ACTIVITY BUDGET OF WINTERING INDIAN SKIMMER *RYNCHOPS ALBICOLLIS* AT DAMAR CHAR, BANGLADESH

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ABSTRACT

DAS, D.K., GALIB, A.J., KHANDAKAR, N., ROHMAN, M.H., & REZA, A.H.M.A. 2020. Activity budget of wintering Indian Skimmer *Rynchops albicollis* at Damar Char, Bangladesh. *Marine Ornithology* 48: 119–123.

The Indian Skimmer *Rynchops albicollis* is categorized as a globally 'Vulnerable' or 'Critically Endangered' species, depending on the ranking source. This is mostly because of its rapid population decrease due to widespread degradation and disturbance of its habitat in lowland rivers and wetlands. At present, the last strongholds of the Indian Skimmer are in India and Bangladesh. Here we describe the species' activity budget in its wintering ground at Damar Char, an island on the southern coast of Bangladesh. We used scan sampling during 47 hours of observations to quantify the Indian Skimmer activity budget between January and March 2016. Skimmers spent most of the time roosting (49%), followed by flying (33%), being alert (11%), preening (4%), foraging (2%), and interacting with others (1%). There was no significant difference in activity budget over the three-month period. The skimmers spent nearly half of the day flying or being alert ($\Sigma = 44\%$) due to anthropogenic disturbances, a factor found at a high level at the roosting sites in Bangladesh. Protecting their roosting sites and minimizing disturbances would certainly improve conservation of the Indian Skimmer in Bangladesh.

Key words: Indian Skimmer, activity budget, Damar Char, Bangladesh, wintering

INTRODUCTION

The Indian Skimmer *Rynchops albicollis* is categorized as a globally 'Vulnerable' species, mostly because of its rapid population decline due to widespread degradation and disturbance of lowland rivers and wetlands (Birdlife International 2017). The species' former distribution included the entire Indian subcontinent, along the major rivers of Myanmar and the Mekong in Indo-China. Currently, Indian Skimmers are a rare visitor to Nepal, and the species is extinct from the Mekong Delta (Birdlife International 2017). The remainder of the present-day distribution includes a small population in Pakistan, three recorded sightings of individuals in Myanmar, and large populations in India and Bangladesh (Das 2015). In addition, due to the presence of serious threats to the Indian Skimmer's main wintering habitat (i.e., Bangladesh), this species has recently been listed as 'Critically Endangered' in the national Red List of Threatened Animals of Bangladesh (IUCN Bangladesh 2015). Thus, Bangladesh has a vital responsibility in the species' conservation owing to the large population wintering on its coast.

In recent decades, the highest flock count of Indian Skimmer (*ca.* 5 400 birds) was reported in 2001 from Bangladesh (Li *et al.* 2009). However, Mohsanin (2014) reported a 90% population decrease between 2000 and 2013 in Bangladesh, and Rahmani (2012) reported a 58% decrease (555 to 230 individuals) in the core breeding area in Madhya Pradesh, India, between 1994 and 2010. Therefore, this species probably faces a higher threat of extinction than implied by its global 'Vulnerable' status. Yet, the Indian Skimmer is one of the least studied species in India (Rahmani 2012) and Bangladesh, with much of the information available on its ecology and habitat being anecdotal and descriptive (Collar *et al.* 2001, Sundar 2004).

Time-activity budgets for any species reflect a combination of factors including individual physical condition, food availability, social structure, and environmental conditions (Paulus 1988). Understanding how birds divide their activities throughout a day and a season is important for understanding how they interact with their environment and how they invest energy and time for survival and reproduction (Defler 1995). Moreover, an activity-budget study of any migratory species can provide insight into the role of seasonal use of habitats relative to the annual cycle of migration. Activity budgets of species coupled with habitat analyses have been useful in formulating suitable conservation strategies and management plans in many parts of the globe (Paulus 1988).

In general, the primary conservation threats to most species are human activities. To formulate a species-focused conservation management plan, we must know its basic ecological facts. In the case of the Indian Skimmer, several aspects of its ecology, such as its activity budget, foraging ecology, migration, interaction with other species, and breeding ecology, are either scant or completely lacking. Summaries of observation notes and population surveys are among the most common publications (Barua 2002, Sundar 2004, Siddiqui *et al.* 2007, Sharma 2008, Mohsanin 2014, Malla *et al.* 2015, Kabir *et al.* 2016, Debata *et al.* 2017, Singh & Sharma 2018), along with a few studies on breeding (Das 2015, Dilawar & Sharma 2016, Debata *et al.* 2017, Rajguru 2017) and a single study on nest parasitism (Debata *et al.* 2018). Similarly, habitat use and preference, the effects of habitat attributes, biotic factors, and human disturbances on skimmer distribution, are not well known. This lack of knowledge has hindered the creation and implementation of an effective conservation plan for this species (Rahmani 2012).

The main objective of our study was to shed further light on Indian Skimmer activity patterns during the winter migration season in Bangladesh. Bangladesh has a vital role in the species' conservation owing to the large population wintering on its coast. This will help area managers understand the habitat use and interaction patterns of the Indian Skimmer in their wintering site. These findings will eventually help in developing a conservation action plan for the species throughout its range.

STUDY AREA

Damar Char (22°01′30″N to 22°05′00″N and 091°02′30″E to 091°06′30″E) is an island on the southern coast of Bangladesh within the Ganges-Brahmaputra-Meghna delta (Fig. 1). This coastal island is very dynamic and productive, due to the large volume of sediments collecting from three major river systems (Ganges, Brahmaputra, and Meghna) (Hossain *et al.* 2016). Damar Char has been recognized as one of the global Important Bird and Biodiversity Areas (Birdlife International 2017), and it is located within one of the protected areas of the country, the Nijhum Dwip National Park. Protecting the wintering grounds of migratory birds is included in the management plan of the Nijhum Dwip National Park; if implemented properly, this would also benefit the Indian Skimmer.

Large numbers of Indian Skimmers were common in most parts of coastal Bangladesh until the 1990s (Perennou *et al.* 1994, Lopez & Mundkur 1997, Li *et al.* 2009), when populations were observed to be declining for unknown reasons. Currently, Damar Char is the only site in Bangladesh where large flocks of Indian Skimmer (> 500 birds) have regularly been observed during the last 10 years. Skimmers start arriving at Damar Char in late December and start departing by late March. A few individuals overstay their wintering ground until mid-May (Mohsanin 2014). Apart from skimmers, Damar Char and its adjacent mudflats are a regular wintering site for at least 10 other globally threatened migratory wetland species (Perennou *et al.* 1994; Li *et al.* 2009; Bird *et al.* 2010; Mohsanin 2014; Mundkur *et al.* 2017). Damar Char is one of very few sites in Bangladesh where the River Tern *Sterna aurantia* still breeds on a regular basis (Mohsanin 2014).

METHODS

Data collection

To generate an activity budget for the Indian Skimmers on Damar Char, we conducted 'scan sampling' at five-minute intervals (Altmann 1974, Baldassarre *et al.* 1988). This is a widely used method to record animal behavior and activity in predefined categories, and it allows researchers to quantify the time-activity budget of any species. In addition, we estimated the population of Indian Skimmers on Damar Char.

Skimmer activities were categorized into six types: i) Alert – standing or sitting with head or neck protracted or in a posture that appeared ready for take-off; ii) Flying – normal flapping flight or gliding; iii) Foraging – skimming the surface of water and/or handling food; iv) Roosting – bill tucked into the scapular feathers while standing, sitting with eyes open or closed, or standing with eyes closed; v) Preening – actively manipulating feathers with bill, scratching, and stretching; and vi) Interaction – intra- and interspecific interaction, with or without aggression.

We recorded the following information for each time block while collecting behavioral data at each location: GPS coordinates, weather (cloudy, sunny, or rainy), vegetation/ground cover, and tide condition. We divided our entire diurnal observation period into four time blocks: early morning (06h00–09h00), morning (09h00–12h00), mid-day (12h00–15h00), and afternoon (15h00–18h00). A total of 48 hours of field observation data were collected between January and March 2016. Observations were made using a camera, a pair of binoculars, and two telescopes. Two authors (DKD and AJG) were the observers and two others (NK and MHR) were the recorders. Trials were conducted together at the outset of the study to minimize inter-observer variation. To avoid any disturbances from the observers, a safe distance of around 100 m from the birds was maintained. In most cases, we took cover in a boat (observing from the water) or any other natural hide whenever possible during the data collection.

Data analysis

The activity pattern of Indian Skimmers on Damar Char was categorized based on three factors: i) daily activity budget, ii) monthly activity patterns, and iii) activity pattern due to tidal condition. For daily activity budget analysis, data for the six activity categories were divided among four time-blocks per day and frequency was analyzed. The same six activity categories were used for monthly pattern analysis as well, to record any variation in tidal condition. We used single-factor ANOVA to test any significant variation among the factors.

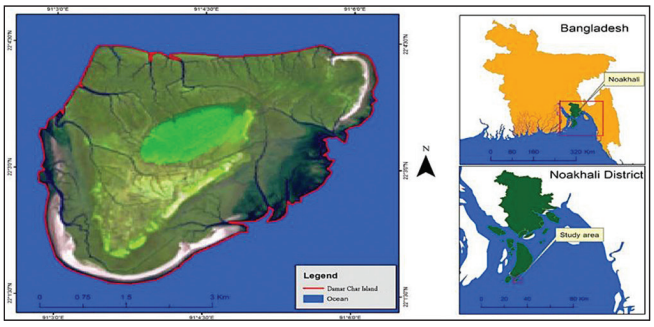

Fig. 1. Map showing the study area, Damar Char, Noakhali, Bangladesh.

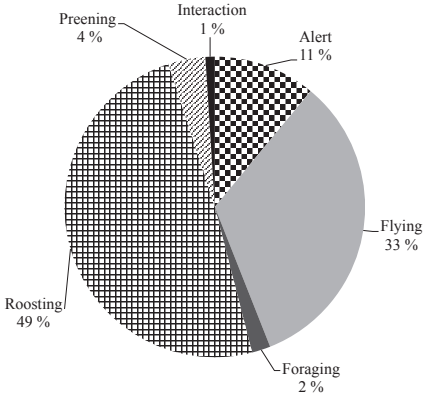

Fig. 2. Time-activity budget (%) of Indian Skimmer in Damar Char, Bangladesh.

RESULTS

Our data revealed that Indian Skimmers in our study area spend most of their time roosting (49%), followed by flying (33%), being alert (11%), preening (4%), foraging (2%) and interacting (1%) (Fig. 2). We were also able to count the total population at Damar Char, which was highest in February 2016 at ~1300 individuals.

For the monthly activity budget, the most time was spent roosting in January (64%); this was reduced to 44% in March (Fig. 3). Flying occupied the second major share of the time, with the maximum recorded in March (35.7%) and the minimum recorded in January (23.5%). The maximum time spent alert was in February (11.9%), while the minimum was in January (6.8%). Time spent foraging was minimal (1.3%–4.5%) compared to other activities. Even though there is a slight monthly variation in most of these activities, there was no significant difference detected (F 2.40 < F crit 3.68, P = 0.12).

In terms of the daily activity budget, skimmers were most active during late morning between 09h00 and 12h00 (38%) and least active during early morning between 06h00 and 09h00 (14%) (Fig. 4). The activity pattern did not vary much during mid-day (12h00–15h00) or late afternoon (15h00–18h00). This slight variation in individual activity was not significantly different (F 0.59 < F crit 3.09, P = 0.59). Apparently, tidal pattern had some impact on the activity pattern as alert, flying, and interacting were recorded more during high tides; foraging, roosting, and preening were recorded more during low tides (Fig. 5).

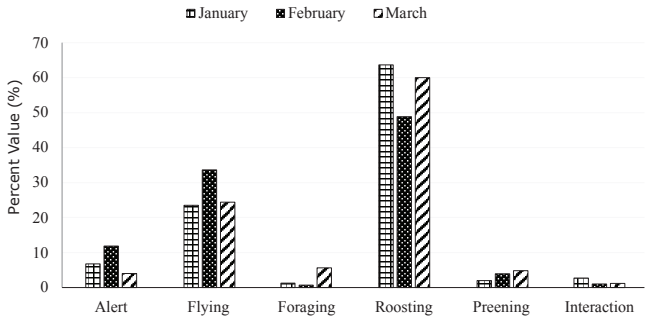

Fig. 3. Monthly variation in activity budget (%) of Indian Skimmer in Bangladesh.

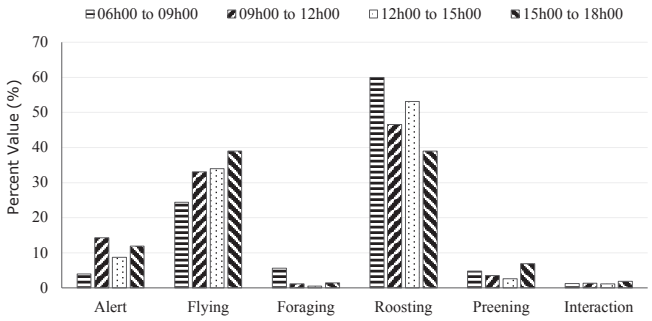

Fig. 4. Daily diurnal activity budget (%) of Indian Skimmer in Bangladesh, divided among four time-blocks: early morning (06h00–09h00), morning (09h00–12h00), mid-day (12h00–15h00), and afternoon (15h00–18h00).

DISCUSSION

We collected field data on Indian Skimmers only during the daytime, and their activity budget shows that they spent most of their time roosting and very little time (only 2%) foraging. The results suggest that skimmers forage at night (as mentioned in Ali and Ripley (1983)), as their energy requirements cannot conceivably be met from the very small amount of time they forage during daylight hours. As the birds spent much time flying (33%), they should require a great deal of energy because flight is energetically expensive (Gill 2007). Rasmussen & Anderton (2005) mentioned that Indian Skimmers may feed in twilight and at night due to strong summer winds or prey activity; Black Skimmers *Rynchops niger* are well known to forage at night (Tomkins 1951, Rojas *et al.* 1997). However, as monitoring nocturnal activity was not feasible during this study, this theory requires further investigation. The skimmers remained alert 11% of the time, which suggested the presence of an abnormal disturbance at the site; we believe that our presence caused negligible additional stress, given the normal level of activity for the island's human population (~250 people). Protecting the daytime roosting sites and mitigating anthropogenic disturbances are indispensable for conserving Indian Skimmer wintering grounds in Bangladesh.

Anthropogenic disturbances at Damar Char include different kinds of fishing activities, water traffic (fishing and commuter boats), cattle grazing, and a high human traffic. Our observations about anthropogenic disturbances corroborated those of Mohsanin (2014). In addition, we noticed a high abundance of raptorial birds in the area, which supposedly impact the regular activities of the skimmers (Kyne 2010). The common raptors we observed were: Brahminy Kite *Haliastur indus*, Black Kite *Milvus migrans*, White-bellied Sea Eagle *Haliaeetus leucogaster*, Peregrine Falcon *Falco peregrinus*, Greater Spotted Eagle *Clanga clanga*. During our study, the skimmers were affected by tidal pattern, as they were mostly observed close to the water edges. At the start of high and low tide, they moved accordingly higher or lower along the water line. During high tide, the skimmers seemed to be alert as the area is largely flooded. They bathed and preened themselves in the receding water.

Indian Skimmers spent more time roosting in January after their long migration (possibly from Upper Ganges in India), perhaps due to flight fatigue and a necessity to recover energy. The skimmers seemed to fly more in the later part of the winter, possibly rehearsing the return flight to their summer breeding ground (also possibly in the Upper Ganges area in India). Flying behavior was significantly

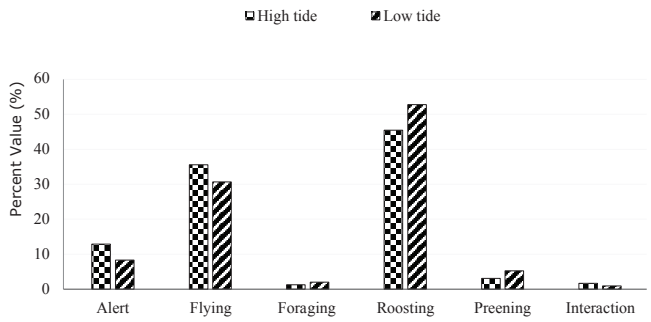

Fig. 5. Daily time spent (%) on different activities by the Indian Skimmer during tidal phases in Bangladesh.

affected by anthropogenic disturbances as well as for unknown reasons. We observed the flying response every time a raptor was present. The raptors, on the other hand, were also frequently chased by the skimmers if they came too close to the flock.

Comparing Indian Skimmer activities between high and low tides, we found that flying, being alert, and interacting were more common during high tide, while foraging, roosting, and preening were more common during low tide. During high tide, since a major portion of their roosting ground is under water, the birds had to relocate to other areas nearby. Whereas skimmers were observed to be relatively stationary for some time during high tide, they moved towards the water line to preen when the tide was receding. Whether the tide was rising or falling, they foraged opportunistically when re-positioning to the new water line.

As mentioned earlier, we have recorded several anthropogenic disturbances in the Indian Skimmer habitat during our study period. When disturbed, skimmers became very alert and would often take a short patrolling flight. Roosting birds were often forced to leave the site due to disturbances (Kirby *et al.* 1993, Smit & Visser 1993). If the species is highly active at night, which needs to be confirmed by further study, then disturbances during the daytime might result in a high costs, in the form of fitness and energy expenses (Rogers *et al.* 2006). Further study is required to measure how disturbances at the wintering grounds might affect the survival and, more specifically, reproductive success of skimmers on the breeding grounds. We anticipate that the findings of this study will contribute to the conservation of the Indian Skimmer in Bangladesh and throughout its range.

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