Indian Ocean Seabird Group

Newsletter n°8

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EDITO

Dear IOSG members,
we are very pleased to share the 8th issue of the IOSG newsletter. We have a very nice set of stories in this issue:
- First investigation of the at-sea distribution of seabirds in the Bay of Bengal ;
- Research at the three northern-most breeding colonies of the little penguins in western Australia;
- Continuation of the resettlement of seabirds at Tromelin Island after rat eradication;
- A pilot study on the use of drones to survey red-footed boobies on a remote atoll of the Seychelles,
- Some fascinating results on the tracking of juvenile sooty terns during their first year at sea;
- another pilot study coupling automated time lapse cameras and citizen science to investigate breeding ecology of the mysterious petrels of Round Island, Mauritius.

Thanks to all the contributors for sharing these wonderful studies.

The production of the newsletter of the IOSG is now included in a new Europe-funded research project that has just started at UMR ENTROPIE (SMAC project, see "Announcements"). This is the reason why we have a nice logo of the European Commission and of the Région Réunion on the cover page. This project will allow us to have three newsletters per year, so we look forward to receiving your contributions for the next issues!

Matthieu Le Corre
Sabine Orlowski (SMAC project, in charge of the IOSG newsletter until December 2022)
Aurélie Labbé

ANNOUNCEMENTS

← Beginning of the FEDER SMAC project 2020-2022 →

The SMAC project - Seabird Multidisciplinary Applied research for Conservation - began on December 2020 and will last until December 2022. It is led by UMR ENTROPIE in collaboration with UMRs PVBMT and Espace-Dev, at the University of Reunion Island. The project is funded by the European Commission (FEDER grant), the Région Réunion and the Préfecture of La Réunion. It involves collaborations at a local, national and international scales.

A part of the team in the field, ready to start the operations!

The SMAC project will investigate the ecology and conservation of the breeding seabirds of Reunion Island and their habitats. It is a follow up of the LIFE+ Petrels project (2015-2020), another European-funded project, which was dedicated to the two endemic and threatened petrels of the island (The Barau's Petrel and the Mascarene Petrel, see IOSG newsletters n°4 and 7). The SMAC project concerns the two endemic petrels but also the four other breeding seabirds of the Island: Wedge-tailed and Tropical Shearwaters, Brown Noddy and White-tailed Tropicbird.

The four main objectives are:
- Understanding and predicting the benefits of conservation actions on seabird population dynamics;
- Studying the marine phase of seabirds (habitat selection when foraging and when migrating, plastic ingestion and

bioaccumulation of other pollutants, such as heavy metals);
- Understanding the genetic structure of the populations in order to guide conservation programs;
- Investigating social representation and developing citizen science.

A website will be soon created to broadcast the operations. Stay tuned!

MEMBERS CONTRIBUTIONS

1°) Seabird and Cetacean distributions in the Bay of Bengal in relation to marine productivity and commercial fishing effort

Ravichandra Mondreti, Priya Davidar, Peter G. Ryan, Jean-Baptiste Thiebot & David Grémillet

The present survey is the first systematic attempt to study seabird and cetacean distributions in the northeastern Indian Ocean. We surveyed the Bay of Bengal aboard passenger and research vessels recording seabirds and cetaceans en route. We carried out nine cruises during April–May 2012, February–March 2013, and January 2014, along two major shipping routes: Chennai to Port Blair (CPB) and Kolkata to Port Blair (KPB) in India.

Fig1. Observing and recording seabirds and cetaceans from the flying bridge

During all the cruises, we covered a total distance of 4722.3 km at an average speed of 20 km.h^{-1}. The total duration of surveys and the total linear survey effort was 39 days and 323 hours of observation, respectively. We recorded 2697 seabirds of 17 species and 1441 cetaceans of at least eight species. 97 % of all birds observed were Sooty Terns *Onychoprion fuscatus* (*n* = 2282 individuals) and Wedge-tailed Shearwaters *Ardenna pacifica* (*n* = 327 individuals), while 91 % of all individual cetaceans observed were Indo-Pacific Bottlenose Dolphins *Tursiops aduncus* (*n* = 533 individuals) and Spinner Dolphins *Stenella longirostris* (*n* = 772 individuals). In our study, we observed that both seabird (8.3 birds·h^{-1}) and cetacean (4.5 dolphin·h^{-1}) encounter rates were much lower than that recorded in the Mozambique Channel (89.4 birds·h^{-1}; Jaquemet *et al.* 2005, 2014) and in the western tropical Indian Ocean (77.1 dolphin·h-1; Ballance & Pitman 1998) respectively. One possible reason for this low occurrence of seabirds is the lack of seabird breeding sites in Bay of Bengal. Whilst for cetaceans it might be due to the low habitat quality resulting from periodic freshwater input from the Ganges.

Remotely sensed Sea Surface Temperature (SST), Chlorophyll *a* (ChlA) and Bathymetry (BATH) data, which are proxies of surface water mass distributions, primary productivity and water depth were retrieved for the entire study region. Sea Surface Temperature (SST) and Chlorophyll *a* (ChlA) values were uniform across the Bay of Bengal (Fig 1 & 2), while bathymetry (BATH) increased gradually from north to south (Fig. 3). Seabirds and cetaceans occurred throughout the study area, independent of changes in SST, ChlA and BATH (kriged raster layers). However, the highest numbers of Sooty Terns and cetaceans were observed in the shelf-break waters (~200 m deep) of Andaman and Nicobar islands, which are characterized by high productivity and low surface temperatures. We also generated fishing effort maps using catch and effort data from the Indian Ocean Tuna Commission (IOTC) website. When we overlaid the seabird and cetacean abundances on the fishing effort maps, we observed highest number of seabirds and cetaceans in intense fishing zones (Fig 4).

One of the fundamental challenges in understanding the distribution of seabirds and cetaceans in relation to the impact of fisheries in Bay of Bengal is the lack of periodic at-sea monitoring data. Therefore, we are planning to carry out both at-sea and colony-based observations in this region over the next few decades. Our present work is published in the April 2020 issue of *Marine Ornithology* (Mondreti *et al.* 2020).

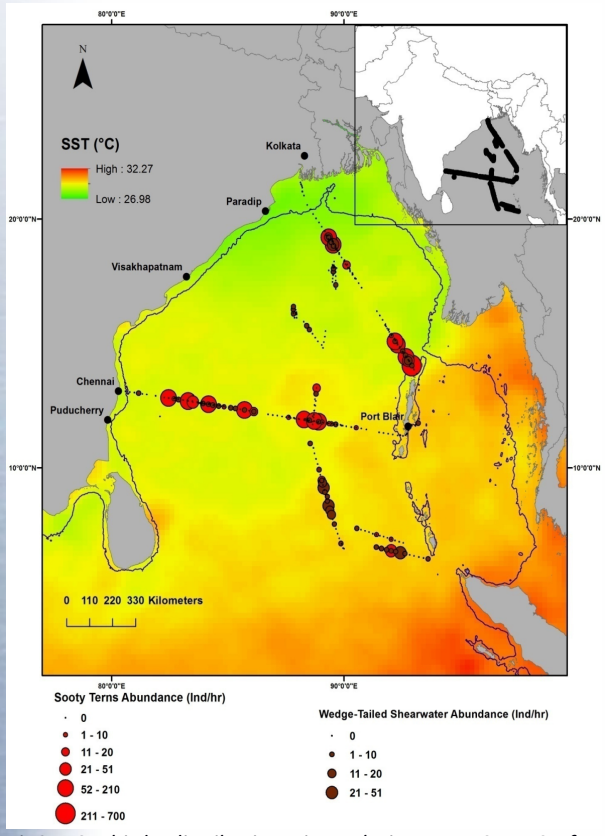


Fig2. Seabird distribution in relation to Sea Surface Temperature (SST). The solid line indicates the 200m bathymetric contour.

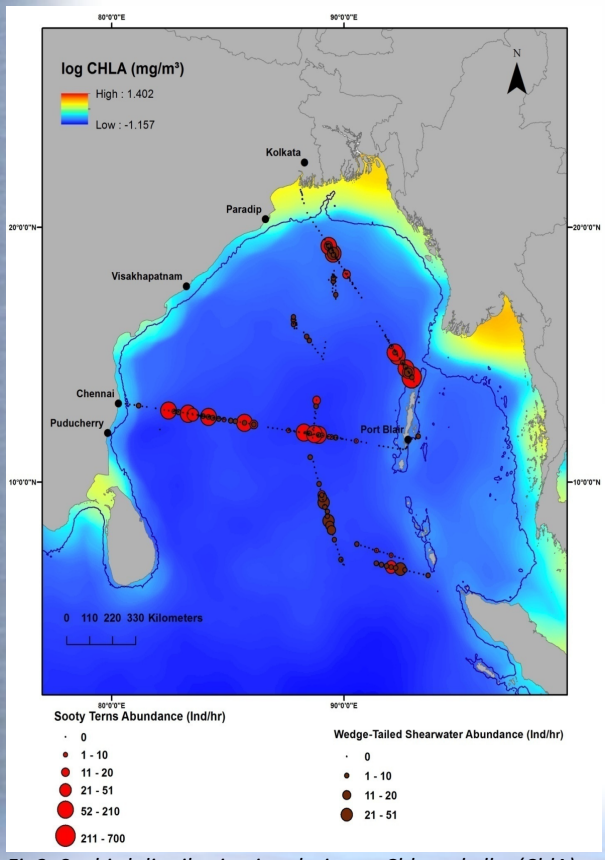


Fig3. Seabird distribution in relation to Chlorophyll a (ChlA).

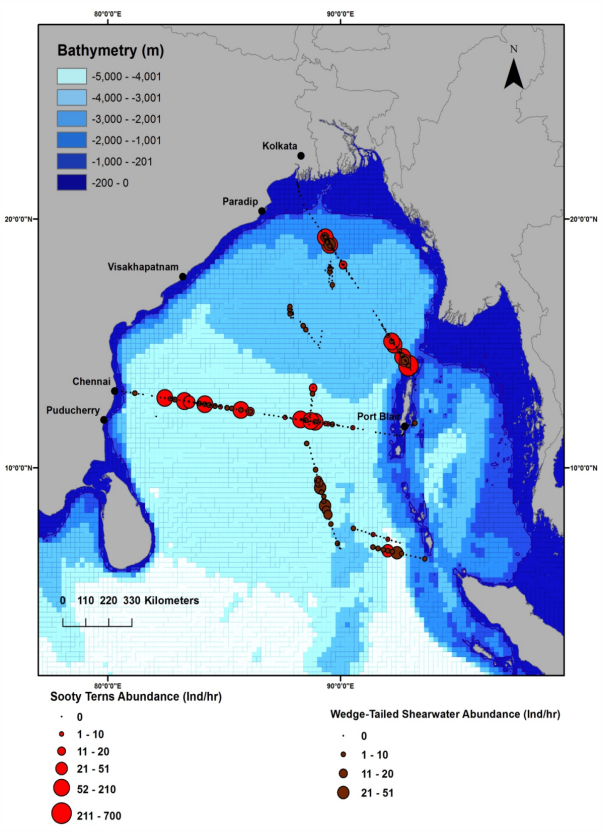


Fig4. Seabird distribution in relation to bathymetry (BATH).

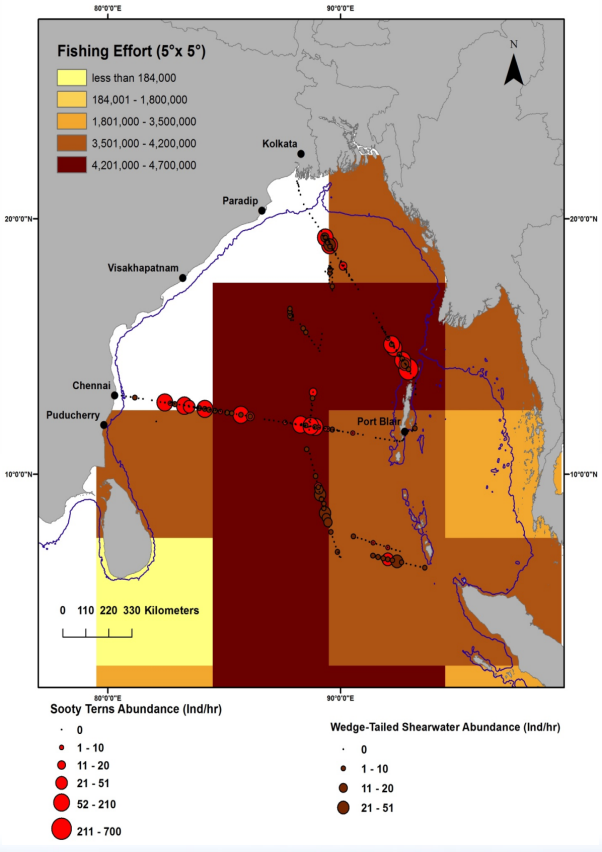


Fig5. Longline fishing effort overlaid on seabird abundance. Fishing effort is expressed as mean number of longline fishing hooks deployed per year.

2°) Little penguins in a changing world

Dr Belinda Cannell

Three colonies of Little Penguins are found offshore near Perth, the capital city of Western Australia (WA): Penguin Island (PI), Garden Island (GI, a naval base), and Carnac Island (Fig. 1). The penguins on PI and GI have a similar genetic structure, and although no samples have been obtained from the third colony, it is presumed that they all can be regarded as a single metapopulation. These colonies represent the northern range edge of Little Penguins in WA. A long research history is associated with the colonies on PI (> 35 years) and GI (20 years). The sandy substrate of PI means the penguins nest under vegetation and in nestboxes that were first placed on the island in 1986. On GI, with a similar sandy substrate, but little vegetation, the penguins nest in rock wall installed in the 1970s. Many aspects of the penguins' ecology has been studied on one or both islands, including reproductive parameters, population estimates, foraging behaviour, diet composition, nest micro-climates, genetic analysis, and causes of mortality.

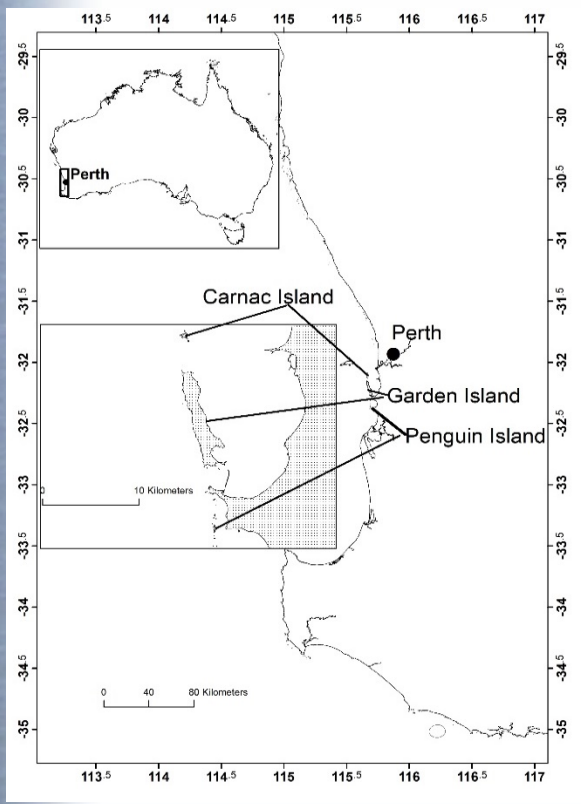


Fig1. Location of the three colonies of the research.

From tracking studies, we know that the penguins from both islands forage in coastal waters < 30 km from the colony during chick rearing, and, for the PI penguins, sometimes more than 200 km from the colony during incubation. These coastal waters are flanked by numerous industries and increasing urban development, and are heavy with commercial shipping and/or recreational boating. It is thus not surprising that watercraft injury causes the highest rate of mortality of the penguins.

Fig2. A little Penguin with its chick.

Starvation, the second most prevalent cause, was particularly high in 2011, the year of an unprecedented marine heatwave along the WA coast. Water temperatures > 3°C above average were recorded, and have generally been above average in most years since, particularly in winter. Elevated levels of Tributyltin, an antifoulant used on ships, has been identified in penguins from both colonies. Despite a total phase-out of TBT on naval vessels since 2002, hotspots of TBT still occur in sediments near GI. Its impact on penguins needs further investigation.

Penguin breeding success on PI has generally been poor since 2011, and my recent mark-recapture studies identified a population decrease by >50% since 2011. The current population estimate is <400 birds. So what was once the largest population in WA is probably no longer. Interestingly, the GI colony is faring much better, likely due to more consistent prey within their foraging habitat.

I am now researching colonies in SW WA to determine their size, foraging behavior and likely impacts. All necessary components for effective management of penguins in WA.

3°) Latest news from Tromelin Island: first successful breeding of the Wedge-tailed Shearwater, first breeding attempt for the Lesser Noddy and first observation of a Mascarene petrel on land

Quentin d'Orchymont, Julien Gazal, Matthieu Le Corre & Maxime Amy

Tromelin Island, a small coralline island of about 1 km², is located at 435 km East of Madagascar. The island is managed by the Terres Australes et Antarctiques Française since 2005. Introduced Brown rats (*Rattus norvegicus*), were eradicated in December 2005 in order to protect native biodiversity, particularly breeding seabirds. For details on this operation see Le Corre *et al.* 2015. Since the eradication, 15 years ago, the seabird community has increased from 2 to 7 breeding species, and from a few hundred pairs to nearly 3,500 pairs (Le Corre *et al.* 2015 and unpublished data).

One of the last species to have settled following the rat eradication is the Wedge-tailed Shearwater (*Ardenna pacifica*). The species is observed since November 2017 on the island. At least three pairs now breed or attempt to breed each year, during austral summer. While all attempts failed in 2017, 2018 and 2019, 2020 brought a successful breeding attempt with a chick that fledged in April 2020.

The fledging Wedge-tailed Shearwater photographed with a camera trap just before its very first flight, Tromelin Island.

The latest species which tried to breed on Tromelin is the Lesser Noddy (*Anous tenuirostris*). The species is known to roost there at night (several hundred birds), but no breeding attempts had been observed since 1856. In March 2020, 2 to 3 pairs were observed displaying during the day. A first pair started to build a nest in late March and laid an egg in April. This attempt failed because the nest was destroyed by strong winds. The pair rebuilt a nest twice but was unsuccessful. However, this first attempt is very good news as the last time this species was noted as a breeding species was more than 150 years ago! Let's see what will happen during the coming breeding seasons.

The first Lesser Noddy observed in incubation on Tromelin Island.

And last but not least, a camera trap deployed in February 2020 to study the breeding Wedge-tailed Shearwaters filmed a very unexpected visitor. A Mascarene Petrel *(Pseudobulweria aterrima*) landed near the shearwater burrow and stood there for a few minutes. The Mascarene Petrel is a critically endangered seabird endemic to Réunion Island. This observation is extremely intriguing, as petrels are not supposed to land while at sea, except for breeding! A new breeding species for Tromelin Island ??? The future will tell!

The Mascarene petrel photographed with a camera trap at Tromelin island.

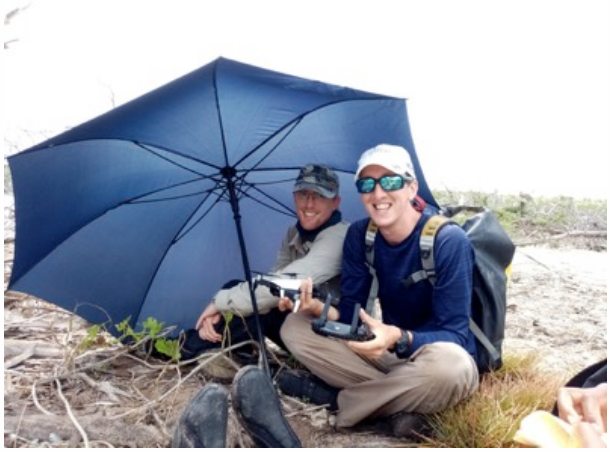
4°) A drone survey to inventory and characterize the Red-footed Booby colonies (*Sula sula*) of Farquhar atoll

Matthieu Le Corre, Sabine Orlowski, Isabelle Urbina-Barreto, Matthew Morgan, Francois Baguette, Pierre-André Adam, Anabelle Cupidon & Gerard Rocamora

Monitoring seabird colonies can be challenging if time in the field is limited, if breeding habitats are difficult to reach or if the number of breeding birds is extremely high. Furthermore, walking amongst seabird colonies for survey proposes can generate significant disturbance and reduce breeding success. Drones are increasingly used in such situations as they can cover large areas considerably faster than traditional techniques. At the correct altitude, they can fly over entire colonies without disturbing birds, whilst simultaneously collecting high resolution photographs that can be used for an in-lab census after the fieldwork.

"Barachois 3", the main nesting colony.

Farquhar Atoll (Seychelles) holds one of the largest Red-footed Booby colonies in the Western Indian Ocean. During November 2019, Island Conservation Society (ICS) and UMR ENTROPIE conducted a pilot experiment to assess the feasibility of using a drone to census the seabird population on the atoll. This research was part of a project ("Abundance, habitat selection and movements at sea of the Red-footed Booby as informative tools for conservation management within the Seychelles Marine Spatial Plan") conducted by ICS, UMR ENTROPIE (University of Réunion Island) and the Zoological Society of London. The project is funded by the Seychelles Conservation and Climate Adaptation Trust (SeyCCAT) and supported by the Government of Seychelles, Islands Development Company and Farquhar Foundation. Additional technical support and supervision was provided by the Island Biodiversity and Conservation Centre of the University of Seychelles.



Matthew and François, the drone pilot and co-pilot!

The experiment went extremely well. Preliminary flight tests at various altitudes showed that the drone did not frighten boobies. We conducted 21 flights in 5 days and covered the two main colonies of the atoll (63 ha). These flights produced 3168 photos that were used to build a mosaic orthophotograph with the dedicated photogrammetry software Agisoft Metashape. We then used the orthophoto in QGIS for image interpretation and nest counting. Nests were counted manually and classified in terms of breeding status: adult on a nest (protecting an empty nest, incubating or brooding); chick on a nest; fledging. We also pointed all resting adults (not on a nest). In total we counted 9112 breeding pairs, which is similar to previous land-based surveys. We are now collaborating with an expert in automated image analysis to automatically classify and count booby nests and non-breeding birds.

5°) Tracking juvenile Sooty Terns from Bird Island, Seychelles

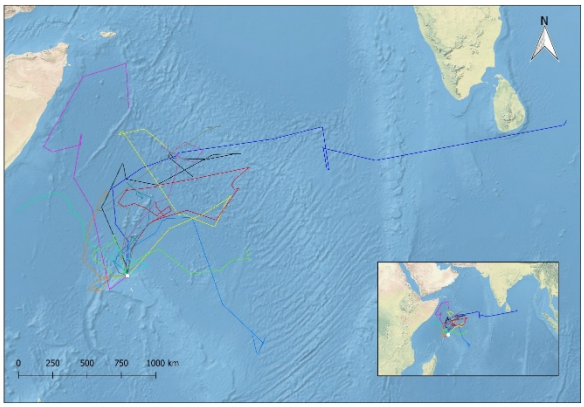
Chris Feare, Rachel Bristol & Christine Larose

As a continuation of our investigations of the at-sea movements of Bird Island's Sooty Terns, in August 2019 we deployed satellite tags on 15 juveniles in the few days before fledging. Our aim was to investigate where the juveniles were likely to attain independence from their parent(s), an area that we postulated would likely be a predictably profitable feeding area where adults could continue to provision their young and where juveniles could gain their required prey-capture skills.

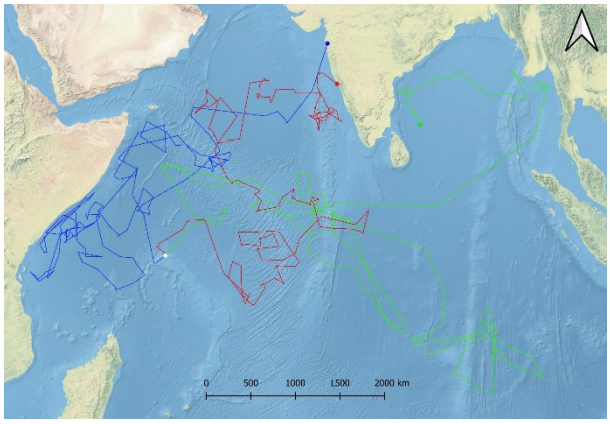
Lotek 6 g ArgosPoint

Microwave Telemetry Inc 5 g solar PTT

We used Teflon tube thigh-loop harnesses to attach five Microwave Telemetry Inc 5 g PTTs and ten Lotek 6 g ArgosPoint tags to juveniles estimated to be within two weeks of fledging, and of minimum body mass of 180 g. The tags were deployed 27-30 August 2019. One of these birds failed to fledge. The remaining birds left the island between 6 and 17 September but one bird remained in the colony until 26 September. They were tracked for up to 11 months.



Tracks of juvenile Sooty Terns from Bird Island (white dot) up to 7 October 2019



Tracks of the three surviving juveniles in July 2020. Bird Island is the white dot, coloured dots represent the last fixes from these birds

On leaving Bird Island twelve of the birds headed north. The other two birds initially headed west or south west for c. 150 km before they too headed north. The most conspicuous bathymetric feature at the centre of their distribution shortly after departure is the Coco de Mer ridge, a submarine mountain range the southern end of which lies c. 300 km north of Bird Island, and the ridge extends c. 350 km NNW. The tracks have yet to be fully analysed but after their initial heading the birds then dispersed widely, with some individuals visiting offshore of the East African coast from Somalia south to the Comores in the northern Mozambique Channel, north into the Arabian Sea, others ranging in the vicinity of the Chagos-Laccadive and 90°East Ridges, and one bird feeding around the Andaman Islands and in the Bay of Bengal. From these data it looks as though

juveniles in their first year establish distribution patterns similar to those discovered of adults in our earlier geolocator studies.

Remarkably, one of our tagged birds was found alive inland north of Mumbai on 27 July 2020. It was emaciated and died two days later. The MTI tag was recovered but we have still not been able to retrieve it!

Our study was funded by the Seychelles Conservation and Climate Adaptation Trust (SeyCCAT) and supported by Bird Island Lodge, for which we are extremely grateful.

6°) Petrel Watch – Monitoring Round Island petrels with citizen science

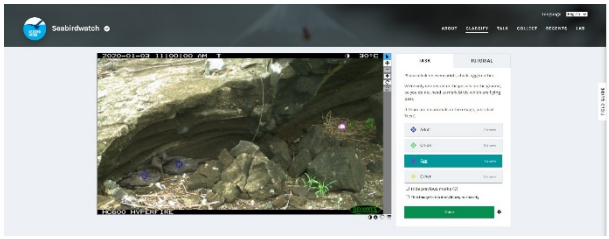
Kirsty Franklin, Johannes Chambon, Nik Cole, Vikash Tatayah, Kevin Ruhomaun & Malcolm Nicoll

Effective monitoring of seabird colonies is essential to understanding long-term population trends. However, for tropical seabirds which may breed all year round and often in remote locations, visiting breeding colonies regularly is logistically difficult, can cause high disturbance, and is often expensive in terms of time and money. One method which has the potential to overcome some of these challenges is automated time-lapse photography.

In November 2019, we installed 10 time-lapse cameras on Round Island, Mauritius in order to trial this methodology to monitor the hybrid population of *Pterodroma* petrels that breed there. Preliminary analysis of long-term survey data has revealed seasonal variation in breeding success, but further detailed data and analyses are required to understand why this pattern occurs. We have therefore programmed cameras to take photos at hourly intervals in order to capture this seasonal variation, as well as the identification of key phenological dates (e.g. egg-laying, hatching, chick fledging) and nest success.

Since their deployment, these cameras have generated an enormous number of images, and we now need to turn this wealth of photographic information into a dataset that allows us to answer our research questions. One method which has proved successful in speeding up image processing, particularly before AI (Artificial Intelligence) can be trained on a new species, is citizen science. We have therefore joined forces with the team at *Seabird Watch*, a citizen science project previously aimed at measuring populations of seabirds in the North Atlantic.

Images from Round Island are hosted on the *Seabird Watch* website (www.seabirdwatch.org) and volunteers are asked to 'tag' petrels by clicking on them. Volunteers are also asked to classify each record as an 'adult', 'chick', 'egg' or 'other'. This latter group is used to tag the other inhabitants of Round Island, such as the endemic Round Island boa, Telfair's skinks, giant tortoises or tropicbirds.



So, if you're intrigued by this unusual population of petrels and fancy getting involved, or know of someone else who would be, then we would love your help! It is incredibly easy, and there is a two-minute tutorial on the website. Every click counts!

Acknowledgements: Thanks to the British Ornithologist's Union (BOU) for funding this studentship, and to the University of East Anglia and Zoological Society of London for their support. Also, thanks to the Mauritian Wildlife Foundation and Mauritian Government National Parks and Conservation Service for their long-term support for the Round Island petrel project.

Thanks to all the contributors for this newsletter:

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Thanks to all of you!

Call for contributions: This is the eighth newsletter of the Group. We plan to prepare the next issue for April-May 2021, so please send your contributions to Sabine or Aurélie (see above) from now! ☺