitat destruction are the causes of decline of dolphin population in the Indian rivers. Dams and barrages have fragmented the dolphin habitats and genetically isolated the dolphin population . The dwindling riverine fishery is adversely affecting the dolphin population also. Besides in Ganges and Brahmaputra the habitat of susu has shrunk in all the larger as well as smaller tributaries. From most of the areas of the distribution range the dolphin is either extinct or its population is very thin.

Introduction

The Ganges river dolphin *Platanista gangetica* (Roxburgh1801) commonly known as susu is a freshwater dolphin which never enters sea. Only four species of freshwater dolphin, *Platanista minor* (Owen,1853) also known as Bhulan, Yangtze river dolphin, *Lipotes vexillifer*(Miller 1918) also know as Baiji an Amazon river dolphin, *Inia geoffrensis* (de Blainville,1817) also known as Boto, are found in Pakistan, China and Latin America, respectively.The Ganges river dolphin is distributed in Ganga-Brahmaputra-Meghna and Karnaphuli river systems of India , Nepal, Bangladesh and Bhutan (Jones, 1982 ; Reeves and Brownell, 1989) .The population of this animal, one time distributed abundantly from tidal zone to foothill of the Himalayas, has declined and there has been substantial decrease in abundance where the animals still occur (Reeves and Leatherwood, 1995). Anderson (1878) emphasised that the upstream range of this dolphin was limited by insufficiency of water and by rocky barrieres and reported that even in the month of May, when the Ganges is very low, dolphins were present in the Yamuna river as far as Delhi.

The only recent record of dolphin in Yamuna at Delhi was that of a dolphin caught in fisherman's net in 1967 and brought dead to the Delhi Zoo (K.S. Sankhla , personal communication). The International Union of Conservation of Nature and Natural Resources (IUCN) classified susu as vulnerable (Klinowska, 1991) which has recently been changed to endangered (Baillie and Groombridge, 1996) . Susu is a solitary animal, however, occasionally it is found in groups of 2 or

3 or more (Nath, 1974; Jones,1982). Infrequent sightings of pairs are presumed to involve mothersand calves (Kasuya and Haque, 1972) .The Ganges river dolphin has been reported to migrate into tributaries from the main stream of the Ganga especially in floods . The susus have marked preference for particular reaches where convergent flow caused counter-current eddy systems to develop . Smith (1993)categorised it as primary habitat of susu. Such microhabitats were created where small stream branches or tributaries converged with the main river channel . Highest densities of Boto have also been at confluences and higher densities near sandbars, at major bends, and downstream of large temporary islands of debris than elsewhere in the rivers (Reeves and Leatherwoods, 1994; Leatherwood *et al.,* 1991). Evolutionary adaptation by the dolphins to a turbid fluviatile environment has resulted in regression of the eye (Herald *et al.,* 1969) and the development of a sophisticated echolocation system (Pilleri *et al.,* 1976). The dolphins swim almost constantly often on their sides. Shortly after initiating a dive the dolphin spins 90^0 on its lateral axis and 180^0 on its longitudinal axis to swim on its side, in the direction opposite from the surfacing direction (Smith, 1993). During side swimming the body is oriented head down at an angle of approximately 10^0 from the bottom . The head sweeps up and down in scanning motion and the flipper trails along or slightly above the bottom (Herald *et al.,* 1969). The flippers almost feel the bottom to identify the habitat by the nature of its bottom.

The purpose of the present paper is to discuss the current status and distribution of the Ganges river dolphin in India and to set priorities for future research and conservation action . It may be emphasised that the accurate assessment of susu population in its entire distribution range is not available . Nevertheless, the estimate of abundance given in this paper will indicate relative occurrence and gross population level.

Materials and Methods

The estimates reported in this paper were generally obtained from surveys conducted by various workers without rigorous application of a well-defined survey design. We conducted surveys in the mainstream of the Ganga between Allahabad and Ganga Sagar Island besides small stretches of some of the tributaries of Ganga, like Yamuna, Sarda, Ghaghara, Gandak, Kosi, Sone and Punpun rivers . We used a direct count survey method to estimate dolphin abundance as recommended by panel of experts of Cetacean Specialist Group of the world conservation union, the IUCN (Perrin and Brownell, 1989). We remained in the area for approximately 15 minutes to record the count of dolphin whenever they were sighted. Usually the number was greater at confluences of two or more rivers, streams or branches of the same river and at meandering of the river. At such sites more time was devoted in order to reduce the chances of counting a single animal more than once or under counting when more than one animal was present. We used sail/oar driven country boat during the surveys and every day floated down from early morning to sun set. We recorded best, high and low estimate of the number of animals in the group . The low estimate was considered to be an absolute minimum count and the high estimate an absolute maximum count . The high and low estimate were used to reflect our confidence in the accuracy of the best estimate. We used identical best, high and low estimates to indicate a high level of confidence in our best estimate. During some sightings dolphins appeared to follow the boat which added uncertainty to whether subse-

quent sightings were new or the same animal(s). In this case we used a low estimate of zero to reflect the possibility of making double counts. Long time dives, unpredictable movements and quiscent behaviour also made using a single count unreliable. During quiscent behaviour, dolphins surface without an audible blow and expose only the upper most dorsal surface of the melon. Sightings that could not be substantiated by subsequent surfacings or confirmation by a second member of the team were given a best and low of zero and a high estimate of one . We also used distinctive physical characteristics of individual animals (e.g. scarring, length of rostrum relative to the height of melon, and body size) and the location of surfacings relative to shore line features or other animals to assist in making group-size estimates. Estimates were arrived by consensus among the team of observers that initially sighted the dolphins.

Status and Distribution

Main channel of the Ganga River

Entire Ganga river has not been surveyed, however, various workers (specialists and amateurs) have reported sightings, distribution and counting of susus in Ganga mainstream . Farthest upstream sightings was reported at Nangal (50 km downstream of Hardwar) in September 1994 (R.Kumar pers. comm.). Rao (1995) sighted 22 dolphins between Bijnor and Narora Barrage. He sighted 2 dolphins at Farukkabad. Gupta (1986) sighted 52-55 dolphins at 27 different locations between Allahabad and Calcutta. Ali (1992) recorded a minimum of 28 and maximum of 159 dolphins in lowest and highest water season from Buxar to Sirighat.

We conducted continuous survey between Patna and Farakka (500km) in November 1994 and estimated a best of 224 with lowest count of 207. In October 1995 during a continuous survey between Allahabad and Patna (700 km) best estimate of 237 dolphins was obtained (lowest 198, highest 265). On 7 January 1996 a minimum of 92 dolphins were counted by us in the Vikramshila Gangetic Dolphin Sanctuary between Sultanganj and Kahalgaon (50km) in Bihar. In October 1996 we conducted a continuous survey between Patna and Farakka and could sight a best of 112 dolphins with 103 lowest and 130 highest count. In December 1996 we sighted 26 dophins between Bijnor and Narora Barrage.

Farakka feeder canal, Bhagirathi and Hoogly rivers

In April and August 1995, March and September 1996 and February 1997 we counted 20,14,14,21 and 12 dolphins, respectively. We conducted a continuous surveys in Bhagirathi (320 km) and Hooghly (upto Calcutta Botanical garden) rivers in April 1995 and sighted best of 119 dolphins (lowest 104 , highest 132) in Bhagirathi and of 12 dolphins (lowest 10 , highest 16) in Hooghly .About 5km below Barrackpore and Howrah Bridge due to unavoidable circumstances we had to floatdown during high tide in night so we could not sight any dolphin. We sighted a single dolphin at Kakdwip ferry station on 12 April 1995 . The same day local fishermen at Ganga sagar Island informed the presence of dolphin downstream the Holy bathing ghat of Ganga Sagar . We could not confirm the same as no vessel was available to go to the site. The dolphins were found frightened in Hooghly near Calcutta due to heavy river traffic of steamers and motorized boats. The animals were found occupying very small available undisturbed areas in and around Vidyasagar Setu.

Tributaries of Ganga

Yamuna river

Last record of dolphin in Yamuna at Delhi was in 1967 when a dolphin caught in fishing net and already dead was brought to Delhi Zoo (Pers. Comm. K.S. Sankhla, the then Director of Delhi Zoo). We sighted 18 dolphins between Kausambi and Allahabad in October 1995. Maximum(11), were sighted in Yamuna at Allahabad as this river has greater depth as compared to Ganga so it harbours most of the dolphins.

Chambal river

Singh and Sharma (1985) sighted 45 dolphins between Batesura and Pachnada (305 km). Later on, in March 1993 Sharma (1993) sighted 72 dolphins between Pali and Pachnada (435 km) and again the same authors (Sharma *et al.*, 1995) sighted 75 dolphins between Pali and Bhare (425 km) while conducting Gharial survey in the National Chambal Sanctuary.

Ghaghara river

Upstream Girijapuri Barrage at Kailashpuri in Baharaich district of Uttar Pradesh Ghaghara is known as Girwa river which is a Gharial Sanctuary betwen India-Nepal border and Katarnia ghat. In between India - Nepal border and the barrage 16-23 dolphins were sighted (Smith *et al.*, 1994) We frequently sighted 1-3 susu at Revilganj, Chhapra in Bihar (approximately 20 km upstream confluence of Ghaghara and Ganga).

Gandak river

Dolphins are frequently sighted in Gandak near Vaishali (approximately 60 km upstream confluence of Gandak and Ganga) as reported by the local fishermen. Very often we see dolphins in Gandak at Hajipur (40 km downstream Vaishali). We did not find any dolphin on both sides of Gandak Barrage at Valmikinagar on India-Nepal border in October 1994.

Kosi river

Ganges river dolphins are distributed throughout the river between Kosi Barrage on India-Nepal border and convergence of Kosi with Ganga near Kursaila. During our one-day survey on both sides of Dumri Bridge (approximately 15 km distance) near Mansi we oberved 2-3 dolphins in July 1991. Local fishermen reported large number of susu further downstream at Vijay ghat, Naugachhia.In May 1994 a best estimate of 26 dolphin were sighted (highest 32, lowest 22) by our team between Kosi Barrage at Birpur and Supaul (approximately 60km) during a continuous survey.

Mahananda river

No comprehensive survey has been conducted in Mahananda or its tributaries . However, information collected from local people confirmed the presence of susu even in smaller tributaries of this river near India-Nepal border. In February 1993 we received a dead pregnant susu which was reportedly caught in a small river Mariadhar. In Lohandra river, another small tributary, an adult female was caught in January 1993. A local enviornment activist reported sightings of ap-

proximately 10 dolphins in river Bhalwa (S.Sahay Pers. Comm). All these rivers are part of Mahananda basin.

Sarda river

During our continuous survey in March 1994 between Sarda Barrage and the farthest upstream limit of dolphin, distribution water was insufficient to support dolphins near Dudhwa National Park. We did not sight any dolphins, locals reported sightings of susu in monsoon season, however, we could not confirm the same when we visited during monsoon season in 1994.

Sone river

Reportedly dolphins migrate from Ganga into Sone upto Indrapuri Barrage (approximately 75km) during monsoon. We could not confirm the sightings of susu at Indrapuri Barrage in September 1995. During rest of the year river Sone dose not have sufficient water to support dolphins. Probably the dolphins return back to the mainstream of Ganga after the flood is over. Wildlife officials of Madhya Pradesh reported presence of dolphins in Sone river at Sidhi in Madhya Pradesh. Dolphins have also been reported from smaller tributaries in north Bihar viz. Burhi Gandak, Bagmati, Baya etc.

Brahmaputra river

Currently the susu is distributed in Tista, Manas (Jackson, 1986), Buri Dihing, Disang, Dikhow, Dibong, Dihong, Janji, Lohit, Diphlu, Disduya, Siang, Sibu, and Subansiri(Reeves *et al.*, 1993). Dey *et al.* (1992) surveyed the entire main channel of Brahmaputra in Assam between Saikhowaghat and south Salmara during 1990-91. 201 dolphins between Saikhowaghat and Silghat, 220 between Silghat and Gauwahati and 905 between Gauwahati and South Salmara were sitghted. The total count of 1326 was considered by the authors to be an estimate of the population size in the Brahmaputra and its tributaries. Mohan (1994) monitored most of the tributaries of Brahmaputra extending upto Arunachal Pradesh. Altogther 268 dolphins were counted during the census in Brahmaputra and its tributaries. The total population was estiamted to be about 400 . In river Kulsi approximately 12 resident dolphins were reported (Mohan, 1994) . In Mihi Beel (Lake) of Kaziranga National Park only one dolphin was sighted. Definitely this single dolphin isolated in a lake will never survive for long. Lal Mohan, Dey, Bairagi and Roy conducted a detailed study of susu population from South Salmara to Sadiya and counted 268 dolphins in Brahmaputra river in approximately 650 km stretch (Mohan, 1996). They also reported a few dolphins in river Kulsi, Subansiri and Mihi Beel of Kaziranga National Park.

Discussion

Currently total population of the Ganges river dolphin in Indian territory cannot be estimated but status in specific areas has been recorded from various sources. The distribution of range mapped by Anderson (1878) has also been updated after more than one hundred years. The habitat preference of the susus has also been identified in Ganga and its tributaries. Ganges river dolphins have marked preference for particular reaches with specific physiographic and hydrologic features . Smith (1993) called it " Primary habitats" which were defined as sites where convergent flow caused

counter-current eddy systems to develop. Such microhabitats were created where small stream branches or tributaries converged with the main river channel. The susus were sighted maximum at river confluences, below rapids , behind sandbars, at meanderings of the river during our survey. In all these habitats counter-current eddy systems are formed. Smith (1993) hypothesized that such areas enable dolphins to maintain their position with minimal energetic output while at the same time monitoring opprtunities to catch fish that pass in higher velocity currents near by. Interestingly throughout the stretch of Ganga between Allahabad and Farakka and in Bhagirathi river between Jangipur and Tribenighat near Kalyani dolphins were sighted at ferry ghats and near cremation ghats. Probably with human activities at ferry ghats and cremation ghats fishes especially cat fishes get attracted as they get food materials, and in turn the susus are attracted. In Ganga major concentrations were found at Allahabad 'Sangam' (confluence of Ganga and Yamuna), confluence of Tons and Ganga at Sirsa, confluence of Ghaghara and Ganga at Doriganj near Chhapra, confluence of Gandak and Ganga at Patna, at Kahalgaon near mid channel rock islands and at confluence of Kosi and Ganga near Kursaila.

Construction of dams/barrages in the main channel of Ganga and at the heads of all the tributatries has fragmented the susu populations into genetically isolated subpopulations and reduced prey due to blocked migratory routes. Unfortunately, whenever a dam or barrage has been constructed in an area inhabited by dolphins, no systematic study was carried out to document both pre-and post-development conditions. No baseline information is available for the dam/barrage sites to compare the current status, behaviour and ecology of susu with those of pre-dam conditions. Besides construction of dams and barrages other causative factors of habitat degradation are high siltation due to deforestation in catchment areas of the river and other anthropogenic activities, like obstruction of river water for various human uses resulting in very low flow of river water, pollution from various sources affecting overall health of the river etc. High concentration of organochloride especially DDT and PCBs (Polychlorinated Biphenyls) in fishes of Ganga and tissues of dolphins(Kannan *et al.*, 1993,1994) is a warning of deteriorating conditions of Ganga ecosystem. India is yet to be fully industrialised and if the toxic substances are not managed properly it will be a disaster in future not only for these rare and endangered species but for the human health also.

The Gangetic dolphins feed mainly on smaller fishes which are economically less important (Sinha *et al.*, 1993) . Indiscriminate juvenile fishing especially during post-monsoon season results in decline of prey of susus. Continued use of monofilament nylon gill nets is a matter of great concern as dolphins fail to echolocate such fine thread gill nets and in turn are entangled or drowned. Maximum mortality of young dolphins was observed during June-July with the onset of monsoon. Probably the dolphin's calves and juveniles, born between January and June move to floodplains to catch fishes and at these sites the fishing activities are also intense during this period which result in susu catches. Mohan (1996) opined that the calves of dolphins have less developed sonar senses which result in their more deaths as compared to adults. Approximately 100 dolphins per year were killed in Ganga in Bihar in 1980s and earlier days but after launching of mass awareness programmes under Dolphin Conservation Project of Government of India in 1991 the killing rate has come down to approximately 25 per year.Direct killing has almost completely been stopped, however, inciden-

tal killing is continuing. The dolphins are killed mainly for its oil but its flesh is also eaten by few people of fishing community. The dolphin oil is used by fishermen as a fish bait especially for *Clupisoma garua* and *Eutropiichthyes vacha* (Mohan, 1996a). This practice results in decline in the dolphin population and contaminated organochlorines (DDT.) have been found to be 1.2 million times more in dolphin blubber as compared to river water (Kannan *et al.*, 1994) which is making its way to human body through food chain should be stopped immediately and fishermen be advised to catch these economically important fishes with the help of fishing nets.

Priorities for research and conservation activities.

There is immediate need to survey all the smaller tributaries where susus still occur and upstream barrages which have genetically isolated sub-populations, so that proper management plan can be formulated to save these animals from extinction. Unsurveyed part of Ganga, Brahmaputra and their larger triburtaries needs to be surveyed using well defined uniform survey methods to fully assess the current status of susus in Indian territory. Dolphins inhabiting smaller river channels are probably more affected by anthropogenic factors and are more vulnerable. On India-Nepal border the only river which supports a viable population is the Karnali river of Nepal (Ghaghara in India) (Smith *et al.*, 1994). There is an urgent need of binational conservation action plan to save the surviving susus which may be sponsored by international conservation bodies. In the main channel of Ganga the stretch between Narora and Bijnor barrages harbours a small population of about 30 susus which are facing threats due to various human activities. This area may be declared as a protected area and a detailed study of susus behaviour and ecology must be carried out without much delay. The Farakka feeder canal also harbours a small population of susus (10-20) throughout the year and the canal is under heavy fishing pressure especially at Farakka and Jangipur. This canal (38km) may also be declared as protected area . An effective management plan needs to be formulated and implemented in the Vikramshila Gangetic Dolophin Sanctuary in Bihar between Sultanganj and Kahalgaon. Our aim should be to find out practical and effective means to conserve susu without disrupting the lives of the local people.

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