The status and distribution of major aquatic fauna in the National Chambal Gharial Sanctuary in Rajasthan with special reference to the Gangetic Dolphin *Platanista gangetica gangetica* (Cetartiodactyla: Platanistidae)

Anil K. Nair

81, Shopping Center, Kota, Rajasthan 324007, India
Email: crane_anil@rediffmail.com

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Author Details: Anil K. Nair is a conservationist working in Hadothi region of Rajasthan. Honorable Secretary of Hadothi Naturalists Society and Hobby Nature Club, Kota. A member of BNHS, IBCN, OBC, his latest work is on community involvement for conservation of Sarus Cranes in Hadothi region.

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Abstract: This paper records observation on the status and distribution of Gangetic Dolphin, Gharial, Mugger and other aquatic animals, and birds in the National Chambal Gharial Sanctuary in Rajasthan during the Chambal river expedition conducted with the Indian Army in May 1998. A total of five Gangetic Dolphins, nine Gharials, 14 Indian Mugger crocodiles and 118 species of birds were sighted during the survey of 350km-long stretch of the river Chambal from Keshoraipatan-Bundi to Dhaulpur. The current status of the riverine habitat in view of disturbance and other anthropogenic factors is discussed and suggestions made to safeguard the sanctuary from various threats.

Keywords: Aquatic fauna, birds, Chambal river, *Crocodylus palustris*, distribution, Gangetic Dolphin, Gharial, Rajasthan

Introduction

Chambal is one of the few Indian rivers which flow from south to north. The Chambal valley between the Vindhyan and Aravalli hill ranges was the cradle of civilization in central India in the historical past. The river finds a mention as Charmanyawati in most of the ancient Sanskrit texts belonging to the Vedic period. Chambal is a perennial river having its origin in the Vindhyan range near Mhow in Madhya Pradesh. It flows in a northeastern direction through Rajasthan state to meet with its major tributary Parbati river near Pali in Sawai Madhopur district of Rajasthan. Along its northern course it forms the boundary first between the states of Rajasthan and Madhya Pradesh, then between Uttar Pradesh and Madhya Pradesh and joins with river Yamuna at Pachnada in Uttar Pradesh.

The Gharial (*Gavialis gangeticus*), Mugger Crocodile (*Crocodylus palustris*), Gangetic Dolphin (*Platanista gangetica gangetica*), and Smooth-coated Otter (*Lutrogale perspicillata*) are some of the rare aquatic animals found in the Chambal river. Bustard (1974), who estimated the number of gharials in the Indian rivers to be meager 60-70 individuals, had opined that the Chambal River was one of their last strongholds in India. Whitaker & Daniel (1978) recorded a wild population of less than 200 individuals, which rose to around 500 in 1981 (Whitaker & Basu 1982) largely owing to the captive breeding and release of gharials in the rivers.

The Gangetic Dolphin was once abundant in the major rivers of the Indo-Gangetic plain, and its presence in Chambal River was noted only by Jones (1982). Singh & Sharma (1985) reported 44 and 47 Gangetic Dolphins in the Chambal River between Batesura and Pachnada. They concluded that the shrinkage of suitable habitat stretches of the river posed an immediate threat to their continued survival and called for sustained monitoring of the Chambal populations. In response the State Forest Departments of Madhya Pradesh and Uttar Pradesh have taken several measures, including the periodic monitoring of the numbers of Gangetic Dolphins in the Chambal River.

The Smooth-coated Otter is another threatened species of aquatic mammals of Indian rivers, and habitat destruction due to increased human activities along the river-banks is a major cause for their rarity. Chambal River holds a small yet significant population of smooth Indian otters and was surveyed by Hussain in 1992.

In a most welcome gesture, the Indian Army approached the Wildlife Wing of the Rajasthan State Forest Department to conduct an expedition of the river for studying the flora and fauna of National Chambal Gharial Sanctuary between Keshoraipatan and Dhaulpur, a stretch of about 350km. A team of five wildlife enthusiasts including the author was nominated by the Wildlife Wing of Rajasthan to conduct this expedition. The team carried out the survey between 7-13 May 1998, and compiled detailed records

of all major aquatic and riverine fauna including the rare and endangered species. The results of the expedition are reported in this article.

Study Area

The National Chambal Gharial Sanctuary in Rajasthan extends along the Chambal river from Jawaharsagar dam to Kota barrage, and again after a gap of 18km of free zone from Keshoraipatan to Pachnada at the confluence of Chambal and Yamuna rivers (Fig. 1). The geographical limits of the sanctuary include the river bed and land area that falls within 1000m distance from both banks of the river. The sanctuary lies between 25°30'-26°52'N & 76°28'-79°01'E. In its physiography, the deep and fast flowing Chambal river varies considerably. The substrate ranges from mud and silt to sand and rock. During the dry season (April-June), the river is 100-250m wide and has a maximum depth of 20m. During the monsoon (July-September), the river floods naturally and high extents of erosion and deposition of silt takes place. The maximum depth during this period is around 50m.

The Chambal river is relatively shallow in most parts between Kota and Pali. However, the sheet rock and the shallowness of the river give rise to a number of rapids, which are extremely difficult to pass. The rapids at Nimoda, Dharampura-Sewanti, Pali and then between Mandrel and Sewar and onwards are very rough. The river is fairly deep at the confluence of Kali Sindh at Batawada and Parbati at Pali and Rameshwar. Along the entire stretch of the expedition, rampant human activities were noted in the form of illegal fishing, mining of rocks and sand. Sand mining was being carried out openly at Balita 5km downstream of Keshoraipatan and near Dhaulpur. The river is also used by commuters between villages on either side and for their daily needs. In a few places, cash crops were also grown besides the traditional farming of summer vegetables and fruits, and we even observed lift-irrigation at some places. A notable feature of the river banks was the absence of any vegetation; in fact, there wasn't a single long stretch where one could find the banks covered by vegetation. The only plants recorded include *Tamarix*, *Azadirachta indica*, *Dalbergia sisoo* and *Prosopis juliflora*, which occur in small numbers.

Methods

A stretch of about 350km was chosen for survey in consultation with the Indian Army authorities. The expedition originated from Rangpur on the western bank of the river right opposite to Keshoraipatan. It was decided to cover at least 50km on each day and the following stopovers were planned at the beginning of the expedition.

Stretch I Rangpur-Mandawara (Night halt)
Stretch II Mandawara- Gainta (Night halt)
Stretch III Gainta-Pali (Night Halt-Sheopur)
Stretch IV Maharajpur-Mandrel (Night Halt)
Stretch V Mandrel-Sewar (Night halt)
Stretch VI Sewar-Dhaulpur (End)

Depending upon the depth of the river, presence of rapids and the terrain, the earlier researchers Singh (1985) and later followed by Hussain & Choudhury (1997) had divided the river stretch into seven zones between Keshoraipatan and Pachnada (Fig. 1). Out of the seven zones, we covered four zones fully and the fifth one partially. The zones covered during the present expedition were:

Zone 1	Keshoraipatan-Chhiparda	29km
Zone 2	Chhiparda-Pali	113km
Zone 3	Pali-Rahu Ka Gaon	110km
Zone 4	Rahu ka Gaon-Bassi Dang	60km
Zone 5	Bassi Dang-Dhaulpur	40km

The zone 5 is up to Pureini,which is about 25m ahead of Dhaulpur. The zones 1 and 2 are not considered suitable for deep-dwelling animals like Gharial, Mugger Crocodile and Gangetic Dolphins.

During the survey, information on all the aquatic and terrestrial flora were recorded. A line transect census lasting fifteen minutes was conducted from the moving boat at an interval of every one hour. During the census, the numbers of all animals present on either side of the bank and in the river waters were noted. A fixed-point survey was also done at mid noon and stopover points. In addition, observations were made on fauna and flora along with habitat features wherever the boats were stopped.

Results

I. Gangetic Dolphin:

The first sighting of a Gangetic Dolphin (*Platanista gangetica gangetica*) was on 11 May at 1215hr at village Bharra, which is about 20km from Sewar on the upstream. It was seen five times surface leaping within a gap of 4-5 minutes each. The second dolphin was sighted at 1525hr the same day downstream of village Bharra. On 12 May at 0805hr about 10km downstream of Sewar at Girwa village, two more dolphins were observed surface leaping every 5-6 minutes close to each other at village Girwa. They remained about 5m apart while doing the surface leaps. The last dolphin was sighted on the same day at 1835hr near Dhaulpur at Barolli village (Table 1). All the sightings were made in river stretches where the water was calm and deep. An earlier survey in 1984-85 (Singh & Sharma 1985) did not record any dolphins before Batesura. The survey revealed that maximum concentration of the Gangetic Dolphin was found from Bassi Dang to Bharra, where one animal could be found for every 6.5km. The area of its distribution in Chambal has not changed drastically in the last 12 years. With limited data in hand, we agree with Singh & Sharma that the surfacing interval of the dolphin to breathe is about five minutes and not one minute as mentioned by Prater (1988).

II. Crocodilians:

We had our first sighting of the Gharial (*Gavialis gangeticus*) at Dharampura-Sewanti (Table 2), about 5km upstream from Pali. Two Gharial were seen close to the causeway and reportedly there were four Gharial and two Mugger Crocodiles (*Crocodylus palustris*) in that stretch of about 2km length. The presence of Gharial and Mugger at Pali and Rameshwar is undisputed. In this deeper section of water, a variety of river terrapins were also seen. Both the crocodilian species were seen at regular intervals from Pali to Dhaulpur. We were informed by the local people that muggers are to be found up to 60km upstream from Pali at the confluence of Kali and Sindh at Batawada when the river waters swell. Gharial do not seem to venture as far, and are seen at Nimola, about 30km upstream from Pali (Fig. 2)

Table 1. Location of sightings of Gangetic Dolphin (*Platanista gangetica gangetica*) during Chambal River Expedition in 1998 in Rajasthan

Location (Village name)	Number of Dolphin	Time of sighting	Surface leaps recorded
Bharra	1	12:15	4-5 times
Bharra	1	15:25	Once
Ghirwa	2	08:05	6-7 times
Barolli	1	18:35	Once
Total	**5**		

Table 2. Sighting of crocodilians during the Chambal River Expedition in 1998

Location	Time	Species		Activity
		Mugger	Gharial	
Dharampura–Sewanti	16:15	-	2	Swimming
Bharra	12:35-12:45	4	-	Basking
Basai Dang	15:38-15:45	3	1	Swimming & basking
Ghirwa	08:40-09:07	1	1	Swimming & basking
Barolli	16:45-18:30	7	4	Swimming & basking

III. Smooth-coated Otter (*Lutrogale perspicillata*)

We did not have any first-hand sighting record of Smooth -coated Otter (*Lutrogale perspicillata*) during this expedition. But local people informed us that they have often seen these animals active between Dharampura and Pali during floods.

IV. Fresh Water Turtles

Seven species of freshwater turtles are known to exist in Chambal river. We sighted five of them, while evidence for occurrence of other two species was obtained from villagers who recognized them from the photographs shown. A Monitor Lizard (*Varanus bengalensis*) was seen basking on a small rocky island and a dead Russell's Viper (*Daboia russelli*) was once observed floating in the river.

V. Bird Species

During the survey 118 bird species were sighted of which 16 were migratory.

The highest ever congregation of 323 Sarus Crane (*Grus antigone*) was seen during the survey between Keshoraipatan and Pali. Ten bird species were observed nesting on the banks and islands of the river (Table 3). Sharma & Singh (1986), on the basis of their field study in Chambal during October 1983 to 1986, reported the occurrence of 86 resident and 33 migratory bird species.

VI. Other Fauna

Besides Gangetic Dolphin, one Jackal (*Canis aureus*) and a Jungle Cat (*Felis chaus*) were seen at Pali and Sewar. Rao (1988) mentions a variety of terrestrial mammals, which were seen in the sanctuary area. With the possible exception of Fox (*Vulpes bengalensis*), Common Langur (*Semnopithecus achates*), Indian Crested Porcupine (*Hystrix indica*), Indian Hare (*Lepus nigricollis*) and Wild Boar (*Sus scrofa*), it is highly unlikely that the deer and carnivores have survived the human disturbance and habitat degradation.

The fish fauna of the Chambal river is rich and a variety of carps, catfish, mullet, cyprinids and spiny eel inhabit the river waters. The carps and the catfish prefer the deeper waters which are also home for Gharial and the Gangetic Dolphin. A Mullet (*Rhinomugil corsula*) locally known as *natera* is a fish of shallow, clean water, which was common around Kota but the pollution of the river probably has forced its distribution downstream by more than 70km. Hussain (1992) refers to this fish as a preferred food species of the Smooth-coated Otter.

Though fishing is banned within the sanctuary limits, it was observed to be regular at a number of places and was reportedly rampant outside the limits.

Threats to the wildlife sanctuary and its fauna

During the current survey, we also undertook an exercise to assess the threats that face the sanctuary and its wildlife. The major threats are listed below:

1. Extensive human activity:
    a. Excavation and mining of sand from river-bed
    b. Stone quarrying
    c. Extension of agriculture on the banks
    d. Cattle movement and grazing
    e. Illegal fishing
2. Soil erosion, gully formation and formation of ravines
3. Deforestation
4. Weed infestation

The human activity on the riverbanks has increased manifold over the past few years. Major sand excavation activity was seen at Balita near Kota, where 15 boats were seen operating and a number of motorized vehicles and camel carts were being loaded. Similar activity was again observed on a massive scale near Dhaulpur.

Stone quarrying is rampant on the rocky banks of the river near Nimoda. Besides, a big industrial house of Kota has its limestone quarrying facility on the banks of Chambal river at Nimoda. The blasting of the stone continues till late in the night.

We could not find a continuous stretch of even 1-km which was free from human activity. The muddy slopes, sandbars, mud banks and alluvial deposits are all under the plough. Though the cultivation of summer vegetables and fruits is a traditional practice, the recent trend of cultivation of crops like wheat and mustard is worrying. The increased cattle movement is basically fallout of the increased human interference with nature. The compaction of the mud banks can be seen at a number of places. The frequent movement of the cattle herd inside the sanctuary disturbs breeding animals. We feel that immediate measures need to be undertaken to ensure enough undisturbed stretches of river bank for successful breeding and long term survival of the Gharial, Mugger, terrapins, terns, plovers, pratincoles and skimmers.

The remaining four disturbance factors are interrelated. The deforestation has led to extensive soil erosion and gully formation, which is leading to formation of ravines in some parts. The precious top soil is taken away by the floodwaters and gets deposited as alluvium on the banks. The loss of the soil from the riverbank further leads to deforestation and weeds like *Prosopis*, *Parthenium* and *Tamarix* have taken over. This problem also needs to be tackled on priority.

Recommendation

1. Illegal fishing has been observed and mainly reported from Batawada, Gainta, Nimoda, Mandrel, and Sewar. The problem

Table 3. Bird species sighted during the Chambal River Expedition in 1998

S.no.	Common name	Scientific name
1.	Grey Francolin	*Francolinus pondicerianus*
2.	Quail	*Coturnix sp.*
3.	Indian Peafowl	*Pavo cristatus*
4.	Lesser Whistling Duck	*Dendrocygna javanica*
5.	Ruddy Shelduck	*Tadorna ferruginea*
6.	Comb Duck	*Sarkidiornis melanotos*
7.	Spot-billed Duck	*Anas poecilorhyncha*
8.	Garganey	*Anas querquedula*
9.	Coppersmith Barbet	*Megalaima haemacephala*
10.	Indian Roller	*Coracias benghalensis*
11.	Common Kingfisher	*Alcedo atthis*
12.	White-throated Kingfisher	*Halycon smyrnensis*
13.	Pied Kingfisher	*Ceryle rudis*
14.	Green Bee-eater	*Merops orientalis*
15.	Blue-tailed Bee-eater	*Merops philippinus*
16.	Asian Koel	*Eudynamys scolopacea*
17.	Greater Coucal	*Centropus sinensis*
18.	Rose-ringed Parakeet	*Psittacula krameri*
19.	Plum-headed Parakeet	*Psittacula cyanocephala*
20.	Eurasian Eagle Owl	*Bubo bubo*
21.	Indian Nightjar	*Caprimulgus asiaticus*
22.	Rock Pigeon	*Columba livia*
23.	Laughing Dove	*Streptopelia senegalensis*
24.	Eurasian Collared Dove	*Streptopelia decaocto*
25.	Red Collared Dove	*Streptopelia tranquebarica*
26.	Spotted Dove	*Streptopelia chinensis*
27.	Sarus Crane	*Grus antigone*
28.	Purple Swamphen	*Porphyrio porphyrio*
29.	Common Coot	*Fulica atra*
30.	Chestnut-bellied Sandgrouse	*Pterocles exustus*
31.	Black-tailed Godwit	*Limosa limosa*
32.	Common Redshank	*Tringa totanus*
33.	Common Greenshank	*Tringa nebularia*
34.	Wood Sandpiper	*Tringa glareola*
35.	Common Sandpiper	*Actitis hypoleucos*
36.	Little Stint	*Calidris minuta*
37.	Ruff	*Philomachus pugnax*
38.	Black-winged Stilt	*Himantopus himantopus*
39.	Pheasant-tailed Jacana	*Hydrophasianus chirurgus*
40.	Beach Thick–knee	*Esacus neglectus*
41.	Small Pratincole	*Glareola lacteal*
42.	Little Ringed Plover	*Charadrius dubius*
43.	River Lapwing	*Vanellus duvaucelii*
44.	Red-wattled	Lapwing *Vanellus indicus*
45.	River Tern	*Sterna aurantia*
46.	Little Tern	*Sterna albifrons*
47.	Black-bellied Tern	*Sterna acuticauda*
48.	Whiskered Tern	*Chlidonias hybrida*
49.	Indian Skimmer	*Rynchops albicollis*
50.	Osprey	*Pandion haliaetus*
51.	Black-shouldered Kite	*Elanus caeruleus*
52.	Black Kite	*Milvus migrans*
53.	Egyptian Vulture	*Neophron percnopterus*
54.	White-rumped Vulture	*Gyps bengalensis*
55.	Long-billed Vulture	*Gyps indicus*
56.	Eurasian Griffon	*Gyps fulvus*
57.	Red-headed Vulture	*Sarcogyps calvus*
58.	Eurasian Marsh Harrier	*Circus aeruginosus*
59.	Shikra	*Accipiter badius*
60.	Little Grebe	*Tachybaptus ruficollis*
61.	Darter	*Anhinga melanogaster*
62.	Little Cormorant	*Phalacrocorax niger*
63.	Indian Cormorant	*Phalcrocorax fuscicollis*
64.	Great Cormorant	*Phalacrocorax carbo*
65.	Little Egret	*Egretta garzetta*
66.	Great Egret	*Casmerodius albus*
67.	Intermediate Egret	*Mesophoyx intermedia*
68.	Cattle Egret	*Bubulcus ibis*
69.	Indian Pond Heron	*Ardeola grayii*
70.	Grey Heron	*Ardea cinerea*
71.	Purple Heron	*Ardea purpurea*
72.	Little Heron	*Butorides striata*
73.	Black-crowned Night Heron	*Nycticorax nycticorax*
74.	Glossy Ibis	*Plegadius falcinellus*
75.	Black-headed Ibis	*Threskiornis melanocephalus*
76.	Black Ibis	*Pseudibis papillosa*
77.	Eurasian Spoonbill	*Platalea leucorodia*
78.	Painted Stork	*Mycteria leucocephala*
79.	Asian Openbill	*Anastomus oscitans*
80.	Wooly-necked Stork	*Ciconia episcopus*
81.	Bay-backed Shrike	*Lanius vittatus*
82.	Long-tailed Shrike	*Lanius schach*
83.	Great Grey Shrike	*Lanius excubitor*
84.	House Crow	*Corvus splendens*
85.	Large-billed Crow	*Corvus macrohynchos*
86.	Eurasian Golden Oriole	*Oriolus oriolus*
87.	Small Minivet	*Pericrocotus cinnamomeus*
88.	Black Drongo	*Dicrurus macrocercus*
89.	Oriental Magpie Robin	*Copsychus saularis*
90.	Indian Robin	*Saxicoloides fulicatus*
91.	Brown Rock Chat	*Cercomela fusca*
92.	Brahminy Starling	*Sturnus pagodarum*
93.	Asian Pied Starling	*Sturnus contra*
94.	Common Myna	*Acridotheres tristis*
95.	Bank Myna	*Acridotheres ginginianus*
96.	Great Tit	*Parus major*
97.	Wire-tailed Swallow	*Hirundo smithii*
98.	Streak-throated Swallow	*Hirundo fluvicola*
99.	White-eared Bulbul	*Pycnonotus leucotis*
100.	Red-vented Bulbul	*Pynonotus cafer*
101.	Plain Prinia	*Prinia inornata*
102	Ashy Prinia	*Prinia socialis*
103.	Oriental White-eye	*Zosterops palpebrosus*
104.	Common Tailorbird	*Orthotomus sutorius*
105	Common Babbler	*Turdoides caudatus*
106.	Large Grey Babbler	*Turdoides malcolmi*
107.	Indian Bush Lark	*Mirafra erythroptera*
108.	Ashy-crowned Sparrow Lark	*Eremopterix grisea*
109.	Rufous-tailed Lark	*Ammomanes phoenicurus*
110.	Crested Lark	*Galerida cristata*
111.	Purple Sunbird	*Nectarinia asiatica*
112	House Sparrow	*Passer domesticus*
113.	Chestnut-shouldered Petronia	*Petronia xanthocollis*
114.	White-browed Wagtail	*Motacilla maderaspatensis*
115.	Grey Wagtail	*Motacilla cinerea*
116.	Yellow Wagtail	*Motacilla flava*
117.	Baya Weaver	*Ploceus philippinus*
118.	Crested Bunting	*Melophus lathami*

needs immediate attention from forest authorities, as this may pose the gravest danger to the Gangetic Dolphin, crocodiles and other aquatic fauna of the Chambal Sanctuary in Rajasthan.

2. In view of ecological and biological importance of the present Sanctuary, it is necessary to enhance protection to the riverine ecosystem in general and its flora and fauna in particular.

3. All commercial activity must be immediately stopped within the limits of the Sanctuary.

4. The encroachment of the riverbank has to be stopped and agriculture should be regularized, so as not to interfere with the nesting activity of birds.

5. Planting of native trees and grasses along the river banks should be taken up to stop the erosion of top soil and to stabilize the sand bank. In this regard, ravine reclamation work on watershed must also be taken up on priority. Along the stretch of 350km covered by this survey, at least 300km is at immediate risk of soil erosion and gully formation.

6. The critical habitat for feeding and nesting of aquatic fauna should be identified and protected. It may be done on the basis of suggestions put forward by Singh & Sharma (1985), Rao (1988), Hussain (1992) and the present survey. Forest guards and other frontline staff should be posted in sufficient numbers at vulnerable places.

7. Meticulously planned population monitoring of keystone species must be done on a yearly basis.

8. It is practically not possible to manage a sanctuary stretched over 400km. The responsibility may be divided among two or three wildlife divisions in each of the states namely

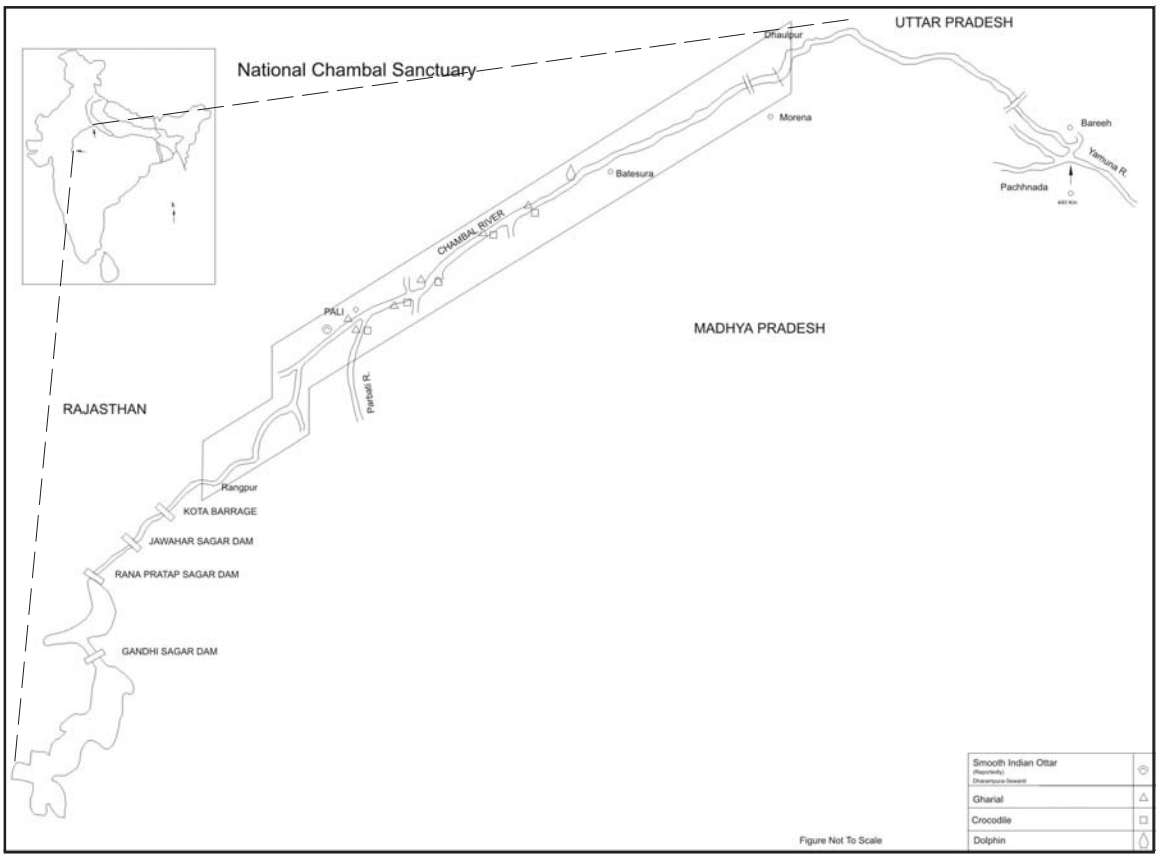

Figure 1. The sighting distribution of Gharial, crocodiles and Gangetic Dolphin during the 1998 survey.

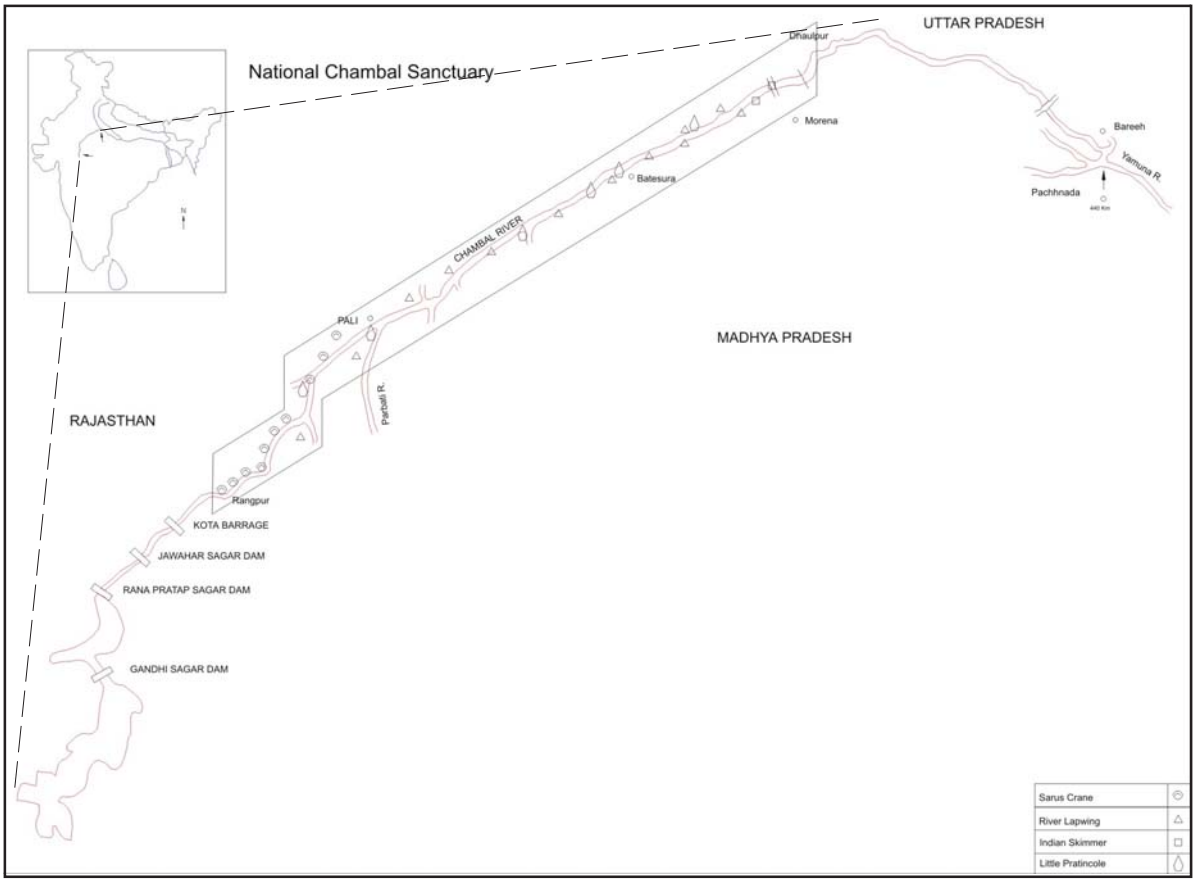

Figure 2. Sighting of some important birds during the 1998 survey.

Rajasthan, Uttar Pradesh and Madhya Pradesh. For example, the 150km stretch between Jawaharsagar and Pali in Rajasthan can be brought under the Kota Wildlife Division and the stretch between Pali to Sewar under the jurisdiction of Kailadevi Wildlife Sanctuary. The Sanctuary guards are needed to be posted at Nimoda, Gainta, Dharampura, Rameshwar, Maharajpur, Mandrel, Sewar, Dhaulpur and Pureini.

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