Building evidence for conservation globally

Journal of Threatened Taxa

10.11609/jott.2024.16.2. 24615-24818
www.threatenedtaxa.org

26 Februaru 2024 (Online & Print)
16(2): 24615-24818
ISSN 0974-7907 (Online)
ISSN 0974-7893 (Print)

Open Access

ISSN 0974-7907 (Online); ISSN 0974-7893 (Print)

Publisher
Wildlife Information Liaison Development Society
www.wild.zooreach.org

Host
Zoo Outreach Organization
www.zooreach.org

43/2 Varadarajulu Nagar, 5th Street West, Ganapathy, Coimbatore, Tamil Nadu 641006, India
Registered Office: 3A2 Varadarajulu Nagar, FCI Road, Ganapathy, Coimbatore, Tamil Nadu 641006, India
Ph: +91 9385339863 | www.threatenedtaxa.org
Email: sanjay@threatenedtaxa.org

For Focus, Scope, Aims, and Policies, visit https://threatenedtaxa.org/index.php/JoTT/aims_scope
For Article Submission Guidelines, visit https://threatenedtaxa.org/index.php/JoTT/about/submissions
For Policies against Scientific Misconduct, visit https://threatenedtaxa.org/index.php/JoTT/policies_various

continued on the back inside cover

Cover: Common Keeled Skink *Eutropis carinata* in oil pastels, colour pencils, & micron pen adapted from photograph by H. Byju © Pooja Ramdas Patil.

Journal of Threatened Taxa | www.threatenedtaxa.org | 26 February 2024 | 16(2): 24737–24745

ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)

https://doi.org/10.11609/jott.8593.16.2.24737-24745

#8593 | Received 15 June 2023 | Final received 01 August 2023 | Finally accepted 17 December 2023

OPEN ACCESS

COMMUNICATION

Observations on Indian Skimmer *Rynchops albicollis* Swainson, 1838 (Aves: Charadriiformes: Laridae) breeding colonies in Middle Ganges stretch, India

Kumar Ankit [1], Mujahid Ahamad [2], Vivek Ranjan [3], Sanjay Kumar [4], Syed Ainul Hussain [5] & Govindan Veeraswami Gopi [6]

[1,2,3,5,6] Wildlife Institute of India, Chandrabani PO Box #18, Dehradun, Uttarakhand 248001, India.
[4] Lal Bahadur Shashtri Bhawan, Sarojini Naidu Marg, Raj Bhavan Colony, The Mall Avenue, Lucknow, Uttar Pradesh 226027, India.
[1] kumarankit.shiats@gmail.com (corresponding author), [2] mujahid@wii.gov.in, [3] rvivek@wii.gov.in, [4] sanjaykumarias02@yahoo.co.in, [5] hussain@wii.gov.in, [6] gopigv@wii.gov.in

Abstract: Indian Skimmer *Rynchops albicollis* Swainson, 1838 is a riverine habitat specialist bird and a species of significant conservation concern. In 2020 it was up-listed to the 'Endangered' category of the IUCN Red List. Breeding grounds of the species are known from the major rivers of India like Ganga, Chambal, Son, and Mahanadi. We monitored breeding colonies of the species in two breeding seasons (2017 and 2018) in the middle Ganges stretch. We identified nine nesting islands and monitored a total of 111 active nests during the study period. A total of 302 eggs were counted with clutch sizes ranging 1–5 and the mean clutch size of 2.7 (±1.18 SD). We observed a 10% & 7% of hatching and fledgling success rate in 2017 and 10% & 17% in 2018, respectively. Low breeding success was probably due to the severe anthropogenic factors such as egg collection, cattle trampling, and stochastic weather events such as flooding and sand inundation by sand storms in nests. We also recorded instances of nest abandoning because of unknown reasons. This article recommends more surveys to identify new breeding colonies of Indian Skimmer in the middle Ganges and subsequently provide adequate protection to the colonies. We also recommend sensitization programs for different stakeholders to create more awareness for the conservation of this threatened species in the middle Ganges stretch.

Keywords: Breeding birds, breeding phenology, endangered birds, nesting birds, prayagraj, river island, riverine birds, threatened riverine bird, waterbirds.

Editor: S. Balachandran, Rtd. Deputy Director, Bombay Natural History Society, Mumbai, India. **Date of publication:** 26 February 2024 (online & print)

Citation: Ankit, K., M. Ahamad, V. Ranjan, S. Kumar, S.A. Hussain & G.V. Gopi (2024). Observations on Indian Skimmer *Rynchops albicollis* Swainson, 1838 (Aves: Charadriiformes: Laridae) breeding colonies in Middle Ganges stretch, India. *Journal of Threatened Taxa* 16(2): 24737–24745. https://doi.org/10.11609/jott.8593.16.2.24737-24745

Funding: Wildlife Institute of India, Dehradun and National Mission for Clean Ganga, Ministry of Jal Shakti, Government of India.

Competing interests: The authors declare no competing interests.

Author details: KUMAR ANKIT is senior research fellow at Wildlife Institute of India, Dehradun. He is also PhD scholar of AcSIR, Ghaziabad. His specialization is in movement ecology, human-carnivore interaction, water birds and population ecology. MUJAHID AHAMAD is a PhD scholar and currently working as a senior project biologist at the Wildlife Institute of India, Dehradun. He specialized in animal ecology and human-wildlife interaction. VIVEK RANJAN is a PhD scholar at the Wildlife Institute of India working on human-wildlife interaction in human-dominated landscapes. SANJAY KUMAR is IAS of 2002 batch with Uttar Pradesh as home cadre. He is author of many books on birds and nature conservation. He had played a vital role in the field of conservation by providing technical support to the government in establishing ramsar sites, important wetland areas and conservation reserves. SYED AINUL HUSSAIN is the project manager (NMCG) and former scientist-G at the Wildlife Institute of India. His specialization is in wetland ecology and habitat ecology. GOVINDAN VEERASWAMI GOPI is scientist at the Wildlife Institute of India. He is member of different IUCN commissions. His core research interests are in understanding about inland and coastal wetlands and the species that depend on them. He is also involved in assessing developmental projects, teaching, training and supervising in-service officers, master's and PhD students at WII.

Author contributions: KA—conceptualization, data collection, data analysis & analysis, methodology, writing the original draft. MA—data collection and analysis. VR—data collection. SK—conceptualization and data visualization SAH—conceptualization, data visualization investigation, supervision GVG— conceptualization, data visualization investigation, supervision, review & editing.

Acknowledgements: We express our sincere thanks to the director, dean, researchassociate and course director of XV. MSc of Wildlife Institute of India for their support in the study. We are grateful to the National Mission for Clean Ganga and the Ministry of Jal Shakti, Government of India, to fund the fieldwork related to this work. We express our sincere gratitude Uttar Pradesh Forest Department and Prayagraj District Administration for providing permission and logistical support. We acknowledge Mrs. Divya IFS (Former DFO, Prayagraj) for her kind support. We also thank Mr. Vikash Tiwari, Mr. Deepak Dhakad, and Mr. Rajesh Kumar for volunteering in data collection. We are grateful to Ankita Sinha & Naman Goyal for reviewing the manuscript and Ashish Jangid for helping in map preparation.

भारतीय वन्यजीव संस्थान
Wildlife Institute of India

National Mission for Clean Ganga
An Authority (Under EPA vide notification dated: 07 October 2016)
Ministry of Jal Shakti
Department of Water Resources, River Development & Ganga Rejuvenation
Government of India

INTRODUCTION

The Skimmers are a group of birds that belong to the genus *Rynchops* of the family Laridae (BirdLife International 2023). They are known for their uneven bill for foraging on the fishes, insects, and shrimps through skimming on the water surface (Zusi 1996; Martin et al. 2007). Globally, three members of *Rynchops* genus are known—the African Skimmer *Rynchops flavirostris*, the Black Skimmer *Rynchops niger*, and the Indian Skimmer *Rynchops albicollis* (Bhushan 2018). Among them, the Indian Skimmers are globally threatened riverine birds native to southern and southeastern Asia. They have been recently up-listed to the 'Endangered' category of the IUCN Red List because of the declining population trend (Birdlife international 2023). Indian Skimmers are medium, tern-size birds of 40–43 cm in length with a wingspan of around 108 cm (Grimmett et al. 2016; Shaikh et al. 2018). The adults have a drooping orange-red bill with lower mandible projecting beyond the upper mandible (Ali & Ripley 1987). It has a black cap and mantle, and wings contrasting with white underparts (Grimmett et al. 2016). In 2001, the adult population was estimated to be 4,000–6,700 individuals. However, with the recent assessment in 2020, the population estimate of the Indian Skimmer is 2,450–2,900 mature individuals. It is estimated to be 41% decline of the population from 2001 to 2020 (Birdlife International 2023).

Historically, the population was distributed in the major river systems of Myanmar, Cambodia, Vietnam, and the Mekong delta (Sundar 2004). However, the current distribution of the species is believed to be from Pakistan and Nepal, with the stronghold of the population in India and Bangladesh (Rajguru 2017; Debata et al. 2019). In India, the breeding population of the species is known from the major rivers like Chambal, Mahanadi, Ganges, and Son (BirdLife International 2023). However, in recent years non-breeding population are also recorded from the peninsular India, east and west coast, and other wetlands (Gopi & Pandav 2007; Malla et al. 2015; Shaikh et al. 2021). There are also records of wintering and breeding grounds of the species from Bangladesh (Mohsanin 2014; Kabir et al. 2016; Chowdhury et al. 2020; Das et al. 2020). The known breeding grounds of the species reported from India are National Chambal Sanctuary on river Chambal in the state of Uttar Pradesh, Rajasthan and Madhya Pradesh (Sundar 2004; Das 2015; Shaikh et al. 2018; Singh & Sharma 2018), Narora Ramsar Site on river Ganges in Uttar Pradesh (Siddiqui et al. 2007), Son Gharial Wildlife Sanctuary on river Son in Madhya Pradesh (Dilawar & Sharma 2016), and Pong Dam Wildlife Sanctuary in Himachal Pradesh (Fernandes & Besten 2013). However, new breeding records have been reported in the last five years from the middle Ganges stretch (Ankit et al. 2018; Mital et al. 2019) and Mahanadi (Rajguru et al 2017; Debata et al. 2018). The breeding season starts after the winters ranging from February to May in different breeding sites. Indian Skimmers breed in colonies and sometimes with other species like River Tern *Sterna aurantia*, Little Tern *Sternula albifrons*, River Lapwing *Vanellus duvaucelii,* and Small Pratincoles *Glareola lactea* (Rahmani 2012; Rajguru 2017; Ankit et al. 2018; Debata et al. 2019). Generally, Indian Skimmers lay eggs in sandy spits of emerged river islands; the clutch size ranges between 1–5, and both the sexes are involved in incubation and parental care after the hatching of eggs (Shaikh et al. 2018; Debata et al. 2019).

Habitat degradation due to several anthropogenic disturbances resulting in low reproductive success is considered a major cause for the rapid population decline. Also, there are records of stochastic weather events causing nest failure of the species at different breeding sites (Shaikh et al. 2018; Debata 2019). However, the essential information pertaining to the breeding biology, threats to the breeding colonies, and long-term population monitoring are still very limited across its breeding ranges (Rajguru 2017; Debata et al. 2019; Shaikh et al. 2018). After the discovery of new breeding colonies in the middle Ganges stretch in the year 2017, we investigated different aspects of the breeding biology of Indian Skimmer. We also identified threats to the breeding colonies in the middle Ganges stretch by monitoring two breeding seasons, which is far apart from the earlier known breeding grounds of other riverine system.

METHODS

Study Area

This study was carried out in the Prayagraj District (25.4727^{0}N, 81.8783^{0}E) of Uttar Pradesh (formerly Allahabad) (Image 1). The district is known for the confluence of two major rivers of India—Ganges and Yamuna—and the invisible Saraswati. The river Ganges has been divided into three courses—Upper (stretch in mountainous regions of the Himalaya), Middle (stretch of floodplains), and Lower Ganges (stretch after the confluence of major river till it meets the Bay of Bengal) due to its characteristics such as flow, channel width, depth and sedimentation. settings. The Prayagraj

district is adjacent to middle Ganges stretch. Prayagraj experiences three prominent seasons, summer (March–June), monsoon (July–September), and winter (October–February). The average maximum temperature ranges 23°–41°C with 1,027 mm annual rainfall. The district is famous for 'Kumbh Mela' at the confluence point which is known for world's largest human congregation due to traditional beliefs. Additionally, the area also witnesses human gathering round the year due to religious practices, annual 'Magh Mela' during the winter is one of the examples. The Ganges in Prayagraj is also one of the polluted stretches because of several anthropogenic activities, including the effluent discharges from the leather industries of Kanpur city, which is located on the upstream of the river. However, the area supports good biodiversity of riverine species like the Gangetic Dolphin *Platanista gangetica*, Gharial *Gavialis gangeticus*, Marsh Crocodile *Crocodylus palustris,* different species of turtles, fishes, and wetland birds like the River Tern *Sterna aurantia*, Little Tern *Sternula albifrons*, River Lapwing *Vanellus duvacellii,* Small Pratincoles *Glareola lactea*, and Ruddy Shelduck *Tadorna ferruginea.* The dry and hot summer causing low water levels exposes sandbars and river islands, which facilitates breeding riverine birds like Little Tern, River Lapwing, and Indian Skimmer. As a part of an ongoing project on waterbirds, after a few sightings of Indian Skimmer in the confluence area in January 2017, we extensively surveyed a total of 75 km of riverine stretches in Prayagraj district (25 km stretch each upstream and downstream of the river Ganges and 25 km upstream of the Yamuna from the confluence) in January to June in both the year of 2017 and 2018. The banks of the rivers were mostly sandy with intermittent mudflats, cultivations and settlements. There were also exposed river islands mostly in the river upstream of Ganges (from the confluence) due to low water depth.

Observations on nesting birds

The survey method included trail walking along the banks and opportunistic surveys through mechanised boat from February to June. After observing the events of the courtship display and congregation of birds, we considered the river islands as the nesting island of the

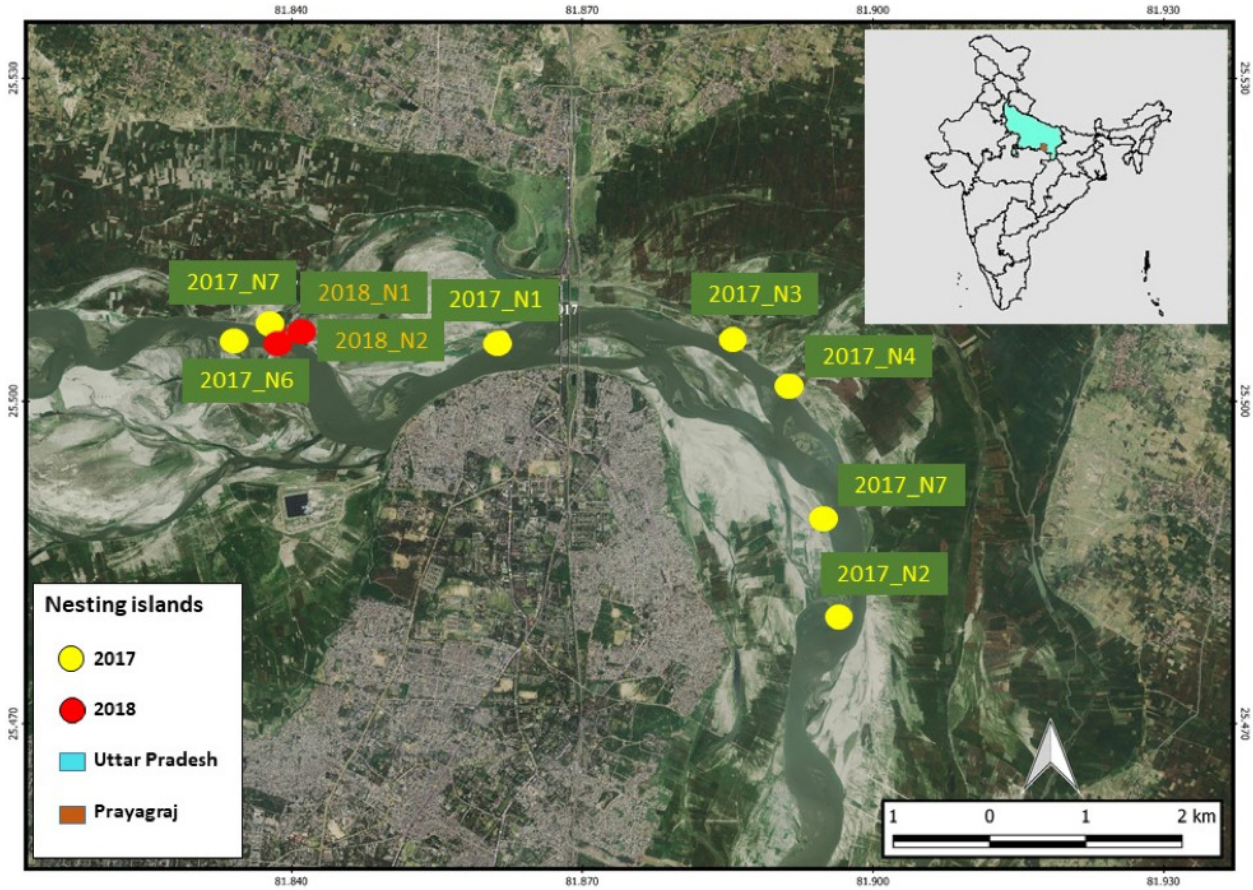

Image 1. Locations of identified nesting islands of Indian Skimmer in Prayagraj in the years 2017 and 2018.

birds. After 3–4 days, we visited the islands to record any breeding activity such as nest preparation. After getting ensured the sign of nest preparation, we considered it as nesting island. we started regular monitoring the nesting islands in the morning (0600–0800 h) or evening time (1600–1800 h) from the river bank using Bushnell 8 × 42 binocular. Only after observing signs of incubation, we visited the nesting islands using a non-motor boat, ensuring minimal disturbance to the breeding birds. Further, we started regularly visiting the nesting island in the morning (0600–0800 h) or evening (1600–1800 hs). Two observers visited the islands and separately recorded the number of individuals, nests, clutch sizes, hatchlings, nest failures, and anthropogenic disturbances. The observer's entry and exit times to the nesting island were fixed. One observer was followed by the second observer in the multiple straight lines with inter-distance of 1.8–2.4 m (n = 8–18 depending on the size of the nesting island). The double observer method ensured the confirmed identification of the nests, and presence of new active nests. Since, most of the islands were having fewer active nests, the double observer method minimised the possibility of double counting or missing of active nests.

We ensured that the observation took minimum possible time while collecting the data, which were around 5–10 min depending on the number of nests and island size. We did not use any invasive techniques to mark the nest or the eggs, and during the observation, precautions were made to minimize the disturbance to the birds. We consciously walked on the islands to minimize the footprints on the island. Same survey and monitoring protocols were used in both the years of the breeding cycle. Successful nest was considered with the minimum one egg hatched in a particular nest and hatching success percentage was calculated as the proportion of number of successful nest and number of nests (Debata et al. 2019). Whereas, the fledgling success was calculated as the proportion of nest with fledglings and number of successful nests. We also analyzed the clutch size the percentage of the nest failure because of the different factors.

RESULTS

Sightings, abundance, and breeding phenology

Sightings of Indian Skimmers were continuous from January to March 2017 & 2018, mostly on flights or during foraging. We recorded the first congregation of the birds on a river island in late March 2017 and early April 2018. Subsequently, we recorded seven and two nesting islands in 2017 and 2018, respectively (Image 1). A total of 356 (n = 232 in 2017, n = 144 in 2018) individuals of Indian Skimmers were observed in the different nesting islands. The sporadic sightings of the birds during the surveys are excluded from the total count. Courtship display, mating, and nest preparation continued between late March and April in both years. However, mating events and nest preparedness were also observed in May and the first week of June 2017 in some nesting islands. In 2017 season, the first clutch was noticed during the first week of April. However, we located nesting in the second week of April in the year 2018. The first hatching of eggs in the nests was observed during mid-May in 2017 and late April 2018 (presuming the first clutch of the season in the last week of March). In 2017, the hatching of eggs was also observed till June in a couple of nesting islands. In May and early June, we observed the dispersal of fledglings from the nesting islands. Both the mating partners were involved in parental care and nest guarding during the breeding cycle.

Active nests and clutch size variation

All the nine nesting islands were approximately in the range of 15 km upstream of river Ganges from the confluence point. We recorded 111 active nests of Indian Skimmers (n = 73 in 2017 and n = 38 in 2018) and these active nests were the shallow depressions in sands, mostly away from the edges of the river islands (Table 1). A total of 302 eggs were laid by the species in the study area (n = 186 in 2017 and n = 116 in 2018) (Table 1). The clutch size varied between 1–4 and 1–5 in different nesting islands of 2017 and 2018 observations, respectively. The mean clutch size was 2.54 (SD ± 1.11) and 3.05 (SD ± 1.27) in the years 2017 and 2018, respectively. We also recorded the active nests and fledglings of River Lapwing, Little Tern, Small Pratincole, and Black-winged Stilt on the nesting islands of Indian Skimmer.

Breeding Success and possible causes of nest failure

Out of all the nine nesting islands in 2017 and 2018, nesting failure was observed in three islands due to anthropogenic and natural causes in the year 2017. The remaining six nesting islands recorded hatching (n = 4 in 2017 and n = 2 in 2018). Among all the monitored active nests, only 10% and 11% of the nest successfully produced chicks in 2017 and 2018 respectively whereas, 10% and 7% survived up to fledgling stage with respect to the number of nests in the year 2017 and 2018,

Table 1. Total number of eggs and active nests and nesting islands description of Indian Skimmers recorded in Prayagraj on different nesting islands in the years 2017 and 2018.

Nesting islands	Total active nest	Total number of eggs	Perimeter of nesting islands (in meters)	Distance from bank (in meters)	Distance from human settlement (in meters)
2017_N1	8	11	1056	187	210
2017_N2	13	42	1934	413	1652
2017_N3	6	15	433	224	1284
2017_N4	31	86	708	220	1794
2017_N5	3	9	225	108	1705
2017_N6	3	8	862	198	1926
2017_N7	9	15	2179	377	1915
2018_N1	26	85	743	197	1553
2018_N2	12	31	509	179	15608

Table 2. Causes of nest failure of Indian Skimmers in Prayagraj in the years 2017 and 2018.

Causes of failure	2017		2018	
	Number of nests	%	Number of nests	%
Egg Stage Failure				
Egg collection	8	12	0	0
Flooding	16	24	0	0
Predation	28	42	0	0
Sand Inundation	0	0	18	60
Cattle trampling	0	0	5	17
Abandoning	14	21	7	23
Chick stage failure				
Abandoning	0	0	2	25
Cattle trampling	0	0	6	75

respectively. The main causes of the nest failure were anthropogenic pressure such as cattle trampling, egg collection, and natural causes include predation, flooding, and sand inundation (Table 2).

DISCUSSION

Long-term ecological monitoring is an essential tool for the conservation of any species. It provides basic ecological information of the targeted species and its associated community in lieu of different environmental conditions. It gradually helps in identifying key conservation priorities and monitoring the effect of change in policy and environment (Havstad & Herrick 2003; Giron-Nava et al. 2017). However, long-term ecological monitoring of the waterbirds and their associated habitats is limited in India (Prasad et al. 2002; Kar et al. 2018; Singh & Sharma 2018; Debata et al. 2019). The riverine systems of India facilitate the occurrence of river-dependent birds by providing shelter, forage, and breeding grounds (Islam & Rahmani 2008; Rajguru 2017; Sinha et al. 2019). Many species of birds are known to utilize the river and its associated habitats to complete partial or entire lifecycles (Page & Gill 1994; Vaughan et al. 2007; Froneman et al. 2011; Rahmani 2012). Additionally, the riverine system has an intricate relationship with humans, which sometimes causes overexploitation and habitat degradation, and can adversely impact the populations of species like the Indian Skimmer and the Black-bellied Tern *Sterna acuticauda* (Kar et al. 2018; Kar & Debata 2019). In our study area, we observed multiple pressures on the river system, which negatively impacts the breeding cycle of Indian Skimmer and may severely affect the species at the population level on a long run.

Population and breeding in the middle Ganges stretch

There were previous sighting and breeding records (Narora-Ramsar Site) of Indian Skimmers from the river Ganges (Siddiqui et al. 2007). The recent breeding records from the middle Ganges stretch is from Prayagraj (Ankit et al. 2018) (Image 2) and Varanasi (Mital et al. 2019). This study and previous records suggest the congregations of the birds in December and January in the middle Ganges stretch (Shukla 2016). Both the years 2017 and 2018, we observed the congregation of more than 100 Indian Skimmers in different Islands. However, the nesting islands were relatively less with respect to the total number of individuals sighted. There may be a possibility that most of the birds used these islands as a stopover site. There was a difference between the nesting islands in the years 2017 and 2018, we presume that after a couple of nest failures these individuals laid their second clutch in our study area hence, we located more breeding colonies in 2017. The records of only two breeding islands in 2018 led to the speculation that there would have been more nesting colonies in the upstream of the Ganges beyond our study area because of the observance of higher number of individuals in one of the nesting islands. These individuals might have shifted to the upstream for breeding as there are observations on breeding Skimmers in upstream of Allahabad recorded by Survey teams of Wildlife Institute of India in Bulandshahr and Farrukhabad districts in between the year 2017 and 2021. The breeding period

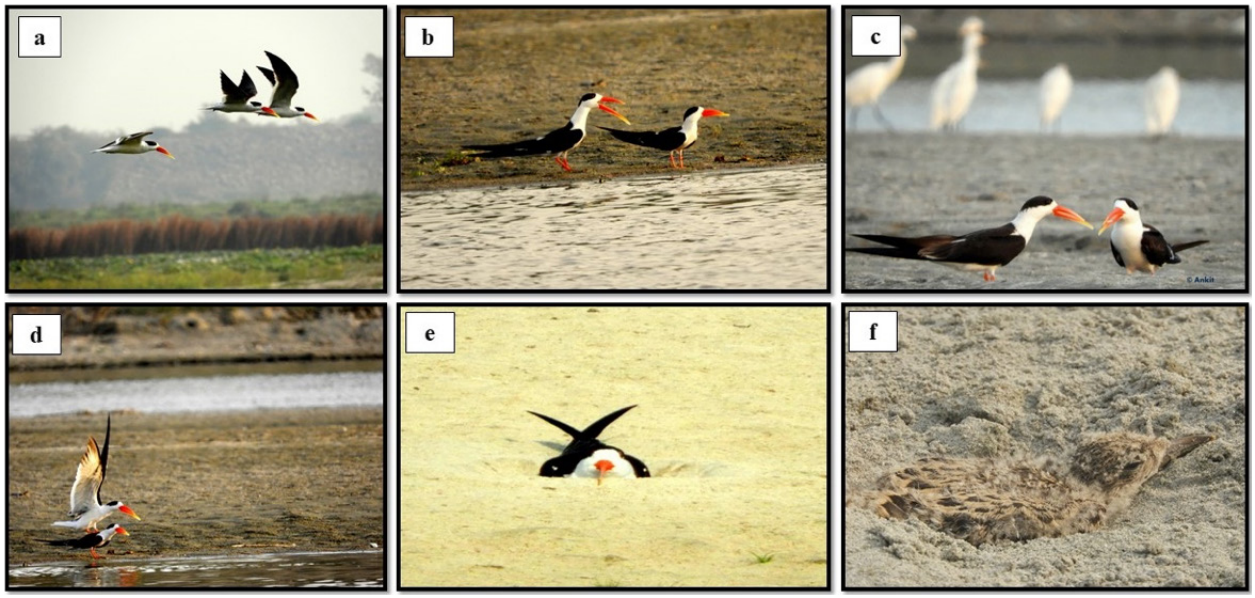

Image 2. Series of events recorded for Indian Skimmers in Prayagraj: a—occasional sightings | b—congregation in river islands | c—courtship display | d—mating events | e—laying and incubation of eggs | f—hatching of eggs. © Kumar Ankit.

ranges between February and May, similar to the observation made at different breeding sites (Dilawar & Sharma 2016; Rajguru 2017; Shaikh et al. 2018; Debata et al. 2019). Across the two monitoring years, no nesting islands were observed in the Yamuna stretch, possibly because of the unavailability of river islands as the river Yamuna which had high water levels during both the surveyed years. However, there are recent nesting records have been observed in Yamuna in Prayagraj District (Mani 2023)

Poor breeding success and threats to the breeding colonies

Prayagraj is one of the densely human-populated cities of the Northern-India; hence it poses severe anthropogenic pressure to riverine stretches adjacent to the city. All the nesting islands were in close proximity to the periphery of the city, which has caused the enabling of multiple threats to the breeding colonies. The main reason for the nest failure was due to the anthropogenic pressures followed by the stochastic events that caused low breeding success in the study area (Image 3). Similar threats have also been identified at different breeding sites (Siddiqui et al. 2007; Debata et al. 2018; Shaikh et al. 2018; Mital et al. 2019). The breeding success is very low when compared to the similar study of Debata et al. (2019) in the Mahanadi River in the same breeding season. It highlights the magnitude of anthropogenic pressure on the middle Ganges which may be negatively impacting other riverine species too. Multiple anthropogenic threats were identified that had directly impacted the breeding colonies, such as cattle trampling. It was observed that because of low water depth, cattle use these islands as passage to go from one bank to other for foraging. Additionally, they venture in to the river islands to forage on vegetation growth. We also observed egg collection by the locals. However, no information on consumption or commercial use was available. There are indirect threats such as disturbances because of agricultural activities in the bank of the river and on river islands. The locals grow seasonal crop such as watermelon, pumpkin, and other cucurbitaceous crops of the gourd family on the sandy area of banks and river islands. We haven't recorded any agriculture on the nesting islands but we observed agriculture activity on the nearby banks. Additionally, free-ranging dogs, and boat activity, which may have led to the abandoning of the nests by the breeding pairs.

After the nesting failure in multiple nesting islands due to anthropogenic activities in 2017, we availed help from the forest department and Prayagraj administration for ensuring the protection of the nesting islands through awareness in adjoining villages for farmers working in the adjacent field. Forest officials were deployed in the daytime as nest guardians (near the bank) to minimize the anthropogenic disturbance. No casualty was reported in the breeding island during the night and all the chicks fledged during this phase resulting in no nest failure at the chick stage in the year 2017. In the year 2018, the nest failure and egg

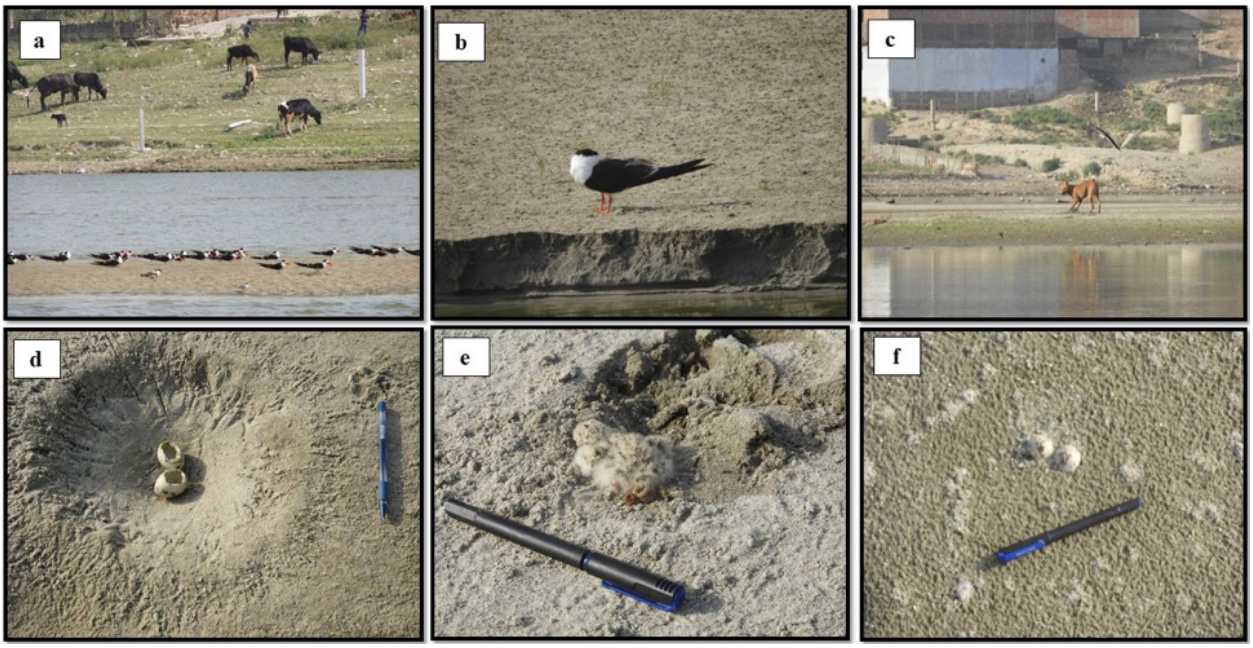

Image 3. Direct and indirect threats observed on the breeding colonies of Indian Skimmer a—Disturbance because of cattle and human | b—Island erosion | c—Disturbance because of free-ranging dogs | d—predation on the eggs by house-crow | e—chick mortality because of cattle trampling | f—inundation of sand in the nest because of rain and wind. © Kumar Ankit.

collection didn't happen probably due to the awareness created among the villagers in and around the nesting islands by the forest department team immediately after the locations were informed to the Forest department. Forest officials were deployed again in the daytime as nest guardians (near the bank) to minimize any sort of anthropogenic disturbance. However, after sunset, we recorded the event of cattle trampling in nesting islands which resulted some casualties on eggs and chick stages. The impact of pollution and prey availability due to fishing was not quantified in this study. This could have been the major cause of abandoning the nesting islands because of low food resources; hence, it needs investigation in the future. However, we observed disturbances to the breeding birds on the nesting islands due to fishing activity of human and boat in the proximity of the nesting islands. There were no instances of river bed material collection observed like in other breeding sites (Shaikh et al. 2018; Debata et al. 2019). However, erosion of non-nesting islands was observed because of increased water current and depth due to both natural and manmade factors, natural factors include unseasonal rainfall and manmade factors include water flow regulation from the upstream of Kanpur barrage for irrigation. However, we don't have data regarding the causes of water flow and water level fluctuation in the study area.

Conservation actions required

The basic ecological knowledge of breeding biology, diet, and movement during the non-breeding period of Indian skimmers is inadequate from all the breeding locations. However, it is notable that emphasis has been given by the scientific community on breeding and non-breeding sites of the species through continuous monitoring on different ecological aspects (Kabir et al. 2016; Rajguru 2017; Shaikh et al. 2018; Debata et al. 2019; Chowdhury et al. 2020). Recently observation has been also made in other rivers like Gomti in Ganga Basin (Chauhan 2023). The continuous monitoring and exploration in the potential breeding areas will unearth more information pertaining to the species for conservation.

The middle Ganges stretch is in lieu of several disturbances around the year. Hence, it becomes crucial to identify the breeding colonies in this particular stretch through continuous surveys and expeditions. Subsequently, nest protection should be provided to the breeding colonies through nest guarding and minimizing the anthropogenic pressure especially fishing during the nesting season. The 'nest guardian' program for protecting Indian skimmer nesting colonies is already in practice in National Chambal Sanctuary (Mishra & Tandon 2021), which can be replicated in the middle Ganges stretch. Sensitization of different stakeholders

through awareness drives, workshops, and community participation can also help in the protection of the nest and nesting islands during the season. Convincing locals and farmers not to do agriculture on river islands can also provide more availability of nesting islands for the Indian Skimmer and other riverine birds during peak breeding periods.

The glimmer of hope is that surveys have been conducted at regular intervals under the objective of biodiversity conservation of National Mission for Clean Ganga program in the past few years. It has helped in the identification of breeding locations of Indian Skimmers along the Ganges. Additionally, community participation programs such as 'Ganga Prahari' under the same project to involve the locals in biodiversity conservation of the river Ganges. However, with all these efforts it is necessary to protect breeding colonies of endangered Indian skimmer in the future which may subsequently help in increasing the population of the species and its survival. The record of the breeding colony from Prayagraj and Varanasi are promising findings that warrant further exploration surveys for more breeding colonies in the future.

REFERENCES

Ali, S. & S.D. Ripley (1987). *Compact Handbook of the birds of India and Pakistan together with those of Bangladesh, Nepal, Bhutan and Sri Lanka. 2nd Edition*. Oxford University Press, Delhi, 737 pp.

Ankit, K., V. Ranjan, M. Ahmad, S. Kumar, S. Hussain & G.V. Gopi (2018). Newly discovered breeding colonies of Indian Skimmer *Rynchops albicollis* in middle Ganges, India. *BirdingASIA* 30: 99–100

Bhushan, B. (2018). Skimmer Bird Beak *(Rynchops)* Surface for Fluid Drag Reduction in Turbulent Flow. *Biomimetics* (p. 563-576).

BirdLife International (2023). Species factsheet: *Rynchops albicollis*. Downloaded from http://www.birdlife.org. on 15 May 2023.

Chauhan, A. (2023). Breeding site of rare Indian skimmers spotted along Gomti in UP's Barabanki. Accessed at https://timesofindia.indiatimes.com/city/lucknow/breeding-site-of-rare-indian-skimmers-spotted-along-gomti-in-ups barabanki/articleshow/98217143.cms?from=mdr. Accessed on 24 February 2023.

Chowdhury, S.U., M. Foysal, N.U. Prince, S. Mohsanin, M.K. Miron & A.B.M.S. Alam (2020). Discovery of a new wintering area for Indian Skimmer *Rynchops albicollis* in Bangladesh. *BirdingASIA* 32: 99–102.

Das, D.K. (2015). Breeding status of Indian Skimmer *Rynchops albicollis* in the National Chambal Sanctuary, India. *Indian BIRDS* 10(2): 53–54.

Das, D.K., A.J. Galib, N. Khandakar, M.H. Rohman & A.H.M.A. Reza (2020). Activity budget of wintering Indian Skimmer *(Rynchops albicollis)* at Damar Char, Bangladesh. *Marine Ornithology* 48: 119–123.

Debata, S. (2019). Impact of cyclone Fani on the breeding success of sandbar-nesting birds along the Mahanadi River in Odisha, India. *Journal of Threatened Taxa* 11(14): 14895–14898. https://doi.org/10.11609/jott.5480.11.14.14895-14898

Debata, S., T. Kar, H.S. Palei & K.K. Swain (2019). Breeding ecology and causes of nest failure in the Indian Skimmer *Rynchops albicollis*. *Bird Study* 66(2): 243–250. https://doi.org/10.1080/00063657.2019.1655526

Debata, S., T. Kar, K.K. Swain & H.S. Palei (2018). The vulnerable Indian Skimmer *Rynchops albicollis* Swainson, 1838 (Aves: Charadriiformes: Laridae) breeding in Odisha, eastern India. *Journal of Threatened Taxa* 9(11): 10961–10963. https://doi.org/10.11609/jott.3445.9.11.10961-10963

Dilawar, M. & V. Sharma (2016). A new breeding location of Indian Skimmer *Rynchops albicollis*, and notes on other birds in Son Gharial Wildlife Sanctuary, Madhya Pradesh, India. *Indian BIRDS* 11(2): 35–38.

Fernandes, M. & J.W.D. Besten (2013). Some interesting breeding records for Pong Dam Wildlife Sanctuary, Himachal Pradesh, India. *Forktail* 29: 141–143.

Froneman, A., M.J. Mangnall, R.M. Little & T.M. Crowe (2001). Waterbird assemblages and associated habitat characteristics of farm ponds in the Western Cape, South Africa. *Biodiversity and Conservation* 10: 251–270. https://doi.org/10.1023/A:1008904421948

Giron-Nava, A., C.C. James, A.F. Johnson, D. Dannecker, B. Kolody, A. Lee, M. Nagarkar, G.M. Pao, H. Ye, D.G. Johns & G. Sugihara (2017.) Quantitative argument for long-term ecological monitoring. *Marine Ecology Progress Series* 572: 269–274.

Gopi, G.V. & B. Pandav (2007). Avifauna of Bhitarakanika mangroves, India. *Zoos' Print Journal* 22(10): 2839–2847.

Grimmett, R., C. Inskipp & T. Inskipp (2011). *Birds of the Indian Subcontinent. 2nd ed*. Oxford University Press & Christopher Helm, London, 528 pp.

Havstad, K.M. & J.E. Herrick (2003). Long-term ecological monitoring. *Arid Land Research and Management* 17(4): 389–400. https://doi.org/10.1080/713936102

Islam, M.Z.U & A.R. Rahmani (2008). *Potential and existing Ramsar sites in India*. Oxford University Press, 592 pp.

Kabir, M.T., S.U. Chowdhury, O. Tareq, A.B.M.S. Alam, S. Ahmed, O. Shahadat & M. Foysal (2016). New breeding records of riverine birds in Bangladesh. *BirdingASIA* 26: 39–42.

Kar, T. & S. Debata (2019). Assemblage of waterbird species in an anthropogenic zone along the Mahanadi River of Odisha, eastern India: Implications for management. *Proceedings of the Zoological Society* 72(4): 355–363. https://doi.org/10.1007/s12595-018-0276-9

Malla, G., P. Ray, P. Bagaria, K. Sivakumar, J.A. Johnson, G.V. Gopi & P. Sathiyaselvam (2015). Does the Indian Skimmer *Rynchops albicollis* have a future in East Godavari District, Andhra Pradesh. *BirdingASIA* 23: 58–59.

Mani, R. (2023). Large nesting site of Indian Skimmer discovered in Prayagraj's Palpur village. https://timesofindia.indiatimes.com/city/allahabad/large-nesting-site-of-indian-skimmer-discovered-in-prayagrajs-palpur-village/articleshow/99743641.cms. Accessed on 25 April 2023.

Martin, G.R., R. Mcneil & L.M. Rojas (2007). Vision and the foraging technique of skimmers (*Rynchopidae*). *Ibis* 149(4): 750–757. https://doi.org/10.1111/j.1474-919X.2007.00706

Mishra, M.C. & A. Tandon (2021). Chowkidar turns conservationist for winged friends in Chambal. https://india.mongabay.com/2021/02/chowkidar-turns-conservationist-for-winged-friends-in-chambal/. Accessed on 1 February 2021.

Mital, A., S.S. Khan & R.S. Kumar (2019). Indian Skimmer *Rynchops albicollis* and other riverine birds on the islands near Turtle Wildlife Sanctuary, Uttar Pradesh. *Indian BIRDS* 15 (2): 64–65.

Mohsanin, S. (2014). Survey of wintering Indian Skimmer *Rynchios albicollis* in Bangladesh. *Birding ASIA* 21: 105–106.

Page, G.W. & R.E. Gill Jr (1994). Shorebirds in western North America: late 1800s to late 1900s. *Studies in Avian Biology* 15: 147–160.

Prasad, S.N., T.V. Ramachandra, N. Ahalya, T. Sengupta, A. Kumar, A.K. Tiwari, V.S. Vijayan & L. Vijayan (2002). Conservation of wetlands of India—a review. *Tropical Ecology* 43(1): 173–186.

Rahmani, A.R. (2012). *Threatened Birds of India: Their Conservation Requirements*. Oxford University Press, New Delhi, xvi + 864 pp.

Rajguru, S.K. (2017). Breeding biology of Indian Skimmer *Rynchops*

albicollis at Mahanadi River, Odisha, India. *Indian BIRDS* 13(1): 1–7.

Shaikh, P., M. Panigrahi & T. Katti (2021). Indian Skimmer *Rynchops albicollis* (Swainson, 1838) Migration in India: Resighting Records of Birds Colour Tagged in National Chambal Sanctuary, Madhya Pradesh, India. *Journal of the Bombay Natural History Society* 118: 25–30.

Shaikh, P.A., A. Mendis, J. Luis, D.K. Das & S. Surve (2018). Status and distribution of Indian Skimmer *Rynchops albicollis* in the National Chambal Sanctuary, India. Final Report submitted to BirdLife International, 46 pp.

Shukla, N. (2016). Chambal loses its rare 'skimmer'. https://timesofindia.indiatimes.com/city/lucknow/chambal-loses-its-rare-skimmer/articleshow/50923409.cms. Accessed on 10 February 2016.

Siddiqui, A.I., J. Pandey & R. Mandal (2007). House-crow: threat to Indian Skimmer. *Mistnet* 8(2): 4–6.

Singh, L.A.K. & R.K. Sharma (2018). Sighting trend of the Indian Skimmer (Charidiformes: Laridae: *Rynchops albicollis* Swainson, 1838) in National Chambal Gharial Sanctuary (1984–2016) reflecting on the feasibility of long-term ecological monitoring. *Journal of Threatened Taxa* 10(5): 11574–11582. https://doi.org/10.11609/jott.3732.10.5.11574-11582

Sinha, A., N. Chatterjee, S.J. Ormerod, B.S. Adhikari & R. Krishnamurthy (2019). River birds as potential indicators of local-and catchment-scale influences on Himalayan river ecosystems. *Ecosystems and People* 15(1): 90–101. https://doi.org/10.1080/26395916.2019.1591508

Sundar, K.S.G. (2004). Observations on breeding Indian Skimmers *Rynchops albicollis* in the National Chambal Sanctuary, Uttar Pradesh, India. *Forktail* 20: 89–90.

Vaughan, I.P., D.G. Noble & S.J. Ormerod (2007). Combining surveys of river habitats and river birds to appraise riverine hydromorphology. *Freshwater Biology* 52(11): 2270–2284. https://doi.org/10.1111/j.1365-2427.2007.01837

Zusi, R.L. (1996). Family Rynchopidae (Skimmers), pp. 668–677. In: delHoyo, J., A. Elliott & J. Sargatal (eds.) *Handbook of the birds of the world. Vol. 3. Hoatzin to Auks*. Lynx Editions, Barcelona, 821 pp.

Journal of Threatened Taxa is indexed/abstracted in Bibliography of Systematic Mycology, Biological Abstracts, BIOSIS Previews, CAB Abstracts, EBSCO, Google Scholar, Index Copernicus, Index Fungorum, JournalSeek, National Academy of Agricultural Sciences, NewJour, OCLC WorldCat, SCOPUS, Stanford University Libraries, Virtual Library of Biology, Zoological Records.

NAAS rating (India) 5.64

Print copies of the Journal are available at cost. Write to:
The Managing Editor, JoTT,
c/o Wildlife Information Liaison Development Society,
43/2 Varadarajulu Nagar, 5th Street West, Ganapathy, Coimbatore,
Tamil Nadu 641006, India
ravi@threatenedtaxa.org

Journal of Threatened Taxa

www.threatenedtaxa.org

ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)

February 2024 | Vol. 16 | No. 2 | Pages: 24615–24818
Date of Publication: 26 February 2024 (Online & Print)
DOI: 10.11609/jott.2024.16.2.24615-24818

Publisher & Host

WILD zoo reach
Zoo Outreach Organisation

Threatened Taxa