



**SEABIRD ECOLOGY ON DANGER ISLAND:
January 2019 research expedition report**



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Executive summary

In January 2019 a team from ZSL's Institute of Zoology, as part of the Bertarelli Programme of Marine Science, visited BIOT, for the fifth time, to conduct research into the importance of the Marine Protected Area for seabirds. For the first time, with support from British Forces BIOT and the BPV Grampian Frontier, a team was successfully deployed on the uninhabited, Danger Island (western Great Chagos Bank). The team (3 people) spent 10 days 'under canvas' on island, where they deployed 33 sets of short-term tracking devices on breeding Red-footed Boobies (RFBs) and recovered 32 of these. These have provided the first tracks of breeding RFBs from the western islands in BIOT and the preliminary results suggest they do not use the same area of the MPA as the RFBs tracked at Diego Garcia or Nelson's Island. Of note was the first record of a breeding RFB leaving the MPA during a foraging trip. The team also successfully tagged breeding Brown Boobies (BBs), with 15 sets of short-term GPS tracking devices and activity sensors deployed and 11 of these were recovered. The preliminary results suggest that the breeding BBs from Danger Island remain in the MPA and do not utilise the same at-sea area as those on Nelson's Island. Two time-lapse cameras were set up to explore their potential as tools for monitoring seabird breeding ecology in the northern atolls. The team conducted a full census of seabirds on Danger Island and five species were recorded breeding on the island. A further five species of non-breeding seabirds were also recorded. Coconut Crabs were present on the island, tracks of Green Turtles were frequently observed and non-native Red Junglefowl (chickens) were regularly seen and recorded breeding.

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Dates: 14-25 January 2019.

Introduction

As part of the Bertarelli Programme in Marine Science (BPMS) the Zoological Society of London (ZSL) and Exeter University conducted a seabird research expedition to Danger Island (DI – Fig. 1 & 2), British Indian Ocean Territory (BIOT), during January 2019. The expedition to DI was combined with research on Diego Garcia (DG); but due to the unique nature of the DI phase, a specific report has been produced. The research team were on DI from 15-25 January 2019 without close boat support as per the Nelson’s Island expedition in July 2018.

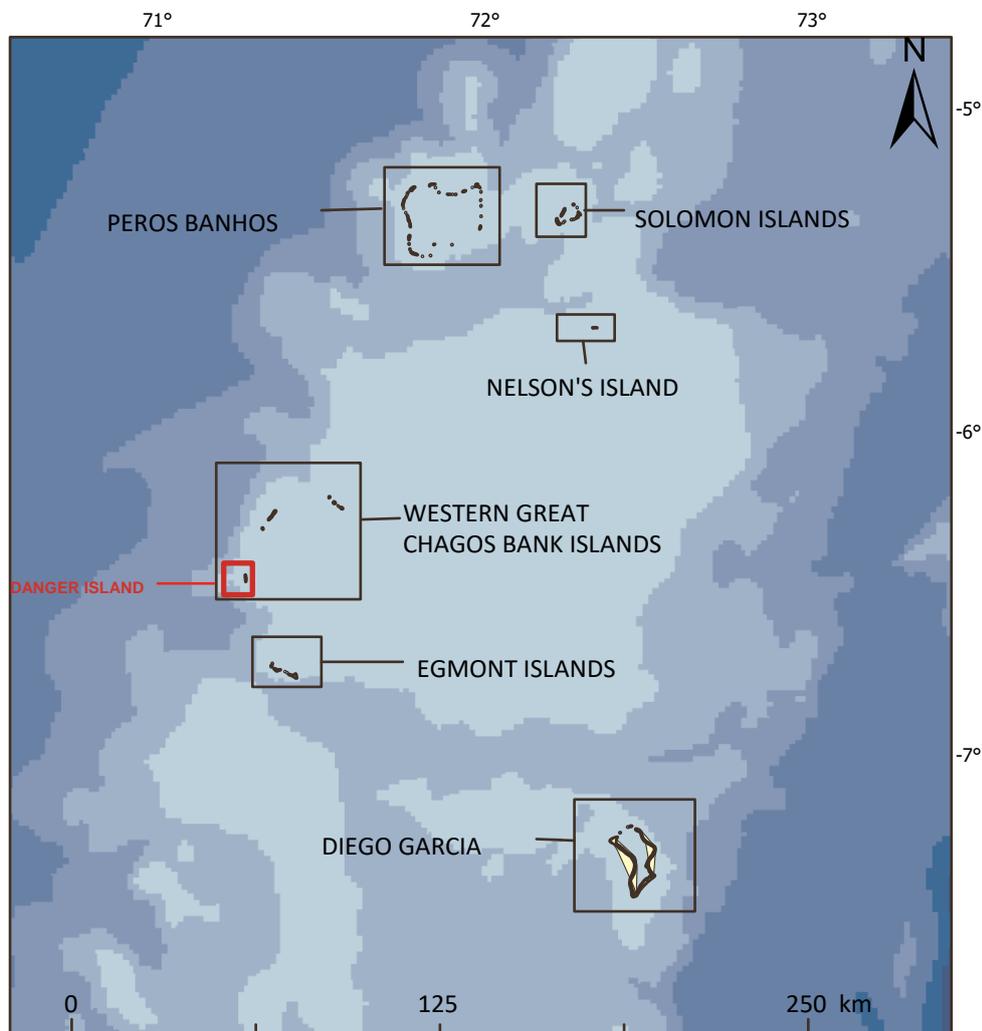


Figure 1. The location of Danger Island in the western section of the Great Chagos Bank, BIOT.



Figure 2. Google earth image and vegetation map of Danger Island, BIOT.

The research expedition to DI was part of the ongoing four-year seabird ecology programme to explore the importance of the BIOT Marine Protected Area (MPA) for seabirds. It extends previous research conducted over the last two years at Barton Point (Diego Garcia) and Nelson’s Island (NI). The expedition focused on the following three objectives:

Objective 1

To explore the potential for using remote technology to monitor, year-round, seabird breeding ecology in the remote, northern islands of BIOT.

Objective 2

To explore the foraging ecology of the Red-footed Booby (RFB) and Brown Booby (BB) on DI.

Objective 3

To establish the status and distribution of breeding seabirds on DI.

In addition, 20 blood samples were collected as part of a collaborative, regional examination of RFB population phylo-geography.

Any novel incidental observations of the flora and fauna on DI were recorded.

Methodology

Objective 1

Remote camera technology could potentially be used as tool to monitor seabird breeding ecology on islands in the northern atolls of BIOT. However, to date the potential of this has not been explored. 2 Reconyx Hyperfire trail cameras were set up, on bespoke aluminium frames, opposite groups of nesting RFBs to monitor the year-round breeding ecology of this species. The cameras were programmed in a time-lapse mode, taking a single image every hour between 06:00 and 20:00 daily. They will require servicing (new batteries/SD card) and

images downloaded in 6 months. Full spectrum acoustic loggers (Audiomoths; Open Acoustic Devices, Oxford) were taken to explore the presence of the more cryptic/nocturnal species such as shearwaters, but no visual signs of shearwater breeding activity (burrows) or individual's arriving on the island at dusk were observed so no devices were deployed.

Objective 2

The techniques used to explore the foraging strategies of both RFB and BB are the same as used throughout the research programme, with the exception that BB, being bigger than RFB, is fitted with a larger unique identifying British Trust for Ornithology (BTO) metal ring. Tail-mounted GPS loggers (15g, IGotU GT-120, Mobile Action Technology Inc) and leg-mounted geolocators (3.0g, Intigeo C330, Migrate Technology) were attached to 33 breeding RFBs and 15 BBs to document at-sea foraging locations and behaviour whilst breeding. Tags were deployed for between three and eight days and no apparent adverse effects were observed on either breeding success or welfare.

Objective 3

The standard method to census breeding seabirds is to count the number of Apparently Occupied Nests (AONs) of a given species. Given the relatively open access of DI and the amount of time available for the census, all AONs were counted direct and estimations of breeding populations were not required.

Blood samples were collected from the brachial vein of RFBs and stored in the buffer DNAGuard.

Opportunistic records were also gathered on other avian taxa, Coconut Crab and turtles when time permitted.

Results

The DI seabird research expedition was a success with all stated objectives achieved, and the principle results are described below.

Objective 1

The two time-lapse cameras were deployed and tested during the 10 days on island and have been set up to last for ~6 months.

Objective 2

Thirty-three pairs of GPS and GLS tracking devices were deployed on breeding RFBs and 32 of these were recovered. Fifteen pairs of devices were deployed on BBs and 11 pairs recovered. A summary of this and additional ringing are provided in Table 1. The outstanding success of the fieldwork can, again, be attributed to meticulous preparation coupled with the experience of the field team.

Table 1. Tagging activities.

RFB ringed	BB ringed	RFB fitted with short-term GPS/GLS	BB fitted with short-term GPS/GLS	RFB short-term GPS/GLS recovered	BB short-term GPS/GLS recovered
37	15	33	15	32	11

Preliminary mapping of the RFB GPS tracks shows that RFBs undertake both short (single day) and long (multiple day) foraging trips. One individual was recorded leaving the MPA on a round trip that took in over 1000km of ocean over a period of five days (Fig. 3).

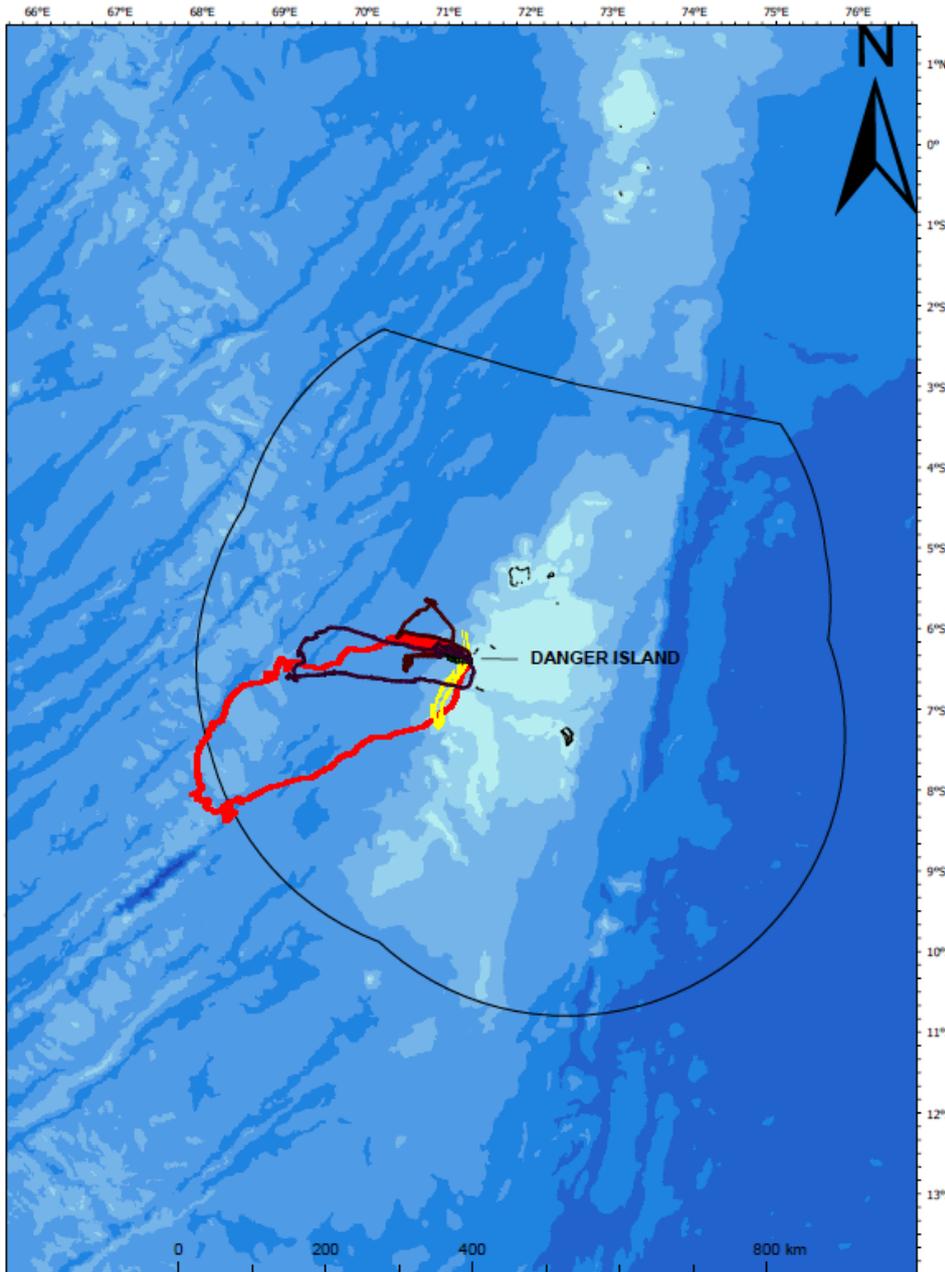


Figure 3. The location of Danger Island in BIOT in relation to the MPA border (black line) and sample tracks of breeding Red-footed Boobies, collected during January 2019.

Preliminary mapping of the foraging tracks recorded from the BBs indicated that this species of booby was less pelagic than RFBs and did not venture further than ~100km from DI (Fig. 4).

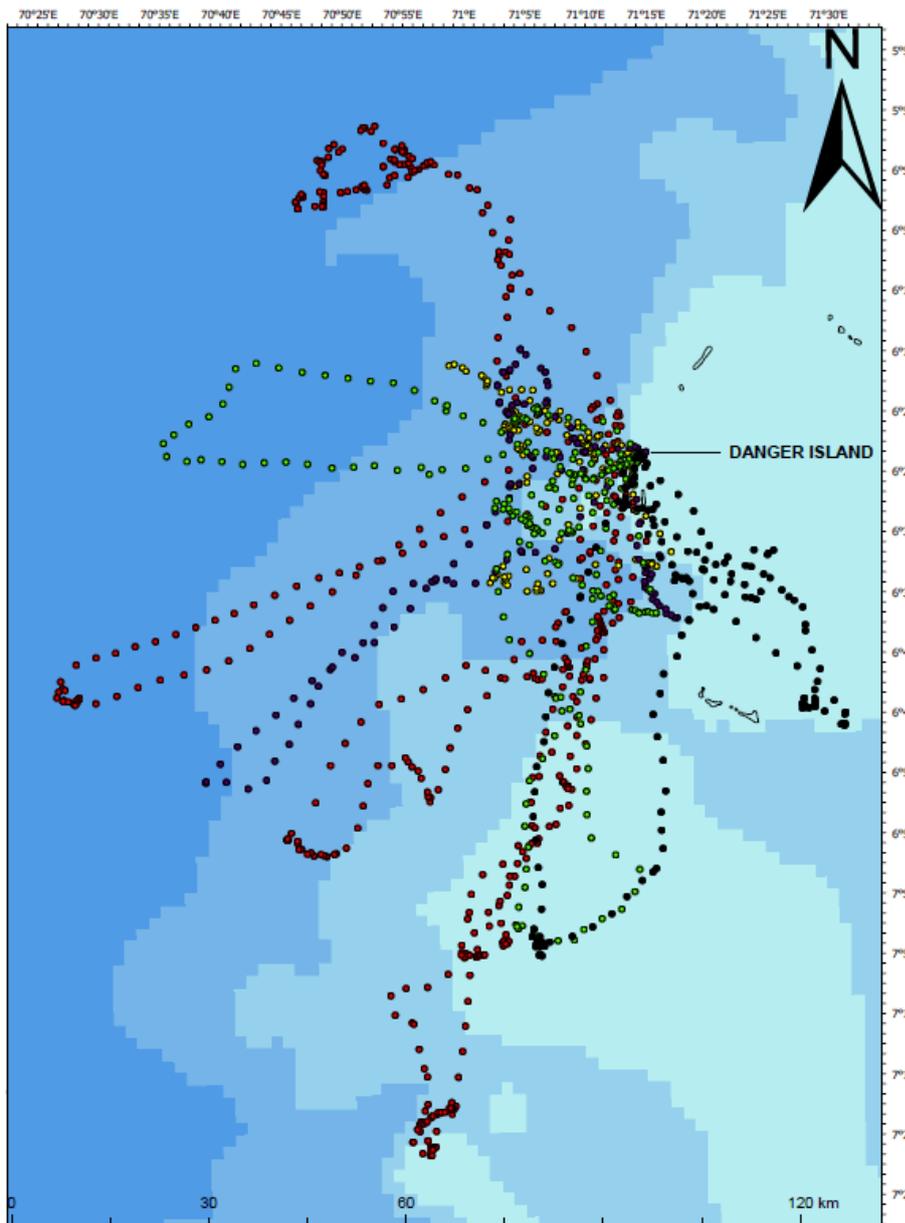


Figure 4. A selection of foraging tracks of breeding Brown Boobies from Danger Island, recorded during January 2019.

Objective 3

Currently, DI is important for breeding seabirds, having been classified as an IUCN Important Bird Area (IBA) in 2006¹. The January 2019 fieldwork offered an opportunity to

¹ Carr. P. 2006. British Indian Ocean Territory. In, Sanders, S.M. (Ed.). Important Bird Areas in the United Kingdom Overseas Territories. Sandy, UK: RSPB.

ground-truth the original data used to designate the island; 3,470 breeding pairs of RFB and 11,100 breeding pairs of Brown Noddy in 1996². Also, in 1996, 245 breeding pairs of BB were recorded. In 2019 there were 750 breeding pairs of RFB, 35 breeding pairs of BB and a mere 10 pairs of Brown Noddy. A full list of breeding seabird populations on DI in January 2019 is in Table 2.

Table 2. Breeding seabird numbers on Danger Island in January 2019.

Species	Breeding pairs	Comments
Red-footed Booby	750	Danger Island is the second largest breeding colony of RFB in BIOT.
Brown Booby	35	Danger Island is the second largest breeding colony of this species in BIOT.
Common Noddy	10	
Lesser Noddy	60	
White Tern	12	
Great Crested Tern	0	A total of 27 birds were present on DI with three recently fledged juveniles in the flock.

Opportunistic records gathered during the main fieldwork included the finding of a Kentish Plover (less than 10 records in BIOT since 1971) and a population of (>30) feral Red Junglefowl (chickens). The provenance of this flightless species on an oceanic island is unknown.

² Symens, P. 1999. Breeding seabirds of the Chagos Archipelago. In, Sheppard, C.R.C. & Seaward, M.R.D (Eds.) Ecology of the Chagos Archipelago. Linnean Society Occasional Publications, Westbury Publishing, Otley, West Yorkshire.



Figure 5. Red Junglefowl (chickens) are present on Danger Island.

In addition to the bird records above, a population of Coconut Crab is resident on the island, including some very large individuals in excess of 2kg. Fresh Green Turtle tracks to possible breeding pits were noted on a near daily basis.

Discussion:

DI is the most westerly of the three study sites in the four-year BPMS seabird ecology research project. This expedition was the first of its kind to the island, whereby a team of scientists was permitted, without immediate boat support, to spend 10 days on island. The expedition was a success; tracking the foraging ecology of breeding boobies and conducting the most thorough survey of this important seabird island.

To date we have successfully tracked >150 breeding RFBs. from three colonies, during their at-sea foraging trips and for the first time we recorded one leaving the MPA. This occurred at DI and the RFB undertook a foraging trip >1000km over almost five days to the west-south-west of the colony. The duration and distance of this trip is unique and only a few birds from Barton Point on DG have done something similar, but notably have remained within the boundaries of the MPA. The multi-colony tracking data collected to date suggests that RFBs from the different colonies do not overlap and appear to use different areas of the MPA during the same monsoon periods. Further data collection from DI and NI, during the different monsoon periods, are required to be able to formally examine this.

This is only the second time that the foraging tracks of breeding BBs have been documented in BIOT. Preliminary investigation of the tracking data suggests that they use a very different area to those tracked at NI. However, they might exhibit a similar foraging strategy with individuals foraging within 100km of the island and most trips being conducted within the same day.

The surveys of the breeding seabirds on DI revealed population sizes that were typically lower than those estimates recorded during the North West monsoon period in 1996 and were used to designate DI as an IBA. If the current data were used to assess the IBA status of DI then it would not qualify. Exactly why this is the case and if there has been a genuine decline in breeding seabird numbers on DI is unclear and will be explored as part of the project.

Value of research to BIOTA: This expedition provides further comprehensive data on the current status and distribution of breeding seabirds in BIOT and begins to explore the potential of remote technology for monitoring seabirds on the outer islands in the Territory. While the former already contributes directly to monitoring biodiversity in the Territory as part of the BIOT Conservation Management Plan (CMP) the latter has potential to be an integral long-term tool in this process.

Understanding where and when breeding seabirds make use of the surrounding MPA is important as an indicator of the conservation impact of the MPA and hence of direct relevance to the BIOT CMP. The data collected on this expedition contributes to our understanding of this. In addition, as boobies are associated with sub-surface predators (i.e. tuna, shark and billfish) when foraging, the larger set of data from multiple booby colonies across the archipelago could identify areas that are important for these types of predators at particular times of year and hence inform enforcement activities.

Conclusion: The January 2019 fieldwork on DI has provided invaluable seabird breeding population and tracking data during the North West monsoon period. However, this needs to be complemented by further research during the South East monsoon period and an application will be submitted to repeat the research expedition to Danger Island in July 2019. The tracking data has added further information to the growing understanding of how two top pelagic predators (RFB/BB) utilise the BIOT MPA for foraging. The ornithological census work on DI has unearthed interesting questions on the long-term population trends of breeding seabirds in BIOT. These questions are challenging due to the historical nature of the comparative data available. The testing of remote technology for monitoring seabird distribution and ecology is a first for BIOT and the ongoing test will provide an indication of its potential as a useful tool for seabird monitoring in the long-term.

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Expedition data summary

Expedition ID	Dates	Location (place or coordinates)	Taxa or Species	Objective	Method	Data
Jan 2019 seabirds	15-25/01/2019	Danger Island	Seabirds	Population monitoring	Census surveys	Estimates of breeding populations for 5 species
Jan 2019 seabirds	15-25/01/2019	Danger Island	Red-footed Booby	Population monitoring	Ringling	37 individuals ringed with steel BTO rings
Jan 2019 seabirds	15-25/01/2019	Danger Island	Red-footed Booby	Regional population genetics	Blood sampling	20 individual blood samples
Jan 2019 seabirds	15-25/01/2019	Danger Island	Brown Booby	Population monitoring	Ringling	15 individuals ringed with steel BTO rings
Jan 2019 seabirds	15-25/01/2019	Danger Island	Red-footed Booby	Use of MPA	Tagging: GPS loggers & Geolocators	Foraging tracks of 31 breeding individuals
Jan 2019 seabirds	15-25/01/2019	Danger Island	Brown Booby	Use of MPA	Tagging: GPS loggers & Geolocators	Foraging tracks of 10 breeding individuals
Jan 2019 seabirds	15-25/01/2019	Danger Island	Red-Footed Booby	Monitoring of breeding ecology	Trial of time-lapse cameras x 2	Images - to be downloaded in July 2019

NOTE: For further information please contact Malcolm Nicoll at malcolm.nicoll@ioz.ac.uk