# SEABIRD ECOLOGY ON DIEGO GARCIA:
# January-February 2019 Research Expedition Report

**Hannah Wood[1], Robin Freeman[1] & Steve Votier[2]**

*[1]Institute of Zoology, Zoological Society of London, Regent's Park, London NW1 4RY.*
*[2] Environment and Sustainability Institute, University of Exeter, Penryn Campus, Penryn, Cornwall, TR10 9FE, UK*

## Executive summary

In January and February 2019, a team from ZSL's Institute of Zoology, as part of the Bertarelli Programme of Marine Science, visited BIOT, for the third year, to conduct research into the importance of the Marine Protected Area for seabirds. A team of 3 researchers spent 9 days 'under canvas' on island, where they deployed 15 sets of short-term tracking devices on breeding red-footed boobies (RFBs) and recovered 11 of these. These have provided the first ever high-resolution tracks and accelerometery data from breeding RFBs in BIOT. Preliminary results suggest that the majority of individuals do not leave the MPA while breeding although one breeding RFB did leave the MPA during a foraging trip.

In addition, long-term tracking devices were recovered from 13 breeding and non-breeding adults, providing new information about the movements of adult RFB during the non-breeding season.

**Participants:** Steve Votier (Penryn Campus, Exeter University), Robin Freeman and Hannah Wood (Institute of Zoology, Zoological Society of London).

**Dates:** 29 January to 12 February 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 Diego Garcia (DG), British Indian Ocean Territory (BIOT), between January and February 2019. The expedition to Barton Point on the eastern arm of DG was preceded by a research trip to Danger Island which has been detailed in a separate report.

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

Objective 1

To deploy new combined GPS/time depth recorder and acceleration loggers (AxyTrek GPS/Accelerometer/Time-Depth-Recorder, TechnoSmart) on breeding RFB in order to obtain new fine-scale foraging and at-sea activity data.

Objective 2

To retrieve previously deployed long-term loggers which have been recording non-breeding season movements of RFBs.

Objective 3

To add to our knowledge of breeding individuals in this area and their life history, breeding frequency, breeding-site and partner fidelity.

Objective 4

In addition, the collection of up to twenty blood samples as part of a collaborative, regional examination of RFB population phylo-geography.

**Methodology**

Objective 1

Tail-mounted AxyTrek GPS/Accelerometer/Time-Depth-Recorders and leg-mounted geolocators (3.0g, Intigeo C330, Migrate Technology) were attached to 15 breeding RFBs to document at-sea foraging locations and behaviour whilst breeding. Tags were deployed for between three and six days. There was one nest failure during this time, but the tagged animal was seen on the nest for 3 days after initial capture, so failure is not thought to be attributed to the tagging.

Capture of the individuals proved exceptionally difficult this season due to low numbers of breeding adults and the inaccessibility of nests, requiring more complex and strategic captures than has been previously required, see Figure 1.

Figure 1: Dr Robin Freeman and Prof. Steve Votier capture a nesting red-footed booby

Objective 2

Previously deployed logging devices (Intigeo C330, Migrate Technology) were retrieved from both loafing individuals and breeding individuals which were on nests. In order to maximise retrievals, checks for tagged individuals were conducted in the evening and early morning when non-breeding birds had returned to roost in the colony. This data will help us to understand more about the non-breeding season movements of RFB from Diego Garcia.

Objective 3

Previously BTO-ringed individuals were identified and recorded, and their breeding and location details will be added to an ongoing database.

Objective 4

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

## Results

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

Objective 1

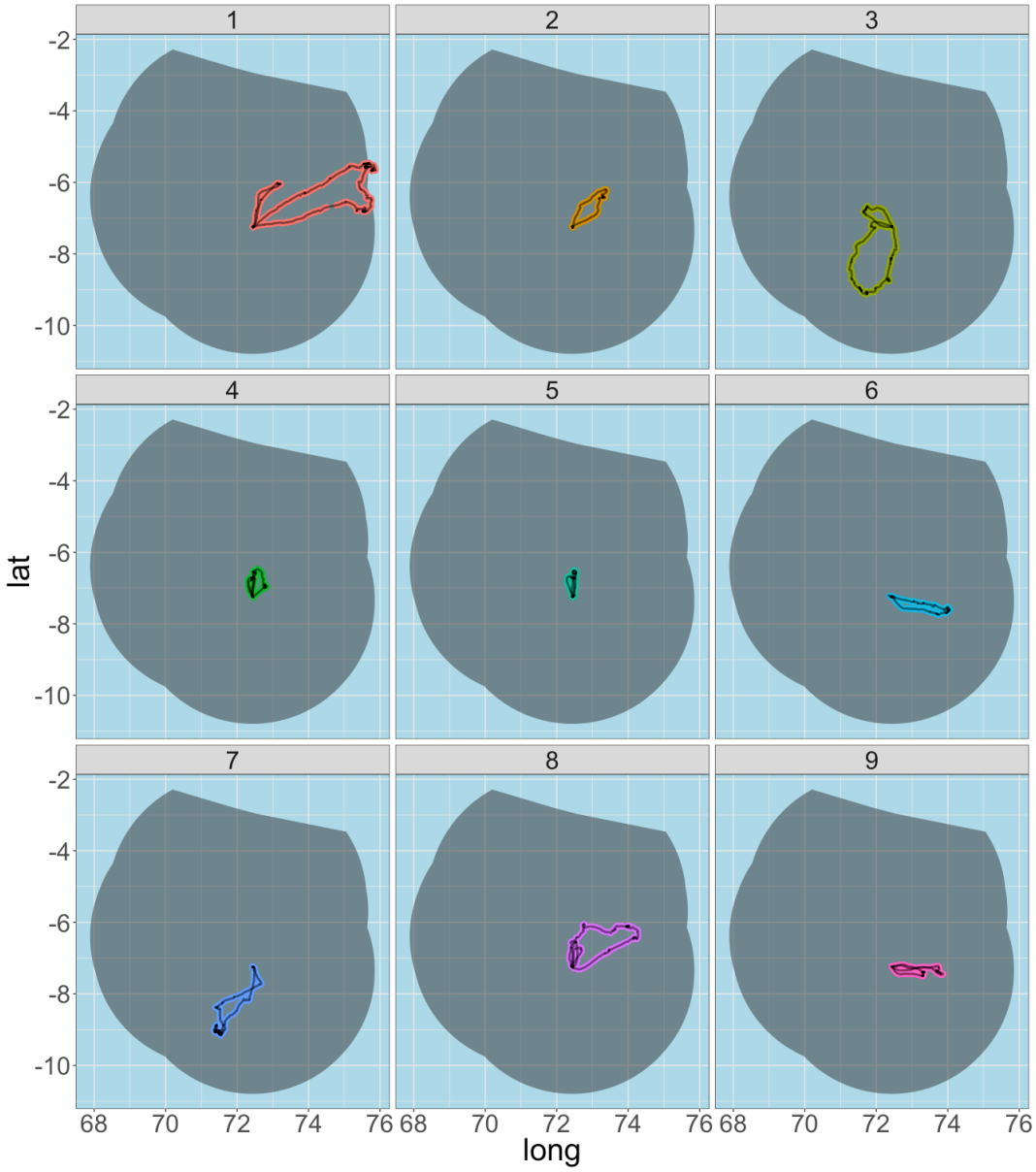
Despite a lack of breeding pairs in the area and few ideal study nests, of the fifteen breeding birds tagged with the combinations of tail-mounted Axytrek loggers and leg-mounted Intigeo tags, eleven individuals were recaptured, and the devices successfully collected. Two of the Axytrek loggers failed to download properly and will be returned to the manufacturer in order to retrieve the data. A summary of the GPS track data can be found in the Table 1.

Table 1. Tag Deployment Data.

| TagID | Max Distance from colony (km) | Total Distance travelled (km) | No. Fixes | Duration (days) | Mean Speed (m/s) |
|---|---|---|---|---|---|
| **1** | 427.32 | 1969.39 | 15486 | 5.78 | 5.03 |
| **2** | 163.77 | 619.9 | 10217 | 3.93 | 2.53 |
| **3** | 217.05 | 1269.12 | 14623 | 5.25 | 3.17 |
| **4** | 95.51 | 790.77 | 11827 | 4.32 | 2.54 |
| **5** | 90.38 | 597.46 | 10816 | 4.31 | 2.23 |
| **6** | 184.43 | 731.64 | 8643 | 3.19 | 4.46 |
| **7** | 226.91 | 1028.54 | 10860 | 4.11 | 3.49 |
| **8** | 238.5 | 1309.21 | 15946 | 5.79 | 3.08 |
| **9** | 161.1 | 903.02 | 10420 | 4.02 | 3.26 |

Preliminary mapping of the RFB GPS tracks indicates that both long (multiple day) and short (single day) trips are being undertaken by breeding adults. One individual was recorded leaving the MPA, as displayed in Figure 2.

Figure 2. GPS tracks of Red-footed Boobies tagged on Diego Garcia




The trial of these new tags was considered successful as no recaptured individuals were found with the tag missing or with physical damage attributed to the tag application. We are confident that the tag-attachment method is suitable for these birds and can be repeated in the future.

Objective 2

Thirteen leg-mounted Intigeo devices were retrieved in addition to a leg-mount where the device had detached over time. The majority of these were retrieved from loafing individuals which were not attending a nest, but a few were from nesting individuals who were then fitted with a new Intigeo and an Axytrek GPS device.

Objective 3

Fourteen individuals that had been BTO-ringed while breeding during previous field seasons were recaptured adding to data about the breeding frequency and site-fidelity of RFB on DG.

Objective 4

Blood samples were successfully collected from twenty RFBs and stored in the buffer DNAGuard. These will be analysed in collaboration with Mathieu Lecorre, La Reunion later in 2019.

**Discussion**:

**Value of research to BIOTA:** This expedition provides further comprehensive data on the at-sea distribution of breeding seabirds in BIOT and begins to explore the potential of using high-resolution tags for investigating and identifying at-sea activity in order to confidently identify foraging locations.

Importantly this expedition has also added information about the movements of individuals in the non-breeding season, when adults are not required to incubate an egg or feed a chick. This information is very limited for BIOT and each tag retrieved adds significantly to our understanding of the behaviour of these birds.

Understanding where and when breeding seabirds make use of the surrounding MPA, and identifying particular foraging locations, is important as an indicator of the conservation impact of the MPA and hence of direct relevance to the BIOT Conservation Management Plan (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 DG has added new, more detailed information about the foraging locations and behaviour of breeding red-footed boobies during the North West monsoon period. This data would be complemented by further research during the South East monsoon period and an application will be submitted to repeat the use of these high-resolution, multi-parameter recording tags, on an expedition to Danger Island in July 2019. The long-term tracking data has added further information to the growing understanding of how a top pelagic predator (RFB) utilises the BIOT MPA for foraging over multiple years, as well as between breeding seasons.

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## Expedition data summary

| Expedition ID | Dates | Location (place or coordinates) | Taxa or Species | Objective | Method | Data |
|---|---|---|---|---|---|---|
| Jan-Feb 2019 seabirds | 01-09/02/2019 | Diego Garcia | Red-footed Booby | Use of MPA during breeding season | Tagging: GPS loggers & Geolocators | Foraging tracks of 11 breeding individuals |
| Jan-Feb 2019 seabirds | 01-09/02/2019 | Diego Garcia | Red-footed Booby | Population monitoring | BTO Ring identifications | 14 individuals resighted from previous years |
| Jan-Feb 2019 seabirds | 01-09/02/2019 | Diego Garcia | Red-footed Booby | Regional population genetics | Blood sampling | 20 individual blood samples |
| Jan-Feb 2019 seabirds | 01-09/02/2019 | Diego Garcia | Red-footed Booby | Use of MPA during non-breeding season | Retrieval: Geolocators | Long-term activity data from 13 adult individuals |

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