British Indian Ocean Territory Expedition Report
SV Antsiva 13th – 20th March 2020
Expedition Lead – Prof Heather Koldewey, ZSL

Summary

The team on board the *SV Antsiva* included a film crew of four from ZDF in Germany to make a documentary for their popular series Terra X, provisionally called 'The undersea garden of the Chagos Archipelago'. Five experts (from ZSL, Oregon State and Stanford Universities) provided the local knowledge and technical information to inform the documentary. We experienced complex logistics due to rapidly changing travel plans due to the global Covid-19 situation, resulting in the unfortunate premature cancellation of the expedition on the 18th March 2019. The team were incredibly grateful for the support of Rachel Jones, Emma Levy, the Bertarelli Foundation and BIOTA for their help in securing the relevant permissions and associated logistics for our safe return.

During our time in BIOT, we were able to opportunistically collect data on seabirds, terrestrial invertebrates and plastics. We serviced eight receivers from Speakers Bank, Egmont and the Grand Chagos Bank, deployed two acoustic tags on mantas and one tag on a silver tip shark, and collected isotope samples from seven fish species. The ZDF crew were able to secure 7.8 hours of raw footage for their documentary and we secured some recordings for use in podcasts.

Expedition objectives

The objectives of the *SV Anstiva* trip were as follows:

1. Film and document wildlife and habitats in BIOT, including seabirds, sharks, manta rays, turtles, coconut crabs, terrestrial invertebrates, corals, and seamounts.
2. Film and document the research activities of scientists from the reef- and oceanography-based expeditions on other vessels.
3. Showcase island-based work linked to conservation and management e.g. rat/bird islands and the process of restoration, coconut crab recovery, management of plastic waste in remote archipelagos.
4. Conduct routine management activities to service the acoustic array infrastructure and maintain the functionality of the array by tagging sharks and rays. These activities will be showcased as part of the documentary.

Logistics

Date	Location	Activity
11th March	Joined *SV Antsiva* in Gan, including expedition medic Dr Tom Hewitt due to delays in travel logistics for the Reef 1 team on the Grampian Frontier	
11th – 14th March	Gan to BIOT transit	Transit

14th March	Arrived Egmont Atoll and returned medic to Grampian Frontier	Pete Carr/Heather K visited Iles Lubine, Sipaille and des Rats as reconnaissance for filming activities following day.
15th March	Egmont Atoll	Morning PC/HJK returned to Iles Lubine, Sipaille and des Rats for further opportunistic surveys and preparation for filming. Film crew spent morning covering acoustic receiver maintenance and afternoon covering islands (coconut crabs and plastics).
16th March	Egmont Atoll	PC/HJK visited Iles Sudest, Tuttamucca and Carr-Pate. Film crew spent day covering manta tagging and further coverage of coconut crabs on Ile des Rats
17th March	The Brothers	Transit to The Three Brothers. PC/HJK plus film crew visited South Brother to film seabirds and islands. PC and the crew stayed overnight while HJK returned to the *SV Antsiva* to organise logistics.
18th March	The Brothers	Island team decamped after filming sunrise and seabirds. **Expedition terminated.** Began transit in the afternoon.
18th – 23rd March	Transit from The Brothers to Male then onto Australia/Germany/UK/USA.	Transit

Communications outputs

ZDF filming

The film crew were able to secure 2.15 terabytes of footage which translates into 7.8 hours of raw footage, both underwater and on land. Due to the schedule and weather conditions, the following filming components were covered:

- Seabirds and associated research
- Coconut crab habitat and ecology
- Island habitats and ecology
- Impact of rats on seabird islands
- Impact of plastic
- Manta rays and whale shark – spot pattern photo identification and tagging
- Acoustic receiver maintenance

Due to the early conclusion of the expedition, no footage was captured of the coral reefs (which was to be conducted with the Reef 1 team on the *Grampian Frontier*) or the shark tagging (which was scheduled for Peros Banhos). This will require a follow up visit to BIOT to secure this footage.

In addition to assistance with filming, the team provided considerable local knowledge, wildlife expertise, practical advice and assistance to the film crew, including landing safely on coral islands from small boats and "surviving" the night under canvas on South Brother.

Further voice recordings were made on seabirds by Pete Carr for the ZDF online magazine.

Podcasts
Due to the changes in schedule and early completion of the expedition, limited podcast recordings were possible, covering seabird research, coconut crabs and plastic.

Opportunistic terrestrial sampling

Ornithology
Complete seabird censuses were undertaken of all islands visited (n = 7). An internationally recognised standard method of counting breeding seabirds was used whereby Apparently Occupied Nests (AONs) are counted directly for visible nesting species and estimated for burrow and cryptic nesting species. All other birds on islands seen were recorded.

Fifteen of the 18 breeding seabirds in the Chagos archipelago were recorded of which eight were actively breeding (Wedge-tailed Shearwater, Tropical Shearwater, Masked Booby, Red-footed Booby, Great Crested Tern, Sooty Tern, Brown Noddy, Lesser Noddy and Common White Tern). The two shearwaters were recorded in exceptional breeding numbers on South Brother, Wedge-tailed equating to the highest count ever (563 in 2006, 550 in 2020) and Tropical Shearwater more than doubling the highest previous count with 1100 in 2020. Red-footed Booby continue to increase in breeding numbers and colonise further islands in relict stands of native forest trees. Particularly interesting results were recorded in Egmont atoll: On the Ile Lubine complex breeding numbers increased from a single pair recorded on Lubine in 2012 and 2015 (probably the first records for over 100 years) to 32 pairs this census. On the Sudest complex, 123 breeding pairs were recorded mostly from Carr-Pate with a few pairs on Tuccamucca in 2013, which increased to 457 pairs this survey spread across the three islands. Other records of note were a wintering flock of 80 Little Tern on des Rats and a vagrant Bulwer's Petrel in the seas of the northern area of the BIOT EEZ.

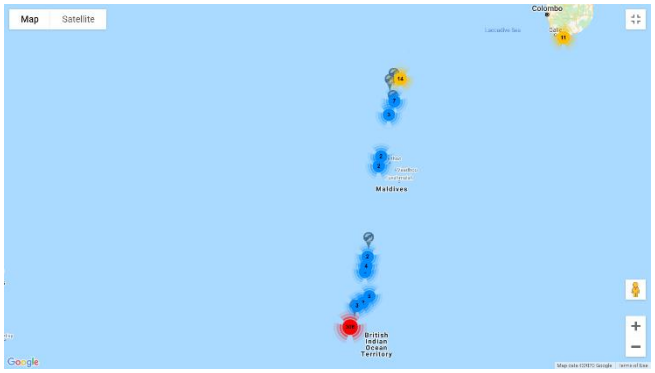
On 16th March, a white-tailed brown morph Red-footed booby *Sula sula* was recorded breeding on Ile Sudest, Egmont Islands. This is an exceedingly rare sighting as 99.9% of the *c.* 22,000 Red-footed boobies in the Chagos archipelago are of the all-white morph. There are three previous documented records, one on Diego Garcia in 1995 and a second bird breeding on Grand Coquillage, Peros Banhos in November 2008 and again in November 2009. The nearest breeding colony of white-tailed brown morphs is Europa Island in the Mozambique Channel.

Invertebrate collecting and recording
Invertebrates were recorded on all islands visited (Lepidoptera and Odonata) and collected opportunistically using sweep-netting and manual collection on South Brother (while filming of red-footed boobies was underway).

No new species for atolls were visually recorded though four species of Lepidoptera and Odonata each were sighted. Several undetermined specimens were collected and will be prepared and passed to ZSL invertebrate specialists for identification and recording.

Assisting Coconut Crab research
Presence/absence of Coconut Crabs was recorded for all islands visited. One of ten trail cameras was fixed in place, monitoring a crab burrow on Ile des Rats (Egmont atoll). The camera will remotely record 10s video footage of crab activity when triggered, repeating filming after a 10s interval. The equipment will record for 4-6 months and the footage stored on an SD card for collection in the future.

Plastic surveys and research
Floating plastic debris was opportunistically recorded at sea in transit to and from the Maldives on the Marine Debris Tracker application. On Ile des Rats (Egmont), repeat surveys (3x 100 m transect on Marine Debris Tracker and 3x photoquadrat surveys) were completed at the same locations on the beach cleaned as part of the BIOTA/ZSL/Swansea Darwin Plus project to look at re-accumulation rates. A single dead green turtle hatchling was found being consumed by a crab and dissected, but no plastic was identified in the guts.



Marine Debris Tracker map of items recorded

Array maintenance and tagging

We were able to retrieve some time-sensitive equipment, service receivers in the southern end of the archipelago and deploy a limited number of tags. We retrieved two of the three acoustic release receivers from Speakers Bank, 5 VR2W acoustic receivers from Egmont and the Grand Chagos Bank (Table 1), deployed 2 acoustic tags on mantas and 1 tag on a silver tip shark (Table 2). We also collected isotope samples from 14 animals from 7 species of fish (Table 3).

We transferred equipment (left and picked up from Ile des Rats beach to maintain isolation of the two teams) to the team on the *MV Tethys Supporter* with the aim of retrieving the three acoustic receivers while at Sandes Seamount. Unfortunately, due to weather conditions and early termination of their expedition, this activity was not completed. Due to the lifespan of these receivers, we will need to explore other opportunities to retrieve them before the end of June.

As we relocated from Egmont Atoll to South Brother, we opportunistically encountered a juvenile (5 m) male whale shark (*Rhinocodon typus*). As very few whale sharks have been documented in BIOT, the tagging team took photo ID shots for later referencing with databases for known individuals in the Indian Ocean. A positive connection to any individual would be an exciting step forward in our understanding of the role of BIOT for this elusive elasmobranch.

During the expedition, we also encountered several abandoned, lost or discarded fishing gears at Egmont. On the beaches, the terrestrial team documented two satellite transponders washed up on the shore. These transponders were consistent with those used on drifting fishing gears such as the longlines or fish aggregation devices. Additionally, the tagging team found a short (~1 km) longline entangled on the reef in northeast Egmont. The gear was more consistent with those expected from a multipurpose vessel out of Sri Lanka or India, rather than an industrial longliner. Each line had a short wire leader – illegal in the territory – and a 'J' hook. No identifiers were found on the gear. The location of the gear was reported to the Senior Fisheries Protection Officer onboard the Grampian Frontier and was filmed by the ZDF underwater camera team.

Table 1. Details of acoustic array receiver servicing

Location	Receiver Type	Status
Speakers Bank 01	Acoustic release	Serviced
Speakers Bank 02	Acoustic release	Serviced
Egmont 01	VR2	Serviced
Egmont 04	VR2	Serviced
Egmont 07	VR2	Serviced
Egmont Global 01	VR4G	Replaced with VR2W
Grand Chagos Bank 03	VR2	Serviced
Grand Chagos Bank 07	VR2	Serviced
Grand Chagos Bank 09	VR2	Serviced

Table 2. Acoustic tags deployed

Common Name	Scientific Name	Acoustic Tag
Manta ray	*Manta alfredi*	2
Silvertip shark	*Carcharhinus albimarginatus*	1

Table 3. Isotope samples collected

Common Name	Scientific Name	Number
Dogtooth tuna	*Gymnosarda unicolor*	1
Jobfish	*Aprion virescens*	2
Bluefin trevally	*Caranx melampygus*	1
Smalltooth emperor	*Lethrinus microvoa*	1
Rainbow runner	*Elagatis bipinnulata*	2
Kawakawa	*Euthynnus affinus*	7

Other activities

The *SV Antsiva* deployed two of the NOAA drifters, with the other six deployed by the *MV Tethys Supporter.* This is part of the Global Ocean Observing System and will help fill an important gap in global ocean

observing, identified during the UN Decade of Marine Science Indian Ocean Regional Meeting in Chennai, India, in January 2020.

Drifter ID #	Date and time deployed	Latitude/Longitude
300234068054470	13th March 2020 0700 GMT	05°02874' S 072° 26613' E
300234068055710	18th March 2020 1347 GMT	05° 65458' S 071° 58171' E

Expedition team

Zoological Society of London (ZSL) – Heather Koldewey, Pete Carr, David Curnick
Oregon State University – Taylor Chapple
Stanford University – Sammy Andrzejaczek
Medic – Dr Tom Hewitt
ZDF film crew – Claudia Ruby, Christian Howe, Ulrich Kunz, Lars Erik Torbjörn Karvang

Acknowledgements

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