

# Chagos News

The Periodical Newsletter of the  
Chagos Conservation Trust and  
Chagos Conservation Trust US

No 53 December 2018

ISSN 2046 7222







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# Editorial

Alistair Gammell, CCT acting chair

**During the past year CCT has been working closely with the British Indian Ocean Territory Administration (BIOTA) to develop plans for an ambitious project to eradicate invasive, non-native rats from the Chagos Archipelago.**

Approximately half of the archipelago's outer islands are infested by rats.

Their removal would have a hugely beneficial effect on native bird, turtle and invertebrate populations, aid the re-establishment of native forest, and have a very positive impact on the important marine ecosystem surrounding the islands—as shown in a recent *Nature* paper (see page 8).

Rat eradication from all the effected outer islands (excluding Diego Garcia) is a hugely ambitious goal and one that we estimate will cost £2–3 million to achieve, but it is also one of the most impactful and cost-effective conservation actions that could be undertaken.

The project will be delivered in four distinct phases:

- 1) Engaging rat eradication experts to provide a comprehensive project plan that can be implemented and that determines how the work can be undertaken safely for both people and the Chagos' environment and native wildlife.
- 2) Launching a fundraising campaign to secure the money required to fully fund

the project from the implementation phase through to post-eradication monitoring.

- 3) Implementing the rat eradication programme across all the identified infested islands.
- 4) Conducting a post-eradication assessment to confirm that the rats have been successfully removed. Once the archipelago is declared rat free, accidental re-introduction will be prevented by working with the BIOTA to screen visiting boats, and through periodic monitoring of the islands.

The icing on the cake will be to see the native plants and animals of these beautiful islands bounce back to health and flourish once again.

Earlier this year we submitted a Darwin Plus application to allow us to launch the first phase of this eradication project, but just before this edition of Chagos News was finalised, we got the very disappointing news that our application had been refused.

This project is a priority for us and BIOTA, so we will of course now try to raise the funds from elsewhere.

If you know of any generous donors who might be interested in supporting this vital work, please contact us.





# To watch the flight of seabirds

Hannah Wood, Post-graduate Research Assistant, Science Directorate, ZSL

**Seabirds, whose existence is tied to the ocean, have long been a source of inspiration for artists and naturalists alike due to their mysterious lives, ethereal beauty and transient natures.**

Observers are often only able to glimpse a segment of seabirds' lives; as they soar past a ship on the open ocean, or flock together on the sands along our coastlines.

Even during the short period when seabirds breed and raise their chicks, they are often located on secluded islands, or cliff faces inaccessible to onlookers. For me, the allure of the unknown and the mystery of what they do when they are out of sight makes the study of seabirds a captivating occupation.

Thanks to funding from the Bertarelli Foundation and support from the British Indian Ocean Territory Administration (BIOTA) and local military forces, a small team of researchers from the Zoological Society of London and the University of Exeter, including myself, have begun to unravel some of

the mystery around when and where the Chagos Archipelago's seabirds breed and feed.

Though seemingly abundant, seabirds on this chain of islands remain little understood. Twelve species breed in the archipelago, but their colonies are over 500 km from the nearest landmass and have had relatively little attention from scientists.

The isolation and inaccessibility of many of these uninhabited islands makes studying their seabird populations challenging but always rewarding, as we discover new information about where individuals from different colonies forage at sea.

Our main study location over the past year has been a colony of breeding Red-footed Boobies (*Sula sula*) at Barton Point on the eastern arm of Diego Garcia.

Here, human disturbance had reduced the number of Red-footed Boobies to only a handful of birds in the 1970s. We are pleased to report that surveys we conducted in





*"To stand at the edge of the sea, to sense the ebb and flow of the tides...to watch the flight of shore birds that have swept up and down the surf lines of the continents for untold thousands of years...is to have knowledge of things that are as nearly eternal as any earthly life can be."*

Rachel Carson, *The Edge of the Sea*



January and June of 2018 indicate that the number of breeding pairs has since risen to over 8,000.

This startling recovery is a testament to the environmental benefits which have arisen from designating the archipelago as a Marine Protected Area (MPA) in 2010, protecting breeding habitats from disruption and safeguarding species from over-exploitation.

The MPA provides a valuable haven for seabirds when they are breeding. However, because of their ability to travel vast distances, it is possible that in order to feed themselves, and to provide for their chicks, they are foraging outside its boundaries.

The location of feeding events and the extent of these trips is one of the questions our team is trying to address. To do this we are deploying location-logging devices which use both satellites and day length to fix the bird's position on Earth.

To date, we have focused primarily on the movements of breeding adults. This increases our chances of tag recovery, as they regularly return to the nest, and provides valuable insight into an integral part of a seabird's lifecycle.

Of 154 tagged birds from across the archipelago, only one individual has

been recorded leaving the MPA. This is positive news because it indicates that the demarcated area of the MPA is sufficient to support the foraging requirements of adult Red-footed Boobies rearing chicks.

This is only part of the story however, as given the dispersive potential of seabirds, it is possible that when they are no longer tied to the nest, adults roam much farther from the MPA to other island chains, or into waters which are affected by human activities.

Because of this we are also deploying long-term location loggers that record year-round and which we hope to retrieve data from next year.

In June this year, our team took another exciting new step and began studying boobies breeding on Nelson's Island; one of the archipelago's rat-free locations. Here we were able to track Brown Boobies (*Sula leucogaster*) for the first time, in addition to an unstudied colony of Red-footed Boobies.

We have found that the Red-footed Boobies from Nelson's Island undertake much briefer foraging trips than those from Diego Garcia, which spend multiple days at sea.

However, when comparing the two species from only Nelson's Island, Red-footed Boobies still cover much larger distances



Red-footed Booby © Hannah Wootton



In the field, Nelson's Island © Maic Nicol

than Brown Boobies, which forage in shallow coastal waters.

These behavioural and spatial differences in movement patterns were unanticipated, illustrating the need for further research on different seabird colonies across the archipelago in order to better understand how birds' behaviour differs across locations, and whether there are shared or separate foraging areas within or beyond the MPA, which deserve protection.

Conducting fieldwork in the archipelago is an incredible privilege, but it is also a palpable reminder of how humans can impact the marine environment.

On first arrival it seems that you've stumbled back in time to a place where wildlife exists free from human influence. The cacophony of sound from a colony of red-footed boobies bickering and chattering, the noisy beats of their wings as they take off, behind you the forest floor rustling with the scuttling of huge coconut crabs and all encompassed by the metronomic crash of waves on the beach.

Upon closer inspection however, the curtain of an untouched paradise falls away. First you notice plastic.

Plastic used thousands of miles away carried by unwitting ocean currents and now littering the shore of this unseen land, tangled into the

undergrowth and occasionally lining the nests of boobies.

In the corner of your eye you see the black rats introduced by humans, and responsible for the loss of ground-nesting seabird populations, scurrying vertically up tree trunks, or chasing and devouring ghost crabs. And the lines of planted coconut groves where ancient hardwoods full of nesting birds once stood.

None of these impacts are irrevocable though. We can still improve this environment and, given the right protection as we have seen at Barton Point, it is possible for seabirds to recover.

Although our work only covers a few small islands, in the middle of a vast ocean, the information we are gathering can be used to guide research far beyond this archipelago.

I hope that the work I am contributing to will help to inform the further safeguarding of these incredible areas, so that these wild places, and the seabirds which inhabit them will be around to inspire future generations of artists, scientists and nature lovers.

The Chagos Archipelago Seabird Ecology Team will be returning in January 2019 to continue our ongoing research, as well as beginning a new study on the excitingly named Danger Island!



# News in brief



## Removing rats could save coral

In June this year a major scientific breakthrough was published in Nature.

Scientists studying the Chagos reefs say there is a direct link between rats and coral ecosystems.

Professor Nick Graham and his team have been working on the Chagos Archipelago, as part of the Bertarelli Programme in Marine Science, and discovered that invasive rats are causing huge problems for the surrounding coral reefs.

Rats decimate seabird populations leaving few or no seabirds on rat-infested islands.

This in turn reduces the volume of bird droppings, which is now known to be an important natural fertiliser for corals—and key to reef productivity.



## New satellite vegetation maps

The Geographic Information System team from RBG Kew, in partnership with CCT, has produced a set of vegetation maps for 30 islands in the Chagos Archipelago using satellite imagery, expert input and available plant location data.

The maps provide a baseline for future conservation actions, particularly the terrestrial rehabilitation of the Chagos Archipelago.

This is the first time comprehensive vegetation data for the archipelago has been publicly available and can be found on the Chagos Information Portal, a reference library of science, research and conservation work.

The maps were developed with Darwin Initiative Darwin Plus funding.





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## Marine Science Symposium 2018

The inaugural Marine Science Symposium for the Bertarelli Programme in Marine Science took place in September at the Royal Geographical Society in London.

This one-day symposium brought together scientists, students, conservationists, policymakers and marine protected area managers to listen to presentations highlighting key research being undertaken in the Chagos Archipelago.

This impressive lineup of speakers included keynote presentations from Amb. Peter Thompson, the UN secretary General's Special Envoy for the Ocean, the New York Times' journalist Ian Urbina—recounting stories on 'outlaw ocean'—and a special video message from HRH the Prince of Wales.



© Jon Slayer

## Corals of Chagos, anytime, anywhere

The 'Corals of Chagos' resource on the Chagos Information Portal is now available offline for expeditions.

The resource documents the approximately 300 corals and reef-building relatives found in the Chagos Archipelago and was compiled by Charles Sheppard, Douglas Fenner and Anne Sheppard in 2016, with funding from the John Ellerman Foundation.

CCT hopes this resource will help scientists and researchers who travel to the Chagos Archipelago to identify corals without relying on limited internet availability.





# Surveillance from the skies: using drones for ecology and enforcement

Melissa Schiele, MSc student & Dr  
Tom B Letessier, Zoological Society of  
London

© Melissa Schiele

**The British Indian Ocean Territory Marine Protected Area (MPA) was set up to offer safe refuge to marine wildlife and support ecosystems within and beyond its boundaries.**

**But at 640,000 km<sup>2</sup>, managing such a vast area can be challenging. MSc student Melissa Schiele and Dr Tom B Letessier explain how they're trialling new technology to monitor both wildlife and people.**

The management of large and remote MPAs such as the Chagos Archipelago is notoriously difficult.

Having enough staff, vessels and fuel to successfully patrol a territory, which is thousands of square kilometres in size, is costly in time and money. Illegal, unreported and unregulated fishing activity occurs, often undetected, and remains a threat in the archipelago, particularly to the shark and tuna populations.

Protected area managers on land and sea are starting to implement innovative solutions

to tackle long-range surveillance in real time, which is producing exciting results and opportunities for ecological monitoring.

The Zoological Society of London was part of an expedition to the MPA to trial a new amphibious fixed-wing drone. The expedition and trials were supported by the Bertarelli Foundation as part of the Bertarelli Programme in Marine Science and by the Marine Management Organisation.

Our UAV (unmanned aerial vehicle, or drone) is a specially commissioned waterproofed unit for marine surveillance and monitoring.

Using a live-camera stream from the front of the unit, the pilot can watch from land or from a vessel. In addition, there is a secondary camera in the base of the fuselage which can take images of the terrain and wildlife below.

Our aim was to see if the UAV could be used for ecological surveying of the open ocean, the reefs and the islands, whilst also serving as an enforcement surveillance tool. Ultimately, having 'eyes' which can travel further than the radar and much faster than



the patrol vessel may provide evidence that can support cases against illegal fishing activities, and also act as a deterrent.

Flying of UAVs over land is much more common than over the sea, so we were entering uncharted territory.

To our knowledge, no one else was using this system, which required the support of the patrol vessel crew for launching and recovery after water landing.

We successfully deployed the UAV from the bow of the patrol vessel as well as from the islands, with many water landings going smoothly.

However, as our UAV was a prototype, there were a few teething issues meaning the unit was not 100% watertight. Weather was also an issue as we were under the increasing influence of the southwest monsoon and winds were picking up.

As for any UAV operations, it is ill-advised to fly when the wind is blowing more than 16 knots.

It was up to us and the kind engineers from the patrol vessel (and also on Diego Garcia) to repair or replace the components each evening, which taught us a whole new set of electrical and mechanical skills.

During the enforcement surveillance trials, we were able to fly with great manoeuvrability and chase a decoy 'illegal vessel' on the water over several kilometres.

We could detect and photograph the fishing gear in the water from 65 m altitude, but realised a higher megapixel camera would be needed to photograph the identification numbers on the vessels.

The fisheries officer on board and the skipper both agreed that, with a few technical tweaks, a UAV could be an invaluable tool for the patrol team, cutting their steaming time considerably and allowing them to survey more of the territory from the safety and comfort of the wheelhouse.

Most importantly, the ability for them to gather photographic evidence of illegal fishing activity as it happened, before the illegal fishers even saw the patrol vessel, would be hugely valuable.

We will test the new iteration of the UAV next year in the Turneffe MPA in Belize, with the view to then bring it back to the Chagos Archipelago for further trials.

Follow how the team get on #BIOTscience and please visit our blogs: The Intrepid Ecologist and ZSL.



© Melissa Schiele





# BIOTA briefing

© Zoë Townsley

## Hope for coral reefs in BIOT

**This November, Chief Scientific Adviser (CSA) to the BIOT, Mark Spalding, made his annual visit to the territory.**

Alongside seeing key elements of the US Naval Support Facility, trips were made to important natural sites on Diego Garcia and the outer islands.

Top of the itinerary for Diego Garcia were a rare fern wetland and the centuries-old takamaka trees in a small native forest near the old settlement and leper colony of Point Marianne.

During his visit to the Facility, the CSA also heard of the ongoing efforts to reduce single-use plastics, and of progress towards the exciting development of renewable energy for the island.

The visit also enabled the CSA and Environment Officer to repeat a series of shallow lagoon reef surveys.

The survey sites, located in Diego Garcia and each of the northern atolls, seek to identify overall coral health and to describe the fish communities. These are of particular interest following the mass coral mortality from the global bleaching event of 2015–16.

Initial review of the findings suggest that the shallow reef flats are showing good signs of recovery.

Live coral cover remains low and the dead coral still dominate in most sites, overgrown with fine algae or coralline algae.

However, total cover of live coral is considerably higher than in 2017 and the number of new corals is also much higher than last year, which is fantastic news.

Recent research has found that the reefs are faring much better at depths of 15m and below, potentially indicating that these healthier, deeper reefs are aiding recovery in the shallow waters.

Other visiting scientists have also been welcomed to Diego Garcia this November.

Two scientists from RBG Kew have been undertaking some detailed surveys of vegetation using a drone, and also collecting plant specimens, plus the return of the ‘turtle team’ for their bi-annual visit.

Both teams, and the CSA, have been able to give presentations of their work and of the natural history of the islands to personnel, which is a fantastic way to raise awareness and concern for this unique place.



The British Indian Ocean Territory is one of 14 British Overseas Territories. It is administered from London by the British Indian Ocean Territory Administration.









Goose harpoons arriving on marine debris © Helen Roy

## Preventing the arrival of invasive species

Helen Roy, Jodey Peyton and Oli Pescott,  
Centre for Ecology & Hydrology

**The British Indian Ocean Territory (BIOT) comprises extensive coral reefs and unique terrestrial habitats; there is much to protect.**

As part of a team of ecologists led by the Centre for Ecology & Hydrology in collaboration with the Foreign and Commonwealth Office (FCO), and funded by the UK government's GB Non-Native Species Secretariat, we had the opportunity to visit the archipelago.

The overarching aim of our expedition was to work with the small environment team on Diego Garcia to identify a list of invasive non-native species with the potential to arrive, establish and threaten biodiversity and ecosystems, human health or the economy.

It is an immense privilege to visit the archipelago. Not only to see the amazing wildlife and beautiful environment, but also to meet with the people working to conserve this

precious place. The knowledge and passion of the environment team for the remarkably varied habitats on and around Diego Garcia is incredible.

We enjoyed every moment in their company and learnt so much about the natural history of these atolls, but also the ways in which biosecurity is implemented.

Through two workshops we were able to work collaboratively to agree priority lists of invasive non-native species to inform biosecurity.

In the first workshop, we presented lists of species currently absent that have the potential to arrive, establish and have adverse effects across the archipelago within the next 10 years.

We had identified these species through extensive review of databases, literature and consultation with experts. Each species was assigned a score of 1 (least



likely) to 5 (most likely) for the likelihood of arrival, establishment and impact for each of the three categories—biodiversity and ecosystems, human health or the economy.

At the workshop we reviewed these lists with the environment teams, altering scores and adding species. The species were then ranked to produce a priority list to use in the next workshop for developing action plans for the most damaging species.

Snakes and ants topped the lists for posing the greatest threats. There are currently no snakes established on the archipelago but there are a number of non-native reptiles, and sadly many rats.

These species, particularly the rats, are already causing problems but the arrival of the brown tree snake, *Boiga irregularis*, is a huge concern. This invasive non-native species, infamous for invading the island of Guam, has caused ecological devastation and the extinction of many birds, with a subsequent cascade of knock-on effects.

We were amazed at the abundance and diversity of ants in all the terrestrial habitats we visited, but through our horizon scanning work we have identified many more that could arrive. Some would have profound human health impacts and all have the potential to disrupt ecosystem functioning.

Perhaps most worrying are the effects they could have on the coconut crabs. Ants, specifically yellow crazy ants, *Anoplolepis gracilipes*, have wreaked havoc on Christmas Island through predation of red crabs, *Gecarcoidea natalis*, which is considered a keystone species. Such a situation is not hard to imagine on Diego Garcia, so yellow crazy ants were categorised as high priority in our horizon scanning.

Fortunately, there are simple biosecurity measures that can reduce the risks. We heard from the customs and environment teams about the approaches already in place and how preventative measures at pre- and post-border controls have been effective at intercepting a number of species.

Everyone has a part to play in biosecurity; the military and civilian communities on the archipelago can assist in many ways. Raising awareness about invasive non-native species and the problems they cause is important.

But there are challenges.

The community is constantly changing as people come and go. Many of the invasive non-native species are tricky to identify and can be quite cryptic. However, importantly, there is shared interest in protecting the archipelago from the most damaging invasive non-native species.

Memories of these remote atolls, the incredible wildlife and stunning views, but also the wonderful people we met, will remain with us. We have returned home with many thoughts and ideas inspired by our visit.

We are extremely grateful to many people for all they did to make this incredible experience possible, but specifically Ariella Combes (Deputy Administrator, British Indian Ocean Territory Administration), Harri Morrall (Environment Officer, British Indian Ocean Territory Administration), Nestor Guzman and Linda Corpus (US Public Works Department, British Indian Ocean Territory).



© Helen Roy



The Chagos Archipelago is a rare haven of beautiful reefs, diverse wildlife and clean waters, located in the midst of the Indian Ocean. The Chagos Conservation Trust is the only UK charity dedicated to protecting it.

For more information please visit [chagos-trust.org](http://chagos-trust.org)

If you would like to contribute to Chagos News please email [chagosnews@chagos-trust.org](mailto:chagosnews@chagos-trust.org)

