Department for Environment Food & Rural Affairs

DARWIN INITIATIVE

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Darwin Initiative
Final Report

*To be completed with reference to the Reporting Guidance Notes for Project Leaders (http://darwin.defra.gov.uk/resources/) it is expected that this report will be a **maximum** of 20 pages in length, excluding annexes)*

Darwin project information

Project Reference	19-027
Project Title	Strengthening the world's largest Marine Protected Area: Chagos Archipelago
Host Country/ies	British Indian Ocean Territory (BIOT)
Contract Holder Institution	Bangor University
Partner institutions	University of Warwick, Zoological Society of London, FCO BIOT Administration
Darwin Grant Value	£287,788
Start/end dates of project	2012/13 – 2014/15
Reporting period (eg Apr 2013 – Mar 2014) and number (eg Annual Report 1, 2, 3)	Final Report
Project Leader name	Dr John R Turner
Project websites	Chagos Conservation Trust: http://chagos-trust.org/ Chagos website ZSL: http://www.zsl.org/regions/uk-and-overseas-territories/chagos-archipelago Chagos Science and Conservation Expeditions: http://chagos-trust.org/2015-darwin-science-expedition-0 http://chagos-trust.org/biot-mpa-survey-expedition-2015 http://chagos-trust.org/2014-biot-expedition http://chagos-trust.org/projects/latest/feb-2013-expedition http://www.cct-chip.org/ Chagos Environment Outreach Project: http://www.zsl.org/conservation/regions/africa/chagos-coral/chagos-community,1915,AR.html Marine Reserves Coalition:http://www.marinereservescoalition.org/?s=chagos&x=0&y=0
Report author(s) and date	Dr John Turner, Prof Charles Sheppard, Dr Heather Koldewey, Kirsty Richards, Amdeep Sanghera, Rudy Pothin contributed to report and/or annexes on Connect Chagos Outreach.

1 Project Rationale

Project Goal: To strengthen the Chagos Marine Protected Area by providing scientific knowledge for effective management, and to develop a strategy that engages the support of potential stakeholders through outreach, education and engagement. ***The legacy is sound management and increased value of what is currently the world's largest no-take Marine Protected Area (MPA) and a unique and globally important reference site.***

Location: The Chagos archipelago is situated in the middle of the Indian Ocean at the southernmost end of the Laccadive-Chagos ridge. There are 5 atolls with 54 small islands exposed, and 12 submerged atolls and banks. All islands are uninhabited (and have been for over 50 years) except for Diego Garcia atoll, where there is a US naval facility, and this is excluded from the Marine Protected Area by a 3 nm limit. The British Indian Ocean Territory extends to 200 Nm around the islands, encompassing approximately 640,000km^2 of ocean, between 25% and 50% of the Indian Ocean's most healthy coral reefs including the world's largest atoll structure, and 60,000km^2 of shallow water habitats (Figure 1 map and Figure 2 & 3 BIOT EEZ & MPA).

Rationale: The BIOT/Chagos Marine Protected Area, declared in 2010, is the world's largest strict Marine Reserve representing 60% of the world's no-take area and 16% of protected coral reef. (*The UK government did announce in the budget that Pitcairn will become an even larger Marine Protected Area of 834,000 km^2 but this has yet to be agreed. Other MPAs, such as those of the USA in the Pacific are larger (1,271,500 km^2) and UK South Georgia and Sandwich Islands 1.07 million km^2 (20,431 km2 No-Take) but are neither continuous or all strict marine reserve. New large MPAs are expected in the future: Chile Easter Island 631,368 km^2, New Zealand Kermadec Islands 620,000 km^2, Kiribati Phoenix Islands 408,250 km^2)*. The MPA is of sufficient size to protect site-attached and migratory species in the Indian Ocean by protecting island biota, pelagic, reptile, seabird and sea mammal species at a time of increasing human impact and climate change. The small islands (total land area is 53km^2) were used extensively for coconut plantations from late 1700s and were abandoned by 1970, when the remaining people (now known as *Chagossians*) were relocated to Mauritius or Seychelles from where they descended, and many thence to England. The islands have since been unoccupied, and bird and turtle populations have recovered to internationally significant populations, although rats and overgrown plantation limit recovery of all areas, and poaching (mainly from Sri Lanka) of turtle, sharks, and sea cucumbers remains a concern. **The challenge now is to ensure that the Chagos MPA justifies its full no-take status, particularly considering over-fishing in the region, and that it fulfils its role as a unique scientific reference site for marine biodiversity**.

Chagos harbours 76 threatened species (*IUCN Red List*) including Hawksbill turtle, Red footed booby, silky shark, Coconut crab, and Bigeye tuna, providing an internationally important refuge and reference site. This Ocean Legacy MPA is part of the global Big Ocean Network of large MPAs and will protect entire ecosystems rather than species in isolation, including deep sea, pelagic, reef and small island systems including migratory species (cetaceans, sharks, turtles, birds) and those vulnerable to poaching and trade (sharks, turtles, sea cucumbers). **The project addressed the target of reduced pressures on coral reefs, contributing to restoring at least 15% of degraded areas through conservation and restoration activities, and effective MPA exceeds the target of protecting 10% of marine/coastal areas in the region.**

Scientific understanding will supports adaptive management based on data from representative sites and times, allowing the quantification of magnitude and significance of potential impacts from scenarios including climate change, island ecosystem restoration and possible human resettlement. The project will has communicated scientific evidence and recommendations to the BIOT Section FCO to implement the management of Chagos.

Aims and Objectives: **The aim of the project was to address those aspects that strengthen the Chagos Marine Protected Area) by providing scientific knowledge for effective management, and developed a strategy that engaged the support of potential stakeholders through outreach, education, and involvement.** The rationale was that a very large no-take MPA will protect functional ecosystems and

species, benefitting the large but poor human populations around the Indian Ocean. But, only 3% of the archipelago has been explored, and urgency exists in establishing a baseline against which to measure change and mitigate future impact. Direct engagement in science and communicating a broader understanding of the objectives of conservation will strengthen acceptance of the MPA. To achieve this, proactive engagement with major stakeholders was central to the project.

The main objectives of the Darwin Initiative to strengthen the world's largest MPA were:

(1) **To establish a permanent monitoring protocol for the coral atoll and island systems of the Chagos**; Outputs established the condition on commencement of MPA management against which change can be assessed, and will aid understanding of the magnitude and significance of potential impacts. Terrestrial restoration will be expanded with input from Chagossians. Marine surveys extended to areas previously unexplored, and the level of functional redundancy and response diversity in the biodiversity was established to assess resilience to natural and anthropogenic impacts. Scientific expeditions, were led by Warwick, Bangor and ZSL with a wide range of international collaborators.

(2) **Engagement of Chagossians in the UK, Mauritius and Seychelles through training workshops and outreach activities**. Activities were aimed at Chagossians of different generations to raise their awareness of the value of biodiversity and importance of conservation. Individuals were identified and selected for further externally funded initiatives, such as dive training and practical island restoration and conservation work. Workshops were organised jointly with Chagossian leaders, through ZSL, partners and local societies in UK, Mauritius and Seychelles where possible.

(3) **Highlight the significance of the Chagos Ocean Legacy MPA in the UK and internationally as a major step forward in conserving marine ecosystems and biodiversity**; achieved through high profile media workshops and supporting events in the UK and Mauritius, led by Bangor, Warwick, ZSL, and partner organisations such as Chagos Conservation Trust and Pew Environmental Group.

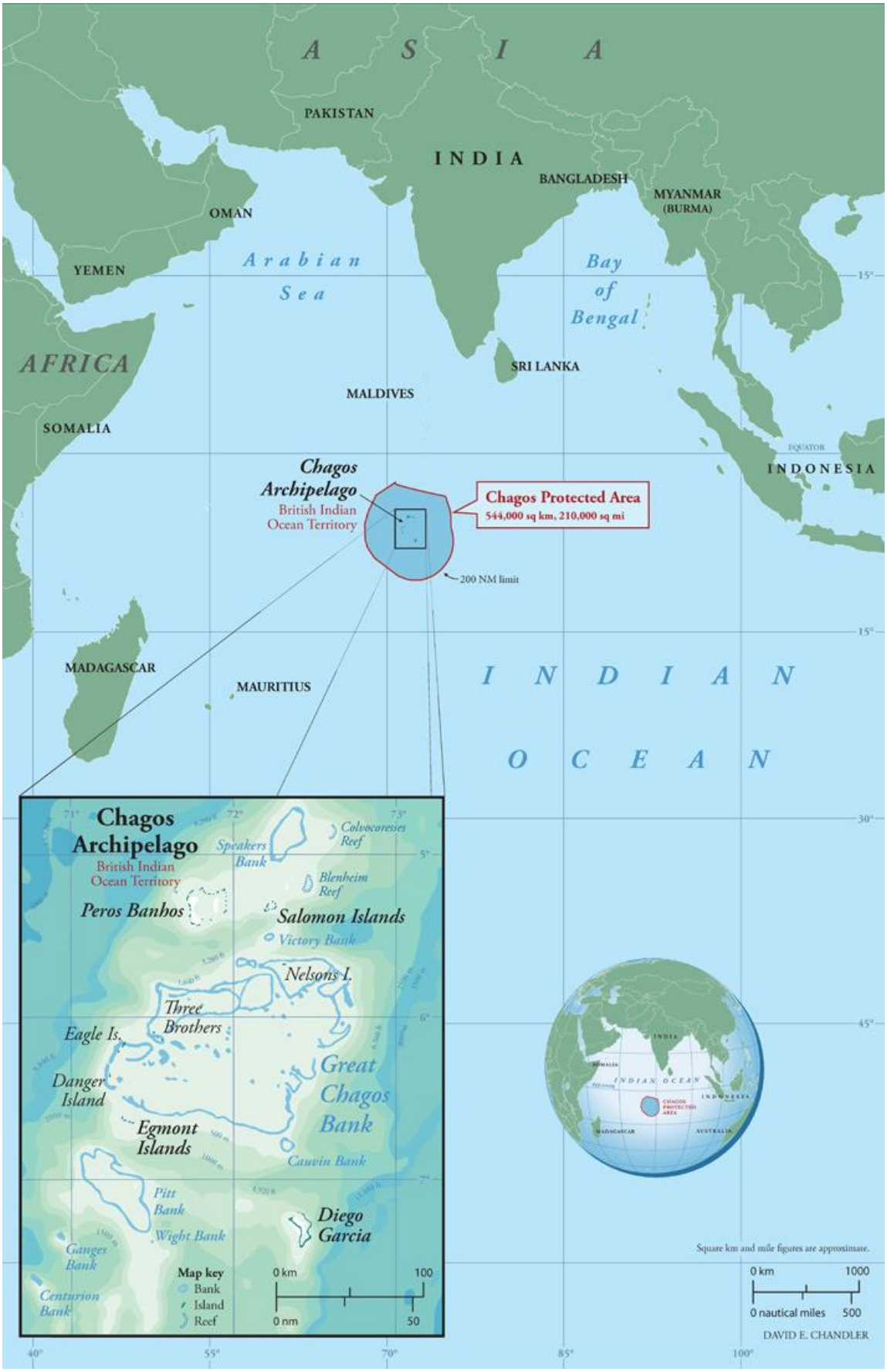

Figure 1: British Indian Ocean Territory, Chagos Marine Protected Area and Chagos Archipelago (inset) in the Indian Ocean. (Source http://chagos-trust.org/sites/default/files/images/chagos_map.jpg)

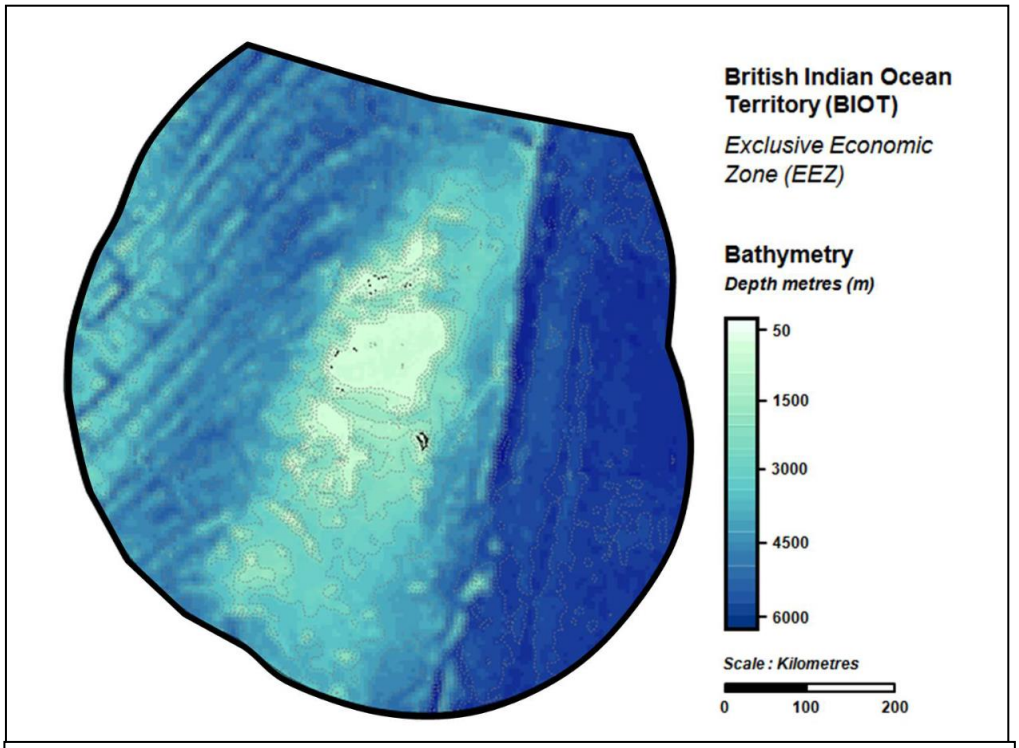

Figure 2: The British Indian Ocean Territory EEZ and bathymetry (Source Tetley & Turner)

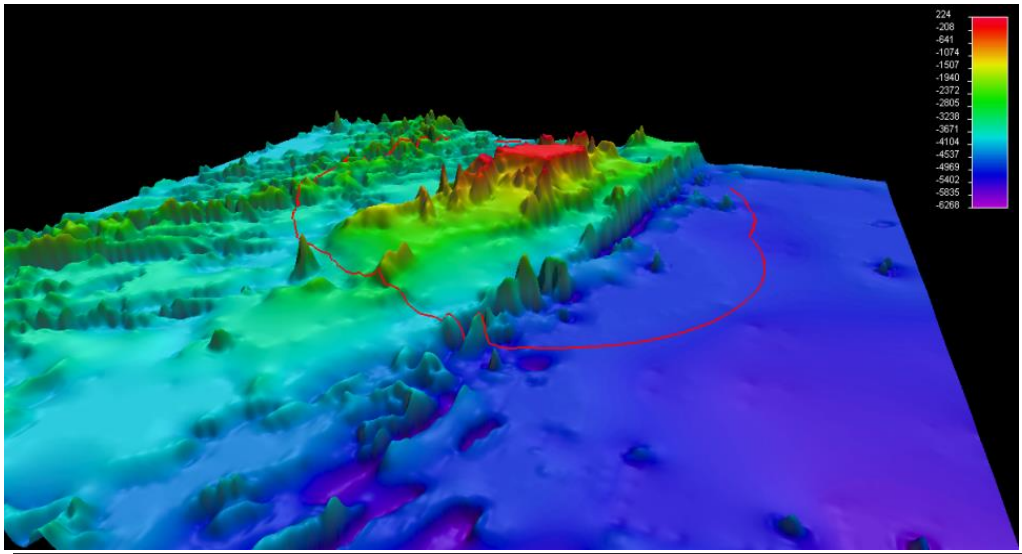

Figure 3: 3D image of Chagos Archipelago (Source Riegl & Purkis)

2 Project Achievements

2.1 Outcome

Please See Annex 1 and 2: summary of progress against the project logframe

The Project Purpose/Outcome was to strengthen the Chagos Marine Protected Area by providing scientific knowledge for effective management and to develop a strategy that engages the support of potential stakeholders through outreach, education and awareness. The legacy will be sound management and increased value of what is currently the world's largest Marine Protected Area and a unique and globally important reference site.

We have achieved the first part of the Project Purpose by successfully completing 3 Science and Conservation Expeditions in 3 years to obtain scientific data to establish the Chagos Marine Protected Area as a unique scientific reference site for marine biodiversity and on which to base effective management (See Output 1 below). The means of verification were achieved in exploring the habitats and ecosystems of atolls (Peros Banhos, Salomon, Egmont and Diego Garcia), submerged atoll of Belnheim, the Great Chagos Bank and 82% of the islands throughout the Archipelago. The work was directed at understanding the status of biodiversity on the atoll islands and reefs, and assessing change in the absence of direct human impact. Chagos is one of only a few uninhabited locations where such work can be carried out. The three Darwin Science and Conservation expeditions have involved 34 scientists from 12 institutions. The Expeditions have addressed 13 separate projects over the three years, advancing our knowledge of the Chagos Archipelago, and producing findings that contribute to the Interim Chagos Conservation Management Plan (**Annex 17**), and on recommendations regarding policy (eg. on *environmental* aspects of resettlement) (Annex **18, 19, 20**) and contribute to the AICHI Biodiversity Targets (**Annex 4**). Data are being submitted to relevant global databases (Fishbase, Reefbase, ReefGIS, Seabird databases) as well as being made available through our own Chagos information Portal, and a Chagos '*Coralpedia*' is being developed. **See Annex 7, 8, 9: Science and Conservation Expedition Reports 2013, 2014 and 2015.**

Key to scientific endeavour in this remote location has been the permanent establishment of scientific, diving, medical and safety equipment stores on Diego Garcia, and a containerised laboratory for mounting on the deck of the patrol ship during expeditions to provide a working space (see Output 2 below). The store has enabled scientists to minimise equipment shipped to Chagos for subsequent expeditions. This has been an important consideration, because access is challenging and expensive, via commercial flights to Bahrain or Singapore and then US military flights or supply ship to Diego Garcia, and no facilities exist for spares or servicing in the region. **See Annex 10: Expedition stores inventory and Annex 11: Expedition medical stores inventory.**

The second part of the Project Purpose on engaging stakeholders through outreach, education and awareness has been achieved through the Chagossian outreach programme, and through highlighting an awareness of Chagos amongst scientists, conservationists and the general public (see Output 3 and 4). This Darwin project has joined partners BIOT and CCT over the last 3 years to contribute to 'Connect Chagos', a programme that has successfully engaged Chagossian stakeholders in the UK, and initiated programmes in Mauritius. 32 Chagos Environmental Ambassadors have graduated from the training course during the project (with a further 10 in 2015), 13 have received advanced skills training, and 3 have participated in the Darwin Science and Conservation Expeditions, and 2 in other scientific expeditions. **See Annex 12: Connect Chagos Report; Annex 13 Connect Chagos Overview.**

The annual Chagos Conservation conferences have communicated our successes to a wide audience (ranging from the general public, Chagossians, undergraduates, media, Chagos Conservation Trust members and other conservation groups, to scientists and BIOT staff). It of course takes time after the expeditions for scientific data to be thoroughly analysed and for papers in international journals to be published, but these are now beginning to formalise **(see Annex 5**) the preliminary observations presented at our conference, and some have been presented at international scientific symposia (**see Annex 5**). The involvement of our team in the **Big Ocean Network shared research agenda** http://bigoceanmanagers.org/wp-content/uploads/bigocean_research_agenda_narrative_020113_FINAL.pdf

ensures common understanding and good practice across the world's largest MPAs (and has resulted in two papers). The scientific blogs, expedition reports and films are proving excellent material to engage wider public interest, and both the London Zoo Chagos Aquarium exhibit (**Annex 37**) and potential for incorporation of Chagos material in the BBC series 'Oceans' will advance this. The raised awareness helps highlight the unique and global importance of the Chagos. (Output 4). The Chagos Archipelago is now recognised world-wide as a flagship for such conservation, whose value is further enhanced by being part of a global network. The highly protected reefs of the Chagos Marine Reserve are important globally and recognised recently when the Chagos conservation initiative was selected by the UK Collaborative on Development Sciences (a Grouping of 14 UK government departments and research funders (including Defra), 2015) as *'one of the most important elements for international development emanating from the UK',* appearing in the **top 20 of Research Excellence Framework impact case studies**, http://www.ukcds.org.uk/the-global-impact-of-uk-research and http://www.ukcds.org.uk/the-global-impact-of-uk-research/conserving-marine-environments, and the latter web page was the **2nd most viewed of the top 20 impact stories**. In addition, the Darwin Project won the award for **Best Impact on Public Policy and/or Public Services** (sponsored by the ESRC Impact Accelerator Account in the *Bangor University Impact and Innovation Awards December 2015*: see

http://www.bangor.ac.uk/news/latest/bangor-university-rewards-outstanding-impact-from-its-research-and-enterprise-activities-25168.

The logistical and scientific approaches developed have provided a sound basis for new scientific initiatives in Chagos, including bids for new projects to continue reef and seabird monitoring work within a very large Consortium framework project to the Bertarelli Foundation, and a bid from our terrestrial scientists for a Chagos Atoll Restoration Expedition (CAREX) to the current round of Darwin Plus.

The project therefore successfully achieved its main purpose and outcome, although there were some relatively minor limitations beyond the control of the project. It was disappointing that the scientists from the University of Mauritius were unable to join any of our expeditions due to the Mauritian Government's position on challenging the sovereignty of the Chagos and non-recognition of the MPA. Relations with Mauritian scientists and NGOs remain good, but we have had to accept their difficult position. This was an Important Assumption highlighted as a risk in the original proposal. A major success was therefore being able to initiate outreach in Mauritius amongst Chagossian communities, even though further development will be reliant on Mauritian scientists and NGOs (eg, Mauritian Marine Conservation Society) which can be turned into a positive outcome. Further, outreach in Seychelles was not approved by FCO BIOT at this time. Although we remained willing to make presentations to military personnel on Diego Garcia, there appeared to be no appetite for this from island staff during our visits. Additional logistical challenges arose because BIOT permitted a number of international scientific teams to access Chagos at the same time, with minimal time for communication and planning, resulting in some duplication of work. Steps have been taken to improve communication. Finally, we still await greater security for our stores because equipment 'borrowed' and not returned can jeopardise future expeditions and increase our expenses (all discussed in later sections in greater depth).

All of the above will be expanded upon under the Outputs section below.

2.2 Impact: achievement of positive impact on biodiversity and poverty alleviation

The Goal/Impact of the project was to ensure that the Chagos MPA justifies its full no-take status, particularly considering ever increasing fishing pressure in the region and that it fulfils its role as a unique scientific reference site for marine biodiversity.

The measurable indicators were: Acceptance of the Ocean Legacy Large Marine Protected Area by stakeholders on the basis of scientific knowledge, underpinning the need for strict conservation; and assessment of effects of climate change in the absence of local anthropogenic impacts.

The Means of verification were: Agreement on marine protected area management initiatives which will include no marine resource extraction or habitat modification (except restoration) in the MPA, and establishment of monitoring protocols that are sustainable long term, and centralised accessible data basing.

The higher level impact on conservation of biodiversity has been achieved. The MPA remains a strict Marine Reserve (with the exception of 3nm limit around Diego Garcia, although much of eastern arm of the island is protected by RAMSAR). The scientific and conservation expeditions have established 34 coral reef monitoring sites across the archipelago, and monitor bird populations in 10 International Bird Areas and 2 further areas. **The findings are comprehensive, providing information on:** *coral community change, coral recruitment, coral diversity, cryptic fauna diversity, coral traits, coral growth rates, bioerosion, coral reef carbonate budgets, coral disease, coral bleaching and warming events, diversity of macroalage, sponges and black corals, biogeography of fish, reef fish diversity and abundance, Crown of Thorns starfish outbreaks, density of sea cucumbers, population assessment of Coconut crab (Birgus latro), bird breeding populations (especially Red foot booby), nutrient interactions between islands and marine environment, monitoring effectiveness of pilot study of rat eradication, and identification of terrestrial invasive species*. **The scientific knowledge details biodiversity in a place where current direct human impact is very low, providing a benchmark for improving degraded reefs in other localities and a baseline against which change can be measured.** A centralised database for Chagos (The Chagos Information Portal – *ChIP* http://www.cct-chip.org/) has been established with additional funds from the Chagos Conservation Trust, and its development has been secured through funding from the John Ellerman Foundation.

Due to the absence of people on the Chagos islands (with exception of military personnel and contractors on the Naval Facility), this project did not plan to address poverty alleviation and human welfare in Chagos. However, the *Connect Chagos* outreach programme to which the project has contributed, has sought to engage Chagossian people in the UK and Mauritius through awareness, education and participation in biodiversity conservation. The project has engaged a large proportion of the Chagossian UK population through family events (attended by 965), Facebook pages (777 followers), an Environmental Training Course (42 graduates), advanced skills training (13) and opportunities for individuals to join the science and conservation expeditions (5). The training course and advanced skills training (which includes careers advice and communication skills) potentially provides better opportunities for future employment. Involvement in the expeditions has inspired individuals such as Yannick Mandarin, Nadine Dorotree, Claudia Naraina and Jenny Bertrand (**Annex 14: Darwin Bursary Fellows Chagos expedition experiences**). Feedback indicates that there is now a much greater awareness about nature and the need for conservation in Chagos (**Annex 15: Connect Chagos People & Wildlife Community Booklet; Annex 16 Connect Chagos**).

In the meantime, the Legality of the MPA has been challenged by Mauritius, and the Marine Protected Area *has been found to violate international law*. This is a factor outside of the control of this project. On 18 March 2015 an Arbitral Tribunal under the UN Convention on the Law of the Sea ruled that the Marine Protected Area declared by the UK is not compatible with obligations under the Convention to give proper regard to the rights of Mauritius and is therefore *not lawful*. However, the Tribunal found that it did not have the jurisdiction to consider Mauritius's claim to sovereignty but has upheld that that the UK must cede Chagos to Mauritius when the archipelago is no longer required for defence purposes. The findings mean that Mauritius could, in the future, fish the waters surrounding Chagos and could exploit mineral deposits. The UK Government has not responded officially to the finding of the Arbitral Tribunal.

A challenge by Oliver Bancoult and the Chagos Refugees Group versus The Secretary of State for Foreign and Commonwealth Affairs over the legality of the MPA because it did not consider the feasibility of resettlement, has run since August 2010, and was dismissed by the Court of Appeal in May 2014. An application to the Supreme Court Appeal was heard in June 2015 and is pending a judgement.

A new resettlement feasibility study by KPMG was launched in April 2014 by Minister Mark Simmonds and responses are currently being considered. KPMG found that that there were no "fundamental legal obstacles" to resettlement. The study proposes three options in both scale and geographic locality followed by a gradual increase over several years, but does not consider detailed environmental impact

or detailed costings. Mauritius has declined to engage with the feasibility study. The study has not clarified demand from Chagossians (and is now attempting to so so), and notes that costs and liabilities to the UK taxpayer are uncertain and potentially significant.

A BIOT Interim Management Plan has been prepared and the interim designation is on the basis that the MPA and its management may change should resettlement proceed. Scientific findings to date have informed: (1) the BIOT Interim Management Plan; (2) consultations with KPMG on environmental aspects of resettlement feasibility (meeting September 2014 at KPMG and subsequent meetings/phone consultations); and (3) the Chagos Conservation Trust response to the BIOT Policy Review on Resettlement (See: **Annex 17: BIOT Document: BIOT Interim Management Plan; Annex 18: CCT document: Submission to BIOT Feasibility study Policy Review of Resettlement**). The PIs and Alistair Gammell also briefed the All Party Parliamentary Group on the Chagos Islands about aspects of conservation and science during a meeting in Westminster on 15th October 2014 (**Annex 19: CCT APPG briefing; Annex 20: CCT APPG meeting**).

The issues discussed above are mostly beyond the control of the project, and highlight the importance of our scientific studies assessing and monitoring biodiversity, and accessibility of the centralised database. They indicate that the MPA is not yet secure, and that its no-take status is vulnerable, and that environmental impact assessment may be necessary in the future. However, despite this, the Important Assumptions in the original proposal have so far held true: that BIOT would support an integrated management of the MPA based on scientific evidence and an ecosystem approach, and that they would implement the management plans, and that they would continue to resource enforcement of the MPA in the long term. Enforcement is currently resourced with support from the Blue Marine and the Bertarelli Foundation but is inadequate for such a large area, and BIOT are investigating how to increase the level of enforcement. With regard to the US Naval Facility on Diego Garcia, under the 1966 Exchange of Notes between the UK and the US, a decision on whether to extend the arrangement for a further 20 years must be made by 31 December 2016. There is pressure for the arrangement to facilitate and support Chagossian resettlement. Although Diego Garcia has a Ramsar site and protected areas, it is not part of the Chagos Marine Protected Area.

A further Important Assumption was that Chagossians be united in their further support for the MPA, primarily by accepting that it does not affect their right to return. The Chagossian Support Association and Chagos Refugees Group have argued against the MPA because they believe that it will prevent resettlement. The Outreach programme has connected with many Chagossians in Manchester, Crawley and Mauritius, and helped them to appreciate the importance of conservation, and many who have engaged understand that the MPA is not a device to prevent resettlement, but a necessity to secure the biodiversity of the region. Individuals and communities aware of the need for conservation and protection do not necessarily have the same view as their representatives and societies arguing for resettlement in the political arena, and many wish for both an MPA and resettlement. One proposal under review is resettlement on Diego Garcia, an atoll excluded from the MPA.

2.3 Outputs

Output 1 was: To continue established baselines and develop a more comprehensive approach to long term marine and island ecosystem monitoring against which change can be assessed, and develop an understanding to assess the magnitude and significance of potential impacts from several scenarios, including climate change, island ecosystem restoration and possible human resettlement. The Chagos/BIOT Management Plan will include BAPs and identify how CBD/CMS/CITES strategic goals and AICHI targets will be addressed.

The measurable indicators were: ***Measures of flora and fauna mapping; reef resiliency, functional diversity and response diversity; and assessments of island erosion and accretion; Development of impact matrices and mitigation measures for potential impacts; development of restoration initiatives for island flora and fauna***.

Means of verification were: Permanent transects and monitoring sites established on representative islands, reefs, and atolls; archived biodiversity data, including underwater video image records, and enhancement of current GIS database as a central resource; Incorporation of data sets into relevant global biodiversity monitoring systems; A management plan incorporating BAPs, and where potential impacts identified and understood, their significance and magnitude assessed, and methods for their mitigation verified through feedback monitoring & adaptive management.

Output 1 was achieved successfully by undertaking three Darwin Science and Conservation Expeditions during March-April in 2013, 2014 and 2015 (activity 1.3 -1.7) to undertake scientific projects, some of which were core projects running across all three years, and some were projects completed on one of the expeditions **(Annexes 7,8,9**). Late March to April is one of only two weather windows (the other is late November/December) when conditions favour small boat and diving operations due to the change in prevailing wind direction. Southeast Trade winds blow consistently and strongly from May to October and bring large seas; much lighter winds mainly from the Northwest affect the atolls from January to March. Previous scientific expeditions have taken place at this time, allowing for annual comparisons. While observations from different times of year would be valuable to understand variability with seasonality, it is not feasible at present because of the long lead in time required for implementing expeditions in this remote location, which prevents exploiting opportunities of good weather outside of the known calm weather windows. In each case, expeditions were operated from the BIOT patrol ship, the *MV Pacific Marlin* which provided access to the outer atolls and Great Chagos Bank from its base in Diego Garcia. Our expeditions join the ship in Diego Garcia following mobilisation and our equipment stores are established in BIOT facilities within the US Naval facility. Daily operations were launched from the *MV Pacific Marlin* using small boats to access the coral reefs and islands. Expeditions were limited to 14 persons, most of whom were scientists, one of whom was a medical doctor, another logistic support and another a Chagossian. Each expedition was led by one of the Darwin project PIs (Sheppard in 2013, Koldewey in 2014 and Turner in 2015), with at least one other PI as a co-leader. Besides the Captain and crew, a BIOT Enforcement Officer was also present on each cruise, assisting with expedition activities when his duties allowed.

Core projects running through all three expeditions were:

- Long term hard coral cover, juvenile coral settlement, and seawater temperature monitoring and development of 'Chagos Coralpedia' *Prof. Charles Sheppard, Anne Sheppard, University of Warwick, UK* with assistance from David Curnick (ZSL) in 2014.
- Video recording of reef cover and community structure at permanent sites and establishment of a video archive to document resilience *Dr John Turner and Dr Ronan Roche, Bangor University, UK*.
- International Bird Area population assessments, breeding habitat requirements of the Sooty tern; feeding and foraging behaviour of Red footed booby; monitoring the spread of invasive species; population dynamics of the Coconut Crab *Peter Carr with Heather Koldewey, ZSL*.

Projects running across 2 expeditions were:

- Coral disease assessments (2014/15) *Dr Courtney Couch: Hawai'i Institute of Marine Biology, USA.*
- Coral reef cryptofauna biodiversity assessment (2013/2015) *Prof Morgan Pratchett, James Cook University, Australia and Catherine Head, University of Oxford.*
- Coral reef functional redundancy, and Sea cucumber assessment (2014/2015) *Dr Elizabeth Widman: University of Warwick - Dr Widman replaced Prof Andrew Price (University of York).*

Projects conducted on one of the expeditions were:

- Assessments of macroalgae, sponges and back corals (2013) *Dr Daniel Wagner, NOAA, Papahanaumokuakea Marine National Monument, USA*.
- Biogeography of fishes (2013) *Dr Michelle Gaither, California Academy of Sciences, USA:*
- Development of instrumentation for pelagic fish monitoring (2013) *Gary Fletcher, Zoological Society of London, UK*.
- Large bodied reef fish abundance and biodiversity (2014) *Dr Melita Samoilys, CORDIO Kenya and Dr Heather Koldewey, Zoological Society of London w*ith some tagging work on Manta rays *by David Curnick (ZSL).*
- Coral diversity (2014) Dr Doug Fenner, American Samoa, Chagos Conservation Trust USA scholar, including *'Coralpedia'* electronic reference source.
- Benthic carbonate budget Assessment (2015) *Prof Chris Perry and Gary Murphy Exeter University UK*.
- Productivity of benthic communities and interactions with nutrient enrichment from islands (2015) *Prof. Nick Graham and Dr Shaun Wilson, James Cook University/Department of Parks & Wildlife, Australia.*

Up to 36 marine sites across the 6 atolls were visited on the expeditions, and many of the same sites had been visited on previous expeditions in 1996, 1999, 2001, 2006, 2010 and 2012. As a result, reef and island flora and fauna monitoring has been achieved, addressing the indicators of assessing flora and fauna, reef resiliency, functional diversity and response diversity. A short list of 22 reef monitoring sites, and 10 island IBA sites with 2 potential new sites, have been identified for future monitoring (**Annex 21: Chagos Monitoring Sites**). All data is now being archived in the Chagos Information Portal with appropriate datasets (eg seabirds, fish, corals) being submitted to global biodiversity monitoring systems (*Fishbase*, *Reefbase*, *ReefGIS*, *Seabird Information Network*) and a *Chagos Coralpedia* (a coral identification for Chagos similar to Sheppards's Darwin Initiative supported Caribbean coral and sponge guide http://coralpedia.bio.warwick.ac.uk/). The data will be used to produce BAPs to further develop the Management Plan. Specific projects on assessing reef carbonate budgets have investigated reef accretion and erosion (which subsequently builds islands), and studies of nutrients related to soil enrichment, bird communities and rat eradication have provided baseline information for island flora and fauna restoration. This activity is now mainly undertaken by a Darwin Plus project: Ile Vache Marine Bird Habitat Restoration. In August 2014, a grid of baiting stations for rat eradication was undertaken, and no rats were observed during monitoring in March 2015.

All projects provided baseline data against the measurable indicators to develop an understanding to assess the magnitude and significance of potential impacts from several scenarios, including climate change, island ecosystem restoration and possible human resettlement. For example, our direct knowledge from the expeditions has been used in responses to BIOT Administration in compiling the Chagos/BIOT management Plan, March 2014 (activity 1.9); responses to KPMG in consultations over Chagossian resettlement plans, July 2015; and Response to BIOT Feasibility study policy review of resettlement, October 2015 (**Annexes 17-20**). If resettlement plans are considered further following the policy review, then it is likely that Environmental Impact Assessments will be required and these will rely heavily on our data. We have recommended that a Strategic EIA should be undertaken ahead of EIAs for individual developments.

The Chagos Management Plan (activity 1.9): The project log frame indicated our aim to develop the Management Plan for Chagos, and to expand the then current plan into one which incorporated Biodiversity Action Plans. In year 1, a draft Management Plan was prepared but without BAPS (First Annual Report: 'Draft Chagos Management Plan (Annex 5 to that report) and submitted to BIOT Section and to the BIOT Science Advisory Panel in July 2012 ahead of schedule. The Plan was a working document, to be further developed on the basis of findings from research expeditions. The Plan made recommendations on marine, fisheries and island science and monitoring; and general needs and management activities, but did not yet include detailed Biodiversity Action Plans (BAPs) on species, and

was not formatted as a formal management plan. The Plan was to develop over the next two years to reflect the strengthening of the knowledge base and identification of management issues and solutions.

Between January and June 2014, the new BIOT Administration drafted an interim conservation management plan for the Territory. The plan was *interim* because BIOT were reviewing their policy on the resettlement of the islands, and therefore could not come to a decision on longer term conservation activity beyond the interim plan. The BIOT Administration made it clear that they need to own the conservation plan in interim form and in the longer term, but acknowledge that they are not subject experts, and recognised the importance of drawing on our, and government department advice, to help develop a plan which is both ambitious and recognises the Territory as a world class environmental asset. They acknowledged that our Draft Management Plan provided a good basis, and that the scientific workshop held in Geneva in October 2013 (which the PIs attended) provided a further plan of conservation activity. BIOT wanted to build upon the plans, but did not want a single non-governmental organisation to lead it (e.g. CCT, our Darwin project, Blue Marine Foundation etc.), but rather they would have Natural England provide the technical expertise to bring together stakeholder views into a plan. The Blue Marine Foundation did coordinate a meeting on behalf of BIOT at the FCO on 5th March to discuss the development of the plan, again attended by some of our PIs, and subsequently there were further consultations and iterations with 44 stakeholders. The objective and structure of the resulting Interim Management Plan was as follows:

The plan was to take into account FCO Overseas territories overarching objectives as follows:
'The natural environment, whether through individual species, habitats or whole ecosystems, is to be appropriately valued; Unique, highly vulnerable or sensitive natural environments are identified, protected and conserved by appropriate means including through the use of management plans, underpinned by scientific research; Manage terrestrial and marine natural resources sustainably and address challenges of climate change, including by putting environmental considerations at the heart of all decision-making; Oversee exemplary environmental management of the uninhabited Territories; Ensure compliance with the requirements of relevant multilateral environmental agreements; and to strengthen co-operation with the Non-Governmental and scientific community.'

In taking ownership of the plan, BIOT were very clear about their principles for the plan, including:
'*The plan will be no more than 5 pages (exc. references etc.); the plan will contain high level conservation objectives for the key ecosystem components of the Territory including terrestrial and marine; ·Objectives will cover the various designations including the MPA and the Ramsar sites; Conservation objectives will be as SMART as possible; BIOT will look to include management objectives for activities where these are needed i.e. where it is not obvious that activities may or may not be incompatible with the conservation objective; The conservation plan will not include a comprehensive list of science needs as this will be covered in a separate document; The plan will not look in detail at enforcement as this is being looked at separately but for objectives to be SMART BIOT should consider how practical they are to achieve through management and enforcement; Although interim the plan should not just set out where we are now but where we want to be including any desired environmental improvements and potential threats such as climate change.*
The structural components of the plan were: Description of natural values; Vision / desired outcomes; Conservation objectives for each key habitat/ecosystem component e.g. coral reefs, seamounts, birds, terrestrial flora/fauna; Key threats; Main management actions (either proactive management if relevant for terrestrial habitat/ecosystems, or likely restricted/permitted activities for management of marine habitats); Monitoring and reporting plan/cycle; Indicators of success/performance criteria.'

The plan was eventually launched at the end of September 2014 as the '**BIOT Interim Conservation Management Framework' Annex 17**.

Development of Biological Diversity Action Plans: During the Darwin project, we have identified important species for which BAPs will be appropriate (below), and various scientists are working up data which will contribute to these. Some of the scientific work on species is being further developed in

new projects too, such as turtle research (Darwin), elasmobranch studies (Bertarelli Foundation), IBA bird monitoring, atoll vegetation and the proposed Darwin Plus CAREX project. Of course, what we do not know is whether there will be human occupation and access to specific islands, and therefore we are unsure over the level of threat and requirement for future management. We are currently at a stage where we are reviewing candidate species for inclusion not only because of their IUCN Red List status, but also on the basis of their local status in Chagos, potential threat, restoration value, and functional or indicator role. We have good data on some species groups (plants, birds, Holothuria, Coconut crab, some fish) and some habitats (coral reef habitats, native woodland). Scientists working on specific groups will complete a template for their species (not unlike the Darwin Ascension Island examples e.g. at http://www.ascension-island.gov.ac/government/conservation/projects/bap/ and then these will be edited by the PIs, and the finished documents will be available through the Chagos Science Portal, and will be submitted to BIOT Administration for inclusion as annexes to the BIOT Interim Conservation Management. This work is underway and is dependent on data analysis from the field work, with expected completion of a shortlist of BAPs by end 2016.

Each BAP requires: (a) inventories of biological information of selected species/habitats; (b) assessment of the conservation status of each species within a specified ecosystem; (c) targets for conservation or restoration; (d) budgets, timelines and institutional partnerships for implementing the BAP. Potential BAP species currently under review by the project team include:

Plants:
Remnants of native flora and important bird habitat:
Cololejeunea planissima var. *chagosensis* (liverwort) **Endemic**.
Lumnitzera racemosa (Black mangrove) IUCN Red List status Least Concern. Small grove on Moresby, Peros Banhos atoll. Surveyed.
Pemphis acidual (Mangrove). Least Concern. Ile Anglaise & Ile du Passe Salomon atoll
Barringtonia asiatica (Fish poison tree, Rose tree). Least Concern. Few surviving in Chagos. Surveyed.
Cordia subcordata Least Concern.
Guettarda scabra (Beach Gardenia) Least Concern. Groves.
Hernandia sonora (the Lantern Tree). Woodland.
Pisonia grandis Trees. Surveyed.
Calophyllum inophyllum

(Note: Terrestrial species BAPs to be considered for preparation by Darwin CAREX)

Invertebrates:
Ctenella chagius (endemic Chagos brain coral) **Endangered.** Surveyed
Birgus latro Coconut robber crab. **Data Deficient.** Surveyed
Holothuria (sea cucumbers): Poached & overexploited:
Stichopus chloronotus Greenfish) Least Concern. Surveyed
Holothuria atra (Lollyfish) Least Concern. Surveyed
Holothuria nobilis (Black teatfish**)** **Endangered**. Surveyed

Fish:
Amphiprion chagosnensis (Chagos anemone fish) **Possibly endemic**. Not yet assessed for IUCN Red List
Plectropomus laevis (Coral trout) **Vulnerable.** Easily overfished. Surveyed.
Epinephelus polyphekadion (Camouflage Grouper) **Near Threatened.** Easily overfished. Surveyed.
Chlorurus strongylocephalus (Heavy beak Parrot fish) Least Concern. Small excavator. Surveyed.
Cheilinus undulates (Humphead wrasse) **Endangered.** Surveyed.
Bolbometopon muricatum (Green Humphead Parrotfish) **Vulnerable.** Major eroder. Surveyed.
Aprion viriscens (Green job fish Snapper) Apex piscivore. Surveyed.

Chaetodons (Butterfly fish) Obligate and facultative corallivores are a secondary indicator of coral community health. 8 species assessed: *C. bennetti, C. lineolatus, C. melannotus, C. meyeri, C. ornatissimus, C. trifascialis, C. trifasciatus, C. zanzibarensis.*
Chaetodon trifascialis (Triangulate Butterflyfish). **Near Threatened**. Surveyed.
Chaetodon bennetti (Bluelashed Butterflyfish). **Data Deficient** Surveyed.
All others are Least Concern

Sharks and Rays: Overexploited in Indian Ocean, poached in Chagos
Manta alfredi (Reef Manta ray) **Vulnerable.** Surveys underway.
Manta birostris (Giant Manta ray) **Vulnerable**. Surveys underway.

Carcharhinus ambylrhnchos (Grey reef shark) **Near Threatened.** Surveyed & underway.
Carcharhinus albimarginatus (Silvertip shark) **Near Threatened.** Surveyed & underway.
Carcharhinus limbatus / melanopterus (Blacktip Shark**)** **Near Threatened**. Surveyed & underway.
Nebrius ferrugineus (tawny nurse shark) **Vulnerable.** Surveyed & underway
Galeocerdo cuvier (Tiger shark) **Near Threatened.** Rarely seen.
Triaenodon obesus (Whitetip reef shark) **Near Threatened**. Surveyed.

Turtles:
Chelonia mydas (Green turtle) **Endangered**. Surveyed
Eretmochelys imbricata (Hawksbill turtle) **Critically Endangered** Surveyed

Birds
Important breeding colonies in 10 IBAs + 2 provisional IBAs. All birds below surveyed regularly now. These are all of Least Concern but important locally for due to vegetation management:
Sula sula (Red footed booby)
Sula dactylatra (Masked booby)
Anous stolidus (Brown Noddy)
Anous tenuirostris (Lesser Noddy)
Onychoprion fuscatus (Sooty tern)
Fregata minor (Greater Frigate bird)
Fregata ariel (Lesser Frigate bird)
Puffinus iherminieri (Audabon's puffin)
Puffinus pacificus (Wedge tailed shearwater)

Potential BAP Habitats:

Coral reef. To include specific reef zones (lagoon, leeward and patch reefs, seaward reef, algal ridge, reef terrace, shallow and deep forereef slope. All atolls. Surveyed.
Mangrove. Rare and localised in Chagos (Moresby, Eagle).
***Scaevola/Argusia/Tornefortia* thicket.** Important Habitat & Engineer species. Surveyed
Native tree groves. Important Habitat. Surveyed.

The Important Assumptions held true. BIOT permitted our expeditions over the 3 years, and the Air Mobility Command flights continued to carry scientists to Diego Garcia, although the route was changed from via Singapore to via Bahrain, which had minimal effect on the budget. BIOT continued to allow us access to the BIOT patrol vessel *Pacific Marlin*. The ship's contract runs out in March 2016, and for the time being, no further expeditions utilising the ship are permitted for 2016. None of the surveys were delayed by activation of the US Naval Support Facility, although in 2014 we were required to board the patrol ship and depart Diego Garcia on arrival due to other activities requiring BIOT facilitation on Diego Garcia. Lack of mobilisation time was just about manageable, largely because we were prepared.

The project is disseminating scientific and technical knowledge relating to biodiversity value, functioning and trends and consequences of its loss. Data from the three expeditions is now being collated into the Chagos Science Portal (http://chagos-trust.org/news/launch-chagos-information-portal and http://www.cct-chip.org/, from which it will be disseminated into global databases. (Activity 1.8).

Output 2 was the provision of scientific survey equipment and a permanent facility for safe and secure storage between scientific visits, thereby reducing transportation logistics and associated costs.

The measurable indicators were purchase and installation of diving compressor, boat and engine, diving equipment, survey equipment and safety equipment accessible to visiting scientists.

The Means of verification were: Scientific equipment available to scientists for series of visits over the next 3 years and beyond.

Scientific, diving and safety equipment has been built up over the 3 expeditions, and is now permanently stored in the Royal Marine's ex-workshop at Moody Brook on Diego Garcia, and therefore Output 2 has been fully achieved. A sustainable **strategy (Annex 22: Chagos Equipment Terms)** has been developed for other scientific groups wanting to use the equipment, bearing in mind the high wear and tear incurred by using equipment in harsh conditions, transportation logistics, and the need to have a full complement of spares and consumables to be self-sufficient in the field. (Activity 2.1).

The Chagos Science and Conservation store has air conditioning, shelving and a garage area suitable for the storage of boats and other large items. Equipment is mostly stored in numbered boxes keyed by an inventory (**Annex 10 & 11; Chagos Expedition Stores & Medical Stores Inventories 2015).** There are further plans to increase security, construct more shelving, and to convert an adjoining area into a sample preparation area. This is important because nearly £1000 worth of tools and boat anchors were stolen/'borrowed and not returned' in the period between the 2014 and 2015 expeditions, and the rubber boats had deteriorated. The equipment was moved from its temporary storage in the Customs House after the second expedition, and previous to that it was in a temporary USA facility store. 7 boat engines, pyrotechnics (flares), chemicals and part of the medical kit are stored permanently on the *MV Pacific Marlin* to ensure security. The containerised laboratory is stored at Moody Brook between expeditions, and has now been made more weatherproof by installation of a new door.

The Means of Verification – that scientific equipment will be available to scientists for the series of visits over 3 years and beyond - were therefore addressed, and the Important Assumptions – that space will be allocated in a dry building adjacent to the harbour/marine, held true.

Output 3: Engagement of Chagossians in the UK, Mauritius and Seychelles in importance of biodiversity and conservation through training workshops and outreach activities.

The Measurable Indicators were: Chagossians from all representative groups attending and taking an active part in events in UK, Mauritius, Seychelles. Chagossian societies centrally involved in the organisation of the workshops and design of the activities.

The Means of verification were: Interest and engagement of Chagossians – list of participants and workshop evaluation forms. Individuals identified and selected for further externally funded initiatives (eg diving and underwater survey training, practical conservation techniques).

Output 3 has been very successfully achieved through the 'Connect Chagos' programme run by the Zoological Society of London and supported by this Darwin Project, the Chagos Conservation Trust and BIOT in collaboration with the project partners **(Annex 12: Connect Chagos 2014-2015)** . The Darwin Project co-funds a Project Coordinator (Kirsty Richards who replaced Rebecca Short in September 2014) at the Zoological Society of London, supported by an Outreach Officer (Amdeep Sanghera who replaced Audrey Blancart in January 2015) and an Outreach Assistant (Rudy Pothin – Chagossian heritage and Creole speaker).

The objectives of **Connect Chagos** were to:

1. Increase general awareness within the Chagossian communities of the tropical marine environment and issues affecting the environment of the Chagos Islands.
2. Identify individual Chagossians with the interest in, and potential for, environmental training.
3. Provide in depth mentoring, support and training to build scientific and technical conservation capacity for a small group of individual Chagossians with demonstrated potential.
4. Develop priority conservation projects in Chagos that are implemented with the help of Chagossians as part of an integrated training programme.
5. Evaluate the programme on an on-going basis to ensure training is effective.

The activities have built on those of 2012/13 and 2013/14 to the extent that over the course of the project we have successfully addressed **activities 3.3 and 3.4** and the above objectives 1-3 & 5:

- 965 Chagossians have attended family environmental days.
- 42 Chagossian Environmental Ambassadors have graduated from the Environmental Training Courses (**Full list see Annex 23: Connect Chagos Ambassadors 2012-2015**)
- 13 received advanced training skills through Darwin and Chagos Conservation Trust Bursaries.
- 5 Chagossians joined scientific expeditions to Chagos, 3 on the Darwin Science and Conservation expeditions.

Objective 4 above will be achieved through the Darwin Plus Chagos atoll restoration expedition proposal (CAREX) – if successful - in which Chagossians assist in habitat restoration.

As in previous years, activities this year have ranged from implementing specific environmental sessions, an environmental training course, and the provision of advanced training through bursaries. ***However, wherever possible, the Chagossians themselves were encouraged to take responsibility for organising some of the activities to ensure involvement and ownership***. To exemplify the activities, those undertaken in this last year are described:

An Environmental open day (Annex 24) was held at Tulley's Farm, Crawley in June 2014, and was attended by 150 Chagossians from both Manchester and Crawley communities. The event offered environmental-based activities for all ages as well as workshops focused on the fauna and flora of the Chagos Islands **(Activity 3.2)**. This event was also an opportunity to raise awareness and recruit for the summer environmental training course.

8 Chagossian trainees attended the **Chagos Environmental Training Course** which ran between the 5th July and 20th September, 2014 **(Activity 3.2)**. Similar to last year, the training course addressed three themes: marine conservation, terrestrial ecology and communication for conservation. The course was comprised of the following:

- Careers and communication tutorial with Cassandra Murray (ZSL Evaluation Officer)
  The session was two-fold: firstly, the focus was on how to communicate conservation issues to a broad range of audiences, and secondly, the trainees were shown a variety of career paths available in conservation.

- Botany course with Helen Hicks (Kew Education Officer, Wakehurst)
  This session gave an introduction to plant anatomy and structure, followed by methods of reproduction.

- Habitat management with Kenneth Greenway (Tower Hamlets Cemetery Park Ranger, London)
  This session explored invasive species (using coconut trees in Chagos as an example) while also giving the trainees an understanding of issues that arise when habitats are mismanaged.

- Coral reef ecology with Rachel Jones (ZSL Aquarium Team Leader)
  Emphasis was on coral reefs' overall function and linked to the wider ecosystem. Surveying and monitoring techniques were also covered with Chagossian reefs used as a prime example throughout the session.

- Bird monitoring with Ian Robinson (RSPB Broads Area Manager at Pulborough Brooks Reserve, West Sussex). *This session highlighted bird monitoring techniques with respect to in-flight and abundance estimates, while providing the opportunity for trainees to identify and monitor nesting sites.*

- Marine conservation and species identification with Rebecca Short (ZSL Marine and Freshwater Project Co-coordinator at Seven Sister's Country Park, East Sussex). *The session gave the trainees hands-on experience through the collection and identification of various rocky shore-based species. The class-based activity explored the global importance of MPA's along with commercial fishing methods and their sustainability.*

- Try SCUBA dive, London School of Diving. *The trainees learnt the basics of SCUBA diving and took their first breaths underwater.*

- Wild weekend at the Sustainability Centre, Hampshire. *The trainees learnt about sustainable living through demonstrations of how solar power is generated and how clay ovens and composting toilets work. A walk with a trained herbalist also highlighted the natural healing powers of plants, and finally a camp fire enabled course participants to reflect on their time with the project.*

  A specific video for the Connect Chagos 2014 Environmental Training Course can be found here - https://vimeo.com/112487497

The environmental training course culminated in an awards ceremony ***organized by the graduating trainees themselves***, was held at the Tilgate Community Centre, Crawley, on 14th November 2014 (Activity 3.2). Over 60 people attended including Prof Charles Sheppard who awarded all 8 Chagos Ambassadors with their certificates. Also in attendance were family members of the ambassadors, the Connect Chagos staff, 4 ZSL education officers who played key roles in planning and developing the training course, and Rachel Jones (ZSL Aquarium Team Leader), Kew's Helen Hicks and Allen Vincatassin (provisional Chagos President).

A further Chagos Environmental Training Course was run beyond the end of the Darwin Project **(Annex 25).**

In addition, Connect Chagos Ambassadors benefited from advanced skills training this year through the Darwin funded bursaries (Activity 3.4):

- Lia Tallot, Yvane Elyse and Jenny Bertrand completed their LANTRA CS30 chainsaw training with Ian Robinson from the RSPB in February 2015.
- ***Claudia Naraina and members of the Manchester Chagossian community organised and hosted their own environmental open day*** where over 120 people attended. A choreographed play involving school children was performed to the audience highlighting the value of marine protected areas, along with traditional Chagossian dances.
- Claudia Naraina completed her PADI Advanced and Rescue diving qualifications with Yu diving in Manchester.
- Jenny Bertrand, Nelson Betrand, Nadine Dorothee, Joanne Dorothee, Marie Noel Pirogue, Jane Baptise and Eleanor Bandoo are currently undertaking introductory swimming classes at K2 Leisure Centre in Crawley, and are being taught using the nationally recognised syllabus *ASA Learn to Swim Pathway.*
- Jenny Bertrand had intended to use her bursary to pursue a botanical course at Plumpton College, however withdrew her interest as the required number of volunteer hours per week were not compatible with her work and personal life. She is currently looking for a more suitable option.

Five Connect Chagos Ambassadors applied for an opportunity to join a scientific expedition to Chagos. Jenny Bertrand, Nadine Dorothee and Claudia Naraina were shortlisted for the three available places on the following expeditions:

Bertarelli funded Chagos Pelagic Expedition, Jan/Feb 2015 - Jenny Bertrand was selected to join the expedition, led by ZSL's Tom Letessier. She relished the opportunity and enjoyed getting involved with preparing bait for the mid-water cameras as well as assisting other members of the team in their work.

Caitlin Seaview Survey Expedition, Feb 2015 - When a last minute place opened up Nadine Dorothee jumped at the chance to join the Chagos expedition. She assisted with coral monitoring as well as helping the underwater crews prepare for their dives. Upon her return she shared her experience at community feedback events in Crawley and Manchester (attendance approx. 50 people total (Activity 3.2).

Darwin Chagos Scientific Expedition, March/April 2015 -Claudia Naraina joined the team for this expedition, and as a PADI Rescue diver (funded by a Darwin bursary) she was able to assist the team with coral reef monitoring as well as bird surveys and the occasional turtle rescue. *Claudia: "The trip was truly one of the best things I have ever done. It was hard work but so much fun, definitely one of the best experiences of my life. If I do get another opportunity like this again, I will not think twice. I can never thank you all enough for such a great opportunity"* **(Annex 14).**

Following the training course the Connect Chagos staff continued to provide outreach activities by running tailored sessions in Crawley and Manchester (attended by 150 people in total). Topics and activities ranged from advice on completing job applications, to discover SCUBA diving sessions, tree-climbing and coral identification.

Through meetings with key Chagossian community members such as Allen Vincatassin (provisional Chagos President), Mylene Augustin (leader of Chagos Women's Welfare Group and Chagos Youth Group) and past Chagos Ambassadors in January of this year, the project team is looking to further benefit from these existing community structures to maximize engagement in all its outreach activities including future tailored sessions and the final 2015 Environmental Training Course (which took place beyond the end of the Darwin Project).

Connect Chagos project staff met with Dr Malcolm Nicoll, a Senior Research Fellow at ZSL's Institute of Zoology to continue to develop the strategy for outreach in Mauritius and Seychelles. Dr Nicoll has over 10 years of experience working on species recovery and island restoration programs in Mauritius and Seychelles, and his valuable experience and networks in that region may be utilised by Connect Chagos to advance work undertaken during the 2014 scoping visit to Mauritius. (For report of this, covered last year, **see Annex 26: Connect Chagos Scoping visit to Mauritius**).

The Important Assumptions for Output 3 held true: there was continued and genuine involvement of Chagossians in all of the activities, and external partners maintained their commitment and support to the training initiatives. **Output 3 has been extremely successful and a highlight of the project**. While many groups have challenged the MPA and treatment of the Chagossians, it is only our partnership that has actually engaged the Chagossians in environmental training and provided them with opportunities to be involved with the science behind the MPA. Opportunities for engagement in Mauritius and Seychelles have been limited by the political situation and FCO BIOT requiring a very light involvement in Mauritius (and none so far in Seychelles), but have been stimulated at least in Mauritius by the scoping visit and involvement of the Mauritius Marine Conservation Society.

Output 4: Increased general public awareness in UK, Diego Garcia, Mauritius and internationally of the high value of the Chagos Marine Protected Area in protecting a wide range of oceanic ecosystems for benefit of people around Indian Ocean, and as a control site against which to assess impacts of climate change.

Measurable Indicators: Outreach workshop and high profile media events at Zoological Society of London, Diego Garcia (for US military) and Mauritius, to highlight our scientific understanding of the

importance of the Chagos, and objectives of conservation. Activities aimed at different age groups. Development of online educational materials and exhibits and use of social media.

Means of verification Interest and engagement of general public at local, national and international levels; Workshop participant lists; positive media output – number of articles, types of media; number of visitors to exhibit and results of formal evaluation. Number of Facebook 'likes', number of followers on Twitter, number of visitors to web-pages, number of downloads of web-resource materials.

This Darwin Initiative Project worked closely with Chagos Conservation Trust, Pew Environment Group (UK) and ZSL on increasing public awareness of the Chagos Archipelago and Marine Protected Area, delivering Output 4 to a high extent. Outputs were delivered through 3 annual conference on Chagos (and a 4th in November 2015), 22 talks at national and international conferences and workshops, 17 publications in books and journals to date, 8 Reports, 5 MSc theses, a London Zoo Chagos themed aquarium exhibit, dissemination of 210 Videos (inc. 3 films 57 quadcopter aerial sequences, 57 video clips of biodiversity) 7 scientific blogs, rushes for a BBC series and 14 contributions to Darwin Initiative, Bangor and CCT Newsletters (See Annex 5, **Social Media output and data can be seen in Annex 27, and see Annex 37 for London Zoo exhibit**). These Measurable Indicators have achieved a more balanced output about Chagos, countering the usual press articles that report the legal claims of Mauritius and repeat descriptions of the poor treatment Chagossian's received, by actually describing the biodiversity and importance of conservation and protection. There remains a bias amongst newspaper journalists who focus their articles on the former.

Public outreach, media events and materials were discussed by PIs during regular meetings, skype conversations and e mails and at the Planning Workshop on 4th December 2015. A follow up meeting was held with BIOT on 2nd June 2015, and regular correspondence continues between ZSL and BIOT regarding extending the Connect Chagos Programme (Activity 4.1).

The Chagos Conservation 2014 conference at the Zoological Society of London was hosted by the Chagos Conservation Trust with the support of the Pew Charitable Trusts, The Zoological Society of London and the Darwin Initiative on 5th December 2014). The conference attracted 115 participants representing NGOs (11 organisations), academia (15 organisations), companies (4 organisations), one government agency and 5 Connect Chagos ambassadors. Three members of the Pitcairn Island community attended the conference, providing an opportunity to exchange experiences with scientists working in Chagos, as well as meeting members of the Chagossian community. The programme showcased the results from Darwin expeditions and the Connect Chagos project. **(Annex 28: Programme & Annex 29: Attendees List**
– note 89 subscribed beforehand but additional people signed up on the day). Presentations came from participants on the 2014 Darwin Expedition, the 2014 Pelagic Expedition, 2014 Turtle Expedition and Connect Chagos and included: Professor Charles Sheppard - Coral cover trends and temperature reports; Dr John Turner - Recent changes in community structure of the coral reefs of the Chagos Archipelago; Courtney Couch - Coral health in the Chagos Archipelago, is coral disease a concern; Melita Samoilys and Heather Koldewey – Groupers in Chagos; Audrey Blancart- Connect Chagos 2014; Tom Letessier – Pelagic megafuna, Jon Slayer and Peter Carr - Rat eradication and island restoration; Catherine Head- cryptic reef fauna; Nicole Esteben and Graeme Hayes – Turtles in Chagos, beaches, breeding and long distance swims; Jon Slayer and Stuart McPherson – Film making in Chagos. (Activity 4.2).

The Forthcoming 4th Chagos Conservation Conference (postponed from 27th November to January) will feature work conducted on the third Darwin Science and Conservation, and includes:

Tom Letessier- human impact on pelagic realm; Nick Graham – rats vs birds: nutrient subsidies to coral reefs in Chagos; Chris Perry – carbonate production and reef accretion potential around Chagos; Pete Carr – bringing back the birds; John Turner – video transects : changes in reef condition; Ronan Roche – Crown of thorns outbreaks and coral diseases; David Curnick – manta monitoring; Charles Sheppard – recent bleaching, temperatures and coral cover; Catherine Head – Cryptic fauna in Chagos; Nicole Esteban – sea turtles in Chagos: incubation conditions and status update; Sam Purkis – Diego Garcia

erosion and accretion; Bernard Riegal - coral population and community dynamics: how healthy and protected reefs respond differently to recurrent stresses; Pippa Gravestock – Economics of Chagos reefs; Daniel Paulay – Fisheries reconstructions in BIOT; Nigel Wenban Smith - a history of Chagos, Rudy Pothin – Connect Chagos.

The Darwin project featured in both a plenary presentation by Dr Heather Koldewey and a symposium talk by Dr John Turner at the **Society for Conservation Biology International Marine Conservation Congress**, held in Glasgow 14-18 August 2014. (Activity 4.5)

A Darwin Workshop was held at ZSL on 4th December 2014 to finalise planning and outputs of the 2015 Science and Conservation expedition and to integrate activities with an unprecedented number of other expeditions for 2015, including the Pelagic Expedition (January 2015), Catlin Seaview Expedition (February 2015), and Google Tracker expedition March 2015. There were subsequently 3 further expeditions that happened in March/April /May 2015 – The Bertarelli Vava-Stanford Acoustic Servicing Expedition, 2 The Pangea/University of Western Australia Expedition, and 2 phases of the Living Oceans Foundation Expedition (Activity 4.6).

An event was planned as a series of presentations on Diego Garcia for military and contact personnel on an evening prior to the expedition, but there was little interest on island for this event at the time. (Activity 4.3).

The FCO has advised against specific activities in Mauritius and Seychelles while Mauritius continues to challenge the MPA and UK sovereignty of the Chagos Archipelago. (Activity 4.4).

3 Project Partnerships

Bangor University worked closely with the University of Warwick, Zoological Society of London (ZSL) and The British Indian Ocean Territory (BIOT) Section at the Foreign and Commonwealth Office (FCO) to deliver this project. Bangor had project partnership agreements in place with Warwick and ZSL. BIOT Section FCO permitted scientific expeditions to access BIOT, and they provided the MV *Pacific Marlin* patrol vessel as a platform to support the expeditions. The Project Investigators (PIs): Dr John Turner (Bangor), Professor Charles Sheppard (Warwick) and Dr Heather Koldewey (ZSL) have shared project responsibilities: Dr Turner managed the overall project and budget, and led expedition 3, Prof Sheppard led expedition 1, and Dr Koldewey led expedition 2, and her team at ZSL ran the Chagos Connect Outreach Programme. Due to extensive travel amongst the PIs, Skype was used extensively, interspersed by e mail and telephone calls, and meeting up at scientific conferences and Chagos Conservation Trust meetings. The PIs have all visited Chagos many times, and are now well versed in planning scientific operations there.

This Project supports a Chagos Project Support Officer (Outreach) in ZSL (Rebecca Short then Kirsty Richards) supported by 2 Outreach Officers (Audrey Blancart, then Xaviour Hamon and then Amdeep Sangher, and Rudy Pothin), and a Researcher at Warwick (Anne Sheppard). The succession of staff on the outreach programme has been well handled and continuity maintained. BIOT continued to fund the Connect Chagos Outreach Project, together with contribution and Bursaries from the Chagos Conservation Trust and this Darwin project.

The BIOT Section is in the Falklands and Southern Oceans Department of the Overseas Territories Directorate of the Foreign and Commonwealth Office, and underwent a complete staff change in year 1 of the project. This was unfortunate, but a fact of how government departments operate and we had to recognise a new staff and a significant change in approach. Dr Peter Hayes became BIOT Commissioner and Director Overseas Territories Division in October 2012. Tom Moody took over as Administrator and Head of Section from John MacManus in July, 2013, and Richard Seedhouse replaced Michelle Moat as BIOT Assistant Administrator in August 2013 and has now himself moved on. Rupert Compston took over from Jo Bowyer as Deputy Administrator and Desk Officer in April 2014, and become the major contact for scientific matters in June 2014. The BIOT Scientific Advisor changed from Prof Charles Sheppard (who held the post for 10 years previously) to Dr Mark Spalding in November 2013, and the most recent Science Advisory Group went into abeyance. Helen Stevens from JNCC was

appointed to a new post of BIOT Environment Officer in May 2015. A new British Representative on Diego Garcia was appointed shortly after the end of this project.

BIOT Section granted permission for our expeditionary work in Chagos, and facilitated access to military flights and received and stored shipped equipment, and provided shiptime aboard the MV *Pacific Marlin* all as planned. BIOT also provided the permanent storage facility for the project's equipment and assisted with the mobilisation of the expeditions.

Changes in the BIOT Administration meant that communication was necessary to brief BIOT staff on the project's objectives and requirements, since those staff involved in the initial design of the project were no longer present, and the new staff did not have the same level of ownership of the project. We also became aware of a significant change in direction in BIOT policy in 2013. We held constructive post expedition meetings at the FCO on 7th May 2014 and 2nd June 2015 with the new staff and meetings pre and post expeditions with Lee Hardy, British Representative, in Diego Garcia. The apparent change in agenda involved an increase in scientific opportunity in Chagos, but in many ways this overtook our project, which had always aimed to establish a base line for broad scale monitoring, an expansion in scientists involved and relevant sub-projects, protocols and equipment for working in BIOT. As a result, new projects were being encouraged before these baselines were established and before a logical framework for delivering science for management in this remote location had been fully developed. A broader scientific programme with a larger international participation – a consortium - began to take shape as a result of a workshop in Geneva in 2013 organised by the Bertarelli Foundation and ZSL, with a greater focus on pelagic and deep water systems. However it became apparent at our planning meeting in December 2014 that greater coordination of the growing science was necessary due to the lack of communication between different scientific projects which resulted in potential overlap in space and time in the field, and some duplication of objectives. The Consortium now has a Coordinator (Tom Letessier at ZSL) and the appointment of the BIOT Environmental Officer should improve the situation in the future. The PIs of the Darwin Project are part of the Consortium's bid to the Bertarelli Foundation, and intend to continue monitoring the reefs and atoll islands of Chagos. Therefore, the partners will continue to work together and build new partnerships with the growing scientific body planning to work in BIOT.

4 Contribution to Darwin Initiative Programme Outputs

4.1 Project support to the Conventions (CBD, CMS and/or CITES)

The 2014 World Parks Congress reaffirmed that if marine reserves are to have a meaningful effect in reducing the decline of the ocean's vital life-support systems, at least 30% of the oceans need strict protection. The Chagos Archipelago is now recognised world-wide as a *flagship* for such conservation, whose value is further enhanced by being part of the global **Big Ocean Network**. Chagos is entirely constructed from coral reefs, and reefs are responsible for a disproportionately high proportion of the world's biodiversity and productivity, but at present an insufficient fraction of them are protected. **The highly protected reefs of the Chagos Marine Reserve are therefore important globally.**

Under the 2001 BIOT Environmental Charter, the UK Government facilitates the extension of the UK's ratification of multilateral environment agreements of benefit to the BIOT and which the BIOT has the capacity to implement. CITES and CMS have been extended to the Territory, but CBD has not, due to the current inability to fulfil all of the Convention requirements in Chagos, for practical reasons. But, as per the World Heritage Convention, the area is treated by the UK Government with no less strict regard, subject only to defence requirements, and in the case of CBD, the capacity to implement. This project increased the capability of BIOT in these regards:

- MOU on the Conservation and Management of Marine Turtles and their Habitats of the Indian Ocean and South-East Asia. We have liaised with the Secretariat who recognises the significant value of the Chagos MPA to marine turtle conservation, particularly as they are considered as flagship species on which to base interventions aimed at protecting habitats of importance for a myriad of other marine species. Turtle nesting and tagging have been specifically addressed by

another Darwin Project in Chagos, but habitat protection remains a key aspect of this project, and coral reef and associated habitats such as seagrass have been assessed.

- MOU on Migratory Sharks. This is particularly important as several migratory shark species (particularly blue sharks) were the primary bycatch of the tuna fisheries that operated in Chagos prior to the establishment of the no-take MPA. We have a working relationship with the IUCN Shark Specialist Group. Reef sharks are being monitored during this project by direct observation, and novel automated methods have been developed to assess migratory species.
- The CMS MOU for dugongs may also apply. One of the islands in the Chagos archipelago is named after dugongs and this species may exist within the archipelago. Only 3% of Chagos has been explored and an undefined large area of seagrass on the perimeter of the Great Chagos Bank near Danger Island has been investigated on each expedition. To date, no dugongs have been observed.
- Bycatch is a CMS Initiative addressed to some extent by this project. As the fisheries (inshore and pelagic) in Chagos are now closed, yet had significant documented bycatch, we have monitored reef fish communities and sea cucumbers for management purposes.
- While there is no international trade in CITES-listed species from Chagos, this emphasises its' value as a reference site for comparison with exploited sites, particularly for corals, giant clams, cetaceans, marine turtles and sea cucumbers. This Convention is also relevant in Chagos for several bird species, notably boobies, and potentially for several CITES listed sharks and seahorses (the latter have not yet been documented in Chagos).

The project has addressed **AICHI targets** 10, 11, 12, 15, 17 and 19 by:

(1) Recommending that anthropogenic pressures on coral reefs that may arise from resettlement are minimised so that the reefs maintain their integrity and functioning and can therefore respond to climate change impacts (Target 10).
(2) At present most of BIOT is protected by the no take MPA, and although Diego Garcia atoll is excluded (to 3nm), over half of the atoll is highly protected, and managed to protect biodiversity and ecosystem services. Our research is demonstrating ecologically representative areas and connectivity such that any future changes to protected areas can be considered based on sound scientific data (11).
(3) The breeding habitat requirements of threatened bird species such as Red footed booby and sooty tern have been assessed and their use of islands beyond the current IBA have been identified. Rat eradication has been piloted on Isle Vache and monitored. Indigenous flora has been identified and plans made to restore flora in pilot plots. Poached species such as sea cucumbers are being monitored (12).
(4) Resilience of coral reefs has been measured, and the most resilient and least resilient reefs in Chagos have been identified. Coral disease and bleaching mortality. Sea water temperature is monitored by NOAA satellites and verified through maintaining data loggers in the field. Restoration of terrestrial ecosystems has begun (15).
(5) A national management plan incorporating a participatory national biodiversity strategy plan has been drafted although requires further BAP development. In addition, a comprehensive scientific plan for the next 5 years has been formulated through a consortium of scientists and has been submitted for funding (17).

See Annex 4 for contributions made to AICHI targets.

4.2 Project support to poverty alleviation

The project is DEFRA funded and does not contribute directly to poverty alleviation, largely because, with the exception of the military facility on Diego Garcia, the islands have been unoccupied for >50 years. However, the scale of the MPA suggests that benefits will be significant at an ocean scale, and communities in some of the poorest countries around the Indian Ocean may benefit from the preservation of a genetically-balanced stock of species which may overspill propagules, juveniles and adults to unprotected regions. This is of course very difficult to prove, but genetic data from this project (especially with fish species) is being used in wider studies (eg by Gaither & Bowen) to demonstrate connectivity.

There are no local communities in the Territory (other than military base personnel and contractors on Diego Garcia), although the feasibility of resettlement by Chagossians is under consideration. However, as explained in earlier sections, the project consults, involves, and educates Chagossian communities in the rich natural environment and conservation of the islands and surrounding marine environment. Women have taken the greatest interest in our initiatives, with 24 of the 42 Chagos Environmental Ambassadors, and 3 of the 5 competitively awarded places on the scientific expeditions being women. Elements of the Connect Chagos have benefited Chagossian trainees, not only by making them more environmentally aware and better able to communicate, but also by allowing selected individuals to learn new skills which should help them find future employment. For example, 13 individuals (10 of whom were women) received training in swimming, SCUBA diving qualifications and chainsaw qualifications, providing a practical means and potential for income generation. Yannick Mandarin for example, is applying for posts that would use the expertise he has gained.

Awareness of the rich biodiversity of the UK Overseas Territories, is continually being raised both nationally and internationally by our outputs, demonstrating how Ocean Legacy MPAs can protect ecosystems and serve as important global reference sites to help understand environmental change in the absence of human impacts. This allows us to quantify what an intact and functioning ecosystem is, and provides a benchmark for the management of more degraded systems to return them to levels of high productivity and sustainable income generation. Measurement of the ecosystem service value to communities is beyond the scope of this project but the scientific assessment of an intact system is a major part of the work. An assessment was undertaken by one of the PIs immediately prior to the designation of the MPA (Gravestock & Sheppard, 2015). Valuing the ecosystem services of the Chagos: review of challenges and estimates. *Marine Ecology Progress Series* 530: 255-270.

4.2.1 Programme indicators

- Did the project lead to greater representation of local poor in management structures of biodiversity?

Not directly, because no people are resident in Chagos, other than military personnel and their contractors on Diego Garcia. Indirectly, Chagossians in the UK and some in Mauritius have been represented through community meetings, and have had the opportunity to attend family events to increase their awareness of biodiversity and conservation. Not all of these people live in poverty – although those in Mauritius are significantly worse off. Those most motivated have had a further opportunity to receive environmental and conservation training, and In the UK, this has included careers and communications advice, and some have benefitted from advanced skills training through the Darwin and CCT bursary awards scheme, and places on scientific expeditions to Chagos. As a result, some have experienced involvement in biodiversity assessment and conservation initiatives, and many have been sensitised to their importance. The Chagos Environment Ambassadors have been encouraged to further communicate the need for conservation within their communities.

- Were any management plans for biodiversity developed?
  Yes – the BIOT Interim Management Plan (**Annex 17**).
- Were these formally accepted?
  Yes – It is the FCO BIOT plan, but remains a working document and will be constantly modified.
- Were they participatory in nature or were they 'top-down'? How well represented are the local poor and women, in any proposed management structures?
  The Interim Management plans was developed by BIOT, scientists and CCT. Feasibility studies for potential resettlement analysed by KPMG on behalf of BIOT and CCT have suggested that Chagossians could be involved in ranger type duties, scientific support and groups may be involved in island restoration projects in the near future.

- Were there any positive gains in HH income as a result of this project?
  Not directly, but advanced skills (ranging from conservation skills to communication and swimming) acquired by some Chagossians may lead to better employment opportunities.
- How many HH saw an increase in their HH income?
  N/A
- How much did their HH income increase (e.g. x% above baseline, x% above national average)? How was this measured?
  N/A

4.3 Transfer of knowledge

Did the project result in any formal qualifications?

i. How many people achieved formal qualifications?
ii. Were they from developing countries or developed countries?
iii. What gender were they?

The work of 4 expedition scientists (Head, Carr, Curnick, Murphy) from UK will contribute to their PhDs (1 female)

4 Bangor MSc theses have analysed Chagos data during the Darwin project (Bartow, Dickinson, Suchley, Garcia Saiz of which 3 are female), 1 Imperial College London MRes (Jenkins), 1 University of Warwick MSc (Carr).

All of these are from developed countries.

42 Chagossians have graduated from the Connect Chagos Environmental Training Course (includes 2015 course) (24 of whom are female) (**Annex 23).**

A BIOT Interim Management Plan has been prepared and the interim designation is on the basis that the MPA and its management may change should resettlement proceed. Scientific findings to date have informed the BIOT Interim Management Plan (**Annex 17**); consultations with KPMG on environmental aspects of resettlement feasibility; and the Chagos Conservation Trust response to the BIOT Policy Review on Resettlement (**Annex 18**). The PIs have met with BIOT, and have also attended a meeting of the Chagos Islands All Party Parliamentary Group in Westminster to answer questions from the Members (both Houses) (**Annex 19, 20**). This transfer of knowledge has been via meetings, consultations, written responses and printed documents.

4.4 Capacity building

i. Did any staff from developing country partners see an increase in their status nationally, regionally or internationally? For example, have they been invited to

participate in any national expert committees, expert panels, have they had a promotion at work?

ii. What gender were they?

42 Environmental Training Course graduates became Chagos Ambassadors (24 of whom are women), with a view to increasing awareness and interest in biodiversity and conservation with their families, friends and communities. Those who participated in the scientific and conservation expeditions have taken part in activities and given presentations to their communities about their experiences of Chagos and the science and conservation initiatives in which they too part (Notably Yannick Mandarin, Claudia Naraina and Jenny Bertrand). In addition, a series of events enabled these individuals to share their experiences to the wider community. They attracted a large cross-section of the overall Chagossian demographic (approx. 50 people) and were positively received. Furthermore, successful engagement of Chagossians in scientific expeditions to the Archipelago has inspired them to participate, co-produce and lead certain elements of the 2015 Chagos environmental training course, and plans are underway to develop this content through a series of one-on-one meetings with these ambassadors **(Activity 3.1)**. A new and updated Connect Chagos Community Pack was produced in November 2014 and distributed at the Chagos Conservation Trust (CCT) conference in December 2014 as well as throughout the Chagossian communities in Manchester and Crawley and to our project partners **(Annex 15)**.

4.5 Sustainability and Legacy

There is knowledge of the project amongst scientists in the UK, and internationally amongst coral reef scientists and those involved in Marine Protected Areas. This is being further established by the Chagos annual conference, international conference presentations, scientific publications, expedition reports and blogs, video material and films, and submissions to a Chagos Science Portal. The Chagos MPA has participated in producing the **Shared Research Agenda of the Big Ocean Network** and much of the research undertaken on the scientific expeditions has addressed this Agenda: http://www.bigoceanmanagers.org/sites/default/files/docs/feb2013/bigocean_research_agenda_narrative_020113_FINAL.pdf.

The first stable and sustainable end-point was the establishment of the scientific infrastructure and protocols for a comprehensive approach to long-term monitoring against which change can be assessed. The scientific infrastructure has been maintained, and expedition planning, risk assessments, and monitoring protocols have been developed to encompass island work and exploration of new sites. Monitoring and experimental studies data is currently under analysis by researchers, and will be centrally archived and made accessible through the Chagos Science Portal which will also feed into global biodiversity systems. Scientific evidence/recommendations will continue to improve the Management Plan, enabling BIOT managers to implement conservation strategies, and the data will inform environmental impact assessment, proposed mitigation measures, and strategic enforcement plans.

The monitoring will continue beyond the three years of this project through the Reef Theme and Pelagic Theme of the Consortium Chagos Science project, which will be funded by the Bertarelli Foundation – a philanthropic organisation. The programme for this project was developed at the second meeting of the Consortium held in Italy in June 2015, attended by 2 of the PIs of this project. A 5 year monitoring plan of reefs was proposed, and seabird monitoring will take place along with other megafauna (sharks, turtles, manta rays) under the pelagic theme. Other themes address enforcement and project administration, but not terrestrial island work. Further island work is the focus of a 2015 Darwin Plus application on atoll island restoration.

Further, scientific study needs to be expanded to underwater banks and shoals and mesophotic (deep) areas of the reefs These sites are numerous and cover some 60,000 km^2, but accessing and diving such features in open water is challenging due to their isolation, depth, high currents, and unknown structure. *This work requires greater facilities and support than we currently have available, especially in terms of safety equipment for diving, and deployment of remotely operated vehicles.*

The second stable end point was achieved by the active participation and support of Chagossian societies in events and in the case of bursary recipients, training in relevant practical conservation techniques. Chagossian societies and stakeholders in Mauritius were engaged in plans for future outreach activities there. With respect to enabling a legacy, the training materials from past environmental training courses are now being consolidated and compiled into a standardised format and placed on the ZSL website for the Chagos community to use. A physical booklet comprising these training materials will also be disseminated throughout the Chagossian communities; this is particularly important considering the limited web access that many community members face (and is being undertaken by the Connect Chagos team at ZSL. Once on board and engaged, it is important that Chagossian stakeholders remain involved by taking ownership of the ongoing events and activities. This has begun to happen, with Chagossian Ambassadors attending alumni events and organising their own community activities. When combined with scientific output, and general public conservation awareness discussed above, the latter is the means to **stable end point 3 whereby the importance and significance of the BIOT/Chagos MPA is widely recognised and supported in the UK and internationally**.

5 Lessons learned

The Project was closely managed by the three PIs, with each having clear roles and sharing leadership of the expeditions. **The PIs were also 3 of the 14 Trustees of the Chagos Conservation Trust, ensuring good communication with one of the 'end users' of the research, and both PIs and CCT directly communicated with BIOT Section in the FCO.** This structure worked very well due to regular communication. The Connect Chagos programme was a partnership between BIOT, CCT and this Darwin Project, and was led from ZSL under the management of one of the PIs. Outreach staff were employed by the Connect Chagos programme, and assisted through a Project Support Officer at ZSL part funded by the Darwin project. Again, this structure worked very well.

Scientific and Conservation expedition places were given to scientists of international reputation with track records of undertaking science in the areas of the sub-projects, thus ensuring the right expertise on the project to ensure that the project objectives were met. Most of the team had worked in Chagos before (Sheppards, Turner, Koldewey, Pratchett, Price, Graham, Head, Carr, Slayer, Price) and these introduced new scientists to this locality (Widman, Roche, Fenner, Fletcher, Samoilys, Perry, Wilson, Murphy, Curnick). **Links through the Big Ocean Network ensured participation of scientists who work in other very large MPAs (Gaither, Wagner, Couch) ensuring shared good practice**. Similarly, by including **experienced outreach personnel from within ZSL, but then engaging officers such as Rudy Pothin, Xavior Hamon, and Amdeep Sangher with regional cultural knowledge, we ensured success of the outreach programme.**

The project was well planned – we understood the underlying issues and correctly identified the scientific questions. The Identified Assumptions held true and risks were correctly identified. Outputs that could not be completed in full were due to political situations outside of the control of the project and were risks correctly identified in advance (eg. the impasse with Mauritius).

The field elements of the project were very challenging, due to the logistical requirements and narrow windows of opportunity to operate in this remote locality. **However, experience ensured that we were very well structured and well equipped.** We had our own medical officer on the expeditions with expertise in diving, tropical and emergency medicine and had taken care to develop thorough risk assessments and carry appropriate medical supplies. Our small boat and diving activities were operated to HSE Codes of Practice for Scientific Diving Operations, and we operated with clear chains of command when working with the patrol vessel. As a result, we operated efficiently and safely.

Our approach to scientific work involving diving operations in such a remote region was necessarily conservative, with self-imposed limitations arising from well-developed risk assessments based on experience of working in Chagos. We were disappointed that BIOT did not fully appreciate this, and was prepared to permit other expeditions to operate beyond these limits with only the same level of training and equipment, and yet without direct experience of working in Chagos (though they may have had comparable experience of work elsewhere). Again, these were factors outside of the control of the project, but events outside of our control could have impacted on our project (eg. a serious incident resulting in no further diving).

Lessons specific to Chagos expeditions

The new BIOT Section staff required specific information about the 2014 expedition schedule earlier than had been the case for previous expeditions in order to provide permits and to make arrangements over support, which ranged from personnel to vehicles. Some activities on islands planned for in the immediate run up to the expedition were not approved, and multi-party communications became complex and confused in an attempt to keep all parties informed at a detailed level. Long standing informal arrangements and expectations of provision were no longer acceptable, and therefore more detailed information about plans were found to be required by the new administration. The situation was exacerbated by resources on Diego Garcia being stretched by other coinciding activities**. For 2015, an agreed timeline was developed and communications were directed from the PIs through the Darwin Expedition Leader to Rupert Compston, Deputy Administrator and Desk Officer, which worked in a much more satisfactory manner**. However, we were surprised to learn late on (December) of a series of 5 other expeditions across the same window planned against a tight timeframe which stretched resources significantly and did not allow adequate time for synchronisation or collaboration. Some rapid communication between expedition leaders solved issues of limited anchorages and mutually exclusive activities (eg shark baiting and diving!).

Our decision to reschedule the 2014 expedition from November 2013 to March - April 2014 on the basis of greater knowledge of weather, and consequently delay the final expedition to March April 2015, was found to be appropriate. Although conditions remained variable, they were tolerable, and only one dive was cancelled due to poor weather in 2014, and none in 2015.

However, field expeditions in March- April do compromise prompt reporting at the end of the financial year, because major expenditure is at this time, and claims and sub project reports have to be prepared, submitted and collated and reviewed. This inevitably resulted in late reporting in both years (for which we apologise).

The 2014 and 2015 expeditions involved connecting commercial flights with Air Mobility Command flights in Bahrain rather than Singapore. While generally more convenient and cost effective, the route was new to us in 2014, and complications arose due to lack of agents in Bahrain, which exposed us to difficulties in clearing equipment through customs and transferring it between international and military airports in both years.

In 2014, activities on Diego Garcia meant that we joined the ship on the evening of arrival and departed immediately. This did not allow for shake down dives, training in procedures for first time members, nor preparing and setting up equipment and supplies in appropriate areas of the ship, and it is evident that 2 days are required on Diego Garcia prior to leaving harbour for the outer islands, to establish ourselves and equipment appropriately. The situation was much better in 2015, allowing for full mobilisation and diving operation around Diego Garcia, and we consequently felt much better prepared. This also allowed for the delayed arrival of two of the team from Australia.

Sea conditions damaged equipment due to harsh movement within the boats and extreme sunlight and temperature degraded exposed equipment. The boats themselves were damaged when craned out of the water onto the deck between dives. Lifting caused stresses to seams already weakened by high temperatures, and abrasion of floor boards against the outer skin of the hull, causing air leaks. In 2015 we purchased bespoke lifting slings such that the boats were supported underneath rather than being lifted from eyes rigged on top. Our 2015 expedition was nearly compromised by another expedition using two of the boats immediately prior to our expedition. These boats were in poor state and failed during the expedition.

Equipment wear and tear, in field servicing and subsequent replacement of parts has proven considerably more expensive than expected, largely due to transporting items to Diego Garcia, and additional charges incurred by agents in handling, especially where hazardous materials are concerned (chemicals, oils, glues, oxygen, lifejacket gas inflators etc.). The equipment is now stored under good conditions, but has not been for all of the 3 years. Last year, approximately £1000 worth of equipment was 'borrowed and not returned', leading us to increase security and require permissions to enter the store. Arrangements are now in place for the equipment to be checked on a regular basis by BIOT personnel on Diego Garcia.

With the above in mind, the priority for all expedition equipment is for use by the Darwin scientific expeditions. Requests have been made by others to use the equipment, and therefore agreement is necessary over how we ensure that the equipment remains adequately maintained and is fit for service so as not to compromise our own expeditions; and that equipment is insured and can be replaced in time on site; that there is no liability for failure of equipment causing injury for the project and institutions that own the equipment; and that others using the equipment are competent to do so, and work to risk assessments within the Approved Code of Practice for Scientific Diving (ACoPs). It is not uncommon for scientists working at non UK institutions, or UK institutions without an established knowledge of Diving at Work Operations to be unaware of ACoPs and Duty of Care requirements.

Due to illness, two team members were replaced immediately prior to expeditions. Fortunately well trained replacements were found from within the existing teams and permits granted, but it is advisable that future expeditions and other projects always plan for standby personnel and ensure sufficient paperwork is ready for permitting their involvement at late notice.

Dive planning was simplified and operations made more efficient by pairing personnel by sub project. Dive teams of more than two persons with multiple objectives are inefficient and can compromise safety.

Diving in Chagos remains necessarily conservative due to the lack of hyperbaric and hospital facilities to treat a decompression or related incident. The diving operations risk assessments address the Approved Code of Practice for Scientific Diving in this context. The bid to the NERC Facility for Scientific Diving for a hyperbaric chamber was successful but turned down by BIOT Section due to concerns over liability. Any future expedition planning more ambitious diving operations must have a hyperbaric facility on site.

Lessons specific to outreach programme

With regard to the Chagos Environmental Training Course, the course content for 2014 was adapted and set at a more suitable level than earlier years. In addition, participants have normally been over 18

years old, however the addition of a 12 year old individual (Nelson Bertrand) helped to catalyse discussion within the group (and particularly with reserved participants) through his inquisitive nature.

An issue with Connect Chagos this year was the failed attendance of some participants at some of the Environmental Training Course modules. This affected the lesson plan and the overall outputs of that particular module, while also lessening the motivation of those trainees participating. In order to remedy this, the project would, in the future, look to confirm dates of modules with all participants so they could arrange necessary leave from their work, and confirm attendance with all participants before the module implementation.

In terms of recommendations to other similar projects, achieving the suitable level and quality of community engagement is key. This helps to build trust with the community while also developing a healthy understanding of community interests, suspicions and fears. Through our long-term presence in Chagossian communities, some individuals have been able to understand the project's aims more coherently and this has facilitated trust and participation with the project. So an approach that that is community-centred, transparent and genuine is recommended.

5.1 Monitoring and evaluation

Please refer to Annex 1 and Annex 2. There were no major changes to the logframe other than an adjustment of timing to the expeditions to take into account patrol ship availability and weather windows, as explained above.

The Project Investigators and Connect Chagos coordinators met as the project Steering Group and regularly skyped to evaluate progress, and briefing sessions have been held with BIOT Section in London and British Representative on Diego Garcia before and after each expedition and when appropriate. Dr Ranjeet Baghooli of the University of Mauritius had to decline his place on the Steering Committee, and BIOT discontinued the Science Advisory Group, and therefore there was no SAG representative. Instead. the Steering Group reported direct to BIOT, CCT and to Darwin Initiative via interim and annual reports. A BIOT representative and Tom Letessier of the Consortium were invited to attend the December 2014 workshop meeting. Bangor University provided financial monitoring and auditing for the project as planned, with partner claims coordinated by ZSL and Warwick. The project has run to plan, with the exception of Mauritian involvement as explained previously.

The PIs evaluated the scientific programme before, during, and after each expedition, ensuring all objectives were addressed by teams with the relevant expertise. The PIs are now working with participants to ensure that scientific publications follow and that the data is entered into the Chagos Information Portal.

Chagos communities were represented through the Connect Chagos Outreach Officer. The Outreach programme has been thoroughly evaluated each year (**Annex 12).** For example, in 2014, a monitoring and evaluation exercise was carried out with 7 participants from the 2014 Chagos Environmental Training Course. All 7 participants felt the course met their expectations with the following skills having been learnt via the course: Carbon footprint (57% of participants, n=4), Species/habitat monitoring (71%, 5/7), Communication skills (43%, 3/7) and Chagos environmental knowledge (100%, 7/7). Feedback indicated that there was need for greater flexibility in timing because of trainees commitments. Courses had to be tailored to specific groups, although the communities in Manchester and Crawley liked to work together when possible. Language remained a barrier, and many Chagossians struggled to express themselves on environmental and conservation topics, without the assistance of outreach staff who spoke Creole. The fact finding visit to Mauritius by the Chagos Outreach Team was highly informative (**Annex 26)** and provided information that can be built upon for future activities there, beyond the scope of this project.

Raising awareness of the Chagos Marine Protected Area was achieved in collaboration with the Chagos Conservation Trust and Zoological Society of London and the Pew Environment Group. These organisations have professional personnel skilled in delivering public events and disseminating information in the media, and have played a key role. A major activity for involvement and delivery have been the collaborative annual conferences which largely focus on the results of the scientific expeditions and attract a wide audience of about 100 people. Expedition participants contributed to these, and the effectiveness of the meetings was assessed by public attendance and feedback questionnaires. In addition, scientists have given presentations at international conferences and are publishing in academically peer reviewed international journals and writing popular articles and making contributions to books and other works (**see Annex 5 for output so far**). The usual measures of invitation, peer review, and publication are used to demonstrate this output. The Chagos Science Portal was established to archive the varying formats of data and increase accessibility. It will be a challenge to monitor whether awareness increases as a result of this Darwin Project alone, **but 3 external measures of success have been:**

(1) Co PI Professor Charles Sheppard (also Chair of the Chagos Conservation Trust) **awarded the OBE in the Queen's Birthday Honours list in 2014 for services to environmental conservation in the British Indian Ocean Territory**.

(2) The **Chagos conservation initiative** was selected by the *UK Collaborative on Development Sciences* (a *grouping of UK government departments and research funders, including DEFRA)* **as *'one of the most important elements for international development emanating from the UK'*.** http://www.ukcds.org.uk/the-global-impact-of-uk-research
and http://www.ukcds.org.uk/the-global-impact-of-uk-research/conserving-marine-environments.

(3) **The Darwin Project won the award for Best Impact on Public Policy and/or Public Services (sponsored by the ESRC Impact Accelerator Account) in the *Bangor University Impact and Innovation Awards December 2015*.**
http://www.bangor.ac.uk/news/latest/bangor-university-rewards-outstanding-impact-from-its-research-and-enterprise-activities-25168.

5.2 Actions taken in response to annual report reviews

Response to Comments From First Annual Review:

Comment: *on specific documentaries or media channels for video material. A media output directed at general public would be very valuable.*

Currently, some videos and images can be found here: http://chagos-trust.org/galleries/videos.

Jon Slayer recorded most videos, and these are on Vimeo and You Tube sites, and can be found on searching Chagos, or can be accessed from his sites: http://jonslayer.tv/about; https://vimeo.com/jonslayer.

We are now moving all relevant videos into the Chagos Information Portal to make them available to the public. http://www.cct-chip.org/resources/media. This project has just begun with funding from the John Ellerman Foundation.

The BBC Natural History unit plans a new series *Ocean: New Frontiers* for broadcast in 2017, and a researcher joined the 2014 expedition to examine the possibility of a Chagos feature. We do not know at this point what will be covered.

Comment: *Political issues with Mauritius and lack of approval for the MPA could diminish impact at regional level. Alternative support from international conservation NGOs to raise awareness of importance of MPA as a global resource.*

Support for the MPA has been provided by other international conservation organisations, in particular Pew Environmental Group http://www.pewtrusts.org/en/archived-projects/global-ocean-legacy-chagos; Blue Marine Foundation:

http://www.bluemarinefoundation.com/projects/chagos-marine-reserve/

Bertarelli Foundation http://www.fondation-bertarelli.org/marine/chagos/

To date, the Connect Chagos programme is the only organisation raising awareness of biodiversity and providing conservation and environmental training for Chagossians, but we have had to limit activity in the region (Mauritius and Seychelles) based on FCO BIOT advice. The Mauritius Marine Conservation Society have indicated an interest in assisting in Mauritius, and The Chagossian Committee in the Seychelles may initiate some activity now that it has a Canadian trained oceanographer as Chair, although at present it seems more focussed on resettlement generally.

Comment: *Problems with FRIB for future expeditions.* BIOT Section agreed availability of the Fast Response Inflatable Boat on future expeditions when possible. The vessel was made available to access islands in 2014 when not being used by the Fisheries Officer, but was not always available when required, giving rise to further clarification over use with BIOT for 2015.

Comment: *Highly recommend continued involvement of Chagossian trainees on expeditions.* Following the success of Yannick Mandarin joining the expedition in 2013, we awarded a place to a Chagossian on each of the 2014 and 2015 expeditions, and were pleased to see the practice followed by the organisers of the Pelagic Expedition in 2015 and the Catlin Seaview expedition.

From Second Annual Review:

Comment: *Potential Channels and audiences for video material*: addressed above.

Comment*: Problems with FRIB*. Due to change in Fishery Officer, the Fast Response Inflatable Boat was made available for all island landings in 2015. The captain also made the boat available during periods of rough weather when he did not allow our own smaller boats to be launched (eg while operating at Egmont atoll in 2015).

Comment: *Plans for Chagos Environment Ambassadors beyond Darwin Funds – how likely are they to continue to be involved in conservation activities in Chagos?* There are plans led by some Chagossian Environment Ambassadors to form a Chagossian Environment Group to which the Chagos Conservation Trust and Darwin project PIs have offered help and support. The Environment Ambassadoes have also stayed involved through their first alumni event. There are plans for further outreach activities and continued expedition places for Chagossians on future expeditions (eg. a 2016 Pelagic expedition funded by the Bertarelli Foundation).

6 Darwin identity

The Project was called the ***'Darwin Initiative project to strengthen the world's largest Marine Protected Area, Chagos Archipelago'***., and has been recognised throughout as distinctly Darwin Initiative supported. The Outreach Programme 'Connect Chagos' has been supported jointly by BIOT, Darwin and CCT and has therefore been as collaborative project by the Darwin Project partners. The Pew Environmental Group have supported the Chagos Conferences. The Darwin finch logo has been used whenever possible along with Bangor, Warwick, ZSL, BIOT, CCT and when appropriate Pew Environmental Trust logos on all presentations and outreach materials. The Initiative was very prominent at International Marine Conservation Congress and RCUK conference (2014).

The Connect Chagos programme continues to feature the Darwin logo along with the BIOT, ZSL and CCT logos. Documents advertising the Bursary scheme also feature the logo and project. 4 sizes of waterproof and UV proof stickers have been placed on all Darwin Initiative project equipment, and feature the Darwin logo along with the words ***'Chagos Science and Conservation'***. These appear on packing cases, the container laboratory, diving cylinders, compressors, tools and all major items of equipment (**Annex 30: Chagos stickers**). All 2014 scientific expedition personnel and the Pacific Marlin crew were provided with T shirts featuring the Darwin logo and the partner organisation logos **(See cover of Chagos Scientific Expedition Reports 2014 and 2015, Annex 8, 9)**.

National and international scientists, BIOT Section (In FCO and represented by Royal Marine personnel in Diego Garcia) and many Chagossians who have engaged with the programme understand the role of Darwin Initiative funding. It is unlikely that the American personnel based on Diego Garcia are aware of the Darwin Initiative, (but then most have orders for only one year) although they do understand that scientific research and conservation is now on going.

7 Finance and administration

7.1 Project expenditure

Project spend (indicative) since last annual report	2014/15 Grant (£)	2014/15 Total actual Darwin Costs (£)	Variance %	Comments (please explain significant variances)
Staff costs (see below)			na	
Consultancy costs			na	
Overhead Costs			15.2%	Actual audit fee less than budget
Travel and subsistence			5.4%	
Operating Costs			23.7%	Some unexpected freight costs and replacement parts, spares & additional safety equipment necessarily purchased. Conference & workshop under budget (due to PEW, CCT contributing), but fieldwork operating costs include replaced capital items (shown below, and consumables from Others)
Capital items (see below)			0	Some small capital items (listed) are included in Operating Costs above
Others (see below)			16.1%	Bursaries to Chagossians shown. Consumable costs of £1150 included above in Operating Costs
TOTAL	**92,548.007**	**95,225**		

Staff employed (Name and position)	Cost (£)
John Turner (Project Leader)	
Heather Koldewey, Co-PI ZSL	
Rebecca Short/Kirsty Richards, PSO ZSL	
Charles Sheppard, Co-PI Warwick	
Researcher, Warwick	
TOTAL	**32,469.00**

Capital items – description (Not originally budgeted for necessary)	Capital items – cost (£)

Nautilus Life Line GPS Diver safety location beacons Boat lifting slings (necessary to protect boats from crane damage)_ Replacement anchors and chains (stolen) Replacement tools (stolen) Outboard engine, compressor, diving equipment replacement and spare parts	
TOTAL	4154.35

Other items – description £7,150 budgeted for	**Other items – cost (£)**
Consumable items: boat & compressor oils, ropes, shipped from Singapore by agents (allowed for 1150 in budget, therefore 2767.71 over budget on CITES UK import licence Freight UK to Singapore (All of above included under Operating Costs) Chagos Darwin Bursaries (shown under Others)	
TOTAL	9,917.71

7.2 Additional funds or in-kind contributions secured

Source of funding for project lifetime	**Total (£)**
BIOT Pacific Marlin Vessel	
Chagos Conservation Trust UK	
Chagos Conservation Trust USA-Kayne Foundation ($5,000)	
ARC Centre of Excellence for Coral Reef Studies	
NOAA (Hawaii, California, Papa)	
Additional bursaries CCT	
ZSL rooms & facilities	
Overheads	
Warwick & Bangor equipment	
TOTAL	**£406,239.6**

Source of funding for additional work after project lifetime	**Total (£)**
Chagos Conservation Trust Science Portal	
Science Portal John Ellerman Foundation 2015-2018	
Bertarelli Foundation 2015-2020 (reef monitoring)	
TOTAL	**£1,396,346.44**

7.3 Value for Money

Value for money has been excellent since all objectives were completed on budget and substantial further funds were levered for additional and future research. The project was made feasible because BIOT provided the patrol vessel as a platform for seagoing research valued at £100,000 per expedition (£300,000 in total). It would have not have been possible to commission and mobilise a research vessel or even several suitable yachts to work in Chagos without this contribution. The ship provided an operations base, accommodation, safety support and experienced crew.

Good value was achieved by working with BIOT and CCT, to provide the Chagos Connect outreach project. **The Darwin funds successfully levered additional funds, and for the lifetime of the project, raised were £406,239.60. Project funds for future initiatives are nearly £1.4 m, demonstrating the success of the approach which has acted as a catalyst for further endeavour.**

Annex 1 Project's logframe, including indicators, means of verification and assumptions.

Note: Insert your full logframe. If your logframe was changed since your Stage 2 application and was approved by a Change Request the newest approved version should be inserted here, otherwise insert the Stage 2 logframe.

Project summary	Measurable Indicators	Means of verification	Important Assumptions
Goal: Effective contribution in support of the implementation of the objectives of the Convention on Biological Diversity (CBD), the Convention on Trade in Endangered Species (CITES), and the Convention on the Conservation of Migratory Species (CMS), as well as related targets set by countries rich in biodiversity but constrained in resources.			
Sub-Goal: To ensure that the Chagos MPA justifies its full no-take status, particularly considering ever increasing fishing pressure in the region and that it fulfils its role as a unique scientific reference site for marine biodiversity.	Acceptance of the Ocean Legacy Large Marine Protected Area by stakeholders on the basis of scientific knowledge, underpinning the need for strict conservation. Assessment of effects of climate change in the absence of local anthropogenic impacts.	Agreement on marine protected area management initiatives which will include no marine resource extraction or habitat modification in the MPA. Establishment of monitoring protocols that are sustainable long term, and centralised accessible data basing.	
Purpose To strengthen the Chagos Marine Protected Area by providing scientific knowledge for effective management and to develop a strategy that engages the support of potential stakeholders through outreach, education and engagement. The legacy will be sound management and increased value of what is currently the world's largest Marine Protected Area and a unique and globally important reference site.	Engagement of Mauritian scientists in scientific data acquisition for monitoring, island ecosystem restoration and impact mitigation. Active involvement of all. Chagossian groups in workshops and training initiatives in UK, Mauritius and Seychelles. Increased public awareness of the importance of the Chagos MPA, in the UK, Mauritius and Seychelles	Extend exploration of ecosystems, including awash atolls, Great Chagos Bank lagoon, and islands. Incorporation of scientific knowledge into management plans & global data bases (flora & fauna mapping, ecosystem restoration, anchoring zones, environmental impact assessment). Publication of collaborative scientific reports, and papers in international conservation journals.	Mauritian scientists will collaborate with UK scientists (we have worked together on previous projects) to provide scientific knowledge to underpin conservation. BIOT Administration will support development of ecosystem approach and integrated management of MPA based on scientific evidence and resulting recommendations, and implement the management plans. BIOT Administration to resource active enforcement of the MPA long term.

		Lists of Chagossian participants in workshops on the conservation of marine resources and documentation of relevant skills attained eg. PADI dive certification. Lists of individuals and organisations attending workshop events. Numbers of news items and articles in various local, national & international media.	Chagossians to be united in their further support for the MPA, primarily by recognising that it does not affect their right to return.
Outputs 1. To continue established baselines and develop a more comprehensive approach to long term marine and island ecosystem monitoring against which change can be assessed, and develop an understanding to assess the magnitude and significance of potential impacts from several scenarios, including climate change, island ecosystem restoration and possible human resettlement. The Chagos/BIOT Management Plan will include BAPs and identify how CBD/CMS/CITES strategic goals and AICHI targets will be addressed.	1 (a) Measures of flora and fauna mapping; reef resiliency, functional diversity and response diversity; and assessments of island erosion and accretion. Development of impact matrices and mitigation measures for potential impacts. Development of restoration initiatives for island flora and fauna.	1 (a) Permanent transects and monitoring sites established on representative islands, reefs, and atolls. Archived biodiversity data, including underwater video image records, and enhancement of current GIS database as a central resource. Incorporation of data sets into relevant global biodiversity monitoring systems. A management plan incorporating BAPs, and where potential impacts identified and understood, their significance and magnitude assessed, and methods for their mitigation verified through feedback monitoring & adaptive management.	BIOT will permit regular scientific survey expeditions over the next 3 years. US Air Force flights from Singapore to Diego Garcia will continue to carry visiting scientists. No change in patrol needs that would compromise the agreed in-kind access to the BIOT patrol vessel. Destabilisation in Middle East or Central Asian regions involving activation of Diego Garcia military facility could delay scientific visits.
2. Provision of scientific survey equipment and a permanent facility for safe and secure storage between scientific visits, thereby reducing transportation logistics and associated costs.	Purchase and installation of diving compressor, boat and engine, diving equipment, survey equipment and safety equipment accessible to visiting scientists.	Scientific equipment available to scientists for series of visits over the next 3 years and beyond.	Space will be allocated in a dry building adjacent to harbour/marina by US Naval support facility/BIOT Administration.

3. Engagement of Chagossians in the UK, Mauritius and Seychelles in importance of biodiversity and conservation through training workshops and outreach activities.	Chagossians from all representative groups attending and taking active part in events in UK, Mauritius, Seychelles. Chagossian societies centrally involved in the organisation of the workshops and design of the activities.	Interest and engagement of Chagossians – list of participants and workshop evaluation forms. Individuals identified and selected for further externally funded initiatives (eg diving and underwater survey training, practical conservation techniques).	Assumes the continued and genuine involvement of Chagossians. Assumes external interest and sponsorship for Chagossian training initiatives, such as that previously provided by RSPB and Coral Cay Conservation.
4. Increased general public awareness in UK, Diego Garcia, Mauritius and internationally of the high value of the Chagos Marine Protected Area in protecting a wide range of oceanic ecosystems for benefit of people around Indian Ocean, and as a control site against which to assess impacts of climate change.	Outreach workshop and high profile media events at Zoological Society of London, Diego Garcia (for US military) and Mauritius, to highlight our scientific understanding of the importance of the Chagos, and objectives of conservation. Activities aimed at different age groups. Development of online educational materials and exhibits and use of social media.	Interest and engagement of general public at local, national and international levels; Workshop participant lists; positive media output – number of articles, types of media; number of visitors to exhibit and results of formal evaluation. Number of Facebook 'likes', number of followers on Twitter, number of visitors to web-pages, number of downloads of web-resource materials.	Media in UK accomplish the planned documentary programmes, encouraging a rational approach to conservation in Chagos.

Activities (details in workplan)

1.1 Steering Group Meetings to establish Darwin Project and to monitor progress and delivery (inc. preparation)

1.2 Meetings with BIOT section FCO and BIOT Science Advisory Group (inc. Preparation) for monitoring and evaluation.

1.3 Develop protocols for environmental survey baseline and monitoring sites, including resiliency and functional diversity/response diversity measures, Establishment of GIS and data archiving

1.4 Develop restoration initiatives for island flora and fauna, erosion and accretion assessment.

1.5 Develop impact matrices and mitigation measures for potential impacts

1.6 Scientific planning meetings for field research expeditions (inc. preparation) to cover expedition logistics.

1.7 Scientific research expeditions (3 x 1 month) during calmest weather periods, establishment of permanent monitoring sites and biodiversity assessment

1.8 Data collation, analysis, archiving and input into relevant global biodiversity monitoring systems

1.9 Development of Chagos/BIOT Management Plan incorporating BAPs and Impact mitigation recommendations

2.1 Organise & arrange preparation of safe scientific storage facility for/in Diego Garcia, including purchase and installation of diving air compressor, safe storage of boats and engines, and scientific monitoring equipment.

3.1 Planning meetings with Chagossian Societies and Associations to organise workshops and activities to maximise engagement in outreach activities, including

	meetings with representatives in Mauritius and Seychelles
3.2	Events, activities and workshops for Chagossian communities in UK, Mauritius and Seychelles
3.3	Identification of Chagossian Darwin Fellows for specific training in conservation , and participation in Darwin project bursary and externally funded approved training in diving, survey and practical conservation techniques
3.4	Conservation skill training on approved courses for Darwin Fellows (x 6)
4.1	Planning meetings to organise a variety of public outreach and media events with supporting materials in UK, Diego Garcia and in Mauritius (inc .preparation)
4.2	Events in UK (inc preparation)
4.3	Diego Garcia Event (inc .preparation)
4.4	Event in Mauritius (inc .preparation)
4.5	Presentation of results at national and international scientific conferences (RCUK, ESRS, ICCM, ISRS) and publication in peer reviewed journals
4.6	Project final Chagos MPA workshop UK (inc .preparation)
X.X	Darwin half yearly interim and annual/final report (s)

	Activity	No of	Year 1 2012/13				Year 2 2013/14				Year 3 2014/15			
		Months	Q1 A-J	Q2 J-S	Q3 O-D	Q4 J-M	Q1 A-J	Q2 J-S	Q3 O-D	Q4 J-M	Q1 A-J	Q2 J-S	Q3 O-D	Q4 J-M
1.1	Steering Group Meeting s to establish Darwin Project and to monitor progress and delivery (inc. preparation)	1	▪		▪		▪		▪		▪			▪
1.2	Meetings with BIOT section FCO and BIOT Science Advisory Group (inc. Preparation)	0.5	▪			▪				▪				
1.3	Develop protocols for environmental survey baseline and monitoring sites, including resiliency and functional diversity/response diversity measures, Establishment of GIS and data archiving	6	▪	▪	▪									
1.4	Develop restoration initiatives for island flora and fauna, erosion and accretion assessment.	4	▪	▪	▪									
1.5	Develop impact matrices and mitigation measures for potential impacts	1		▪	▪									
1.6	Scientific planning meetings for field research expeditions (inc. preparation) to cover expedition logistics.	3		▪				▪		▪				
1.7	Scientific research expeditions during calmest weather periods, establishment of permanent monitoring sites and biodiversity assessment	3				▪				▪				▪
1.8	Data collation, analysis, archiving and input into relevant global biodiversity monitoring systems	15					▪	▪			▪	▪		▪
1.9	Development of Chagos Management Plan and BAPs	18							▪	▪	▪	▪	▪	▪
2.1	Organise & arrange preparation of safe scientific storage facility for/in Diego Garcia, including purchase and installation of diving air compressor, safe storage of boats and engines, and scientific monitoring equipment.	6	▪	▪	▪						▪			▪
3.1	Planning meetings with Chagossian Societies and Associations to organise workshops and activities to maximise engagement in outreach activities, including meeting s with representatives in Mauritius and Seychelles	1	▪	▪										
3.2	Events, activities and workshops for Chagossian communities in UK, Mauritius and Seychelles	3			▪		▪		▪		▪		▪	
3.3	Identification of Chagossian Darwin Fellows for specific training in conservation , and participation in Darwin project bursary and externally funded approved training in diving, survey and practical conservation techniques	0.5			▪									
3.4	Conservation skill training on approved courses for Darwin Fellows (x6)	6					▪	▪			▪	▪		
4.1	Planning meetings to organise a variety of public outreach and media events and materials in UK, Diego Garcia and in Mauritius (inc .preparation)	1			▪									
4.2	Events in UK (inc preparation)	3				▪	▪		▪				▪	
4.3	Diego Garcia Event (inc .preparation)	0.5								▪				▪

4.4	Event in Mauritius (inc .preparation)	1					▪							
4.5	Presentation of results at scientific conferences (RCUK, ESRS,ICCM, ISRS)/papers	6		▪	▪		▪	▪	▪		▪		▪	
4.6	Project final Chagos MPA workshop UK (inc .preparation)	3												▪ ->
X.X	Darwin half yearly interim and annual reports	2			▪		▪		▪		▪		▪	▪

Annex 2 Report of progress and achievements against final project logframe for the life of the project

Note: For projects that commenced after 2012 the terminology used for the logframe was changed to reflect DFID's terminology.

Project summary	Measurable Indicators	Progress and Achievements April 2014 - March 2015	Actions required/planned for next period
Goal/Impact To ensure that the Chagos MPA justifies its full no-take status, particularly considering ever increasing fishing pressure in the region and that it fulfils its role as a unique srcientific reference site for marine biodiversity.		Project activities have contributed scientific information to: underpin the need for strict conservation, and to assess change in the absence of local anthropogenic impacts. The second scientific expedition has obtained results that contribute to understanding the status of biodiversity within the MPA; the need to reduce pressure on coral reefs; restore degraded areas and contribute to addressing Goal 1 of CITES and AICHI Biodiversity targets. (**Annex 4**).	Do not fill not applicable
Purpose/Outcome To strengthen the Chagos Marine Protected Area by providing scientific knowledge for effective management and to develop a strategy that engages the support of potential stakeholders through outreach, education and engagement. The legacy will be sound management and increased value of what is currently the world's largest Marine Protected Area and a unique and globally important reference site	Engagement of Mauritian scientists in scientific data acquisition for monitoring, island ecosystem restoration and impact mitigation. Active involvement of all Chagossian groups in workshops and training initiatives in UK, Mauritius and Seychelles The Connect Chagos Outreach Project increases the understanding of and need for the MPA amongst different community groups	Mauritian scientists were invited to join the expeditions, but have been unable to engage while Mauritius challenges the legality of the Chagos MPA. 150 Chagossians from London and Manchester attended the Environment Day at Tulleys Farm, Crawley, June 2014 (**Annex 24**). 8 trainees attended the Environment Training course (5th July – 20th September 2014) Annex 12, 13,16,25) graduating as Chagossian Ambassadors (**Annex 23**) on 14th November in front of 60 friends and family members and project partners. Three Chagossians joined the 2015 scientific expeditions (one Darwin expedition) (**Annex 14**). Chagos Bursaries were spread over 10 trainees for advanced skills training. 2 community meetings in Manchester	Do not fill not applicable

	Increased public awareness of the importance of the Chagos MPA, in the UK, Mauritius and Seychelles	and Crawley were held this year. (**Annex 15**) Chagos Conservation 2014 conference at ZSL on 5th December 2014 (**Annex 28**). 115 attendees. (**Annex 29**) Outputs delivered through 3 annual conference on Chagos (and a 4th in November 2015), 22 talks at national and international conferences and workshops, 17 publications in books and journals to date, 8 Reports, 5 MSc theses, a London Zoo Chagos themed aquarium exhibit, dissemination of 210 Videos (inc. 3 films 57 quadcopter aerial sequences, 57 video clips of biodiversity) 7 scientific blogs, rushes for a BBC series and 14 contributions to Darwin Initiative, Bangor and CCT Newsletters. (**see Annex 5, 38**)	
Output 1. To continue established baselines and develop a more comprehensive approach to long term marine and island ecosystem monitoring against which change can be assessed, and develop an understanding to assess the magnitude and significance of potential impacts from several scenarios, including climate change, island ecosystem restoration and possible human resettlement. The Chagos/BIOT Management Plan will include BAPs and identify how CBD/CMS/CITES strategic goals and AICHI targets will be addressed.	Measures of flora and fauna mapping; reef resiliency, functional diversity and response diversity; and assessments of island erosion and accretion. Development of impact matrices and mitigation measures for potential impacts. Development of restoration initiatives for island flora and fauna.	The scientific plan and programme for the Darwin 2015 expedition was developed at a meeting of most expedition participants (with exception of Australians and the Medical Officer) at a planning meeting held at the Zoological Society of London on 4th December, 2014. The 3rd Darwin Science and Conservation expedition to Chagos was conducted from 16th March to 14th April 2015 using the *MV Pacific Marlin* patrol vessel and involving 14 scientists and support members from UK, USA and Australia. 325 person dives were logged, equivalent to over 330 hours spent underwater and 82% of the islands of the archipelago were surveyed for birds. The expedition focussed on 7 projects: (1) Long-term surveys of coral cover, recruitment and long term survey of temperature; (2) Testing reef resilience at permanent monitoring sites by developing videography database to assess change in reef benthic communities over time; (3) Assessment of coral diseases and comparisons with other large MPAs (Big Ocean Network initiative); (4) Benthic carbonate budget assessment; (5) Cryptic marine fauna and recovery of ARMS devices; (6) Productivity of benthic communities and interactions with nutrient enrichment from islands; and (7) Tagging and monitoring seabirds, rat and Coconut crab assessments. **Annex 9: Chagos Scientific Expedition Report 2015**	

Activity 1.1 Steering group meeting to monitor progress and deliver		PIs held a progress review meeting on 4th December 2014
Activity 1.2 Meeting with BIOT section FCO		A further post expedition briefing meeting with BIOT Section held on 2nd June 2015.
Activity 1.3 Develop protocols for environmental survey baseline and monitoring sites, including resiliency and functional diversity/response diversity, measures, establishment of GIS and data archiving.		The 2015 Science and Conservation expedition to the Chagos Archipelago was led by PI Dr John Turner. The scientific expedition participants developed and undertook the following methodologies this year: Professor Charles Sheppard and Anne Sheppard, University of Warwick/Chagos Conservation Trust UK undertook Long-term surveys of coral cover, recruitment and long term surveys of temperature; and flew quadcopter flights to attain imagery of islands and reefs. Dr John Turner and Dr Ronan Roche, Bangor University/CCT UK tested reef resilience at permanent monitoring sites, developing videography database to assess change in reef benthic communities over time; Dr Courtney Couch University of Hawaii, USA Assessed coral diseases and comparisons with other large MPAs; Prof Chris Perry and Gary Murphy (doctoral candidate), Exeter University UK, measured benthic carbonate budgets; Catherine Head (doctoral candidate) University of Oxford UK, Cryptic marine fauna and collection of ARMS devices; Dr Nick Graham and Dr Shaun Wilson, James Cook University/Department of Parks & Wildlife, Australia; Productivity of benthic communities and interactions with nutrient enrichment from islands; Pete Carr with support from Jon Slayer and Claudia Naraina, Zoological Society of London, CCT and University College of London, UK, Tagging and monitoring seabirds, rat and Coconut crab assessments. Data from this, and the two previous expeditions is now being collated into the embryonic Chagos Science Portal (http://chagos-trust.org/news/launch-chagos-information-portal and http://www.cct-chip.org/), from which it will be disseminated into global databases. (**Annex 9**).
Activity 1.4 Develop restoration initiatives for island flora and fauna, erosion and accretion assessment.		This activity now mainly undertaken by Darwin Plus project: Carr & Harper, Ile Vache Marine Bird Habitat Restoration In August 2014, a grid of baiting stations for rat eradication was undertaken, and no rats were observed during monitoring in March 2015. Erosion and accretion (carbonate budget study) completed by Perry & Murphy during Expedition 3, 2015.
Activity 1.5 Develop impact matrices and mitigation measures for potential impacts		Leopold Matrix for development activities and environmental and socioeconomic consequences and mitigations is being compiled from data from the scientific results from the expeditions. Broad data has contributed to the CCT response to the BIOT Policy Review of Resettlement Consultation Document, in which comments fall into three categories: potential damage caused from construction, properly sustainable livelihoods, and climate change complications (**See: Annex**

	17: BIOT Document: BIOT Interim Management Plan; Annex 18: CCT document: Submission to BIOT Feasibility study Policy Review of Resettlement) (**Annex 19: CCT APPG briefing; Annex 20: CCT APPG meeting**).
Activity 1.6 Scientific planning meetings for field research expeditions (including preparation) to cover expedition logistics.	The scientific plan and programme for the Darwin 2015 expedition was developed at a meeting of most expedition participants (with exception of Australians and the Medical Officer) at a planning meeting held at the Zoological Society of London on 4th December, 2014.
Activity 1.7 Scientific research expeditions during calmest weather periods, establishment of permanent monitoring sites and biodiversity assessment	All 3 expeditions have been planned and completed. 34 marine sites were revisited and surveys conducted to assess change in coral reef communities at 6 major atolls (Salomon, Peros Banhos, Blenheim, Great Chagos Bank, Egmont and Diego Garcia). Visual census and video transects were recorded to 25m depth, and reef carbonate budgets and assessment of disease were conducted at 10m depth. 15 Temperature loggers were downloaded and exchanged where necessary, and 2 sets of Autonomous Reef Monitoring Structure (ARMS) were retrieved after 2 years and fauna inhabiting them catalogued. Stained corals were also retrieved after 2 years for assessment of growth rates. The biodiversity of microbial, phytoplankton and zooplankton l communities at 10m depth in water over reefs was collected at 11 sites. 6 islands with bird communities and 6 infested by rates (and hence low abundances of birds) were investigated to assess whether nutrients are transferred v into the reef system. The 10 designated and 2 proposed Important Bird Areas were surveyed Secondary aims were to: Continue the fieldwork, archipelago-wide, researching the distribution, abundance and habitat preference of Coconut Crab *Birgus latro*, an IUCN Red-Listed Data Deficient species; Conduct the first check of the success (or not) of the 2014 invasive mammal eradication operation undertaken on Ile Vache Marine, Peros Banhos **Annex 9: Chagos Scientific Expedition Report 2015.**
Activity 1.8 Data collation, analysis, archiving and input into relevant global biodiversity monitoring systems	Data collation and analysis underway, and Chagos Portal structure completed for collating all scientific data. http://www.cct-chip.org/
Activity 1.9 Development of Chagos Management Plan and BAPs	First draft completed of Management Plan submitted to BIOT Section in year 1. Darwin team members contributed to BIOTs new Interim Management Plan spring this year. (**Annex 17**) Full Management Plan is being developed within this Darwin project, and BAP to be incorporated later in project after all expeditions complete. One aspect of Objective 1, Activity 1.9 that was not fully completed as envisaged at the beginning of the project was the Final Management Plan. the Darwin PIs working through the Chagos Conservation Trust (CCT) originally prepared a Management Plan at BIOT's request in 2012 (and which was adopted by the BIOT Administration at that time), but there was objection from some quarters that this appeared as owned by CCT (because BIOT did not have a

		website and it was only accessible from the CCT website). By year 2 of our project, the new BIOT Administration was in place and understandably wanted to take full ownership of the Management Plan, but due to the ongoing policy review of resettlement, only wanted the plan to be 'Interim'. They took advice from Natural England and prepared a prescriptive outline management plan, which did not include specific Biodiversity Action Plan (BAPs) because insufficient information was known of species and habitats at that stage, and more importantly, it was unknown whether resettlement will occur. This project therefore contributed to the Interim Plan, but did not produce the long term plan as originally intended in our Log Frame. However, it is our intention that the results of our scientific studies form the basis of some BAPs as indicated below, and we plan to develop BAP webpages in a very similar manner to those being developed for Ascension Island http://www.ascension-island.gov.ac/government/conservation/projects/bap/. These then will be added to the management plan in due course, but will first appear in the Chagos Science Portal which is under development as explained in the report
Output 2. Provision of scientific survey equipment and a permanent facility for safe and secure storage between scientific visits, thereby reducing transportation logistics and associated costs.	Purchase and installation of diving compressor, boat and engine, diving equipment, survey equipment and safety equipment accessible to visiting scientists.	Scientific, diving and safety equipment has been built up over the 3 expeditions, and is now permanently stored in the Royal Marine's ex-workshop at Moody Brook on Diego Garcia. A sustainable strategy has been developed for other scientific groups wanting to use the equipment, bearing in mind the high wear and tear incurred by using equipment in harsh conditions, transportation logistics, and the need to have a full complement of spares and consumables to be self-sufficient in the field.
Activity 2.1. Organise & arrange preparation of safe scientific storage facility for/in Diego Garcia, including purchase and installation of diving air compressor, safe storage of boats and engines, and scientific monitoring equipment.	The Chagos Science and Conservation store has air conditioning, shelving and a garage area suitable for the storage of boats and other large items. There are further plans to increase security, construct more shelving, and to convert an adjoining area into a sample preparation area. The equipment was moved from its temporary storage in the Customs House after the second expedition, and previous to that it was in a temporary USA store. 7 boat engines, pyrotechnics (flares), chemicals and part of the medical kit are stored permanently on the *MV Pacific Marlin* to ensure security. The containerised laboratory is stored at Moody Brook between expeditions, and has now been made more weatherproof by installation of a new door Updated inventory. **Annex 10: Expedition Stores Inventory 2015, & Annex 11 Medical Stores Inventory; Annex 22: Chagos Equipment Terms)**	
Output 3. Engagement of Chagossians in the UK, Mauritius and Seychelles in importance	Chagossians from all representative groups attending and taking active part	Third year of Connect Chagos was more focussed on facilitating Chagossian ownership of Environmental Training Course through individuals co-producing

of biodiversity and conservation through training workshops and outreach activities.	in events in UK, Mauritius, Seychelles. Chagossian societies centrally involved in the organisation of the workshops and design of the activities.	and leading elements of the course rather than ZSL and project staff, who assisted them to achieve this. **(Annex 12: Connect Chagos 2014-2015; Annex 15: Connect Chagos People & Wildlife Community Booklet; Annex 16 Connect Chagos**).
Activity 3.1: Planning meetings with Chagossian Societies and Associations to organise workshops and activities to maximise engagement in outreach activities, including meetings with representatives in Mauritius and Seychelles		Meetings held with key Chagossian community members such as Allen Vincatassin (provisional Chagos President), Mylene Augustin (leader of Chagos Women's Welfare Group and Chagos Youth Group) and environmental training course graduates 'Chagos Ambassadors' to collaboratively work on using existing community structures to maximize engagement in all outreach activities including the 2015 Environmental Training Course. Meetings with Chagossians that have undertaken Chagos scientific expeditions to determine content for 2015 Chagos Environmental Training Course that they will personally develop and deliver.(**Annex 25**)
Activity 3.2: Events, activities and workshops for Chagossian communities in UK, Mauritius and Seychelles		An Environmental day was held at Tulley's Farm, Crawley in June 2014 and attended by 150 Chagossians from both Manchester and Crawley communities. Event involved Chagos-specific environmental workshops and raised awareness/enabled recruitment for Environmental Training Course. **Annex 24: Environmental open day.** 8 trainees attended Chagos Environment Training Course (5th July - 20th September, 2014); training addressed three themes: Marine Conservation, Terrestrial Ecology and Communication for Conservation. Training split into modules including habitat management, coral identification, bird monitoring and marine conservation (not exhaustive). Subsequent awards ceremony organized by graduating trainees and held at Tilgate Community Centre on 14th November 2014. Over 60 people attended including graduates' family members, members from project partners CCT, ZSL, Kew, and key individuals from Chagossian communities (Annexes 12, 13, 15, 16, 24). Community meetings held in Manchester and Crawley for Nadine Dorothee to present her experiences from the pelagic Chagos Expedition in February 2015 (approx.. 50 people).
Activity 3.3: Identification of Chagossian Darwin Fellows for specific training in conservation and participation in Darwin project bursary and externally funded approved training in diving, survey and practical conservation techniques		See 3.4. Following 2 rounds of 5 interviews and then 3 shortlisted candidates, Jenny Bertrand was selected to join the Pelagic Scientific Expedition to Chagos 2015 in January, Nadine Dorothee to the Catlin Seaview Science Expedition and Claudia Naraina was selected for the Darwin Science and Conservation in March 2015. (**Annex 14: Darwin Bursary Fellows Chagos expedition experiences**)

Activity 3.4: Conservation skill training on approved courses for Darwin Fellows (x6) (3 per year 2 and 3)		Lia Tallot, Yvane Elyse and Jenny Bertrand completed their LANTRA CS30 basics of chain saw use training with Ian Robinson from the RSPB. Claudia Naraina hosted an environmental open day for the Chagossian community in Manchester where over 120 people attended. Claudia Naraina completed her PADI Open Water diving qualifications with Yu diving. Jenny Bertrand, Nelson Betrand, Nadine Dorothee, Joanne Dorothee, Marie Noel Pirogue, Jane Baptise and Eleanor Bandoo undertook introductory swim classes at K2 Leisure Centre in Crawley, using the nationally recognised syllabus *ASA Learn to Swim Pathway.* Jenny Bertrand had intended to use her bursary to pursue a botanical course at Plumpton College, however withdrew as required number of volunteer hours per week were not compatible with her work/personal life.
Output 4 Increased general public awareness in UK, Diego Garcia, Mauritius and internationally of the high value of the Chagos Marine Protected Area in protecting a wide range of oceanic ecosystems for benefit of people around Indian Ocean, and as a control site against which to assess impacts of climate change.	Outreach workshop and high profile media events at Zoological Society of London, Diego Garcia (for US military) and Mauritius, to highlight our scientific understanding of the importance of the Chagos, and objectives of conservation. Activities aimed at different age groups. Development of online educational materials and exhibits and use of social media.	This Darwin Initiative Project continues to work closely with Chagos Conservation Trust, Pew Environment Group (UK) and ZSL on increasing public awareness of Chagos Archipelago and Marine Protected Area. Outputs delivered through annual conference on Chagos, talks at national and international conferences and workshops, zoo exhibit, dissemination of films, scientific blogs and contributions to DI and CCT Newsletters. (**Annex 5**) .
Activity 4.1: Planning meetings to organise a variety of public outreach and media events and materials in UK, Diego Garcia and in Mauritius (inc .preparation)		Topics discussed by PIs during regular meetings, skype conversations and e mails. Also discussed at Planning Workshop on 4th December 2015. Meeting held with BIOT on 2nd June, and regular correspondence between ZSL and BIOT regarding extending the Connect Chagos Programme.
Activity 4.2: Events in UK		The Chagos Conservation 2014 conference at the Zoological Society of London was hosted by the Chagos Conservation Trust with the support of the Pew Charitable Trusts, The Zoological Society of London and the Darwin Initiative on5th December 2014. Presentations came from participants on the 2014 Darwin Expedition, the 2014 Pelagic Expedition, 2014 Turtle Expedition and Chagos Connect and included: Professor Charles Sheppard - Coral cover trends and temperature reports; Dr John Turner - Recent changes in community structure of the coral reefs of the Chagos Archipelago; Courtney Couch - Coral health in the Chagos Archipelago, is coral disease a concern; Melita Samoilys and Heather Koldewey – Groupers in Chagos; Audrey Blancart- Connect Chagos 2014; Tom

	Letessier – Pelagic megafuna, Jon Slayer and Peter Carr - Rat eradication and island restoration; Catherine Head- cryptic reef fauna; Nicole Esteben and Graeme Hayes – Turtles in Chagos, beaches, breeding and long distance swims; Jon Slayer and Stuart McPherson – Film making in Chagos. **Annex 28: Programme & Annex 29: Attendees List**
Activity 4.3: Diego Garcia Event (including preparation)	An event was planned as a series of presentations on Diego Garcia for military and contact personnel on an evening prior to the expedition, but there was little interest on island for this event at the time.
Activity 4.4: Event in Mauritius (including .preparation)	The FCO has advised against specific activities in Mauritius and Seychelles while Mauritius continues to challenge the MPA and UK sovereignty of the Chagos Archipelago.
Activity 4.5: Presentation of results at scientific conferences (RCUK, ESRS,ICCM, ISRS)/papers	The project featured in both a plenary presentation by Dr Heather Koldewey and a symposium talk by Dr John Turner at the Society for Conservation Biology International Marine Conservation Congress, held in Glasgow 14-18 August 2014. **Annex 5**
Activity 4.6Project final Chagos MPA workshop UK (inc .preparation)	A Darwin Workshop was held at ZSL on 4th December 2014 to finalise planning and outputs of the 2015 Science and Conservation expedition and to integrate activities with an unprecedented number of other expeditions for 2015, including the Pelagic Expedition (January 2015), Catlin Seaview Expedition (February 2015), and Google Tracker expedition March 2015. There were subsequently 3 further expeditions that happened in March/April /May 2015 – The Bertarelli Vava-Stanford Acoustic Servicing Expedition, 2 The Pangea/University of Western Australia Expedition, and 2 phases of the Living Oceans Foundation Expedition.
Activity XX: Darwin half yearly interim and annual reports	This report submitted being submitted late as forewarned due to return from Chagos Scientific Expedition in mid April and necessity to submit and collate expenditure and scientific reports arising from expedition.

Annex 3 Standard Measures

Code	Description	Total	Nationality	Gender	Theme	Language	Comments
Training Measures							
1a	Number of people to submit PhD thesis	3	UK	3 M,	Marine Biodiversity	English	
1b	Number of PhD qualifications obtained	1 (Head)	UK	1 F	Marine Biodiversity	English	
2	Number of Masters qualifications obtained	5	USA, Spain, UK	2F 3M	Marine Biodiversity	English	
3	Number of other qualifications obtained	13	Chagossian in UK	10F 3 M	Various skills: diving, habitat restoration etc	English	
4a	Number of undergraduate students receiving training	790	Mostly UK but various Overseas	>50% F	Marine biology	English	
4b	Number of training weeks provided to undergraduate students	6					
4c	Number of postgraduate students receiving training (not 1-3 above)	60	Mostly UK but various overseas (Inc Mauritius & Seychelles)	>50% F	Marine Environmental Protection	English	
4d	Number of training weeks for postgraduate students	6					
5	Number of people receiving other forms of long-term (>1yr) training not leading to formal qualification(e.g., not categories 1-4 above)	42	Chagossian in UK	24 F, 18 M	Marine environmental training – Chagos Ambassadors	English + some Creole	

Code	Description	Total	Nationality	Gender	Theme	Language	Comments
6a	Number of people receiving other forms of short-term education/training (e.g., not categories 1-5 above)	965	Chagossian in UK & Mauritius	>50% F	Wildlife and conservation	English+ some Creole	
6b	Number of training weeks not leading to formal qualification	18					
7	Number of types of training materials produced for use by host country(s) (describe training materials)	9					Module training materials

Research Measures		Total	Nationality	Gender	Theme	Language	Comments
9	Number of species/habitat management plans (or action plans) produced for Governments, public authorities or other implementing agencies in the host country (ies)	1 Management Plan					Participatory process? Top down but yes
10	Number of formal documents produced to assist work related to species identification, classification and recording.	2 Coralpedia (under production) Cryptofauna PhD thesis					
11a	Number of papers published or accepted for publication in peer reviewed journals	12					Papers listed below
11b	Number of papers published or accepted for publication elsewhere	5					Coral Reefs of Overseas Territories Book (Springer)
12a	Number of computer-based databases established (containing species/generic information) and handed	2 Coralpedia					

	over to host country	(underconstruction Chagos Information Portal					
12b	Number of computer-based databases enhanced (containing species/genetic information) and handed over to host country	3 Chagos GIS, Fish Corals					
13a	Number of species reference collections established and handed over to host country(s)	5 (Sponges, Black corals, macroalgae (Wagner) Cryptofauna (Head) Coral Disease (Couch)					
13b	Number of species reference collections enhanced and handed over to host country(s)	2 Fish (Gaither & Bowen) Coral (Fenner, Roche)					

Dissemination Measures		**Total**	**Nationality**	**Gender**	**Theme**	**Language**	**Comments**
14a	Number of conferences/seminars/workshops organised to present/disseminate findings from Darwin project work	3					
14b	Number of conferences/seminars/ workshops attended at	22					

	which findings from Darwin project work will be presented/ disseminated.						

Physical Measures		**Total**	**Comments**
20	Estimated value (£s) of physical assets handed over to host country(s)	£100,000	£60,000 in capital equipment, spares and consumables, but due to shipping, on site value significantly greater
21	Number of permanent educational, training, research facilities or organisation established	2	Science and conservation store Containerised laboratory
22	Number of permanent field plots established	44	34 underwater sites, 10 International Bird Areas + 2 additional

Financial Measures		**Total**	**Nationality**	**Gender**	**Theme**	**Language**	**Comments**
23	Value of additional resources raised from other sources (e.g., in addition to Darwin funding) for project work	1,802,586.04					

Annex 4 Aichi Targets

	Aichi Target	Tick if applicable to your project
1	People are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably.	
2	Biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems.	
3	Incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, taking into account national socio economic conditions.	
4	Governments, business and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable production and consumption and have kept the impacts of use of natural resources well within safe ecological limits.	
5	The rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.	
6	All fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits.	
7	Areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.	
8	Pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.	
9	Invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.	
10	The multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning.	√
11	At least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.	√
12	The extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.	√
13	The genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.	

14	Ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable.	
15	Ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 15 per cent of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification.	√
16	The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is in force and operational, consistent with national legislation.	
17	Each Party has developed, adopted as a policy instrument, and has commenced implementing an effective, participatory and updated national biodiversity strategy and action plan.	√
18	The traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels.	
19	Knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied.	√
20	The mobilization of financial resources for effectively implementing the Strategic Plan for Biodiversity 2011-2020 from all sources, and in accordance with the consolidated and agreed process in the Strategy for Resource Mobilization, should increase substantially from the current levels. This target will be subject to changes contingent to resource needs assessments to be developed and reported by Parties.	

Annex 5 Publications

Type * (e.g. journals, manual, CDs)	Detail (title, author, year)	Nationality of lead author	Nationality of institution of lead author	Gender of lead author	Publishers (name, city)	
0. Journal Paper	Sheppard et al 2012	British	British	M	*Aquat Conserv Mar Freshwat Ecosyst*	Wiley.com Annex 31
1. Book Chapter	Sheppard et al 2013a*	British	British	M	*Coral Reefs of the UK Overseas Territories, No 4. Coral Reefs of the World Vol 4*. Springer.	Springer Annex 32
2. Book Chapter	Sheppard et al 2013b*	British	British	M	"	Annex 33
3. Book Chapter	Graham et al 2013*	British	Australian	M	"	Annex 34
4. Book Chapter	Carr et al 2013*	British	British	M	"	Annex 35
5. Book Chapter	Readman et al 2013*	British	British	M	"	Annex 36
6. Journal paper	Antwerberhen et al 2013	Eritrea	British	M	*Marine Pollution Bulletin*	Elsevier
7. Journal paper	Pratchett et al 2013	Australian	Australian	M	*Marine Environmental Research*	Elservier.com
8. Journal paper	Roche et al 2015	Irish	British	M	*Marine Biology*	Springer.com
9. Journal paper	Head et al 2015	British	British	F	*Coral Reefs*	Springer.com
10. Journal paper	Gravestock & Sheppard 2015	British	British	F	*Marine Ecology Progress Series*	Inter Research (int-r
11. Journal paper	Wilhelm et al 2014	USA	USA	F	*Aquatic Conservation: marine and freshwater ecosystems*	Wliey.com
12. Journal	Toonen et al	USA	USA	M	*Marine*	Elsevier.com

paper	2013				*Pollution Bulletin*	
13. Journal paper	Redding et al 2015	British	British	M	*Animal Conservation*	CUP Cambridge Jour
14. Journal paper	Curnick et al 2015	British	British	M	*Animal Conservation*	CUP Cambridge Jour
15. Journal paper	Januchowski-Hartley 2015	British	Australian	M	*Biological Conservation*	Elsevier.com
16. Journal paper	Graham et al 2015	British	Australian	M	*Nature*	Nature.com
17. Journal Paper	Perry et al (in press)	British	British	M	*Scientific Reports*	Nature.com
18. PhD Thesis	Head (2015)	British	British	F	*PhD Thesis*	University of Oxford
19. MSc Thesis	Bartow (2015)	USA	British	F	*MSc Thesis*	Bangor University
20. MSc thesis	Suchley (2014)	British	British	M	*MSc Thesis*	Bangor University
21. MSc thesis	Dickinson (2014)	British	British	F	*MSc Thesis*	Bangor University
22. MSc thesis	Jenkins (2014)	British	British	M	*MSc Thesis*	Imperial College Lon
23. MSc thesis	Carr (2013)	British	British	M	*MSc Thesis*	University of Warwi
24. MSc thesis	Gracia Saiz (2013)	Spanish	British	F	*MSc Thesis*	Bangor University
25. 57 aerial video sequences	Sheppard (2015)	British	British	M		https://www.youtub
26. 3 Films on BIOT science	Slayer (2013)	South African	British	M		https://vimeo.com/ http://vimeo.com/7 http://vimeo.com/7
27. 150 video clips of Chagos science & biodiversity	Slayer (2013)	South African	British	M		Darwin Chagos Unde https://www.youtub Darwin Chagos Islan https://www.youtub Darwin Chagos Scier https://www.youtub Darwin Chagos Birds https://www.youtub

FURTHER DETAILS OF OUTPUTS:

JOURNAL PAPERS & BOOK CHAPTERS

Relevant peer-reviewed publications (bold denotes people actively engaged with Darwin project) are shown below with abstracts where accessible:

0 Sheppard CRC, Ateweberhan M, Bowen BW, **Carr** P, Chen CA, Clubbe, C, Craig MT, Ebinghaus R, Eble J, Fitzsimmons N, **Gaither** MR, Gan CH, Gollock M, Guzman N, **Graham** NAJ, Harris A, Jones R, Keshavmurthy S, **Koldewey** H, Lundin CG, Mortimer JA, Obura D, Pfeiffer M, **Price** ARG, Purkis S, Raines P, Readman JW, Riegl B, Rogers A, Schleyer M, Seaward MRD, **Sheppard** ALS, Tamelander J, **Turner** JR, Visram S, Vogler C, Vogt S, Wolschke H, Yang JMC, Yang SY, Yesson C. (2012) Reefs and islands of the Chagos Archipelago, Indian Ocean: why it is the world's largest no-take marine protected area. *Aquat Conserv Mar Freshwat Ecosyst* **22**:232–261.

Abstract:. The Chagos Archipelago was designated a no-take marine protected area (MPA) in 2010; it covers 550 000km2, with more than 60 000km2 shallow limestone platform and reefs. This has doubled the global cover of such MPAs.

2. It contains 25–50% of the Indian Ocean reef area remaining in excellent condition, as well as the world's largest contiguous undamaged reef area. It has suffered from warming episodes, but after the most severe mortality event of 1998, coral cover was restored after 10 years.

3. Coral reef fishes are orders of magnitude more abundant than in other Indian Ocean locations, regardless of whether the latter are fished or protected.

4. Coral diseases are extremely low, and no invasive marine species are known.

5. Genetically, Chagos marine species are part of the Western Indian Ocean, and Chagos serves as a 'stepping-stone' in the ocean.6. The no-take MPA extends to the 200nm boundary, and. includes 86 unfished seamounts and 243 deep knolls as well as encompassing important pelagic species.

7. On the larger islands, native plants, coconut crabs, bird and turtle colonies were largely destroyed in plantation times, but several smaller islands are in relatively undamaged state.

8. There are now 10 'important bird areas', coconut crab density is high and numbers of green and hawksbill turtles are recovering.

9. Diego Garcia atoll contains a military facility; this atoll contains one Ramsar site and several 'strict nature reserves'. Pollutant monitoring shows it to be the least polluted inhabited atoll in the world. Today, strict environmental regulations are enforced.

10. Shoreline erosion is significant in many places. Its economic cost in the inhabited part of Diego Garcia is very high, but all islands are vulnerable.

11. Chagos is ideally situated for several monitoring programmes, and use is increasingly being made of the archipelago for this purpose. **Annex 31**

1. **Sheppard**, CRC; Bowen, BW., Chen, C., Craig, MT., Eble, J., Fitzsimmons, Gan, C., **Gaither,** MR., Gollock, M., Keshavmurthy, S., **Koldewey**, H., Mortimer, J., Obura, D., Pfeiffer, M., Rogers, A., **Sheppard**, A., Vogler, C., Worheide, G, Yang, M., Yesson, C. (2013), British Indian Ocean Territory (the Chagos Archipelago): setting, connections and the Marine Protected Area. Chapter 17, P223-240 in Sheppard ed. (2013) *Coral Reefs of the UK Overseas Territories, No 4. Coral Reefs of the World Vol 4*. Springer. **Annex 32.**

2. **Sheppard**, CRC., Ateweerhan, M., Chen, A., Harris, A., Jones, R., Keshavmurthy,S., Lundin, C., Obura, D., Purkis,S., Raines, P., Riegl, B., Schleyer, M., **Sheppard**, A., Tamelander, J., **Turner**, JR., Visram, S., Yang,S. (2013). Coral reefs of the Chagos Archipelago, Indian Ocean. Chapter 18, P.241-252 in Sheppard ed. (2013) *Coral Reefs of the UK Overseas Territories, No 4. Coral Reefs of the World Vol 4*. Springer. **Annex 33.**

3. **Graham, NAJ, Pratchett, M.S**., McClanahan, TR.(2013) The status of coral reef fish assemblages in the Chagos Archipelago, with implications for protected area management and climate change. Chapter 19, P.253-270 in Sheppard ed. (2013) *Coral Reefs of the UK Overseas Territories, No 4. Coral Reefs of the World Vol 4.* Springer. **Annex 34.**

4. **Carr P**., Hillman, JC., Seaward MRD., Vogt,S., **Sheppard,** CRC. (2013). Coral Islands of the British Indian Ocean Territory (Chagos Archipelago). Chapter 20, P.271 -282 in Sheppard ed. (2013) *Coral Reefs of the UK Overseas Territories, No 4. Coral Reefs of the World Vol 4*. Springer. **Annex 35.**

5. Readman, JW., DeLuna,F., Ebinhaus, R., Guzman, N., **Price**, AG., Readman, E., **Sheppard**, A., Sleight, VA., Sturm,R., Thompson, RC., Tonkin, A., Wolschke, H., Wright, R., **Sheppard,** CRC. (2013). Contaminants, pollution and potential anthropogenic impacts on Chagos/BIOT. Chapter 21, P.283-298. in Sheppard ed. (2013) *Coral Reefs of the UK Overseas Territories, No 4. Coral Reefs of the World Vol 4.* Springer. **Annex 36.**

6. Ateweberhan*,* M; Feary, D A; Keshavmurthy, S; Chen, A; Schleyer, M. H; and **Sheppard, CRC**. *(*2013*) Climate change impacts on coral reefs: synergies with local effects, possibilities for acclimation, and management implications*. *Marine Pollution Bulletin*, Volume *74* (Number 2). pp. *526-539*.

Abstract: Most reviews concerning the impact of climate change on coral reefs discuss independent effects of warming or ocean acidification. However, the interactions between these, and between these and direct local stressors are less well addressed. This review underlines that coral bleaching, acidification, and diseases are expected to interact synergistically, and will negatively influence survival, growth, reproduction, larval development, settlement, and post-settlement development of corals. Interactions with local stress factors such as pollution, sedimentation, and overfishing are further expected to compound effects of climate change. Reduced coral cover and species composition following coral bleaching events affect coral reef fish community structure, with variable outcomes depending on their habitat dependence and trophic specialisation. Ocean acidification itself impacts fish mainly indirectly through disruption of predation and habitat-associated behavior changes. Zooxanthellate octocorals on reefs are often overlooked but are substantial occupiers of space; these also are highly susceptible to bleaching but because they tend to be more heterotrophic, climate change impacts mainly manifest in terms of changes in species composition and population structure. Non-calcifying macroalgae are expected to respond positively to ocean acidification and promote microbe induced coral mortality via the release of dissolved compounds, thus intensifying phase-shifts from coral to macroalgal domination. Adaptation of corals to these consequences of CO2 rise through increased tolerance of corals and successful mutualistic associations between corals and zooxanthellae is likely to be insufficient to match the rate and frequency of the projected changes Impacts are interactive and magnified, and because there is a limited capacity for corals to adapt to climate change, global targets of carbon emission reductions are insufficient for coral reefs, so lower targets should be pursued. Alleviation of most local stress factors such as nutrient discharges, sedimentation, and overfishing is also imperative if sufficient overall resilience of reefs to climate change is to be achieved.

7. **Pratchett MS**; Pisapia C; **Sheppard CRC** (2013) Background mortality rates for recovering populations of *Acropora cytherea* in the Chagos Archipelago, central Indian Ocean. *Marine Environmental Research.* 86: 29-34.

Abstract: his study quantified background rates of mortality for *Acropora cytherea* in the Chagos Archipelago. Despite low levels of anthropogenic disturbance, 27.5% (149/541) of *A. cytherea* colonies exhibited some level of partial mortality, and 9.0% (49/541) of colonies had recent injuries. A total of 15.3% of the overall surface area of physically intact *A. cytherea* colonies was dead. Observed mortality was partly attributable to overtopping and/or self-shading among colonies. There were also low-densities of *Acanthaster planci* apparent at some study sites. However, most of the recent mortality recorded was associated with isolated infestations of the coral crab, *Cymo melanodactylus*. *A. cytherea* is a relatively fast growing coral and these levels of mortality may be biologically unimportant. However, few studies have measured background rates of coral mortality, especially in the absence of direct human disturbances. These data are important for assessing the impacts of increasing disturbances, especially in projecting likely recovery.

8. Roche, R.C., Pratchett, M.S., Carr, P., TURNER, J.R. Wagner, D., Head, C., Sheppard, C.R.C. (2015) Localized outbreaks of Acanthaster planci at an isolated and unpopulated reef atoll in the Chagos Archipelago. *Marine Biology* Ms. No. MABI-D-15-00124R2, 14/07/15.

Abstract Outbreaks of the crown-of-thorns starfish (COTS), *Acanthaster planci*, have occurred at many locations throughout the Indo-Pacific and are a major contributor to widespread coral loss and reef degradation. The causes of outbreaks remain controversial, but are commonly attributed to anthropogenically elevated nutrients and/or over-fishing. If so, it seems unlikely that outbreaks would occur in reef systems that are largely isolated from anthropogenic disturbances. However, high densities of COTS were recently observed on reefs in the Chagos Archipelago, a remote group of atolls and banks within the central Indian Ocean, which experience very limited anthropogenic influence. Aggregations of COTS were first noticed at Eagle Island in 2012, which, although unquantified, appeared to be at outbreak levels, and very high densities (1624 km−2) were subsequently recorded at Danger Island in 2013. While these islands are uninhabited by humans, it is possible that nutrient inputs result from upwelling zones around the Archipelago, or high densities of breeding seabirds. Among islands within the Great Chagos Bank, densities of the red-footed booby *Sula sula* ranged from 8 to 7888 individuals km−2, with associated guano input ranging from 96 to 25,381 kg island−1 year−1. However, Danger and Eagle Islands where high COTS densities were recorded, had both high and low levels of guano production, respectively, which suggests that outbreaks may not be directly linked to guano nutrient enrichment. Other factors which might be responsible for intermittent COTS outbreaks should be considered in isolated reef systems such as the Chagos Archipelago.

9. Head, CEI, Bonsall, MB., **Koldewey, H., Pratchett, MS.,** Speight, M., Rogers, AD. (2015). High prevalence of obligate coral-dwelling decapods on dead corals in the Chagos Archipelago, central Indian Ocean. *Coral Reefs* DOI 10.1007/s00338-015-1307-x

Abstract Small and cryptic organisms that live within the interstices of reef habitats contribute greatly to coral reef biodiversity, but are poorly studied. Many species of cryptofauna have seemingly obligate associations with live coral and are therefore considered to be very vulnerable to coral mortality. Here we report the unanticipated prevalence of obligate coral-dwelling decapod crustaceans on dead colonies of branching corals in the Chagos Archipelago (British Indian Ocean Territory) in the central Indian Ocean. A total of 205 obligate coral-dwelling decapods, including Trapezia crabs, were recorded from 43 (out of 54) dead coral colonies of *Acropora* and Pocillopora collected across five different atolls. *Trapezia* individuals found on dead corals were mainly juveniles, and the few adults were almost exclusively male. Among the shrimps (Pontoniinae), however, it was predominantly adult females found on dead corals. Obligate coral-dwelling species that typically occur only on live *Pocillopora* hosts (e.g., Trapezia spp.) were recorded on dead *Acropora*. These findings suggests that these obligate coral-dwelling decapods are not simply persisting on coral hosts that have died, but may be explicitly recruiting to or moving to dead coral hosts at certain stages in their life cycle. Variation in the abundance of live coral among sites had no affect on the presence or abundance of obligate coral-dwelling decapods on dead corals. This study shows that habitat associations of obligate coral-dwelling organisms, and their reliance on different habitat types, are complex and further work is required to establish their vulnerability to widespread habitat degradation on coral reefs.

10. Gravestock P**, Sheppard** CRC. 2015. Valuing the ecosystem services of the Chagos: a review of challenges and estimates. *Marine Ecology Progress Series* 530: 255–270.

Abstract This study provides a preliminary review of the economic value of the ecosystem goods and services of the Chagos Islands, central Indian Ocean, in the period immediately prior to the designation of the Chagos marine reserve in April 2010. The goods and services valued include inshore and offshore fisheries, shoreline protection, scientific value, the islands' possible role in-supporting southwest Indian Ocean fisheries and in southwest Indian Ocean reef recovery and its-value as a unique and unspoiled ecosystem. The goods and services identified were largely intangible,-with few associated directly with a market. Both the nature of the subject, particularly the-significance of its non-use values and the uniqueness of the site,

as well as incomplete data, presented-valuation challenges. In order to accommodate these characteristics, estimates of annual-economic flow were provided in addition to economic values. The study estimated possible annual-economic flows of several hundred million pounds, with an economic value in excess of £1 billion-(£109), with the benefits accruing both regionally in the southwest Indian Ocean and globally.

11. Wilhelm TA, **Sheppard** CRC, **Sheppard** ALS, Gaymer CF, Parks J, **Wagner** D, Lewis N. 2014. Large marine protected areas – advantages and challenges of going big. *Aquatic Conservation: marine and freshwater ecosystems*. 24: 24-30.
Abstract: 1. The Aichi Biodiversity Targets were designed to promote and implement the Convention on Biological Diversity (CBD) by providing a framework for action to save biodiversity and enhance its benefits for people. Specifically, Target 11 aims to protect 10% of all seas by 2020. The percentage of the world's oceans that are protected has increased steadily in recent years, mainly due to very large marine protected areas (MPAs). 2. The issue of making major gains in achieving protection targets through 'going big' has brought added scrutiny to the subject ofMPAs. There is economy in scale, but several people have called into question whether going large will protect representative habitat and result in true protection, or whether it ismerely a politically expedient way for some nations to attain targets by creating paper parks, while avoiding tough conservation decisions. 3. The recent creation of large MPAs has greatly enhanced the chance of achieving global protection targets. Large areas typically contain several ecosystems and habitats that interact ecologically, and allow for more holistic conservation. The interactions between ecosystems in large MPAs occur without many of the problems associated with networks of smaller MPAs, where the connectivity between sites is often affected by human activities. 4. The disadvantages of large MPAs include difficulties of surveillance, enforcement and monitoring of vast offshore areas, as well as high total costs. While the cost per unit area may be lower for large MPAs, conducting surveillance and monitoring in such vast areas requires much more expensive technologies. 5. Large MPAs complement and add to existing management and conservation measures. Decision makers should consider designating them as one of a suite of possible protection measures. Besides greatly enhancing the chance of reaching agreed biodiversity targets, large MPAs improve the quality of conservation.

12. Toonen, R.J.; Wilhelm, T.A., Maxwell, S., **Wagner**, D., Bowen, B., **Sheppard**, CRC., Taie, S.M., Teroroko, T., Moffitt, R., Gaymer, C., Morgan, L., Lewis, N., **Sheppard**, A., Parks, J., Friedlander, A.M., The Big Ocean Think Tank. 2013. One size does not fit all: the emerging frontier in large scale marine conservation. *Marine Pollution Bulletin*. 77: 7-10.
Abstract: On the 20th anniversary of the Convention on Biological Diversity, a network of very large marine protected areas (the Big Ocean network) has emerged as a key strategy in the move to arrest marine decline and conserve some of the last remaining relatively undisturbed marine areas on the globe. Here we out line the ecological, economic and policy benefits of very large-scale MPAs and show their disproportionate value to global marine conservation targets. In particular we point out that very large-scale MPAs area critical component of reaching the Aichi targets of protecting 10% of global marine habitats by 2020, because in addition to encompassing entire ecosystems, they will bring forward the expected date of achievement by nearly three decades (2025 as opposed to 2054). While the need for small MPAs remains critical, large MPAs will complement and enhance these conservation efforts. Big Ocean sites currently contain more than 80% of managed area in the sea, and provide our best hope for arresting the global decline in marine biodiversity.

13. Redding, D.W. **Head**, C., Huang, G., Crabbe, C., Gollock, Hoeksema, B.W., Johnson, K.G., M., Jones, R.; **Koldewey**, H. Obura, D.O., Rosen, B.R., Smith, D.J., Taylor, M.L., **Turner**, J.R., Wren, S.(2015). Response: Setting evolutionary-based conservation priorities for a phylogenetically data poor taxonomic group (Scleractinia). *Animal Conservation*. 18(4) 320-321.doi10.1111/acv.12228.

Abstract: We thank the authors for their thought-provoking and insightful commentaries on our work. We agree with the majority of points raised, and give our detailed responses below. Our study concentrates on how to award species an EDGE score (Isaac *et al*., 2007). EDGE is a bipartite measure that combines a species' extinction risk (GE) and a measure of the number of close relatives a species has due to its relative position in the evolutionary tree-of-life (termed ED here). In our study, we concentrate solely on the ED component, undertaking the pragmatic task of awarding scores for data-poor groups, both through surveying expert opinion and taxonomy-based interpolation.

14. **Curnick**, D., **Head**, C., Huang, G., Crabbe, C., Gollock, Hoeksema, B.W., Johnson, K.G., M., Jones, R.; **Koldewey**, H. Obura, D.O., Rosen, B.R., Smith, D.J., Taylor, M.L., **Turner**, J.R., Wren, S., Redding, D. W., (2015). Setting evolutionary-based conservation priorities for a phylogenetically data poor taxonomic group (Scleractinia). *Animal Conservation*. 02/2015; DOI:10.1111/acv.12185.

Abstract. Given the current extinction crisis coupled with the shortfall in funding, there is a pressing need to establish species conservation priorities. The prioritization of phylogenetic diversity and evolutionary distinctiveness is one approach; however, taking such an approach requires more phylogenetic data than are currently available for most taxa. Here, we investigate the effects of increased phylogenetic knowledge on the accuracy of evolutionary distinctiveness (ED) scores over time using scleractinian corals as a case study. ED scores were calculated from four molecular-based phylogenies from 2008 to 2013, each one representing a chronological step of increased phylogenetic knowledge for scleractinian corals, finally resulting in a full species-level phylogeny which is used here as the reference dataset. As expected, the most complete and up-to-date phylogenies performed well at predicting scores taken from a recent, full-coverage species-level phylogeny of scleractinian corals. Surprisingly, however, older phylogenies and scores derived from expert opinion also performed well. More unexpectedly, the expert opinion-led scores, when used as a basis for imputing scores for missing species, achieved a close second in terms of prediction accuracy compared with the most recent and largest tree, which had nearly 10 times more taxonomic coverage. We recommend, once tested further, that ED score imputation be considered for assessing the conservation priorities for other poorly studied groups.

15. Januchowski-Hartley FA, **Graham** NAJ,. Cinner JE, Russ GR. 2015. Local fishing influences coral reef fish behavior inside protected areas of the Indo-Pacific. *Biological Conservation* 182: 8–12.

Abstract. Fishing is altering aquatic ecosystems through changes in the abundance, species composition and behavior of target species. Changes in fish behavior have received relatively little attention, despite significant evidence of behavioral change driven by human impacts mediating function and processes in terrestrial ecosystems, and emerging evidence that the same is true in marine systems even within marine reserves. Here, we measured the wariness of two families of coral reef fishes in both fished areas and marine reserves embedded within a fished seascape along an exploitation gradient ranging from wilderness sites (Chagos) to heavily fished areas (the Philippines). We used linear mixed effect models to identify relationships between fish flight initiation distance (FID) and fishing pressure, fish size, habitat complexity and life-history stage. Critically, fish FID increased with fishing pressure both in fished areas and inside marine reserves. These results imply that as fishing pressure increases in adjacent areas, progressively greater fish wariness may reduce the magnitude of some ecosystem functions within small marine reserves.

16. **Graham** NAJ, Jennings S, MacNeil MA, Mouillot D, **Wilson** SK. 2015. Predicting climate-driven regime shifts versus rebound potential in coral reefs. *Nature* doi:10.1038/nature14140.

Abstract. Climate-induced coral bleaching is among the greatest current threats to coral reefs, causing widespread loss of live coral cover1.Conditions under which reefs bounce back from bleaching events or shift from coral to algal dominance are unknown, making it difficult to predict and plan for differing reef responses under climate change. Here we document and predict long-term reef responses to a major climate induced coral bleaching event that caused

unprecedented region wide mortality of Indo-Pacific corals. Following loss of .90% live coral cover, 12 of 21 reefs recovered towards pre-disturbance live coral states, while nine reefs underwent regime shifts to fleshy macroalgae. Functional diversity of associated reef fish communities shifted substantially following bleaching, returning toward spre-disturbance structure on recovering reefs, while becoming progressively altered on regime shifting reefs. We identified threshold values for a range of factors that accurately predicted ecosystem response to the bleaching event. Recovery was favoured when reefs were structurally complex and in deeper water, when density of juvenile corals and herbivorous fishes was relatively high and when nutrient loads were low. Whether reefs were inside no-take marine reserves had no bearing on ecosystem trajectory. Although conditions governing regime shift or recovery dynamics were diverse, pre-disturbance quantification of simple factors such as structural complexity and water depth accurately predicted ecosystem trajectories. These findings foreshadow the likely divergent but predictable outcomes for reef ecosystems in response to climate change, thus guiding improved management and adaptation.

17. **Perry** CT, **Murphy** GN, **Graham** NAJ, **Wilson** SK, Januchowski-Hartley FA, East HK. (In Press) Remote coral reefs can sustain high growth potential and may match future sea-level trends. *Scientific Reports* (a Nature journal). Abstract not yet available (embargoed).

COMPLETED PhD THESIS

1. **Head, C.** (2015). Community structure of coral associates in the Chagos Archipelago. DPhil Thesis. University of Oxford.

Abstract The aim of this study is to assess the biodiversity of the reef cryptofauna (with a focus on the decapods, Crustacea) on dead coral microhabitats, and to begin to understand the processes underpinning their community structure in the Chagos Archipelago. The majority of reef biodiversity is comprised of the cryptofauna, defined as small, often cryptic, mainly invertebrates, which inhabit the reef structure. Despite this the cryptofauna are severely understudied relative to the fish and coral faunal components. An estimated 168,000 species of reef invertebrates have been described on coral reefs, and approximately 20% of reef invertebrates are crustaceans, making them one of the most speciose taxa on coral reefs.

The Chagos Archipelago represents one of the most resilient reefs globally, partly because of its remote location, away from the majority of human pressures. Consequently, it serves as an unaffected reference site for biodiversity and ecosystem function studies. The decapod species richness estimate for Chagos (at least 217 species) exceeds that of any other location globally. A high proportion (32%) were rare species (singletons), suggesting this component of biodiversity maybe more vulnerable to biodiversity loss than previously thought. Furthermore, any biodiversity loss could also have implications for ecosystem function if rare species contribute disproportionately more to vulnerable ecosystem processes than dominant species. Data is presented on determining the most accurate species delimitation method for estimating decapod species richness utilising DNA barcoding. Performance of species delimitation methods was taxon-specific within the decapods, and delimitation of singletons was challenging for all methods. However, the Poisson tree processes (PTP) approach was generally the most accurate at delimiting decapod putative species.

Whilst assessing decapod diversity a high prevalence of obligate coral-dwellers on dead coral microhabitats were discovered. Obligate coral-dwellers are almost universally found on live coral, inferring they have a strong reliance on live coral for food, habitat and/or recruitment. The prevalence of obligate coral-dwellers on dead coral suggests that these decapods are not simply persisting on coral hosts that have died but may be explicitly recruiting to or moving to dead coral hosts at certain stages in their life cycle.

Finally, the processes influencing community assembly and maintenance of a family of decapods, the Palaemonidae, on dead coral colonies was investigated. There was spatial hierarchy in trait and phylogenetic diversity, with environmental filtering acting only at the local level (within atolls and between coral colonies). Whilst, phylogenetic signal at the metacommunity level (the archipelago) was inconclusive, trait convergence and lability of trait evolution were key processes determining species distribution at the local level.

This thesis represents the first biodiversity estimation of the cryptofauna in Chagos on any microhabitat and subsequently provides a baseline against which to compare this component of biodiversity in other areas experiencing higher levels of anthropogenic stressors, at least in the Indian Ocean. I also produce a rare empirical evaluation of species delimitation methods, which will provide guidance for future decapod molecular studies. The prevalence of obligate coral-dwellers on dead corals demonstrates the complexity of these organisms' habitat associations and highlights the need for further investigation to establish their vulnerability to habitat degradation on coral reefs. Furthermore the identification of some of the deterministic processes driving community structure of the Palaemonidae contributes to understanding of ecosystem function.

COMPLETED MSc THESES

1. Bartow, B. (2015). Atolls of the Chagos Archipelago, British Indian Ocean Territory: a video data analysis of reef slope coral community structure. *MSc Thesis, Bangor University.* 140p.

Abstract: The Chagos Archipelago, located in the central Indian Ocean, is a vital coral reef ecosystem that encompasses an area of 640,000 km^2, is the world's largest no-take Marine Protected Area (MPA), and contains coral reefs in excellent condition. Video surveys of the Chagos atolls reef slopes were conducted in 2006, 2013, 2014, 2015, and will be repeated in 2016. In 2015, video transects were performed at 36 sites across six atolls and point count techniques were applied to evaluate substrate cover, diversity, and community composition. Coral reefs of the Chagos continue to show excellent condition with high coral cover (40.0 ± 1.8%), low macroalgal cover, and low levels of observable coral disease. The senescence of *Acropora* table corals resulted in higher abundance of dead coral cover but the abundance of live table corals had not decreased and community composition remained similar to 2014. Although a slight decrease in hard coral cover and a slight increase in soft coral cover occurred, there was no significant change in total coral cover from 2014 to 2015 across Chagos as a whole.

2. Suchley, A. (2014). Video data analysis of community structure of the Chagos Archipelago. *MSc Thesis, Bangor University*. 140p.

Abstract: The Chagos Archipelago, situated in the centre of the Indian Ocean, is highly important due to its 640,000 km2 size, remote location in the world's largest no-take Marine Protected Area (MPA) and the excellent condition of its coral reefs. Video surveys of the reef slopes of Chagos atolls were performed in 2006, 2013 and 2014, and will be repeated at least once more in 2015, adding to a growing archival record. In 2014, video transects were performed at 25 sites across six atolls and point count techniques utilised to assess substrate cover, diversity and community composition. Six 2006 sites also surveyed in 2014 were re-analysed, providing an unbiased assessment of ongoing recovery from 1998 El Niño-related mass coral bleaching. Reef structural complexity was evaluated by fractal analysis to compliment assessment of reef condition through live coral cover. The results were benchmarked with *in situ* observations of a coral taxonomist. Chagos coral reefs continued to display very good condition, with high coral cover (41.4 ± 1.5 %), low macroalgae cover and low prevalence of coral disease. Although recent extensive senescence of *Acropora* table corals resulted in elevated dead coral cover, live table coral abundance had not decreased and

community composition remained remarkably similar to 2006. Total coral cover and disease prevalence had not changed significantly from 2006 to 2014, although partial replacement of soft coral by hard coral may reflect ongoing community evolution. Trends in coral cover, diversity, community composition and reef complexity generally matched *in situ* observations and previous findings. Although mass bleaching was not observed, a unique bleaching event had occurred in Salomon lagoon causing extensive deep coral mortality.

3. Dickinson, M. (2014). Video archive analysis of coral health, disease and succession over 8 years in the Chagos Archipelago, British Indian Ocean Territory. *M degree thesis, Bangor University*, 39p.

Abstract: Coral disease is a global threat to coral reefs. Understanding the mechanism of disease is important for management, as information on source and contagiousness could contribute to the development of control methods. The Chagos Archipelago is the site of a Pew Ocean Legacy marine reserve where recent observations have suggested an increase in coral disease in large *Acropora* tables. This study aims to assess coral health in the Chagos Archipelago and identify successional processes affecting *Acropora* tables. Video archive analysis is used to compare the coral reefs between 2006 and 2014. Percentage coral cover is summarised for 2014 using screen-grabs analysed using Coral Point Count software. Coral disease prevalence in the region of all hard corals is currently at 9.17±3.64% (mean±SD). Large tabular *Acropora* are the most vulnerable group to disease in the region with a prevalence of 32.33±11.36% (mean±SD) in tables >30cm, with especially high prevalence in those >100cm diameter. Disease prevalence in *Acropora* tables is significantly higher in 2014 than in 2006 (Paired t-test: t=-6.963, df=6, p<0.001). The ratio of dead-standing to live coral indicates a significantly higher mortality in 2014 (1.36±0.73; mean±SD) than in 2006 (0.12±0.06; mean±SD) (Paired t-test: t=-4.544, df=6, p=0.004). The results suggest that disease in *Acropora* tables is due to senescence and there are signs of *Acropora* community recovery from disease, as dead-standing tables provide a juvenile settlement surface; and more juveniles were found in 2014 than in 2006 (2,006 and 1,170 respectively).

4. Jenkins, T. (2014). DNA barcodes reveal patterns of biodiversity in snapping shrimp (Alpheidae) from 3 coral reefs across the Chagos Archipelago and western Madagascar. M Res Thesis. Department of Life Sciences, Imperial College London.

Abstract: Coral reefs are thought to be the most biodiverse marine ecosystems. However, it is only recently that species richness estimates of reef communities have included studies of the cryptofauna. These organisms reside in the interstitial spaces within the coral framework and are likely to comprise the largest component of reef biodiversity. Here, DNA barcodes were used to compare the diversity of snapping shrimp across the Chagos Archipelago and two separate sites along the west coast of Madagascar (Andavadoaka and Nosy Sakatia). The samples were collected from dead branching coral colonies at depths of 8-12m and partial fragments of the 16S ribosomal gene were sequenced and sorted into molecular operational taxonomic units (MOTUs). Overall, 39 putative species were resolved using the generalised mixed Yule coalescent method. The mean species richness per dead coral colony was shown to be significantly higher in the Chagos Archipelago compared to both Andavadoaka and Nosy Sakatia.Furthermore, the total species diversity estimated by Chao 1 and ACE statistics suggested at least 34 species of snapping shrimp in Chagos,22 in Andavadoaka, and 10 in Nosy Sakatia. These results indicate that the northern Mozambique Channel does not necessarily harbour high levels of marine biodiversity for all taxa, as shown by stony corals. In addition, the high diversity across Chagos provides further evidence for the importance of the archipelago. In a world where the future of coral reefs is uncertain, it is important to continue preserving areas like the Chagos Archipelago, which have the potential to act as source populations to replenish localities under more direct human pressures.

5. **Carr, P.** (2013) Red footed booby and factors impacting their selection of islands in the Chagos for breeding and the implications for future island management plans. *MSc Thesis by research, University of Warwick.*

Abstract: The factors influencing the selection of breeding sites by Red-footed Booby were examined throughout the Chagos Marine Reserve and it is demonstrated that the composition of shoreline vegetation is the greatest influence on breeding numbers and, when coupled with the presence/absence of rats accounted for 71% of the variability. *Pisonia grandis* holds the largest number of breeding platforms; by resource selection (use versus availability) *Callophyllum inophyllum* is the preferred option followed by the mangrove *Luminitzera racemosa*. *Callophyllum* accounts for < 2% of shoreline vegetation and mangrove is an extremely limited range species accounting for < 0.1%. Coconut *Cocos nucifera* accounts for ≈ 70% of shoreline vegetation, (the majority thought to have been planted for crop rather than being Cocos "bon dieu"), yet accounts for < 0.2% of Red-footed Booby nests. There is a highly significant difference (P = 0.001) in the availability of tree species for breeding platforms and their use. The breeding platform preference results broadly agree with other research in the Caribbean, western Indian and Pacific Ocean where tree species used for breeding have been recorded. There is a highly significant difference (P = 0.001) between breeding numbers on rat-infested and rat free islands; the rat impact results are very similar to results from a previous study in the Chagos. Two other factors, the distance of an island from human settlement and time elapsed since regular human disturbance were also statistically significant factors in island selection. The analysis of factors influencing the selection of breeding site by Red-footed Booby is novel. The implications of these findings are that coastal erosion-sensitive restructuring of shoreline vegetation composition coupled with the eradication of rats on islands that are distant from former permanently inhabited islands would substantially increase the availability of breeding habitat for a globally decreasing species.

6. Gracia Saiz, A. (2013). Video data analysis of coral community structure on the reef slopes of the atolls of the Chagos Archipelago, British Indian Ocean Territory. *MSc Thesis, Bangor University*. 93p.

Abstract: An increasing combination of environmental and anthropogenic pressures are causing the decrease of coral reefs all around the world, being climate change, human overuse and pollution possibly the greatest threats. However, the Chagos archipelago which is located in the centre of the Indian Ocean and it is uninhabited, presents minimal anthropogenic pressures, consequently it is one of the most pristine coral reef areas in the world. This research aims to study the change in community structures on coral reefs within the Chagos, just influenced by natural environmental changes. In addition, this study will create a historical record for future studies, which will allow comparing of data over long-term time scales. The study was carried out at 23 sites located at five different atolls within the Chagos archipelago. Underwater video transects on each site were recorded and divided into four depth bandings (25-20m, 20-15m, 15-10m and 10-5m). These videos were analyzed for species composition and percentage cover using Point Count with Excel extensions (CPCe) software. Significant differences in species composition were found according to reef type (seaward or lagoon areas), localities and depth. Overall cover of hard coral was highest in Peros Banhos and Salomon atoll. In addition, percentage cover of hard coral and dead/diseased coral was significantly higher at lagoon (41.6±19.8% and 20.8±13.8%, respectively) than at seaward slopes (27.8±13.5% and 13.2±11.8%). Also, significant differences were noticed for cover of hard coral, dead/diseased coral and algae between shallowest (5-10 m) and deepest areas (15-25m) at seaward reefs. One of the most significant details in this research is the high percentage cover of dead coral presented. Also, a shift from coral table (*Acropora* sp.) dominance to massive *Porites* dominance was evident, *Porites* being a coral genus less vulnerable to climate change. Finally, It should be highlighted the importance of the video survey tool applied to develop this research. It is an important possibility of having information of large surveyed areas, interesting for extensive monitoring works.

CONFERENCE PRESENTATIONS

1. **Turner**, J.R., **Sheppard,** C., **Koldewey**, H. (2014). Darwin Initiative to strengthen the World's Largest Marine Protected Area, Chagos Archipelago. Making Marine Science Matter

In: Ecosystems - Given the variation in characteristics of individual species, how can conservation strategies be implemented to maintain connectivity across taxa, habitats, and scales to ensure resilient marine communities*?*

Abstract: The British Indian Ocean Territory (BIOT) Chagos MPA covers 640,000 km2 of ocean and is one of the 'Big Six' Network of Ocean Legacy Marine Reserves, which aim to significantly increase strict protection of multiple ocean ecosystems. The MPA represents 60% of the world's no-take area and is of sufficient size to protect both site-attached and migratory species including 50% of the region's most healthy coral reefs, the world's largest atoll, 60,000km2 of shallow water habitats, a rich pelagic regime, an abyssal trench and half of all seamounts in the Indian Ocean. Chagos is an internationally important refuge site harbouring 76 threatened species including Hawksbill turtle, Redfoot booby, silky shark, Coconut crab, and Bigeye tuna, and an important reference site because its coral reefs have proven to be more resilient to climate change due to the absence of direct human impact. Cessation of fishing has prevented the by-catch of over 10,000 sharks per year. Long-term benefits of the MPA will be the protection of biodiversity in a wide range of ecosystems, and protection of functional links between ecosystems, and of migratory species. However, There challenges in managing and enforcing very Large MPAs. The scale of the MPA suggests that benefits will be significant at an ocean scale, and communities in some of the poorest countries around the Indian Ocean may benefit from the preservation of a genetically-balanced stock of species which may overspill propagules, juveniles and adults to unprotected regions.

2. Llewellyn, F; **Koldewey**, H (2014) Plenary lecture: Project Ocean: Fish meets **fashion**. *IMCC3: International Marine Conservation Congress*, 14-18th August Glasgow, Scotland. ***Abstract:*** If marine conservation is truly important then why is it such a low priority for most people? What will it take to make marine conservation fashionable, ultimately leading to changes in behaviour and a more sustainable relationship with our ocean? In 2011 the Zoological Society of London (ZSL) embarked on a conservation-communication, "retail activism" experiment called Project Ocean, teaming up with luxury department store Selfridges to bring ocean issues to new audiences. Focusing on overfishing, marine reserves and pollution, Project Ocean aims to make a positive difference by changing consumer buying habits and engaging people in marine conservation. As part of this initiative, Selfridges switched to only supplying sustainable seafood in their foodhalls and restaurants, produced an associated seafood guide, facilitated the implementation of a new marine reserve in the Philippines, and supported the creation of the Marine Reserves Coalition (ZSL, Greenpeace, Marine Conservation Society, Pew Charitable Trusts, Blue Marine Foundation). Four years on and Project Ocean is going from strength to strength; enhancing marine reserve enforcement in the Philippines, tackling the issue of shark oil use in cosmetics and addressing the growing problem of plastic in our oceans. We review this experiment and discuss how NGOs and industry can work together in often surprising and unlikely partnerships to achieve marine conservation goal

3. **Koldewey**, H. (2015) '*Finding solutions in marine conservation: A reason for ocean optimism*'. keynote speaker for the Bevan Series on Sustainable Fisheries, University of Washington in Seattle in March 2015. Included discussion of Chagos and the Darwin project. This can be seen online and received social media coverage https://panopto.uw.edu/Panopto/Pages/Sessions/List.aspx?#folderID="6822d016-50e0-4bf4-893b-8e19266f3ea8"

4. **Samoilys**, M. (2014). Regional patterns in the diversity of coral reef fishes in the Western Indian Ocean. 17th Annual Meeting, Reef Conservation UK, Zoological Society of London 6th December 2014.

5. **Head**, C. (2014). Reef cryptofauna community structure. .7th Annual Meeting, Reef Conservation UK, Zoological Society of London 6th December 2014.

6. Jenkins, T. & **Head**, C. (2014). DNA barcodes reveal patterns of biodiversity in snapping shrimp (Alpheidae) from coral reefs across the Chagos Archipelago and Madagascar. 17th Annual Meeting, Reef Conservation UK, Zoological Society of London 6th December 2014.

7. Sheppard, CRC. (2014). Coral trends and temperature report. *Chagos Conservation Trust Conference.* 5th December 2014. Zoological Society of London.

8. **Turner**, J., Suchley, A., **Roche, R.** (2014). Recent Changes in community structure of the coral reefs of the Chagos Archipelago. *Chagos Conservation Trust Conference.* 5th December 2014. Zoological Society of London.

9. **Couch, C. & Roche, R.** (2014). Coral health in the Chagos Archipelago: is coral disease a concern? *Chagos Conservation Trust Conference.* 5th December 2014. Zoological Society of London.

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2. **Turner**, J.R. **Sheppard**, CRC., **Koldewey**, H. (2015) Chagos Science Expedition Report March 16th to April 14th, 2015. *Expedition Report.* 55p.

3. **Turner**, J.R. (2015) Chagos Science Expedition Plan and Logistics. *Darwin Initiative Expedition Planning Report* 29p.

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OTHER MEDIA:

1. Chagos Conservation Trust Quarterly Newsletters May 2012 – December 2015 (edited by Anne Sheppard):
http://chagos-trust.org/resources/newsletter

DEFRA Darwin Initiative Newsletters

1. Article on Scientific Expedition to Chagos 2015
http://www.darwininitiative.org.uk/assets/uploads/2014/05/November-2015-Darwin-Newsletter-UKOTs.pdf

2. Article on Scientific Expedition to Chagos Archipelago Marine protected Area 2014, page 8 of
http://www.darwininitiative.org.uk/assets/uploads/2014/05/Darwin-Initiative-Newsletter-June-2014-Final1.pdf.

3. Article on Outreach programme 'Chagos Connect' Awards ceremony, pages 5 & 6 of
http://www.darwininitiative.org.uk/assets/uploads/2014/05/Darwin-Newsletter-Issue-24-Oct-2013.pdf

4. Article on Chagos Environment Outreach Programme and the first Darwin Chagos Scientific Expedition 2013, pages 5 & 6 of
http://www.darwininitiative.org.uk/assets/uploads/2014/05/Darwin-Newsletter-Issue-23-July-2013.pdf.

5. Article on Strengthening the World's Largest Marine Protected Area, pages 5 & 6 of
http://www.darwininitiative.org.uk/assets/uploads/2014/05/Darwin-Newsletter-Issue-23-July-2013.pdf.

Various Other Newsletters:

6. **Sheppard** CRC 2015. The reef conservation conundrum, in one coral archipelago. *Reef Encounter*. **41**: 11-16.Commentary on the role of the BIOT marine reserve, the need for it, opposition to it, and more. Available at http://coralreefs.org/wp-content/uploads/2015/03/Reef-Encounter-March-2015-FINAL2-HIGH-RES.pdf

7. **Sheppard** CRC. 2015. Central Indian Ocean – Effects of Climate Change. Ocean Digest. Quarterly Newsletter of the Ocean Society of India. Vol 2: 2-6. Invited summary of sea surface temperatures and sea levels from the Chagos Archipelago. Available at http://www.oceansociety.in/newsletter/oceandigest_2015v2i1.pdf

8. Pala, C. 2013. Giant Marine Reserves Pose Vast Challenges. News Focus Article, Science 339 640-641. Feb 7th 2013. Including quotes from **Sheppard** & **Koldewey** regarding Chagos MPA.

Recent Bangor University Research News items:

9. Bangor Research Impact Awards: http://www.bangor.ac.uk/news/latest/bangor-university-rewards-outstanding-impact-from-its-research-and-enterprise-activities-25168

10. Bangor Research Impact Awards: http://www.bangor.ac.uk/news/latest/bangor-university-to-reward-outstanding-impact-from-its-research-and-enterprise-activities-25099

11. Bangor in the Indian Ocean: http://www.bangor.ac.uk/oceansciences/news/bangor-in-the-indian-ocean-23005.

12. Bangor scientists on expedition in Indian Ocean:http://www.bangor.ac.uk/oceansciences/news/bangor-scientists-in-the-indian-ocean-18340

13. Bangor Scientist to Strengthen the World's Largest Marine Reserve: http://www.bangor.ac.uk/news/archive/bangor-scientist-to-strengthen-the-world-s-largest-marine-reserve-7345

Scientific expedition blogs and other media:

Official Expedition blogs:

1. http://chagos-trust.org/2015-darwin-science-expedition-0

2. ttp://chagos-trust.org/2014-biot-expedition

3. http://chagos-trust.org/projects/latest/feb-2013-expedition

4. Extended blog combining David Curnick's pre expedition work and the expedition: and http://www.zsl.org/blogs

5. The CCT USA Scholars blog by Dr Doug Fenner: http://cctus.org/conservation-science/2014-expedition-scholar/2014-expedition-scholar-douglas-fenner-ph-d/2014-expedition-scholar-blog/

6. Blog by Courtney Couch, University off Hawai'i http://www.donahuelab.com/2014/03/chagos-here-i-come/

https://www.facebook.com/protectchagos?fref=photo

Video clips and Films:

57 aerial video sequences from quadcopter by Charles Sheppard 2015 scientific expedition: https://www.youtube.com/playlist?list=PLgYJmUc38e11i8QGZGLdBD-Sptqc9onVR

Films by Jon Slayer from 2013 scientific expedition:
(1**)** Protecting a unique environment in the Indian Ocean (https://vimeo.com/77250118)
(2) British Indian Ocean Territory Marine Protected Area BIOT science Part 1 (http://vimeo.com/71374932)
(3) British Indian Ocean Territory Marine Protected Area BIOT science Part 2 (http://vimeo.com/72064338)

Besides the films highlighted above, a series of **150 video clips of scientific activities and biodiversity** were posted, and these can be viewed at:

Darwin Chagos Underwater: 50 video clips:
https://www.youtube.com/playlist?list=PLgYJmUc38e11ab4qjcUaFX-W6EK6WNpNk
Darwin Chagos Islands: 47 video clips
https://www.youtube.com/playlist?list=PLgYJmUc38e12Xn-2vFBtagfxqJCoX2AfA
Darwin Chagos Science in Action: 25 video clips
https://www.youtube.com/playlist?list=PLgYJmUc38e10jsi64HO90PM4FVVlaahJb
Darwin Chagos Birds: 28 video clips
https://www.youtube.com/playlist?list=PLgYJmUc38e119L5AHN9q7li8HB4uYUAcZ

Other films have followed on from the 2013 expedition: Gary Fletcher on technological developments to monitor megafauna:
http://garygfletcher.wordpress.com/category/chagos-expedition/
http://garygfletcher.wordpress.com/2013/05/22/zsl-chagos-report/

Dr Heather Koldewey and Charles Sheppard talked at CCTs 20th Anniversary 7th October 2013. https://www.youtube.com/watch?v=obPYgP0QyVA and http://chagos-trust.org/media-gallery/detail/2/804.

AWARDS:

1. Professor Charles Sheppard, CO-PI on this project was **awarded an OBE** in the Queen's Birthday Honours List 2014 for services to environmental conservation in the British Indian Ocean Territory.

2. The **Chagos conservation initiative** was selected by the *UK Collaborative on Development Sciences* (a *grouping of UK government departments and research funders, including DEFRA)* **as *'one of the most important elements for international development emanating from the UK'*.** http://www.ukcds.org.uk/the-global-impact-of-uk-research and http://www.ukcds.org.uk/the-global-impact-of-uk-research/conserving-marine-environments.

3. This Darwin Project won the award for **Best Impact on Public Policy and/or Public Services** (sponsored by the ESRC IAA) in the *Bangor University Impact and Innovation Awards December 2015* http://www.bangor.ac.uk/news/latest/bangor-university-rewards-outstanding-impact-from-its-research-and-enterprise-activities-25168 and

http://www.bangor.ac.uk/news/latest/bangor-university-to-reward-outstanding-impact-from-its-research-and-enterprise-activities-25099