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**Population Size, Behavior and Threats to Indian Skimmers (*Rhynchops*  
*Albicollis*) at their Largest Known Wintering Site**

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**Abstract.** —Bangladesh hosts most of what is left of Indian Skimmer (*Rhynchops albicollis*) populations a globally endangered species. Each October-March from 2015-2020, 21 surveys of nonbreeding birds were made in Nijhum Dweep National Park, Bangladesh. High tide or evening roosts were counted from vantage points whenever a build-up or breakdown of skimmer concentration was noticed, and site use noted by marking all observations of presence and activity on maps. The largest single count was 3,108 skimmers on 18 February 2020, constituting 30-50% of the known global population. Indian Skimmers mostly occurred in Damar Char West and at the tip of the Majher Char. Throughout the day with incoming tide, skimmers moved between preferred roosting areas to forage in the shallows. We describe a unique group-foraging strategy in which skimmers chase fish from deep water to shallow water along the shoreline. Circling high over the tidal channel, the flock of skimmers dives down in unison to just above the water surface, then spreading like a net towards the shore. Raptors caused disturbances to roosting skimmers, and we observed one instance of predation of a skimmer by White-bellied Sea Eagle (*Haliaeetus leucogaster*). Human fishing activities disturbed nearshore foraging and shoreline roosting skimmers. We suggest protecting Damar Char West side by regulating human activities to minimize disturbance from December to March.

**Key words.** — Bay of Bengal, Central Asian Flyway, East Asian-Australasian Flyway, Important Bird Area, Indian Skimmer, Marine Protected Area, Meghna Estuary, *Rhynchops albicollis*

Suggested running head: INDIAN SKIMMERS IN BANGLADESH

Only three species of skimmers are found worldwide. All of them occur in large, sandy, slow-flowing lowland rivers, lakes, and marshes during the breeding season and in estuaries and coasts during the non-breeding season. Indian Skimmers (*Rynchops albicollis*) are uplisted as a globally endangered species by IUCN (BirdLife International 2020), once widespread in the major river systems of Pakistan, India, Bangladesh, Myanmar, and South-East Asia along the Mekong River, but now are mostly confined to Bangladesh and India (Das 2015; Mundkur *et al.* 2017; BirdLife International 2020). This is a consequence of habitat fragmentation and degradation of lowland river and lake systems throughout much of their range (BirdLife International 2020). At present, India is the last remaining breeding ground for Indian Skimmers where they mainly breed in Ganges (Ankit *et al.* 2018; Mital *et al.* 2019), Chambal (Das 2015), Son (Dilwar and Sharma 2016) and Mahanadi rivers (Debata *et al.* 2017). Bangladesh is the last remaining stronghold for nonbreeding Indian Skimmers in winter, and >1,000 skimmers can still be seen in Nijhum Dweep National Park in the south-central coast of the country annually (Islam and Khan 2005; Das 2015; Das *et al.* 2020a). In Nijhum Dweep, 5,400 skimmers were reported in 2001 (Li *et al.* 2009) and 3,200 skimmers in 2008 (Thompson *et al.* 2018), the highest counts across its range in the last 20 years. Yet, Mohsanin (2014) reported a 90 % decrease of Indian skimmers in Bangladesh between 2000 and 2013, and the species is now considered Critically Endangered by IUCN Bangladesh (2015). Any form of protection or management, however, is hindered by specific ecological knowledge (Rahmani 2012; Debata *et al.* 2017; Das *et al.* 2020a).

As a first step toward gaining ecological knowledge, we here report our observations on the numbers, site use, and the occurrence of foraging and roosting as a function of tide and time of day in nonbreeding Indian Skimmers in the Nijhum Dweep National Park from the 2015-16 to the 2019-2020 winters (Oct – March). Additionally, we describe a unique group-foraging behavior observed at the site as well as existing threats to skimmers at the site to inform specific conservation actions.

## METHODS

### Study Area

Nijhum Dweep National Park (Fig. 1) (22°03'51.4" N, 91°00'03.4" E) encompasses an area of 16,358 ha and is located in the Meghna Estuary on the Bay of Bengal on the south-central coast

of Bangladesh (See details in Das *et al.* 2020b). The park is within the Ganges-Brahmaputra-Meghna delta, which is recognized as an Important Bird and Biodiversity Area (IBA) for migratory birds using the East-Asian Australasian flyway and the Central Asian flyway (Islam and Khan 2005; BirdLife International 2020). Damar Char, within Nijhum Dweep National Park, is the only site in Bangladesh where large flocks of Indian Skimmer have regularly been observed during the last 10 years (Das *et al.* 2020a).

Even though Nijhum Dweep National Park is a protected area, > 12,000 people (BBS 2014) inhabit the park. Shoreline and mudflats are extensively used by people for subsistence, mainly for fishing and other wetland ecosystem services. Fishing with long seine nets set with poles along the shoreline is a common practice here, and setting nets demands heavy manpower and hours of work on the mudflat (Fig. 2, c-d).

## Survey Methods

We divided our study site into four subsites: Nijhum Dweep, Damar Char West, Damar Char East and Majher Char for convenience and conducted monthly surveys during the winter season (October-March) (Fig.1). We conducted monthly surveys lasting three-five days and visited once per subsite for counting roosts and other activities or more. A motorboat was required for accessing the sites and to function as hides. Roosts were counted from vantage points on shore (Sutherland 1996; Bibby *et al.* 2000) as well as from the boat. Whenever a build-up of large aggregations or breakdown of a concentration of skimmers was noticed, repeated count was made to determine the size of the roost and to check where they went for site use. To show the importance of the areas we here report the maximum count per month.

The counts were simultaneously made by multiple observers (two-four persons) and then averaged to reduce individual bias. In total, we made 21 surveys from 2015-16 to 2019-20 winter season. Only one survey was conducted in 2016-17 and four counts in 2015-16 and 2017-18 due lack of funding. However, we counted six times each in 2018-19 and 2019-20. Trials were conducted together at the outset of the study to minimize inter-observer variation. To avoid any disturbances due to presence of observers, we did not approach the birds closer than 100 m. In most cases, we took cover in a boat (observing from the water) or any other natural hide whenever possible during the data collection.

Behavioral observations were made using 60-80x spotting scope and Garmin eTrex10 GPS unit was used to record location of behaviors. Site use, foraging activities such as active foraging time, pattern, methods and potential threats such as presence and activities of people, cattle and raptors were recorded.

## RESULTS

On average, during the 21 surveys we counted 479 Indian Skimmers. Maximum 3,108 skimmers were counted on 18 February 2020 in 2019-20 and minimum was zero skimmers in 2016-17 (Table 1). Skimmers arrived in the park in December, half of the population departed by March and the rest later on. Most of the time they occurred in Damar Char West and in the tip of the Majher Char and used these areas for diurnal roosting and crepuscular and nocturnal foraging (Fig. 1). On rare occasions, we encountered a few skimmers (<3) on the west side of Nijhum Dweep and in Dama East.

Skimmers roosted on the edge of the waterline. During low water when mudflats were exposed and there was no disturbance from fishermen, they roosted in the mid-west of Damar Char area near Kheyar Khal (a, in Fig. 1). Skimmers were found at the south sandbar of Damar Char (e, Fig. 1) when other areas were covered by tidal water. Skimmers foraged in small flocks along shallow waters of the shoreline. They were frequently seen to forage in the shoreline water close to the tip of Majher Char (near to b in Fig. 1), corner of Dama north end (near to c, Fig. 1) and from mid-west to Dama north end shoreline (between a to c, Fig.1).

They were also seen to skim along the small channels within the mudflat when it started to be covered from incoming tide water. Sometimes, skimmers used a group-foraging strategy. The entire flock first circled high over a large part of the channel and after couple of rounds the flock dove to just above the water surface, then spreading like a virtual net and thus approaching the shoreline catching the fish driven in front of them (Fig. 3). They would repeat this behaviour several times. By this process, they chased fish from deep water to shallow water along the shoreline. When the entire mudflats and channels were inundated and water surface was calm, they skimmed up to 1 km from the waterline in the mid-west of Damar Char (shoreline to near a, Fig. 1).

Fishing activities in the channels and on the mudflats disturb foraging and roosting migratory birds including Indian Skimmers frequently. Fishing activities occurred day and night

in all seasons and the intensity increased during spring tides. During spring tides (between 10-15 day of the moon) >50% of the shoreline of Dama West and 80-100% of the shoreline of Majher Char used by skimmers was covered with seine nets. Targeted fishing for mullet (*Rhinomugil corsula* and *Liza parsia*) was another common fishing practice. These nearshore activities were encountered 100% of survey days and a major disturbance to roosting skimmers, as were cattle grazing, vessel movements and people moving in and out of the Damar Char. Average distance they allowed before being alert and take flight was  $61 \pm 16$  m with a minimum distance of 49 m.

We recorded the skimmers being disturbed (alert and taking off) by Eastern Marsh Harrier (*Circus spilonotus*), White-bellied Sea Eagle (*Haliaeetus leucogaster*), Peregrine Falcon (*Falco peregrinus*), Greater Spotted Eagle (*Clanga clanga*), Brahminy Kite (*Haliastur indus*) and Black Kite (*Milvus migrans*). We once spotted a White-bellied Sea Eagle eating a skimmer on the mudflat of Dama West. We did not see the chase but assumed it was hunted by the eagle. Brahminy and Black kites were very common. In our observation of all encounters between skimmers and kites, skimmers responded to flying kites (but not perching kites) by taking off from their roost. Also, some skimmers mobbed kites for distances of 0.5 km.

## DISCUSSION

The area is a regular wintering site for thousands of skimmers since 1980s (Thompson *et al.* 2018). However, large number of skimmers were absent for consecutive three winter seasons 2016-17 to 2018-19 in this site (see Table 1). With maxim counts of 3,000-5,000 skimmers, the study area may thus host up to 30-50% of their global population (Wetlands International 2020).

Skimmer foraging occurrence and roosting locations were predicted on the basis of tidal phase. However, the reasons for the skimmers to select specific areas will require systematic study of feeding opportunities, prey availability, and disturbance patterns. Skimmers are known for their crepuscular and nocturnal foraging (Bhatnagar and Bhatnagar 2009; Winkler *et al.* 2020). They have a unique bill structure and feeding method that restrict them in habitat use. Black and Harris (1983) quantified feeding habitat in the Black Skimmer *Rynchops niger* and found that feeding occurred in shallow water (10-20 cm) far from land (Black and Harris 1983). The latter is reflected in Indian Skimmers foraging in shallow water up to 1 km from the waterline in the mid-west of Damar Char.

Skimmers prey on mullet fish preferentially (Galib 2017). Although we did not quantify fishermen numbers and effort, in the course of our study we observed an increase both in numbers and intensity of fishing. Thus, potential exists for resource competition between skimmers and fisherman, which could force skimmers to change wintering sites due depletion of prey and/or increased disturbance. We recommend future study on impact of mullet fishing on skimmers.

Human disturbances such as fishing, walking, cattle grazing and vessel movements were previously documented by Mohsanin (2014) and Thompson *et al.* (2018). Though we observed a flight response every time a raptor showed up, the only predation attempt was the one by a White-bellied Sea Eagle. White-bellied Sea Eagle feed on fish, aquatic birds and turtles and are also reported to hunt Silver Gull (*Chroicocephalus novaehollandiae*) in Australia (Mo *et al.* 2017). A nest of White-bellied Sea Eagle was present in nearby mangroves and they occasionally foraged in the areas used by skimmers.

Damar Char West is an important and preferred site within the national park for diurnal foraging and roosting of skimmers. Disturbance due to humans, nearshore fishing in particular, is increasing, and existing protection in the park is insufficient. We suggest protecting Damar Char West by regulating human activities to minimize disturbance to skimmers from December to March, accompanied by monitoring of the effects of such regulations. We realize the socio-economic situation of the local people and their high dependence on fishing, but nevertheless recommend sustainable practices be implemented as part the formulation of a conservation action plan develop ways for vulnerable birds and people to coexist.

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189

190

## LITERATURE CITED

191

Ankit, K., V. Ranjan, M. Ahamad, S. Kumar, S.A. Hussain and G.V. Gopi. 2018. Newly

192

discovered breeding colonies of Indian Skimmer *Rynchops albicollis* in the middle Ganges,

193

India. BirdingASIA 30: 99-100.

194

BBS. 2014. Bangladesh Population and Housing Census 2011. National report volume 2, Union

195

Statistics. Ministry of Planning, Govt. of Bangladesh.

196

Bhatnagar, S.P. and M. Bhatnagar. 2009. Eco-behavioural studies of the Indian Skimmer

197

(*Rhynchops albicollis*), a vulnerable waterbird in the National Chambal Wildlife

198

Sanctuary, Rajasthan, India. Newsletter for Birdwatchers 49: 24-25.

199

Bibby, C., N. Burgess, D. Hill and S. Mustoe. 2000. Bird Census Techniques. Academic Press,

200

London.

201

BirdLife International. 2020. *Rynchops albicollis*. The IUCN Red List of Threatened

202

Species 2020: e.T22694268A178970109. [https://dx.doi.org/10.2305/IUCN.UK.2020-](https://dx.doi.org/10.2305/IUCN.UK.2020-3.RLTS.T22694268A178970109.en)

203

[3.RLTS.T22694268A178970109.en](https://dx.doi.org/10.2305/IUCN.UK.2020-3.RLTS.T22694268A178970109.en). Accessed on 12 March 2021.

204

Black, B.B. and L.D. Harris. 1983. Feeding habitat of Black Skimmers wintering on the Florida

205

Gulf Coast. Wilson Bulletin 95: 404-415.

206

Das, D.K. 2015. Breeding status of Indian Skimmer *Rynchops albicollis* in the National Chambal

207

Sanctuary, India. Indian BIRDS 10: 53–54.

208

Das, D.K., A.J. Galib, N. Khandakar, H. Rohman and A.H.M.A. Reza. 2020a. Activity budget of

209

wintering Indian Skimmer (*Rhynchops albicollis*) at Damar Char Bangladesh. Marine

210

Ornithology 48: 119-123.

211

Das, D.K., N. Khandakar and M.S. Ali. 2020b. Large-billed Crow depredates wintering waders

212

on the coast of Bangladesh. Wader Study 127: 165-168.

213

Dilawar, M. and V. Sharma. 2016. A new breeding location of Indian Skimmer *Rynchops*

214

*albicollis*, and notes on other birds in Son Gharial Wildlife Sanctuary, Madhya Pradesh,

215

India. Indian BIRDS 11: 35–38.

216

Debata, S., T. Kar, K.K. Swain and H.S. Palei. 2017. The Vulnerable Indian Skimmer

217

*Rynchops albicollis* Swainson, 1838 (Aves: Charadriiformes: Laridae) breeding in

218

Odisha, eastern India. Journal of Threatened Taxa 9: 10961–10963.

Galib, A.J. 2017. Winter ecology of Indian Skimmer *Rynchops albigollis* and shorebirds at Domar Char, Hatiya, Bangladesh. M.Sc. Thesis, Department of Zoology, Jagannath University, Dhaka, Bangladesh.

Islam, M.S. and M.A. Khan. 2005. Conservation values of south central coast of Ganges Delta-record flock of Indian Skimmers. *Stilt* 47: 2-3.

IUCN Bangladesh 2015. Red List of Bangladesh—Volume 3: Birds. Dhaka, Bangladesh: International Union for Conservation of Nature, Bangladesh Country Office.

Lank, D.B. and R.C. Ydenberg. 2003. Death and danger at migratory stopovers: problems with “predation risk”. *Journal of Avian Biology* 34: 225-228.

Li, Z.W.D., A. Bloem, S. Delany, G. Martakis and J.O. Quintero. 2009. Status of Waterbirds in Asia—Results of the Asian Waterbird Census, 1987–2007. Kuala Lumpur, Malaysia: Wetlands International.

Mital, A., S. Khan and R.S. Kumar. 2019. Indian Skimmer *Rynchops albigollis* and other riverine birds on the islands near Turtle Wildlife Sanctuary, Uttar Pradesh. *Indian BIRDS* 15: 64.

Mohsanin, S. 2014. Survey of wintering Indian Skimmer *Rynchops albigollis* in Bangladesh. *BirdingASIA* 21: 105–106.

Mo, M., C. Wrightson, D.R. Waterhouse, P. Hayler and A. Hayler. 2017. Predation by White-bellied Sea-Eagles *Haliaeetus leucogaster* on birds. *Victorian Naturalist* 134: 43-47.

Mundkur, T., T. Langendoen and D. Watkins. 2017. The Asian Waterbird Census, 2008–2015: Results of Coordinated Counts in Asia and Australasia. Kuala Lumpur, Malaysia: Wetlands International.

Rahmani, A.R. 2012. Threatened Birds of India: Their Conservation Requirements. Oxford, UK: Oxford University Press.

Sutherland, W.J.E. 1996. Ecological Census Techniques: A Handbook. Cambridge University Press, Cambridge.

Thompson, P., E.U. Haque, S.U. Chowdhury and S. Mohsanin. 2018. Waterbird trends and impacts of conservation and co-management in four wetlands. CREL Technical Report No. 2. Climate-Resilient Ecosystems and Livelihoods (CREL) Project, Dhaka, Bangladesh.

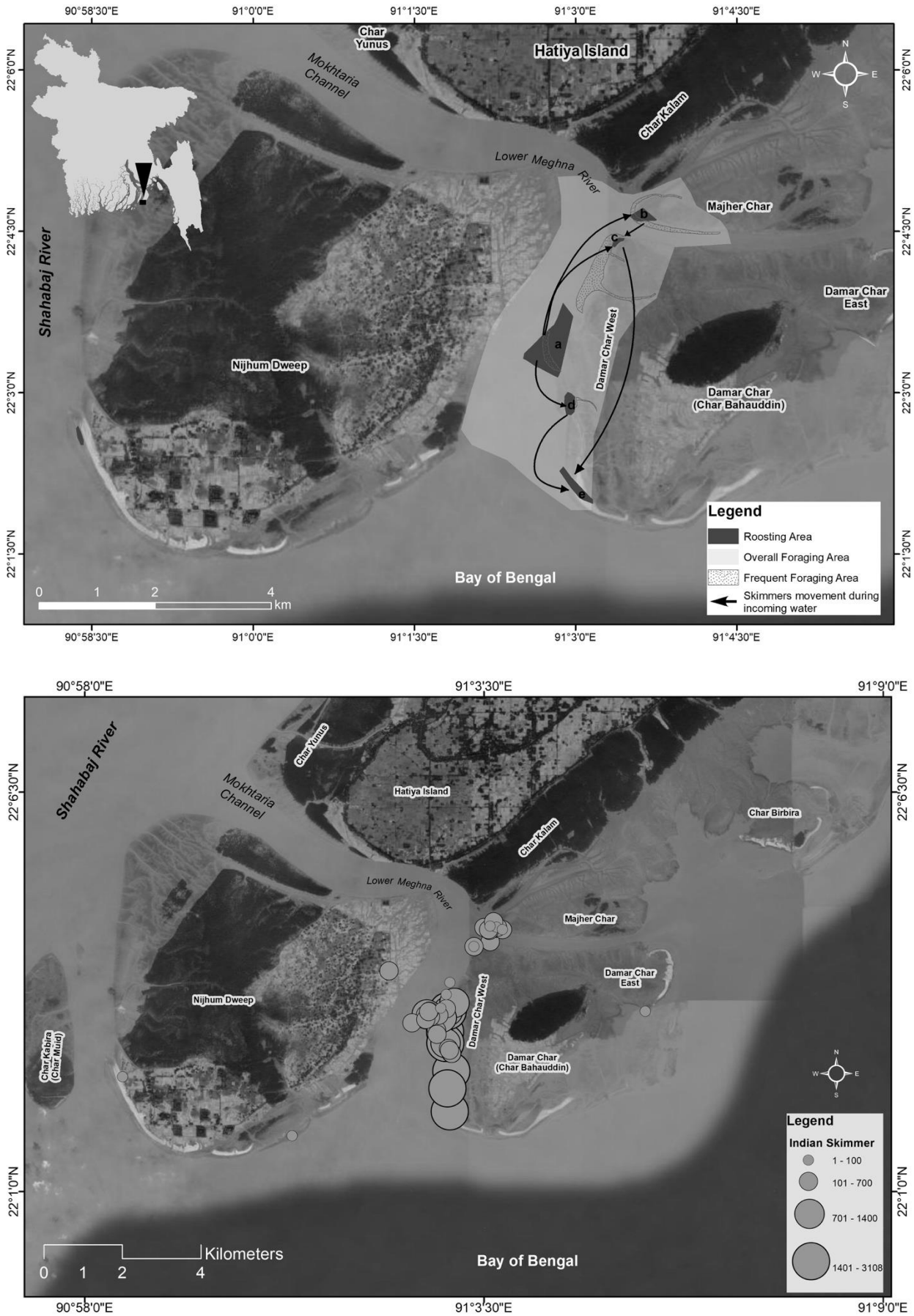
Wetlands International. 2020. “Waterbird Population Estimates”. [http:// wpe.wetlands.org](http://wpe.wetlands.org)., Accessed 06 July 2020.

250 Winkler, D. W., S. M. Billerman, and I.J. Lovette. 2020. Gulls, Terns, and Skimmers (*Laridae*),  
251 version 1.0. In Birds of the World (S. M. Billerman, B. K. Keeney, P. G. Rodewald, and  
252 T. S. Schulenberg, Editors). Cornell Lab of Ornithology, Ithaca, NY, USA.  
253 <https://doi.org/10.2173/bow.larida1.01>

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Figure 1. Site use and distribution of Indian Skimmers in the Nijhum Dweep National Park. In the top, map of the study area showing diurnal site use (roosting and foraging) by Indian Skimmers along with their general movement overview during incoming water in the top panel and in the bottom, distribution of Indian Skimmers counted as separate flocks during 21 surveys (results combined) between 2015-16 and 2019-20.

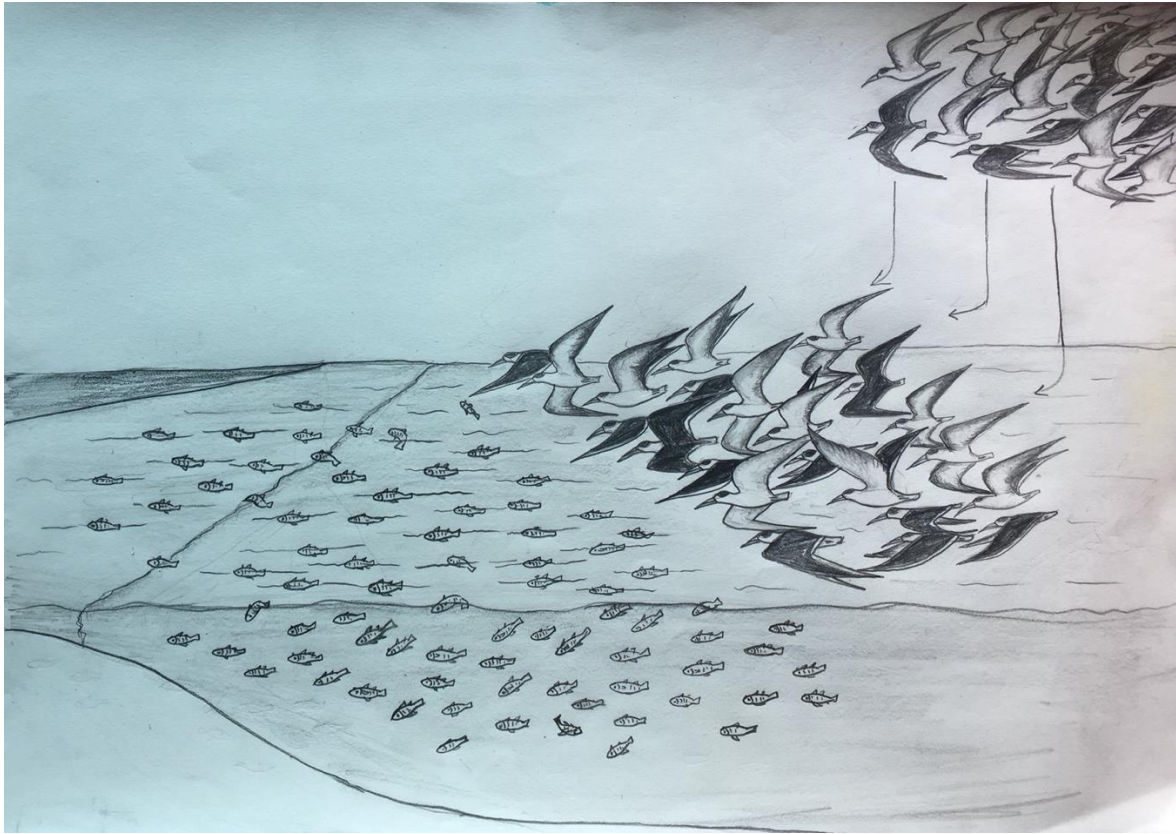


**Figure 2. Showing some disturbances to skimmers. a-b: showing a portion of flock of a large flock occurs in Nijhum Dweep National Park area during winter. c-d: Setting up long seine nets and a mullet fisherman collecting his net in the vicinity of skimmers, e-f: disturbance by feral buffaloes and commuting vessel. (Photo Credit: Irin Sultana and Delip K. Das)**





273 **Figure 3. Diagram of the group-foraging strategy of Indian Skimmers during which they**  
274 **chase fish from deeper to shallower water on the shore. Drawing by Farhana Akhtar based**  
275 **on observations at Nijhum Dweep.**



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**Table 1. Counts of Indian Skimmer in Nijhum Dweep National Park and highlighting the maximum counts in each season and across all seasons as well as mean count at each site in five seasons (X = area not surveyed).**

Sites	2015-2016					2016- 2017	2017-2018					2018-2019						2019-2020						Peak of all seasons	Mean		
	Dec-15	Jan-16	Feb-16	Mar-16	Max	Mar-17	Dec-17	Jan-18	Feb-18	Mar-18	Max	Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Max	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20	Max		
Majher Char	135	339	0	162	339	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	339	30
Nijhum Dweep	X	X	0	X	0	X	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	2	2	1
Damar Char West	X	X	1286	340	1286	0	2	0	0	0	2	0	0	2	0	0	0	2	0	0	0	2200	3108	1600	3108	3108	449
Damar Char East	0	0	X	X	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Total	135	339	1286	502	1625	0	4	1	0	0	5	0	0	2	0	0	0	2	0	0	1	2200	3108	1602	3110	3450	480







