

2017 Annual Report Chief Science Advisor, BIOT Administration



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Key Recommendations

Throughout this document recommendations are highlighted in **bold typeface**.

Below is a summary of the key recommendations only.

Recreational fishing:

The work already undertaken on the creel survey needs to be analysed and written up as a priority.

Further assessment of fisheries not covered by the creel survey should be planned, in particular to target: Yachts in transit; opportunistic fishing during working hours; unreported recreational fishing from MWR vessels; fisher survey in the villages.

There is a clear and urgent need for greater clarity on regulations, for clear communications of these, and for a clear framework for enforcement.

Clarity. The regulations on catch limit should be clarified; the list of restricted species should be extended. Suggestions are provided.

Communication. The regulations need to be made available in simple terms and available to all language groups on Diego Garcia. These should be incorporated into new-staff Induction programmes.

Enforcement. Even in the absence of legal regulations, policy can be set to create the same effect. Plans should be made to encourage compliance after new regulations are clearly implemented.

Illegal fishing

Efforts should be made to consider opportunities and pursue funding to support further occasional or regular aerial surveillance.

The active removal and logging of FADs by OISP and regular patrols should be continued, as should active UK engagement in ongoing discussions around international measures to reduce FAD abandonment and loss.

Further consideration is needed to deal with the challenges of high running costs of the BPV to ensure there is no loss of patrolling efficacy. This could include further consideration of unmanned patrolling and opportunistic observations from other vessels in transit.

Yachts

Efforts to tighten guidelines are to be encouraged. In particular a clear ban on the leaving of any waste on the islands should be emphasised. Fires, currently permitted, should be restricted and some notes on a policy are provided.

The requirement to return fishing log-sheets needs to be made very clear, stating that visiting customs officers may request to see these during any visits. The right to inspect catches should be made clear.

Waste

A programme for plastics removals is needed for all islands in BIOT, prioritising the nature reserve islands.

Current investigations into the possibility of establishing an Adopt-a-Beach campaign on Diego Garcia should be encouraged. Establishment of such a scheme would require building a structure that will be enabled and supported for the long-term.

A programme of quantifying and monitoring solid waste on beaches should be established by the EO, in collaboration with the PWD, and with guidance from CSA and others as needed.

The shipwreck on the northeast coast of Diego Garcia should be removed if this can be done with appropriate environmental precautions. Irrespective of removal, it will be important to clear the wreck and adjacent beaches of the many components which are likely to be dispersed over a large area.

Discussions on a BIOTA led programme of water quality assessment should be resumed and put into action.

A tighter policy on dealing with recyclable solid waste on DG may be needed to avoid risks of pollution from materials that are currently held in the open for up to three years adjacent to the lagoon. This could include pre-sorting and separation of high-risk components, and more frequent collection to avoid the accelerating impacts that may come with corrosion.

The development of a composting facility should be encouraged as a means to reduce waste and emissions. It could provide a source of biogas generation. Expert advice is needed on the subsequent application of compost in the sensitive atoll setting, and on options for using such compost for limited cultivation.

BIOTA should encourage the purchase of new incinerators in advance of any breakdown. This might be incentivised by clearer and more stringent regulations on the dumping of unprocessed waste. The possibility of generating energy from waste.

It is critical to continue emissions reductions and to attain the targets established under the UK commitments under the UN Framework Convention on Climate Change and the Paris Agreement. The proposed installation of a solar plant is welcomed and should be expedited. Further installation of solar or other renewable energy should be encouraged subject to environmental risk assessments. Reductions in energy use also need to be made and reported.

Natural habitat impacts

Despite concerns being raised every year, damage continues to native vegetation around Diego Garcia. The BIOT Administration should provide strict protection to coastal vegetation and insist that any future requests to clear or even reduce height for operational purposes are fully reviewed by EO or other environmental experts. Any work underway must be subject to regular site inspection. BIOTA should consider whether it may be appropriate to place tree protection orders on the more ancient native trees on DG.

BIOTA should consider options for reviewing the needs for coastal engineering in Diego Garcia in preparation for future discussions with the US as further requests for engineering arise.

Invasive species

There appear to be a number of risks for invasive species arrival which could be reduced considerably, notably with changes to the current import inspection process for organic matter arriving in shipping containers.

Environmental Management

Environmental work and roles need to be more clearly formulated, notably for the Plantation Manager and the SFPO.

Additional environmental staffing is needed on Diego Garcia, and funds should be sought through externally funded, project-focused grants.

External environmental research should continue to be encouraged, while it would be useful for BIOTA to formally state some of the key elements of research. This would include research that is management-relevant as well as new exploration. Timely and adequate reporting is already required, but researchers should continue contact and share other publications as these emerge. BIOTA should encourage research expeditions that engage or train regional partners and researchers from other Indian Ocean nations and Chagossians. Data sharing needs to be made explicit, while giving a fair opportunity for academic researchers to publish prior to data release.

The use of the BPV as a research platform, for up to two months per year, should be maintained, but given the high running costs it may be necessary for BIOT to seek additional funds from expeditions to make a full or partial payment for these.

The BIOT Administration should actively seek additional funding such as Darwin Plus, to support its environmental work, and should also give itself sufficient lead-time to apply for these.

The need to re-allow diving by BIOT Administration staff and qualified and appropriate volunteers needs urgent attention.

Attention should be given to the development of island-specific data, pulling together currently disparate knowledge from key experts.

It would be valuable to establish a more comprehensive library of published and grey literature on the BIOTA web-site site, notably expedition reports and legal texts.

There may be growing opportunities for volunteering and these should be considered in future planning.

Fishing

Recreational fishing

Assessment

The creel survey described in 2016 has not been written up. There was insufficient time prior to the handover from the outgoing Environment Officer. **Following the CSA visit, analysing this work and writing it up has been prioritised. It needs to be done to inform the writing of the new environmental management plan.**

The creel survey focused on coastal fisheries. It would be helpful if, alongside this a summary of catch return forms could be made available, including those from the MWR and offshore vessels.

Going forwards, **a further assessment of fisheries not covered by the creel survey would be appropriate.** This could target four broad areas:

1 – Yachts in transit. It seems unlikely that the volume of traffic from yachts is sufficient to have a large negative impact on fish populations, but it would be useful to quantify this in order to be more definitive and to bring in regulations if needed. The obvious approach would be to develop a simple creel survey to be undertaken as part of Outer Island Sovereignty Patrols. It could be kept independent of formal Customs and Immigration checks and considered voluntary, to be undertaken by the SFPO and/or EO. It may be appropriate to forewarn yachts appropriately, perhaps as part of the permitting and added to the guidance note. Yachts could be informed that this is a creel survey, boats are asked to complete forms which will be collected, and that we will ask to look at any catches present on board.

2 - Opportunistic fishing during working hours. As mentioned in 2016 Annual Report, this is widespread, with workers fishing off the back of working vessels, and probably along the coast, for example along the engineered sea-wall on the outside of the small-boats harbour. Some initial work is needed to identify the catch-points and then a creel survey of returning fishers should be undertaken.

3 – Unreported recreational fishing. There is consensus that catch returns from MWR are incomplete, especially from private hire vessels (Makos) where MWR staff may not accompany the boats (it is MWR staff who complete the returns). There may also be a failure to include catch by MWR staff who may be accompanying recreational fishers, or indeed fishing alone, on these catch returns. It would be useful for EO and SFPO to plan a programme to meet returning vessels and independently enumerate returns. It may also be valuable for EO or SFPO to randomly join some fishing trips to record fishing processes and catches.

4 – A fisher survey in the villages. The completion of catch-returns from these fisheries is non-existent and would be time-consuming and difficult to enforce. The creel survey should reveal some aspects of this fishery, but a non-confrontational approach to discussion with these fishers would be of considerable value as an addition to the creel survey (though it should not slow down the need to complete the latter and should be reported separately). The current EO has considerable skills and background in these survey techniques

It may be valuable to continue elements of the creel survey as a form of ongoing recreational fishery monitoring, but this should be determined after the initial report is completed.

Regulation and enforcement

The closure of certain areas to fishing around Diego Garcia has been created by a combination of legal restrictions and safety/security restrictions creating *de facto* closures. These were clearly explained and promulgated, as highlighted in the 2016 Annual Report. This same report also recommended that the no-fishing areas on the outer margins of Diego Garcia be extended beyond the reef crest. The same request was more recently made for practical reasons (the current convoluted boundary is unenforceable), a draft version was drawn up with input from CSA and BritRep, with a fishing exclusion area to go offshore along the East coast of Diego Garcia. This was proposed to have a simple boundary contained by a small number of fixed co-ordinates. A small sector has been left at the far north of this east-facing coast to provide for fishing during periods when sea-states prevent fishing along the west coast. These final boundaries are undergoing final legal approval and will be printed on a new release of the Hydrographic Chart for BIOT.

In terms of the enforcement of fisheries regulations, the Royal Overseas Police Officers (ROPOs) on island in Diego Garcia informed the CSA that they have focused their enforcement efforts on no-fishing areas. Other regulations or policies, notably around catch limits and restricted species have largely been left unpoliced, in large part due to perceived challenges in interpreting and enforcing these.

There is a clear and urgent need, which was reiterated by multiple sources, including some fishers, for greater clarity on regulations, on the need for clear communications of these, and on the need for a framework for enforcement.

1 – Clarity.

We need to develop clear, simple and enforceable regulations. A Guidance Document, issued to MWR in May 2017 (Annex 1), but is considered long, confusing, and ambiguous. My recommendations are:

Catch limit. The current regulation for 3-days fish for personal consumption is ambiguous. A clear interpretation needs to be provided which should be for no more than 3kg of fish (unprocessed). To allow for the capture of larger fish additional terminology could be included to allow for one large fish (>3kg) only, but we should take advice on how this might lead to bycatch waste if it was the last fish caught.

Weight or size restrictions. Limiting the catches of particular species is a widely used technique to prevent catching juveniles that have never bred (minimum size of individuals taken) or to maintain a pool of the most fecund large adults (maximum size). At the present time, with relatively low fishing pressure it seems an unnecessary complication, although the findings of the creel survey or ongoing future monitoring could necessitate such restrictions in future.

Restricted species. The following species may not be taken and must be returned to the water alive.

1. Napoleon or humphead wrasse *Cheilinus undulatus*
2. Giant grouper *Epinephelus lanceolatus*
3. Blacksaddled coral grouper *Plectropomus laevis*
4. Squaretailed coral grouper *Plectropomus areolatus*
5. Giant guitarfish (*Rhynchobatus djiddensis*)
6. Longtailed tuna *Thunnus tonggol*
7. Narrow barred Spanish mackerel *Scomberomorus commerson*
8. Yellowfin tuna *Thunnus albacares*
9. Billfish (marlin and sailfish)

10. Sharks

Of these, the change in status of yellowfin tuna will be unpopular among many recreational fishers. This is recommended following the assessment of the Indian Ocean Tuna Commission that this species is currently overfished and being depleted. Recreational catches in BIOT have largely been of immature fish that have not yet had a chance to breed.

Gear restrictions. These are well understood – no spears, no steel trace. Future regulations might restrict hook size or line strength to prevent deliberate targeting of largest fish.

2 – Communication.

People need to be told what these regulations are in plain language, and with interpretive materials for non-native English speakers. **A simple Guidance Note is needed. Signs need to be placed in prominent places, including Downtown and the villages, and at the Marina. Laminated versions should be placed prominently in MWR vessels.**

These regulations could also be included in regular new-staff Induction process that takes place for all staff (every 2 months). The EO should make a short presentation as part of the induction, or a representative if the EO is not present on-island.

3 – Enforcement.

For policing, it is ideal if regulations could be set established in law. Given the challenges of establishing any new legal controls on fishing this may not be possible, although it should be noted:

- There is already legal provision for the protection of billfish and sharks under 2007.5 The Fisheries (Conservation and Management) Ordinance
- It may be valuable to investigate whether other species listed above could be protected under existing regulations to protect threatened species (that being the reason for their inclusion).

Even in the absence of legal regulations, policy can be set to create the same effect, and can be enforced. It may be worth setting some spot checks by ROPOs on returning MWR vessels to encourage compliance after new regulations are clearly implemented.

To support compliance and reporting work currently underway by the EO, preparing a series of flash-cards, plastic rulers and weighing scales to be placed on fishing vessels, needs to be completed.

Illegal fisheries monitoring and assessment

MRAG have provided detailed reports to the IOTC (Mees 2017) and to the British/Seychelles Fisheries Commission (Moir-Clark et al. 2017).

During 2017 some 12 mid-sized fishing vessels were observed in BIOT waters, all from Sri Lanka. Three were observed during the first week of operations of the new BPV. They were approached and photographed but no further interventions were made. Three arrests were made in February (also mentioned in the 2016 Annual CSA Report) – each was tried, found guilty and paid a fine prior to release. A further arrest in September was taken to Diego Garcia, but then transferred to the jurisdiction of the Sri Lankan Authorities as part of a bi-national agreement with the Sri Lankan government. Five other vessels were boarded in May, June and July, but were released with no further action taken as there was insufficient evidence of illegal fishing (Moir-Clark et al. 2017).

The MRAG report to the British/Seychelles Fisheries Commission includes a summary of the trials of new surveillance approaches which took place in mid-2016. These included 100 hours of aerial surveillance which was used both to detect BPV detection success and the inter-operability between an air asset and the BPV. This surveillance, in May-June 2016, supported the successful apprehension of 5 IUU vessels, some six further possible IUU vessels and four fishing vessels in transit but not declared. The report further suggests that there could be some change in IUU activity, including:

- *More sophistication by employing better technology to avoid detection (radar & smart phone / navigation technology);*
- *A possible switch of focus to deep water tuna species in response to patrol effort on shallow banks; and*
- *Cooperative fishing expeditions with several vessels working together for safety in numbers; perhaps even prepared to sacrifice one vessel so the remaining can escape.*

Given the above, efforts should be made to consider opportunities and pursue funding to support further occasional or regular aerial surveillance, or indeed the use of drones. This might be considered in partnership with other Indian Ocean nations, or indeed with the research community if there are overlapping interests.

Other trials reported in this document included radar detection and other electronic warfare equipment, but in both cases trials were insufficiently long to overcome issues around testing and equipment calibration. Further it was suggested that such equipment may, in large part, but impractical for the key IUU vessels being intercepted which are small and low-tech, making many of them invisible to systems designed to intercept electronic signals from fishing vessels (Moir-Clark et al. 2017).

Drifting Fish Aggregating Devices

One other component of the work of MRAG has been to gather and document the numbers and distribution of Fish Aggregating Devices (FADs) found in open water, on reefs or on beaches in BIOT (Davies et al. 2017). In the period from 2014 to September 2017 some 74 FADs have been recorded by MRAG. Most are found beached (41), or in the open ocean (27). Many have identification markings and can be traced to the vessel, with the majority of these coming from the Spanish and French purse seine fleets which are the most active in the western Indian Ocean.

FADs, by definition, attract fishes and their increasing use (the numbers of FADs drifting in the Indian Ocean increased fourfold between 2007 and 2013 and is likely still increasing (Maufroy et al. 2017)). While the increasing deployment of FADs could be adding to the problems of over-harvest, it is perhaps the lost or abandoned FADs which are of more immediate concern. FADs have greatly increased overall quantity of large drifting objects in the open ocean and with this comes increasing risks of marine invasive species transfers through the process known as rafting. Further problems posed by FADs include ghost fishing; physical damage to reef structure as they become entangled on the sea-bed; and becoming a physical obstruction on beaches. They are largely made of non-biodegradable plastic netting, which means they may remain in situ for decades to centuries, gradually breaking down into microplastics.



Some of the FADs observed by the CSA: Top left: Ile Parasol, 2017; Top centre and right: Danger Island 2017; Bottom left: Middle Brother, 2016; Bottom centre and right: Peros Banhos, 2015.

The current work of MRAG and the OISPs includes the documentation of FADs, collection of FADs where drifting or hooked onto the reef, and the removal of transponders from any FAD. **This should continue, while perhaps more important is the active engagement of the UK in ongoing discussions around international measures to reduce FAD abandonment and loss through international fora such as the Indian Ocean Tuna Commission.**

BIOT Patrol Vessel

BIOT has benefitted from the arrival of the new BIOT Patrol Vessel (BPV) which arrived in Diego Garcia on 20 January, 2017. It has now completed a full year of operations. After some initial sea trials the majority of its time has been spent on fisheries patrols and Outer Island Sovereignty Patrols (OISPs), with some further time invested in expedition support and support for Chagossian Heritage visits (Moir-Clark et al. 2017).

The new BPV has some considerable advantages in terms of both surveillance equipment and the speed both of the main vessel and the daughter craft. It is also spending more time at sea, with fewer returns to Diego Garcia. In an effort to optimise cost-effectiveness the BPV is largely being operated at highest fuel efficiency, with relatively slow patrolling speeds, and spending periods idling or at anchor.

Some further refinement of patrolling is needed to ensure it can follow a mixed strategy, including exploratory patrolling and occasional faster transit times to access more remote areas.

Part of such a solution may be found in the application of unmanned patrolling and opportunistic observations from other vessels in transit. The uptake of the former may require up-front expenditure which is unlikely given current constraints but forward-thinking and some additional start-up funds, wisely invested could lead to net savings and more effective patrolling.

Yachts

Work is underway to develop a revised guideline document for visiting yachts. The following comments may support this work:

It will be important to make it clear that no waste (including organic, or material for recycling, may be left on the islands. It may be worth stating that organic waste may be dumped at sea, but only beyond 3 nautical miles from any island or shallow banks.

There has been some concern about the permission to light fires (which is allowed in the current regulatory regime), some further tightening of this regulation would be sensible. **A suggested policy for fires might include:**

- Fires to be permitted in a demarcated area only. This would require additional signage, and would suggest only on Boddam, Ile de Coin and maybe Diamante? (The first two have quite clear areas where people gather).
- They must only be lit in open areas, cleared of all natural and flammable material for a 3m circumference around the fire, and with no overhanging branches less than 10m from the fire.
- Must not be left unattended.
- Must be no larger than 1m diameter and built no more than 60cm high.
- May only burn natural plant materials (no treated wood, plastic, or other man-made materials).
- Must be fully extinguished (can be touched by hand) prior to departure.

The requirement to complete and submit fishing log-sheets is already clearly stated (including a requirement to submit nil returns for non-fishing visitors). Although vessels are required to submit these within two weeks of departure very few have been returned. **There may be some value in further emphasising that this is a requirement and that visiting customs officers may request to see these during any visits. This may further encourage submission, and should make it relatively easy to undertake the creel survey or a more pro-active approach to inspecting vessels.**

37 yacht permits were granted last year and 18 applications for 2018 had already been made by early January 2017. BIOTA in London have become very thorough in vetting requests and have been able to intercept a number of private tourism enterprises offering trips to BIOT. There has been some question about the possibility of capping out yacht numbers. This would be difficult to justify given the “safe passage” argument for permitting visits. It would also be difficult to manage as yachts can be unpredictable on their timings. If there is genuine concern about either environmental impacts or human safety then two options could be considered: limiting periods of stay, notably during peak season (April-June); or capping permits for any given time. The latter would clearly deal more effectively with any need for a hard cap, but would require some flexibility. For example it might be that no more than 15 permits are granted to run concurrently, later applicants might then have to delay arrival or stay for a shorter period. Some flexibility could allow for unforeseen changes in timing, perhaps requiring those altered requests to only anchor in locations where there are fewer other vessels?

Waste

Solid waste on beaches

The accumulation of solid waste is a global problem which is accelerating with time. In remote settings such as BIOT such waste is entirely from remote sources, and is predominantly made up of plastic and polystyrene, with some elements of treated wood, fiberglass, metal and composites. FADs (see above) are increasingly found and can be particularly problematic as a source of entanglement, notably for nesting turtles.

Beach cleaning in DG has been an ongoing process for some years. Under the BOS contract, contractors must clean seaward beaches from GEODSS to Canon Point two times per year.

In addition, volunteers are regularly engaged (see flier, Annex 2). Volunteers cover less ground, and may be less thorough (for example not retrieving plastic waste from under the scavvy where it is regularly lodged). Locations for volunteer clean-ups are *ad hoc* and based on perceived needs. Over the last 2 years (2016-2017) help has been received from 539 volunteers, who have collected an estimated 8212lb (3.7 tonnes).

This year, as a one-off, using some remaining funds under the closing contract for CPP, the contractors have begun a major beach clearance for the east of the island. An initial clean along one mile generated 1410lb (640kg) of litter. They followed a thorough protocol, extending from the high-tide landwards some 20 feet (6m), reaching under scavvy and other coastal vegetation. This gave some indication of the scale of the problem and the logistical challenge of clearance. Following this, there was some additional discussion with the EO and CSA on the methodology as it was important to avoid any heavy human footprint in the nature reserve area or to remove coastal vegetation for vehicular access. It was determined that litter could rather be bagged and carried by hand to boats on the lagoon side.

By 1 December the entire lagoon coast had been cleared northwards from GEODSS, and work was advancing on the outer shore, from the north around to Cust Point. In this distance (approx. 35km), they had collected 47,970lb (almost 22 tonnes) of litter. It was estimated that the waste was approximately 80% plastic, 20% polystyrene, with some other components (e.g. metal).

Relatively little additional information is being gathered on the distribution or composition of the waste, however **there may be some potential for data-gathering before the work is completed, while the cleared state of the shore will provide a valuable base-line for measuring rates and patterns of arrival** (see below).

A flier which is used for the voluntary beach clean-ups is provided in Annex 3.

Outer islands

Litter on the outer islands is equally problematic. A growing concern we should be aware of is that this litter will not go away without manual clearance. Over time, however, it is likely to breakdown into smaller plastic particles which may present a greater threat to wildlife, and which will become increasingly difficult to remove. We need to **consider a programme for plastics removals from all islands in BIOT, prioritising the more natural nature reserve islands. Further science is also needed to understand plastic accumulation rates and, over time, to identify hotspots of accumulation** (Critchell and Lambrechts 2016).

Adopt-a-beach

The idea behind adopt-a-beach programmes, which are widespread in the USA and elsewhere, is that community groups, corporations or others take some responsibility for particular stretches of coast. They take responsibility, typically, for beach clean-ups, but this could also be expanded to other activities (citizen science). (See, for example, California - <https://www.coastal.ca.gov/publiced/aab/aab1.html>; Texas - <http://www.glo.texas.gov/adopt-a-beach/>); Critical to success would be ensuring some sense of “ownership” and possibly some competition and annual recognition to “best beach”, “best clean-up”.

There is fairly widespread support for setting this up (currently EO and US military Chaplain are key supporters). **This should be encouraged, but establishment should be contingent on ensuring a**

structure that will be enabled and supported for the long-term. There might also be value in setting up partnerships with other such schemes world-wide.

Beach litter research

It would be of considerable value to understand in better detail the volume, structure, distribution origins and rates of arrival of plastics in BIOT. Such information might help in the many ongoing global campaigns to reduce waste escape, as well as regional programmes already helping to address this issue, notably in Australia. Better information on rates of arrival and on patterns and hotspots for accumulation would further inform BIOT’s efforts to remove such waste.

ZSL have provided a suggested approach to the study of beach litter, while another, citizen science approach has been reviewed by the CSA (van der Velde et al. 2017). During the CSO visit some further discussion was had with the US Environmental Team and initial plans for some litter monitoring were developed.

A key objective would to understand rates of litter arrival. Ideally this should be done by means of a series of samples before and after clearing and then at a timed interval. CSA and EO were able to trial a 100m transect along a beach near the wastewater outflow. Clearly too small to be representative, it nonetheless provides some insight into a possible survey approach (Table 1). If such a sample was representative it would imply totals of >10,000 bottles and >14,000 flip flops along the coast of Diego Garcia – and with data on arrivals since clearing it might be possible to calculate likely arrival rates island-wide, and to identify seasonal and spatial concentrations.

Table 1: Sample classification of litter types for assessment and quantification (based on ZSL and (van der Velde et al. 2017)). These observations are intended to be exploratory, and were from a rapid 100m assessment in late November. Such an approach could be used to better understand key locations for litter deposition (hot-spots) and accumulations rates.

	Total observed		
PLASTICS		Hard plastic containers	
LIQUID CONTAINERS		Polystyrene packing	4
Plastic water bottle	19	Plastic bag	2
Other drink bottle	5	Sack	
Non-drinking liquid container (e.g. shampoo, cleaning fluids)	1	String	3
Bottle caps	14	Rope	
Styrofoam cup		Insulating foam	2
Plastic crockery		Foam mattress material	2
Plastic cutlery		Cigarette lighter	5
Drinking straws		Toys	
Food wrapping (e.g. sandwich, crisps)		Other hard plastic	15
Toothbrush	1	Other soft plastic	15
SHOES/CLOTHING		Tyre	1
Flip-flops (or part thereof)	24	Balloon	
Polyester/acrylic clothing	1	GLASS	
		Glass bottle	1
		Light bulb	

FISHING MATERIALS		METAL	
Line		Drinks can	2
Reel	1	Metal cans (e.g. paint)	
Net		Batteries	
Float	1	Other	1
FAD		WOOD (treated/altered)	

EO, in collaboration with the PWD, and with guidance from CSA and others as needed should endeavour to undertake some preliminary surveys of beach waste, if possible to enable some enumeration of the waste clearance programme as this reaches completion. This should lead to a more regular monitoring programme which it may be possible link to clean-up exercises. Volunteers could be engaged in both activities.

Shipwreck

An unnamed 15-20m vessel has grounded and split in half on the north-west coast. Both halves are currently adjacent and resting on landwards edge of reef flat at the base of the sand beach.

Some scouring/erosion behind leading to steepening of upper beach profile. The beach in this area terminates with a very steep dune-margin held in place by scavvy rising >2m above high water.

Vessel appears to be old longliner. It is a complex composite with a hull of wood, fiberglass and hardened foam. There does not appear to be any fuel or other toxic liquids. There is considerable metal waste, including engine gear and former refrigeration tubing. A large volume of monofilament longline are still in place in the hull and adjacent waters. As the vessel breaks up a considerable volume of materials are being dispersed along the coast.

It would be advantageous to have the hull removed from the reef flat but access is sensitive. Cutting through scavvy and creating a track down the dune-face and steep beach would have some notable impacts. A lower impact option might be to cut an access track through from further to NW and then to access the site at low tide along sand shore. (Access from the south-east would require crossing considerable areas of beach rock which would be more sensitive to heavy machinery.)



Approximate location of the shipwreck

Irrespective of wreck removal, it will be important to return every 2 weeks and remove the rapidly disintegrating and transportable parts (metal, plastic, fishing gear, foam) from the beaches and to remove all loose materials from the wreck itself, including fishing lines.



Shipwreck as on 24 November, 2017. Between the two halves is a considerable volume of longline and other litter which are also spreading along the beaches (bottom right).

Waste disposal

The base is still relying on the ongoing performance of two incinerators which are acknowledged to be old.

We have been unable to begin the proposed water quality assessments supported in earlier reports. These would have included lagoonside assessments for leachates from the unlined waste pits or indeed from the considerable mass of stored materials awaiting recycling. They would have also included an attempt to assess the spatial footprint of nutrient release from the treated wastewater outlet on oceanside. **Discussions on a BIOTA led programme of water quality assessment with CEFAS should be resumed and put into action.**

No algal blooms have been observed by, or reported to, the Installation Environmental Program Deputy since the last CSA visit.

Waste reduction

The primary target for solving waste issues is to produce less waste. **BIOTA should develop with the Public Works Department a vision for how less waste can be generated, notably around packaging.**

It would also be useful to encourage less waste from personal consumption. This could include measures to reduce use of single-use plastic bags and single use plastic bottles. The Ship's Store has already switched entirely to paper bags. **The introduction of charges, or an outright ban, on single-use plastic grocery bags might help; while efforts to discourage the use of small disposable**

drinking water bottles would be most welcome. It would also be valuable to encourage the relevant persons responsible for ordering stores to actively enquire about packaging and strive towards sourcing lightly packaged or plastic-free packaging for incoming goods. When the new safe drinking water supplies are connected to accommodation (this is apparently imminent) this may make it easier to encourage or enforce reductions in the purchase of bottled drinking water, although there may need to be some well-structured communications to bring personnel alongside.

Recyclable waste removal

Very large volumes of recyclable waste are held on Diego Garcia prior to occasional removal (approximately every 3 years). These include metal goods, electrics, old tyres and often more complex mixed materials. In November, 2017 the CSA was able to visit and understand this process as a private company was commencing a process, under contract from the BOS Contractor to dispose of this waste.

On visiting the waste processing plant it was clear that this waste build-up is very large indeed, covering some hectares. It was also apparent there was far more material than the contract would cover, leaving the possibility of a higher cost, or an incomplete job. The contractors bring in heavy plant to help the work of sorting and separating recyclable materials (for example shredding tyres and extracting the metal wires therein). This process of separation has to be done prior to packing up for export as different materials go to different locations.

It is not ideal to have these materials held in the open adjacent to (just a few metres away) from the lagoon, as there is a risk of nutrient or toxic leaching, especially as there is considerable corrosion during the years that some of this material may be held there.

One suggestion from the contractor was to leave some of the heavy machinery on DG to enable pre-sorting here. This could help with the separation and removal of non-recyclable elements. Further consideration should be given to the risks of different materials, with a more secure holding location where leachate could be held and treated. It would also be valuable to consider increasing the frequency of collection of these materials.



Images of some of the mixed waste being held for recycling. Bottom right, freshwater from recent rain is likely to be leaching through this site and draining into groundwater or the sea a few metres away.

Composting

There has been some exploration of the establishment of a composting plant on Diego Garcia, focusing on food waste. The initial appraisals were for a relatively simple concrete base, with drainage of fluids which could be taken for processing as wastewater.

This may prove to be a valuable way of reducing waste and emissions (associated with incineration). It would be valuable to further investigate the possibility of biogas generation. It would also be important to consider subsequent use. BritRep expressed interest in allowing or even encouraging some gardening or small-scale production of edible fruit and vegetables, further noting the recreational/quality of life enhancement that it might bring to personnel and contractors, and potential as an alternative to fishing.

Such developments could be encouraged with some caution on two areas.

- 1 The addition of nutrient-rich compost to nutrient-poor atoll soils is to some degree unnatural (although it might not be so different from the addition of guano on the main bird-nesting islands). Further advice should be sought on where and how compost should be used in the atoll setting, and there would likely be a need for small-scale ongoing monitoring to assess any impacts such as eutrophication of groundwater or even leaching into sea
- 2 The growing of non-native plants is currently not permitted although some such cultivation does take place. Any decision to formally permit limited cultivation should be made with caution. Cultivation should be limited to species and varieties that could not pose any risk of invasion, with cultivators obtaining seeds or stock from a centralised process. Some policing would be required.

Expert advice is needed prior to any decision on this.

Incinerator

The two incinerators need replacing and this will become more urgent with passing time. PWD have a request for new incinerators, but it is notable that the new ones being considered are still not generating electricity.

An air curtain has been installed and is working through a back-log of piles of pallets that were built up over 8 months when incinerators were out. (they are NOT using on natural wood which is still being stockpiled). They do not plan to use these for regular ongoing work.

BIOTA should strongly encourage the US to purchase new incinerators in advance of any breakdown. This might be incentivised by clearer and more stringent regulations on the dumping of unprocessed waste. They should consider the possibility of generating energy from waste.

Stronger requirements for emissions reductions might help to incentivise the generation of energy from any new composting plant or in the purchase of new incinerators.

Public Works Department have recently completed a solid waste management plan. A copy has been requested but not yet provided.

Energy-use and emissions

A 3.4MW solar plant has been approved and signed off by BritRep. Start of installation will depend on a soil survey as the proposed area was once a "skeet shoot" and if lead levels are high in the soil it will have to be removed.

Further installation of renewable energy could include additional solar power, but also wind and potentially deepwater cooling for air conditioning. These latter should be encouraged subject to environmental risk assessments. Wind-farms may be a threat to nesting birds, and warm-water outflows could have a localised impact on reefs. Models of collision-risk and of deepwater flows might help to quantify these potential impacts.

As mentioned in the 2016 annual report, **there are also considerable opportunities for reductions in energy use and these need to be made and reported. As a coral reef territory, it is critically important that BIOTA take a lead in joining BIOT into the wider commitments made by the UK under the UN Framework Convention on Climate Change and the Paris Agreement and hold all present on Diego Garcia to these commitments.**

Military sonar

In 2015 the US Navy agreed to limit its use of military sonar and other equipment which may, unintentionally, be harming marine life, particularly marine mammals. This agreement was in respect of certain US jurisdictional waters in the Pacific. It is not clear where and how much such technologies may be being utilised in BIOT waters. It is understood that the ships in the lagoons will only have depth sounders, while there is just one sonar for hydro-acoustic monitoring in the lagoon. Any visiting vessels would have to request permission to use sonar. While use in the lagoon is also unlikely (also because of risks to swimmers) the possibility of use elsewhere needs to be considered.

It is not clear whether such noise pollution would be permitted, however **it would be valuable to request further information about this potential threat. BIOTA should further consider drafting preventative legal mechanisms to limit mid-frequency active sonar and in-water explosions within BIOT's jurisdiction.**

Native and coastal vegetation

Public Works have been supporting a set of botanical surveys of native vegetation on Diego Garcia. They have run 150 x 50' transects across the island, and will share the findings and details of the methodology when these have been prepared.

Vegetation clearance

There has been partial recovery along the long coastal strip that was cleared of vegetation at S end of runway. In late 2016/early 2017 the CSA advised that some of the dense burden of debris that was dumped on the coastal margin should be removed. It is not clear whether this advice was taken, but the thick layers of woody debris remain an obstacle to regrowth in a few places, and have reduced density of recovering scaevola over a large area. This area is thus still somewhat more at risk from storm/erosion, however time it is most likely now too late for any large-scale remedial action.



Top left cleared beach vegetation, 2016. Top left: same coastline 2017 – although there is some scavvy and palm growing through the debris, vigorous growth was inhibited, leaving the coast vulnerable to erosion. Bottom: wide area of debris where the only vegetation is a surface vine.

The site that was cleared for removal of the shipwreck at GEODDS in 2016 is beginning to recover. The initial restoration of scavvy in this site failed and there was clearly no follow-up. There is now some recovery, although the area is still sparsely covered and vulnerable.



Above and below left: cut in beach vegetation made for the removal of shipwreck debris, as photographed in November 2016. Above and below right: same view in November 2017 showing partial recovery.

The scavvy outside the military and Administration HQ and VIP accommodation remains cut too low and grass and coconut are growing among the scavvy, while a few scavvy plants appear to have died. It is not clear whether erosion has accelerated in this location, but the risk of erosion may in any case be heightened. It is recommended (like last year) to allow the scavvy in this area to grow to a minimum of 5 feet (1.6m)



Scavvy landscaping in front of BIOT and Navy HQ has led to the death of some plants and invasion by coconut and some grass.

Major works are being undertaken to clear vegetation to a distance of 20feet from (6m) from power lines and road margins. This has led to some rather striking damage to centuries-old trees, although

it is to be hoped that they will survive. **BIOTA should consider whether it may be appropriate to place tree protection orders on the more ancient native trees on DG.**



Above: one of many very old trees which has been badly damaged by an effort to cut vegetation away from power-lines.

Perhaps of greater concern has been the total clearance of coastal vegetation, including low scavvy shrubs, around Mile 11 and the important facilities along this road. The scavvy in this area could be unlikely to grow sufficiently high to be a risk on power lines, however it may be necessary to consider raising the height of the lower power cable if this remains a concern. Scavvy can also be pruned rather than cleared if a clear case can be made. **Scavvy must be immediately replanted along this entire stretch.**



Above: Clearance of coastal vegetation around Mile 11, exposing the road and critical facilities to the risk of erosion and flooding.

Taken together it is apparent that ill-advised coastal clearance is still taking place despite clear advice and objections that have been raised in earlier reports and in separate correspondence between the CSA and BIOTA and Public Works officials. In part this may be due to a poor communication or understanding of the risks by the BOS contractors and insufficient oversight of works in progress. **The BIOT Administration should raise this and strict protection of coastal vegetation must be given with full checks and balances to ensure that any future requests are fully reviewed by EO or other environmental experts. Any work underway must be subject to regular site inspection. Alternative solutions to clearance are provided whenever possible.**

As previously stated, coastal vegetation is effectively a zero cost, self-regenerating soft engineering solution to the maintenance of island margins. When removed it elevates the risk of coastal erosion.

Coastal engineering

The rebuilding of the revetment adjacent to the Fuel Farm is completed. The vertical sea wall above the revetment is a new feature for such structures. Scavvy has been planted landwards of this structure. See photos. There are no immediate plans for more engineering, although this could change.



Above: completed revetment work adjacent to the fuel farm, including a new concrete wall (left) above the revetment (right).

Immediately SE of the revetment areas outside the accommodation block UPH6 there has been some loss of beach in front of the Reindeer Station, which has left exposed some of the old concrete blocks that were once dumped in a somewhat haphazard manner along a much larger coastal extent. Similar blocks were removed during the revetment work, but this area lay beyond the scope of that work. It is apparent that in their current configuration these blocks are providing no protection and could even be exacerbating this erosion. This erosion should be watched and expert advice might be sought. The danger with intervention could be a displacement of the problem further along the shore.



Above: eroding embayment in front of the Reindeer Station, with haphazard concrete blocks to the left which are remains of prior efforts at coastal protection.

Coastal engineering remains a costly activity and a potential risk to wildlife, with interventions often leading to knock-on effects elsewhere. **BIOTA should consider its own options for reviewing the situation, and particularly the opportunities for natural or hybrid interventions. The particular case of the deep-scoured ponds on the ocean side from the Fuel Farm and along the runway present a particularly challenging but important opportunity for considering restoration options. It may be possible to discuss such work with Natural England or other UK statutory agencies who may have both experience and the possibility of providing some expert input without incurring high consultancy costs.**

Invasive species

Rats.

Public Works are about to trial new “humane” rat-trap which uses a physical blow rather than poison. Following test to ensure it is not impacting native species, these may be deployed across Diego Garcia. They are already being used in areas of conservation importance in New Zealand and would appear to be both effective and low-cost over the longer-term.

<https://www.goodnature.co.nz/products/rat-stoat/>. It will be interesting to follow progress with this work.

Cats.

A small population of cats are still extant on DG. Estimated 7 individuals in downtown area, with a few scattered individuals elsewhere. Kittens were recently observed downtown area.

Egrets.

It is not clear that egrets are a threat to other biodiversity, and indeed they have been noted as vagrant visitors to the Islands since at least 1885. Their numbers have likely increased in response to human habitation, providing open grassland and human waste which provides excellent feeding grounds. The greatest concern about these birds is to aviation, as bird-strikes can be hazardous. Numbers have greatly increased even in the year since the last CSA visit. They are widespread in the vicinity of Downtown and the runway, and this is despite of ongoing culling by current XO and other officers. USDA (Dept Ag) are sending marksmen to shoot more.

Nesting in Channel Islands appears to be increasing. Some 86 active nests were counted on W Island in October 2017: these are largely in low vegetation, including scavvy and can be accessed by hand.

Small number 13 nests on E Island. None were observed on Middle Island. Control of these colonies can be undertaken, but this needs to be restricted to highly trained marksmen, with limited human footfall, and avoided during active nesting periods. Marksmen should remove all waste (cartridge cases) and dead birds. Although lead shot contamination can be a problem, particularly in aquatic settings, the amounts remaining in the environment from this level of cull is likely to be negligible.

Invasive risks and pathways

The UK authorities under the Senior Customs and Immigration Officer (and one Assistant) are responsible for inspecting the incoming goods on the MV Corsica, the main supply ship which arrives approximately monthly from Singapore. These are all security tagged on departure from Singapore, but believe this is largely to control illicit materials rather than biosecurity.

Work involves opening and inspecting each container. This is done with a powerful torch and a search for any signs – recent spider webs, droppings. The recent arrival of a python was NOT found in this search. Customs searches cannot physically enter, and therefore cannot search solid packed containers.

Once inspected the goods are taken to a warehouse (on Britannia Way, opp fuel dump, just before airport.) The live python mentioned above which was not found in the Customs and Immigration inspection, was later found by the distribution staff on a pallet of bananas. This is not a criticism of the customs officer, but it clearly points to a need for further thought. Public Works made it clear that they see the UK Customs inspection as the key line of defense. A number of key contractors in the supply and distribution chain are given an annual training course on key high-risk species such as snakes, but in reality it would appear there is no further formal checking, but a reliance on things being spotted. Further it would seem that small animals and plant matter would not even be questioned.

The exception to this rule is for ANY cargo arriving from Guam which are required to have prior clearance from the US Dept Agriculture (implying a thorough check at the place of origin).

For incoming planes, hold luggage, mostly passenger cases, is pulled up for random inspections. A particular concern arises from long-term contractors who often stay very long-term on Diego Garcia. These have been regularly found bringing in seeds and hence are more thoroughly checked by customs.

Other imports include stones and aggregate for engineering works. This has been reviewed before (see annual report, 2014). It is believed that the invasive *Mimosa* now growing in the villages may have come from aggregate imported for concrete. This is currently being removed (by hand) by the BOS Contractor.

Yachts in transit in the northern atolls are regularly visited by customs officers, however full inspections are rare and it was suggested that grounds for suspicion would be required to undertake a full vessel search.

US Military boats and planes cannot be searched by UK Customs and Excise. Military vessels rarely come alongside (but they do), but the greater risk here would be air transport, particularly the military transport C17s which may be carrying foodstuffs or other materials on a regular basis.

It is perhaps worth noting that the cost of invasive species is significant not only for nature but also for people – brown tree snakes in Guam cost \$4.5 million per year solely from their effect on short-circuiting power-lines (<http://dlnr.hawaii.gov/hisc/info/invasive-species-profiles/brown-tree-snake/>); snake bites drive very large numbers of hospital visits annually.

BIOTA have been requested to support the drafting of a report on *Tackling Invasive Non-Native Species in the UK Overseas Territories* from the Animal and Plant Health Authority and this represents an important opportunity to strengthen the overall understanding of the problem and to devise solutions.

There is a need to increase inspection ability across the entire import and distribution chain.

There may be a case for requiring an initial unpacking of all organic matter from shipping containers prior to unloading, or ensuring they are unpacked in a biosecure space by trained staff only.

It may be important to develop or increase the number of full vessel inspections for yachts in transit.

Environmental management and planning

Day-to-day management of environmental issues on Diego Garcia and in the northern atolls falls to the BIOT-based Administration and, on DG only, the US administration, notably the Public Works Department (PWD). Many of the activities on the ground are undertaken by a large, multi-faceted contractor (the BOS Contractor) under the direction of the PWD.

Previous annual reports have noted the important, although occasional, meetings of an Environmental Protection Council, and encouraged the full and direct engagement of the BritRep and EO at these. During 2017 it was reported that these meetings have become very infrequent (they are called on an “as needs” basis but minimum yearly). To help environmental management, however, an informal monthly “environmental” meeting has been set up with the Installation Environmental Program Director and Deputy, BritRep and EO. This is to be welcomed as it remains clear that environmental decisions are being made on a regular basis and such meetings may help to prevent risk and damage, or to expedite positive activities.

The updated Final Governing Standards are apparently in their final stages. It is not clear at this point whether there have been any significant updates on environmental regulations (as recommended in 2016 Annual Report) and the CSA was not consulted.

Change in the BOS Contractor

The end of 2017 will see the replacement of the “BOS contractor”, the agency which supplies the workforce and equipment to run most of non-defence components of life on DG – from food imports and restaurants to transport, to leisure activities; waste collection and management, energy generation, land management etc.

This is a change that could have dramatic environmental relevance. The contractors form a critical component in key dimensions of environmental security and risk reduction, ranging from the interception of invasive species, to the avoidance of spills, to land management decisions which affect native vegetation. It seems likely that many staff and much equipment will be transferred from the old contractor (Centerra Parsons Pacific) to the new contractors (KBR), however there appear to have been considerable cuts in the costs, and changes to staff contracts.

While the terms of the over-arching contract, including all matters relating to environmental protection and security will remain unchanged, it will be of great importance to ensure that the new contractor maintain high standards around environmental issues, or indeed improves upon these. If there are increases in staff turnover or excessive efforts at cost-cutting for elements of the work, these could lead to increased environment risks.

It will be extremely important to scrutinise and changes in work-planning and programming under the new contractors and to make efforts to scrutinize work on the ground as it begins.

During the field visit some time was spent with key personnel to better understand the important roles they perform. The following notes summarise key elements relating to environmental issues.

Conservation Management Plan

The Interim Conservation Management Framework (BIOT Administration 2014) was introduced in 2014 as a short-term framework to be replaced in due course by a more complete management plan. Work is now underway in the consultation process that will support that plan.

BIOT-supported personnel and environmental roles

Plantation Manager

BIOTA supports a Plantation Manager and Assistant who perform a broad range of roles, including maintenance of the Nature Reserve and East Point Plantation, and support in a broad range of “handyman” work for the Administration. The Manager has been particularly involved in the recent heritage visits as a guide, support and translator. Although this work is clearly important and appreciated, **there would be value in clarifying the roles and supervision responsibilities around this position. It is not clear at present how much time can be used for conservation engagement and who should be supporting and supervising such work.**

There would also be value in developing a list of baseline or background tasks, which would include patrolling of the Strict Nature Reserve, and contributing to habitat restoration both at the restoration sites and potentially at new locations.

Customs and Immigration

This work largely falls to the Senior Customs and Immigration Officer and one Assistant. From an environmental standpoint, key tasks concern the prevention of import of alien species and the export of species that are protected by BIOT legislation or under CITES.

It seems that matters of exports are largely well controlled, including the restriction on the removal of sea shells. There are challenges, however, to the ability to sufficiently reduce risks of invasion (see Invasive Species).

Police

The Royal Overseas Police Officers (ROPO) are responsible for implementing legal matters across BIOT. From an environmental perspective, this includes fisheries infractions and other illegal impacts on vegetation and wildlife.

Concern has been raised around the challenge of enforcing the catch controls on fishing, which are both unclear and which include a mix of legal and policy measures (see notes under Fisheries). It was suggested that policy regulations could be enforced by the police although they prefer a legal framework.

There is some ongoing concern about possible harvest of coconut crabs and they are keen to begin some work to find potential offenders.

Senior Fisheries Protection Officer

This role is largely based on the BIOT Patrol Vessel where the SFPO works alongside the captain and crew to devise a patrol and monitoring programme. The SFPO reports on all observed or suspected IUU activities, and on illegal catch data. The SFPO also visits islands, often with the OISPs, and they

have been making environmental observations, including reports on turtle and seabird nesting, collecting data on FADs. On Diego Garcia, the SFPO has also engaged in the gathering of recreational fisheries data.

The SFPO role is in many ways already complimentary to the environmental needs of the BIOT Administration, although at the present time it is not clear how many of the tasks being undertaken are formally contracted, or undertaken consistently between different SFPOs. **There would be value in clarifying and formalising these roles.**

Environment Officer

The post of EO has been slightly revised with the current position being resident in BIOT for about two-thirds of the year (~2 months on, one off), and with some of the more policy and planning elements being supported from the UK by the Deputy Administrator.

The roles of the EO, discussed in detail in 2016 Annual Report, continue to be broadly based and to some degree opportunistic. Some of the of the EO work has been reduced, notably with the stronger environmental tasking of the Deputy Administrator; and with the increased support to expeditions being co-ordinated by the Bertarelli Foundation and ZSL. **Even so it is critical to look for additional support to be based on Diego Garcia. The most likely route for finding additional support will be through externally funded, project-focused work such as Darwin Plus grants.** In addition to enabling the undertaking of more work, the presence of two environmental staff on DG will enable a degree of independence and open opportunities to undertake elements of work which require two persons without depending on volunteers and having to work every weekend. This could include reef survey work and diving.

Among the important elements of this work in 2018 will be:

- Strategic and advisory. Giving oversight and supporting the ongoing activities of the facility and the territory to be undertaken with minimal environmental impact and supporting environmentally positive activities. Providing advice and raising concerns.
- Science. Critical elements will include the writing up of the creel survey; continuing monitoring of recreational fisheries; terrestrial monitoring; reef monitoring; plastics survey
- Conservation and outreach. Supporting volunteers on restoration, beach cleaning and citizen science. Supporting environmental education, communication and outreach
- Science support. Largely practical support to expeditions, and some direct engagement in support of their science.

Environmental Research and Expeditions

Research into environmental issues in BIOT has a broad base, but a key focus is a range of biodiversity research programmes, largely led by university-based academics. BIOT has a critical role in reviewing and permitting research, and can help to shape future research in collaboration with researchers and funders. **Key elements of the ongoing and future research programme include:**

- **Setting research priorities.** A key priority should be to support management-relevant research, however BIOTA should also be highly supportive of new exploration, recognising the considerable opportunities for research into undisturbed ecosystems
- **Timely and adequate reporting.** This is already set out in the permitting process. Researchers should also be encouraged to report broadly, where relevant beyond the tight

bounds of their specific study area, and to consider management-relevance of their observations. There is also a need to continue communications and share other publications as these emerge, rather than just the initial reports.

- **Engagement of regional partners and researchers.** Research in BIOT needs to have a broader geographic context and can play a role in improving our understanding of the entire Indian Ocean Basin. Priority should be given to research that engages nationals from other Indian Ocean nations and Chagossians where possible and appropriate. This should include opportunities for training.
- **Data sharing.** Recognising the need for academic researchers to publish, a strict requirement to share raw data should nevertheless be placed on all researchers to allow for novel uses and new research opportunities.

Over many years the BIOT Administration has provided some limited use of the BPV for research, for up to two months per year. This has enabled a very productive ongoing research programme, making BIOT a key global reference in multiple fields. **Going forwards, the high running costs of BPV may make it necessary for BIOT to seek additional funds from expeditions to cover or subsidise these expenses.**

Bertarelli Programme in Marine Science

This work has seen a significant boost with the formal start of a programme of research funded by the Bertarelli Foundation. Further details of this Bertarelli Programme in Marine Science can be found on www.fondation-bertarelli.org/marine/.

The BPMS made considerable efforts to ensure that their research agenda would fit closely in with the interests and research needs already outlined in the Interim Conservation Management Plan and to co-ordinate their planning with the BIOT Administration. The Chief Science Advisor to BIOTA was also independently supported by the BPMS to review research proposals.

The BIOT Administration have been clear that – despite their interest in this work and particularly in those components of utility for management – the BPMS is independent and not owned or driven by the Administration. Additionally it is important to note that the BPMS does not provide a full coverage of the Administration’s research priorities: it has a strong academic research focus, and a clear interest in marine elements for example, while the Administration has a broader interest, including developing terrestrial management plans and testing interventions; assessing threats or impacts around Diego Garcia; and establishing basic terrestrial and marine monitoring efforts to enable increased assessment of change, impacts and recovery.

The central co-ordination of the BPMS, through the Zoological Society of London, has greatly reduced the management load on BIOTA and is helping to ensure timely and appropriate applications for research permits. More practically it is helping with the organisation and utilisation of equipment already on Diego Garcia, and the transport and logistics associated with new equipment. BPMS are actively seeking alternative vessels which can be used by one or more concurrent or sequential research expeditions. They are further helping to ensure that expeditions are reporting back their findings and are helping to track ongoing academic publications and other outputs relating to BIOT.

Among the many benefits that the BPMS may bring is an additional commitment to regional engagement, including the involvement of scientists from the Indian Ocean. They are supportive on ensuring that management relevant aspects of research are clearly laid out and utilised. Further they are committed to rapid dissemination and the open sharing of data.

Darwin Initiative

One unfortunate cancellation this year was the Darwin Initiative funded Carex expedition which had been originally planned for 2016. The aim of this expedition was to conduct island-specific surveys and from these to develop action plans for each island. The start of this expedition was deferred given the absence of the BPV. Given the high running costs of the new BPV in 2017, coupled with the high and growing demand for this platform for other research, it was considered impossible for the BIOT Administration to make the vessel available for the 21 days originally planned without some further funding. The expedition leaders were encouraged to rebalance their focus, with a 12-day vessel-based phase and a longer period on Diego Garcia. The expedition leaders felt that it was better to return the funding and re-apply at a later date.

A further omission was the failure of any entities to apply for funding to the 2017 call for Darwin Initiative funding, particularly as the listed priorities included elements that were of particular interest for BIOT, including support for the development of management plans. The failure to apply was largely down to a shortage of staff in BIOT in the months leading up to the deadline.

The BIOT Administration should actively seek additional funding such as Darwin, to support its environmental work, and should also give itself sufficient lead-time to apply for these.

Recent research

During 2017 there were only three research trips, all undertaken under the generous support of the Bertarelli Programme in Marine Science.

Dates	Participants	Aims
5 th -20 th April	BPMS expedition 1 ZSL, Bangor University, UCL, Scottish Association of Marine Science	Assessing the impact of the 2016 bleaching event on the reefs of the northern atolls. Check rat status of Ile Vache Marine Field test of hydrophone equipment for IUU enforcement application
27 th April-2 nd May	BPMS expedition 2 Stanford University, ZSL	Retrieving acoustic receivers deployed in deep water via acoustic release and download data.
19 th September – 13 th October	BPMS expedition 3 Deakin University, Swansea University	Satellite tagging of nesting green turtles to track their return to home feeding territories across the WIO.

In addition, as mentioned above, US scientists were invited by the Public Works Department to undertake a Botanical survey: results will be shared when available.

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Forthcoming, 2018 Expeditions and research visits

Jan-Feb	Sea bird tagging, BPMS
Mar	Acoustic array servicing, BPMS
Mar-Apr	Reef 1, BPMS
May	Reef 2, BPMS
Jun-Jul	Turtle, BPMS
Jun-Jul	Sea bird tagging 2, BPMS
Nov	Turtle 2, BPMS

BIOT-led research and monitoring

Marine

In November 2017, the EO and CSA trialled and commenced a simple programme of coral reef monitoring. The aim of this work is to enable BIOT to gather data on demand and to maintain a simple picture of reef condition in a few locations across the archipelago. It should further foster engagement by personnel who can, after training, contribute and support the work. By adopting internationally accepted reef monitoring protocols it should further be possible to compare reefs in BIOT with those of other locations world-wide.

The method adopted is based on that devised by ReefCheck (www.reefcheck.org), but refined from input from regional scientists. This offers a relatively simple, but robust method that has been favourably compared to academic research findings (Done et al. 2017). During the trial period, the study sites were restricted to shallow lagoon reefs that could be surveyed by snorkelling.

Going forwards the CSA and EO will need to develop a formal description of the methods, standardise the equipment and data entry forms, and devise simple training materials. Once this is completed the EO should commence a simple programme of training, initially focusing on a few volunteer individuals who will be present on DG for at least 10 months.

The need to re-allow diving by BIOT staff and qualified and appropriate volunteers needs urgent attention. While snorkel surveys are clearly useful, the majority of biodiversity in BIOT is found in the offshore reefs at depths below 5-10m. Furthermore, these reefs show very different ecological responses to the shallow lagoon reefs, and one cannot be used as a proxy for the other. Without such survey work we will remain ignorant as to condition and change on most of the coral reefs of this critically important coral reef wilderness.

Fisheries

The most important recent work has been the data-gathering for a creel survey. This should be the basis for a report, while further aspects of this fishery should be targeted in a novel research programme (see notes above).

MRAG and the SFPO continue to be engaged in summarising and reporting the MWR fishery returns, and in reporting to the IOTC. There may be opportunities to grow the collaboration with IOTC, including through the collection of genetic sampling (fin-clips) from IOTC-interest fish species captured in recreational fisheries.

Terrestrial

Southern Restoration Site

The information boards funded under the best project have been put in place and the pathways have all been enthusiastically laid by a number of volunteer parties. Forest re-growth over the past 12 months is really noticeable, and this site is looking great.

Some suggestions were made for moving 2-3 of the signs to be a little closer to the habitat or the species they describe.

It will be important to continue the maintenance of the site (primarily keeping paths clear), and also to continue low-level re-planting of native trees. This should be done cognisant of the signage – keep some of the coconut forest where that sign remains. Focus a few new seedlings each year around the Restoration sign.

The work to monitoring tree growth and recovering should be continued and expanded (including improve and re-label most trees). We need a minimum of 5 trees for each species to give us a valuable metric of growth rates. We could also investigate buying a simple app which enables you to measure tree height using a mobile phone.



Restoration site – tree #9 in November 2016 and in November 2017

We have no knowledge of the number of visitors to this site. It is likely few, but **it would be useful to encourage occasional visitors**. Approaches to do this might include:

- Adding it as a bus-stop on the bus service to East Point Plantation
- Allowing visitors to go to the site without requiring a permit. They would probably have to leave their cars at GEODSS, but it is a short walk.
- Permitting recreational swimming on the beach (lagoonside) as a further incentive.

It was not possible to visit the other restoration sites in 2017, and it is not known if there is any established monitoring in these sites, but they had been looking somewhat run-down and there may be some advantage in going back in to remove collapsed fencing and fallen labels.

Eastern Arm Nature Reserve

Previous SCA annual reports had mentioned the possibility of low-cost restoration of hardwoods over extensive areas by assisted regeneration. The idea here would be to focus on areas where native trees are already growing in mixed forests with coconuts, and particularly where there are native saplings under coconuts. It will be important to identify the non-coconut trees and to select areas where these are positively identified as native species. Selective felling of coconuts in these areas will facilitate the growth of the native saplings (Shono et al. 2007). Return visits will be needed

to cull sprouting coconuts, but if mature coconuts have been removed, such returns will only be required one or two times.



Example of a mixed coconut and hardwood forest (from 2015) with good growth of hardwood saplings on the forest floor. Selective felling of coconuts in such areas would deliver rapid returns in extending native forest areas.

It would be an interesting and valuable to assess the efficacy of this work – this could be done by establishing 1 or more pairs of plots with controls – could be 50x50m of mixed forest. Mark the plots with permanent posts. Count numbers of trees and saplings by size class in each, and also mark 10 trees and 10 saplings for more exact measurement of DBH (identify species). Undertake coconut clearance in one and remeasure the same after 6mo, 1yr and 2 years to track recovery, and assess any improvement in hardwood growth following coconut removal.

Island data and Terrestrial Action Plans.

The need for research of the type intended under the original Carex Proposal (see Darwin Initiative details above) is clear, but it is also the case that a time-limited, one-off expedition could only begin the process of individual island management plans.

Separately, MRAG are developing a series of island-specific risk assessments, anticipated to be completed for all major islands in 2018 (see Annex 4). These are being built up based on the observations of the SFPO during regular patrolling, and while the primary focus is on the prevention of illegal fishing (including temporary settlement on the islands) such descriptions would provide a useful base for broader management planning.

Additional valuable information on individual islands is held by a small number of people who visit islands, including OISP and BIOT Environmental experts as well as expedition participants and even visiting yachts. In relation to this, SFPO has generated a dataset of georeferenced images covering almost every island (41 in total), which he has shared. **Given the considerable costs of formal**

expeditions, and the extremely time-limited view that any such expeditions can achieve, there would be considerable merit in developing a simple Wiki style database to host and manage such information. Such a site could be password protected, with editorial rights being further restricted. It would enable the sharing of images, observations and data such as nesting bird observations. An alternative or add-on could be a map-based tool enabling photographs and comments (e.g. on erosion, location of FADs, nesting etc) to be uploaded.

Environmental Outreach

During 2017 the EU-supported BEST programme (Voluntary Scheme for Biodiversity and Ecosystem Services in Territories of European Overseas) enabled the development of a number of important environmental materials including:

- Film – a 23 minute film describing the environment and giving information about regulations and volunteering opportunities, primarily aimed at people visiting BIOT.
<https://biot.gov.io/environment/>
- Environmental Brochure – a 12-page brochure with similar aims to the above, to inform and educate visitors to BIOT and to the Northern Atolls. Available in hard copy on Diego Garcia and available as a PDF to all - <https://biot.gov.io/environment/>
- Snorkel Trail – This has been marked with buoys, but more work is needed
- Information Boards – two sets were made. One is now in place along the restoration site/nature trail. The second set has been delayed due to transport and logistics but will be put up when they arrive.



Left: BEST Interpretive information board in place on the Restoration Site Nature Trail. Right: the nature trail passing through a recently cleared open area.

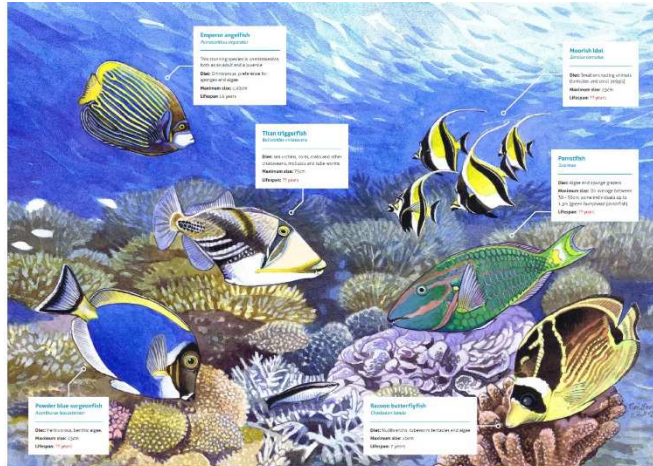
Reef Fish & Snorkel Trail

The bright clear waters of the coral reefs of the British Indian Ocean Territory are home to a myriad of fish, in every shape and size and in a riot of colour. For many species, vibrant patterns are a means of attracting attention – they serve to advertise their presence, perhaps to attract a mate or to deter a rival from encroaching their territory. At the same time the remarkable patterns can serve to deter or confuse predators. Butterflyfish are amongst the most striking of all – their bright colours make them easy to identify, even from a boat, but predators can be confused by the strong black lines and eye stripes, which break up their silhouette.

Another bright, if destructive, little fish is the cleaner wrasse whose black and white stripes are further highlighted by an electric blue. For clean colour is an advertisement, attracting fish of all shapes to come to their territories where they perform a remarkable service: picking spots and carefully nibbling away to remove spots of dead skin or parasites – they even swim into the mouths and gills of predators but are never eaten – their services are simply invaluable.

Danger is inherent in coral reef life. Some predators rely on stealth and camouflage their dark or mottled colours enabling them to blend into the shadows. Others strike by the sneak, others lack sometimes burst in packs, but rely on speed to catch their victims. In this world defence is key. Staghorn fish employ the most complex on the base of their tails, which can be fished out to snare at other fish. Triggerfish, when hit hard or crushed in the reef sand, will freeze and they can snap independent spines on their heads and bodies to lock themselves in place. ‘Spine’ fish are also notorious for biting, sending pain down their nervous system, to which out for these species, if they are hovering over shallow depressions in sandy patches.

Some fish are even able to get on top of the reef. They use their distinctive beaks to bite pieces out of the reef rock. They dig out the algae but expect pieces of the rock to fall, which they catch as they swim through the water. This process is so much that it can eat away coral beaches. Most of them are built through the digestive action of a fish!



Birds of BIOT

The majority of birds in BIOT depend on the ocean, and many of the islands have globally important populations, some nesting tens of thousands of birds, during the breeding season.

The domestic fowl, and their heavier dark cousins, the mallards are found throughout BIOT, and are often seen about town in Diego Garcia. The mallards nest in vast numbers on the outer islands, while the fowls have more restricted ranges, although ‘fowl’ is a slightly misleading term as these birds simply lay an egg on a convenient branch.

Small waders, such as plovers, are often seen on the beaches, voraciously foraging across sand and rocks and wading into shallow water to pick up any small invertebrates they can find.

One of the most dramatic seabirds is the red-tailed booby. These beautiful birds fly effortlessly over the open ocean, gliding just a few feet above the surface in search of fish, and diving into the water, and even swimming underwater with their large webbed feet to catch their prey. They are less adept on land, being clumsy on the ground and struggling hard to take off again.

Frigates are another spectacular bird. Two species are found in BIOT. They are seen effortlessly, using thermal air to rise to altitudes of 3000m or more, and sometimes staying aloft, day and night, for up to 2 months. They patrol land on the sea, and usually feed by ‘bullet-dropping’, taking flying fish as prey in flight. Frigate birds are also sometimes called ‘pirates’ as they are occasionally seen mobbing other birds such as boobies in flight to force them to regurgitate their own catch, which the frigate birds swoop down and catch in mid-air.

One of the biggest threats to BIOT’s seabirds are rats, which have invaded most islands and are eating eggs and chicks. Efforts to remove rats from islands can lead to dramatic recoveries of seabird colonies.



Two of the information boards which will be placed in locations around Diego Garcia in early 2018.

Further work is needed to fully utilise these resources:

The film could be considered for showing at the arrivals terminal. It could also be screened on occasion prior to main films in the cinema.

The snorkel trail was laid in low visibility conditions – such conditions may be seasonal and hence this may be a resource that can only be fully enjoyed during certain times of year. The trail needs some publicising – there is a notice-board which will go up when it is available, however it would be valuable to develop some more explanatory notices about where it is and what to do. Several of the marker buoys for the trail have been lost and need to be replaced. It would be worth numbering them to facilitate future education and observations. A number of recreational craft (pedalos and paddle boards) are transiting over this reef, probably enjoying looking at the corals and fish below. At low tides this may present a risk of grounding which would lead to damage to the reef and to those who may fall on corals. There should possibly be a warning or even a ban on crossing these reefs at low tide.

Some duplicates of the notice boards are available. A public place should be found to display these (possibly in the Galley or other restaurant areas). There could be an opportunity to promote these in an exhibition, possibly with a first formal showing of the film.

Heritage visits

The BIOT Administration is organising a number of “heritage visits” to enable Chagossians to visit their former homes and villages. Feedback from staff on-island, and a brief meeting with some Chagossians on one of these visits gave a favourable impression. The visits have helped to dispel certain myths about damage to the islands (such as a rumour that Middle Island had been blasted to make a channel into the lagoon). Although these visits have prioritised giving access to older Chagossians who themselves once lived here, some were accompanied by second or third generation family members.

Sharing current knowledge of biodiversity and conservation in BIOT is already providing an important, positive message to the Chagossians. **Given sufficient funds and interest there may be opportunities to explore a deeper engagement, including extended stays for any Chagossians who might be interested in supporting environmental work, perhaps initially as conservation volunteers.**

Further opportunities

The BIOTA web-site (www.biot.gov.io) represents an important site for disseminating information about BIOT, including news, governance, and environmental information, as well as advice for visitors. **It would be valuable to establish a more comprehensive library of published and grey literature on this site, notably expedition reports and legal texts.**

Other web-sites also provide a rich source of information about BIOT, and the Chagos Information Portal (ChIP, www.chagosinformationportal.org) in particular has the potential to become a key reference site. **There would be considerable value in developing a co-ordinated approach to building up a data platform where research findings and datasets could be placed in an easily accessible and searchable location.**

Many of the visiting scientists are now enthusiastically giving presentations on their work or on the reefs more generally. **This is to be encouraged and is something that will have greatest impact if the presentations can be agreed sufficiently in advance to publicise across the island.**

2018 is the International Year of the Reef and there may be opportunities for special events around Earth Day, World Ocean’s Day or indeed around the visits of scientists (many visitors to BIOT are among the leading academics in the world in their fields). Events could be tied in with current events such as beach clean-ups, and could lead to increased engagement of volunteers.

There may be growing opportunities for volunteering and these should be considered in future planning. Key areas could include the aspects of quantifying and itemising solid waste, around reef monitoring, and terrestrial work on forest restoration or beach clearance.

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Annex 1: Fisheries Guidance Note, 2017

GUIDANCE NOTE

Issued by the Director of Fisheries
pursuant to regulation 36(1) of the Fishing Regulations 2007

The following guidance is provided to Morale, Welfare and Recreation.

It is in two parts. The first of which relates to catching specific species and the second relates to areas that are designated for fishing.

Part 1: Types of fish to be released if caught.

a. Sharks or other large game fish. Game fish include marlin and sailfish.

If caught, these fish must be released live back into the fishing waters.

If these fish are not released live back into the fishing waters, the person or persons who caught the fish could be liable to prosecution for fishing without a licence.

b. Fish which are under threat internationally, as defined by the International Union for the Conservation of Nature (any species classified as Vulnerable, Endangered or Critically Endangered), or considered to be 'overfished and subject to overfishing' as defined by the Indian Ocean Tuna Commission.

For IUCN threatened species, assessments are occasionally updated. In June, 2017 some 48 coral reef species were listed as threatened under the IUCN (www.iucnredlist.org). These include the following, which occur in BIOT and might be taken by fishers:

1. Napoleon or humphead wrasse *Cheilinus undulatus*
2. Giant grouper *Epinephelus lanceolatus*
3. Blacksaddled coral grouper *Plectropomus laevis*
4. Squaretailed coral grouper *Plectropomus areolatus*
5. Giant guitarfish (*Rhynchobatus djiddensis*)

For IOTC listed species, stock assessments are updated annually or biennially and amendments to the list of species judged as "overfished and subject to overfishing". In the following website should be monitored for such alterations:

<http://www.iotc.org/science/status-summary-species-tuna-and-tuna-species-under-iotc-mandate-well-other-species-impacted-iotc>

Current list of 'red' IOTC species:

1. Yellowfin tuna *Thunnus albacares*
2. Longtailed tuna *Thunnus tonggol*
3. Narrow barred Spanish mackerel *Scomberomorus commerson*

If caught, these fish should be released live back into the fishing waters.

Catching and keeping such fish may not amount to a criminal offence, but it would be detrimental to the environmental conservation efforts that are being made in the territory.

Background information

IUCN Threatened species

The International Union for the Conservation of Nature maintains the most comprehensive assessment of species' conservation status world-wide. Its widely endorsed "Red List" is compiled under a comprehensive, expert-led review process, with strict criteria for assigning species to a series of categories of risk. Among these, species assessed as Critically Endangered, Endangered, or Vulnerable are referred to as "threatened" species.

IOTC species

The Indian Ocean Tuna Commission assesses the sustainability of catching commercial tuna and tuna-like species. This organisation undertakes quantitative assessment of the populations of tuna caught from the Indian Ocean based on catch statistics provided by the hundreds of vessel registered to fish for these species. This is called a stock assessment and identifies what level of probability there is that the targeted fish populations will increase, decrease or remain the same.

If a stock is assessed as 'red', this means the species is both 'overfished' (i.e. the amount of spawning fish left is insufficient to recover populations to a sustainable level), AND 'subject to overfishing' (i.e. the amount of fishing activity is too high to allow the stock to recover to sustainable levels). It is worth observing that 'sustainable level' for a population refers to a population that can be fished at the highest

level without diminishing stocks or catches over the long term (this level of fishing is called the “Maximum Sustainable Yield”). Typically, when caught at this level, fish stocks are still only about half the size of an unfished population.

With this in mind, recreational fishing for consumption, of species which are effectively in a decline at the scale of the Indian Ocean, is inappropriate, not least given the status of BIOT as an MPA. Although recreational fisheries are not a formal part of the IOTC assessment, and therefore there are no legal requirements which apply to any Member States’ recreational fisheries, it is consistent with BIOTs ‘conservation credentials’ to extend a restriction to species which are ‘red’ on IOTC stock assessments.

In addition, given the dominance of yellowfin tuna at around 70cm in the BIOT recreational fishery, there is a possibility that Diego Garcia has some function as supporting habitat for juvenile yellowfin tuna. These are fish that are not yet large enough to breed, and should be protected.

Releasing fish live back into the fishing waters

The fate of released fish is primarily determined by angling behaviour (e.g., gear selection, handling time, photographing/admiration etc) and post capture handling and therefore adopting certain angling practices can improve fish survival and reduce risks of long-term injury. In most cases long fight duration and extended time out of the water are significant factors increasing probability of post release mortality. Also environmental factors such as temperature affect survival.

- 1) Gaffs should not be used and, if at all possible, hooks should be removed from fish being returned.
- 2) If possible, remove hooks from fish without lifting them out of the water. Removal of a fish from the water significantly increases the risk of post-capture mortality, so use a net and hold them in the water.
- 3) If you have to cut a hook off, cut it to leave as little trailing line as possible. (If fish are deep hooked cutting the hook or line and leaving the hook in the tissue often results in less injury, physiological disturbance, and greater survival than hook removal).
- 4) No lifting fish by the tail or gill covers – this will damage them and the likelihood of post-release mortality is high. Instead, if you do want or need to bring the fish aboard, use a landing net.
- 5) Putting a wet towel over the fishes head can help to calm them and allow easier unhooking.
- 6) Minimise air exposure for the fish and get it back in the water as soon as possible.
- 7) If holding a fish up for pictures, make sure you support the fish at the tail and head ends, rather than holding them up by a single point.
- 8) Don’t throw the fish back in the water – instead, place it back in, head first.
- 9) If the fight has been long (e.g. exceeding 20 minutes, especially for larger fish) and the fish is clearly tired, supporting the fish in a forward position for a few seconds while the boat is driven forward slowly can help recovery by getting oxygenated water over the fish’s gills.
- 10) If you are fishing purely for sport, consider using circle hooks or barbless hooks, or squeezing down any barbs with a pair of pliers.
- 11) Avoid using fishing gear that is too light – long fights are more stressing to fish, and post-release mortality is higher.
- 12) Note that fish taken from deeper water (e.g., snappers, groupers) may suffer ruptured swimbladders if brought up from depths beyond 10m, and are unlikely to survive being released. Consider not fishing for these species for sport. Venting these species may be undertaken by experienced fishermen.

Fishing Areas

A copy of the image shown in the posters is attached.

No fishing is permitted in the areas shown in red, because this is a restricted area.

No fishing takes place in the areas marked in blue, or in the cross-hatched area, where entry is not permitted.

The Interim Conservation Management Plan identified the following actions:

*‘Assess current approach to reducing risks of shark-human contact on Diego Garcia.
Maximise safe access to nature for personnel, with improved information to reduce risks. Guidelines produced to advise on, and improve, public safety.’*

Recreational fishing entails attracting fish into targeted areas. Playing or landing fish results in movements which may attract fish predators, including sharks. In order to avoid fishing inadvertently attracting any sharks into areas where people frequently swim, it was considered appropriate to restrict fishing on grounds of health and safety.

Identification

Napoleon or humphead wrasse *Cheilinus undulatus*

Yellowfin tuna *Thunnus albacares*

Annex 2: 2017 Trip outline and field notes

Nov 21	Arrive	Nov 26	Peros Banhos – Vache Marine, Parasol, Longue
Nov 22	BritRep Lunch with mmt team PWD CO UPH6 snorkel	Nov 27	Danger Egmont
Nov 23	Expedition store Marina survey Middle Island surveys	Nov 28	UP6 Survey Restoration site GEODSS Turtle Cove
Nov 24	Meeting with SCIO Waste disposal plant and recycling work S end of Runway – former vegetation clearance Banyan Cemetery BPV	Nov 29	Middle Island Presentation to BIOTA personnel Planning and discussion Meeting with PWD Coastal engineering site visit and litter survey Chagossian Heritage visit
Nov 25	Salomon – Mapou island and snorkel survey, Jacobin, Ile du Sel, Boddam	Nov 30	Planning ReefCheck next steps

Diego Garcia

Middle Island

Brief circumnavigation of the island. There is a brackish/freshwater pool on the south side of the island which is bounded on the south by a largely unvegetated sand and rubble bar. Dead trees show that this was perhaps more vegetated historically, but there is also some new growth of coastal scrub vegetation. The main island is a generally low mixed hardwood, but with some small areas of grass and ferns. Plastic waste extends quite far inland. Red-footed boobies mostly roosting but some initial signs of nesting.



Middle Island. Left: brackish pool. Right Plastic waste extends across much of the island

Snorkel UPH6

Reef here is essentially dead with <1% live coral cover. Handful of small colonies in 3-8cm size range, few or none smaller.

Dead corals are still largely *in situ* with only a few areas where coral has collapsed.

Fish still abundant, but predominantly grazers – surgeons, some parrotfish and damsels. Previous visits have noted numerous butterflyfish, but these are now rare (one *Chaetodon auriga* and 3 *Heniochus*). Many small grey groupers, a few *Cephalopholis argus*. *Lutjanus bohar* and *gibbus* quite common.



Left: small patches of recovering Echinopora. Right: grazing surgeonfish are abundant.

Snorkel Marina

Laid transect along snorkel trail. Several buoys missing.

Reef showing good recovery with 20% live coral and clearly increasing fast. Fish diversity still very low, and huge predominance of damsels and other grazers.

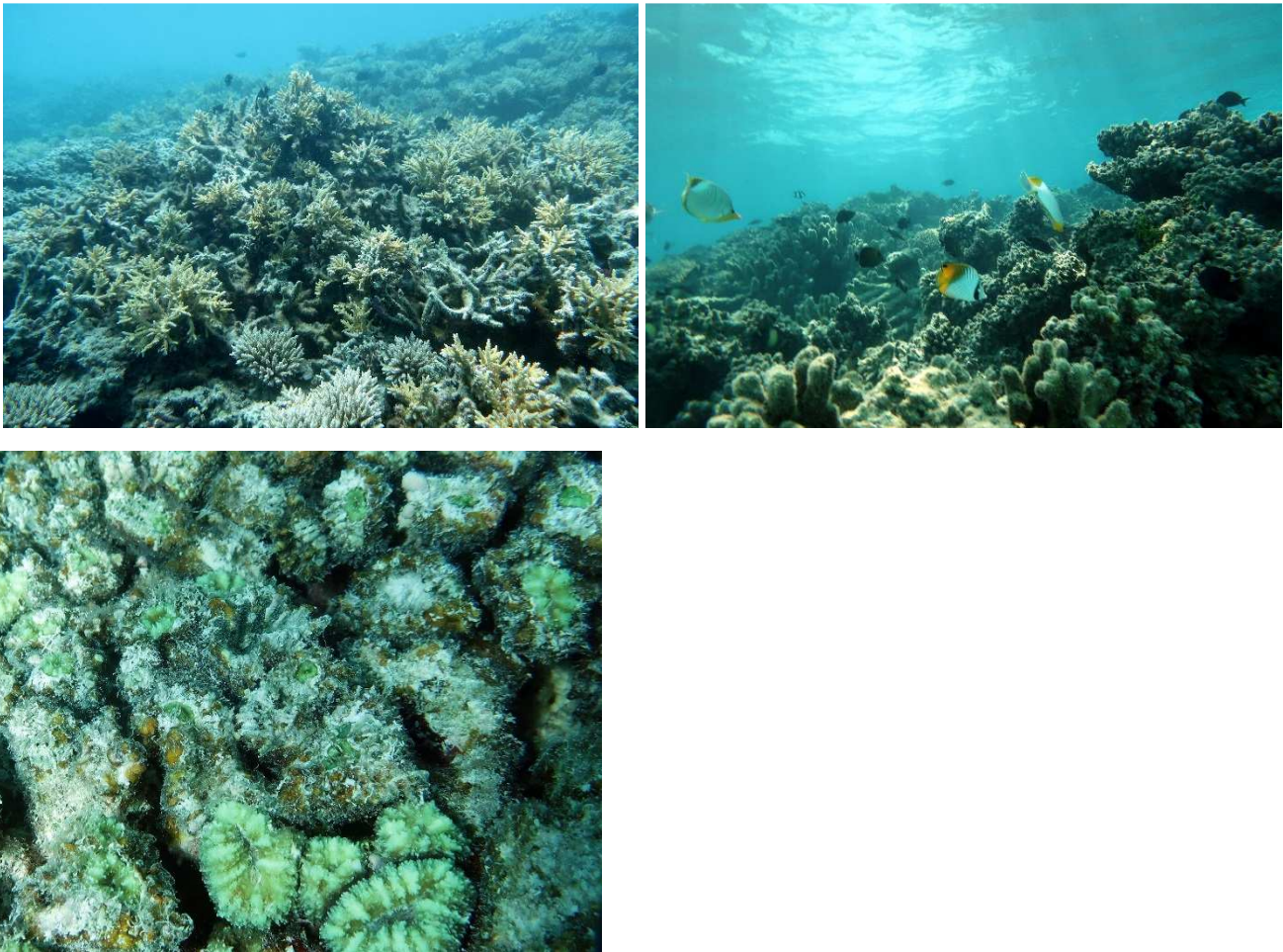


Rapid recovery of Echinopora on reefs outside the Marina

Snorkel Middle Island

This reef location, close to the channel mouth, but in a protected mini-lagoon created by shallow reef on three sides is very different from the shallow-water coral banks of UPH5 and the Marina, with clearer waters dropping to a sandy floor at about 7-10m depth. There is an abundant and diverse fish community, including species more often associated with deeper water or offshore reefs (e.g. large *Plectropomus* groupers, large schools of snapper, Napoleon wrasse).

Coral cover is still very low (~5%) in most places, but there was some recruitment. In a few areas there were quite extensive patches of recovery. It was also interesting to see *Lobophylla* corals regrowing from the centre of apparently dead calices.



Upper photos: reef scenes, Middle Island. Lower: small points of re-growth in middle of apparently dead calices of Lobophylla coral.

Salomon Atoll

Ile Mapou

Small rat-free island. There is some island expansion to the west, but larger sections of the SE and E coasts appear to be eroding and quite a lot of coastal hardwood trees were largely defoliated, although some appearing to re-grow.

The small lake on the E coast is probably freshwater/brackish, but no mangrove trees and a largely bare coast with no specialist wetland/mangrove plants. Towards the north there is a hardwood forest including some high *Intsia bijuga* trees.



Mapou Island. Left, small pond on east coast. Right, *Intsia bijuga* trees on northern coast.

Fauna:

- RFBs nesting. Saw >50 nests, so suspect 100+. Several had small chicks, others eggs, others nothing yet.
- Large numbers of frigates, mostly greater, but no signs of nesting or courtship.
- Some larger brown noddies inland, no nesting.
- Mourning gecko *Lepidodactylus lugubris* found lizard curled inside *Intsia* pod



Left, mourning gecko inside *Intsia* seed pod. Right, red-footed booby on nest, with heavy infestation of ticks on the back of its neck.

Jacobin and Ile du Sel

Jacobin is almost entirely coconut but with some *Intsia* trees. Ile du Sel has slightly more native hardwoods

Erosion is significant on W, S and E margins of both islands, with deposition on the northern margins. There was also extensive exposed sand-banks towards the lagoonward margin of the reef flats

between these islands and extending further east towards Ile Sepulture. These may provide a dry connection between these islands at the lowest tides. It is not clear to what degree such patterns of erosion and deposition are seasonal, but there could be a process of lagoonwards migration of islands going on here.



Left, Ile Jacobin is predominantly coconut. Right, Ile du Sel has some hardwoods in among coconuts.

Although both islands were de-ratted in 2015, and there were no obvious signs of rats having returned, there were few birds, and, despite appropriate hardwoods at coast of Ile du Sel no sign of nesting RFBs.

Boddam

A brief visit was made, with a walk to the cemetery and visit to the main ruins. There were no bags of litter (seen on previous visits) and no concerns overall. There are no long fishing return forms on island, but a visitor book is there, with many entries.

Marine observations, Salomon

Primary site was the survey location W of Mapou. Reef slope here showing very good live coral cover – 20-25%. This included both surviving massive corals as well as rapidly recovering stands of sub-massive and branching corals. There were also some smaller numbers of new (sub 5cm) recruits. Fish communities were abundant and diverse, including large numbers of coral-sheltering *Chromis* which can be reduced following coral die-off. Also healthy populations of grouper and snapper.

Very similar observations from brief views on reefs off Jacobin, Ile du Sel and, on the opposite side of the lagoon at central Ile Anglaise.



Reefs off Ile Mapou. Sub-massive/columnar corals were widely impacted, but some areas are showing good recovery. Right, large *Porites* colonies like this appear to have survived in locations across the lagoon

Peros Banhos

Ile Vache Marine

Circumnavigated and passed briefly into small area of a few hardwood trees on N side.

N and NW shores very wide sand and perhaps 30 turtle nests, including one fresh track of green turtle with 4 connected nest holes (Tom has dimensions). Further round where beach is starting to erode (seasonal?) on WSW were older nest holes. From S to E sand has largely eroded to the scavvy.

Inland no coconut crabs observed. Did see (but no photo) a small lizard which was similar mottled brown to that seen on Mapou. Most likely also mourning gecko *Lepidodactylus lugubris*, but appeared to be shorter and less fat.

No nesting seabirds. We saw fairy, bridled, crested terns, brown noddy, some frigates in flight, but no boobies.

As everywhere, plastic waste litters the islands shore and extends inland around 5-10m. In a ten-minute search for “labelled” waste we found water bottles from Malaysia, Thailand, Indonesia, China, Taiwan, Maldives and Sri Lanka. Average distance floated by these bottles is probably greater than 3000km.



Left – on all islands plastic litter extends 5-10, sometimes more, inland. This may be from overwash or wind-borne. Centre and right: plastic water bottles from Malaysia and Sri Lanka.

Snorkel

Surveyed and explored the reef on NW shore where, about 20+m from shore there is a steeply shelving reef slope. At the upper slope the topography is very uneven. There are some areas where extensive remains of dead table coral (killed by disease in 2014-2015, prior to bleaching) are found. Many have coral recruits, but others largely devoid. There are still lots of massive *Porites*, many are still complete and growing, others partly dead but recovering. Overall coral cover was perhaps 10% and recruitment seemed low.

Quite extensive areas of *Caulerpa* are growing in some areas at 2-3m depth. Also quite abundant dark brown soft coral, perhaps *Nephtia*. Toward NE there is less algae and some wider beds of other surviving hard coral, notably branching. One grey reef shark.



Left – the complex reef topography generated by dead plate corals and recovering massive corals. Right: some areas where branching corals appears to be thriving.

Parasol

This is one of the rat-free islands on the northern shore. The island is 65% grass, with scavvy exterior and some other hardwoods (10%) rest is coconut.

Lesser noddies were nesting in most of the tall hardwood at SW – perhaps 500 nests. RFBs also nesting all around island margins and in some high trees. At least 50 nests, though the 3-4 we looked in were new, with no eggs. Two nearly mature fledgling chicks. No coconut crabs were seen

About 8 older turtle nests

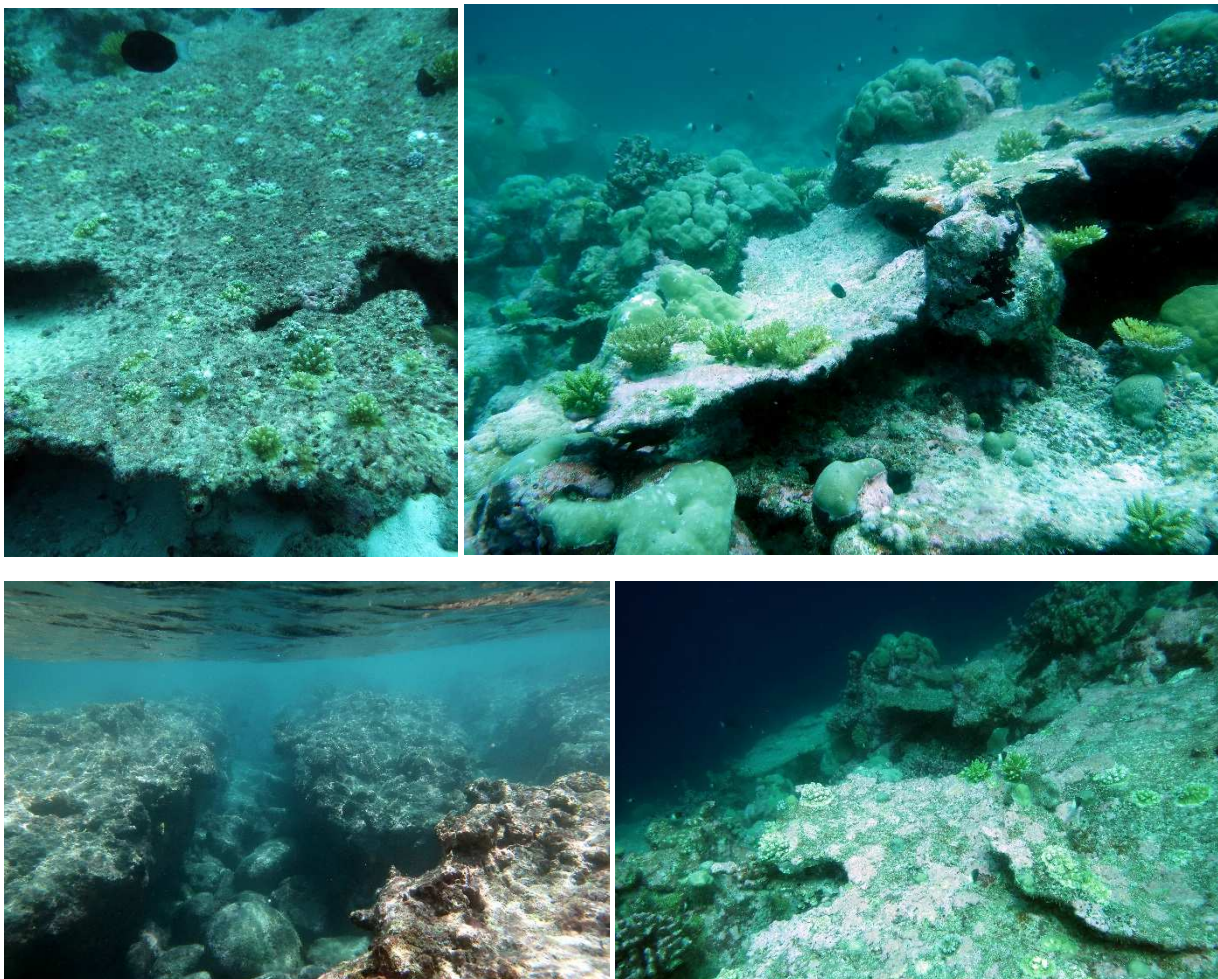


Marine observations Parasol and Ile Longue

A brief view of the lagoonward reef of Parasol. Lots of predators, including school black and white snapper and very large twinspace and onspot snappers. Quite good recruitment on plate corals

Seaward on Parasol, we made a brief stop at a location of FAD. This was a relatively small wooden frame hooked on seabed, with only a small amount of remaining net attached. It was not removed by our team as this would have prevented any further work and it was deemed to be relatively harmless with its low volume.

The seaward reef at both Parasol and Ile Longue was very similar, following a classic profile from spur and groove onshore with a gradual slope down to a drop-off at ~10-12m. The shallow reef around and just below the spur and groove was almost completely devoid of live coral and showed very little recruitment. From 3 m down to 6-7 metres smaller massive *Porites* colonies were quite abundant, together with a few live branching and digitate forms, creating a live coral cover of 10% or so. Recruitment became abundant, most visible on plates, but actually widespread. Most was a single <1yr old class, but there appeared to be some larger recruits, probably indicating two clear recruitment pulses.



Upper images, Ile Parasol. Left: abundant recruitment observed on some dead plate corals. Right: older recruits probably representing a >1 year old cohort.

Bottom images, Ile Longue. Left: spur and groove. Right: lower reef slope above drop-off with mixed-age recruitment.

Lagoonwards at the mid-point of Ile Longue we made a simple reef survey. This reef is still somewhat waveswept, with a clear coralline-algae spur and groove, falling into an uneven area with some massive corals. Below about 4m depth the reef slope is carpeted by extensive beds of *Halimeda*. Roving schools of larger parrotfish.

Landwards of the spur and groove was one area (not continuous but spreading 10m to one side, with near continuous branching corals in <40cm of water (1hr post high tide).



Left: extensive Halimeda growth on lagoonward reef slope at Ile Longue in about 3-6m depth. Right: extensive live coral cover on reef flat, Ile Longue.

Danger Island

Access from beach at mid-point of island, lagoon side. Calm day and relatively few waves – sand bottom most of way in.

Traversed island just N of wide area of low scavvy in a forest dominated by high *Pisonia*. Fairly open underneath, a few burrows, but I think mostly crabs. Fairly large numbers of papaya and chickens across entire island. It is not clear if papaya is sufficiently abundant to be competing in any significant way with native vegetation, but it may be being enhanced by the chicken population.

Both should be monitored with a view to possible removal efforts in future.

W shore more waveswept. Upper beach steep going into scavvy with numerous old turtle nests – hard to count but many 10s. Saw one fresh track (<a week) and one older, but others all old. Split into two parties to circumnavigate to N and S.

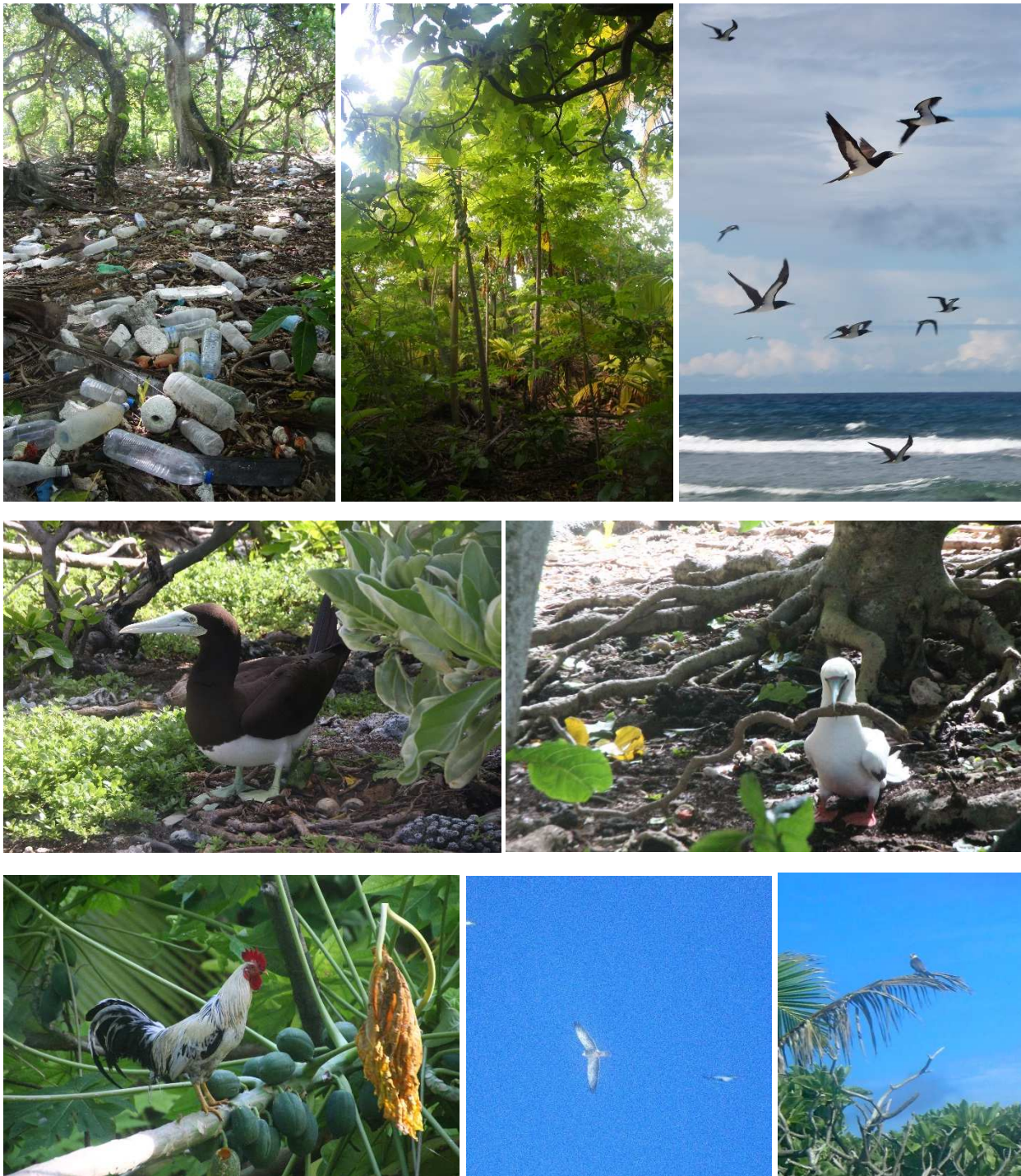
Coastal margins are heavily littered with plastic waste, which is clearly a partial impediment to ground-nesting species. It is not clear, but possible that plastic fragments may present an ingestion hazard. **Removal should be considered.**

Large number of brown boobies and all starting to nest. Many in low forest areas on the ground collecting leaves and twigs. Nesting along coasts along most of the southern 1/3 of the island (E and W shores). Only a few nests were already made (~30), but look like they are going to be very crowded nesting grounds with at least 500 nests, but I suspect closer to 1000. A small number had 1 or 2 eggs. SFPO reported no brown boobies on N half of the island.

Lesser noddy colony of perhaps 50 nests in low *Pisonia* near the W shore. Did not see any elsewhere.

Amur falcon perched on palm leaf on E shore

One FAD transmitter on W shore (N party also found 1), both were returned to the BPV



Top Left: Plastic waste dominates the island margins where brown boobies will nest. Middle: papaya is abundant. Right: brown boobies grouping prior to nesting.

Middle Left: Brown booby with nest and two eggs. Right: Red-footed booby gathering nesting material.

Lower Left: one of many chickens on a fallen papaya. Centre and Right: single amur falcon.



Reef lagoonside – largely dead with almost no recruitment – just a few encrusting and branching colonies on what are very large spurs of coral rock, with many long-dead small *Pocillopora* colonies. Below 5m there were some extensive areas of *Heliopora*. These were short and growing through macroalgae. Gave the impression that they may be relatively young regrowth?

Oceanside – brief snorkel from upper spur and groove to 9m. Very little growth right on spur and groove, but a few branching colonies and much dead *Pocillopora*. Slightly deeper, from 2 to 5m there was a lot of new growth with encrusting, foliose and branching forms. Some quite large patches of branching coral. Below this again cover was low (<5%), although some *Porites* obviously not killed by the bleaching. Some new recruits on dead plates (see photos). Small amount of *Heliopora*.



Left: reef at 3-5m with quite extensive coral cover (20%). Right: below 6-7m substrated dominated by dead standing coral cover with some recruitment visible on dead plate corals, but relatively low

Egmont

Visit to the westernmost island. Geomorphologically these islands are growing relatively fast. The islands Ile des Rats, Ile Sipaille, and Lubine have all now joined to make one large island, with the connections between them fully vegetated. The eastern lagoonward margin of this island has extended by some 10s of metres in the past decades, with much of it now heavily covered by scavvy and coconut.

In crossing this island we found the lagoon formally in Ile des Rat/Sipaille has become isolated from the sea, with a land-bridge now fully closed over and vegetated. This has left a large lake of (around 6ha): the mud in the lake bed is soft and sulphurous, but the water is fresh. This is probably the largest freshwater lake in BIOT: while there are some channels towards the former lagoon mouth, they do not connect to the sea even at high tide (though they may during storm events). Some waders – whimbrels and something like turnstones (check photo). **BIOTA should consider working (perhaps with Chagossians) to rename this island and name the lake!**

Near the lake a large pile of 50 plus empty sacks marked as “potting compost” were found in an area of open ground. These had been folded and piled up so had been put in this location. This may have been be visiting scientists, but we are unaware of a possible origin. It is not clear what other cause could be, unless there is some illicit cultivation, although this seems highly unlikely.



Upper left: incomplete land strip across lagoon mouth in 2005, view looking south (Photo: Homer Jack). Upper right: the land strip now closed (view looking west).

Lower left and right: freshwater lake in the island.

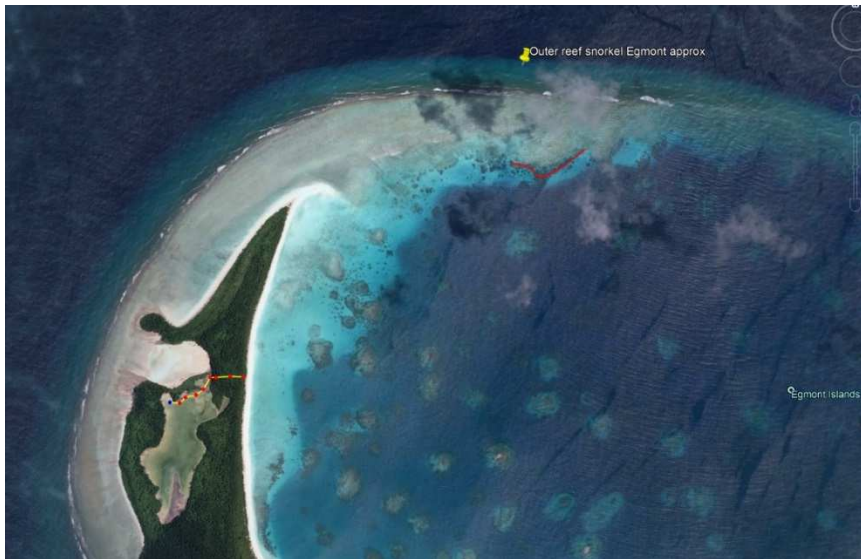
Marine observations, Egmont

The lagoon reef was surveyed close to the atoll channel. This reef had remarkably high live coral cover but almost entirely of a single species of branching *Acropora*. There was also a very high abundance of fish, including multiple snapper species. Butterflyfish were less abundant. This was the only location where we saw *Oxymonacanthus longirostris* (two pairs), a corallivorous fish which is one of the first species to disappear after severe bleaching.

Two hawksbill turtles were seen, others observed a manta in the lagoon.



Left – large Porites almost entirely intact with small patch of recovering lesions on uppermost surface. Right: although there were areas of dead branching coral, large areas of monospecific branching Acropora were found in the northwestern lagoon.



A brief snorkel on the outer reef showed wide areas of very low coral cover and low surface complexity, especially across the upper reef slope between 3 and 5m depth. There was active recruitment in all areas, but percentage cover remained very low.



Left: upper reef slope, with very low surface complexity. Right: deeper reef slope

Annex 3: Beach cleaning volunteers flier



(Group/Organisation)
VOLUNTARY BEACH CLEAN UP
 U.S. NAVY SUPPORT FACILITY
 DIEGO GARCIA, B.I.O.T.

Safety and Environmental Notes

Location: (Ocean Side)
 When: _____

HISTORICAL BACKGROUND: Since 1997, PWD Environmental spearheads the voluntary beach cleanup twice a year to promote sea turtle awareness, prepare the beaches for the seasonal turtle nesting and to celebrate the annual Earth Day event. In 2011, the NSF Council for Environmental Protection approved the increase of beach clean ups to 3 times per year. In 2013, NSF was unable to support future beach clean-up events and sponsored the last beach cleanup in November 2013. However, NAVFACFE PWD Environmental continued to provide coordination to any voluntary beach cleanup event and British Forces BIOT shall provide the logistical support such as plastic trash bags.

SAMPLE MAP OF BEACH CLEANUP SITE



SITE DESCRIPTION:

- ✓ GEODSS is approximately 17 miles from Downtown. Past GEODSS is a wildlife preserved area and access is restricted.

ENVIRONMENTAL NOTES:

- ✓ The ocean shores at GEODSS is a turtle nest site where two endangered species of sea turtles, the Hawksbill and Green turtles, lay eggs year round. April through June is the peak nesting season for Green turtles and November through January is the peak nesting for hawksbills. Mixed nesting is observed on other months.
- ✓ Turtle Cove is located on the lagoon side and across the antenna site which provides a good spot for viewing turtles especially at low tide. To know more about BIOT sea turtle conservation program and research, look for the informational board at Turtle Cove or visit us at PWD Environmental. Our contact number is 370-4546/370-4542.

One big problem that Chagos Archipelago faces is the amount of garbage washed to shore from trans-oceanic floating debris that pollute turtle habitats and nest sites. Diego Garcia is not exempt, as debris is washed to shore by the strong MALABAR current from the direction of South East Asia.

CLEANUP GUIDE: The DO's and DON'T's

- ✓ Trash is deposited underneath shoreline vegetation. Be careful when reaching for them and watch out for any stinging insects such as wasps or bees.
- ✓ Do not collect plastic buoys, sharps and syringes.
- ✓ Do not collect containers suspected to contain hazardous materials or hazardous waste. Note and report location to PWD Environmental. Contact numbers are 370-4545/370-4542.

SAFETY NOTES:

- ✓ Wear proper clothing and NO open-toed shoes.
- ✓ Bring own drinking water, skin and eye protection.
- ✓ Pay attention to overhead hazards.
- ✓ Vehicle operators will practice defensive driving techniques.
- ✓ Muster your people before and after the cleanup.
- ✓ Portuguese Man-of-War (stinger jellyfish) sometimes are washed ashore. They appear to be light blue bubbles with a long single tentacle. Do not let the stinger touches your skin. The dead are still deadly.



Portuguese Man-of-War

Respect the wildlife. All wildlife on DG are protected under the BIOT Law except those considered as pests such as cats and rats.



Above: A green sea turtle trying to find a spot underneath the shoreline vegetation (scaevola).
 Below: Nest site where the turtle will sit and lay eggs for long hours.



HAVE FUN AND ENJOY!!!

Chagos Archipelago- A Sea Turtle Sanctuary

Before the establishment of the British Indian Ocean Territory (BIOT) in 1984, man had stood upon this largest and most complex group of atolls in the world, the Chagos Archipelago. The Chagos Archipelago is a mixture of fifty five islanded atolls; several submerged or drowned atolls and a collection of submerged banks known as the Great Chagos Bank. This un-spilled chain of atolls provides a relatively undisturbed sanctuary for wildlife especially for the critically endangered hawksbill turtle *Eretmochelys imbricata* and the endangered green turtle *Chelonia mydas*

Though Chagos Archipelago is available for defense and security purposes by both the U.S. and U.K., wildlife in the BIOT is protected under law and heavy penalties apply for infringement of the regulations.

Migration of sea turtles in the Archipelago has gained international attention. In March 2002, U.K. became a signatory of the International Memorandum of Understanding on the Conservation and Management of Marine Turtles and their Habitats of the Indian Ocean and South East Asia.

All seven species of the world's marine turtles are threatened with extinction due to over harvesting of eggs, destruction of habitat, widespread hunting for their flesh and shells and accidental captures in fishing nets worldwide. However, hawksbill and green turtles are known to nest abundantly on Diego Garcia. Immature green and hawksbills forage extensively in the lagoon waters. Crude estimates on the number of females that nest annually in Chagos are: 700 for hawksbill and 800 for green turtles while unknown number of leatherback and loggerhead turtles feed in the surrounding waters.

Several scientific studies and research have been done by both the Foreign Commonwealth Office and the United States Navy to identify critical nesting habitat, the status of nesting population, population structure, growth rates, feeding ecology and patterns. The most recent studies in DG are:

- ◆ Sea turtle nesting incubation conditions
- ◆ Spatial use of Diego Garcia lagoon by juvenile turtles
- ◆ Genetic characterization of turtle population in BIOT
- ◆ Satellite tagging of turtles to determine long distance migration patterns.

NOTES

Location:
 Sample map is from GEODSS to BIOT Rifle Range. If the preferred location is within Downtown to GEODSS on the ocean side please inform PWD Environmental

BOSC Contractor's Support:
 503020 Grounds Maintenance_Spec Item (SI) 3.8 Beach Cleanup. Contractor shall remove non-biodegradable debris from downtown to GEODSS shorelines (Ocean side).

At East Pt. Plantation:
 Contractor shall maintain seven access paths and collect and remove trash during EPP beach cleanup evolutions twice per year.

Adopt a Beach Program:
 Does not conflict with BOS Contract Requirements if BOSC labor support to collect the picked up trash is NOT REQUESTED (Contracts). If adopt a beach coincides with BOSC schedule, the collection of trash from roadside and disposal to the incinerator by BOSC maybe possible through a low level partnering agreement.

Annex 4: Example Island Risk Assessment for Ile de la Passe (Salomon Islands Group).

Ile de la Passe: 29 / 40		Lat.: -5.30267°S Long.: 72.25292°E North east Salomon Islands		
<p>Overall rated a high risk due to the easy access and resource availability. Sea cucumbers, while perhaps not in great abundance, still are present. Risks are mitigated partially by the relatively high conspicuousness of the island and low ecological vulnerability.</p> <p>Island description.</p> <p>From the east overlooks the entry point to Salomon Islands making it an ideal place for surveillance camera placement.</p> <p>The seaward side is dominated by a rocky shoreline while the coast facing the lagoon is generally sandy. Island inspection typically takes 1hr. There is a natural causeway linking the island with Ile Mapou, which can be walked at low tide.</p> <p>Turtle tracks have been sighted here but are uncommon. The centre of the island is quite open with several hard wood trees present.</p> <p>Apparently there was an old poacher's well found here several years ago. However, this has not been confirmed and is not recorded.</p>				
<p>The radar chart for Ile de la Passe displays five categories: Accessibility (score 4), Sea cucumber (score 3), Resources (score 2), Concealment (score 1), and Ecological vulnerability (score 1). The chart uses a scale from 0 to 4, with concentric lines representing each score level. The 'Accessibility' category is the highest, followed by 'Sea cucumber', 'Resources', 'Concealment', and 'Ecological vulnerability'.</p>				
Accessibility	Sea cucumber habitat	Other Resources	Concealment	Ecological Vulnerability
4 (weighted x 3)	3 (weighted x 3)	3 (weighted x 2)	1 (weighted x 1)	1 (weighted x 1)
Easy access, straight onto the lagoon side beach except for extreme spring low tides when a short wade may be required.	Medium fringing reefs with large causeway at low tide to Ile Mapou. However, transects suggest sea cucumber densities and appropriate habitat is medium to low.	Large amount of hard wood trees. Large sea bird population. Likely to be high availability of fresh water supplies. No confirmed presence of poachers	Positioned at the entrance to Ile Salomon, it is possible that visiting yachts may see activity. Frequently visited and passed by the BPV on patrol. However, large and wide island offering high concealment.	Non Strict Nature Reserve, however has reasonable diversity of native trees and turtles known to occasionally nest there.