Darwin Plus:
Overseas Territories Environment and Climate Fund
Annual Report

Important note *To be completed with reference to the Reporting Guidance Notes for Project Leaders: it is expected that this report will be about 10 pages in length, excluding annexes*

Submission Deadline: 30th April 2017

Darwin Plus Project Information

Project reference	DPLUS044
Project title	Assessment and Conservation Actions for Cayman Islands' Seabird Populations
Territory(ies)	Cayman Islands
Contract holder institution	Department of Environment, Cayman Islands Government
Partner institutions	National Trust of the Cayman Islands University of Liverpool (UK), University of Exeter (UK)
Grant value	£201,985.00
Start/end date of project	1st April 2016 – 31st March 2018
Reporting period	Apr 2016 – Mar 2017 (AR1)
Project leader name	Gina Ebanks-Petrie
Project website/blog/Twitter	http://caymanseabirds.weebly.com www.caribbeanseabirds.org.uk Twitter: @CaymanSeabirds
Report author(s) and date	Dr Rhiannon Meier, Gina Ebanks-Petrie, Tim Austin, Dr Jonathan Green, Jane Haakonsson (30th April 2017)

1. Project overview

The Cayman Islands

The Cayman Islands (Grand Cayman, Little Cayman and Cayman Brac) are a UK Overseas Territory located in the western Caribbean Sea, to the south of Cuba and northwest of Jamaica (19°N, 79-82°W, Fig. 1). The marine environment around the Cayman Islands supports a diverse range of fauna including invertebrates, fish, sharks, turtles and seabirds, and this diversity of marine life itself provides strong economic draws through tourism and recreational fisheries. The Islands have benefitted from over 25 years of marine conservation action, focused through a network of Marine Protected Areas (MPAs) that is actively managed and enforced. Nevertheless, these efforts at site protection extend purely to marine habitats and associated reef organisms, while many large mobile marine vertebrates remain insufficiently protected throughout Caymanian waters.

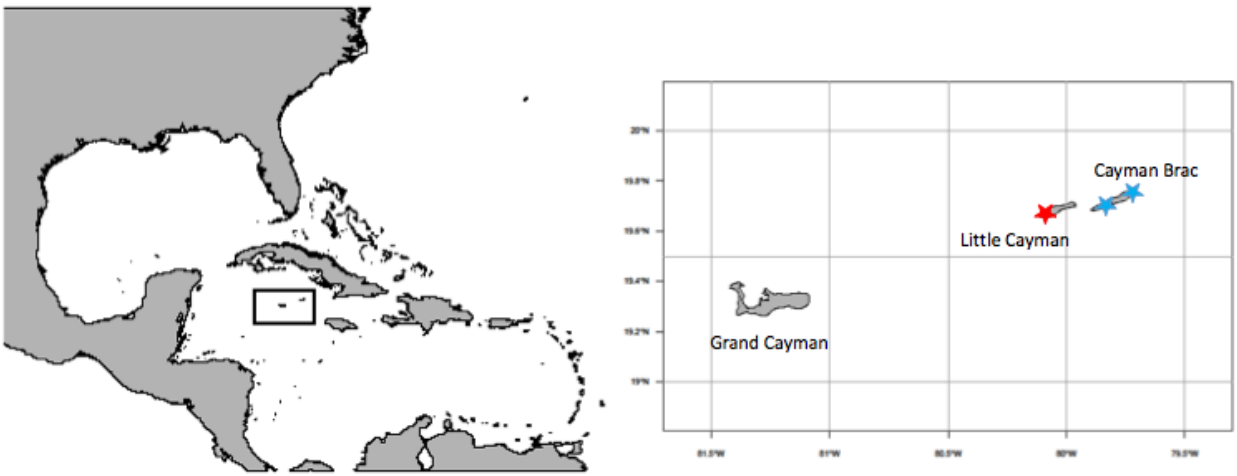


Fig. 1. Map of the Cayman Islands in the western Caribbean Sea. Colony locations of red-footed boobies on Little Cayman (red star) and brown boobies on Cayman Brac (blue stars) are shown.

Project background & key issues addressed

Among such large mobile marine vertebrates are seabirds. The Cayman Islands support multiple breeding seabird species, including globally and regionally important populations of red-footed boobies (*Sula sula*; RFBs) and brown boobies (*S. leucogaster*; BBs). Despite some previous efforts to establish the status and trends of RFB and BB populations in the Cayman Islands, knowledge of resident seabird colonies is insufficient. Data are scarce and incomplete, lacking continuity and a solid methodological framework. Little is known about existing colony sizes, threats, rates of adult survival or breeding success, and routine monitoring is non-existent. The at-sea movements of seabirds in waters are largely unknown and hence they are not currently considered as part of marine spatial planning and/or MPA designation.

Seabirds are vulnerable to a range of threats both at sea and on land. In order to promote their role as marine indicators and establish effective conservation strategies for these highly mobile vertebrates, a thorough understanding of how and when they use the marine environment is required. The Cayman Islands are experiencing rapid, unsustainable in-land and coastal development. Key species and habitats are therefore in urgent need of robust monitoring approaches and effective conservation strategies.

Project aims

This project aims to provide essential information on the status, movement patterns, and ecology of globally and regionally significant seabird populations that breed on the Cayman Islands (RFBs, BBs and magnificent frigatebirds *Fregata magnificens*). This information will be used to inform decisions made by local stakeholders about marine spatial planning around the Cayman Islands, and will allow the Cayman Islands Government to implement appropriate management actions for important resident populations.

Project objectives

1. To identify key at-sea habitats of globally and regionally important seabird populations in the Cayman Islands
2. To identify over-land commuting routes and trip departure/arrival time of RFBs on Little Cayman, and relate this information to site plans for proposed airport developments
3. To improve knowledge on the population size, breeding biology, phenology, diet and predation of globally and regionally important seabird populations, to allow identification of the main threats to colonies on the Cayman Islands
4. To establish self-sustaining seabird census and monitoring programmes that local Government staff, NGOs and community partners can operate

5. To develop draft seabird Species Conservation Plans for approval by managers

2. Project stakeholders/partners

This project is being conducted as a partnership between the Department of Environment (DoE), National Trust for the Cayman Islands (NTCI) and Universities of Liverpool and Exeter, UK. The project application stemmed from initial conversations between Postdoctoral researcher Rhiannon Meier and DoE during 2014 and as such, all partners in the project were involved in the application process from the initiation of the project.

The project started with a meeting between all project partners present in the Cayman Islands (4th April 2016; Annex 3), which helped to plan work in the short and long term, and to establish and build inter-partner relationships. During implementation, representatives from DoE have been involved in project planning, have been heavily involved in fieldwork and have been trained in data collection. NTCI staff have been consulted and involved in operational matters in the field. Members of NTCI have been consulted on fieldwork through town-hall meetings in both communities where the work is being conducted. Other interested parties and local residents have also attended these meetings and have been trained in and involved with fieldwork.

The Royal Society for the Protection of Birds (RSPB) has provided guidance for this work through a site visit and participation in Steering Group Meetings. Furthermore an RSPB staff member recently undertook a voluntary sabbatical to assist in fieldwork on tropicbirds (see Annex 7).

Our initial application provisioned for Dr Meier to be based in the Cayman Islands continuously, with a large portion of time spent at DoE HQ on Grand Cayman, which has been a great benefit to the project. In the end, fieldwork has taken longer than initially anticipated, though this has meant that the project team, especially Rhiannon Meier, has been able to embed closely within the communities most directly impacted by this work. Furthermore, due to flexibility in timing and the budget, Dr Meier has also been able to spend more time in the UK working with project partners from the Universities of Liverpool and Exeter.

3. Project Progress

3.1. Progress in carrying out project Activities

Excellent progress has been made with project activities in Y1, and activities are on schedule moving into Y2 of the project. Our project has two main field seasons: the first (S1) took place between April 2016 and July 2016, and the second (S2) commenced in January 2017 and is due to finish in June 2017.

Output 1. At-sea Habitat Use

We have successfully recovered tracking data from 47 RFBs (S1: 21, S2 to date: 26) breeding within the Globally Important Population at Booby Pond, Little Cayman. Similarly, over two field seasons to date, we have tracked 49 BBs from the regionally important population on Cayman Brac (S1: 13, S2 to date: 36). We have commenced analysis of these data (S1 only so far) to begin the process of identifying habitat use at sea and potential Important Bird and Biodiversity Areas. See Annex 3 and 4 for preliminary maps.

Output 2. Commuting Routes and Times

Tracking data from RFBs on Little Cayman (see Output 1) are being examined to establish commuting routes at fine scale. Preliminary analysis of S1 data indicates routes are likely to avoid the proposed scenarios for airport expansion on Little Cayman, although some overlap may occur. Most foraging trips are initiated in the morning around sunrise and terminate in the

evening around sunset. There is very little activity in the middle of the day. See Steering Group Meeting (SGM) Report 2 in Annex 3 for preliminary maps and figures.

Output 3. Population Biology

Regular visits (S1 & S2 ongoing) to the RFB colony on Little Cayman by the project team have allowed for an assessment of productivity of this population. Productivity was high in S1 (0.75-0.85) though observations in the field in S2 suggest that this may be a year of lower productivity. On Cayman Brac, work by volunteers has accumulated a wealth of data on productivity both during the lifetime of the current project and in previous years. We are currently extracting information from this dataset and compiling a database for the BB population.

Extensive work has been conducted to prepare for and conduct population censuses of both target booby species (S1). Preliminary ground and drone surveys were conducted on Little Cayman (June & July 2016; January 2017) and Cayman Brac (November 2016, February 2017). Aerial survey imagery was then captured for both target species during full censuses, alongside required ground validation surveys (S2), and this population work is now complete. In addition, census work on Little Cayman should allow for an assessment of the size of the magnificent frigatebird population at this site. An MSc student from the University of Liverpool will aid with processing and analysing the wealth of drone footage collected during the Booby Pond surveys. Processing of drone footage from the BB census began in March 2017 and is ongoing. See SGM Report in Annex 3 for more details.

All tracked boobies have been marked with individually identifiable colour rings, and research team members and volunteers have been encouraged to report resightings of these rings. However, the low frequency of visitation to Little Cayman and dense foliage of nesting sites means that resighting rates for RFBs are low, and to date there are no plans to construct a resightings database for this species. The trained network of volunteers on Cayman Brac has been actively reporting sightings of ringed BBs during the project and will continue to do so.

Diet samples have been collected opportunistically from both RFBs and BBs, and were identified with help of fish biologists in S1. In addition to our original plans, we have sampled blood, where possible, from tracked birds in order to assess diet via stable isotope analysis of bulk carbon and nitrogen. Plans exist to analyse fish muscle tissue from regurgitate samples using isotopes, in order to aid interpretation of avian blood isotope data. Analysis of these samples is being funded by partner organisations in the UK. See SGM Report in Annex 3 for further details.

Predation rates have been assessed opportunistically by the research team while working in the Booby Pond field site (S1), and are currently being monitored using automated time-lapse video cameras (S2). Predation by cats has been assessed as a notable problem at this site and evidence of predation events has been recorded (See Annex 5 for summary data and photographs).

Output 4. Training

Five staff members from DoE have been involved in seabird tracking and census work on both islands and have gained considerable skills in this area. New (5) and existing (2) volunteers have received training in and been engaged with census and productivity monitoring of BBs on Cayman Brac. A monitoring document to assist with productivity monitoring on Cayman Brac has been created, and a draft disseminated to volunteers during training sessions (see Annex 6). This guide should streamline and enhance the existing substantial efforts by volunteers. Community Meetings at the start of the project were used to increase the profile of the project and recruit volunteers. The project team have conducted a number of interviews and made features with local TV and other media. The project has a dedicated website (www.caymanseabirds.weebly.com) and Twitter feed (@CaymanSeabirds – 190 followers) to provide updates more widely. See Annex 3 and 4 for further details of media and engagement activities.

Output 5. Species Conservation Plans

Activities for these Outputs are confined to the second year of the project.

Additional Activities Undertaken (not mentioned above)**.**

Many of the GPS loggers to be bought from the project budget were supplied via collaboration with Dr John Arnould from the Deakin University, Australia. This has contributed to allowing the DPLUS44 budget to be spent on additional bio-logging devices to record the diving behaviour and on-water activity patterns of both booby populations. This will enhance the tracking data and allow a much greater insight into the foraging behaviour of our two target species. The addition of extra funding provided by the DoE has allowed tracking of magnificent frigatebirds (*Fregata magnificens*), which also breed at the Booby Pond on Little Cayman, to establish the movements and habitat use of this regionally important population. Furthermore Dr John Arnould visited the field site to assist with tracking research and brought with him a number of other bio-logging devices including miniature video loggers, accelerometers and gyroscopes. These devices will allow further insight into the feeding behaviour of frigatebirds (See Annex 4 for example imagery taken from a camera attached to a frigatebird in March 2017). The project was also the recipient of an award from the Cayman Turtle Centre for $1716 KYD, which will support ongoing project activities in Y2.

3.2. Progress towards project Outputs

We are confident that excellent progress has been made towards the project Outputs in Y1, and that this success will continue into Y2 to ensure that planned objectives are met.

Output 1. At-sea Habitat Use

1.1 *GPS track RFBs from the globally important colony in the Booby Pond IBA, Little Cayman*

1.2 *GPS track BBs from the regionally important colony on Cayman Brac*

1.3 *Identify key at-sea habitats, produce GIS layers and assess presence of marine IBAs*

Working with RFBs at Booby Pond has been challenging. In S1, breeding in this species commenced earlier than we expected and thus was more advanced than we would have liked when we started fieldwork. This limited how many birds could be tracked in Y1. Furthermore, the performance of solar-powered GPS-GSM data loggers that we hoped would transmit data back to us via the phone network was disappointing. We had hoped that these units would provide the bulk of the data required to establish at-sea movements for this species but a relatively small amount of data was acquired (see Annex 3 for details). We compensated by deploying a larger number of archival GPS data loggers, but retrieval rates for these devices, while acceptable, were relatively low and required substantial fieldwork efforts. Compared to other species, including other boobies, the birds were hard to recapture and undertook much longer foraging trips than we expected with much less time spent in the colony. Some GPS foraging tracks were incomplete because of this. All of this conspired to make data collection inefficient in our limited time window. That said, with the full team present and a substantial effort in the field, we were able to obtain a sufficient baseline dataset to build on in Y2 in order to identify Marine Important Bird and Biodiversity Areas (see Annex 3 for example IBA maps). In S2, in response to these challenges, we were able to start field activities earlier. However, it appears that the birds are suffering from a poor breeding season in comparison to S1. While biologically this is interesting and justifies two field seasons, it has been incredibly demanding and time consuming for the project team. Despite these setbacks we are confident of having sufficient data to represent the habitat use of this species, which is substantial progress on the baseline condition of ‘no data’ (see Annex 4 for tracking data collected to date in S2). Data collection will soon be complete and we will move to production of maps, uploading of data and peer-reviewed publications, which remain the most appropriate indicators of success.

In contrast, working with BBs has been much more successful and while again a late start to S1 meant a small sample size, S2 has been more successful than anticipated and an impressive sample size has been amassed including the addition of behavioural information from additional bio-logging devices (see 3.1 above and Annex 4). As S2 comes to a close, we are confident in having sufficient data to produce maps and peer-reviewed publications, particularly in comparison to the baseline of 'no data', which remain the most appropriate indicators of success.

Output 2. Commuting Routes and Times

2.1 *Produce maps of commuting routes and time-activity budgets for RFBs*

2.2 *Visually identify arrival and departure routes and timings of commuting birds*

See above (3.1). Preliminary analysis of S1 data indicates that we will easily have sufficient data to establish commuting routes and timings in the context off airport development, especially when compared to the baseline of 'no data'. Analysis and production of maps and papers will take place in Year 2, which remain the most appropriate indicators of success. Nevertheless, please see SGM report 2 in Annex 3 for an example map showing the overland flyways of commuting RFBs, overlaid on a map detailing the four potential scenarios for airport development on the island.

Output 3. Population Biology

3.1 *Monitor productivity and phenology of both booby populations*

3.2 *Assess census methods and conduct census of RFB population*

3.3 *Conduct census of BB population*

3.4. *Create population monitoring database and associated guide*

3.5 *Undertake baseline assessment of booby diet, focusing on tracked individuals*

3.6 *Assess predation rates at booby colonies using camera traps*

Estimates of population sizes for both species were outdated and insufficient. While work to extract estimates of population size from the aerial survey data is ongoing, we have exceptional coverage of the breeding sites of both species, supported by extensive ground-survey data, which includes habitat information (see Annex 7 for survey maps). With these data, we should be able to generate estimates of population size with some confidence, and start to look at nesting habitat choice by both boobies and magnificent frigatebirds. The latter is now the subject of a Master's project by a student at the University of Liverpool (completion expected September 2017), which should add considerable value to the project and will act as an additional indicator of success.

It may not be possible to establish a population database due to the low rates of resighting marked birds, although this is not integral to the overall project purpose. An annual monitoring report may be inappropriate for the amount and quality of data collected on population monitoring and, instead, publication to our website is probably more appropriate (for example see http://www.puffinisland.org.uk/science/monitoring). This is analogous to how the UK's Seabird Monitoring Programme gathers and shares information. In other words, researchers to do not write individual reports, but instead follow an accepted standardized methodology and upload their data through a portal.

Information on diet and levels of predation at colonies was scarce prior to the start of this project. We have now accumulated a range of diet samples from both booby species, as well as two years of stable isotope samples, which will considerably aid examination of dietary habits, and act as an additional indicator of success. Camera traps are currently being deployed to monitor predation rates, and opportunistic data have indicated that cats are potentially responsibly for notable predation pressure in the booby pond, and are in urgent need of management. There may be insufficient data for a full stand-alone project report, but findings will be summarised (e.g. see Annex 5).

Output 4. Training

4.1 *Train local NGO, government and volunteer staff to implement monitoring and research techniques*

4.2 *Produce seabird monitoring field guide to aid staff volunteers in the field*

4.3 *Conduct workshops, school visits and publicity to engage and train local volunteers*

The training of local staff is ongoing and we have met our targets in terms of DoE staff training (three members of staff have received field training in seabird tracking/handling, and an additional two have been involved the development of double-sampling methods for population survey work). To date, NTCI staff has been unavailable to take part in training activities. The project benefits from our staff having a high baseline of competency. Similarly the project benefits from having an existing volunteer base on Cayman Brac (5x people) who we have worked with in order to enhance and streamline activities. In addition, two volunteers on Little Cayman have been involved in tracking and survey work, and there are plans for interested youth to join the field team during tracking activities on Cayman Brac in S2. However, we have yet to recruit the anticipated 10-20 volunteers and achieving this number is currently unlikely. Production of a BB monitoring document has assisted with volunteer training and remains an appropriate indicator. Most training has been informal, and either person-to-person or involving small groups, so forms of evidence are limited (see Annex 6). Presentations from Community Meetings have been uploaded to our website (www.caymanseabirds.weebly.com).

Drafts of seabird monitoring booklets were produced during April 2016 (later than originally timetabled), and will be refined, printed and disseminated to island volunteers in Y2 (Annex 6). Production of a separate monitoring booklet for Little Cayman will not be an efficient training tool owing to the limited volunteer base on Little Cayman, and site permission issues associated with the Booby Pond RAMSAR area.

Output 5. Species Conservation Plans

5.1 *Produce conservation plans for RFB and BB in accordance with the NCL Section 17*

5.2 *Carry out public consultation in accordance with Section 17(4) of the NCL*

This activity and output will take place in Year 2 of the project. However, progress towards the other Outputs suggests that there will be no difficulties in obtaining the information required to devise the Species Conservation Plans.

3.3. Progress towards the project Outcome

The overall Outcome of our project was to provide information on the at-sea movements and status of important seabird populations on the Cayman Islands, to allow identification of Important Bird Areas, establishment of sustainable monitoring programmes and development of informed marine and coastal conservation strategies in this UKOT.

Despite considerable challenges to date, an exceptional effort in the field means that we are well on course to achieve our intended project outcome. A considerable amount of data has been amassed in terms of both tracking and population assessment, and productivity monitoring is well established and nearly complete. The majority of indicators of success remain adequate, with alternatives proposed where necessary.

The remaining time in the project will focus on analysing and presenting the data to assist with marine spatial planning. For habitat use, the protocols for these analyses have been piloted and established, and incorporation of all data should therefore be straightforward. The project should indeed exceed some of the original outcomes by inclusion of new bio-logging technologies, study species and collaborators. The census approach has been far more sophisticated than was originally envisioned, which will again add value to the project. This in turn has been enhanced by the availability of analytical expertise from DoE and UoL to make the most of these data.

3.4. Project support to environmental and/or climate outcomes in the UKOTs

The 1992 UN Rio Convention requires the development of holistic ecosystem-based management regimes. States around the world are developing integrated marine plans to help to meet this commitment. The Government and NGOs in the Cayman Islands are committed to this approach and remain early-adopters and sector leaders in terms of designation and enforcement of MPAs and the role of Marine Spatial Planning. Our project engages with all relevant stakeholders and is generating information that is demanded by DoE to further their ambitions in this realm.

Seabirds are key components of marine ecosystems, facing a number of threats. They also represent the top of biodiversity pyramids, easily observed and studied using the techniques being deployed in the present study. As outlined above, outputs from these techniques (foraging areas, productivity and population size) are being generated successfully and the next step will be to formally analyse the data and incorporate them into specific management plans. Thus our project has the potential to make a major contribution to ongoing marine conservation work in the Cayman Islands by DoE and NTCI.

3.5. Monitoring of assumptions

The major assumptions of this project are associated with the availability of wild animals for tracking and capacity, involvement of local partner organisations and weather conditions.

Availability of wild animals: The project assumes that focal seabird species will be present at colonies during tracking periods, and available in ample numbers, to ensure 1) collection of sufficient data to capture the range of movement strategies present in the breeding populations, and 2) robust analyses to provide an evidence base for conservation planning. Fieldwork for this project began on the Darwin+ 2016 start date (4th April 2016), with UK staff relocating and working on the project prior to this time. By April 2016, many birds were approaching the end of the chick-rearing period resulting in smaller sample sizes in 2016 than originally anticipated. However, a valuable baseline dataset on at-sea distributions and movements was obtained for both species (see Annex 4). To address this issue in Y2, site visits were undertaken regularly in Y1 allowing activity at nest sites to be monitored (see example camera trap images in Annex 5), and ensuring that tracking work began early in the project's second breeding season. Accordingly, we began planning the field season in Q3 of Y1, purchased all tracking devices for S2 at the end of Y1, and organised availability of ample field staff from January 2017 onwards.

Staffing and local capacity / involvement: As planned, DoE staff has participated in training and fieldwork to maximise capacity and ensure transfer of skills and knowledge (section 3.2). Availability of DoE staff for fieldwork was less in Y1 than originally planned. However, staff members (combined) spent >1000 man-hours in the field at colonies over Y1, and gained valuable skills in seabird handling, tagging and monitoring. Training will continue into Y2. NTCI staff members have not been available to participate in training and/or fieldwork offered during S1.

Weather conditions: We assumed that planned fieldwork would take place during suitable weather conditions and this assumption held during Y1. Capacity has also been built into the project in Y2, should weather conditions inhibit data collection over remaining fieldwork periods.

4. Monitoring and evaluation

To assess project progress against measurable objectives, two steering group meetings have been held over the last year, with representatives from project partner organisations, as well as external independent advisors from the RSPB and the University of Roehampton. This approach has worked well, and has allowed us to identify any field issues, draw on the wealth of experience held by our interdisciplinary project committee, and identify ways forward for Y2 to maximise data collection and project outputs. In addition to steering group meetings, the

Department of Environment and Dr Meier hold regular in-house meetings to discuss project activities and progress, and ensure that the work undertaken contributes to meeting desired project outcomes with maximum impact.

A briefing document is circulated to the steering group committee (steering group meetings) or project partners (in-house meetings) prior the each meeting, and provides a summary of progress made towards achieving each project output (see Annex 3). Indicators of achievements such as species distribution maps and plots of activity patterns have been presented at these meetings to allow project partners to measure success and adopt flexible approaches to project activities where needed (see lessons learnt section for details). The M&E plan for Y2 remains the same, with steering group meetings planned at 6-monthly intervals.

5. Lessons learnt

The collaboration between partners has worked very well, with knowledge and expertise contributed from all angles, to make the project run smoothly in its first year. Despite a number of difficulties encountered, we have amassed an impressive amount of data that will contribute considerably to conservation goals for seabirds in the Cayman Islands. Having Dr Meier on site for the majority of the first year has enabled a flexible approach to data collection to combat some of the timing issues encountered during year 1, and ensure early preparation for our second field season.

One of the major problems that we encountered was the lack of baseline information on the timing of breeding at study colonies at the start of the project, and inter-annual variability in this timing. The seabird team arrived at the beginning of April 2016 with limited prior knowledge and found that both of the project's focal species were approaching the end of their chick-rearing period, resulting in a limited number of available birds to tag. Similarly, we had no prior knowledge about how the birds would respond to being tagged, and the levels of difficulty that would be encountered in recapturing tagged individuals. The height at which birds nest within mangroves, and the dense foliage within which nests are often situated, makes capturing this species very difficult. In addition, the birds are much more flighty than similar ground-nesting species (e.g. BBs), and we discovered that when chicks reach a decent size (8 weeks and above) adults often land to feed for finite periods before leaving the nest to roost elsewhere, making tag recovery problematic. These issues can be partially mitigated by working in the colony at times of peak bird activity and scheduling for flexible extended fieldwork periods to ensure sufficient time for tag recovery. Nevertheless, these challenges have resulted in lower recovery rates than originally anticipated. Re-sighting tagged individuals has presented another challenge. The tree-nesting nature of RFBs inhibits ring visibility, and while we have attempted to mitigate this with use of non-toxic animal paint, arboreal birds inherently difficult to identify (particularly as sex cannot be reliably determined by eye). Remote GPS loggers could prevent some of these problems; however, the affordable GPS-GSM devices budgeted for here were not suitable for RFBs (see section 3.2). As rapid developments continue with tracking technologies, similar remote tags are becoming available, and future projects should budget for remotely downloaded GPS loggers to ensure collection of sufficient sample sizes.

In hindsight, responsibilities of team members could have been better defined at the beginning of the project, particularly with reference to financial reporting requirements. Moving into Y2, and following completion of the project's second field season, DOE will assume responsibility for finance and auditing activities, and Dr Meier will focus on data analysis and preparation of publications associated with the project.

6. Actions taken in response to previous reviews (if applicable)

Not applicable. This is our first annual report.

7. Other comments on progress not covered elsewhere

All comments on progress discussed elsewhere in report.

8. Sustainability and legacy

The project has gained considerable interest within the Cayman Islands, as evidenced through a number of television features, radio interviews and news reports during Y1 (see Annex 8). In addition to these forms of publicity, the work being undertaken has been promoted through community meetings, school talks and magazine articles (Annex 8). Project publicity and dissemination of results will continue into Y2, through continued media activity and community involvement. In addition, there are plans to disseminate project outputs more widely to scientific communities at international conferences and through peer-reviewed scientific publications.

Training local Government staff and other project partners in seabird tagging and monitoring techniques was one of the major project objectives set to ensure that capacity is built and that monitoring and data management can be sustained in the long-term. During Y1, all DoE staff listed on the project have either received training in field techniques from seabird scientists at partner organisations, or been involved in data processing and project management processes. Further training will be undertaken into year 2, to ensure that staff are equipped with the skills to access and use collected data for management purposes and, if required, tag seabirds to collect further tracking data in subsequent years. Efforts have also been made to engage and involve volunteers in project activities on Cayman Brac (x5) and Little Cayman (x2). Volunteers assisted in tag deployment/recovery trips and population survey work on both islands, and have been trained in seabird monitoring skills to promote the continuation of routine monitoring following the end of this project. Achieving these outputs has been made easier as Dr Meier has been based predominately in the Cayman Islands.

The data collected during this project will be used to provide an evidence base for the creation of Species Conservation Plans under the National Conservation Law of Cayman Islands (2013), thus ensuring a sustained benefit to conservation management and a long-term legacy from the project. Generated data will be fed directly to all project partners for use in management processes.

9. Darwin identity

All media releases associated with this project acknowledged the Darwin Initiative as the major funding source, and the Darwin logo was used in public presentations and educational materials (see Annex 8). A twitter feed (@CaymanSeabirds), project website (www.caymanseabird.weebly.com) and links on partner websites (www.caribbeanseabirds.org.uk) also went live during Y1 to further publicise the associated work, and the Darwin Initiative were acknowledged through all of these social media channels.

As the Cayman Islands have benefitted from a number of other high-profile projects that the Darwin Initiation have funded (i.e. DPLUS019, 18-016, EIDPO045), the host country and members of its general public are familiar with this grant scheme. This project and its future outputs moving into Y2 will continue to be clearly identified as stemming from Darwin Initiative funding, and the Darwin logo will be displayed on all project material.

10. Project Expenditure

Table 1: Project expenditure <u>during the reporting period</u> (1 April 2016 – 31 March 2017)

Project spend (indicative) in this financial year	**2016/17 D+ Grant (£)**	**2016/17 Total actual D+ Costs (£)**	**Variance %**	**Comments (please explain significant variances)**
Staff costs			+4.1	Small variance in staff costs (<5%) associated with money lost owing to changes in currency exchange rates in 2016.
Consultancy costs	-	-	-	-
Overhead Costs	-	-	-	-
Travel and subsistence			+7.4	-
Operating Costs			-16.7	As there were considerable delays in the transfer of project funds to DOE in Y1, we had to rely on resources of UK project partners during the first field campaign, which were not originally anticipated in the application. Some of these resources did not need to be replaced. We also transferred money from T&S into operating (change request approved – Dec 2016) as believed that we would need the extra funds here. Transfer of £3000 back into operating would reduce variance to -9.9%.
Capital items			**+36.5**	Original amount budgeted for laptop for postdoctoral researcher was not sufficient for the item by the time that Y1 funds were paid to DOE, and laptop could be purchased. Prices of the required model had increased by the time that the purchase was made. Variance is so high because of the very small budget falling into this category (not previously discussed witb Darwin).
Monitoring & Evaluation			0	-
Others (Please specify)			**-14.1**	Underspend of only £37.97 but variance high due to small amount budgeting in this cost category (£270).
TOTAL			-2.1	

Annex 1: Report of progress and achievements against Logical Framework for Financial Year 2016-2017

Project summary	Measurable Indicators	Progress and Achievements April 2016 - March 2017	Actions required/planned for next period
Impact This project will improve the ability of local stakeholders to manage marine ecosystems and implement sustainable long-term monitoring that will allow detection of population responses to anthropogenic- and environmental-driven change.		Capacity is being built amongst local partners that will contribute to effective monitoring of resident seabirds, and development of appropriate conservation management strategies.	
Outcome Determine the at-sea movements and status of important seabird populations, allowing identification of Important Bird Areas, establishment of sustainable monitoring programmes and development of informed marine and coastal conservation strategies.	0.1. New Marine Important Bird Areas identified using Birdlife International criteria protocols and criteria 0.2. Impact of proposed airport development on RFB colony assessed 0.3. Locally-run self-sustaining seabird monitoring programme established 0.4. Conservation plans developed for globally and regionally important seabird populations identifying threats to seabirds, objectives and framework for action	1. Preliminary maps of important foraging areas produced using S1 tracking data, to be updated following collection of S2 data (currently ongoing) 2. Preliminary maps of overlap between commuting routes and proposed airport sites produced – to be updated following collection of S2 tracking data 3. Methods developed for population monitoring at RFB, frigatebird and BB colonies, and both Government staff and volunteers trained in population monitoring methods 4. Development of draft species conservation plans not planned until final quarter of Y2	1. Undertake second year of tracking work at RFB and BB colonies on the Cayman Islands, analyse tracking data collected over the two field seasons, produce final species distribution maps and identify marine IBAs for consideration in conservation plans *2.* Undertake second year of tracking work at RFB colony, analyse data from the two seasons and produce an assessment document on likely risk of airport development on the breeding population 3. Assess effectiveness of methods developed for gaining population estimates of breeding seabirds on the islands and provide recommendations for future census work 4. Hold planning meetings in Q3-Q4 of project and draw up draft Species Conservation Plans for RFBs and BBs, in preparation for a round of public consultation in 2018

Output 1. Key at-sea habitats of globally and regionally important seabird populations identified	1.1. Species distribution maps and GIS layers highlighting core foraging and rafting areas created 1.2. Peer-reviewed scientific publications produced	We have been working to produce maps of key at-sea habitats for both RFBs and BBs using Birdlife International methods, and will update these outputs once more data have been collected during S2 (Evidence provided in section 3.2 of report, and Annex 3 & 4). We are in the process of analysing data in order to produce a series of peer-reviewed scientific publications based on the information being generated during this project.
Activity 1.1 GPS track red-footed boobies from the globally important colony in the Booby Pond Important Bird Area on Little Cayman		Thirty-five RFBs were tracked with GPS loggers between April – May 2016 (igotUs = 20, GPS-GSMs = 15), yielding 29 full foraging trips from 14 birds, and an additional 12 partial trips. In March-April 2017, 36 RFBs were tracked with archival GPS loggers, 27 of which were simultaneously fitted with, time-depth recorders and immersion loggers, and two of which were fitted solely with GPS. Owing to difficulties with recoveries, additional birds have been tagged with remote GPS-GSM loggers left over from S1. To date, 21 birds have been recaptured, and tracking work on this species will continue into S2.
Activity 1.2, GPS track brown boobies from the regionally important colony on Cayman Brac		Thirteen BBs were tracked with archival GPS loggers in April 2016, yielding 12 full foraging trips from 6 individuals, and 2 partial trips. During February and March 2017, 33 BBs were successfully tracked with archival GPS loggers, time-depth recorders and immersion loggers.
Activity 1.3. Identify key at-sea habitats that are important for the two booby populations. Produce GIS layers and assess presence of marine IBAs		Using Birdlife International methodologies, key at-sea habitats of RFBs and BBs have been identified from initial data collected in S1 and preliminary species distribution maps produced for defining marine IBAs. Example marine IBA maps have been produced using the first year of tracking data, and these maps will be updated in Y2 after collection of the second season of tracking data.
Output 2. Commuting routes and times of seabirds identified in light of proposed airport development on Little Cayman	2.1. Species-specific maps and GIS layers of flyways produced 2.2. Species-specific time-activity budgets produced	Tracking data from RFBs on Little Cayman (see Output 1) are being examined to establish overland commuting routes at fine scale. Preliminary maps using S1 data have been produced (Annex 3) and will be updated following collection of S2 data.
Activity 2.1. Produce fine-scale maps of commuting routes and time-activity budgets based on GPS tracking data from red-footed boobies		Preliminary fine-scale map layers of RFB commuting routes to and from the Little Cayman colony have been produced, and overlaid on maps of the proposed airport development sites. These maps will be updated following collection and analysis of S2 data.
Activity 2.2. Visually identify arrival and departure routes and timings of commuting birds		Preliminary figures showing the foraging trip departure and arrival times of tracked RFBs and BBs in S2 have been produced. These figures will be updated following collection and analysis of S2 data.

Output 3. Understanding of population size, breeding biology, phenology, diet and predation of globally and regionally important seabird populations is greatly improved, allowing identification of threats and production of conservation strategies	3.1. Production of annual reports containing colony monitoring data 3.2. Establish a population database for key resident seabirds 3.3. Report on predation rates at colonies produced 3.4 Production of conservation plans for RFBs and BBs	We have made notable progress towards improving understanding of the status and population biology of RFB and BBs colonies on Little Cayman and Cayman Brac, respectively. Regular visits (S1 & S2 ongoing) to RFB and BB colonies have been undertaken to assess productivity of these populations, and extensive work has been conducted in Y1 to prepare for and conduct population censuses of both target species. Data on diet and potential predation events has also been collected (S1 and S2 ongoing).
Activity 3.1. Monitor productivity (breeding success) and phenology of both booby populations via regular colony visits		Productivity of tagged and control nests at RFB and BB colonies was recorded and compared in S1, and is currently being monitored in S2 for both species. Breeding success data of frigatebirds are also being collected in S2. Breeding phenology of RFBs was monitored in Y1 using camera traps. The recorded photos will be analysed for phenological information early in Y2.
Activity 3.2. Assess census methods (aerial photography, ground surveys; year 1:) and conduct census of red-footed booby population (year 2)		In Y1, two ground surveys were conducted at the Booby Pond (June, 2016, January 2017: to collect data on colony boundaries / nest density levels, and develop ground sampling methods), and one drone trial was undertaken (July, 2016). In Y2, a full-scale population census was undertaken using coupled drone-ground survey methods. Data are being processed in Y2 to obtain a population estimate and make recommendations for routine census work at this site.
Activity 3.3. Conduct census of brown booby population		A full-island population census was conduced in January 2017, following a preliminary survey in November 2016. Data are being processed in Y2 to obtain a population estimate and develop methods for routine census work on this population.
Activity 3.4. Create population monitoring database and associated guide		A population monitoring database and guide is no longer deemed an appropriate indicator for these outputs. However, a population monitoring report will be produced in Y2 containing recommendations for future surveys and outlining analytical methods. DoE staff will be trained in analytical methods in Y2 to ensure the continuation of the population monitoring programme after the end of this project.

Activity 3.5. Undertake baseline assessment of booby diet from spontaneous and opportunistic regurgitate samples, focusing on tracked individuals		Regurgitate samples from tagged RFBs were collected and identified to the nearest taxonomic level in S1 (Annex 5; no BBs regurgitated in S1). Regurgitate samples from RFBs, BBs and FBs are being collected in S2 and will contribute to an assessment of diet. Blood samples from tagged birds have also been collected (S1 and S2 ongoing), and their stable isotope values analysed, to provide a wider assessment of dietary habits in both RFBs and BBs (Annex 5). Potential prey species will be collected and analysed in S2 to aid interpretation of avian data.
Activity 3.6. Assess predation rates at booby colonies using camera traps. Observations of kleptoparasitism by magnificent frigatebirds at red-footed booby colony		Predation rates have been assessed opportunistically by the research team while working in the Booby Pond field site (S1 and S2 ongoing; Annex 5), and are currently being monitored using automated time-lapse video cameras (S2).
Output 4. Local Government staff, NGOs and community partners operate self-sustaining seabird census and monitoring programmes	4.1. Training of two members of staff from DoE and one-two from NTCI in census and monitoring methods 4.2. Two DoE staff trained in maintenance of the population database for key resident seabirds 4.3. 10-20 Islander volunteers recruited and trained in seabird census techniques 4.4. Seabird monitoring field guide produced	Training of DOE staff in seabird monitoring and research techniques is well underway, and effort has been made towards guiding efforts of an existing volunteer base and providing additional training. However, recruitment of the full 10-20 islander volunteers originally anticipated now seems unlikely (particularly on Little Cayman were available volunteers are scarce). Seabird monitoring guides are in production and will be disseminated in Y2.
Activity 4.1. Train local NGO, government and volunteer staff to conduct and implement seabird monitoring and research techniques		DOE staff (x3) have received field training in seabird tracking, handling and monitoring techniques, and an additional two have been involved the development of double-sampling methods for population survey work. NTCI staff have not been available for training to date. Training will continue into Y2 and will be focused on transfer of skills in data processing and analytical techniques from seabird experts to DOE staff.
Activity 4.2. Produce seabird monitoring field guide to aid staff and volunteers in the field		Drafts of seabird monitoring booklets were produced during March-April 2016 (see Annex 6), and will be printed and disseminated to island volunteers in Y2. Production of separate monitoring guides for Little Cayman and Cayman Brac will not be an efficient training tool owing to the limited volunteer base on Little Cayman, and site permission issues at the Booby Pond RAMSAR site.

Activity 4.3 Workshops, school visits and publicity to engage and train local volunteers in seabird identification, monitoring and protection		Community meetings and a school visit were undertaken in Y1 to gain local support and awareness of the project and interested school attendees will join the project team in the field for a site visit in Y2. In addition, the project has been well-publicised through TV/radio interviews, news reports, magazine articles and social media channels. Training has been provided to a group of volunteers on Cayman Brac (seabird monitoring), and 1x volunteer on Little Cayman (monitoring and tracking techniques). Success will be measured through feedback forms, which are being collated (example in Annex 6). Involvement of volunteers in project field activities will continue into Y2.
Output 5. Development of species conservation plans	5.1. Production of conservation plans for RFBs and BBs for approval by National Conservation Council and Cabinet	Activities for these Outputs are confined to the second year of the project.
Activity 5.1. Produce conservation plans for RFB and BB in accordance with the NCL Section 17		Conservation plans will be drafted towards the end of the project in preparation for public consultation, but full adoption of plans will not take place until after project completion.
Activity 5.2. Carry out public in accordance with Section 17(4) of the NCL		While this activity will take place as a result of the outputs of this project, rounds of public consultation may not be conducted / completed by the end of the project, owing to internal Government timeframes for implementation of NCL requirements.

Annex 2: Project's full current logframe as presented in the application form

Project summary	Measurable Indicators	Means of verification	Important Assumptions
Impact: This project will improve the ability of local stakeholders to manage marine ecosystems and implement sustainable long-term monitoring that will allow detection of population responses to anthropogenic- and environmental-driven change.			
Outcome: Determine the at-sea movements and status of important seabird populations, allowing identification of Important Bird Areas, establishment of sustainable monitoring programmes and development of informed marine and coastal conservation strategies.	0.1. New Marine Important Bird Areas identified using Birdlife International criteria protocols and criteria 0.2. Impact of proposed airport development on RFB colony assessed 0.3. Locally-run self-sustaining seabird monitoring programme established 0.4. Conservation plans developed for globally and regionally important seabird populations identifying threats to seabirds, objectives and framework for action	0.1 Marine IBAs listed on Birdlife International online database 0.2 Impact assessment report produced and uploaded to government and project websites 0.3 Reports on stakeholder activity, documentation of techniques, databases and results 0.4 Species Conservation Plans produced, held in government records and uploaded to project website	Sufficient data collected to run Birdlife International procedures. Local organisations and volunteers retain capacity and enthusiasm to operate continuing programmes.

Output 1 Key at-sea habitats of globally and regionally important seabird populations identified	1.1. Species distribution maps and GIS layers highlighting core foraging and rafting areas created 1.2. Peer-reviewed scientific publications produced	1.1 Link to data uploaded to Birdlife seabird tracking database and / or www.movebank.org 1.2 Link to project website 1.3 Peer-reviewed scientific publications	Breeding seabirds will be present at colonies during scheduled tracking work (mitigation: Flexible fieldwork periods incorporated into project work plan). Environmental conditions will be favourable for observation and tracking work (mitigation: flexible fieldwork periods incorporated into project work plan).
Output 2 Commuting routes and times of seabirds identified in light of proposed airport development on Little Cayman	2.1. Species-specific maps and GIS layers of flyways produced 2.2. Species-specific time-activity budgets produced	2.1 Link to data uploaded to Birdlife seabird tracking database and / or www.movebank.org 2.2 Link to project website 2.3 Peer-reviewed scientific publications	Breeding seabirds will be present at colonies during scheduled tracking work (mitigation: Flexible fieldwork periods incorporated into project work plan). Environmental conditions will be favourable for observation and tracking work (mitigation: flexible fieldwork periods incorporated into project work plan). Tracking devices will operate effectively to collect intended data (mitigation: use of tried and tested devices and built-in allowance for some device losses).

Output 3 Understanding of population size, breeding biology, phenology, diet and predation of globally and regionally important seabird populations is greatly improved, allowing identification of threats and production of conservation strategies	3.1. Production of annual reports containing colony monitoring data 3.2. Establish a population database for key resident seabirds 3.3. Report on predation rates at colonies produced 3.4 Production of conservation plans for RFBs and BBs	3.1 Link to birds Caribbean database 3.2 Peer-reviewed scientific publications 3.3 Guide to use and maintenance of database 3.4 Copy of predation report	Suitable sub-sections of colonies amenable to regular monitoring. Techniques for census not affected by variability in environmental conditions (mitigation: flexible fieldwork periods incorporated into project plan; project research officer stationed continuously in-territory).
Output 4 Local Government staff, NGOs and community partners operate self-sustaining seabird census and monitoring programmes	4.1. Training of two members of staff from DoE and one-two from NTCI in census and monitoring methods 4.2. Two DoE staff trained in maintenance of the population database for key resident seabirds 4.3. 10-20 Islander volunteers recruited and trained in seabird census techniques 4.4. Seabird monitoring field guide produced	4.1 Notes and presentations from training sessions 4.2 Copy of field guide	Funds and staffing are available for sustained seabird monitoring. Islander volunteers will show interest in project and workshops (mitigation: hold talks to actively engage islanders in project and gain support for conservation efforts).
Output 5 Development of species conservation plans	5.1. Production of conservation plans for RFBs and BBs for approval by National Conservation Council and Cabinet	5.1 Copies of conservation plans uploaded to government and project websites	Sufficient data collected to inform species conservation plans. Conservation plans will be adopted by the National Conservation Council and approved by Cabinet after positive public consultation.

Activities

Output 1. **At-sea habitat use**

1.1 GPS track red-footed boobies from the globally important colony in the Booby Pond Important Bird Area on Little Cayman

1.2 GPS track brown boobies from the regionally important colony on Cayman Brac

1.3 Identify key at-sea habitats that are important for the two booby populations. Produce GIS layers and assess presence of marine IBAs

Output 2. **Commuting routes and times**

2.1 Produce fine-scale maps of commuting routes and time-activity budgets based on GPS tracking data from red-footed boobies

2.2 Visually identify arrival and departure routes and timings of commuting birds

Output 3. **Population biology**

3.1 Monitor productivity (breeding success) and phenology of both booby populations via regular colony visits

3.2 Assess census methods (aerial photography, ground surveys; year 1:) and conduct census of red-footed booby population (year 2)

3.3 Conduct census of brown booby population

3.4 Create population monitoring database and associated guide

3.5 Undertake baseline assessment of booby diet from spontaneous and opportunistic regurgitate samples, focusing on tracked individuals

3.6 Assess predation rates at booby colonies using camera traps. Observations of kleptoparasitism by magnificent frigatebirds at red-footed booby colony

Output 4. **Training**

4.1 Train local NGO, government and volunteer staff to conduct and implement seabird monitoring and research techniques

4.2 Produce seabird monitoring field guide to aid staff and volunteers in the field

4.3 Workshops, school visits and publicity to engage and train local volunteers in seabird identification, monitoring and protection

Output 5. **Species Conservation Plans**

5.1 Produce conservation plans for RFB and BB in accordance with the NCL Section 17

5.2 Carry out public consultation in accordance with Section 17(4) of the NCL

Annex 3: Steering group summary reports (SGM1 & SGM2)

3.1 Project initiation meeting - Minutes

DPLUS044: Assessment and conservation actions for Cayman Islands' Seabirds.
Project Initiation Meeting Report

Date: 4th April 2016, **Time:** 09:30 – 11:30 (EST – Eastern Standard Time)
Location: Department of Environment Head Office, Grand Cayman, Cayman Islands

Partners present:
Gina Ebanks-Petrie, Timothy Austin, Jane Haakonsson & Jessica Harvey - Department of Environment
Patricia Bradley -National trust of the Cayman Islands
Jonathan Green - University of Liverpool, UK, Stephen Votier - University of Exeter, UK
Rhiannon Meier - Universities of Liverpool and Exeter, UK

Discussion points:

Seabird tracking

- Discussed and viewed types of bio-loggers to by used by team to track boobies this year, and reviewed their advantages/disadvantages/limitations
- Discussed protocols for handling and tagging birds and the methods to be used to minimise disturbance
- Discussed potential future plans for tracking to supplement preliminary work (tracking of magnificent frigatebirds, use of geolocation techniques, recording dive behaviour with time-depth recorders, use of miniaturised cameras for studying at-sea behaviours)
- Discussed prior attempts at tracking red-footed boobies at Booby Pond and negative effects on breeding success. Also discussed other work conducted on RFBs (data on daily activity patterns etc)

Habitats & safety in the Pond

- Discussed the difficult terrain at Booby Pond and risks involved in working in this environment
- Discussed safety protocols when in pond, e.g. suitable clothing, working in hot/sunny environments, water/electrolyte supplies (the need to produce risk assessments prior to the start of fieldwork)
- Discussed the recently mapped location of the colony (last survey in 2010) and past trends in colony movements (following Hurricanes in 2004 and 2008)

Land ownership

- Reviewed high-resolution satellite maps of Booby Pond and noted the need to approach land owners for permission to work off the West End of the Pond

Plans for development of airport

- Identified the proposed site for the new airport and discussed recent progress for planning permissions / EIAs, and the priority data required from seabirds to contribute this process

Population monitoring

- Discussed past successes / challenges in conducting censuses of the colony at Booby Pond
- The need for mapping of the boundary of the colony this year was raised and plans made to conduct preliminary work in May/June
- Discussed the possibility of aerial monitoring using drones owned by DoE or alternatively kites outfitted with cameras – preliminary trials planned for later in the summer (pending permission from the Civil Aviation Authority and insurance – issues to be sorted)

Publicity:

- Discussed media release, plans for news interviews (Environment breaks) in April/May, future targets for articles on the project (Flickr magazine, airline/tourist magazines)
- Discussed publicity through social media and agreed to setup twitter feed for the project and potentially a project website. Project updates can also be posted on the DoE website

3.1 SGM1- Minutes

DPLUS044: Assessment and conservation actions for Cayman Islands' Seabirds.

Steering Group Meeting 1 - Minutes
Date/time: 27th July 2016, 09:25-10:30 (EST – Eastern Standard Time)
Location: Skype (Cayman Islands / Anguilla / UK)

Partners in attendance:
Gina Ebanks-Petrie, Tim Austin, Jessica Harvey & Fred Burton (DoE)
Elizabeth Radford (RSPB, UK), Louise Soanes (University of Roehampton, UK)
Jonathan Green (University of Liverpool, UK), Rhiannon Meier (Universities of Liverpool and Exeter, UK)
Unable to attend:
Patricia Bradley (National Trust of the Cayman Islands),
Stephen Votier (University of Exeter), Jane Haakonsson (DoE)

Welcome and introductions.

Expected project outputs outlined:

1. At-sea habitat use: identify key at-sea habitats of globally and regionally important seabird populations.
2. Commuting routes and times: identify commuting routes and activity patterns of red-footed boobies to assess likely impact of proposed airport developments.
3. Population biology: Monitor productivity and phenology, assess and undertake census work, perform baseline assessments of diet and assess predation rates within red-footed booby (RFB) and brown booby (BB) populations on the Cayman Islands.
4. Training: train local NGO, Government and volunteer staff to conduct and implement seabird monitoring and research techniques.
5. Draft species conservation plans for red-footed boobies and brown boobies and undertake public consultation of plans.

Project progress during the first four months in year 1 (April – July)
RM outlined progress made during the first four months of the project against objectives:

1. At-sea habitat use

1.1 & 1.2) GPS track red-footed boobies and brown boobies
To obtain data on foraging movements, 35 adult red-footed boobies (*Sula sula*) and 13 adult brown boobies were tagged with GPS loggers between 5th April and 24th May 2016. Red-footed boobies were tracked with either igotU GT-120 loggers (n = 20) or GPS-GSM loggers (n = 15). Brown boobies were tracked solely with igotU loggers. A summary of the number of recorded foraging trips can be found in Table 1.

Table 1. Summary of GPS tracking work on red-footed boobies from Little Cayman and brown boobies from Cayman Brac between April – May 2016.

	igotU (RFB)	GPS-GSM (RFB)	igotU (BB)
Deployed	20	15	13
Recovered	11	0	8
Birds recaptured	15	2	10
Birds resighted	20	11*	13
Loggers lost	9	15	5
Foraging trips	20	21	18
Full	17	17	16
Partial	3	4	2

*two of the four remaining birds were unringed and are likely to have been sighted - adults were seen regularly provisioning chicks on these nests during the chick-rearing period.

1.3. Identify key at-sea habitats, produce maps and assess presence of marine IBAs

Data will be analysed over the coming months to identify key at-sea habitats, classify at-sea behaviour, and examine foraging strategies employed by red-footed boobies and brown boobies. Birdlife International methodologies will be used to define marine IBAs.

Supplementary data

Morphometric measurements (e.g. wing length, bill length, bill height, bill depth, tarsus length) were obtained for all tracked birds, and all individuals (with the exception of three) were fitted with a colour ring on the left leg to aid recapture efforts. To enable identification of sex (and obtain tissue samples for stable isotope analysis), small blood samples were collected from the tarsal vein of all tagged birds. DNA sexing and isotope analysis will be undertaken in the UK over the coming months.

2. Commuting routes and times

2.1 Produce maps of commuting routes and time-activity budgets for red-footed boobies
2.2 Visually identify arrival and departure routes and timings of commuting birds

Data will be analysed, and maps produced, over the coming months to identify the main commuting routes and activity patterns of foraging RFBs and BBs.

3. Population biology

3.1 Monitor productivity and phenology of RFBs and BBs

Productivity
The assess the impact of tag deployment on reproductive performance, fledging success data of chicks from tracked nests (n = 28) and a set of unhandled control nests (n = 41) were collected. Nests were visited on a number of occasions between April - July and the status of the chick recorded. See Table 2 for the proportion of fledged chicks in the two study groups.

Table 2. Fledging success data of experimental and control nests from the red-footed booby colony on Little Cayman in 2016.

Treatment	*N*	No. fledged	Proportion fledged
Control	**41**	**32**	**0.78**
GPS - total	**28**	**23**	**0.82**
GPS – igotu only	*13*	*11*	*0.85*
GPS – GSM only	*8*	*6*	*0.75*
GPS - igotu/GSM	*7*	*6*	*0.86*

Phenology
Nine reconyx trial camera were deployed in the colony on Little Cayman in early July to collected data on departure and arrival times of red-footed boobies over the summer/autumn. Collectively, the cameras are monitoring 23 active nests and are set to take photos at hourly intervals. Visits will be made to the colony on a monthly basis to maintain the devices, as well as record fledging/adult activity at existing study nests (n = 77). The cameras will also be used in 2017 to monitor rates of nest attendance, and potentially to collect productivity data in less accessible areas of the colony.

3.2. Assess census methods (aerial photography and ground surveys)

Preliminary survey – June 2016
To identify breeding habitat, and areas of high/low nest density, within the RFB colony, ground counts of active nests were undertaken within 24 strip transects located on the north side of Booby Pond. Transects (20 m wide)

were positioned at 330° angles from magnetic north (90° from the longitudinal axis of the pond). The narrow strip of mangrove along the south side of the pond was also explored for nest presence.

Drone trial – July 2016
An aerial survey was also undertaken at Booby Pond to trial the use of UAVs for estimating nest density. A quadcopter drone was flown at 75ft over pre-programmed transect lines that covered the western half of the colony. To allow a comparison of density estimates from aerial and ground survey methods, nest counts were undertaken over 4x strip transects within the survey area on the same day as the drone trial. Before the next breeding season, attempts will be made to count birds within aerial images (using multiple observers to account for observer bias), and compare estimates from ground and aerial methods.

Survey methods for the colony on Little Cayman will continue to be refined and developed over the summer/autumn in preparation for a census in 2017 (January-March). A census of brown boobies on Cayman Brac is planned for the 2017 season (November-January). Local volunteers on Cayman Brac helping with the census will be briefed and trained later this year.

3.5. Undertake baseline assessment of booby diet from opportunistic regurgitate

Dietary samples
During tracking work on Little Cayman in April and May, eight regurgitate samples were collected from red-footed boobies. Efforts have been made to identify the prey species within dietary samples, and photos of well-preserved fishes have been sent to a fish biologist in the Cayman Islands for species identification.

Stable isotopes
Stable isotope analysis of blood samples was not proposed in the initial Darwin+ application. However, a decision was made to undertake a biogeochemical study to run alongside the Darwin+ project, as a means of improving knowledge on diet and foraging. The isotopic compositions of the blood samples taken from tracked birds primarily for sexing will be analysed at an SIA facility in the UK. Avian data will be interpreted in relation to the isotopic compositions of dietary samples collected from regurgitate and local fishers. Nitrogen isotopes should provide important information about the trophic level at which boobies are foraging, while carbon isotopes have the potential to provide information on spatial variation in distribution (although the latter would require more extensive sampling of both the birds and food web baselines in 2017).

Efforts were made to catch a range of potential prey samples from waters off Little Cayman in order to describe the isotopic niche space occupied by the prey base in this area. Fishing attempts in Little Cayman were unsuccessful. However, a sample of flying fish was obtained from fishers operating on the banks off Grand Cayman, and will be analysed alongside regurgitated prey data.

3.6. Assess predation rates at booby colonies using camera traps, and observe kleptoparasitic events between magnificent frigatebirds and ref-footed boobies

Cats – Little Cayman
Between April and July, cats were observed in the West End of the colony on five occasions close to dusk. Evidence of cat presence in the pond (faeces) was also seen near the National Trust house. No predation events were observed and no direct evidence of predation (i.e. kills) was found.

Peregrines – Little Cayman
One predation attempt by a peregrine falcon on a red-footed booby was recorded during the field season (late April). A peregrine was also observed chasing a snowy egret (again close to dusk) during the first two weeks of April.

9x reconyx trail cameras have been deployed in the Booby Pond on a 1-hour time-lapse setting, to recorded activity at nest sites within the main study area of the colony. The images will be studied for signs of predators later in the year. Cameras could also be used on brown booby nests on Cayman Brac in year 2.

Frigatebirds – Little Cayman
Kleptoparasitic interactions between magnificent frigatebirds and red-footed boobies were observed on a number of occasions during the field season and efforts were made to record the events. It was not possible to collect effort–based data on kleptoparasitism during the first field season, but there is potential for running a Masters project (University of Liverpool or Exeter) on this topic in year 2.

4. Training

4.1. Train local staff in monitoring and research techniques

Training in tracking and monitoring techniques was provided to staff of DoE (x2) during colony work on Little Cayman and Cayman Brac, between April and June. Further training will be provided to DoE staff, NTCI staff and local volunteers during the 2016-2017 breeding season.

4.3 Community involvement and publicity

Community involvement

- Community meetings held on Little Cayman and Cayman Brac to engage locals in the project and inform about the need for seabird conservation efforts in this UKOT
- Efforts made to engage and involve volunteers in seabird tracking and monitoring work on Cayman Brac (3x volunteers). Volunteers assisted in tag deployment / recovery trips, and a number of meetings were held to talk about ways to aid/develop brown booby monitoring efforts by the volunteer network on this island.
- Project update given to NTCI Little Cayman committee meeting (maps of foraging trips shown to community members)
- Update emails sent out the interested community members during the field season
- A project twitter feed was launched to provide information on activities at colonies

Publicity:

- TV interview with Cayman 27 which was aired on 'Environment Break' (May, 2016)
- Media releases on Cayman Islands Government website and Cayman News Service (May-June, 2016)
- Interview with Cayman Compass and release of article on project (June, 2016)
- Article in Flickr magazine on seabird project (June, 2016)
- Radio interview with Radio Cayman (June, 2016)
- TV interview with Cayman 27 which aired on Joseph Avary Channel (June, 2016)
- TV interview with Cayman 27 to provide update on first field season (airing 1st Aug)

5. Species Conservation Plans

Meetings/workshops relating to Species Conservation Plans to be undertaken in Year 2.

Finance

Within budget during the first quarter of year 1. £2500 was saved on bio-loggers as igotu devices were provided 'in kind'. These funds could be used to purchase additional tracking devices for the next tracking season (activity loggers / TDRs). It is unlikely that all T&S funds will be spent in year 1, therefore, a fund change request could be submitted to Darwin+ to transfer funds into 'Operating' and 'Other' cost categories.

Future plans

- Track red-footed boobies solely with igotu tags between January-May 2017 (limited success in use of GSM loggers on RFBs – loggers too heavy for tail deployment and lost after short periods)
- Track adult frigatebirds with tail-mounted GSM loggers between January-March (using 10x remaining GSM loggers purchased for RFB tracking, as a minimum)
- Write grant applications to fund a wider frigatebird tracking project (adults/juveniles – breeding and non-breeding movements: Feb-August, 2017)
- Using funds saved from igotu loggers this year, track RFBs/BBs with geolocators and time-depth recorders to gain data on on-water activity & dive behaviour, respectively
- Conduct census of brown booby population on Cayman Brac in Nov/Dec (dependent on timing of 2017 breeding season)
- Conduct census work (further drone trials, ground surveys and full census) at red-footed booby and frigatebird colonies, Little Cayman (Jan – March: dependent on timing of 2017 breeding season)
- Train NTCI staff in tracking and monitoring methods next season
- Further training of DoE staff in tracking and monitoring methods next season
- Further fish sampling for isotope study during 2017 tracking period
- Launch project website in the next few months

- Media follow-up interviews with Cayman27 news channel, Radio Cayman and Cayman Compass in Nov/Dec
- Give talks to school groups in Sister Islands and/or Grand Cayman later in Y1 / Y2
- RM to present preliminary results of booby tracking work at the UK Seabird Conference, Edinburgh in September 2016
- RM hopes to present at Birds Caribbean conference in Cuba, July 2017
- Potentially conduct questionnaires on seabird bycatch / fisheries interactions amongst fishing communities on the Cayman Islands (Master student / research assistant?)

Personnel

- RM will be travelling back to the UK at the end of July and will spend the late summer / autumn in research groups at the Universities of Liverpool and Exeter.
- MSc/MRes students of UK partners to join RM for fieldwork next year

Additional meeting discussion points / steering group recommendations

- The use of GSM funds for TDR/GLS loggers discussed (following limited success with GSMs on RFBs in 2016). LS advised that Darwin+ should be informed about planned changes for operating costs.
- Use of igotu loggers and the need to account for the high loss rate in RFBs discussed.
- Suitability of chick ages in tracking nests discussed: LS is able to track Brown Boobies with 1-week-old+ chicks on Anguilla (ground-nesting colonies). This might not be possible with RFBs in the mangroves because of the comparatively fragile nature of nests. Nevertheless, tracking might be possible using nests containing younger chicks that previously thought.
- Camera monitoring work discussed: JG has an existing student whose research focuses on camera data. He should be able to provide useful advice on the trial camera data currently being collected. RM to meet with Federico after returning to the UK.
- Plans for monitoring white-tailed tropicbirds were discussed. Data were collected on the numbers of white-tailed tropicbirds observed on Cayman Brac during Brown Booby work. However, future population work requires effort-based data collection, which would likely require additional field personnel. LS recommended reviewing recent work on the species undertaken in the Lesser Antilles, as similar methods might be applicable to the tropicbird population on Cayman Brac.
- ER suggested that RSPB staff might be able to assist with a short (≤1 month) stand-alone project on white-tailed tropicbirds during sabbaticals. RM to send a short project brief to ER before September for consideration.
- Plans for community update meetings in January were discussed
- ER invited RM to give a spotlight talk at the RSPB headquarters on the Cayman Islands' work – ER/RM to discuss dates following RM's return to the UK
- Plans for approaching grant rounds discussed: Partners plan to submit a Darwin+ project focused on tracking the post-breeding and post-fledging movements of adult and juvenile magnificent frigatebirds. This proposed project would span multiple UKOTs, and be an extension to existing tracking work on the Cayman Islands, Anguilla and BVI.

Next meeting planned for January 2017.

3.2. SGM2 Minutes

DPLUS044: Assessment and conservation actions for Cayman Islands' Seabirds.

Steering Group Meeting 2
Date/time: 1st February 2017, 11:00 (EST – Eastern Standard Time)
Location: Skype (Cayman Islands / UK)

Partners attending:
Gina Ebanks-Petrie, Tim Austin, Fred Burton, Jane Haakonsson (DoE)
Patricia Bradley (NTCI), Elizabeth Radford (RSPB, UK)
Jonathan Green (University of Liverpool, UK), Rhiannon Meier (Universities of Liverpool and Exeter, UK)

Unable to attend: Louise Soanes (University of Roehampton, UK) / Paul Watler (NTCI) / Stephen Votier (University of Exeter, UK)

Expected project outputs:

6. At-sea habitat use: identify key at-sea habitats of globally and regionally important seabird populations on the Cayman Islands.
7. Commuting routes and times: identify commuting routes and activity patterns of red-footed boobies to assess likely impact of proposed airport developments.
8. Population biology: Monitor productivity and phenology, assess and undertake census work, perform baseline assessments of diet and assess predation rates within red-footed booby (RFB) and brown booby (BB) populations on the Cayman Islands.
9. Training: train local NGO, Government and volunteer staff to conduct and implement seabird monitoring and research techniques.
10. Draft species conservation plans for red-footed boobies and brown boobies and undertake public consultation of plans.

Project progress August – January
RM outlined progress made between August and January against objectives:

1. At-sea habitat use

1.3 Identify key at-sea habitats, produce maps and assess presence of marine IBAs

Key at-sea habitats of foraging red-footed boobies and brown boobies were identified using Birdlife International methodologies for defining marine IBAs. Kernel density estimates were obtained for both species and data were tested for pseudo-replication and representativeness. Analyses suggested that samples from both species were insufficient to be representative of the wider population, and therefore for defining IBAs. Example density distribution and mIBA boundary maps were produced for each species, and will be updated following expansion of the tracking dataset this season (see Fig 1 & 2 for examples).

Hidden Markov Models were developed to identify patterns of at-sea behaviour in the RFB and BB foraging tracks, using speed of movement and turning angle. The models did not preform well using these descriptive characteristics in isolation, and are in the process of being further refined. Birds will be tracked with both time-depth recorders and activity loggers this year, which will aid model validation in the coming months.

Supplementary data

Blood samples were processed at the Avian Biotech laboratory in the UK in September 2016 in order to DNA sex all processed and tagged red-footed boobies.

2. Commuting routes and times

2.1 Produce maps of commuting routes and time-activity budgets for red-footed boobies
2.2 Visually identifying arrival and departure routes and timings of commuting birds

The main overland commuting routes of red-footed boobies from Little Cayman were identifying, and map layers of density distributions were produced and overlaid on maps of four proposed airport scenarios (see Fig 3 for an example). Outbound and inbound bearings, basic trip metrics and both departure and arrival times of commuting birds were also extracted from the data (see Fig 4-6 for examples).

3. Population biology

3.1 Monitor productivity and phenology of RFBs and BBs

Phenology
Reconyx trial cameras were deployed in the colony on Little Cayman in early July 2016 in front of 23 active nests, and have continued collecting photographs at 1-hourly intervals throughout the summer months. Visits were made to the colony on a monthly basis to maintain the cameras. Data from the cameras will be extracted in the coming months to gain information on departure and return times of fledglings and adults.

3.2 & 3.3 Assess census methods and conduct censuses of red-footed and brown boobies

Drone trial – December 2016

Seven transects were flown over a range of habitat types on Cayman Brac during early December to refine methodologies for the brown booby population survey in 2017. Ground methods were also tested and refined during a series of intensive searches on foot within known high-density nesting areas.

Brown booby population survey – January 2017
A full-scale brown booby population survey was undertaken in January to estimate the size of the breeding population on Cayman Brac. A double-sampling method, involving the use of both a quadcopter drone and ground surveys, was used to obtain counts of apparently occupied nests (AONs). Over a 6-day period, 46x transects were sampled with the drone and 56x ground plots were sampled on foot. Within the ground plots, 66 AONs (and 7 failed breeding attempts) were detected. The number of breeding pairs is expected to be greater than this value as inaccessible cliff-based areas, known to contain breeding birds this season, were sampled purely by drone. The drone footage will be analysed in the coming months and population modelling will be undertaken.

Ground survey trial – January 2017
Three ground survey methods for estimating density of breeding birds at the colony in Booby Pond were tested during January, in preparation for the main population survey next month. Further mapping and planning work will take place during the coming weeks.

3.5 Undertake baseline assessment of booby diet from opportunistic regurgitate

Stable isotopes
Blood samples were processed at the ESRI, University Exeter in October 2016 in preparation for stable isotope analysis, and bulk carbon and nitrogen values within samples were subsequently analysed at SUERC, UK (December 2016). Isotope biplots will shortly be produced to visualise and compare the isotopic niche space of the two focal booby species.

3.6 Assess predation rates at booby colonies using camera traps, and observe kleptoparasitic events between magnificent frigatebirds and red-footed boobies

Predation
Any sightings of predators or signs of predation events will continue to be recorded in the approaching tracking season. Seven of the nine reconyx trail cameras are still recording data at the Booby Pond and have been collecting photos on 1-hour time-lapse since July 2016. Data will be analysed for the presence of predators in the coming months. Two of the nine cameras have been collected from Little Cayman and will be deployed in front of Brown Booby nests on Cayman Brac in the coming weeks.

Frigatebirds – Little Cayman
RM wrote a frigatebird grant application for the Darwin Plus funding round in 2017, which was unfortunately not successful, but funds have been provided by DoE for some tracking work on Magnificent frigatebirds species during the chick-rearing period.

4. Training

4.1 Train local staff in monitoring and research techniques

Further training in tracking techniques will be provided to DoE and NTCI staff during the 2017 breeding season.

4.2 Produce seabird monitoring field guide

A document containing information on brown boobies, including guides to determine chick age and sex of birds, was produced and disseminated to volunteers on Cayman Brac in November 2016. A comprehensive seabird monitoring guide has not yet been produced, but this will be done over the coming months.

4.3 Community involvement and publicity

Community involvement
- Five volunteers from Cayman Brac were trained in seabird monitoring and population survey methods during a series of training sessions in December and January. Volunteers were provided with binoculars, monitoring booklets and field datasheets
- A project website went live in November 2016 and updates have continued to be posted on the project twitter feed

Publicity:

- TV interview with Cayman27 on the population work being undertaken on the Sister Islands (Aired in December 2016)

5. Species Conservation Plans

Meetings/workshops relating to Species Conservation Plans to be undertaken in Y2 of project.

6. Finance

No overspend anticipated for Y1. Darwin authorised transfer of funds for tracking devices from Y2 into Y1. A change request to transfer underspends in 'T&S' and 'Other' cost categories into 'Operating costs' was submitted to Darwin and approved.

7. Future plans

- Track red-footed boobies with igotu tags between February-May 2017
- Track adult frigatebirds with tail-mounted GSM loggers and accelerometers between February-April (10x remaining GSM loggers purchased in 2016, plus an additional 20x devices purchased by DoE in 2017)
- Track RFBs/BBs with geolocators and time-depth recorders to gain data on on-water activity & dive behaviour, respectively (Feb-May)
- Track a small number of boobies with miniaturised cameras
- Conduct census work at red-footed booby and frigatebird colonies, Little Cayman (Feb – March)
- Further training of DoE and NTCI staff in tracking and monitoring methods (Feb - March)
- Further fish sampling for isotope study during 2017 tracking period (April – June)
- Media follow-up interviews with Cayman27 news channel, Radio Cayman and Cayman Compass between Feb-April
- Give talk at Cayman Brac high school (8th February), and hold a second round of community meetings on the Sister Islands to update locals on the project progress (Feb – March)
- Give talk at Cayman Brac NTCI meeting on 14th February
- RM hopes to present at Birds Caribbean conference in Cuba, July 2017, and potentially at an International Bio-logging Conference in September 2017.
- Conduct questionnaires on seabird bycatch / fisheries interactions amongst fishing communities on the Cayman Islands? (research assistant?)

8. Personnel

- RM has been back in the Cayman Islands since Early November and will remain on the islands to coordinate the second field season of the project until July 2017. She will then travel back to the UK to analyse and write up the data / project reports during Autumn/Winter 2017
- A research assistant (Federico De Pascalis) will be joining RM at the beginning of February to assist in the field and with data tasks
- An MSc student from Liverpool University (supervised by both JG and RM) will also contribute to the desk-based component of the population monitoring work

Additional meeting discussion points / steering group recommendations

- Logistics were discussed for arrival of the RSPB warden that will be undertaking a survey of white-tailed tropicbirds on Cayman Brac and Grand Cayman in March-April 2017
- Partners discussed plans for next round of community meetings on Cayman Brac and Little Cayman towards the end of the 2017 tracking season
- RM mentioned plans to give a talk at the high school on Cayman Brac later in February 2017
- RM mentioned the opportunity of a collaborating seabird scientist from Deakin University in Australia visiting the seabird colonies in April 2017 and providing additional tracking devices and expertise to allow extended tracking work on boobies and frigatebirds using miniaturised bird-borne cameras and accelerometers. Collection of these streams of data would improve knowledge of foraging behaviour and movement patterns in these species and further support project aims
- EM requested a meeting with DoE during a site visit to the Cayman Islands in March with RSPB managers, to discuss plans for RSPB involvement in conservation activities in this UKOT

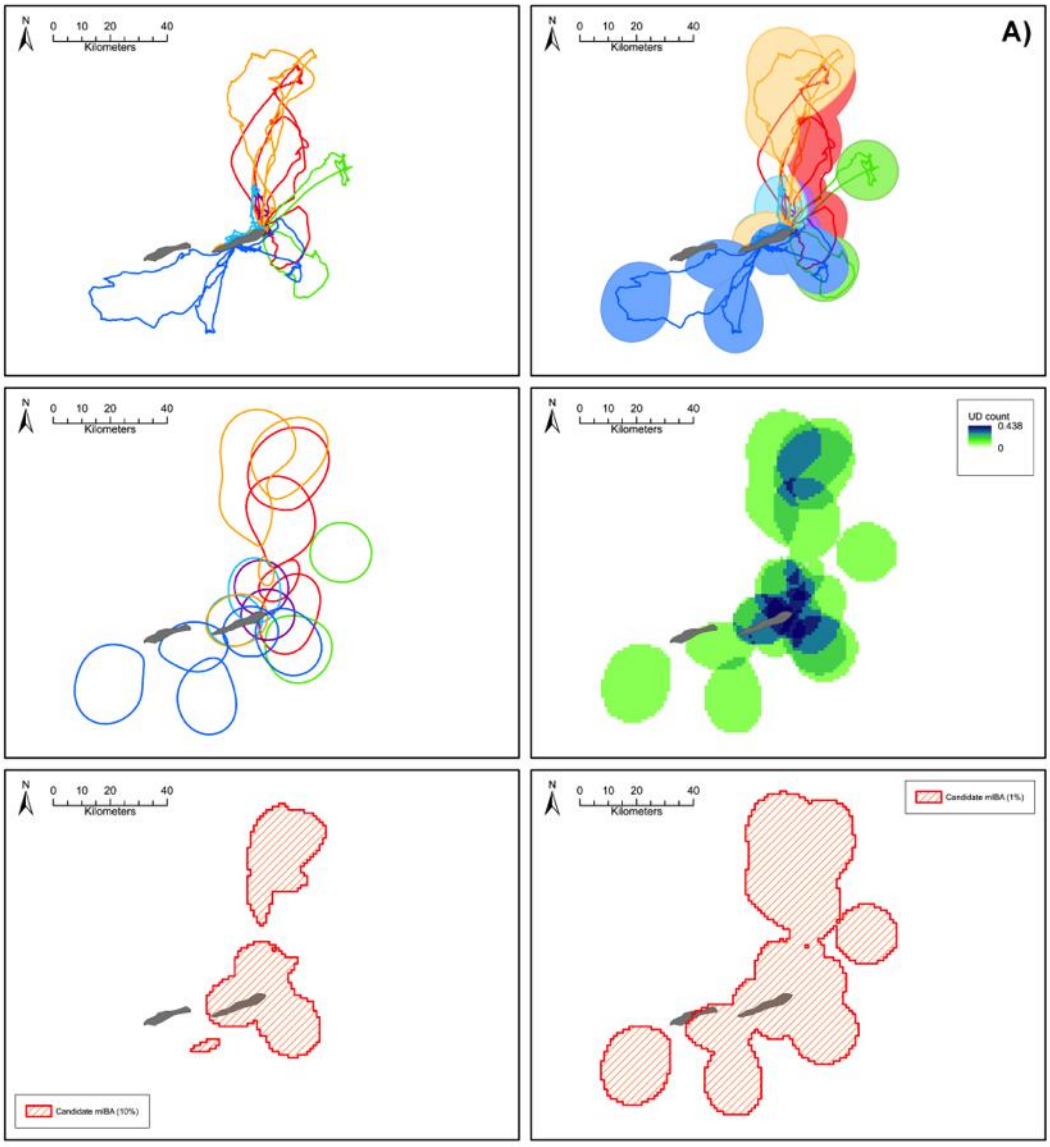


Fig 1. Example density distribution and mIBA boundary maps for brown boobies (*Sula leucogaster*)

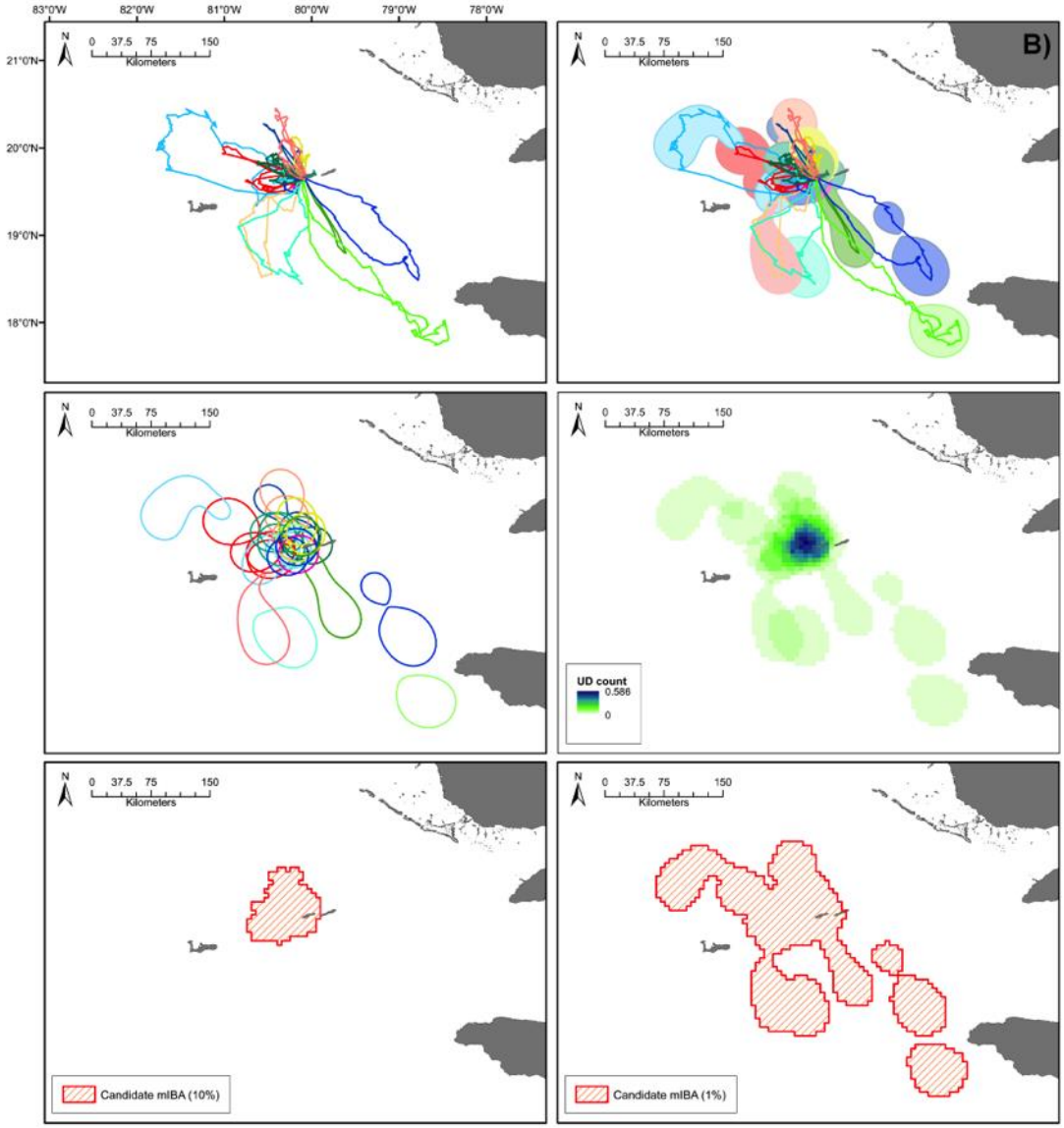


Fig 2. Example density distribution and mIBA boundary map for red-footed boobies (*Sula sula*).

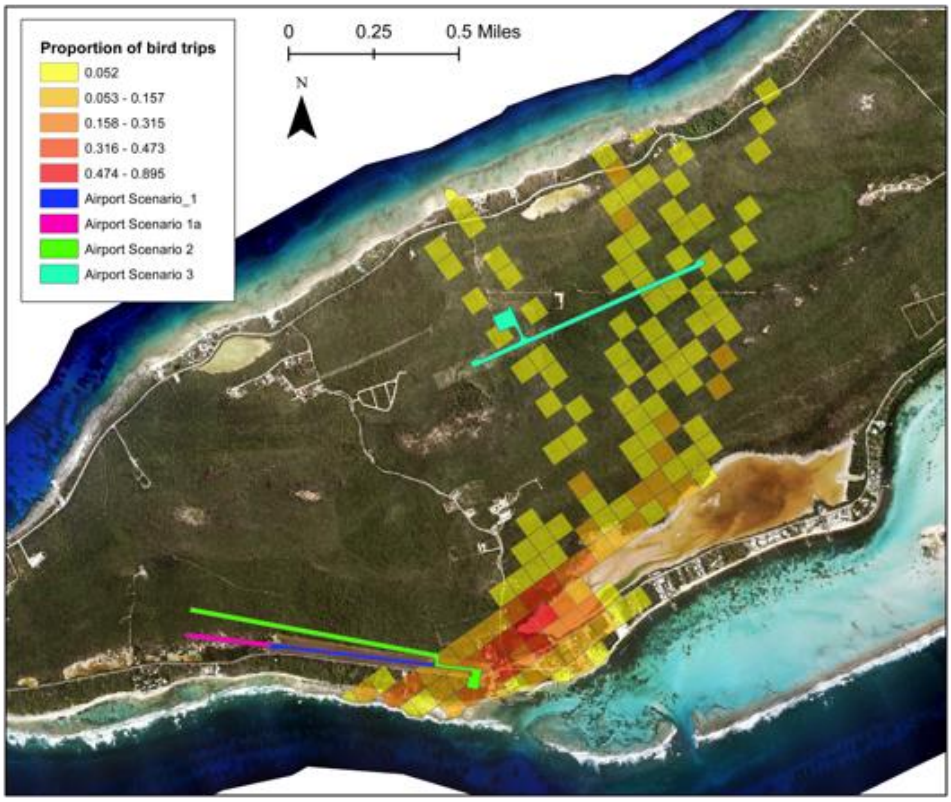


Fig 3. Four proposed airport development scenarios on Little Cayman, overlaid with the proportion of total tracked foraging trips of RFBs within 400m^2 grid cells.

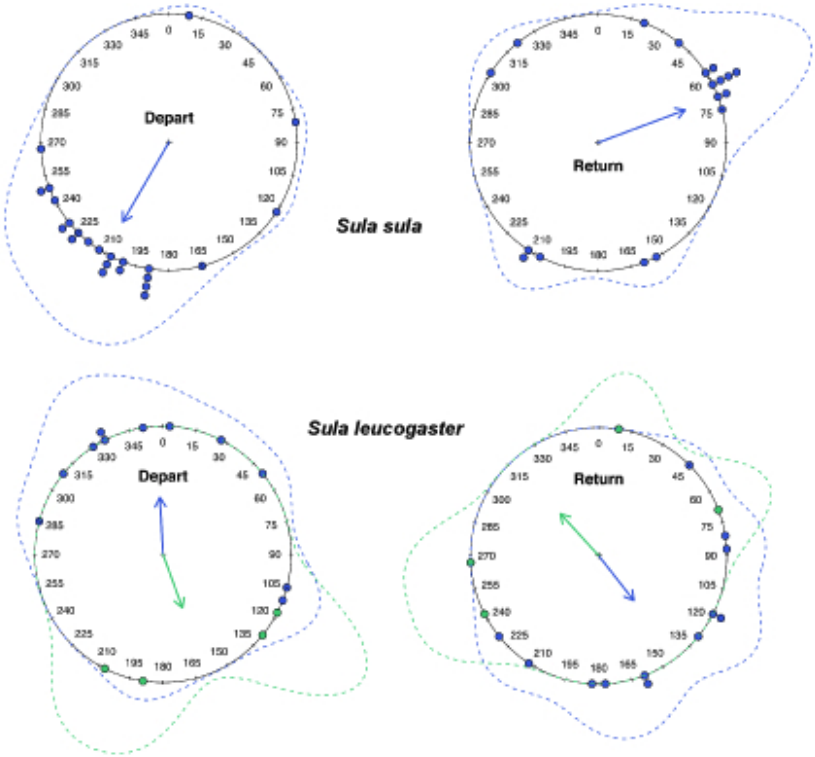


Fig 4. Outbound and inbound bearings of GPS-tracked red-footed boobies (*Sula sula*) and brown boobies (*Sula leucogaster*) in relation to true north (when crossing the 1 km boundary from the colony). Brown boobies: blue = north shore nesting individuals, green = south shore nesting individuals.

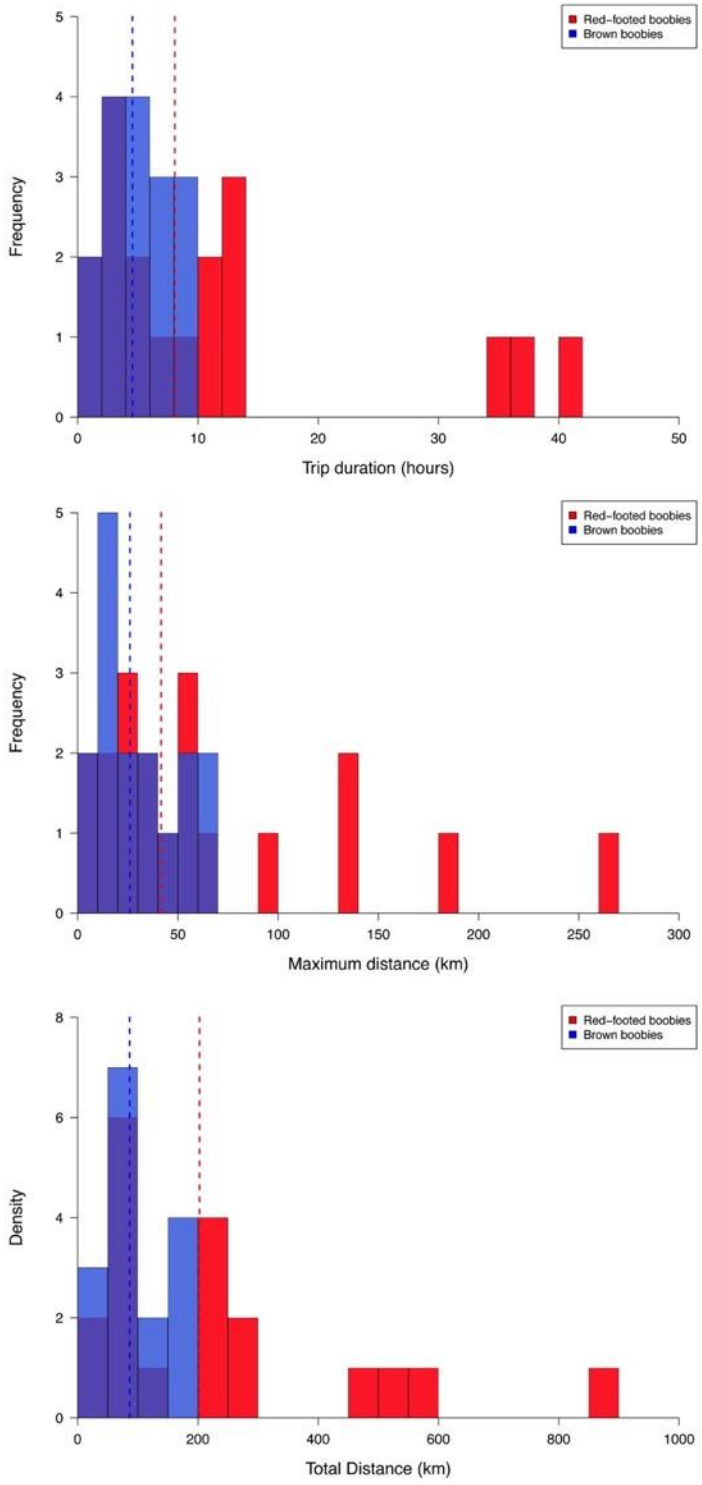


Fig 5. Frequency distributions of trip durations, maximum distance travelled and total distance travelled for foraging trips of GPS-tracked chick-rearing RFBs (red) and BBs (blue) between April-May 2016 on Little Cayman and Cayman Brac, respectively.

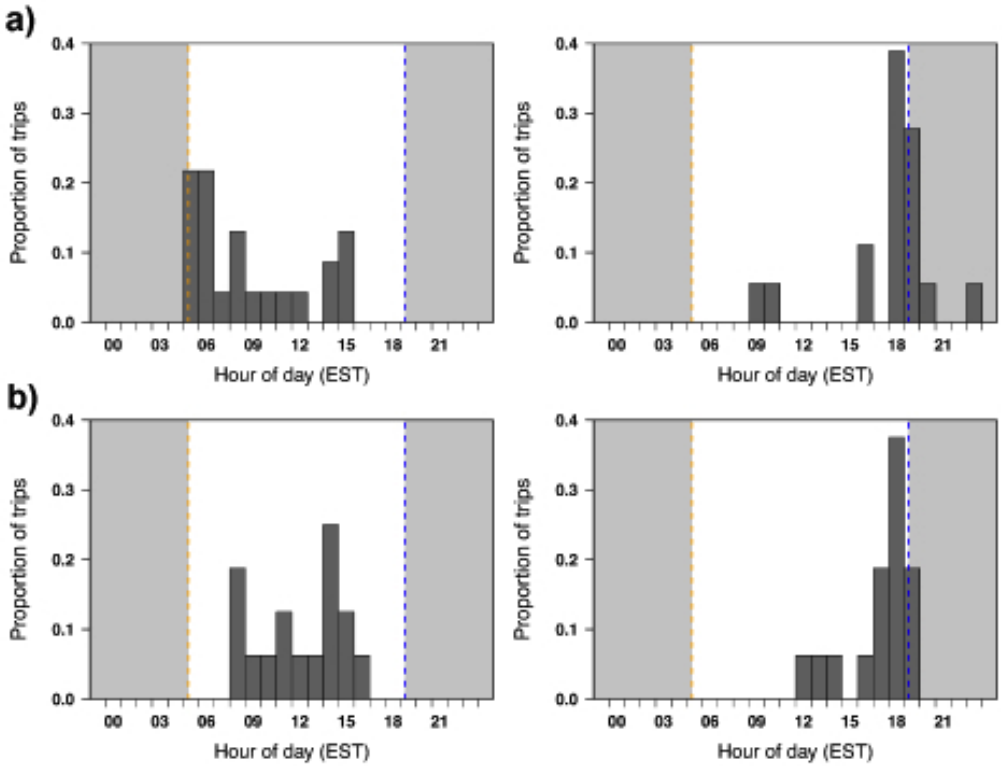


Fig 6. Departure and arrival times of commuting a) RFBs and b) BBs from colonies on Little Cayman and Cayman Brac, respectively.

Annex 4: Preliminary tracking data from season 2

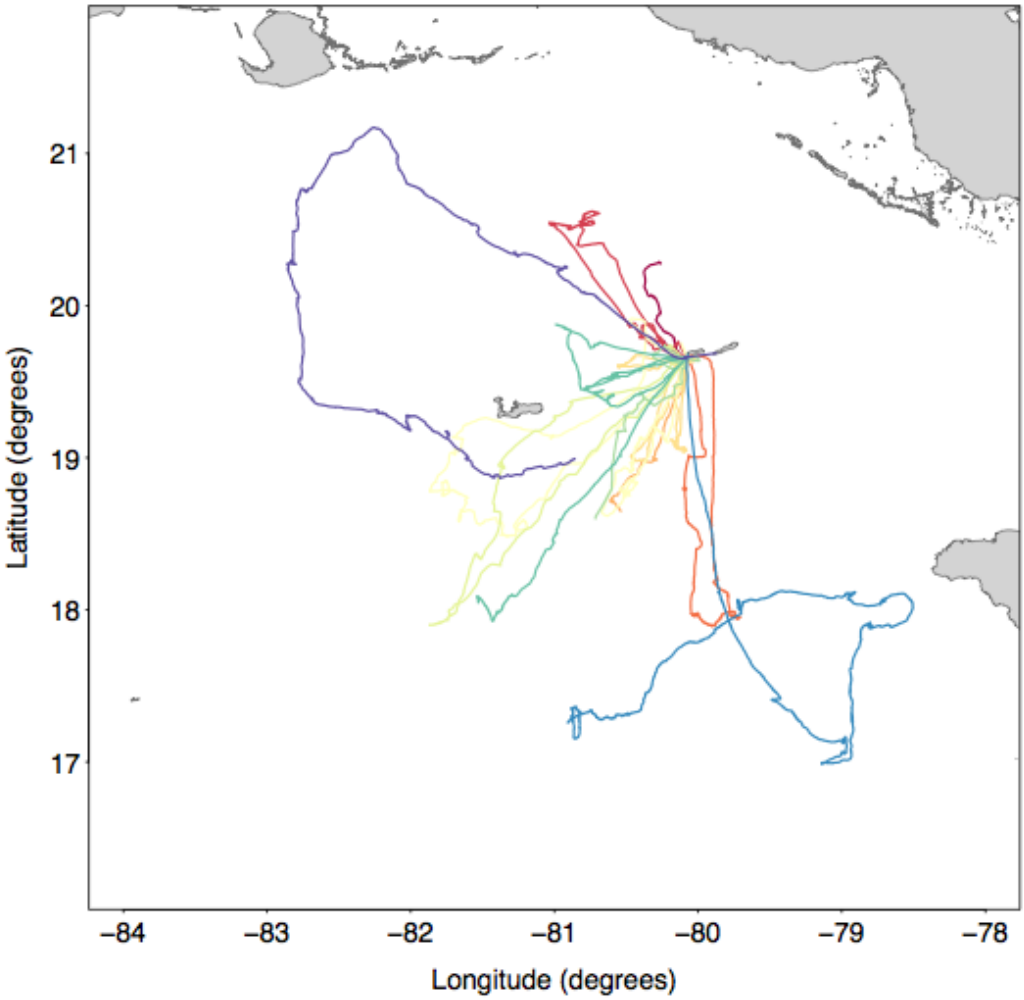


Fig 4.1 Example foraging trip data from red-footed boobies at the Booby Pond colony, tagged and recovered in S2 with archival GPS loggers (tracking ongoing in 2017). Individual birds are coloured uniquely.

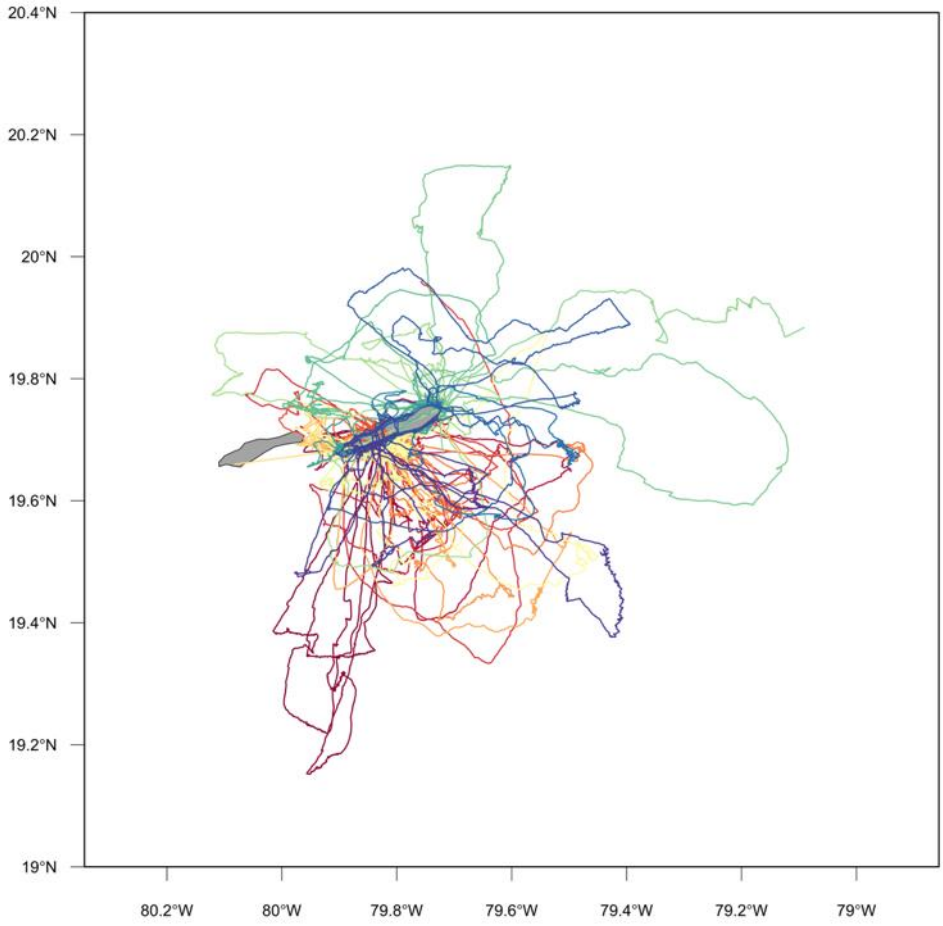


Fig 4.2 Preliminary foraging trip data from brown boobies, tagged and recovered on Cayman Brac in S2 with archival GPS loggers (tracking ongoing in 2017). Individual birds are coloured uniquely.

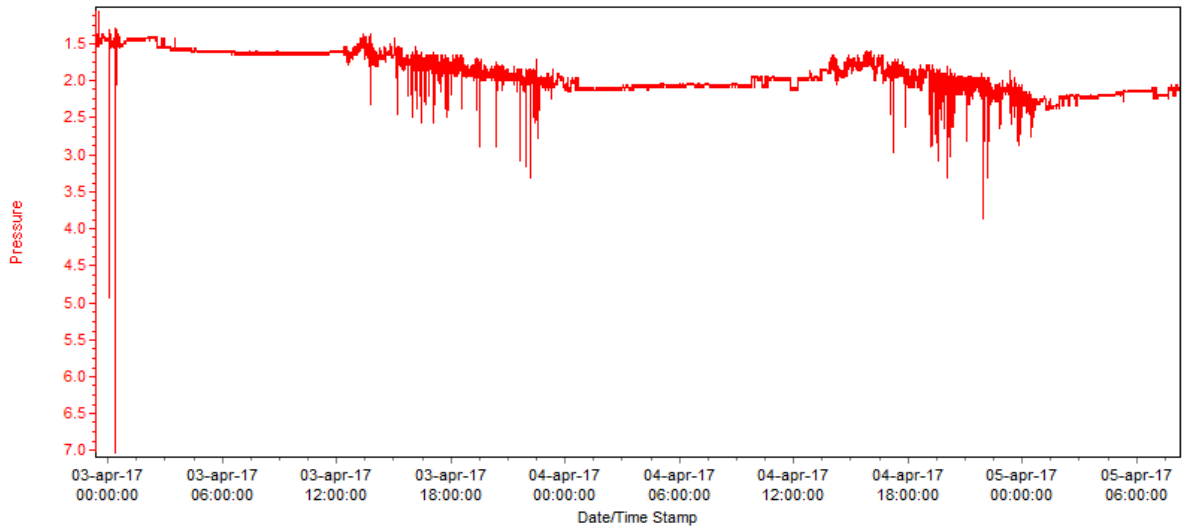


Fig 4.3 Example time-depth trace of a red-footed booby from Little Cayman, collect with a time-depth recorder in S2.

Fig 4.4 Example images captured by a bird-borne camera attached to the back of a female frigate bird breeding in the Booby Pond. Images show prey capture events of conspecifics at sea, and provide valuable information on foraging behaviour.

Annex 5: Evidence of monitoring work at Booby Pond, Little Cayman

Fig. 5.1 Reconyx cameras deployed at the Booby Pond Nature Reserve (June 2016 onwards), to monitor red-footed booby nests.

Fig. 5.2 Example photos of red-footed booby nests recorded with camera traps at the Booby Pond colony in S1

Table 5.1 Summary of observed cat sightings in the Booby Pond, Little Cayman between 6th March - 15th April 2017.

No cat sightings (events)	12
Total no. Animals seen	16-17
Estimated no. Individuals	4
Remains of predated chicks observed	4
Predation attempt on adult	1
Additional signs of cats in pond	1

Fig 5.3 Photographic evidence of a) cats, and b & c) potential predation events on frigatebird and booby chicks, within the Booby Pond colony.

Fig 5.4 Photograph of adult male frigate bird with broken wing in the Booby Pond colony (suspected cat predation attempt).

Table 5.1 Summary of dietary samples collected opportunistically from red-footed boobies during tracking work in 2016 (note: brown booby regurgitate samples collected in S2 also contain a number of Hemiramphids, not found in S1 RFB samples).

Bird ID	No. fish	Taxonomic classification	Total sample weight
L46	1	Exocoetidae (likely *Hirundichthys rondeletii*)	102.44
L10	2	Exocoetidae (likely *Hirundichthys rondeletii*)	197.83
L07	3	Exocoetidae (species unidentified)	54.35
L27	6	Exocoetidae (x4), unidentified spp. (x2)	42.90
L09	7	Exocoetidae (x6), Loligo (x1)	45.95
L13	1	Scombridae (likely *Thunnus atlanticus*)	36.21
N29 (no ring)	1	Scombridae (likely *Thunnus atlanticus*)	17.00
Juvenile	1	Exocoetidae (species unidentified)	NR
L00	-	Unidentified	NR

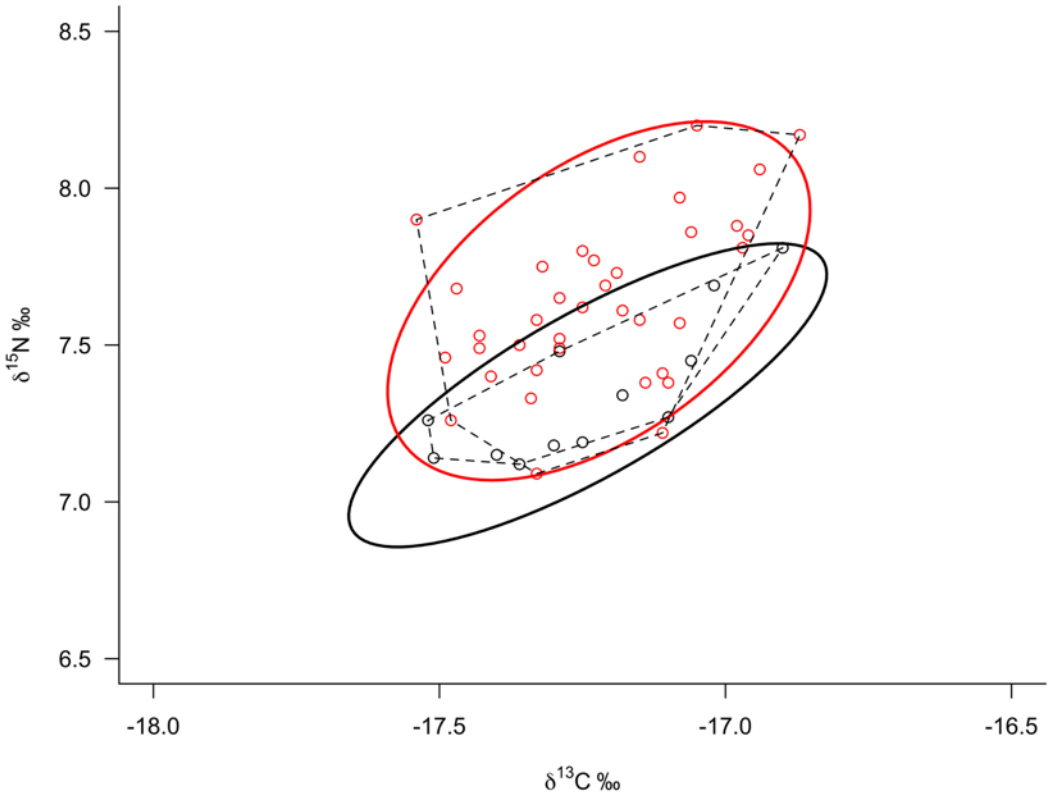


Fig. 5.5 Carbon and nitrogen stable isotope values from blood samples (red blood cells) of red-footed boobies (red points) and brown boobies (black points) sampled in April-May 2016. Circles show standard ellipse areas (SEAc) and dotted lines show convex hulls.

Annex 6: Training and community involvement

Darwin Plus Cayman Islands Seabird Project:
Training feedback form

Department of Environment, Cayman Islands Government
National Trust of the Cayman Islands
Universities of Liverpool & Exeter, UK

Trainee name: Jane Haakonsson

Contact address/email: jane.haakonsson@gov.ky

Training date(s): month of April 2016, March 6th – 23rd 2017

Location: Little Cayman and Cayman Brac

Please provide a description of the training that you received:
Training in capturing, handling and tagging 2 species of sulids.

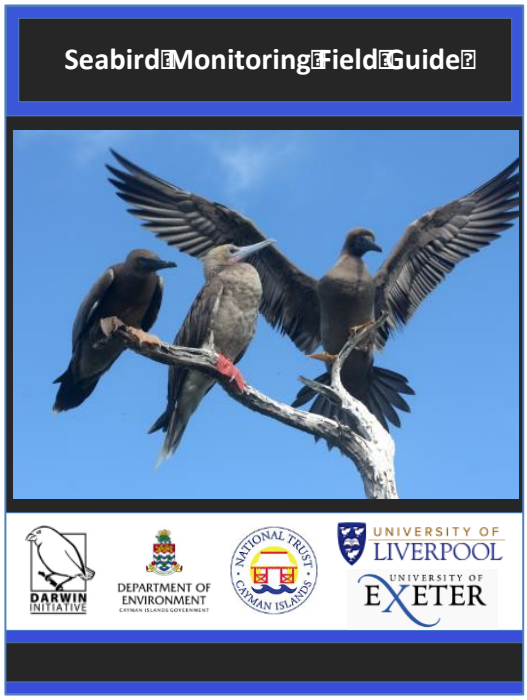
Please provide details of how you were able to implement the skills learnt in your work or volunteer activities:
I implemented the learnt skills during the process of catching and restraining birds as well as while attaching GPS and TDR loggers and rings.

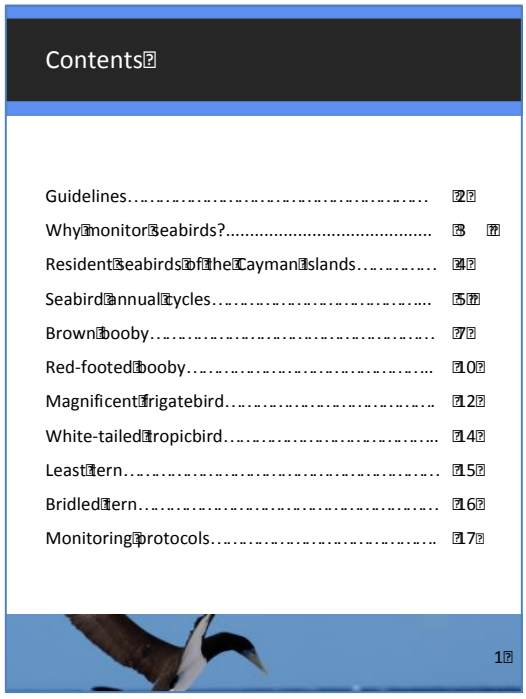
Please rate the training sessions as follows:					
1. Objectives of training clearly explained	1	2	3	4	5
2. Information communicated effectively	1	2	3	4	5
3. Information relevant to your work or volunteer activities	1	2	3	4	5
4. Questions answered clearly and thoroughly	1	2	3	4	5
5. Visual aids used effectively	1	2	3	4	5
6. Session well structured and organised	1	2	3	4	5
7. Please rate your understanding of the information presented	1	2	3	4	5
Overall impression	1	2	3	4	5

1= Excellent, 2= Good, 3= Satisfactory, 4=Needs improvement, 5=Poor

Comments:

Fig 6.1 Example feedback from on project training activities





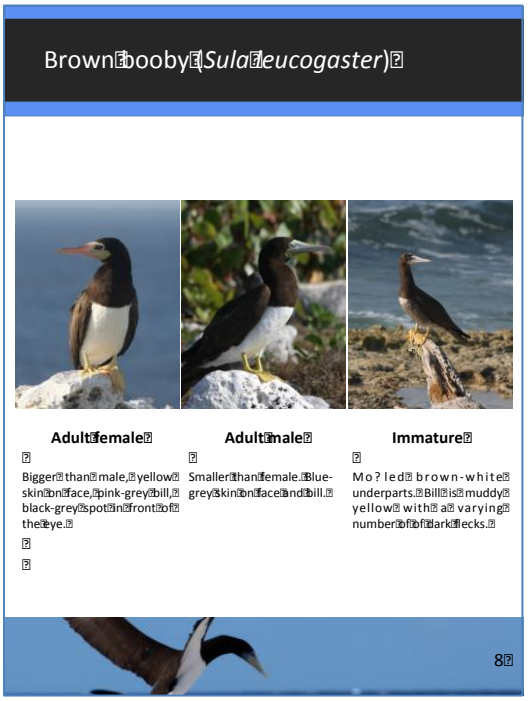


Fig 6.2 Example pages from seabird monitoring guide (currently in production).

Annex 7: Population survey work

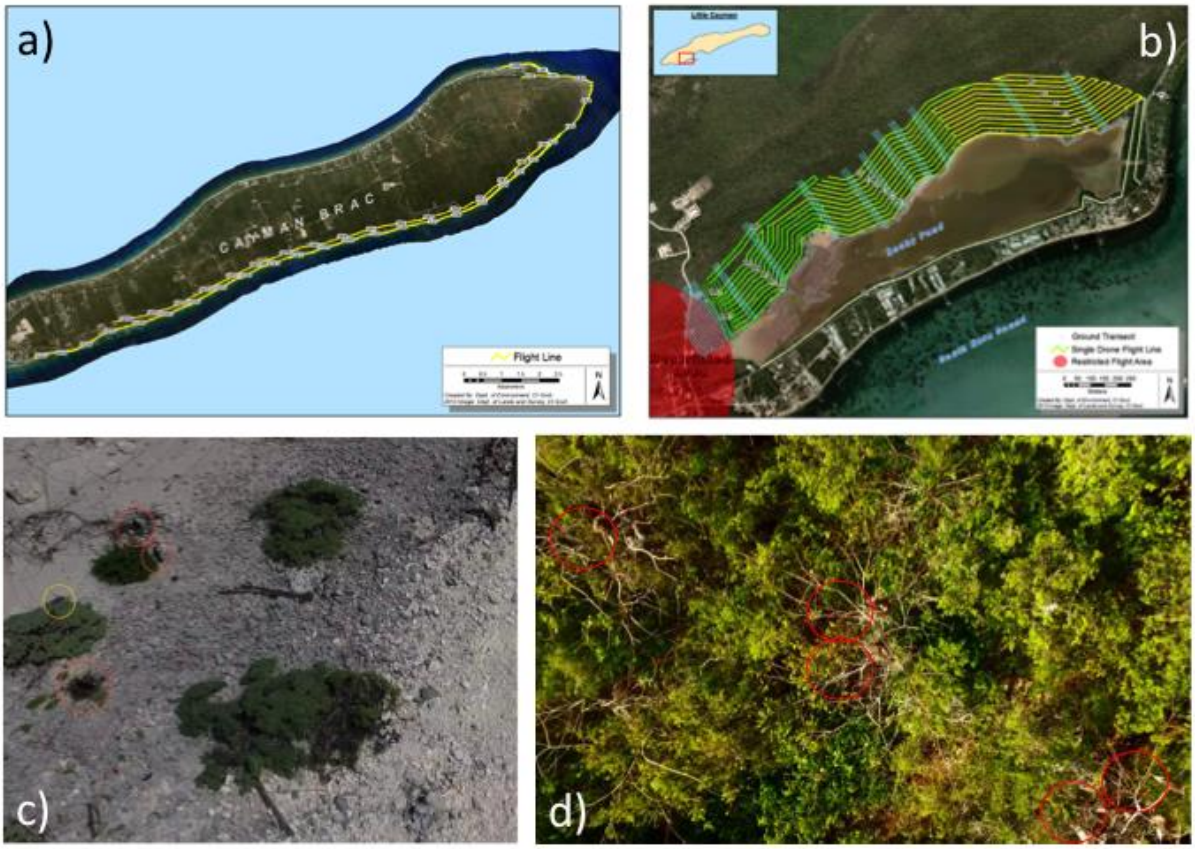


Fig 7.1 Example flight lines flown by the drone over a) the Bluff, Cayman Brac and b) the Booby Pond, Little Cayman to collect aerial imagery of nest sites, and example imagery from the drone footage showing nesting birds on c) Little Cayman and d) Cayman Brac.

Fig. 7.2 Photographs of the project team during drone survey work

Fig 7.3 Map of recorded white-tailed tropicbird nest sites on Cayman Brac, March 2016.

Annex 8: Evidence of project publicity between April 2016 - March 2017

Community meetings and partner meetings

7th April 2016	Little Cayman community meeting, '*The secret life of seabirds*' (see Fig 8.1 and ppt presentation on project website)
12th April 2016	Cayman Brac community meeting, '*The secret life of seabirds*' (ppt presentation on project website)
11th July 2016	Update provided at NTCI committee meeting, Little Cayman
13th July 2016	Update meeting with NTCI head partner (Patricia Bradley)
22nd Nov. 2016	Update meeting with NTCI head partner (Patricia Bradley)
14th Feb. 2017	Talk provided at NTCI committee meeting, Cayman Brac

School talk

8th February 2017	Cayman Brac High School (number of students: ~150)

National media coverage

May, 2016	TV interview with Cayman 27 News Channel. '*Environment Break: The Department of Environment soar to new heights with ground breaking research*' (http://cayman27.ky/2016/05/environment-break-2/)
May, 2016	Media release on Cayman Islands Government website and Cayman News Service, '*Boobies at heart of new seabird research project*' (https://caymannewsservice.com/2016/06/)
June, 2016	Cayman Compass interview and article release, '*Sister Islands seabird study kicks off*' (https://www.caymancompass.com/2016/06/21/)
June, 2016	Article in Cayman Islands 'Flickr' magazine, '*The secret lives of seabirds*' (see Fig. 7.2 and pdf on project website)
June, 2016	Radio interview with Radio Cayman (http://www.radiocayman.gov.ky)
June, 2016	TV interview with Cayman 27, '*Booby Watch: DOE leads Sister Islands seabird research project*' (http://cayman27.ky/2016/06/)
August, 2016	TV interview with Cayman 27, '*Environmental Break: Follow up on the Darwin seabird project*' (https://cayman27.ky/2016/08/environment-break-darwin-seabird-project/)
Nov. 2016	TV interview with Cayman 27, '*Environment Break: The DOE's ongoing seabird project just got a little more "lift" with the help of drones*' (http://cayman27.ky/2016/12/environment-break-22/)
Feb. 2016	Interview for Guy Harvey channel at the Booby Pond, Little Cayman (Video footage in production)

Social media coverage

Project website: www.caymanseabirds.weebly.com

Project twitter feed: @Caymanseabirds

Collaborative project website: www.caribbeanseabirds.org

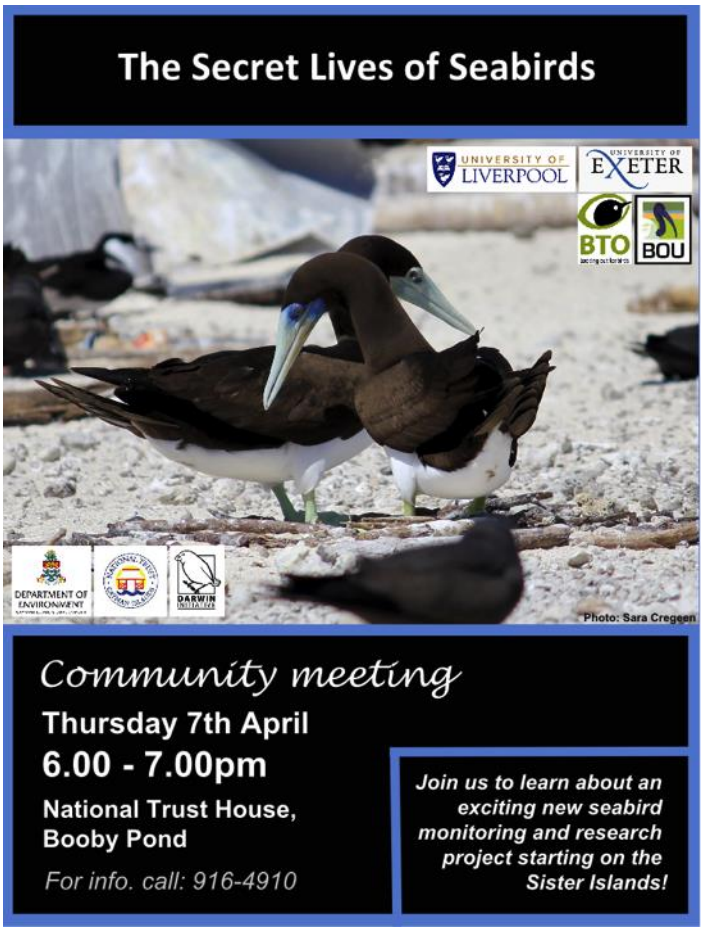


Fig 8.1 Flyer for community meeting on Little Cayman

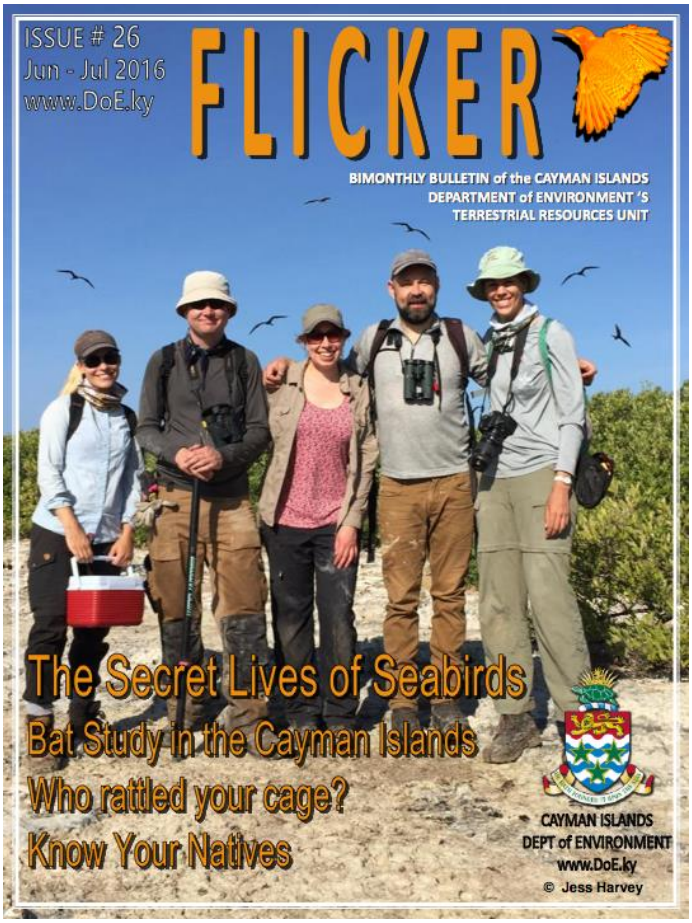


Fig. 8.2 Front cover of Flickr magazine, Jun-July 2016

Checklist for submission

	Check
Is the report less than 10MB? If so, please email to Darwin-Projects@ltsi.co.uk putting the project number in the Subject line.	no
Is your report more than 10MB? If so, please discuss with Darwin-Projects@ltsi.co.uk about the best way to deliver the report, putting the project number in the Subject line.	yes
Have you included means of verification? You need not submit every project document, but the main outputs and a selection of the others would strengthen the report.	yes
Do you have hard copies of material you want to submit with the report? If so, please make this clear in the covering email and ensure all material is marked with the project number.	no
Have you involved your partners in preparation of the report and named the main contributors	yes
Have you completed the Project Expenditure table fully?	yes
Do not include claim forms or other communications with this report.	