Breeding biology of Indian Skimmer 
*Rynchops albicollis* at Mahanadi River, Odisha, India

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**Abstract**

Riverine birds are an integral part of a river’s ecosystem. They play a pivotal role in maintaining its ecological balance. Presently, due to untold biotic and abiotic factors, they are on the decline, and some of them are today in the rare, threatened, or vulnerable lists of the IUCN Red List of Threatened Species. Therefore, there is an urgent need to study these threatened bird species to form conservation strategies to not only help save the species, but also to ultimately help sustain the balance of nature. Among such, the Indian Skimmer *Rynchops albicollis* is a “Vulnerable” species as per the IUCN. Indian Skimmers are found in the Mundli area of Cuttack District, Odisha, India. There is barely any scientific documentation available on the Indian Skimmer. Therefore, an attempt has been made to study the breeding biology of this vulnerable species at Mundli, Odisha, India. The nesting site that was studied, the first such from Odisha, was discovered in the last week of February 2016, during a regular birdwatching trip, when the author saw a pair of skimmers flying overhead. Extensive field survey was carried out between March and June 2016 (about 90 days) at the study area as per standard methods of data collection on breeding biology of avian species. The courtship, nesting, and breeding behaviours were studied. For a proper scientific study the associated flora, fauna, soil, fish, and water of study area were enumerated. Skimmers were ringed, and the nocturnal behaviour of the chicks was studied. The nesting area contained diverse aquatic and sand dune flora as well as faunal species with surface feeding fish, crustaceans, and small telescopic snails. It was noted that 181 eggs of Indian Skimmer survived from 64 nests. Out of these, 139 eggs hatched successfully. A clutch comprised two to five eggs. The present study highlights the biodiversity and geographical conditions that are conducive in encouraging the nesting of the Indian Skimmer.
Introduction
The Indian Skimmer *Rynchops albicollis* [hereinafter, IS] is a riverine bird [1] that belongs to the family Rynchopidae. It is a mid-sized tern-like bird, black above and white below, with a long red bill (BLI, 2014; Mohsanin 2014). Its lower mandible is much longer than the upper, and laterally compressed towards the tip. It has long pointed wings, a short tail, and short red legs with toes linked by incised webbing. It is gregarious and colonial, often loafing in flocks. It is monogamous, and while the sexes look similar, the male is larger. Juveniles are mottled with paler beaks. It does not swim or dive, but feeds on calm water by skimming the surface with the lower mandible, which snaps shut on the prey. It is listed as Vulnerable by IUCN (BirdLife International 2016), and hence it requires urgent conservation measures. The presence of IS has been reported from various habitats of Odisha, including River Mahanadi at Mundali, which comes under Chandaka-Dampada Wildlife Division, Cuttack. This paper reports upon its breeding and nesting behaviour, and hope it will help in framing a proper conservation strategy.

The IS is confined to the large rivers of India, Bangladesh, Pakistan, and some countries that are part of Indochina (Myanmar, Cambodia, Laos, Vietnam). It is a rare visitor to Nepal and was previously recorded in China. It is now extinct from the Mekong Delta (BirdLife International 2001; J. W. Duckworth in litt. 2003). It is seen in very small numbers in Pakistan while Myanmar reports recent sightings from only three localities. With the species being present in good numbers in various riverine habitats in India, it is believed that India is currently the stronghold of this vulnerable species and therefore, any study of it is greatly relevant from the perspective of conservation (Sundar 2004). In India, it is reported in Rajastan, Uttar Pradesh, Madhya Pradesh, Maharashtra, Gujarat, Andhra Pradesh, Bihar, and Odisha. In Odisha, the IS has marked its presence around the year in various habitats, especially in the Mahanadi River belt, even though for a long time it was presumed to be a winter visitor to the state. The species has been sighted in Bhitarakanika, Nalabana in Chilika, Satkosia, Mundali in Cuttack, Dhamra, and Hirakud. While the birds were observed mating in some of these places, no nesting site of the species had yet been discovered (Rahmani & Nair 2015). Its only known nesting site is Chambal Wildlife Sanctuary. Recently there was a report of its nesting on the Son River in Madhya Pradesh, India (Dilawar & Sharma 2016).

The IS’s diet mainly consists of crustaceans, insect larvae, and fish. Its eye is uniquely adapted for nocturnal activity as well as for brilliant, reflected light, daytime conditions. It is crepuscular and nocturnal with juveniles actively foraging at night (Rasmussen & Anderton 2012). Its call is a soft low-frequency bark, like that of a dog. Birds bark as an anti-predatory response, to warn neighbours of potential danger, and also as a display aggression when neighbours intrude into their territory. Typical barking calls can last about five seconds. Head tosses and upright posturing often accompany these barks. Skimmers may also keep their bills open for prolonged periods without uttering any sound. As this is a social species, the congregation consists of dense flocks of both, young, and adult birds. Individuals in the flocks communicate with each other vocally and through posturing displays (Burger & Gochfeld 1990; Gochfeld & Burger 1994).

The IS breeds on broad undisturbed sandbank spits, and islands in large rivers. Its nest is in the open, a mere shallow scrape in loose and porous sand, without any cover of foliage, boulders, rocks, etc. Most of these mid-river sand-spits, chosen for nesting, are usually remote and inaccessible. Therefore, it is extremely difficult to conduct detailed observations while the species is breeding. Hence the IS remains one of the most under-studied birds in India with much of the information available on its ecology and habits being anecdotal and descriptive (Sundar 2004). Very few studies are reported on the breeding of this species (Sundar 2004; Mohsanin 2014). In the present study, we attempt to illustrate the breeding biology of the IS.

Study area
This study was conducted in the Mundali Dam area (20.44°N, 85.75°E) in Cuttack District, Odisha, India. The nesting site is a sand-bar (c. 600x700 m) situated mid-stream on the River Mahanadi, and lies to the south of the Mundali bridge (Fig. 1) (85.73°N, 20.43°E–85.73°N, 20.42°E; 85.73°N, 20.43°E–85.73°N, 20.43°E). Much of the sandbar is composed of loose and porous sand with clumps of *Sachrum spontaneum* grass. It is in close proximity to the Chandaka–Dampada Wildlife Sanctuary, and is only about 300 m away from a busy road with vehicular traffic. It is also close to Sukasan Forest Division, Athagarh, with small and discontinuous hill ranges towards the west. The Mundali Dam regulates floodwaters of the Mahanadi River, released from the Hirakud Reservoir, during peak monsoons. The area further west is adjacent to many small reserve forests in the Athgarh Wildlife Division.

The climate is typically tropical monsoon. During the period of study, the temperature ranged between 35°C and 48°C, with occasional dry ‘kaalbaisakhi’ or localised thunderstorms. No significant rainfall was registered locally though a few spells were recorded in some nearby areas. This site sees a large number of wintering waterbirds during December–February, including Red-crested Pochard *Netta rufina*, Tufted Duck *Aythya fuligula*, Northern Pintail *Anas acuta*, Gadwall *A. strepera*, Ruddy Shelduck *Tadorna ferruginea*, and Pacific Golden Plover *Pluvialis fulva*. Local villagers use the river for fishing and grazing cattle in the sand-beds. Asiatic elephants *Elephas maximus* are known to use this area as a passage during trans-river migration. Approach to the nesting site was by a 20–30 min. boat ride, over about 21–24 m deep water, in a fishing boat hired from local fishermen.
Methodology

Instruments used

The following instruments were used in the present study: (a) One ‘Toplind’ measuring tape of 50m length, (b) a small 30cm ‘Essess’ scale, (c) one slide calipers, (d) one ‘Eurotech’ electronic weighing machine, (e) five sample collection jars, (f) two cameras, Canon 1D mkIV, and Canon 7D mkII with 10–18 mm, 28–300 mm, and a 400 mm lens, (g) temperature meter, hygro meter, and a clock, and (h) a few zip pouches for sample collection.

Data collection

In June–July 2015 local birdwatchers, and the author had regularly sighted and photographed a flock of more than 150 ISs, including sub-adult birds, on a sand-spit to the north of the bridge. In the year of 2016, noticing their presence so early (February 2016) in this habitat, SKR regularly visited the site and observed increasing congregations, and flocking, and behaviour that pointed towards pairing of birds: moving out from flocks and displaying courtship behaviour. The number of individuals ranged between 60 and 205 this year during the breeding period. Studying the behaviour of the IS, SKR was convinced that the birds would nest and breed here. Pairing of birds and courtship display was observed. Over the next few days, mating between several pairs of birds was documented. The pairs were also observed making shallow scrapes in the sand. They mostly chose to make the nesting scrapes in a 30 m wide region circumventing the edge of the sand-bed (c. 1 m above the water level) instead of the higher and safer regions in the centre. The nests were situated at least 15–20 m away from the bank: the closest to the water was at a distance of six meters. They displayed strong territorial behaviour against any intrusion into their nesting space by other individuals of the flock. Watching these activities, I was certain that the skimmers would soon lay eggs. Simultaneous nesting of Black-bellied Tern Sterna acuticauda, River Tern S. aurantia, River Lapwing Vanellus duvauceli, Great Thick-knee Esacus recurvirostris, Small Pratincole Glareola lactea, Spotted Dove Spilopelia chinensis, and Spot-billed Duck A. poecilorhyncha was observed. As the discovery of a nesting habitat of vulnerable and endangered species is of critical importance, the matter was conveyed to the PCCF and Chief Wildlife Warden of the State Forest Department, who sent the DFO of the area to study and report on the developments. Permission was then granted to the author to carry on documentation of the nesting process under the supervision of the state forest department (vide letter no. 2484/4WL-170/2016, dt., 20 March 2016). After a first few visits, the boatmen, who are fishermen by profession, were apprised by SKR about the relevance of the sandbar because of nesting by vulnerable birds. During conversations with them, it was understood that they had been seeing nesting by skimmers in this habitat and on the same sandbar for many years now. Locally the bird is called ‘chirei’ (Odia name: ‘paanchiri’), but the author...
realised that the name was used to refer to skimmers as well as all the terns that inhabited the area.

**Physiochemical analysis of soil and water**
The physiochemical analysis of soil was carried out at the Department of Soil Science and Agricultural Chemistry, Orissa University of Agriculture and Technology, Bhubaneswar, and water was analyzed at Bio-Lab Private Limited, Bhubaneswar using standard methods.

**Results and discussion**

**Population of Indian Skimmer at study area**
The population of IS was analysed during dusk to dawn, each day during the study periods. Maximum numbers were noted. It was observed that birds were in flocks on the sand bar; 24 individuals were counted in February 2016, c. 205 in March, c. 147 in April, and c. 159 in May [4, 5].

**Pre-nesting behaviour, nest making activities and mating of Indian Skimmer**
Courtship, pairing, and mating between a few pairs was observed from 01 March 2016 onwards. The mating pairs move away from the flock, exhibiting courtship behaviour, marked with aerial displays, and indulging in nest-making or scrape-making [6, 7, 8]. In one instance, the pre-mating, and mating time was recorded to be 1 min 40 sec. The mating time lasted for only 40–50 sec. It was observed that the period of nest construction was about six–eight days. Both parents participated in shuffling sand to make the nest-scrape; while one parent made the scrape the other one stood by. When selecting a nesting location, male and female of the pair communicated by kicking sand to establish a scrape at that particular spot. The first egg was seen on 30 March 2016. Grey bricks were placed near each nest as nest-markers from 05 April 2016 with details such as date, and number of eggs, written on them [9].

**The clutch and egg**
Nests were found about 6–10 m away from the bank [10]. The distance between clutches was 4–5 m, either forming a triangle or a quadrangle. One nest contained three River Tern eggs, and one of an IS. The River Tern was seen incubating the eggs in this nest, and all its eggs hatched successfully after 22 days, but the IS’s egg was found abandoned [11]. The mean clutch size of IS was 3.12 (SD=0.41, n=64; range=2-5). It was also observed that average diameter of the nest scrape was 132.85 mm, and its depth was 33.39 mm. The diameter varied between 120 and 143 mm and depth between 28 and 40 mm. The laying periods at study area was 14 days (i.e. from 30 March 2016 to 12 April
Both parents attended to nest duties periodically. Individuals of pairs kept looking in opposite directions as they attended to nest duties. They were seen soaking their bellies, and sitting on the eggs to cool them during the oppressive heat. Incubation was comparatively less at sunset when the parent birds would congregate in flocks at the edge of the water, some of them indulging in bathing and preening activity. The first egg, which was laid on 30 March hatched exactly after 21 days, on 19 April 2016. The eggs in various nests hatched in stages thereafter with the entire hatching concluding by 02 May 2016. All eggs hatched between 21–24 days, registering a median incubation period of 22 days.

**Food habits**

It was observed that the IS feed mainly on available surface feeding fish species. Its diet primarily consists of small fish of 04–14 cm length. Fish that were smaller than 02 cm were fed to young birds. However, Gochfeld & Burger (1994), and Hammerson & Cannings (2006) reported that the Black Skimmer *R. niger* usually consumes common arthropods, crustaceans, and other marine invertebrates. It was enumerated that IS feeds mainly on five major species of fish [13] as observed in the study area.

Samples (fish) were collected from dry dead fishes found near the nests of IS and submitted to, and identified by Dr Satyaranjan Behera, Zoologist, Odisha Biodiversity Board, Bhubaneswar. The identified fishes are as follows:

<p>| Table 1. Morphological variation of nests (n=10) of Indian Skimmer at Mundli, India |
|---------------------------------|------------------|------------------|------------------|</p>
<table>
<thead>
<tr>
<th>Clutch size</th>
<th>Temperature (°C)</th>
<th>Incubation period (IP)</th>
<th>Diameter (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.12 ±0.41</td>
<td>39.43 ±1.34</td>
<td>22.17 ±0.86</td>
<td>132.85 ±7.07</td>
</tr>
<tr>
<td>33.39 ±3.78</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<p>| Table 2. Morphological variation (n=10) clutches of Eggs of Indian Skimmer at Mundli, India |
|---------------------------------|------------------|------------------|------------------|</p>
<table>
<thead>
<tr>
<th>Vertical length (mm)</th>
<th>Horizontal length (mm)</th>
<th>First weight (g)</th>
<th>Last weight (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>42.83 ± 0.90</td>
<td>30.11 ± 086</td>
<td>18.70 ± 0.30</td>
<td>18.56± 0.40</td>
</tr>
</tbody>
</table>

Incubation and hatching

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Salmophasia bacaila: Is a fish which is commonly found at the study area during the breeding season of IS. It is popularly known as large razorbelly minnow, and belongs to the family Cyprinidae. Locally it is called ‘Jalla’. It is distributed in Pakistan, India, Bangladesh, and Nepal (Rema Devi & Dahanukar 2011).

Salmophasia sardinella: It belongs to family Cyprinidae and locally known as ‘Sana Jalla’. It is distributed in India, Bangladesh and Myanmar (Devi & Boguskaya 2009).

Systomous sarana: It is popularly known as Olive barb or Peninsular Olive barb belonging to the family Cyprinidae. Locally known as ‘Jalla bedi.’ It is distributed in India, Nepal, Bangladesh, Bhutan, Afghanistan and Pakistan (Dahanukar 2010).

Pethia ticto: It is popularly known as Ticto barb belonging to the family Cyprinidae. It is locally known as ‘Kerandi.’ It is distributed in India, Nepal, Bhutan, Bangladesh, Sri Lanka, China and Myanmar (Hamilton 1822).

Dermogenys pusilla: It is commonly known as Wrestling Halfbeak belonging to the family Zenarchopteridae. It is locally known as ‘Gania’. It is distributed in India, Myanmar, Thailand, Laos, Cambodia, Vietnam, Phillipines, Malaysia and Indonesia (Hossain et al. 2016).

**Hatchlings and fledglings**

IS hatchlings are semi-precocial. The hatchlings were born with uniform length of upper and lower mandibles. It was noticed that the chicks were able to drag themselves around inside the scrape within 15–20 mins of hatching. The parents diligently removed eggshells from the nest, carrying, and discarding them in the water. This is probably to avoid predation. The egg tooth of new born was visible as a white spot on top of the upper mandible. After a while the chicks would slowly stand and walk out of the nest and settle into another scrape. This attempt to keep unhatched eggs separate from the hatchlings was noticed in almost all the nests. Incubation of unhatched eggs by parent birds and cooling of unhatched eggs and hatchlings continued until all the chicks were able to move out of the nest. After attaining adequate mobility (within five to six days), the cryptic hatchlings would also be found hiding inside grassy vegetation or in shallow scrapes at the edge of the water, so that they are less exposed to predators and elements, thus making it extremely difficult to detect them. Older hatchlings and near-fledglings were seen to be actively foraging on the ground at night on small fish that were washed over to the edge of the water [14, 15]. The length of the lower mandible was observed to be longer than upper mandible by 1.5 mm in a fledging assumed to be more than 20 days old as recorded by SKR. The chicks were born with down feathers but it could not be ascertained whether they were born with eyes open. However they did open their eyes on the first day of hatching. The parent birds fed hatchlings with regurgitation of tiny fish until the first week of hatching [16]. They were observed to be encouraging hatchlings to move out of the nest on the third day after hatching into a fresh scrape nearby. They would sit close to the nest and call constantly (a typical call pattern observed and documented).
Major threats to Indian Skimmer

The main threats were rise in water level, cattle grazing, and fishing activities by the local fishermen. It was also observed that local people burnt the grass *S. spontaneum* for the purpose of hunting small animals for food. It was also noticed that fisherman, sometimes, used pesticides to catch prawns, which would have a negative impact on the skimmer. The industrial waste being released into the river pollutes the water, and in turn, affects the prey base of riverine birds, and needs to be checked.

Ringing of Indian Skimmer

Dr S. Balachandran, of the BNHS, and his team were requested to ring the birds. Prior permission was obtained from the PCCF, Govt. of Odisha. 21 adults and 36 juveniles were individually colour-marked [17].

Floral diversity of study area

A floral survey of the study area revealed that it is rich with edible, medicinal, sand dune and aquatic plants. About 103 plant species of 57 families were recorded. Among them, five floating, 47 sand dune, and seven submerged floras are recorded.

Conclusion

The IS is an extremely poorly studied species and does not give much opportunity for documentation of its breeding biology as most of its habitats are inaccessible. This study provides a description of the skimmer’s breeding area, so comparisons can be made with other breeding locations, which might benefit conservation efforts. Hopefully the ringed birds will throw light in understanding additional aspects of its ecology. The authorities should address the identified threats urgently. The site-protection during the breeding season and surveying the area, conducting awareness camps in the adjacent villages will definitely curb depletion of populations, and encourage the establishment of a safe haven for the IS in particular, and all other endangered and threatened species in general, which were found breeding on the stated study site.

Acknowledgements

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References


Hasselt, 1823 (Zenarchopteridae) and *Labeo bata* (Hamilton, 1822) (Cyprinidae) from the Ganges River (NW Bangladesh). Journal of Ichthyology 22 (4): 744–746.


