

Status and distribution of Indian Skimmer *Rynchops albicollis*  
breeding population in the National Chambal Sanctuary, India

Final Report



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# Status and distribution of Indian Skimmer *Rynchops albigollis* in the National Chambal Sanctuary, India

## Final Report

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## SECTION I

### 1.1. Summary

The Indian Skimmer *Rynchops albicollis* is listed as a 'Vulnerable' species because its population is undergoing a rapid decline due to widespread degradation and disturbance of lowland rivers and lakes. Indian Skimmer is confined to India, Pakistan and Bangladesh, where a large proportion of the population winters, principally in the Padma-Meghna delta, and to Myanmar. India holds the only known remaining breeding grounds for this species and National Chambal Sanctuary (NCS) is one among the very few locations in the country that hosts significant breeding populations of Indian Skimmer. Research attention on this species was mainly focused almost entirely on very basic natural history observations, and major lacunae in even basic habitat requirements of the species persist.

Our study is aimed to identify the important nesting sites, understand the ecological and anthropological factors influencing the nesting habitat selection of Indian Skimmer in NCS. During the winter survey in February 2017 we counted a total of 412 Indian Skimmer at 25 locations. In February survey we observed some individuals in the flock performing the courtship which indicates the beginning of breeding season. The island has to be 30-60 cm elevated island having one side gradual slope and shallow water. We studied detailed breeding biology of Indian Skimmer from February to July 2017.

During the breeding season, we observed a majority of the nesting colony locations in close proximity to the wintering colony locations. We recorded 22 different locations in the NCS where nesting took place. Threats to the nests were recorded from free ranging dogs, cattle trampling, stochastic environment events and sand miners. Our study helped in suggesting conservation measures for Indian Skimmer and other riverine birds in the conservation management plan of the sanctuary.



## 1.2. Introduction

Indian Skimmer *Rynchops albicollis* is one of the three species that belong to the genus *Rynchops* in the family Laridae. It is somewhat tern-like, but like most skimmers, very brightly marked in black, white and orange, making it difficult to miss. It is a species with a specialized feeding apparatus: the upper mandible is shorter than the lower mandible. The species get its name from its feeding mechanism; while foraging for food the bird flies low over water with its bill open and the lower mandible skimming through water. It occurs primarily on larger, sandy, lowland rivers, around lakes and adjacent marshes, and during its non-breeding season along estuaries and coasts.

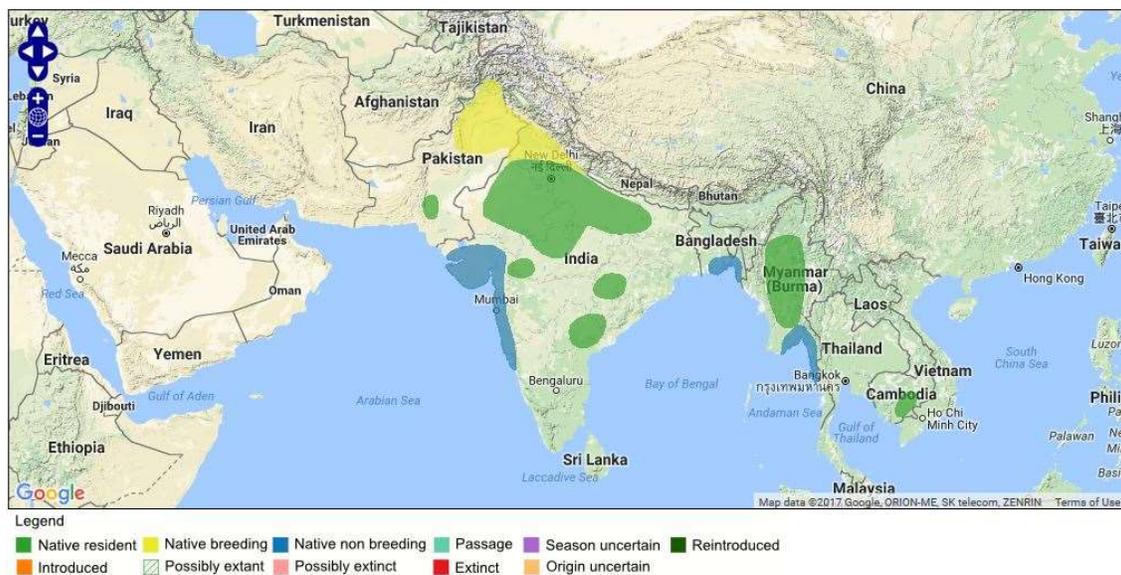
Indian Skimmer *Rynchops albicollis* is confined to India, Pakistan and Bangladesh, where a large proportion of the population winters, principally in the Padma-Meghna delta, and Myanmar. It is a rare visitor to Nepal. It has declined in India and Pakistan, although a new breeding site was discovered in Odisha, India, in 2016. Its population is estimated as 6,000–10,000 mature individuals; however, recent winter surveys in Bangladesh only located a maximum of 600 individuals around Domar Char, though further research will be needed to identify whether this is a result of a shifting distribution or a large decline in the overwintering population there (BirdLife International 2017).



Indian Skimmer *Rynchops albicollis* (Photo credit: Satyendra Sharma)

Indian Skimmer is a globally threatened species and assessed as Vulnerable (VU) since 1994 owing to its population undergoing a rapid decline as a result of widespread degradation and disturbance of lowland rivers and lakes (BirdLife International 2017). India holds the only known remaining breeding grounds and the best-known nesting site is the NCS, which hosts a significant breeding population of Indian Skimmer (BirdLife International 2001). Past research in this sanctuary has focused largely on freshwater turtles (e.g. Vasudevan 1999), the Endangered Gharial (Hussain 1999; Nair 2010) and the Smooth-coated Otter (Hussain & Choudhury 1997). There has been relatively little research attention on Indian Skimmer (BirdLife International 2001), although Sundar (2004) and Das (2015) have studied its breeding status in NCS.

Several new water extraction schemes are scheduled to be developed along the Chambal River, and could potentially affect the management of NCS for Indian Skimmer and other fauna. It is therefore a major concern that information is either scant or completely lacking on Indian Skimmer's habitat use and preferences, and the effects of habitat changes, biotic factors and human disturbances on its distribution and abundance. This study therefore aims to locate the important nesting sites in NCS, and understand the ecological and anthropological factors influencing the nesting habitat selection of Indian Skimmer. The findings of this study will make a major contribution towards establishing practical management protocols for NCS.



**Distribution of Indian Skimmer (Map source: Birdlife International)**

### 1.3. Study Area

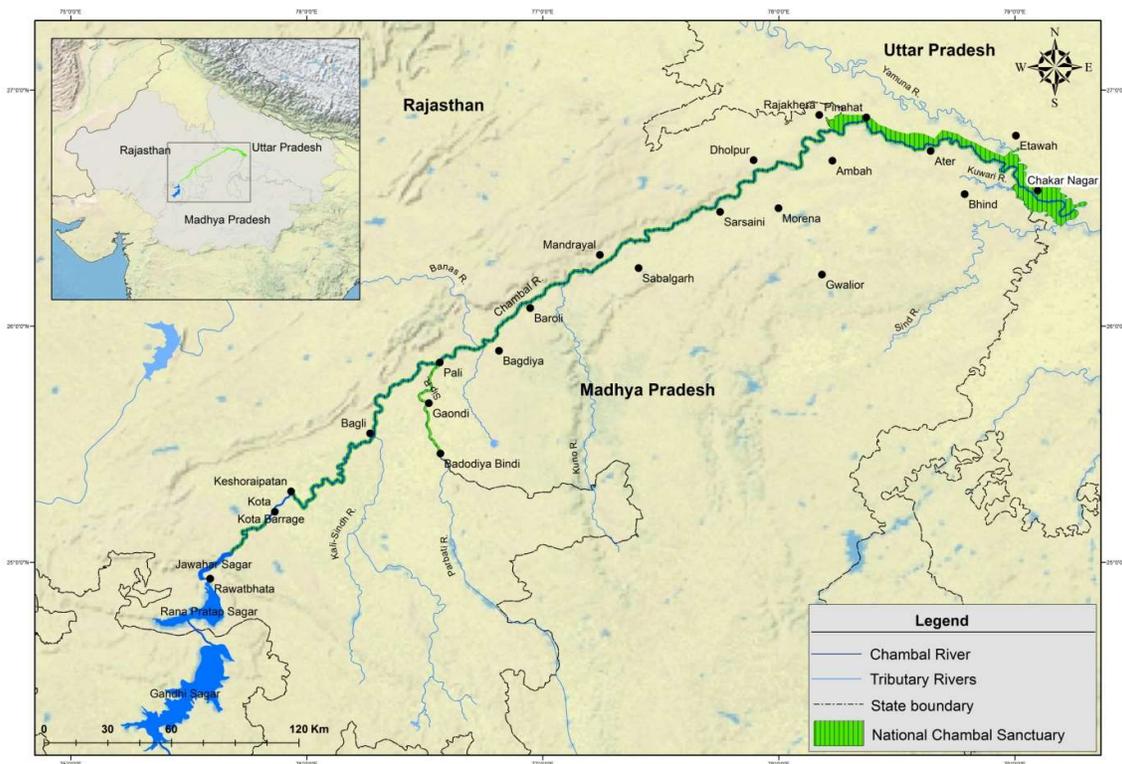
The project is being carried out in the ~435 km stretch of the National Chambal Sanctuary (NCS). It is home to threatened fauna like the Gharial *Gavialis gangeticus*, Gangetic Dolphin *Platanista gangetica*, Red-crowned Roofed Turtle *Batagur kachuga*, Indian Skimmer *Rynchops albicollis*, and Black-bellied Tern *Sterna acuticauda*, among various other riverine species. NCS consists of a ~600km long arc of the Chambal River. Over this arc, two stretches of Chambal are protected as the upper sector of NCS, extending from Jawahar Sagar Dam to Kota Barrage, and the lower sector, extending from Keshoraipatan in Rajasthan to the Chambal-Yamuna confluence in Uttar Pradesh. The study area comprises ~435km stretch of the river within the sanctuary, between Pali and Bhareh, where Chambal confluences with Yamuna. The Chambal River averages 400m in width, 1–26 m in depth (Hussain 1991). The ambient air temperatures range from 2 to 46 °C with a mean annual precipitation of 591.2 mm, the bulk of which is received during the south-west monsoons (Hussain 1999, 2009).

The Chambal Basin (24°55' and 26°50'N, 75°34' and 79°18'E) is a rain-fed catchment and drains a total area of 143,219 km<sup>2</sup>. It is characterised by an undulating floodplain, gullies, forests, ravines, and a mosaic of land-use types including the river stretch, mid-channel islands, sandbars, rocky outcrops and adjacent banks, and is bound on the south, east and west by the Vindhyan mountain range and on the north-west by the Aravallis. The 960 km long Chambal River rises in the northern slopes of the Vindhyan escarpment, 15 km West-South-West of Mhow in Indore District in Madhya Pradesh state, at an elevation of about 843 m (Jain *et al.*, 2007). The Chambal flows first in a northerly direction in Madhya Pradesh (M.P.) for a length of about 346 km and then in a generally north-easterly direction for a length of 225 km through Rajasthan. It flows for another 217 km between M.P. and Rajasthan (Raj) and further 145 km between M.P. and Uttar Pradesh (U.P.). It enters U.P. and flows for about 32 km before joining the Yamuna River in Etawah District at an elevation of 122 m, to form a part of the greater Gangetic drainage system (Jain *et al.*, 2007). Chambal also has a fall of about 732 m in elevation, from the source of the river, down to its confluence in the River Yamuna (Nair 2013). Chambal River has multiple tributaries namely, Shipra, Choti Kalisindh, Sivanna, Retam, Ansar, Kali Sindh, Banas, Parbati, Seep, Kuwari, Kuno, Alnia, Mej, Chakan, Parwati, Chamla, Gambhir, Lakhunder, Khan, Bangeri, Kedel and Teelar (Jain *et al.* 2007; Gopal & Srivastava 2008, Nair 2013).

The area lies within the semi-arid zone of north-western India at the border of Madhya Pradesh, Rajasthan and Uttar Pradesh States (Hussain 1999, 2009), and the vegetation consists of ravine, thorn forest (Champion and Seth, 1968). Evergreen riparian vegetation is completely absent, with only sparse ground-cover along the severely eroded river banks and adjacent ravine lands (Hussain 1999, 2009). The region was also subject to intentional aerial seeding of *Prosopis juliflora* in the 1980s, as a ravine reclamation measure (Prasad 1988), and

therefore *P. juliflora* is widespread in the region. Much of the basin has been influenced by a long history of human occupation (Kaul 1962).

National Chambal Sanctuary is one among few locations in the world that is known to host a significant breeding population of Indian Skimmer. NCS is an Important Bird Area (IBA), and a strong candidate for World Heritage and Ramsar Convention listings. Despite the threats, the Chambal River is relatively considered unpolluted and clean (Allen 1989). As a part of the Greater Ganges Drainage System, the water quality exhibits low suspended solids and low biological oxygen demand (BOD) and high dissolved oxygen (DO) (Hussain and Singh 1999, Hussain 2013). At present, the Chambal River is considered category 'A', on the basis on standards set by the Central Pollution Control Board, Government of India (Hussain 2013).



**Map 1: National Chambal Sanctuary (Rajasthan, Madhya Pradesh and Uttar Pradesh)**



**Riverine Island habitat of River Chambal at Uttar Pradesh (Photo credit: Parveen Shaikh)**



**Flock of Indian Skimmer resting on a sandbar during pre-nesting period (Photo credit: Suyash Katdare)**

## 1.4. Project members

### Parveen Shaikh (Project Leader); Age 30



Parveen is working as a Scientist with Bombay Natural History Society (BNHS). She is a post graduate in Environment Science and has been associated with BNHS since 2012. She leads this CLP project and has been continuing the work on Conservation of Indian Skimmer in NCS with grants which she received from BirdLife International and Ravi Sankaran fellowship. During the CLP project, she was actively part of the project planning and execution. Her role was procuring required permissions from the forest department, field work planning and implementation. She has communicated

results to forest officials and other stakeholders. She was part of all the meetings for discussing the conservation measures for Indian Skimmer and finalising the conservation management plan of the sanctuary. She is recognised as the species expert for riverine birds in the conservation management plan of the sanctuary by Madhya Pradesh forest department.

### Sriman Delip Kumar Das (Team member); Age: 33

Sriman Delip Kumar Das is working as an assistant professor of Zoology at Jagannath University, Dhaka, Bangladesh. He studied and published on breeding status of Indian Skimmer in the National Chambal Sanctuary, India during 2013 breeding season while he was pursuing his M.Sc. degree in India. He was granted a small fund by BNHS for this study. He continued to study wintering population of Indian Skimmer in Bangladesh and recently submitted a manuscript to a journal which is currently under review and waiting for the decision from the



journal editor. He joined the team of CLP and worked on Indian Skimmer for its conservation in the Indian Sub-continent. During the project of CLP, he actively participated in the first survey of Indian Skimmer to explore the Chambal river. He played a role of species expert, data analysis and report writing in the CLP team. He gained more experience on the species, planning research, executing field work and report writing through this CLP project.

**Aristo Mendis (Team member); Age 29**



Aristo is currently working as a Wildlife Crime Analyst with the Counter Wildlife Trafficking Program with Wildlife Conservation Society (India). He is a post graduate in Ecology and Environmental Sciences from Pondicherry University.

Main roles in the CLP Project: Participation in field surveys for assessment of Indian Skimmer population count and breeding biology, assistance in data entry/report writing, assistance in law enforcement awareness workshops

**Jessica Luis (Team member); Age 28**

Jessica is post graduate in Ecology and Environmental Sciences (Pondicherry University). She also has a Post-graduate diploma in Social Communications Media. She has worked independently on project 'Smooth-coated Otter *Lutrogale perspicillata* diet and interaction with inland fisheries in mangrove habitats in Goa, India' funded by the Inlaks Ravi Sankaran Fellowship Program and Wildlife Reserves Singapore. She is member of IUCN-SSC Otter Specialist Group and Marine Life of Mumbai.



Main roles in the CLP Project: Participation in field surveys for assessment of Indian Skimmer population count and breeding biology, assistance in data entry/report writing, assistance in handling social media.

**Siddhesh Surve (Team member); Age 29**



He did his Master's in Environmental Sciences from the University of Mumbai (2012). After that he joined Bombay Natural History Society (BNHS) as Project Assistant in the Important Bird Area (IBA) Programme funded by the Royal Society for Protection of Birds (RSPB). His work mainly consisted of surveying the IBAs from India (designated by the BirdLife International) for threats and updating the information on their website. This exercise enabled us to identify the IBAs in Danger, a global list of IBAs which needed conservation intervention.

Currently (since 2017) he is working as Assistant Director - Capacity Building in the Mangrove and Marine Biodiversity Conservation Foundation of Maharashtra. His role involves imparting training to coastal communities for sustainable livelihood activities which can be taken up in mangrove and adjoining creek areas. In addition to this he also conducts and coordinate the awareness and outreach programmes such as awareness workshop for the fishermen on protected marine species (fishes, cetaceans, sea turtles etc.) under the Wildlife (Protection) Act 1972.

\* Gargi Vijayaraghavan couldn't contribute much to the project because of health issues. She was away for entire project duration. We leave the decision on CLP for further considering her alumni.

## SECTION II

### 2.1. Aim and objectives

Indian Skimmer population is declining rapidly due to widespread degradation of riverine systems. India holds the only known remaining breeding grounds for this bird, and the best-known nesting site is the NCS. It is one of the least studied birds in India, with much of the information on its ecology and habits being anecdotal and descriptive. Hence this project aimed to understand the habitat requirements and needs for conserving their important breeding sites.

Our project objectives were.

1. Identification of key nesting sites/islands on the River Chambal in NCS.
2. Investigate the main ecological and anthropological factors influencing selection of nesting sites
3. Design and conduct an awareness program about the importance of conserving Indian Skimmer with schools, forest department, villages and other stakeholders
4. Design a monitoring program for monitoring the wintering and breeding population of Indian Skimmer and conservation management plan integrating all the stakeholders

### 2.2. Changes to original project plan

Our objective “Investigate the main ecological and anthropological factors influencing selection of nesting sites” had to be modified as the landscape being very dynamic, the feasibility of data collection was challenging and logistically impossible. We tried collecting the data but the analysis seemed not possible as there was no uniformity in data that was collected. Due to which, we tried answering this question on qualitative observations rather than quantitative analysis.

During the course of our fieldwork we realised that NCS staff (forest department) were completely unaware of the Indian Skimmer’s breeding status and the need for their conservation. We decided to focus on the staff and locals around the sanctuary for capacity building about Indian Skimmer conservation.

## 2.3. Methods

*Objective 1:* Identification of key nesting sites/islands on the River Chambal in NCS.

Pre-nesting survey was done in February 2017 (8th – 19th February 2017) during the annual survey organized by the Madhya Pradesh forest department. The survey covered 435km of the 600 km long NCS stretch, from Parbati – Chambal confluence at Pali to Pachnada in Uttar Pradesh. The study area was divided into 11 stretches varying between 22 km to 51 km depending upon the logistic feasibility. The date wise survey segments are given below.

**Table 1: Study area division in 11 stretches from Pali to Pachnada**

Segment No.	Date and Location	Approx. Dist. (kms)
1.	Pali-Rameshwar (08.02.17)	22
2.	Rameshwar-Katernipura (09.02.17)	39
3.	Katernipura-Atar (10.02.17)	51
4.	Atar-Sarseni (11.2.17)	64
5.	Sarseni-Rajghat (12.02.17)	32
6.	Rajghat- Kuthiyana (14.02.17)	30
7.	Kuthiyana – Usedghat (15.02.17)	46
8.	Usedghat-Ater (16.02.17)	40
9.	Ater-Barhi (17.02.17)	41
10.	Barhi- Sehson Ghat (18.02.17)	35
11.	Sehson Ghat – Pachnada (19.02.17)	35
	<b>TOTAL</b>	<b>435</b>

All the stretches were surveyed by a motor boat during the day time (0900hrs – 1730hrs). All observations and readings were taken from the boat, and during certain rapids and falls, the survey team had to walk along the banks. The river stretch upstream of Rajghat is known for its rocky profile and sloping gradient. There are several shallow, riffle stretches as well as strong rapids and one water fall at Rahu Gaon. These parts are not navigable by a fully occupied boat. Hence, during such stretches, the survey team had to walk along the banks while the boatmen negotiated the river till a favourable point where the team could again get onto the boat.

Team members were equipped with binoculars which enabled the surveyors to spot the species from a distance. Once an individual or a group of individuals was spotted, repeated counts were taken to confirm the number. Groups were also photographed to verify the numbers. GPS coordinates were marked for each sighting using the Garmin eTrex 30 Venture HC model. Photographs, wherever possible and necessary, were also taken. River depth was recorded using a Hondex PS-7 Handheld Depth Sounder, distance of the colony from the

banks, other associated riverine species, substratum of the island, bank habitat characteristics, along with anthropogenic activities such as river bank cultivation, water pumps for irrigation, stone and sand mining were recorded for all the sightings.

Nesting surveys were conducted between March and April 2017 for identifying the islands which are occupied for nesting. Along with boat surveys, bank observations were also done at previous year nesting locations (information obtained from forest department and other locals). The probability of encounters was maximized by surveying sites considered favourable based on the island characteristics and substrate. All the emerging islands were scanned for the birds and any sign of nesting. Once birds were observed we took repeated counts to confirm the number, and then the island was scanned for nesting signs and if there were any signs (nest depressions and eggs) the island was considered as an *occupied island* and if there are no signs the island was considered as an *unoccupied island*.

*Objective 2:* Investigate the main ecological and anthropological factors influencing selection of nesting sites

Following parameters were recorded for all the sampled islands (Occupied and unoccupied) for understanding the nesting island selection,

1. Island area was mapped and calculated by using GPS
2. Island substrate was categorized into sand, sand + gravel and gravel.
3. Island slope was recorded at 0, 1 and 2 feet from the water's edge in eight directions (east, south-east, south, south-west, west, north-west, north, north-east) using a Suunto MC-2 Compass/Clinometer. 13
4. Depth was recorded at 0, 1 and 2 meter intervals from the water's edge in eight directions (east, south-east, south, south-west, west, north-west, north, north-east), using a hand-held Hondex Digital Depth Sounder 3394.
5. Elevation of the island from the water level was recorded by using GPS, randomly 10 points were selected for recording the elevation.
6. Distance of the island from both the bank was recorded using a Nikon Forestry Pro Range finder.
7. Anthropogenic activities like sand mining, fishing, bank side cultivation, livestock presence, river crossing and miscellaneous activities (bathing, washing, defecation, grass soaking, temple fairs, etc) were recorded at both the banks.

*Objective 3:* Design and conduct an awareness program about the importance of conserving Indian Skimmer in schools, forest department, villages and with other stakeholders

All the NCS staff (especially the staff who work directly on field) were identified along with locals who are associated with the sanctuary as daily wages staff for monitoring Gharial and other riverine fauna for capacity building.

One day workshop and five closed group field training was conducted as part of this capacity building programme. A bilingual booklet having information of riverine birds was designed for the participants along with a small two minutes video for popularising Indian Skimmer conservation.

*Objective 4:* Design a monitoring program for monitoring the wintering and breeding population of Indian Skimmer and conservation management plan integrating all the stakeholders

All the findings of objective 1, 2 & 3 were used for designing a conservation plan. A simple methodology was laid down for surveying Indian Skimmer breeding population. A document suggesting conservation need for skimmer was designed and submitted to National Chambal Sanctuary forest department. A demonstration session was organised for forest department staff and youths from local communities for using this monitoring program.

## **2.4. Outputs and Results**

*Objective 1: Identification of key nesting sites/islands on the River Chambal in NCS.*

### **Pre-nesting survey observations**

During the pre-nesting survey in February 2017, a total of 133 bird species were observed. We observed maximum individuals of Greater Cormorant followed by Lesser Whistling Duck, Red-crested Pochard and Ruddy Shelduck. Threatened bird species observed are Egyptian Vulture (EN), Black-bellied Tern (EN), Indian Skimmer (VU), Dalmatian Pelican (VU), Woolly-necked Stork (VU), Sarus Crane (VU), Painted Stork (NT), Black-necked Stork (NT), Black-headed Ibis (NT), Oriental Darter (NT), Great Thick-knee (NT), River Lapwing (NT), Eurasian Curlew (NT) and River Tern (NT). A large congregation of Greater Cormorant, Dalmatian Pelican, Great White Pelican, Eurasian Spoonbill, Painted Stork and Greater Flamingo were seen at the confluence of Chambal and Yamuna. This high congregation at the confluence might be due to the high organic content in water of River Yamuna. Indian Skimmer, Little Pratincole, Black-bellied Tern, River Tern and River Lapwing were seen on the emerging sand islands in the river. During the entire survey we observed 412 individuals of Indian Skimmer

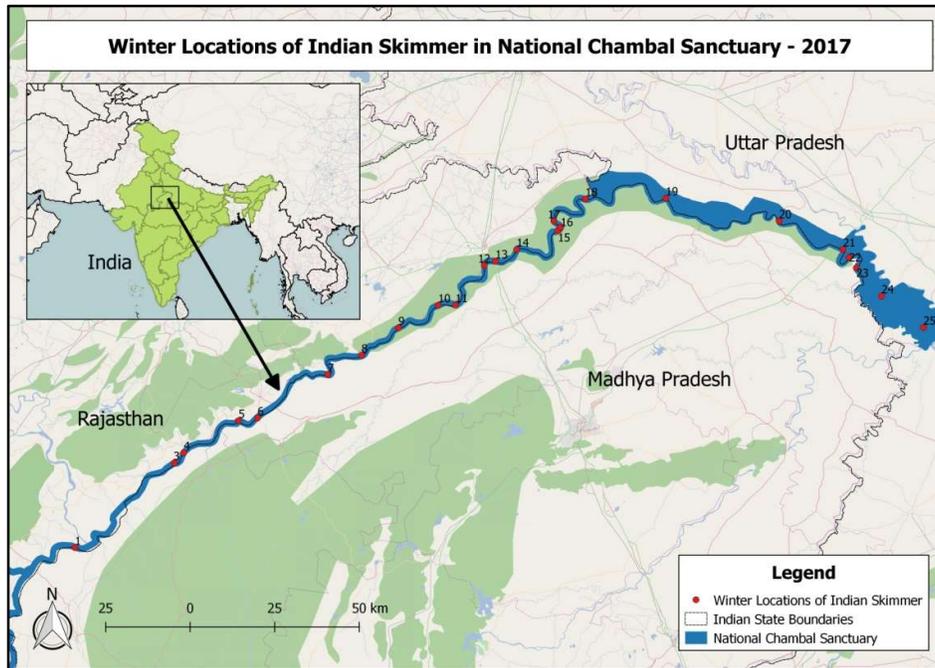
at 24 locations and the largest flock at Nakhloli had 69 individuals. A detailed account of Indian Skimmer sightings is given in the table below. Some pairs of Indian Skimmer were seen performing their courtship rituals, which indicate the start of the breeding season.

**Table 2: Number of individuals of Indian Skimmer recorded during the pre-nesting period in 2017  
(Survey stretch wise)**

<b>Sr No.</b>	<b>Stretch Name</b>	<b>Numbers</b>
1	Pali to Rameshwar	25
2	Rameshwar to Baroli	0
3	Baroli to Atar	56
4	Atar to Sarseni	8
5	Sarseni to Rajghat	59
6	Rajghat to Kuthiyana	21
7	Kuthiyana to Usedghat	74
8	Usedghat to Ater	42
9	Ater to Barai	69
10	Barai to Chakarnagar	17
11	Chakarnagar to Pachnada	41
	<b>TOTAL</b>	<b>412</b>

**Table 3: Location of Indian Skimmer colony recorded during the pre-nesting period in 2017**

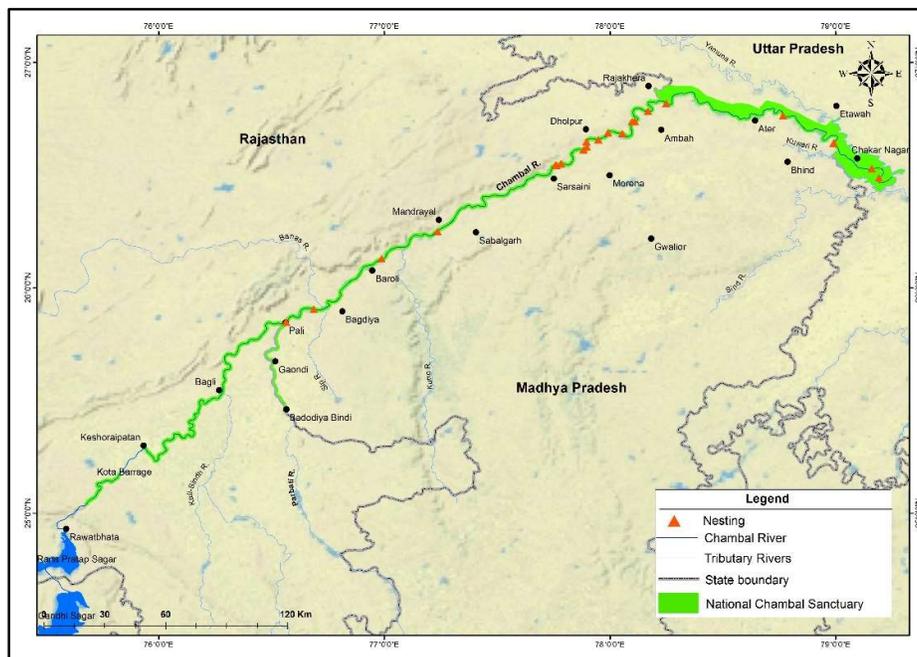
<b>Sr No.</b>	<b>Locality</b>	<b>Colony No.</b>	<b>Numbers</b>
1.	Pali	1	25
2.	Jamudi	3	4
3.	Nadigaon	4	31
4.	Raidi	5	19
5.	In flight	6	2
6.	In flight	7	2
7.	In flight	8	2
8.	In flight	9	4
9.	Dangbasai	10	34
10.	Kainthri	11	2
11.	Rajghat	12	23
12.	Dholpur Railway Bridge	13	2
13.	Tigri Rithora	14	19
14.	Babu Singh Gher	15	66
15.	Aroli	16	4
16.	Reha	17	2
17.	Usethghat	18	2
18.	Kiyori	19	42
19.	Nakhloli	20	69
20.	Barhi	21	2
21.	Khera Ajabsingh	22	2
22.	Saakhri	23	11
23.	In flight	24	2
24.	Patharra	25	41
		<b>TOTAL</b>	<b>412</b>



**Map 2: Pre-nesting locations of Indian Skimmer in National Chambal Sanctuary (February 2017)**

### Nesting Season Survey

We tried to survey the entire sanctuary for finding the nesting colonies. We found in total 22 locations where skimmers nested. Out of 22, 6 colonies were completely disturbed and the nesting was not successful. Map showing the location of the colony and a detail table is given below:



**Map 3: Nesting locations of Indian Skimmer in National Chambal Sanctuary 2017**

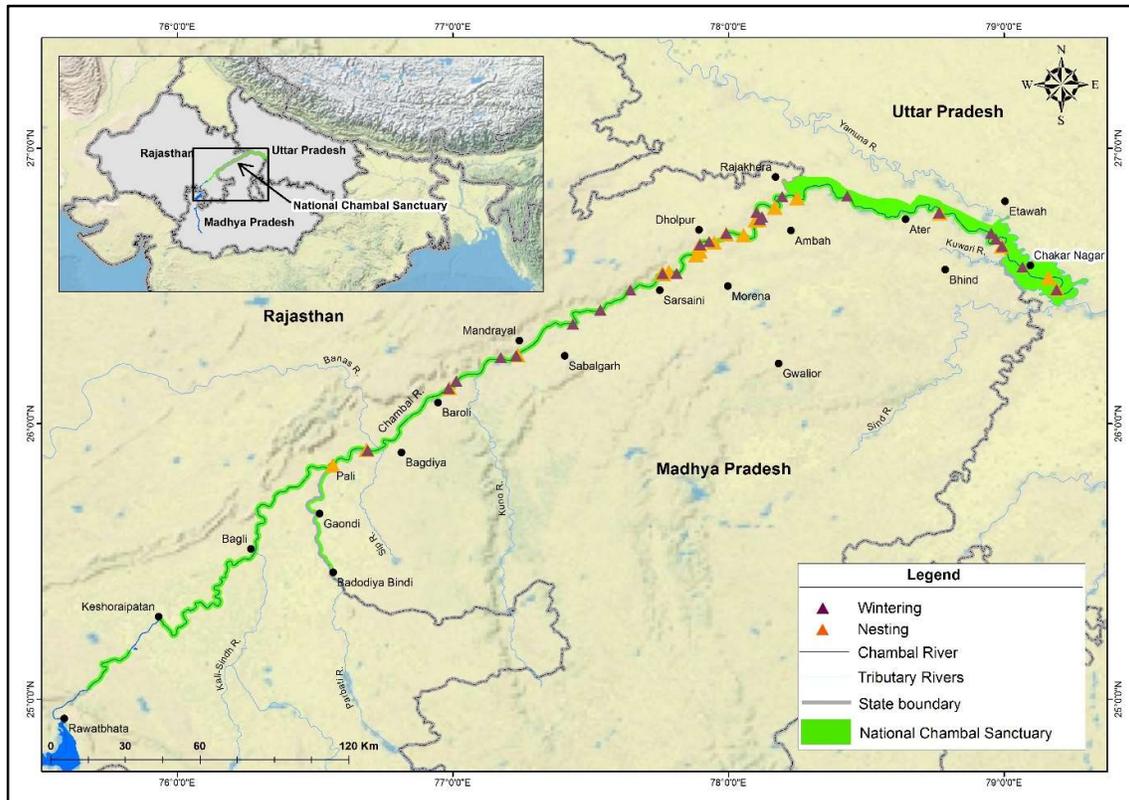
## Brief summary of Nesting Colonies

Sr. No	Nesting Locations	No of Birds	No of Nest	Clutch Number	No of Eggs
1	Pali	22	4	Probably 2 nest second clutch and 2 nest 1st clutch	6
2	Siyapur	3	1	2nd Clutch	2
3	Jamudi	18	5	1st Clutch	11
4	Sahajapur	8	4	2nd Clutch	10
5	Dang Basai A 1	45	18	1st Clutch	62
6	Dang Basai A 2	76	26	2nd Clutch	82
7	Dang Basai B	12	6	1st Clutch	18
8	Kainthri	14	7	2nd Clutch	22
9	Harigir Baba	10	5	2nd Clutch	8
10	Jaithpur	22	11	1st Clutch	39
11	Dholpur Railway bridge	33	9	2nd Clutch	21
12	Tigri Rithora	22	11	1st Clutch	30
13	Shankar Pura	8	4	2nd Clutch	10
14	Babu Singh Gher 1	13	2	2nd Clutch	3
15	Babu Singh Gher 2	39	8	2nd Clutch	19
16	Barsala	32	15	2nd Clutch	52
17	Reha	65		1st Clutch	NA
18	Nakhloli	66	16	2nd Clutch	48
19	Sankri	22		1st Clutch	NA
20	Sankri 1	13	5	2nd Clutch	14
21	Pali UP	22	11	2nd Clutch	39
22	Patharra	36	13	1st Clutch	40

Red: Clutch not successful



Indian Skimmer nest with a hatchling



**Map 4: Nesting and wintering locations of Indian Skimmer in National Chambal Sanctuary 2017**

### Nest site prioritization for future conservation

All the nesting locations were given a score for number of birds and number of eggs. If the range is from 0-5 the score is 1 for each header, 6-10 (score 2), 11-15 (score 3) and henceforth. The threat to the islands were scored from 1-3, 1 describing the lowest level of threat (from local people accessing the island), 2 describing the intermediate level of threat (from local people accessing the island, opportunistic cattle access) and 3 describing the maximum level of threat (from local people accessing the island, feral dogs, frequent cattle movement, sand mining). The total of these scores was using for giving priority status to the nesting colony for consideration for any conservation interventions in the subsequent breeding season. Out of 22 nesting locations, 16 locations had successful nesting and 6 were completely destroyed by dogs and cattle. We have categorized 2 locations as most important sites (score 16 and above), 3 locations as second priority (score 11 to 15), 7 locations as third priority (score 6 to 10), and the remaining 4 locations as the least priority (Table below).

Sr. No	Nesting Locations (Name)	Clutch Number	No of Birds	No of Nest	No of Eggs	No of Birds (Score)	No of Nest (Score)	Threat (Score)	Total (Score)	Priority
1	Pali	1&2	22	4	6	5	1	3	9	**
2	Siyapur	2	3	1	2	1	1	2	4	*
3	Jamudi	1	18	5	11	4	1	1	6	**
4	Sahajapur	2	8	4	10	2	1	2	5	*
5	Dang Basai A 1	1	45	18	62	9	4	3	16	****
6	Dang Basai A 2	2	76	26	82	16	6	3	25	****
7	Dang Basai B	1	12	6	18	3	2	2	7	**
8	Kainthri	2	14	7	22	3	2	2	7	**
9	Harigir Baba	2	10	5	8	2	1	2	5	*
10	Jaithpur	1	22	11	39	5	3	3	11	***
11	Dholpur Railway bridge	2	33	9	21	7	2	3	12	***
12	Tigri Rithora	1	22	11	30	5	3	3	11	***
13	Shankar Pura	2	8	4	10	2	1	2	5	*
14	Babu Singh ka gher 1	2	13	2	3	3	1	2	6	**
15	Babu Singh ka gher 2	2	39	8	19	8	2	2	12	***
16	Barsala	2	32	15	52	7	3	2	12	***
17	Reha	1	65		NA	16		3	19	***
18	Nakhloli	1&2	66	16	48	16	4	1	21	****
19	Sankri	1	22	10	NA	5	2	3	10	**
20	Sankri 1	2	13	5	14	3	1	2	6	**
21	Pali UP	2	22	11	39	5	3	1	9	**
22	Patharra	1	36	13	40	8	3	1	12	***

\*\*\*\* Most important for conservation \* least important (Black \* indicates successful nesting Red \* indicates unsuccessful nesting)

## Objective 2: Investigate the main ecological and anthropological factors influencing selection of nesting sites

### **Ecological and anthropological factors influencing the nest site selection**

We couldn't analyze our data as it was not sufficient and uniform due to logistic reasons and dynamism of the study area. We did improve our knowledge on nest site selection by Indian Skimmer. They nest on isolated sand islands in the river. The island has to be 30-60 cm elevated island having one side gradual slope and shallow water. The success of the nesting completely depends on the isolation of the island, if the water is deep enough around the island it remains isolated providing natural protection to the eggs and hatchlings from predators and other disturbances.

Islands having sand as substratum with no vegetation or very sparse vegetation was preferred, though we got two nesting sites where gravel and coarse sand form major substratum but they preferred those part of the island which had fine sand for laying eggs. Skimmers prefer sites having least anthropogenic pressure as that provides a safe place for nesting. We still don't know whether there is strong site fidelity for the nesting colony as this was first year of our observations.

### **Threats to the nesting colonies**

#### *1. Low Water level*

Water level is one of the major threats to the nesting birds as low water level enables other (potential) threats to gain access to the nesting island. When nesting starts, most of the islands are isolated, but as the nests near hatching time, the islands either get connected to the banks or to the water level recedes, allowing easy passage to predators.

#### *2. Cattle trampling*

Herds of Cattle, most often Buffaloes, have been seen grazing along the banks of the river. But during the summer, the cattle spend maximum hours bathing and drinking water on the river. Nesting period of Indian Skimmers (between February to June) also occurs during the hot and dry summer season. As water levels reduce in summer, it becomes easy for cattle herds to cross the river in the regions of the sanctuary, and they most often make use of nesting sand islands to cross the river. While doing so, very often the cattle accidentally trample eggs and chicks. It was also noted that the intensity in the number of cattle trampling incidents increased with every passing month between February to June, mostly due to the reduction in the water levels during summer.



**Cattle around the nesting island are major threat to eggs and hatchlings (Photo credit: Suyash Katdare)**



**Trampling of chick by cattle at Gadha nesting island (Photo credit: Parveen Shaikh)**

### 3. Predation of nests by free ranging dogs

Free ranging dogs predated on eggs and chicks of Indian Skimmers was documented on several nesting sites along the National Chambal Sanctuary. Dogs were observed accessing nesting sites by swimming across the river to prey on riverine bird chicks. The general timeline of dog predation on nests occurred just before the hatching of the eggs or when the chicks were out. Free-ranging dogs could be using the smell of the about-to-hatch eggs/hatched eggs as an indicator to head to the nesting sites. Local people living in villages situated near the Indian Skimmer nesting sites have observed dogs accompany illegal fishermen to the sites. Remains of fishing gear have also been seen in multiple nesting sites during surveys. Predation by free ranging dogs is one of the major problems faced by Indian Skimmers nesting in the sanctuary.



**Skimmers trying to chase the dog predated on the eggs** (Photo credit: Parveen Shaikh)



**Predation on unhatched eggs by free ranging dogs** (Photo credit: Varun Alagar)



**Predation on the hatched chicks by dogs was observed at Pali Island, Uttar Pradesh**  
(Photo credit: Parveen Shaikh and Aristo Mendis)

#### 4. Disturbance by people

In summer, the locals are dependent on the river for all water requirement and domestic use. This leads to regular movement of people on the bank and increases interaction with wildlife. We never observed any intentional disturbance by people to the nesting colony. People unintentionally walked through the nesting colony while they crossed the river along with their cattle herds. At one of the nesting colonies, we observed all the eggs of riverine birds (including Indian Skimmer, River Tern, Little Tern and River Lapwing) were collected and piled up at one corner on the nesting island. Probably kids did it from the village that unintentionally destroyed the entire colony and all the birds later abandoned the colony. Even tourism activities at tourist points were causing disturbances to the nesting colony as photographers were very keen on clicking nesting birds.



Eggs of riverine birds collected and piled up by kids from the nearby village



Disturbance by tourists approaching very close to the nesting colony for getting photographs

## 5. Sand mining

Sand mining is a very common practice in Chambal. There are few locations where it was practised on a large scale using JCB machines for loading hundreds of tractors. Some of the Indian Skimmer nesting sites along NCS were near illegal sand mining sites. As the sites were frequented by local people and with elevated disturbance, Indian Skimmers remained unsuccessful in nesting and rearing young chicks in these sites. Also, coincidentally, sand mining sites attracted cattle and free ranging dogs near the banks of the river, increasing the disturbance for Indian Skimmer nesting sites.



**Large scale sand mining on banks causes disturbance to the habitat and nesting birds**



**Large scale sand mining near the Indian Skimmer nesting site**

#### *6. Stochastic weather events*

Nesting of Indian Skimmers in National Chambal Sanctuary generally occurs at the start of early summer and continues until the advent of monsoon. Late-February to Early-April generally is stable and dry climatic conditions that favours nesting of Indian Skimmers. In 2018, a few cases of early monsoon showers as well as sand storms near sites and regions of Indian Skimmer nesting sites in National Chambal Sanctuary resulted in unsuccessful nesting of Indian Skimmers. Indian Skimmer eggs were observed being washed away in the river, or submerged in sand because of unpredictable weather conditions.

### Objective 3: Design and conduct an awareness program about the importance of conserving Indian Skimmer in schools, forest department, villages and with other stakeholders

During the fieldwork we conducted five closed group field training at different locations in the sanctuary. This included hands on identification and nest monitoring training to forest department staff and locals.

In March 2018, a capacity building workshop was organized for the ground staff of Forest Department Authorities, mainly forest guards and beat guards working in National Chambal Sanctuary (NCS). Divisional Forest Officer (DFO), Morena and other Forest Department officials also participated in the workshop, offering them an opportunity to directly meet and interact with the ground staff of the department.

The aim of the workshop was to introduce and acquaint participants to some of the priority riverine birds that nest in National Chambal Sanctuary with focus on Indian Skimmer and discussion on conservation action needed for this species. Participants were also equipped with a booklet containing details of the nesting birds in the vernacular/local language (Hindi) (Annexure 1).

Visual exercise using powerpoint presentations and handouts were carried out to assist participants to identify the priority birds: Indian Skimmer, Black-bellied Tern, River Tern, Little Tern, River Lapwing, Great Thick-Knee, and Little Pratincole. Some of the major threats that were discussed were of cattle trampling over riverine bird nests, and about free ranging dogs predated nests of these riverine birds. Following which, there was a discussion about how these threats could be addressed. Participants were asked for suggestions through which these birds could be facilitated to nest successfully.

There was open discussion from the participants side to know about the issues and challenges that they face on duty, to carry out their work and protect the sanctuary from various threats. Ground staff brought about some of such relevant issues like shortage of ground staff personnel, large areas to monitor, and lack of funds and resources to carry out their work.

The DFO and other department personnel took heed to these issues and assured them to provide timely release of funds for the ground staff to carry out their work.

We aim to continue this form of dialogue between the ground staff and other forest personnel so that they can work efficiently, and hopefully it may result in successful increase in the population of the *Vulnerable* Indian Skimmer and the *Endangered* Black-bellied Tern.



**Workshop with forest department staff**



**Participant for one day workshop at the NCS training centre Deori**



**Discussion with the locals and staff for designing conservation and monitoring plan for Indian Skimmer**



**Group field training at National Chambal Sanctuary**

#### Objective 4: Design a monitoring program for monitoring the wintering and breeding population of Indian Skimmer and conservation management plan integrating all the stakeholders

All the findings of objective 1, 2 & 3 were used for designing a conservation plan. A simple methodology was laid down for surveying Indian Skimmer breeding population. A document suggesting conservation need for skimmer was designed and submitted to National Chambal Sanctuary forest department. A demonstration session was organised for forest department staff and youths from local communities for using this monitoring program.

##### *Monitoring Plan*

We designed a breeding population monitoring programme for the NCS, Madhya Pradesh Forest Department. This plan was based on the similar plan that they follow for pre-nesting survey (Explained in Methodology of Objective 1). As most of the staff have smartphones, we designed a simple google form in local language for data collection. One day hands on training for Indian Skimmer breeding population and nest monitoring was conducted for the staff. A WhatsApp group was created for updating of the monitoring status. This google form was used for surveying in 2019 nesting season.

##### *Conservation Management Plan*

Our team leader participated in all meetings related to designing of conservation management plan for National Chambal Sanctuary. We submitted a conservation plan for riverine birds with focus on Indian Skimmer (Annexure 2), this plan is part of Sanctuary's management plan. Our team leader is the listed expert for riverine birds and Indian Skimmer in the sanctuary management plan. As per our suggestions in conservation management plan, forest department started monitoring the breeding population of Indian Skimmer and they have started appointing locals as nest guardians at selected nesting sites.

## Other objective: Studying breeding biology of Indian Skimmer in the National Chambal Sanctuary

Indian Skimmer starts colonizing and courtship from end of February and nesting by mid-March. Nesting starts early on the upstream islands as compared to the downstream islands. They prefer a little elevated island having one side gradual slope and shallow water. On our surveys from February 2017 to June 2017, we studied the detailed breeding biology of Indian Skimmer. Following are brief observations on Indian Skimmer breeding biology across the sites.

### Courtship

Courtship behaviour and mating was observed among pairs from mid-February 2017 onwards. Courtship displays included neck-dipping behaviour (in which the male and female move their necks up and down) as well as courtship feeding (where the male presents the female with a fish and waits for her to accept the fish by holding it in her beak), followed by the male mounting the female. A few pairs were also seen moving around the island together, exhibiting pre-nesting behaviours such as selecting possible nest locations on the island and making “trial nests” before they zeroed in on a conducive location. Trial nesting involved one parent digging a nest or “scrape”, or sitting in the scrape with breast low and wing tips high in the air, with the mate standing nearby (see image below) till they final the nest sites.



A pair of Indian Skimmers showing courtship behaviour (left), and another pair mating (right)

### Nesting

The skimmers were seen nesting in colonies; they made nests on the elevated part of the island. The nests were made on the location which is at least 1–3 ft above the water level and at the centre of the island. Most skimmer nests were “scoops” in the sand (shallow depressions about 21–30 cm in diameter and 2–5 cm in depth) with eggs laid directly on the sand, as is typical for the species. The Skimmers were seen scooping out shallow nests by sitting on the sand; shifting it back and forth with their breasts, and making sweeping side movements with their wings, thus hollowing out a bowl-shaped nest or “scrape”. They were also seen kicking sand back with their feet while digging out a nest. Both parents were seen to participate in nest-making, with one parent making the scrape while the other stood close

by. The substrate for most Skimmer nests was fine sand; however, at the nesting islands in Jamudi Ghat and Pali, we observed nests that were made in heavy gravel mixed with sand (see images below).

The eggs were buff or white in colour with brown blotches and streaks. The nests at all breeding sites were seen to have a clutch size of 1 to 4 eggs each, except for two nests, which had a clutch size of five eggs (see image below). All eggs were not laid at the same time. Most nests usually started off with one egg, with more eggs being laid in the following days, one by one.

Some other species observed nesting along with the Indian Skimmer were the Black-bellied Tern, Little Tern, River Tern, River Lapwing and Small Pratincole.

Skimmers were occasionally seen mobbing predators and intruders. They were seen successfully chasing away a flock of Bar-headed Geese that were wandering too close to the nests; in one incident, even an Egyptian Vulture that was flying overhead. However, they were not seen to defend their nests as aggressively as the other species that were nesting on the same island, with the terns and River Lapwings mobbing predators on most occasions.



**A Skimmer nest seen with a clutch size of five eggs(the maximum number of eggs we observed in a single clutch); a Skimmer digging a nest in fine sand on an island**



**Indian Skimmer nests on different substrates (from left to right): fine sand (Skimmer footprints seen around nest), sand surrounded by fine gravel, and heavy gravel mixed with sand**

## Incubation

Both parents were observed sharing incubation duties; they were seen taking turns to attend their nests, frequently changing places to incubate the egg by sitting on the nest. All the Skimmers were observed foraging around the island early in the morning before the sun came up, probably because it was still cool and they did not need to incubate the eggs to maintain ideal nest temperatures. As the day went on and ambient and sand temperatures increased, the Skimmers were seen changing incubation places more frequently, with time intervals getting shorter and shorter. After the other partner took over, the birds left the nest, skimmed over the water, and returned to it with wet breast feathers, probably to lower the temperature in the nest when they settled on the egg later. While the respective partners incubated the egg, the Skimmers also stood in the water at the island's edge, drinking water and collecting it in their beaks and wetting their feathers, once again, possibly to maintain nest temperatures. The incubation period is from 22 to 24 days, depending on the ambient temperature and sand substrate temperature.



**Left: Two Skimmers sitting on their respective nests incubating their eggs. Middle and right: A Skimmer off incubation duty collecting water in its beak and wetting its feathers to help cool the nest when it returns to sit on it.**



**From left to right: A pair of Skimmers taking turns incubating their nest. Skimmer 1 approaching the nest; Skimmer 2 gets up from the nest; Skimmer 1 sits on the nest while Skimmer 2 goes towards the edge of the island to cool down by drinking water and wetting its feathers until its turn arrives again.**

## Hatchling

The chicks being sand-coloured with brown spots, they had easily camouflaged in the sand as they lay low in the nest scrape (see images below). This made them difficult to detect and probably helped them to remain hidden from predators. Soon after the chicks hatched, the parents were seen clearing the eggshells away from the nest, carrying them in their beaks and discarding them in the water (possibly to avoid detection by predators). The Skimmer chicks were seen opening their eyes on the first day of hatching itself. The hatchlings started moving on the island in a day's time and the parents were seen teaching them to make depressions in the sand to cool them and hide from predators.



From left to right: A day-old hatchling next to an unhatched egg in the nest (it hatched a day later); two hatchlings at Pali next to two unhatched eggs in a nest made on gravel; a nest in Pali with the entire clutch of four eggs successfully hatched



Left and middle: Two older hatchlings (four- and five-days-old respectively) walking around their nest scrape. The parents were seen relocating the nest several times after the chicks hatched (possibly to reduce chances of detection by predators). The hatchlings walked around when the parents were nearby (sometimes sitting under the parent's tail feathers), but lay low in the sand when the parents were away.

Right: One of the two hatchlings (4-5 days old) seen being fed by its parent. The parent approached with a small fish in its beak, which the hatchling proceeded to consume whole.

## Fledgling

The chicks were seen fledging 21 to 25 days after they hatched. The fledglings were observed moving around with the rest of the flock of Skimmers, learning behaviours such as fishing and flying from their parents. All the fledglings of one colony were seen sticking together in the flock. The beak of the fledglings is different from the adult; both the mandibles are more or less equal in size.



**Indian Skimmer Fledgling**



**Indian Skimmer juvenile with adult**

## **2.5. Communication & Application of results**

Project outcomes has been submitted to Madhya Pradesh and UttarPradesh forest department. A presentation on output of our study has been made in both the state forest department.

Our project team leader participated in all meetings related to designing of conservation management plan for National Chambal Sanctuary. We submitted a conservation plan for riverine birds with focus on Indian Skimmer (Annexure 2), this plan is part of Sanctuary's management plan. Our team leader is the listed as expert for riverine birds and Indian Skimmer in the sanctuary management plan. As per our suggestions in conservation management plan, forest department started monitoring the breeding population of Indian Skimmer in 2018 and they even started involving locals from the nearest village for nest monitoring at the suggested nesting sites.

We are continuing our work in NCS. We are in the process of developing a sustainable plan for conserving Indian Skimmer nesting colonies. As per our suggestions partial fencing at the nesting island and appointing of three nest guardians during the nesting period is considered by the forest department. This conservation strategy has been tested at two nesting colonies in 2019 and we are still in the process of making few changes and then implementing in 2020 nesting season. There is need of funds for implementing the conservation plan and we are in the process of submitting proposals for raising some funds.

## **2.6. Monitoring and Evaluation**

Our team leader is still continuing the project in National Chambal Sanctuary with Madhya Pradesh and Uttar Pradesh forest department. We continued the work for two consecutive nesting seasons after the project. We are in continuous dialogue with the forest department for Indian Skimmer conservation. In 2018 and 2019 the Madhya Pradesh forest department initiated multiple activities for monitoring and conservation of Indian Skimmer. This included additional surveys, providing protection to the nesting colonies from predation and trampling, making Indian Skimmer as priority species for conservation along with the Gharial in the sanctuary.

## **2.7. Achievements and Impacts**

Basic species ecology knowledge gap existed in the sanctuary so understanding the breeding ecology of Indian Skimmer was the most important output from the project. This helped us undertsnading the timeline of entire breeding season and threats faced by the nesting birds.

For the first time ever we mapped all the nesting sites in NCS. This will be the most helpful information for long-term population monitoring of the species species. And overall contributing to our aim of Indian Skimmer conservtaion

All the threats considered for the decline of Indian Skimmer were general threats to the riverine species. During our work we identified predation by free ranging dogs is one the major problems faced by nesting birds and responsible for the major loss at egg and hatchling stage. This helped us decide the conservation strategy for Indian Skimmer in NCS.

This project output helped us in making Indian Skimmer as priority species for conservation in NCS along with Gharial. There was change in attitude of forest department staff towards the species, they started recongnising the importance of it nesting in the sanctuary and protecting it. We contributed conservation plan for Indian Skimmer based on this project outputs to the Conservation Management Plan of NCS and this will help in species conservation in the sanctuary and contributing to our goal.

We are still continuing the work with Madhya Pradesh and Uttar Pradesh Forest department for Indian Skimmer conservation by helping them in implementing the monitoring and conservation plan.

## **7.8. Capacity Development and Leadership capabilities**

### **1. Parveen Shaikh (Team Leader)**

I started conceptualising this project as an ecologist and my aim was to understand the basic ecology and conservation requirements of Indian Skimmer. After receiving this grant and the CLP Leadership training I was able to lead the project. This project was a roller coaster ride as it was first of its kind so there were challenges at all steps. We had to modify few objectives to fit in the restricted timeline, available resources and fieldwork challenges. This helped me develop my problem-solving skills. This project helped me learn communicating the project outputs to different stakeholders, specially to the sanctuary managers.

I had never led a project at this position before so it was a great learning process and now, I am managing this project as one the key projects of BNHS and I aim to continue this project a large programme for conserving the riverine nesting species in India. I have already raised fund for two years after CLP project and I am in process to raised fund in initiating a Riverine birds Nest Guardian Programme in NCS as this will help in reducing the loss of nests and help in reducing the population decline.

## 2. Siddhesh Surve (Species Surveyor)

In terms of capacity development, I have got better with the methodology part as the project progressed. This is boosted my confidence on designing methodology of the project for some of my colleagues.

Interacting with local people and conducting awareness workshops helped me a lot, as my current job responsibilities involves conducting awareness programmes for villagers. Communicating with villagers and bringing a behaviour change in them is one of most important and difficult things to do but the experience gained from this project is helping me in my current job. Last but not the least, the report writing has improved my drafting skills as well.

## 3. Jessica Luis (Team member)

One of the first things this project taught me was the importance of project planning. Our team leader Parveen Shaikh had returned from the CLP Training Course, and she shared with us everything she learned there. Armed with these invaluable lessons, we all brainstormed and planned the minutiae of the project – challenges the Indian Skimmer faces in NCS, and how to best involve stakeholders in conserving them. I now have a better understanding of what it takes to plan a project, working as a team, and playing to everyone's unique strengths.

Some things we envisioned while project planning turned out to be quite layered on field – as the landscape was very dynamic. This taught me problem-solving, improvising in the face of new challenges, and handling logistics. It also helped me work and communicate with, and learn from people from different fields – forest department staff and some incredible on-field support involved in the project.

This project also helped me better observe and understand the behaviour of the Indian Skimmer (and other sand-island nesting birds) up-close during field work. I got better acquainted with the Chambal landscape, and learnt to use and apply new data collecting techniques.

Thanks to this project, I got to attend a statistics workshop organized by the CLP alumni network, and interact with conservationists doing amazing work across India. The workshop taught us study design, and gave us statistical tools to collect and interpret data that could translate to meaningful conservation action.

## 4. Sriman Delip Kumar Das (Team Member)

My knowledge on Indian Skimmer enhanced, field survey skill for the species, counting and overall field learning in a remote area in a foreign country got enriched, gathered experience in communication with a diverse team and local people which I was not using in leading research in Bangladesh.

#### 5. Aristo Mendis (Team Member)

The project helped me in growing my wildlife field research skills, including assessment of avian biology populations, conducting wildlife assessment surveys, and avian species identification skills. It also helped me to plan project specific activities (Both short term and long term), focusing on carrying out wildlife surveys for remote areas, and with limited set of resources. It also helped me in being able to have dialogue and communicate with law enforcement agencies who are mandated towards protecting wildlife. I was also able to work on my personal skills like networking and problem solving. And lastly, it allowed me to spend time with fresher and experienced wildlife biologists, from whom I was able to learn and hone my leadership and technical skills.

## SECTION III

### 8.1. Conclusion

Humans have preferentially settled in proximity of freshwater resources and subsequently, freshwater ecosystems and species have suffered from multiple historical and on-going stresses from use by humans. Indian Skimmer is flagship avian species of freshwater ecosystems, and is increasingly threatened due to anthropogenic disturbances.

Reductions in water flow due to dams, modification of river morphology, predation of eggs and chick by free ranging dogs, trampling by cattle are some of the factors affecting Indian Skimmer populations in NCS. Indian Skimmer population is at risk due to the low nesting success rate and this can hamper the survival of the species.

Our study mapped the distribution of Indian Skimmer breeding population in NCS and major threats to them. Our study shows similar results as the previous study on breeding ecology at Orissa but the sample size of the previous study was only one colony whereas we monitored three colonies to support our results. Previous surveys on Indian Skimmer breeding ecology at Chambal by Das (2015) and Sundar (2004) were restricted to certain stretches but our study monitored the entire sanctuary for the first time. Indian Skimmer prefers emergent sand bars/islands in river for nesting. They prefer deep water on the sides of the island for keeping the predators and other disturbances away. The timing of island formation and nesting is very crucial and should coincide. They probably even have strong site fidelity for nesting sites as some of the sites have been observed being utilised very year. The riverine system is a very dynamic and the island formation completely depends on flow rate, rainfall, water released from dam and irrigation canals and water extracted from the lift irrigation plant. Further, all anthropogenic activities like sand mining, human and livestock presence, feral dog presence and people crossing the river, had a negative impact on Indian Skimmer nesting success.

For effective conservation and management of Indian Skimmer within their natural habitats, it is important to be able to assess the impacts of various habitat attributes on nesting success. At present there is a necessity for immediate protection to the nesting colony until we can finalise a long-term sustainable conservation plan. This protection can help to freeze the continuous loss that the population is suffering due to less than 15% nesting success.

There is an increasing demand for water and hence proposals for water extraction and impoundments on the Chambal. These demands will further compromise with the flow rate of the river. The understanding of flow rate requirement for all the key species in Chambal and restoring the flow regimes will be critical for conservation in NCS.

## 8.2. Problems encountered and lessons learnt

- *Which project activities and outcomes went well and why?*

Field work and data collection for objective 1 went well: Our project adviser helped us in networking with the tri-state forest department which made the permission acquiring and logistic arrangements smoother process. Our field work was very well supported by Madhya Pradesh and forest department

Discussion and capacity building with forest department: Forest department were very open to dialogue from us and they were supportive of our ideas and training programmes. There was a need expressed from the forest department for training as there is no knowledge about Indian Skimmer and its significance

Dissemination of our project outcomes: Both the state forest department, were keen on understanding the outcomes of project and they were willing to discuss the measures that need to be taken for improving the nesting success of all riverine birds species.

Acceptance of our suggestions by forest department for Indian Skimmer conservation: From initiation of our project we worked very closely with the forest department and we were continuously updating our work progress to the department. This made us build up the relationship with the ground staff and other officials from forest department.

- *Which project activities and outcomes have been problematic and in what way, and how has this been overcome?*

Data collection for objective 2 was challenging as the methodology designed by us was very ambitious. We still tried collecting the data but the habitat was very dynamic and logistic challenges added to it further. Our work was the first of its kind so there was no prior experience or information on this study area. This created inconsistency in data collection due to which couldn't analyse our data. After discussing with experts, we even understood that question asked by us need some modification designing and data collection. We have taken the inputs and we will be continuing our work in the coming nesting season

- *Briefly assess the specific project methodologies and conservation tools used.*

The pre-nesting and nesting surveys we conducted can be repeated every year and this will help in long-term monitoring of Indian Skimmer population. Since the forest department is trained in systematic survey the department can continue this activity. Capacity building of forest department staff and providing resource material in local language. continuous helping in deciding conservation strategies were some of the conservation tools used. We have suggested nest guardian program and partial fencing as the conservation measures. We tried

testing these interventions in 2019 and it seems a successful measure until some other sustainable conservation measure is implemented

- *Please state important lessons which have been learnt through the course of the project and provide recommendations for future enhancement or modification to the project activities and outcomes.*

For a project first of its kind it is very important to have a significant knowledge of the study area and to understand the logistic challenges. We have modified our one of the objectives to understanding the factors influencing nesting success of Indian Skimmer because the nesting success was observed to be very low and this will help in improvising the nesting success.

### **8.3. In the future**

We are already continuing the project for consecutive two years beyond the CLP project period. This is funded by BirdLife International, BNHS and Ravi Sankaran fellowship.

We have helped Madhya Pradesh forest department in starting conservation measures implementation at selected nesting sites. We are continuously conducting capacity building programs for the staff and local guardians.

We are sending application across for generating funds for independently implementing the nest guardian programme in the sanctuary as financial assistance for nest guardians seems a challenging for the forest department.

Monitoring breeding population and nesting sites was suggested as the part of the conservation plan and Madhya Pradesh forest department has started this activity in 2019.

We recently started monitoring nesting success in 2019 and started marking Indian Skimmer with colour flags to understand their migration pattern and survival of fledglings.

## SECTION IV

### Appendices

Output	Number	Additional Information
Number of CLP Partner Staff involved in mentoring the Project	2	
Number of species assessments contributed to (E.g. IUCN assessments)	2	We are in process to contribute for Indian Skimmer and Black-bellied Tern
Number of site assessments contributed to (E.g. IBA assessments)	2	National Chambal Sanctuary Rajasthan National Chambal Sanctuary Uttar Pradesh
Number of NGOs established	NA	
Amount of extra funding leveraged (\$)	29,800	
Number of species discovered/rediscovered	-	
Number of sites designated as important for biodiversity (e.g. IBA/Ramsar designation)	-	
Number of species/sites legally protected for biodiversity	-	
Number of stakeholders actively engaged in species/site conservation management	2 group of stakeholders	NCS Forest department Local communities
Number of species/site management plans/strategies developed	1	Conservation management plan for NCS by Madhya Pradesh forest department
Number of stakeholders reached	Approx. 200	

<p>Examples of stakeholder behaviour change brought about by the project.</p>		<p>Recognising Indian Skimmer as significantly important species in NCS</p> <p>Identifying Indian Skimmer as the key riverine species along with Gharial in NCS</p> <p>Madhya Pradesh forest department is no more gharial conservation centric. Indian Skimmer is given equal importance for conservation.</p>
<p>Examples of policy change brought about by the project</p>	<p>-</p>	
<p>Number of jobs created</p>	<p>10</p>	<p>Locals appointed as nest guardians and monitoring assistant</p>
<p>Number of academic papers published</p>	<p>-</p>	<p>In process of submitting manuscript</p>
<p>Number of conferences where project results have been presented</p>	<p>1</p>	

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