An ornithological expedition to the Lakshadweep archipelago: Assessment of threats to pelagic and other birds and recommendations

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Introduction

Several previous reports have documented the avifauna of Lakshadweep Archipelago: Hume (1876), Alcock (1902), Gadow & Gardiner (1903), Ellis (1924), Betts (1939), Burton (1940), Bourne (1960), Ramuni (1962), Watson et al. (1963), Mathew & Ambedkar (1964), Bailey et al. (1968), Anon. (1970, 1991), Subiah (1978), Ripley (1982), Chapman (1984), Bhaskaran (1985), Livingstone (1987), Ali & Ripley (1989), Bourne (1989), Mohan (1989), Daniels (1992), Kurup & Zacharias (1994), Robertson (1994), and Santharam et al. (1996).

The last ornithological survey of the archipelago was in 1990–1991 (Santharam et al. 1996). The present 2nd Pelagic Birds Survey from 12–16.iii.2006, a joint effort of ELA Foundation, Pune and Ecological Society, Pune together with Indian Coast Guard, was carried out after a lapse of 16 years. The first part of this survey focused on pelagic bird life off the western coast of India, in the Arabian Sea, and was completed in October–November 2005 (Pande 2005). Here we present the findings of the second lap of our survey, which was restricted to the Lakshadweep archipelago. Pitti Island, a part of the Lakshadweep archipelago, is an Important Bird Area (Islam & Rahmani 2004).

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Brown Noddy *Anous stolidus*

Methods

Observations were made from ICGS Annie Besant during the inter-island voyages on the Arabian Sea. Motorised 'Geminis' were used for reaching the various islands, reefs or sand flats from the ship. We swam to a few sand flats and reefs when the water around their shores had sharp rocky projections that would damage our inflatable boats. Landing on some islands was extremely difficult due to powerful breakers and the skills of the highly trained crew of ICGS Annie Besant was crucial to a successful touchdown. It is worth documenting here that several previous observers had to abandon their studies due to inability to land on Pitti and other islands.

We visited 13 localities (including 11 islands and sand flats and 2 offshore waters near islands) of the Lakshadweep archipelago. We actually landed on sand flats and islands. Only in case of Agatti and Kavaratti islands, the survey was restricted to the offshore marine waters. Observations were made during the inter-island voyages and also after landing on the various islands, etc., while walking on them. Flocks were counted when they re-settled on the ground, after we had landed. Eggs were physically counted. Species composition was also recorded. Photographic documentation with still and video cameras was done. All observations were made during the daylight hours.

Study area and study period

The various islands, sand flats and reefs of the Lakshadweep archipelago (8º0'–12º30'N 71º–74ºE) which lies from about 220–440 km from the west coast of Kerala, that we visited were: Cherbaniani, Byramgore, Bitra, Pitti, Bangaram, Tinnakara, Parli 1 and Parli 2, Agatti's offshore waters, Suheli Valiyakara, Suheli Pitti, Suheli Cheriyakara and Kavaratti's offshore waters. The northern most point we covered was Cherbaniani Island (12º24'N 71º53'E) and southern most, Suheli Cheiyakara Island 10º02'N 72º17'E. Along with these islands the inter-island waters were also surveyed. Due to a time constraint, we avoided the more populated islands of Lakshadweep, since there was no significant pelagic avian life from these islands in any of the previous reports.

Observations and Results

Eight species of pelagic birds from three families were

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A flock of Brown Noddies *Anous stolidus*

recorded during our survey—one species from the Phaethontidae, one from Stercorariidae and six from Laridae. In addition to these 19 non-pelagic species were also recorded (Table 1). We observed that Lesser Crested Tern *Sterna bengalensis* had the widest distribution, occurring on 13 islands followed by Large Crested Tern *S. bergii*, which was found on eight islands. Sooty Tern *S. fuscata*, Brown Noddy *Anous stolidus*, Whimbrel *Numenius phaeopus* and Common Sandpiper *Actitis hypoleucos* were recorded on 5 islands. Ruddy Turnstone *Arenaria interpres* and Pond Heron *Ardeola grayii* were recorded on four islands. Lesser Sand Plover *Charadrius mongolus* and Grey Heron *Ardea cinerea* were seen on three islands while the other species were seen only on two or one of the islands surveyed.

At least 31 species of pelagic and shore birds are reported from Lakshadweep (Kurup & Zacharias 1994; Robertson 1994). We have not added any new species to this list. Daniels (1992) reported Masked *Sula dactylatra* and Red-footed *S. sula* Booby as resident birds but we did not spot them during our survey.

Our observations on major marine tern species encountered on various islands are presented in Table 2. Sooty Tern was the most abundant species followed by Brown Noddy, Large Crested Tern and Lesser Crested Tern. Percent pairs of the two species, Sooty Tern and Brown Noddy, found breeding at Cherbaniani and Pitti islands are given in Table 3. It was observed that pairs of both these species laid only one egg each.

Relative percent distribution of terns irrespective of species recorded on various islands in Lakshadweep Archipelago has been shown in Fig. 1. Percent occurrence of various terns in Lakshadweep Archipelago and percent terns of each species that were breeding has been shown in Fig. 2.

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A Brown Noddy *Anous stolidus* pair

Breeding colonies were recorded only on two islands, particularly Cherbaniani (Belapani Reef) and Pitti. However, Cherbaniani, Pitti, Suheli Pitti and Byramgore sandflats, all appear to be important breeding and / or roosting sites for birds. The previous nesting islands like Tinnakara and Suheli group of islands are presently not used by any of the marine terns for breeding (Kurup & Zacharias 1994). It is therefore important to protect these three islands in addition to Pitti Island, which is already an IBA but does not have any legal protection status. We have photographed the Grey-backed Tropicbird *Phaethon aethereus*, probably for the first time in Indian marine waters, at Cherbaniani sand flat, though previous observers have reported it earlier.

Threats

Threats to avian and other marine life and marine ecosystem, as perceived by us during our survey in March 2006 are listed below. *Continued on page 8...*

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Large Crested Tern *Sterna bergii*

Table 1. Pelagic and shore birds of the Lakshadweep archipelago

Species	Approx. no.	Islands of occurrence	Earlier records[1]
Pelagic birds			
Procellariidae			
Barau's Petrel *Pterodroma baraui*	-	-	*
Jouanin's Petrel *Bulweria fallax*	-	-	*
Wedge-tailed Shearwater *Puffinus pacificus*	-	-	*
Flesh-footed Shearwater *P. carneipes*	-	-	*
Audubon's Shearwater *P. lherminieri*	-	-	*
Persian Shearwater *P. persicus*	-	-	*
Hydrobatidae			
Wilson's Storm-Petrel *Oceanites oceanicus*	-	-	*
Black-bellied Storm-Petrel *Fregetta tropica*	-	-	*
White-bellied Storm-Petrel *F. grallaria*	-	-	*
Swinhoe's Storm-Petrel *Oceanodroma monorhis*	-	-	*
Phaethontidae			
Grey-backed Tropicbird *Phaethon aethereus*	4	1	*
Sulidae			
Masked Booby *Sula dactylatra*	-	-	*
Red-footed Booby *S. sula*	-	-	*
Brown Booby *S. leucogaster*	-	-	*
Fregatidae			
Great Frigatebird *Fregata minor*	-	-	*
Stercorariidae			
South Polar Skua *Catharacta antarctica*	-	-	*
Parasitic Jaeger *S. parasiticus*	-	-	*
Pomarine Jaeger *Stercorarius longicaudus*	1	13	*
Laridae			

Species	Approx. no.	Islands of occurrence	Earlier records[1]
Lesser Crested Tern *Sterna bengalensis*	2,700+	1 to 13	*
Large Crested Tern *S. bergii*	3,200+	1, 2, 4, 9, 10, 11, 12, 13	*
White-cheeked Tern *S. repressa*	40+	1	*
Bridled Tern *S. anaethetus*	20+	13	*
Sooty Tern *S. fuscata*	15,200+	1, 2, 4, 9, 13	*
Brown Noddy *Anous stolidus*	9,200+	1, 2, 4, 11, 13	*
Non-pelagic birds			
Charadriidae			
Lesser Sand Plover *Charadrius mongolus*	10	1, 3, 4	*
Greater Sand Plover *C. leschenaultii*	1	3	*
Scolopacidae			
Bar-tailed Godwit *Limosa lapponica*	4	6, 8	*
Whimbrel *Numenius phaeopus*	22	4, 5, 6, 7, 8	*
Common Greenshank *Tringa nebularia*	1	6	-
Green Sandpiper *T. ochropus*	4	6	-
Spotted Sandpiper *T. glareola*	1	6	-
Terek Sandpiper *Xenus cinereus*	2	6	-
Common Sandpiper *Actitis hypoleucos*	13	5, 7, 8, 10, 11	-
Ruddy Turnstone *Arenaria interpres*	28	4, 5, 10, 11	*
Dromadidae			
Crab-Plover *Dromas ardeola*	6	1	*
Ardeidae			
Grey Heron *Ardea cinerea*	11	6, 8, 10	-
Indian Pond-Heron *Ardeola grayii*	5	5, 6, 7, 8	-
Pandionidae			
Osprey *Pandion haliaetus*	2	7, 13	-
Laridae			
Little Tern *Sterna albifrons*	10+	13	-
Cuculidae			
Asian Koel *Eudynamys scolopacea*	1	5	-
Apodidae			
Asian Palm Swift *Cypsiurus balasiensis*	Several	3, 4	-
Hirundinidae			
Barn Swallow *Hirundo rustica*	Several	5, 10	-
Zosteropidae			
Oriental White-eye *Zosterops palpebrosus*	Several	5, 10	-

[1] Kurup & Zacharias 1994; Robertson 1994.

Abbreviations

1=Cherbaniani (Belapani Reef); 2=Byramgore (Chereapani Reef); 3=Bitra Par Atoll; 4=Pitti Island; 5=Bangaram Atoll; 6=Tinnakara Island; 7=Parli-1 Atoll; 8=Parli-2 Atoll; 9=Agatti Island's offshore waters; 10=Suheli Valiyakara Atoll; 11=Suheli Pitti Atoll; 12=Suheli Cheriyakara Atoll; 13=Kavaratti Island's offshore waters.

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Brown Noddy *Anous stolidus* incubating

Table 2. Island-wise population and occurrence of terns

Island-wise occurrence of individual bird species, number of eggs and the species-wise distribution of birds in the Lakshadweep archipelago, in March 2006.

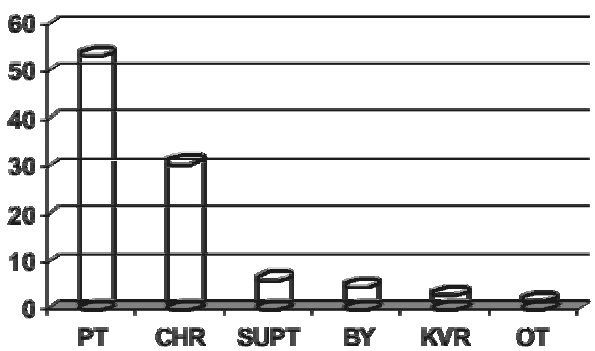
Island	ST	BN	LrCT	LsCT	WCT	BT	Total	Eggs
Cherbaniani	5,000	1,700	1,900	760	40	0	9,400	1,200
% Occurence	-53.20%	-18.10%	-20.20%	-8.10%	-0.40%		-30.70%	
Byramgore	650	250	50	500	0	0	1450	0
% Occurence	-44.80%	-17.20%	-3.50%	-34.50%			-4.70%	
Bitra	0	0	0	4	0	0	4	0
Pitti	9,560	6,600	150	50	0	0	16,360	1,790
% Occurence	-58.40%	-40.40%	-0.90%	-0.30%			-53.40%	
Bangaram	0	0	0	150	0	0	150	0
% Occurence							-0.48%	
Tinnakara	0	0	0	10	0	0	10	0
Parli 1	0	0	0	5	0	0	5	0
Parli 2	0	0	0	2	0	0	2	0
Agatti offshore	4	0	10	150	0	0	164	0
% Occurence	-2.40%		-6.10%	-91.50%			-0.50%	
Suh. Valiyakara	0	0	47	0	0	0	47	0

Island	ST	BN	LrCT	LsCT	WCT	BT	Total	Eggs
Suh. Pitti	0	150	750	1,000	0	0	1,900	0
% Occurence		-7.90%	-39.50%	-52.60%			-6.20%	
Suh. Cheriyakara	0	0	100	100	0	0	200	0
% Occurence							-0.60%	
Kavaratti offshore	84	590	252	10	0	20	956	0
% Occurence	-8.80%	-61.70%	-26.40%	-1.00%		-2.10%	-3.10%	
Total	15,298	9,290	3,259	2,781	40	20	30,648	2,990
% Occurrence	49.90%	30.30%	10.60%	9.00%	0.10%	0.10%	100%	-

Abbreviations

BN = Brown Noddy; BT = Bridled Tern; LrCT = Large Crested Tern; LsCT = Lesser Crested Tern; ST = Sooty Tern; WCT = White-cheeked Tern.

Figure 1. Distribution of terns on various islands in the Lakshadweep archipelago in March 2006 (PT-Pitti; CHR-Cherbaniani; SUPT-Suheli Pitti; BY-Byramgore; KVR-Kavaratti; OT-Other islands).



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Courting Brown Noddies *Anous stolidus*

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Juvenile Large Crested Tern *Sterna bergii*

Figure 2. Occurrence of various terns in the Lakshadweep archipelago and breeding statistics recorded in March 2006. (ST-Sooty Tern; BN-Brown Noddy; LrCT-Large Crested Tern; LsCT-Lesser Crested Tern; WCT-BT-White-cheeked Tern and Bridled Tern. BRD-Breeding; OCC-Occurrence.)

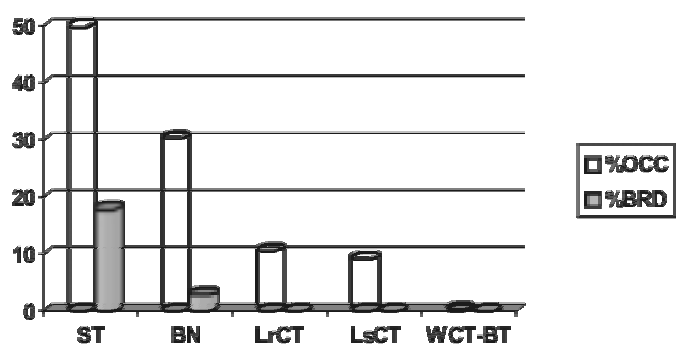

Table 3. Breeding pairs on Cherbaniani and Pitti islands in March 2006

Island	Sooty Tern	Breeding pairs	Brown Noddy	Breeding pairs
Cherbaniani	5, 000	48%	1, 700	0%
Pitti	9, 560	29.30%	6, 600	11.80%
Total	14, 560	35.70%	8, 300	9.40%

1. Pitti and Cherbaniani Islands attract local residents for guano collection. During these visits poaching of eggs and trapping of nesting pelagic birds for eating has been documented by several observers in the past (Kurup & Zacharias 1994). We have also noted heaps of broken eggshells and mounds of feathers confirming that this practice is still prevalent. The entire colony has been earlier ransacked for eggs (Mathew et al. 1991).
2. Guano collection is also rampant as evident by more than one dozen plastic bags filled with guano that we recorded on Cherbaniani (Belapani reef).
3. We noticed some Sooty Terns entangled in the frayed and torn edges of plastic guano collection bags. Those alive were rescued and released.
4. Extensive coconut palm plantations on several islands like Bitra, Parli 1 & 2, Tinnakara, Suheli Veliyakara and Cheriyakara have resulted in their being abandoned as nesting sites by the birds. Nesting was previously documented in Bitra and Suheli group of islands (Mathew & Ambedkar 1964). Growing human population has clearly put a pressure on the available land and increasingly, uninhabited islands are being opened for human activities. These activities are clearly detrimental to the birds. Construction of a tourist hotel at Bangaram has resulted in absence of nesting by pelagic birds at this place.
5. Opening of Suheli Chriyakara to humans has resulted in frequent visits to the adjacent Suheli Pitti Island by people and fishermen and this has driven away nesting pelagic birds from Suheli Pitti as well. Nesting was documented here in the recent past (Mathew & Ambedkar 1964).
6. We noted liberal use of rodenticides like 'Roban' (Zinc compounds) on several islands like Tinnakara, Parli 1

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Mixed colony of Sooty Terns *Sterna fuscata* and Brown Noddies *Anous stolidus*

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Sooty Tern *Sterna fuscata* at nest

& 2 and Suheli Veliyakara. The soil samples in some of the islands have shown alarmingly high levels of Zinc, which is toxic (Bat et al. 1999).

7. Bio-magnification of toxic Zinc is probably already occurring since samples of debris from bird carcasses from Pitti Island, which is devoid of any vegetation and an important breeding ground for pelagic terns, have also revealed higher than permissible levels of Zinc.
8. Alteration of pH of water towards acidic side is seen in a few lagoons. This could be the result of the prolonged practice of dumping 'Mas' or rotting fish and other organic matter on the shore and in the lagoon. The unfavorable pH alteration is detrimental in the long run since the lagoon water tends to concentrate toxic wastes as it is cut off from the open sea by a ring of reefs.
9. Dumping of garbage like plastic, used and leaking batteries, electric glass bulbs, bottles, cigarette cartons, cans, etc., is prevalent on important nesting islands of Pitti and Cherbaniani (Belapani Reef).
10. Recurring oil spills, even in small quantities, from fishermen's boats and tourist transport can cause pollution in the long run.
11. A lack of regular monitoring of the nesting islands by competent authorities of Lakshadweep Archipelago and by Coast Guard has resulted in absence of fear in the minds of fishermen who poach the eggs and birds indiscriminately in spite of Pitti Island being recognized as an Important Bird Area. However no legal protection is accorded to this important island.
12. Stray incidents of poaching of marine fauna by Indian and non-Indian tourists are reported.
13. A lack of knowledge of island and marine ecology and a failure to understand the importance of this fragile ecosystem, the importance of nesting bird colonies on Pitti and Cherbaniani islands, the most important breeding grounds of pelagic birds in Arabian Sea in Indian territory—can be ascribed to administrative apathy.
14. Poaching of eggs of marine turtles is known. Local fishermen also kill marine turtles for oil, which is used for painting boats for rendering them water resistant.
15. Armoring of coasts and cutting of indigenous vegetation has led to a decrease in the availability of sandy beaches for nesting marine turtles. This is causing an irreversible damage to the fragile island biogeography.

Recommendations

1. Cherbaniani (Belapani Reef), Byramgore, Suheli Pitti and Pitti islands should be immediately declared Marine Birds Sanctuaries. They should also be assessed IBAs. A strict penalty should be levied if unauthorized persons are found on these islands, especially during March and November. Cherbaniani is the second most important breeding ground for the pelagic birds of the Lakshadweep archipelago, second only to Pitti Island (Table 2).
2. Regular surveillance and monitoring of bird populations on Cherbaniani and Pitti islands should be undertaken.

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Hermit Crab *Pagurus* sp. predating on egg

3. No habitat modification on these islands should be permitted and their status quo maintained without starting any coconut or other plantations. If such plantations are allowed on Pitti, Cherbaniani, Byramgore and Suheli Pitti islands, the breeding birds on Lakshadweep archipelago are very likey to vanish in the next twenty five years.
4. Suheli Pitti, though devoid of pelagic bird nesting, is a potential breeding ground of these birds. Entry of people to Suheli Pitti should also be strictly prohibited. Resumption of breeding by pelagic birds on this sand bank is very likely to be occurring during the SW monsoon.
5. The Coast Guard should physically patrol Cherbaniani, Byramgore, Pitti and Suheli Pitti islands, rather than simple distant patrolling. Unless the personnel land on these islands in Gemini boats, true status of pelagic birds cannot be evaluated since the larger patrol vessels cannot approach close enough and hence the bird life and other faunal monitoring or exploitation will remain unknown.
6. Use of rodenticides like 'Roban', which contains zinc compounds, should be strictly prohibited in Lakshdweep. There is evidence of high percentage of toxic zinc in soil samples and bio-magnification of this pollutant is already occurring (Mathew et al. 1991). This is definitely a cause for concern. The rodents live on coconut palms and remain in the canopy throughout their life; hence indiscriminate use of rodenticides on ground is of doubtful efficacy. Other measures for rodent control should be tried.
7. Disposal of fish 'Mas' and other vegetative waste like coconut fronds should be correctly carried out in a safe manner such that decomposition of these waste products does not increase the pH of water or produce any unfavorable alterations.
8. Creating public awareness on the importance of Cherbaniani, Byramgore, Pitti and Suheli Pitti islands in Lakshadweep's ecology should be undertaken on a priority basis. Administration should refrain fishermen from visiting these islands and from poaching eggs, killing birds and disposing toxic garbage on them.
9. Officers and crew of the Coast Guard should be involved in a marine ecology orientation workshop wherein the importance of marine ecosystem with respect to marine birds, mammals, fish, reptiles, flora and other fauna is highlighted in a simple manner. The immense role of Coast Guard in the protection, conservation and preservation of our natural but fragile marine wealth should be highlighted, since this area is virtually out of bounds to the common man.

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Lesser Crested Terns *Sterna bengalensis*

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Sooty Terns *Sterna fuscata*

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Guano collection at Cherbaniani Island

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Juvenile Brown Noddy *Anous stolidus*

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A spray of Ruddy Turnstones *Arenaria interpres*