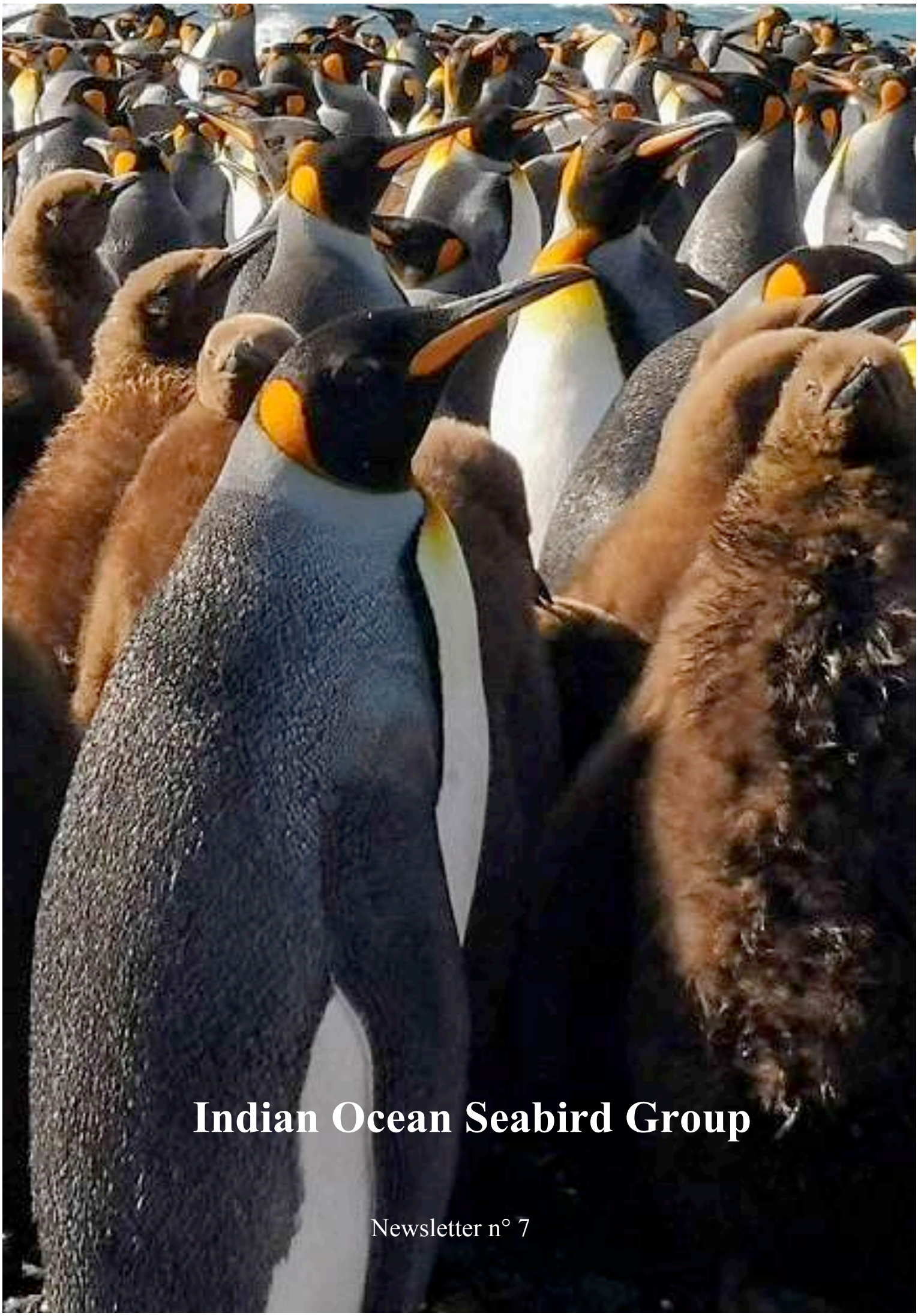

Indian Ocean Seabird Group

Newsletter n° 7

IOSG NEWSLETTER n° 7

January 20

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Here is the 7th Newsletter of the Indian Ocean Seabird Group. Sorry for the delay, we are all very busy! Although we are 6 month late (oouups !) we are proud to share with you this new issue, which is very rich and diverse. We are particularly pleased to welcome several polar, subpolar and temperate contributions this time. Another very interesting originality of this issue is the contribution of Rob van Bemmelen (Wageningen Marine Research, The Netherlands), who studies the migration of the most "seabird-like" of the waders!
Please continue to send us your articles and enjoy the reading!

Matthieu, Aurélie

ANNOUNCEMENTS

LIFE+ 2020: Save the date!

Patrick Pinet

The final seminar of LIFE + Pétrels project will take place the week of 25 to 29 May 2020. This will be an opportunity to take stock of all the knowledge of Reunion's endemic petrels (Barau's petrel and Mascarene Petrel) acquired over five years and discuss with all scientists future directions in conservation research needed for these two endangered species. You are all welcome and we hope to see you in Reunion.
More information soon on: www.petrels.re

MEMBERS CONTRIBUTIONS

Influenza virus on oceanic islands: host and viral diversity in seabirds in the Western Indian Ocean

Camille Lebarbenchon

For the past 20 years, the continued emergence of avian influenza viruses (AIV) in poultry and humans has stimulated both research activities and surveillance programs, worldwide. However, many gaps remain in our knowledge on AIV ecology and epidemiology in wild birds, in particular in the Southern hemisphere. In this study, we investigated the host range of AIV in seabirds of the Western Indian Ocean based on serological assays and molecular detection.

*Oropharyngeal swab collected in Brown noddy (*Anous stolidus*)*

In total, 2997 samples (1647 blood samples and 1350 swabs), from nine seabird species on seven oceanic islands, were collected and tested. Two hundred and twenty-seven samples (13.8%) tested positive for the presence of AIV antibodies, supporting past infection of the tested birds. In particular, high seroprevalences were found in terns, with strong variation between species (Lesser noddy: 60.4 ± 6.8%; Brown noddy: 32.2 ± 8.3%; Sooty tern: 6.35 ± 1.6%; Figure A), and between islands. This high seroprevalence was comparable to antibody

prevalence in mallards (*Anas platyrhynchos*) and other wild duck species recognized as natural host reservoirs for AIV (e.g. 46% in mallards in North America), and further suggests that brown and lesser noddies may play a central role in the epidemiology of AIV on tropical oceanic islands.

We further tested a subset of samples for antibodies against specific hemagglutinin (HA) subtypes to assess the diversity of AIV. Virus subtype diversity was higher in lesser noddies than in brown noddies and sooty terns, with 10 out of the 16 described avian HA AIV subtypes detected in lesser noddies. H16 AIV, a non-pathogenic virus subtype associated with seabirds worldwide, was commonly detected (e.g. 48% of seropositive lesser noddies). AIV subtypes usually associated with wild ducks and poultry (H3, H6, H9, H12) were also found, suggesting that noddies might share habitats with ducks at some stage of their life cycle. Mixing between species and populations originating from different geographic areas could favour virus gene flow between hosts and facilitates cross-species transmission, in particular during the non-breeding period.

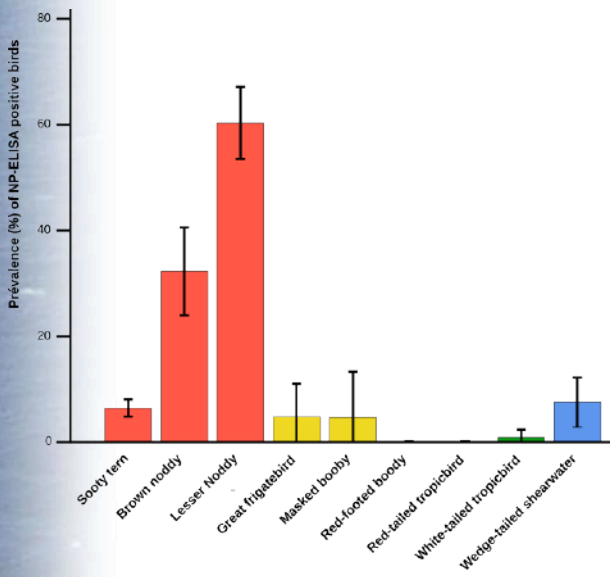


Figure A. Influenza A virus host diversity. Prevalence of seropositive samples (percentage with 95% confidence interval). Colors indicate bird order (red: Charadriiformes; yellow: Suliformes; green: Phaethontiformes; blue: Procellariformes).

Finally, we also identified the geographic origin of circulating viruses based on molecular and phylogenetic analyses. On Reunion Island, 27.6% of non-breeding lesser noddies tested positive for H2 AIV subtype in their faeces (i.e. supporting ongoing infection). Partial nucleotide sequencing of HA gene and phylogenetic analyses highlighted that the detected viruses were closely related to H2N5 and H2N7 AIV isolated in black-headed gulls (*Chroicocephalus ridibundus*) in the Republic of Georgia, in 2012, supporting virus dispersal between Eurasia and the Southwestern Indian Ocean.

Overall, our results demonstrate that terns act as major hosts for influenza viruses on tropical oceanic islands and that, in addition to being infected with viruses usually associated with seabirds, they could also be regularly in contact with viruses that represent a significant threat to the veterinary and human health. This study further demonstrates that the spatial isolation of oceanic islands does not limit connectivity with the global AIV epidemiology and may create opportunities for local maintenance of viruses in wild bird communities.

This work was published in 2015 in PLOS Pathogens (doi:10.1371/journal.ppat.1004925). We are now focusing on the spatial and temporal variation of virus transmission in terns and noddies in the Western Indian Ocean (Seychelles and Eparses islands) and we would be happy to include new study sites and species in our study.

Flexible foragers of the world's largest gannetry

Jonathan Botha & Pierre Pistorius

The endangered Cape gannet (*Morus capensis*) currently breeds at only six locations off the coast of southern Africa. The largest of these breeding aggregations occurs at Bird Island in Algoa Bay, which forms part of the Addo Elephant National Park managed by South African National Parks. This is also the only Cape gannet population situated within the Indian Ocean. Along with his students, Professor Pierre Pistorius, Head of the Nelson Mandela University's Marine Apex Predator Research Unit (MAPRU; https://mapru.mandela.ac.za/) has been conducting research on various aspects of gannet behaviour and demographics at this unique colony since 2010.

Given the large size of this population (ca 90 000 breeding pairs), a key focus of this research is to better understand how individuals respond to changes in prey availability through strategies of resource partitioning and foraging plasticity.

A section of the large Cape gannet colony at Bird Island, Algoa Bay

Few studies have attempted to quantify the foraging effort and diet of Cape gannets during the late stages of the breeding cycle. This is a time when tracking becomes inherently difficult as a result of short and unpredictable periods of nest attendance, but is also a time of potential resource limitation following extensive foraging around the colony. Therefore, during December and January of the 2015 breeding season, we fitted adult Cape gannets with GPS devices during the early (guard) and late (post-guard) stages of chick rearing. In addition, we collected diet samples to provide the first comparative assessment of adult Cape gannet foraging behaviour and prey composition throughout the breeding cycle.

The first thing we found was that adult birds undertook much longer foraging trips during the post-guard phase. In fact, several of these individuals travelled distances of well over 1000 km during a single foraging trip. Furthermore, we found a clear shift from an anchovy (*Engraulis encrasicolus*) dominated diet during the guard stage, to a far more mixed diet during the post-guard phase. During post-guard, the dietary composition included greater proportions of larger pelagic fish, in particular, Atlantic saury (*Scomberesox saurus*). Finally, while birds were generally tracked over a single foraging trip, a second trip was obtained opportunistically for six individuals during the post-guard phase. Interestingly, for all of these individuals, the second trip differed substantially in distance and duration from the first, which suggests that adult Cape gannets may employ a bimodal foraging strategy during the late phases of chick rearing. Overall, our results indicate that Cape gannets breeding at Bird Island show flexibility in their foraging behaviour and diet. Whether this is a direct result of local prey depletion following extensive foraging around the colony, warrants further investigation and calls for a comparison of foraging data with estimates of prey biomass.

Seabirds are well recognized for their potential as indicators of prey conditions. Through automated VHF-based monitoring of foraging trips, in conjunction with data on the local physical environment (*in situ* instrumentation in Algoa Bay providing water temperature, stratification and current among others) and tracking data, the next phase is to better understand the mechanisms driving variability in foraging effort which is closely linked to population growth. This work, and the various other projects run by MAPRU continue to contribute to an improved understanding of the ecology of this iconic southern African seabird. The study of similar species subjected to different environmental conditions enhances ecological insights and there is much potential for comparative and collaborative studies within the Sulidae family (gannets and boobies) within our region. Give a shout in this direction if there is any interest!

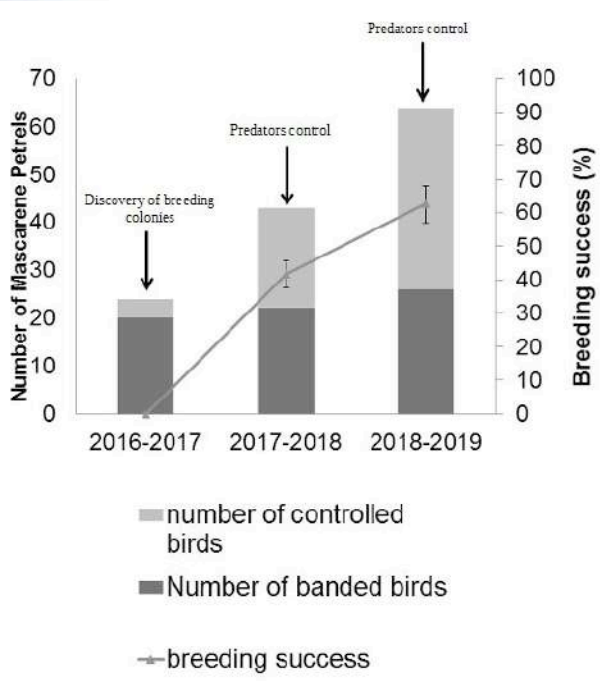
A New Success Story for Mascarene Petrel Conservation, Réunion Island

Patrick Pinet

The Mascarene Petrel (*Pseudobulweria aterrima*) is a critically endangered petrel endemic to Réunion Island. It belongs to the genus *Pseudobulweria*, one of the least known genus among the Procellariidae, with only four species globally. Since the discovery of the first colony in November 2016, 85 birds from 45 burrows in two breeding sites are now monitored. The LIFE+ Pétrels team has conducted predator control on both breeding colonies since their discovery. Over two breeding seasons, we recorded a huge increase in reproductive success, from 0% in 2017 to more than 60% in 2019.

In addition, the project has reached a milestone towards a long-term conservation objective. In 2018, we created the first two Mascarene Petrel artificial breeding colonies, including social attraction through playback calling every night. Now, the waiting game starts! We know that it is a long process...

Surprisingly, artificial sites were quickly visited by birds at night, and we also recorded occupancy of artificial burrows within one year of deploying the nest boxes. Incredibly, the first petrel captured in a burrow, in February 2019, was banded as a grounded fledgling rescued by the local NGO SEOR in 2015, the first year of the project. This unbelievable story confirms that our ambitious and multifaceted LIFE+ project gives real hope that we can succeed in saving this endemic and critically endangered petrel. However, the results of the project also suggest that Mascarene Petrels are currently fully dependent on human conservation actions both in their breeding colonies and in urban areas.



A prospecting Mascarene petrel at the entrance of a artificial burrow.

Recolonization by seabirds following rat eradication on Saint-Paul Island, French Southern Territories

Christophe Barbraud, Karine Delord, Fabrice Le Bouard, Roald Harivel

Saint-Paul Island (38°43'S, 77°31'E) is classified as an Integral Protection Zone by the amended decree 2006-1211 creating the Nature Reserve of the French Southern Territories. In 1997, an eradication project was implemented to remove black rats *Rattus rattus* and rabbit *Oryctolagus cunniculus*, introduced on Saint-Paul Island more than 200 years ago. The documented impact of these mammals on native animal and plant populations motivated such a project, and its success was validated during subsequent surveys.

As part of a long-term post-eradication monitoring, fieldwork was carried out in December 2018 to assess changes in avian populations and the status of introduced mammals. This fieldwork took place within the framework of a collaboration between the Nature Reserve and the French Polar Institute Paul Emile Victor (program 109 OrnithoEco, Centre d'Etudes Biologiques de Chizé, CNRS).

Saint Paul Island

The dense vegetation and low seabird density on the island make it almost impossible for exhaustive monitoring. Therefore, an adaptive systematic sampling was performed for monitoring burrows nesting species (petrels). The method consists, for a network of primary counting points, in counting all petrel burrows within a circle of 10 m radius. If no burrow is found at a point, then the next point is surveyed. If at least one burrow is detected at the point (qualified as primary), the 4 adjacent plots (secondary points) located at the 4 cardinal points (left, right, front and rear) are surveyed. This operation is repeated until no more burrows are detected. Furthermore, to assess the presence/absence of introduced mammal species, a combination of techniques were used, including rat/mice traps, waxtags, camera traps.

Only one introduced mammal species was detected, the domestic mouse *Mus musculus*.

Preliminary results from the island seabird survey show that 48 burrows were found out of the 239 sampling points carried out. For the first time, active burrows of white-bellied storm

petrels *Fregeta grallaria* and little shearwaters *Puffinus assimilis* were found within the island's crater. Several mid-sized burrows, probably belonging to great-winged petrels *Pterodroma macroptera* were found on the southern coast of the island.

A total of 16 seabird species were observed on Saint-Paul Island, of which 14 were breeding or probably breeding. Two colonies of northern rockhopper penguin *Eudyptes moseleyi* were recorded. A direct count of the large colony yielded a total of 3942 chicks. Only one pair of Indian yellow-nosed albatross *Thalassarche carteri* was breeding on the island. Sooty albatrosses *Phoebetria fusca* breed in small numbers on the cliffs of the south coast.

A MacGillivray's prion on Saint-Paul Island. Credit: Karine Delord

The MacGillivray's prion *Pachyptila macgillivrayi*, which breed only on the Roche Quille before the eradication of rats and rabbits, began to recolonize the main island in 1999 with the presence of 5-10 active burrows observed on the slopes facing the Roche Quille. Since then, the species has established a colony on this part of the island and is even locally abundant. Overall, there were at least several hundreds of breeding pairs of MacGillivray's prions breeding on the island. Less abundant than the MacGillivray's prion, the fairy prion *Pachyptila turtur* was captured during almost all mist net sessions. While no occupied burrow was found during the surveys, most captured birds had brood patches and a full stomach (spontaneous regurgitates), strongly suggesting breeding of the species on the island.

The great winged petrel breeds on Saint-Paul Island during the southern winter and should therefore no longer be present on the island at the time of our survey. However, a bird on an egg was found in a burrow on the slopes of the Crater Basin. Egg candling indicated that the egg was sterile. Flesh-footed shearwaters *Puffinus carneipes* were at the incubation stage during our survey. A census of the colony of situated on both sides of Pointe Schmith gave a total of 1531 burrows with signs of frequentation (feathers, vegetation removed, traces on the ground). Five little shearwaters chicks were found in burrows within the same recolonization areas as MacGillivray's prion.

Two pairs of white-bellied storm petrel were found in the Crater Basin. In both cases, there was no egg suggesting later reproduction in this species, probably from January onwards. One black-bellied storm petrel *Fregetta tropica* was caught at night. The bird had an incomplete but well-marked belly band. Another bird with an early ventral bar was captured at the same location a few days later. This is the second record for this species on Saint-Paul (first record in December 2017 during a two-day visit).

For the first time in 150 years, the breeding of the brown skua *Stercorarius antarctica lonnbergi* was confirmed on Saint-Paul Island. Five nests with chicks were found on the outer slopes of the crater. In addition, 3 pairs of skuas were alarming and behaving like territorial pairs. Two individuals banded on Amsterdam Island were observed in a club of 10-15 individuals. Together with the MacGillivray's prion, the Antarctic tern *Sterna vittata* appeared to have increased the most since the eradication of rats and rabbits on the island. Four adults of sooty terns *Onychoprion fuscatus* were regularly observed chasing a skua. The terns landed on the cliffs where Antarctic terns also breed. Two nests with eggs of Australasian gannets *Morus serrator* were observed, and one chick hatched in one of the nests on December 17. One individual red-tailed tropicbird *Phaeton rubricauda*, a new species for Saint-Paul Island, was also observed.

To conclude, preliminary results from this seabird survey on Saint-Paul Island indicate that several species highly beneficiated from the rat eradication: the MacGillivray's prion and the Antarctic tern which now breed on the main island with at least several hundreds of breeding pairs each; little shearwaters,

probably with several tens of breeding pairs; white-bellied storm petrels which were found occupying burrows for the first time on the main island, and black-bellied storm petrels recorded for the first time on Saint-Paul. Brown skuas are now breeding in small numbers on Saint-Paul. These results confirm the importance of eradicating introduced predators on islands for seabird conservation, which should be a priority for conservation bodies managing these island ecosystems.

Seabird tracking through the South African National Antarctic Program

Pierre Pistorius

The Prince Edward Islands, South Africa's sub-Antarctic territory in the Southern Indian Ocean, has a rich history of seabird research. Monitoring efforts stem back from the early 1980's when John Cooper initiated long-term projects on several albatross and penguin species, some that are still running today. These efforts to better understand and manage population changes of various seabird species has more recently been supplemented by much at-sea tracking work harnessing various technological advances in instrumentation to tackle a range of questions.

Marion Island

The main focus has been on Marion Island, the larger of the two islands, where four species of both albatross (wandering, grey-headed, light-mantled, sooty) and penguins (kings, gentoos, macaroni, rockhopper) breed as well as southern and northern giant petrels and a number of other species, including 14 burrow-breeding species. Since 2015, through a project I head at Nelson Mandela University and the Centre of Excellence at the FitzPatrick Institute for African Ornithology, in collaboration with Newi Makhado from Department of Environmental Affairs and Peter Ryan from the Fitz, we have been tracking 12 of these species to better understand the at-sea distribution in order to identify ecologically and biologically important areas in the Southern Indian Ocean. Together with Maelle Connan, also from Nelson Mandela University, we have additionally been collecting dietary and isotope samples to study the trophic ecology of these birds. Using seabirds as samplers of lower-trophic level species that are otherwise logistically difficult to sample through expensive ship-based efforts, we are looking at long-term changes at the mid-trophic level.

Happy field workers!

Recently we collated all historical tracking data from seabirds and seals from the Prince Edward Islands and this data was subjected to habitat modelling in an attempt to identify important drivers of distribution for the respective species and common preferences between species. Ryan Reisinger, a post-doc with me at MAPRU (Marine Apex Predator Research Unit), with help from researchers at the Antarctic Australian Division and Institute for Marine and Antarctic Studies at the University of Tasmania, developed a series of habitat models that highlighted the importance of sea-surface temperature and both wind and current strength as important variables in predicting the distribution of study species. This work was recently published in Diversity and Distributions (https://doi.org/10.1111/ddi.12702) and fed into a much larger project (Retrospective Analysis of Antarctic Tracking data) aiming at identifying important habitat across the entire

Southern Ocean using a similar modelling approach.

Wandering albatross with a chick

In the mean-time, annual systematic tracking of above mentioned species has taken place on Marion Island and PhD student, Tegan Carpenter-Kling, is hard at work analysing this data and looking at the importance of various oceanographic features to foraging seabirds. One of her recent findings, based on the tracking and dietary data from Gentoo penguins, highlights the importance of the position of the sub-Antarctic Front in relation to Marion Island in governing prey composition in these penguins (https://doi.org/10.1016/j.ecolind.2019.01.008). This follows a recent study published in Nature Climate Change (https://doi.org/10.1038/s41558-018-0084-2) which predicted that king penguins may go locally extinct at several of their breeding colonies, including Marion Island, within the next 100 years as a result of climate-mediated shifts in the Antarctic Polar Front. King penguins are reliant on prey associated with this area, which is slowly migrating further southwards as sea temperatures are increasing, making it harder for commuting adults to provision offspring during the breeding season.

There is still a lot to learn and the dynamic nature of the Southern Indian Ocean remains poorly understood. Most certainly conditions are changing and the ability of Southern Ocean seabirds to respond to these changes will largely be determined by the level of plasticity in their behaviour. Long-term monitoring and tracking studies are particularly important in this regard. Through the collection of long-term tracking data, over multiple years characterised by varying environmental conditions, we are hoping to better understand behavioural plasticity in the respective study species which will help us with better understanding the ability of these species to adapt to changing conditions.

As I am writing this article, from Marion Island while on the annual relief voyage, I am reminded of one of the more important contributions of the seabird research programs on Marion Island (and elsewhere for that matter), historically and present. Each year young researchers are trained in various aspects of seabird monitoring and research during this 5-week relief voyage and they then spend a full year on the island as part of a small team collecting data on various seabird projects. Returning to the island a year down the line, it is remarkable to see the incredible growth in these individuals. They learn much about ecological systems and themselves, in a brutal environment where death and suffering and life and opportunity are clearly and inextricably linked. This most certainly help inspire and justify the efforts in running these research programs in remote locations where logistical constraints are significant and associated administrative requirements far from trivial.

False starts, colony failure and a new Fairy Tern longevity record from Western Australia

Claire Greenwell

Each year in spring, around 1500 Fairy Terns descend on the greater Perth metropolitan region. Their return signifies the commencement of the breeding season; an exciting but anxious wait, not knowing where the birds will ‘tern’ up and establish their colonies.

It’s curious that these vulnerable coastal seabirds would choose to nest in such a built-up area of the West Australian coastline, but it’s for good reason. The mouths of the highly productive Swan-Canning (Perth), Peel-Harvey (Mandurah) and Leschanault (Bunbury) Estuary systems are critically important foraging grounds for Fairy Terns, who feed, largely, on

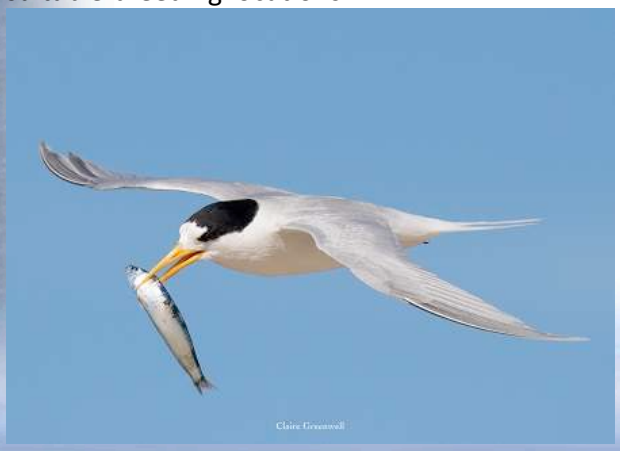
small bait fishes such as sprats, pilchards and anchovies that thrive in these environments.

Small terns don't necessarily nest in the same location each year, with colony site selection driven by various environmental and social factors, such as site stability, prey availability and past reproductive success at a particular site.

Unpredictable weather and food resources during the early breeding season can lead to colony failure and false-starts and the 2019/20 season has been no different. During early October large flocks of fairies were seen on the Peel-Harvey and Leschanault Estuaries, engaged in their ever-entertaining courtship displays. By the end of the October, a small colony of around 30 pairs had established nests at Point McKenna, a sandy beach site situated within a secure area of the Bunbury harbour. Despite the colony forming well above the spring tide mark, all eggs were buried during a storm that hit the region in early November.

Egg burial and inundation of nests during storm events is a common driver of nest failure among beach-nesting birds. However, the early-season loss meant there would be an opportunity to try again. And they did. Within 7 days, a second attempt was underway and by late-November 180 nests had been recorded. The colony will be monitored throughout the season and all going well, we could expect to start to see chicks from early December.

Fairy Tern numbers on Garden Island (an A-class nature reserve and military base) have been increasing over the past two months, with up to several hundred birds coming into roost at night. Each morning at first light, the birds leave en masse, dispersing to various sites across the Perth region to feed, find mates and identify suitable breeding locations.



Small colonies have formed on Garden Island, and Carnac Island, which has resulted in a beach-closure of this A-Class Nature Reserve. Numbers on Carnac Island peaked at around 120 nests during the 2018/19 breeding season and it is possible we will see similar numbers this season.

In Perth's urban centre, two important breeding sites (Point Walter and Rous Head) have been gaining much attention from Fairy Terns, with early-morning prospecting activities recorded at both sites. Point Walter is a prominent sandbar within the Swan River system, and an important aggregation, feeding and breeding site for Fairy Terns. It is also a popular and much-loved water playground during the summer months, making management interventions challenging at times. In recent years, changes in site management during spring/summer, including the installation of temporary fencing and signage, and community education have facilitated successful nesting attempts by Fairy Terns and other shore-nesting birds such as Red-capped Plovers and Pied Oystercatchers.

On 14th November, the first Fairy Tern egg was located, and colony formation was well underway, with nest-scraping, territorial disputes, aerial courtship displays and fish presentation behaviours observed. The first birds to lay selected an alternate colony site location to where they have nested previously, so it is possible that we'll see large numbers of birds nesting at Point Walter this season, with other birds prospecting the former site. We currently have ~65 nests and other pairs are courting and prospecting, so there will likely be an increase in the number of nests over the coming weeks.

The formation of other colonies in the metropolitan area is expected in the coming weeks, including at the Rous Head sanctuary, which has become a significant nesting site over the past six years, supporting 220 pairs last year. Monitoring and community education programs will remain at the forefront of our work throughout the season and it is hoped that proactive management activities (e.g. predator control and habitat management) during the non-breeding season will help make the 2019/20 a productive season for the terns.

On 10th November, an injured Fairy Tern carrying a leg band, was picked up on a beach at Garden Island. It 'terns' out the bird was originally banded as a runner by Dr Nic Dunlop at Tern Island, Shoalwater in January 1997.

At nearly 23 years (22 y, 9 m, 24 d), this recapture is a new longevity record for the species. Unfortunately, due to the nature of its injuries, and despite the hard work of many people involved, the bird was not able to be rehabilitated. While this is a sad story, this bird has provided valuable new information for its species and highlights the importance of long-term conservation efforts to protect these long-lived seabirds.

Island Ark VI Symposium – Australia
A controversial symposium

Aurélie Labbé

The Island Ark VI Symposium which took place on Rottnest Island in Western Australia in February 2019 was a tense event where various conservation bodies and government departments presented the state of their work around Australia.

While some of the projects presented at the symposium gave hope for species conservation, various elements raised eyebrows in the room over the course of the event. Not only did the event take place on an arguably fairly degraded self-managed island (Rottnest Island has its own management plan which came as a result of heavy lobbying through stake-holder engagement and as such is not managed by the department of Biodiversity, Conservation and Attractions like the rest of the state), the attendance of the "Threatened Species Commissioner" as a keynote was in itself interesting. The Threatened species commissioner does not itself implement conservation projects, but instead co-funds conservation projects which are backed externally.

We (Kate Brown, Grazyna Paczkowska and myself) presented our re-vegetation project on Penguin Island in Western Australia which aims to re-establish vegetation cover needed for many seabird species to breed (including bridled terns *Onychoprion anaethetus* and fairy penguins *Eudyptula minor*). Our project has found low-budget alternatives to re-establish coastal salt-resistant vegetation which can be rolled on a bigger scale (on Penguin Island) using cages to protect seedlings from being picked by silver gulls for nesting material during winter when these birds breed. Once the plants are established and are almost growing out of the cage, the cages are removed. To ensure that there is no light competition between the weeds and native plants, intensive hand-weeding has to take place in winter when most of the rain falls. This is only possible thanks to countless volunteers.

A pile of weeds that were removed on Penguin Island

The most satisfying part of this project is seeing birds using the re-vegetated plots for nesting. It is quite a feeling to see a bridled tern pair defending a newly-established berry saltbush patch which they have used as cover for their nest. It does make chick-banding more difficult however!

A bridled tern guarding its nest under the re-established saltberry bush on Penguin Island

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Origin and movements of Red-necked Phalarope wintering in the Arabian Sea

Rob van Bemmelen, Hans Schekkerman & Ingrid Tulp

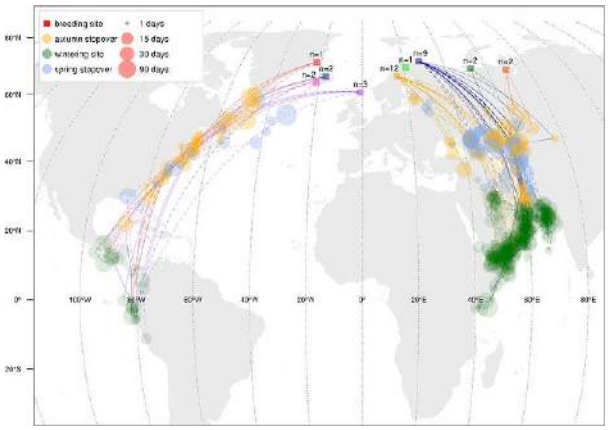
Weighing only ca. 30 g, Red-necked Phalaropes are amongst the smallest seabirds. They are probably best known for their reversed sex-roles, in which females compete for males and leave incubation and care of chicks to the males. While this remarkable breeding system has received quite some attention by (wader) biologists, their biology outside the breeding period has been poorly studied. This is no surprise, given that Red-necked Phalaropes, after breeding on (sub)arctic tundra, migrate long distances to remote, oceanic places. Three distinct wintering areas are mainly known from historical records: the northern Humboldt Current in the Pacific Ocean, the Arabian Sea and in the East Indies. The wintering area in the Arabian Sea has been described by the Dutch captain Mörzer Bruijns, who estimated over 100.000 Red-necked Phalaropes along a transect in the Arabian Sea on 20-21 January 1954 (Mörzer-Bruijns and Mörzer-Bruijns 1957).

The origin of Red-necked Phalaropes wintering in the Arabian Sea has been unclear until recently. Red-necked Phalaropes ringed in northern Norway that were subsequently retrieved to the southeast strongly suggested that at least Fennoscandinan birds winter in the Arabian Sea (Bakken et al. 2003). However, not a single ring recovery exists for the oceanic wintering areas. This shows how ringing studies are suitable for studying overland migrations, but not oceanic movements. Just as in most other seabirds, the study of the phalaropes' migration only fledged after the development of tiny tracking devices: light-level geolocators.

A female Red-necked Phalarope with a geolocator attached, taken in Ammarnäs, Lapland, Sweden. Credit: Rob van Bemmelen

During 2013-2018, we deployed geolocators on Red-necked Phalaropes in Ammarnäs, Swedish Lapland, in Slettnes, northern Norway, and in two sites in Arctic Russia: Tobseda and Erkuta. Another team deployed geolocators in northern Finland. The first four males were retrapped in 2014 and confirmed what we already suspected based on the Norwegian ringing records: they wintered in the Arabian Sea, a migration of ca 6000 km (van Bemmelen et al. 2016). The larger sample (34 annual tracks from 26 individuals), now including tracks from Norway, Finland and Russia, confirmed that also these populations migrate to the Arabian Sea (van Bemmelen et al. 2019). In the latter paper, also 10 tracks (8 individuals) from Greenland, Iceland and Scotland were included, which showed a very different migration route. After the breeding season, these birds migrated westwards across the Atlantic and wintered in the northern Humboldt Current in the eastern Pacific. A truly remarkable migration route!

Probably of special interest for seabird biologists working in the Indian Ocean, are the extensive movements by Red-necked Phalaropes within the Arabian Sea and adjacent areas. Birds generally arrived from their stopovers near the Black, Caspian and Aral Sea to the Gulf of Oman. From here, they dispersed to the Gulf of Aden, the East African coast down to Kenya, or east to Pakistan. In spring, they returned to the Gulf of Oman or to the Persian Gulf before migrating overland back to their breeding areas. During the wintering period, individuals used on average nine sites (range=4-13). The strategy in which birds use multiple sites during the wintering period has been termed 'itinerancy' by (Moreau 1972) and differs from a strategy of residency when individuals remain at a single site throughout the wintering period.



Autumn (solid lines) and spring (dashed lines) migration stopovers and wintering areas of individual Red-necked Phalaropes derived from light-level geolocator tracks.
Credit : Rob van Bemmelen. Published in Frontiers in Ecology and Evolution
https://doi.org/10.3389/fevo.2019.00086

Why do Red-necked Phalaropes show itinerancy? We hypothesize that this results from spatio-temporal dynamics in food availability. Where and when primary productivity peaks in the Arabian Sea and adjacent areas depends strongly on monsoon winds, which change direction twice a year. We were however unable to statistically link phalarope movements to increased experienced primary productivity, which may be due to the fact they feed on zooplankton, not phytoplankton, and to the coarse spatial resolution of the geolocator data and the primary productivity data. Nevertheless, the idea that these movements are driven by environmental dynamics is supported by the strategy of residency shown by Red-necked Phalaropes wintering in the northern Humboldt Current, an area characterized by stable primary productivity throughout the year.

The movements of only few seabird species have been tracked within the Arabian Sea (cf http://seabirdtracking.org), despite this area being one of the most productive marine areas on Earth. We hope our work on Red-necked Phalaropes is an incentive for increased

attention to the study of phalaropes and other seabirds in this rich and dynamic area. In particular, it would be interesting to see whether the strategy of itinerancy is shared among multiple seabird species in the Arabian Sea.

This research was first published in :
van Bemmelen, R. S. A., Kolbeinsson, Y., Ramos, R., Gilg, O., Alves, J. A., Smith, M., Schekkerman, H., Lehikoinen, A., Petersen, I. K., Þórisson, B., Sokolov, A., Välimäki, K., van der Meer, T., Okill, D., Bolton, M., Moe, B., Hanssen, S. A., Bollache, L., Petersen, A., Thorstensen, S., González-Solís, J., Klaassen, R. H. G. and Tulp, I. 2019. A migratory divide among red-necked phalaropes in the Western Palearctic reveals contrasting migration and wintering movement strategies. - Front. Ecol. Evol. 7: 86
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A bivouac for seabird research at Ile du Lys (Glorieuse Archipelago)

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Between April 19th and 24th 2019, a group of 7 seabird researchers camped at Ile du Lys to investigate various components of seabird ecology and conservation on this remote islet of the Glorieuse Archipelago. This expedition was part of the "Opération Iles Eparses 2019", a large multidisciplinary scientific cruise aboard the Marion Dufresne organised by the TAAF and cofunded by the Iles Eparses Consortium (TAAF, IRD, CNRS, IFREMER, AFB, Université de La Réunion, Centre Universitaire de Formation et de Recherche de Mayotte).

The collaborative seabird component of this operation included three research programs: ECOMIE (Ecologie et Conservation des Oiseaux Marins des Iles Eparses, led by Matthieu Le Corre) aims to investigate the population dynamics of seabirds of the Iles Eparses in relation to restoration operations (mostly invasive mammal eradications); SPILE (Structure des communautés et transmission des Parasites dans les ILes Eparses), led by Camille Lebarbenchon) examines the effects of the seabird host community on parasite transmission and spillover on small oceanic islands; CLIMOM (Changements cLIMatiques et Oiseaux Marins, led by Henri Weimerskirch and David Grémillet) is looking at the impact of global warming on tropical seabird ecology and ecophysiology.

The Marion Dufresne. (Credit : Marc Leménager, TAAF)

Thanks to the excellent organisation of the TAAF and the crew of the Marion Dufresne, the stopover at Ile du Lys went extremely well and we all managed to carry out the planned research activities.

Among the interesting results of the expedition, we found that the seabird community now includes 4 (possibly 5) breeding species, 16 years after rats were eradicated from the islet. Brown noddies and sooty terns are still very abundant and two (possibly three) new species were found: the lesser noddy (60 breeding pairs, most of them on eggs + several thousand roosting birds at night), the crested tern (3 pairs, 2 on eggs and 1 on a downy chick + 10 non breeding birds) and the tropical shearwater (two calls heard at night suggesting that some birds may breed on the islet).

A pair of Great crested tern with a chick. This is the first evidence of this species breeding at Ile du Lys, after rat eradication. (Credit: Marc Leménager, TAAF).

Blood samples and swabs were collected from 86 sooty terns, brown noddies, and lesser noddies. This biological material will be tested for the presence of virus and bacteria, using serological and molecular assays. In particular, it will provide information on the level of exposure of these three species to avian influenza viruses and to what point infectious agents are shared among sympatric seabird species (See Camille's contribution in this issue). Several species of ectoparasites were also detected. At least two tick species were found attached on the birds and in their habitat: the soft tick *Ornithodoros capensis*, and the hard tick *Amblyomma loculosum*. Both tick species are widespread in other seabird colonies, but this is the first official report of their presence on Ile de Lys. Tick samples were collected during sampling to investigate the population genetic structure of these parasites among the islands and seabird species of the Western Indian Ocean and to evaluate their potential role as vectors of avian disease.

Amblyoma loculosum attached at the leg of a chick of brown noddy (credit Karen McCoy).

Need for active seabird research in an important pelagic seabird colony in the Northern Indian Ocean

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Marine research in India is largely focused on physical oceanography and fisheries sciences without any due emphasis on marine top predators, particularly seabirds (Mondreti *et al.* 2013). Extensive research has been conducted in the seabird breeding colonies of the Western Indian research (De Monte *et al.* 2012, Mannocci *et al*. 2014, Thiers *et al.* 2014), however in its counterpart, the Northern Indian Ocean, seabird colonies have been poorly studied. In an attempt to fill this lacuna, Ravichandra Mondreti and his team started conducting systematic research from 2013 onwards, in a pelagic seabird breeding colony in Pitti Island, Lakshadweep Archipelago, India. During the course of our study, we made several trips to the island to monitor breeding seabird populations, documented the levels of egg harvesting by humans and natural egg predation by turnstones and crabs; and carried out questionnaire surveys to assess the attitudes of local people towards seabird conservation. The results are quite interesting and led to significant progress in understanding the ecology of this unique pelagic seabird colony (Mondreti *et al.* 2018).

Ravichandra Mondreti while observing the seabird colony in Pitti Island, Lakshadweep

Our future research efforts will be focused in regular monitoring of this important pelagic seabird colony. Our key research interests are studying the feeding ecology of the chicks — either through direct observations or by analysing the stomach contents; breeding behaviour during incubation and chick rearing phases; pollutant analysis through stable isotope analysis of feather and egg samples; periodic questionnaire surveys to understand the changes in attitudes of local people towards seabirds. We further plan to raise awareness among local people about the importance and role of seabirds in the Lakshadweep marine ecosystem.

The breeding seabird colony of Sooty Terns and Brown Noddies in Pitti Island, Lakshadweep

Studies on the pelagic seabird colony in Pitti Island, Lakshadweep, constituted a crucial part of the PhD study of Ravichandra Mondreti. The first phase of the study has already been published in Marine Ornithology: Mondreti, R., Davidar, P & Grémillet, D. 2018. Illegal egg harvesting and population decline in a key pelagic seabird colony of the Northern Indian Ocean. *Marine Ornithology 46: 103-107.*

Currently, we are working on a manuscript 'Perceptions and attitudes of local people towards seabird conservation in Lakshadweep' that will soon be published. Our seabird research in Lakshadweep continues to be unfunded.

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Thanks to all of you!

Call for contributions: This is the seventh Newsletter of the Group. We plan to prepare the next issue for June-July 2020, so please send your contributions to one of the editors (see above) now!