

Spacial and Temporal Variation of Long-Distance Migratory Shorebirds in Taleimannar, Mannar Island- A Key Wintering Ground for Central Asian Flyway

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Sri Lanka represents the southernmost location of Central Asian bird migratory Flyway that spans across Eurasia. Mannar island of Sri Lanka is considered an entry point of migrants to the country and holds critical wintering grounds for migratory shorebirds. These long-distance migratory shorebirds connect geographically separated areas during migration, hence act as global carriers of genes, microbes and pathogens. Therefore, understanding their migration ecology is critical for a global biological centre like Sri Lanka where large numbers of birds annually visit from Asia and Europe. Here we aimed to assess how the temporal distribution and moulting patterns of shorebirds of different origin change throughout the year within a key wintering ground in Mannar. Monthly shorebird surveys were carried out in the tidal mudflat and adjacent lagoon (~1 km²), located at the base of Rama's Bridge, Talaimannar, from 2018 May to 2020 May. The birds were counted while recording their plumage characteristics in systematically placed point count stations (r=100m, 15mins each), at different day-time intervals (0600-0800h, 1000-1200h, 1300-1500h, 1500-1700h, 1700-1900h). The surveys were continued for an average of seven days per month, in a manner that covers each aforementioned time interval. Thirty-one species of shorebirds were observed throughout the period, out of which 19 most common species were selected to assess how the abundance changed throughout the year using monthly maximum count of each species in analysis. Five categories of shorebirds were recognized referring to Bird Life Data Zone based on their breeding origin; throughout arctic, eastern arctic, throughout temperate, western temperate and eastern temperate. Despite its breeding origin, birds of all categories arrived in Talaimannar between August – October and the numbers peaked during February – March. On arrival in August, 19% of birds remained in breeding plumage (81% in winter plumage) and by March, close to northward departure, 08% of birds regained breeding plumage. Though the numbers were less (~11% of the total), the summer loitering shorebirds were seen throughout May-July; 44% of them were in partial or full breeding plumage. An in-depth study of migration and wintering ecology of these shorebirds in Mannar is currently in progress, using bird banding, flagging and GPS-tracking.

Keywords: *biological monitoring, connectivity, tidal mudflats, Sri Lanka*

Overflying the Himalayas; the Northward Migration of Sri Lankan-wintering Brown-headed Gulls

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Abstract – The Himalayan Mountain range, which rises to an average elevation of 6,100m above mean sea level (AMSL), forms the most formidable geographic barrier to birds migrating along the Central Asian Flyway (CAF). Aiming to understand the poorly-studied migration routes of species occurring in CAF, we are tracking several migratory waterbird species including Brown-headed Gull *Larus brunnicephalus* from Sri Lanka, which encounters the Himalayas during its northward migration to reach its breeding grounds in south-central Asia.

In March–April of 2021 and 2022, two Brown-headed Gulls were caught at their non-breeding sites in Mannar Island, Sri Lanka, and fitted with GPS-GSM transmitters, just before their northward migration and their movements were tracked. The birds departed Mannar between 25th April and 14th May and arrived at their breeding grounds on the Tibetan plateau between 4th and 20th May. This northward journey of the gulls lasted 7.5 ± 2.1 (Mean $\pm$ SD) days during which they covered a distance of $3,173.2 \pm 534.3$ km. Both gulls stopped over in the Ganges River, India, for approximately two days. Accordingly, their overall migration speed (including stopover duration) was 451.2 ± 198.9 km/day while the travel speed on travel days was 24.2 ± 10.5 km/h.

During migration, the gulls crossed the Himalayas through Nepal at an altitude of $5,744.1 \pm 298.5$ m AMSL. In the course of this crossing, they flew 888.0 ± 116.8 m above ground (where surface elevation is $4,856.1 \pm 181.7$ m AMSL), over the peaks of Panbari Himal & Cho Oyu.

This is the first evidence of Brown-headed Gull encountering extreme altitudes during migration. Weighing only 372.5 ± 53.0 g, Brown-headed Gull is likely to be the lightest gull species to cross the Himalayas.

Keywords: Brown-headed Gull, Himalayan crossing, Central Asian Flyway



405/D

Tracking the lesser-known migratory routes of *Larus heuglini* (Heuglin's Gull), from Sri Lanka to the Arctic circle

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Larus heuglini (Heuglin's Gull) is one of the largest gulls with a white head, found along the coasts of Northern and North Western Sri Lanka, during the migratory season. It is a species of the Lesser Black-backed Gull, *Larus fuscus* complex whose migration and breeding origins of the South Asian wintering populations are not well understood. Our study aimed to track the route of Heuglin's Gulls for the first time from South Asia to their breeding grounds, to understand their migration ecology and Sri Lanka's connectivity to the rest of the Central Asian Flyway through satellite telemetry. During March-April of 2021 and 2022, three adult Heuglin's Gulls were caught on their non-breeding site in Mannar Island of Sri Lanka (9.0585° N, 79.8185° E), and fitted with GPS-GSM transmitters, just before commencing their northward migration. As of June 2022, we obtained information on migratory movements covering three northward and two southward migrations, involving more than one full annual migration cycle. All three birds traveled to the Yamal Peninsula of the high arctic (70.6708° N, 70.1367° E) to breed during the boreal summer. Following breeding, two of them returned to their non-breeding grounds located in the Indian Sub-continent: Mannar, Sri Lanka and Maharashtra, India. We found that one gull which spent the non-breeding period in Mannar in 2020-2021, spent the following season in Maharashtra. The spatial and temporal characterization of these migrations is shown in Table 1. As a result of tagged birds spending more time in the stopover sites during southward migration (30.0 ± 2.8 days) than the northward migration (18.7 ± 5.9 days), the southward migration was slower (178.0 ± 8.9 km/day) compared to the northward migration (223.0 ± 52.5 km/day). Our findings provide the first definitive evidence for the breeding origin of South Asian Heuglin's Gulls. Our study further highlights the migratory connectivity between Sri Lanka and the arctic circle.

Table 1: Distances and temporal aspects of northward and southward migration, for three Heuglin's Gulls tracked by satellite telemetry

	Northward migration Average (Range)	Southward migration Average (Range)
Onset of migration	13 Apr (1 - 24 Apr)	18 Sep (29 Aug - 9 Oct)
Arrival at breeding/ non-breeding ground	31 May (15 May - 18 Jun)	13 Nov (4 - 23 Nov)
Duration of migration (days)	43.3 (35-55)	56 (45-67)
Total migration distance covered (km)	9,302.7 (8,943-9,956)	9,899 (8,292-11,505)
Migration speed (km/day)	222.9 (162.6-257.4)	178.0 (171.7-184.3)
Stopover duration (days)	18.7 (12-23)	30 (28-32)
No. of stopovers	5.3 (5-6)	7.5 (7-8)

Migration speed is the overall migration speed, including stopover time.

Keywords: Heuglin's Gulls, *Larus heuglini*, migration, Central Asian Flyway, Mannar
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MANNAR ISLAND: A CENTRE FOR THE MOVEMENT OF WATERBIRDS WITHIN THE PALK BAY AND GULF OF MANNAR

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The Mannar Island of northwestern Sri Lanka is a critical site of the Central Asian Flyway. Despite this recognition, our understanding of its usage by migrant waterbirds is limited. We initiated a waterbird tracking program in Mannar in 2020, using GPS tagging to fill that gap. By July 2022, 21 waterbirds of 11 species were tagged and monitored their movement within the Palk Bay and Gulf of Mannar, during the non-breeding season, along northward/southward migrations and as summer loiterers. The movement of birds within Mannar Island and the adjacent mainland was observed linking the key wetlands, including Rama's Bridge and Urumalei mudflat, Korakulam tank, Erukkalampiddy lagoon, Vankalei Sanctuary and Vidaltivu Nature Reserve. The birds moved along Mannar's both coasts and across Mannar Island. Further, four main movement corridors across the region were observed: (A) along the northwest coast from Mannar via Iranativu, Jaffna across Palk Strait to Point Calimere and above, (B) along Rama's Bridge via Dhanushkodi to Point Calimere and above, (C) direct northward route across Palk Bay and (D) Mannar to Dutch Bay across Gulf of Mannar. The crab plover, *Dromas ardeola* (130,690 data points from five birds), utilized three routes, A, B and C. Brown-headed gull, *Chroicocephalus brunnicephalus* (1,260 data points, two birds), using A and C routes. In contrast, lesser crested tern, *Thalasseus bengalensis* (10,106 data points, two birds), used A and D routes. Eurasian wigeon, *Mareca penelope* (4,017 data points, two birds), and arctic skua, *Stercorarius parasiticus* (152 data points, one bird), took only route A, as Heuglin's gull, *Larus heuglini* (3,880 data points, three birds), solely used route B. Grey plover, *Pluvialis squatarola* (11,147 data points, one bird), took direct route C. Iranativu Island, Pooneryn, Chavakachcheri Lagoon and Kayts of Jaffna, Rama's Bridge and Point Calimere were identified as key stepping stones for waterbird movement across the region. This study highlights the connectivity of wetlands across the Palk Bay-Gulf of Mannar region and the necessity of preserving this network. This study provides the first unbiased records of waterbird movement across the region that would be highly useful in conservation planning and making informed management decisions in the rapid development process in northwest Sri Lanka.

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Keywords: Central Asian Flyway, Mannar, Movement patterns, Satellite Tagging, Waterbirds

Breeding ecology of two endangered *Sternula* terns (Saunders's *S. saundersi* and Little *S. albifrons*) in the island chain of Adam's Bridge, Sri Lanka

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ABSTRACT

Nesting ecology and behavior of the Critically Endangered, Saunders's Tern (*Sternula saundersi*) and Vulnerable (VU) Little tern (*Sternula albifrons*) was studied at sand island I of the island chain of Adam's Bridge at Talaimannar, Sri Lanka. We mapped the nesting colony and studied the egg and nest morphometry and the breeding ecology of these two species for two successive breeding seasons of 2018 and 2019. Using focal animal and point count sampling, we studied the breeding behavior and disturbances to nesting of these two tern species in the colony. In July 2019 another large breeding colony of Saunders's Tern was discovered at sand island VII of Adam's Bridge. In this presentation, we provide the descriptive study of a *Sternula* breeding colony and record the largest discovered breeding colony of Saunders's Tern in Sri Lanka. Based on our observations, we suggest mitigatory measures to safeguard these vital breeding sites within this important wetland habitat, which is equally critical for migratory birds of the Central Asian Flyway.

Key words: Saunders's Tern, Little Tern, breeding ecology, nesting, disturbances, Adam's Bridge



Status of the ground-nesting waterbirds of Mannar and Adam's Bridge Islands of Northwestern Sri Lanka

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There are limited habitats available for coastal and offshore ground-nesting waterbirds in the island of Sri Lanka. Based on the population surveys of breeding birds using point counts, line transects and banding, here we critically evaluate the status of waterbird breeding in some of the key wetlands that are well known for their importance for migratory waterbirds of the Central Asian Flyway; the sand islands of the Adam's Bridge Marine National Park and Mannar Island of northwestern Sri Lanka. The sand islands I, II, III, V and VII showed breeding of eight seabird species that include Sooty Tern, Bridled Tern, Little Tern, Saunders's Tern, Roseate Tern, Common Tern, Greater Crested Tern and Brown Noddy. Many of these species are listed as critically endangered (CR) in the national redlist due to their restricted breeding range and small population size. The nests of resident subspecies of Kentish Plover (ssp. *seebohmi*), Spot-billed Duck, Ruddy-breasted Crake, White-breasted Waterhen, Pheasant-tailed Jacana, Common Moorhen, Black-winged Stilt, Yellow-wattled and Red-wattled Lapwings and Oriental Pratincole were recorded in the Mannar Island, which has mudflats, salt marshes, mangrove forests to coastal scrub forests. The Little Tern and Kentish Plover breed in both Mannar Island and sand islands of the Adam's Bridge. Destruction of breeding habitats, nest predation by stray dogs, egg poaching and beach garbage threaten the breeding of these waterbirds in this key region of Central Asian Flyway.

Key words: Adam's Bridge Islands, Central Asian Flyway, Ground-nesting waterbirds, Mannar, Seabirds, Shorebirds, Sri Lanka

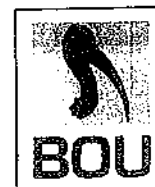


ABSTRACTS

Global flyways

a synthesis of bird migration research

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All presentations in alphabetical order by presenting author

Since 2006 Alejandro has been working for the Migres Foundation, and is currently coordinator of the Migres program for monitoring bird migration through the Strait of Gibraltar.

POSTER | 22 Nov, 0520 UTC

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Why take a detour when there is a shorter route? Heuglin's Gulls' migration between Indian subcontinent and Russian Arctic

The study used GPS telemetry to examine the migration behavior of Heuglin's Gulls from Mannar, Sri Lanka, to their breeding grounds in the Russian Arctic during 2021-2022. The gulls opted for longer migration routes, averaging 8,171 km compared to the shortest available routes of 6,346 km. These detours enabled the gulls to avoid challenging Central Asian mountain ranges, resulting in reduced maximum and average elevations they had to cross (2,960 m compared to 6,109 m and 278 m compared to 849 m, respectively). Their chosen path took them along the west coast of India, passing through Pakistan, Afghanistan, and Central Asia before flying over the west Siberian plain, tracing numerous lakes, marshes, and the river Ob, thereby allowing them daily access to potentially suitable habitats. In conclusion, Heuglin's Gulls preferred migrating through lowlands, even though it required them to travel longer distances. Further analysis will be conducted to assess how varying geographical features influence their migration directionality and specific routes.

Gayomini Panagoda is a PhD candidate on Migration Ecology of Waterbirds across mainland Asia and Sri Lanka, attached to the Department of Zoology & Environment Sciences, University of Colombo. Gayomini's PhD supervisors are Prof. Sampath Seneviratne, Prof. Sarath Kotagama, Dr. S. Balachandran (BNHS) & Dr. Taej Mundkur (Wetlands International) and she has a Bachelor's Degree in Environmental Conservation & Management.

POSTER | 21 Nov, 1050 UTC

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An automated procedure to extract migration phenology from geolocation data

Advancements in animal tracking methods have revolutionized our understanding of the distribution, movement and activity patterns of migratory birds. The most commonly used devices for large-scale trips are light-level geolocators (GLS), whose recorded data require complex processing. We have developed a

Sympatric breeding of two endangered *Sternula* terns, Saunders's *S. saundersi* and Little *S. albifrons* Terns, in the Rama's Bridge of Sri Lanka

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Introduction

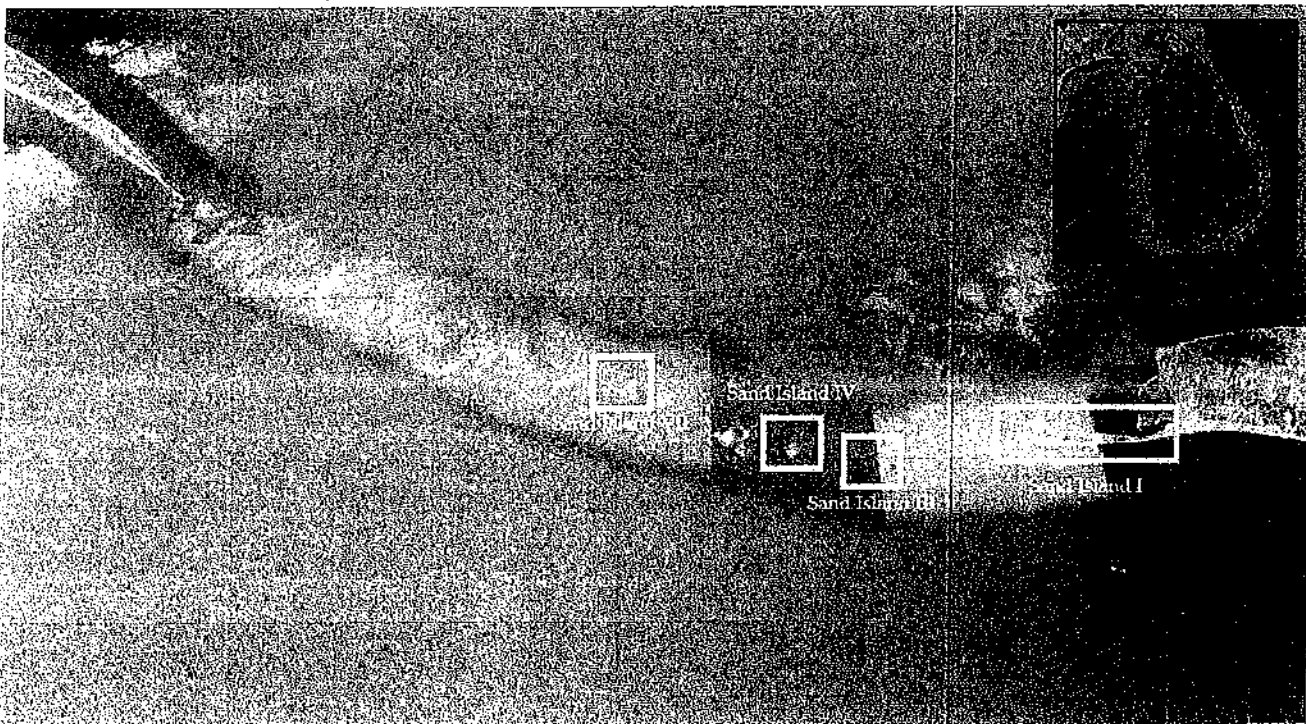
Terns are a cosmopolitan group of birds (Gochfeld & Burger 1996) represented by over 40 species, of which 15 have been recorded in Sri Lanka (Rasmussen & Anderton 2012, Warakagoda *et al.* 2016, Kotagama & Ratnavira 2017). Saunders's Tern *Sternula saundersi* and Little Tern *S. albifrons* are the smallest tern species found in Sri Lanka. Saunders's Tern is a rare breeding resident on the coasts of Mannar and Hambantota districts, in the north-west and south-east of the country respectively (Baker 1935, Phillips 1953, Henry 1998, Warakagoda *et al.* 2016, Kotagama & Ratnavira 2017). Outside Sri Lanka it occurs throughout East Africa, the Red Sea and the west coast of India (Harrison 1983, Chandler & Wilds 1994). Little Tern is an uncommon breeding resident on the coasts, mudflats and tank edges of the dry zone of Sri Lanka (Henry 1998, Warakagoda *et al.* 2016, Kotagama & Ratnavira 2017); elsewhere

it is found in Europe, Africa, Asia and Australia (Harrison 1983, Chandler & Wilds 1994, Harrison & Worfolk 1999).

Both Saunders's and Little Terns are listed as Least Concern (LC) on the IUCN Red List (IUCN 2018). However, Saunders's Tern is considered Critically Endangered (CR) in Sri Lanka due to its restricted range, small population size and rarity at breeding sites (MOE 2012), while Little Tern is listed as Vulnerable (VU) due to its rarity in breeding colonies and the threats to its breeding habitats from dogs and people.

Although Legge (1880) mentioned the probable breeding of Saunders's Tern in Sri Lanka, his reports were not confirmed until Wait (1931). Many recent authors (e.g. Henry 1998, Warakagoda *et al.* 2016, Kotagama & Ratnavira 2017) have reported its status as a 'breeding resident', probably based on those earlier accounts. To our knowledge, however, this

Figure 1. Locations of breeding colonies of *Sternula* terns along the Rama's Bridge island chain, north-west Sri Lanka.



paper is the first detailed documentation of Saunders's Tern breeding in Sri Lanka.

In May 2018, breeding of these two *Sternula* species was observed at the base (eastern end) of the Rama's Bridge, in the narrow channel which separates Sri Lanka from India. We believe this to be the first documented record of sympatric breeding of the two species, although there is one additional instance in the Gulf of Kachch, India (A. Deomurari, pers. comm.). Monitoring of the site continued for the rest of the breeding season and again for the successive breeding season in 2019, when we surveyed the entire Rama's Bridge Marine National Park (NP) for both species.

Methods

Study area

Observations were made from Sand Island I to Sand Island VIII of the Rama's Bridge island chain in Rama's Bridge Marine NP, located at the tip of Talaimannar, Mannar Island, north-western Sri Lanka (Figure 1). The park holds many important habitats for breeding seabirds and migratory birds (Siriwardana 2015, Seneviratne *et al.* 2015, Weeratunga *et al.* 2015).

Sternula breeding colonies were found on Sand Islands I, III, IV and VII. An extensive study was undertaken on Sand Island I, which is approximately 0.94 km² in size: 4.6 km in length and 100–300 m wide. The island consists of numerous habitats, including sand-dunes, saltmarshes, shallow seawater pools and intertidal mudflats. Approximately 500 m from the identified breeding colony on Sand Island I is an area used as a service area for kitesurfing activities on the lagoon (May–September) and the open sea (December–March); 100 m from the breeding site, a Sri Lanka Navy security post is located year-round. During the kitesurfing season, the service vehicle of the resort, a tractor, goes within 10–20 m of the northern edge of the breeding site. This same path is also used regularly by the local fishermen and occasionally by their vehicles throughout the year as their passage to the rest of the island.

Sand Islands III and VII are mostly isolated from human intervention due to restricted access and are located 7–15 km westwards from the base of the Rama's Bridge island chain. Sand Island IV is occupied by the Sri Lanka Navy.

Data collection and analysis

The sandy beach at the base of Sand Island I (9.077°N 79.695°E) was intensively surveyed using line transects and point counts in May–July 2018 and May–June 2019. From the nests encountered, the following details were recorded: GPS location, nest dimensions (length, width and depth), a

qualitative description of the micro-habitat and the immediate surroundings of the nest, number of eggs, egg measurements (length and width) and the number of chicks. Potential disturbances to nesting terns were also noted.

We placed four point count stations, with a radius of 100 m each, within the observed habitat to measure the density and abundance of Saunders's and Little Terns in the area from June–July 2018. Between 06h00 and 18h00, 15 minutes per day were spent in each point and the time of observation was randomly selected. On 26 July 2019, as part of a survey of breeding seabirds in the Rama's Bridge Marine NP, we visited all islands in the study area. Using line transects and point count sampling ($r = 200$ m), islands were intensively surveyed to estimate the abundance of *Sternula* terns and their nests.

Field identification

Positive identification of the two species in the field is possible only in breeding plumage. While breeding adults of both species have neat black crowns and a white forehead, the corner-point of the forehead-blaze reaches over the eye in Little Tern (Plate 1) but not in Saunders's Tern (Plate 2). When viewed from above, three black outer primaries with black shafts can be seen in Saunders's Tern, which form a more definite, larger dark patch on the wingtip. On the contrary, Little Tern has no more than two dark outer primaries with whitish to brown shafts. Adult summer Saunders's is also subtly paler (silvery white) above than adult Little Tern, and Saunders's has a concolorous pale grey mantle, rump and tail, whereas Little has a grey/white rump and a white tail that contrasts with its relatively darker upperparts (Harrison 1983, Rasmussen & Anderton 2012, Perlman 2015). When terns were in non-breeding or juvenile plumage (and thus could not be identified to species), they were left unassigned to species.

Results

Observations at Sand Island I

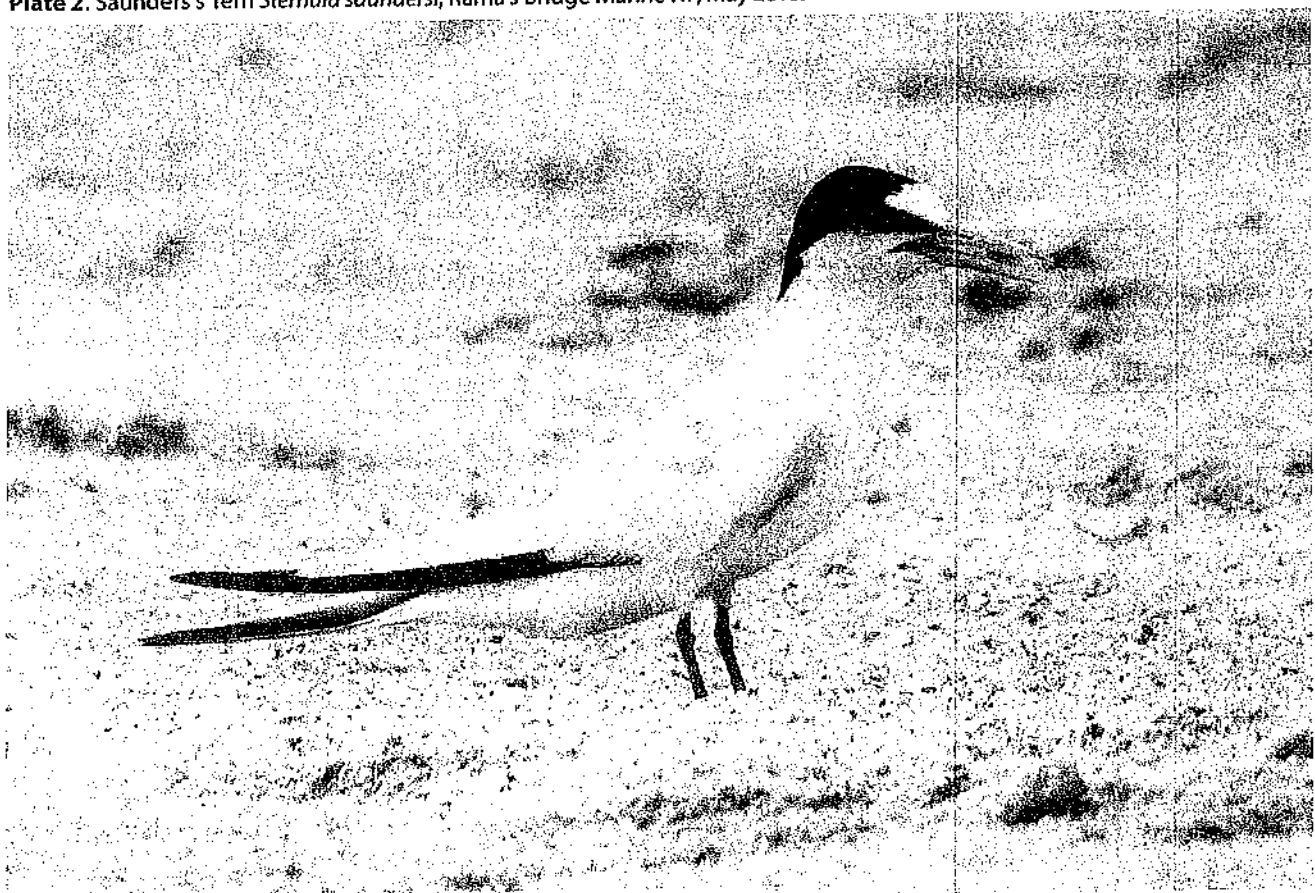
A total of seven nests (five Saunders's and two Little Tern) were observed within the colony (area 0.19 km²) from May to July 2018. In 2019, 10 nests were found (seven Saunders's and three Little Tern). Nests of both species looked similar: an unlined depression on sand positioned on top of small undulating sandy ridges (Plate 3), which are formed by sweeping wind. The sand-dunes were sparsely vegetated, along with scattered cow dung, driftwood and marine debris/garbage. The maximum possible number of nests of Saunders's and Little Terns, which were calculated by extrapolating the observed number of nests within the colony to the

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Plate 1. Little Tern *Sternula albifrons*, Rama's Bridge Marine NP, Sri Lanka, May 2020.

Plate 2. Saunders's Tern *Sternula saundersi*, Rama's Bridge Marine NP, May 2018.



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