

Darwin Initiative – Final Report

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

Darwin project information

Project Reference	18-016
Project Title	Darwin Initiative to Enhance an Established Marine Protected Area System
Host country(ies)	Cayman Islands
UK Contract Holder Institution	Bangor University, Wales (School of Ocean Sciences) SOS
Partner Institution(s)	The Nature Conservancy, USA (TNC)
Host Country Partner Institution(s)	Cayman Islands Government (Department of Environment) (DoE)
Darwin Grant Value	£273,914
Start/End dates of Project	April 2010 – March 2013
Project Leader Name	Dr John Turner, Bangor University
Project Website	http://www.DoE.ky/marine/25-years-of-marine-parks/
Report Author(s) and date	Dr John Turner, Croy McCoy, Laura Richardson, Charlotte Mortimer

Scientific outputs are listed by publication and abstract in Annex 5, and cited in the text as 5/1 and 5/2 etc.

1 Project Background (100 words maximum)

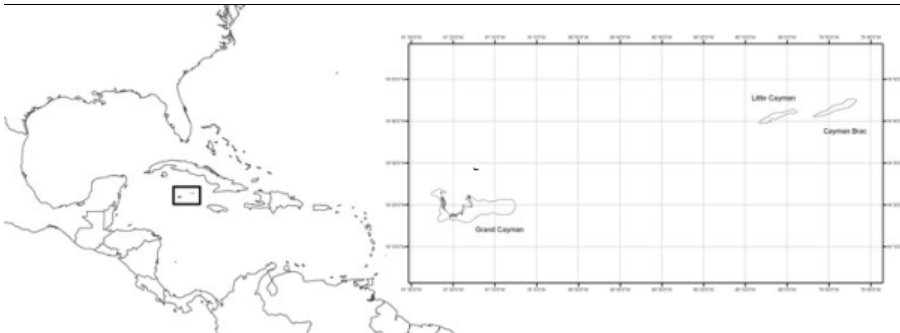


Figure 1: Grand Cayman, Cayman Brac and Little Cayman constitute the Cayman Islands, a UKOT in the central Caribbean.

A well-established and enforced MPA system has existed in the Cayman Islands since 1986, but is threatened by continued population growth, coastal development, overfishing, invasive species and climate change. The project aimed to ensure coastal protection and tourism income by enhancing protection of marine habitats through increased resilience to climate change and human impact. The objectives have been achieved in full and an enhanced MPA system has been submitted to Government for approval, with strong public support. Enhancements will contribute significantly towards positive impact on marine biodiversity and sustainable environmental management.

The project was a **finalist in the Bangor University Research Impact Awards (Best Cultural and Societal Impact), 2013.**

2 Project support to the Convention on Biological Diversity (CBD)

The project provided the scientific evidence, planning, and stakeholder consultation process to recommend an increase in area of strict marine reserve from 16.7% of the shelf to just under 50%. The project partnership (UB-SOS & TNC) has helped the host country institution (DoE) to address the **Strategic Goals and Aichi Biodiversity targets 2011-2020 for CMS and CBD** by contributing in part to each of these targets:

A1: value of biodiversity, A2: local development & poverty reduction, A3: incentives, A4: natural resource use / safe ecological limits.

B5: rate of habitat loss, B6: fisheries overexploitation, B9: control of invasive species. B10: integrity & functioning of coral reef ecosystems.

C11: 10% coastal/marine areas conserved, C12: threatened extinction improved.

D14: Essential ecosystem services restored, needs of local communities & poor, D15: Ecosystem resilience improved, restoration of at least 15% degraded ecosystems.

E17: Updated national strategy & actions plans, E18: traditional knowledge of local communities respected, E19: financial resources for strategic plan for biodiversity.

The project addressed **Goals 1-3 of the strategic vision of CITES** (especially Goal 1: implementation and enforcement).

There are some 36 endangered marine species in Cayman, including 3 species of turtles, 19 fishes (including 6 sharks & rays, 6 Grouper) and 12 corals. Many other species are vulnerable to over-extraction, impact of invasive species (especially lionfish) or habitat modification, due to development and climate change. Local communities have exploited fish SPAGs and this has proven to be unsustainable. The enhanced MPA system provides greater protection by increasing the area of strict marine reserve (ie. No Take) by creating new areas, and by increasing the level of protection on what were zones that either limited catch or protected only specific organisms. By increasing habitat protection, and by ensuring the connectivity of habitats, more species are protected over a wider area.

The host country partner, Department of the Environment (DoE) is the host country focal point, managing conservation (**CBD ratified 1994, CMS 1985, CITES 1979**); (RAMSAR 1979, CARTAGEN, 1986, MARPOL, 1988, UNCLOS, 1997, KYOTO 2007). **Cayman Marine Conservation Law (2007) amended 2013** protect or regulate most local marine life and it is illegal to disturb or remove any marine benthos unless licensed by Government. Extraction of all turtles is heavily regulated, and certain species of fish, and invertebrates (eg. all echinoderms) are on the protected species list. Popular food fisheries such as conch and lobster are strictly controlled via catch limits and closed seasons, and fishing using spear, fish-trap, and nets are heavily regulated. All Nassau grouper spawning aggregations are protected November-March. However, some species such as sharks, turtles, queen conch, and Nassau Grouper, are vulnerable due to illegal exploitation. Certain corals (eg. *Acropora* and *Dendrogyra*) are threatened from habitat modification, disease, and bleaching events.

During the course of this project, the National Conservation Bill has been passed (<http://www.doe.ky/laws/national-conservation-law/>), and the delay in the new MPA system is in part allowing for a new legislative framework to allow for strengthened Marine Conservation Laws. The National Conservation Law, 2013 (NCL) allows the Cayman Islands to protect and conserve endangered, threatened and endemic plants and their habitats as well as the variety of wildlife in the Cayman Islands. The Law is available as [Supplement No.1 published with Extraordinary Gazette No. 9 dated 5th February, 2014](#). The current Marine Conservation Law (2007) amended 2013, provide some protection for most fisheries, but **they have provided few restrictions on habitat modification** which is allowed through the licensing power of other government departments. The NCL recognises the DoE and Conservation (enforcement)

Officers and allows for Environmental Impact Assessment. Much of the protection for species in the National Conservation Law is through publically consulted Species Conservation Plans. DoE with previous Darwin Initiative support has created Biodiversity Action Plans for many species, providing a structure for how these species should be managed under the National Conservation Law <http://www.doe.ky/nbap/>

3 Project Partnerships

The Partners:

This project built on collaborative pilot studies undertaken in the Cayman Islands by the Cayman Islands Government Department of Environment (DoE) and Bangor University School of Ocean Sciences (SOS) and a PhD study (McCoy, DoE) on monitoring Caymanian coral reefs in MPAs. It has also facilitated a relationship between DoE and The Nature Conservancy (TNC) under the *Caribbean Challenge*.

The core project team is comprised of John Turner (Project Leader, Bangor University), Gina Ebanks-Petrie (Director of main Project Partner and Host-country Co-ordinator, DOE, Cayman Islands Government), Croy McCoy (Darwin Fellow, DOE), and James Byrne (Regional Partner, TNC, USA). The roles and responsibilities of each collaborating partner were:

School of Ocean Sciences, Bangor University, UK (Lead UK institution)

This is a research led university school providing academic input in survey design and analysis, marine field research, project co-leadership, financial management, monitoring and evaluation and research publication in high impact international scientific journals. The School has developed a working relationship with the Cayman Island Government Department of the Environment (DoE), and this Darwin project has arisen out of active research collaboration on monitoring coral reefs in the Marine Protected Area system. The Project is co-led from Bangor (Turner). Laura Richardson has been employed by Bangor University as a full-time Project Support Officer in the Department of the Environment, Cayman Islands for 2011-2013. Additionally, Turner provided PhD supervision for a member of DoE (McCoy) and led an international postgraduate Masters course in Marine Environmental Protection, providing training and UK M.Sc. project students to collaborate with DoE and assist during the field research.

Cayman Islands Government Department of Environment (Lead Host-country Partner)

The Department of the Environment (DoE) is under the Cayman Islands Ministry for Tourism, Environment, Investment and Commerce (TEIC). The DoE is the main Government agency responsible for the management and conservation of the environment and natural resources and plays a key role in liaising with government and major stakeholder groups represented by the Marine Conservation Board, Watersports Association and district communities. DoE works to facilitate responsible management and sustainable use of the natural environment and resources of the Cayman Islands through various environmental protection and conservation programmes and strategies.

DoE manages the marine protected area system across all three islands and provides field operational capacity for research and enforcement: 13 staff in research and assessment staff (10 marine); 15 staff in enforcement and operations (10 Conservation/Marine Enforcement Officers); 3 administrative staff; and operates 14 boats and 1 enforcement jet ski, with 1 of these a dedicated research boat and 6 enforcement boats and the rest with multiple use. DoE has the institutional and legal structure to implement the project in the field, but does not have the financial resources and research focus to undertake a scientific assessment of the current MPA system and enhancement planning initiative, while maintaining existing programmes of necessary monitoring and enforcement. DoE led the stakeholder consultation and district community consultation. The project involved 10 DoE staff on 10-100% time, of which 3 staff (Darwin Research Officer Fellows) > 50% time: McCoy 100%, Chin 75% and Gibb 50%. The Director (Ebanks-Petrie) co-leads the project.

The Nature Conservancy USA (Project Partner)

The Nature Conservancy is the leading US conservation organization working around the world to protect ecologically important lands and waters for nature and people. Its *Caribbean Challenge* Program will result in a wholesale transformation of countries' national park systems and will nearly triple the amount of marine and coastal habitat currently under protection, setting aside almost 21 million acres of coral reefs, mangroves, sea grass beds and other important habitat for sea turtles, whales, sharks and other wildlife. Cayman is shortly to join other countries and territories in the Caribbean Challenge. TNC will continue to have a major role post Darwin project. Through collaboration with the UK Darwin Initiative, TNC has developed a Cayman specific Ecological Gap Analysis (<http://www.cbd.int/protected-old/gap.shtml>) has developed habitat mapping data to examine the goals and constraints of an extended marine protected area using Marxan conservation planning software (university of Queensland) (<http://www.uq.edu.au/marxan/index.html?p=1.1.1>) and specifically, the Marzone tool. TNC first began working with DoE in July 2008 with an initial visit by James Byrne (TNC Marine Science Program Manager), followed up with a weeklong Marxan training in February 2009 by Steve Schill (TNC Principal Mapping Scientist and Senior Scientist) focusing on mapping risks and potential protected areas for terrestrial systems. Schill has been principally responsible for DoE Marxan training and the application of the software for Ecological Gap Analysis and conservation planning, working closely with Jeremy Olynik. Byrne has worked at a regional level to promote the work and highlight Cayman as a leader in marine conservation in the Caribbean.

4 Project Achievements

4.1 Impact: achievement of positive impact on biodiversity, sustainable use or equitable sharing of biodiversity benefits

The impact of the project has been to maximise the resilience of reef ecosystems by developing an enhanced Marine Protected Area system (with increasing No-Take area from 15% shelf to ~50%), allowing the reef ecosystems to respond to continued threats from overexploitation and climate change, and to new threats from invasive species, and thereby providing long term protection of biodiversity, personal income, property and economic activity. Fishing has been recognised as cultural activity in Cayman, and of particular importance to low income people. The project has built on the legacy of 25 years of Marine Parks, and maintains Cayman as a Caribbean region and World leader in marine conservation. Individuals from across Caymanian society will now benefit, and in the future, from the enhanced MPA system and therefore will support MPA implementation and operation. Understanding and acceptance of management strategies combined with modified behaviour will secure the sustainable use of resources for all, and maximise the resilience of reef ecosystems to respond to threats from overexploitation, from invasive species, and by providing long term protection of biodiversity, personal income, property and economic activity. A Post Project is now securing the Main Project outcomes by addressing recently identified issues that could undermine the enhanced MPA. These are: (1) Invasive lionfish species control; (2) the protection of fish spawning aggregations (SPAGs); (3) Sustainability of concessions to fishers; and (4) MPA enforcement dilution. The achievements of the project have been demonstrated in the Caribbean region and beyond.

4.2 Outcomes: achievement of the project purpose and outcomes

The purpose of the project was to ensure coastal protection for human settlements and future tourism income by enhancing the protection of coral reefs thereby allowing rehabilitation of supporting ecosystems, through increased resilience to climate change.

The Main Project Outcome was a review of the effectiveness of the Marine Protected Area system of the Cayman islands in maintaining resilience of coral reefs and shallow

marine ecosystems in response to direct human impact and climate change, and if appropriate, to provide the information base to extend the system to increase that effectiveness.

The main achievements of the project have been:

- (1) **Assessment of resilience:** reef health measured at 63 permanently established monitoring sites inside and outside of current MPA system, shows that MPAs generally provide local resilience. (Higher cover and coral recruitment, lower coral bleaching, disease prevalence and macroalgal cover).
- (2) **Assessment of benefit:** overspill of fish into surrounding waters is evident at some MPA boundaries. Number, size and biomass of 53 target fish species is greater in many MPAs than outside, and proportions of herbivorous and carnivorous fish are more balanced. However, invasive lionfish threaten fish communities.
- (3) **Assessment of fisheries impact:** recreational, artisanal and illegal fishing are significant on Cayman reefs, and fishers exploit MPA boundaries. Fishing is an important part of Caymanian culture and understanding the incentives to fish legally and illegally must be included in conservation planning. Fish spawning aggregation sites (SPAGs) have been identified as being vulnerable to overexploitation.
- (4) **Stakeholder consultation,** survey data and protected area planning tools have been used **to plan an enhanced MPA system which increases No-take protection from 15% to ~50% of representative reef habitat, but provides access to fishable areas** (Grand Cayman from 15.73% to 46.63%; Cayman Brac 15.31% to 41.23% and Little Cayman from 10.43% to 64.67%). A campaign of public awareness, education and consultation is maximising understanding and support for the new MPA system.
- (5) **Wide and varied communication:** including 50 scientific reports, 81 stakeholder meetings, 43 press articles, 40 TV and 8 radio programmes, 16 online items, and 10 other outputs (eg. school information packs, MPA promotions).

4.3 Outputs (and activities)

Activities are covered in detail in section 6. The main project outputs were:

Output 1 involved mapping the reef and associated subtidal ecosystem habitats around the islands to assess habitat variation and examine representativeness. Measurable indicators were a marine habitat classification and GIS, from Darwin project 14051, with additional data from satellite, in situ. acoustic surveys and groundtruthing surveys from TNC's Caribbean Challenge. Output 1 was completed. The main output is a Geographical Information System at DoE, based on accuracy assessed habitat maps, and linked via GIS tools to Marxan Marine Protected Area planning tools. Gap Analysis and Marine Environmental Risk Surfaces were completed for all three islands. The indicators remained appropriate and assumptions held.

Output 2 was an assessment of the current level of reef resilience within and outside the Marine Protected Areas of Grand Cayman, Little Cayman and Cayman Brac; and an assessment of the extent of overspill of fish biomass from the No Take Zones into surrounding zones. Indicators were measures of: Coral cover, coral species abundance, calcareous and fleshy macroalgae, coral recruits, frequency of coral diseases and bleaching, frequency of herbivorous fish, quantification of other impacts e.g. anchoring damage; diving surveys of fish species abundance and size, to assess biomass at sites within and at increasing distances outside of No Take Marine Protected Zones. Output 2 was completed, and results have been widely disseminated at regional, national and international conferences. Indicators remain appropriate, although additional surveys were undertaken to assess new threats of invasive lionfish and disease in gorgonian corals. The assumptions held true.

Output 3 was an assessment of the artisanal/recreational fishery. Measurable indicators were socio-economic questionnaires directed at recreational fishers (visiting piers, and via patrol boat), tourists in departure lounge at airport and via hotel excursion operators, diving operators, charter boat skippers, and migrant workers Report to DOE. The assumptions held true. An Interim report was submitted (A5/38):

<http://www.darwininitiative.org.uk/documents/18016/22226/18-016%20Fisheries%20impact%20interim%20report.pdf>

Outputs 4-7 involved planning and promoting an extended MPA system with full public consultation and involvement. Measurable indicators were: using data from objectives 1-4, plan extended MPA zones to cover all representative habitats, covering at least 30% of the shallow marine environment; initial consultation to ensure public participation on all 3 islands, show benefits in terms of results of MPA effects on reef resilience; Ecological gap Analysis, and Protected Area Tools in GIS such as Environmental Risk Surface, Relative Biodiversity Index, and Marxan and Marzone protected area planning software; GIS data system to show revised boundaries and purpose of zones; Stakeholder workshops and public presentations on all 3 islands; Acceptance and implementation of extended MPA system. The proposal for an enhanced MPA system and changes to Marine Conservation Laws were submitted to Government in May 2013 (A5/33: report attached as pdf file).

A new Government was formed on 29th May 2013; and early meetings took place with the Hon. Wayne Panton, Minister for Financial Services, Commerce and Environment from the new administration to brief him on the status of the project for an enhanced system of Marine Protected Areas. While supportive and sympathetic, he advised that he would need to appraise Cabinet of the plans prior to a decision. Further public developments were postponed while Government considered the National Conservation Law Bill first. The Cabinet required more time to consider the proposals, and delay may require further public consultation. The Minister was reappraised of the project's position in January 2014 during a meeting at the Ministry. The Minister attended a public briefing on the launch of the Post Project and in response to questions from the press, stated that he needed time to hold appropriate meetings with the Ministers of Cabinet and the Legislative Assembly prior to Government being able to approve the new Marine Protected Area system and Marine Conservation Legislation.

4.4 Project standard measures and publications

Please see Annex 4 (Table 1) for final catalogue of standard measures

4.5 Technical and Scientific achievements and co-operation

The project contributed to technical and scientific and scientific cooperation as follows:

1. Marine Protected Area Planning

Ecological Gap Analysis assessment (EGA) was conducted during a Marine Conservation Workshop 1 between 6-16th April 2010, led by Steve Schill (TNC) collaborating with Jeremy Olynik (DOE GIS Officer) (A5/39). The objectives included: finalizing the project extent, marine strata, and planning units; creating a marine environmental risk surface; Compiling a list of biodiversity conservation features (targets) and associated conservation goals; training personnel in the use of the latest Marxan support software; and drafting and reviewing preliminary conservation portfolios. Environmental Risk Assessment (ERA) was undertaken for all 3 islands by TNC (Byrne and Schill) with Olynik and Austin (DOE) between April and March 2011. Site Conservation Indices and Relative Biodiversity Indices were calculated under the guidance of Byrne (TNC) in January 2012 at Marine Conservation workshops 2 and 3 involving Ebanks-Petrie, Austin, McCoy, Olynik, Richardson, Bothwell, Byrne, Schill, and with Turner via Skype. Methodologies were discussed, identified and used to assess biological reef health data into the protected area planning models. Schill, Olynik McCoy and Richardson collated ecological survey data for use as a decision support tool for MPA planning (to guide application and use of Marxan output) ((A5/34). Marxan targets and goals were agreed for MPA options.

2. Reef resilience field training and surveys

Reef resilience video & photo surveys were designed by McCoy & Turner, and conducted initially (2010) at 55 permanent monitoring sites, and these were expanded in later years (2011 onwards) to 63 sites within and outside of Marine protected areas on Grand Cayman, Little Cayman and Cayman Brac, to enable more robust analysis of MPA effects. The surveys examined coral reef benthos cover, coral community structure, coral recruitment, coral bleaching, algal biomass, invasive lionfish. The surveys were led by McCoy who provided training for DoE staff (Gibb and Chin), Darwin Project Support Officer (Pisani/Richardson) and visiting MSc research project students from Bangor University and elsewhere each summer.

Campbell, J. (2010) Recovery of Caymanian reefs after a coral bleaching event. *MSc thesis, Bangor University*; also presented as a poster at Reef Conservation UK, December 2010. (A5/47).

Barton, A. (2010) An assessment of Caymanian coral reefs: are the long established marine no take zones enough? *MRes Thesis, University of St Andrews*. (A5/48).

Hillyer, K. (2011) Influence of marine protected areas on resilience to bleaching, disease and compromised health in Scleractinian and Milleporid corals, the Cayman Islands. *MSc Thesis Bangor University* (A5/45).

Looker, E. (2011) Investigating coral reef resilience by analysing Scleractinian and *Millepora* Recruitment within Marine Protected Areas of the Cayman Islands, Caribbean. *MSc Thesis Bangor University* (A5/46).

Higby, L. (2012) Can a lionfish change its stripes? Investigating the effects of the culling initiative on the behaviour, habitat preference and condition of the invasive lionfish *Pterois volitans*, on the north coast of Grand Cayman *MSc Thesis Bangor University* (A5/43). Submitted as paper (A5/4).

McCarten, C. (2012) Invasive Indo-Pacific Lionfish (*Pterois volitans*) use of mangrove, seagrass and reef habitats in the Cayman Islands. *MSc Thesis Bangor University* (A5/42).

Marlow, J. (2012) *Gorgonia* spp Abundance and Resilience to the *Aspergillois* Disease in the Cayman Islands. *MSc Thesis Bangor University* (A5/44).

Warrender, T. (2013): Changing Climates, Changing Reefs: The Effects of the 2009 Mass Coral Bleaching on Grand Cayman Reefs. *B.Sc thesis, University of Dundee*. (A5/41).

Algal biomass surveys: poster at the *Association of Marine Laboratories of the Caribbean Meeting*, 23-28 May, 2011 in Costa Rica (A5/24).

Fish biomass field training and surveys

Fish biomass surveys within and outside the MPA were repeated annually at selected sites on Grand Cayman, Little Cayman and Cayman Brac, led by McCoy, with training for Darwin Project Support Officers (Pisani), Charlotte Dromard (Intern, University of Gaudaloupe) Monique Gral (University of Netherlands intern and Bangor Field Support Officer), Gary Murphy (intern, Manchester Metropolitan University and University of Exeter) and DOE staff Gibb and Chin and Bangor students.

McCoy, M., Dromard, C., Turner, J.R. (2009). An evaluation of Grand Cayman Marine Protected Area Performance: a comparative study of coral reef fish communities. Proceedings of the 62nd *GCFI Gulf and Caribbean Fisheries Institute*, Cumana Venezuela. (A5/32) and (A5/3).

Dromard, C.R., McCoy, C., Turner, J. R. (2010) Evaluation of marine protected area's performances: the case of Little Cayman and Cayman Brac, Cayman Islands. *GCFI San Juan, Puerto Rico* 1st -6th November 2010. (A5/26) and (A5/2).

Socioeconomic assessment of artisanal and migrant worker fishers and socioeconomic assessment of recreational fishers

Socioeconomic surveys of fishers were designed at Bangor and submitted to the University Ethics Committee for approval, prior to distribution in the field by Rhiannon Meier (Bangor Field Support Officer) with support from Laura Richardson (Darwin Project Support Officer), and DOE Enforcement staff during February and March 2011 on Grand Cayman, Little Cayman and Cayman Brac. An analysis of DOE Enforcement report data of illegal fishing between 1993 and 2011 was undertaken by Rhiannon Meier, showing frequency of warnings, arrests and intended prosecutions, and numbers of conch, lobster, fish and turtle caught illegally. An interim report was produced: Meier, McCoy, Richardson, Turner (2011). Quantifying Recreational and Artisanal Fisheries of the Cayman Islands. *Darwin Initiative Interim Report*. (A5/38) <http://www.darwininitiative.org.uk/documents/18016/22226/18-016%20Fisheries%20Impact%20Interim%20Report.pdf>

The results have been disseminated at various conferences (A5/12/13/18/22/23).

4.6 Capacity building

One of the most important drivers for the Darwin Project was that although DoE had the institutional and legal structure to implement the project in the field, it did not have the financial resources and research focus to undertake a scientific assessment of the current MPA system and enhancement planning initiative, while maintaining existing programmes of necessary monitoring and enforcement. The project brought significant financial resources to fund field operations, while partnerships with Turner (Bangor) and Byrne and Schill (TNC) brought expertise in scientific design and planning. TNC trained DoE staff in modern marine planning tools and the project was one of the first to use Marzone tools within the Marxan framework. Dr. Neal Haddaway (Bangor University, UK) visited DOE for 10 days in January 2012 to provide an introductory training workshop for DOE scientists in the statistical programme, *R* to help build capacity in survey design and data analysis. The funding also provided external training opportunities for DoE staff: Olynik attended the ESRI Users conference in July 2010 in San Diego for additional training in GIS tools, and Austin and McCoy attended the TNC Reef resilience workshop in June 2010 at TNC, Key Largo, Florida). Further, a Project Support Officer (Pisani then Richardson) employed by Bangor full time throughout the project was embedded in DoE and provided additional capacity to support administrative, stakeholder consultation, outreach and field aspects of the project. Additional Field Support Officers were employed when necessary (Grohl / Meier / Looker) and the project attracted some excellent interns (Dromard, Murphy) to expand capacity when needed. A major contributor to capacity for undertaking fieldwork was achieved through the involvement of Masters level students from the MSc course in Marine Environmental Protection at Bangor (Gall, Henshall, Campbell, Hillyer, Looker, Higby, McCarten, Marlow), and occasionally from other Universities (St Andrews/Dundee) (Barton, Warrender). The students assisted the project by undertaking specific survey activities as sub projects, each of which was submitted as a research dissertation. Most students were from Bangor University and supervised by Turner with day to day co-supervision and training provided by McCoy. This model proved extremely successful, largely because the students were highly motivated, and competed for the opportunity to work in Cayman, and were required to analyse and write up research as dissertations for their degrees. Most were funded by NERC postgraduate studentships which effectively contributed further funds to the project (£2000 per student). The students benefited from an excellent opportunity to engage in tropical marine research which had direct management applications, and received training and field experience, providing them with good scientific and technical skills for future careers. Gall, Campbell, Hillyer, Marlow and Richardson (Project Support Officer) have gone on to undertake PhDs in the UK, New Zealand and Australia, Henshall works in marine conservation zone planning in the UK, McCarten leads a conservation project in the Maldives, and Looker works as a marine environmental consultant in Oman). The project has increased the capability of Bangor University School of Ocean Sciences to work with partners to deliver major programmes of research on Marine Protected Areas in the UK Overseas Territories in particular. This project has been followed by another Darwin Initiative

Main Project on *Strengthening the World's Largest Marine Protected Area, Chagos Archipelago (British Indian Ocean Territory)*. <http://www.darwininitiative.org.uk/project/19027/>

4.7 Sustainability and Legacy

The major achievement of the project has been to design an enhanced Marine Protected Area system for the Cayman Islands which increases the area of strict protection from 16.7% to ~50%, (Grand Cayman from 15.73% to 46.63%; Cayman Brac 15.31% to 41.23% and Little Cayman from 10.43% to 64.67%) with strong general public and stakeholder support. Built on a legacy of 25 years of Marine Parks in Cayman, the aim is that the new system will be fit for purpose for a further 25 years, emphasised by the DoE tagline '*Saving our Tomorrow Today*'. The proposals have been submitted to Government and are under consideration for approval by Cabinet.

A further important achievement has been to bring awareness of the need for marine protection to the population of Cayman, especially in terms of a vision for future generations to enjoy. It is not uncommon for people on small islands to believe that the vast area of sea around them provides unlimited resources because many are unaware that the productive shelf of the islands is extremely narrow (area), and hence they question why changes in behaviour are required. However, this realisation also creates conflicts and highlights the need for agreement amongst empowered stakeholders and engagement in multiple use planning. The project has worked hard on outreach through education, awareness and engagement.

The project has identified 4 major challenges from field study and stakeholder interaction that could potentially undermine the proposed enhanced MPA system:

- (1) Invasive species control: Lionfish culling programmes are believed to mitigate the impact of lionfish on reef-fish communities, but are resource intensive. Reduced sightings in culled zones may be due to lionfish learning to avoid divers, rather than culling being effective – in which case, resources could be better deployed.
- (2) Protection of fish spawning aggregations (SPAGs): Historically exploited by fishers, sites are now seasonally closed for fishing of Nassau grouper to allow stocks to recover. But, the sites appear important for 22 other species of reef fish potentially all year round. No-Take designation must be justified, and mitigated, due to displacement and possible non-acceptance amongst the poorest fishers.
- (3) Sustainability of concessions to fishers: The enhanced MPA system provides fishing at MPA boundaries (Fig 1) opposite community boat-ramps, minimising fishers' fuel costs. But fish overspill from MPA must be monitored and adaptive management introduced if fishers are to benefit long-term.
- (4) MPA enforcement dilution: Expansion of No-Take MPAs from 15% to ~50% of the Cayman shelf requires an expansion in enforcement, but there are no resources to achieve this. An innovative approach is planned to involve the public.

A Darwin Initiative Post Project EIDP 0045 'Assuring engagement in Cayman's Enhanced Marine Protected Area System' was secured for the period April 2013 to September 2015 by the existing partnership, and with two additional project partners (Scripps Institution of Oceanography and Reef Environmental Education Foundation (REEF)). The role of Project Support Officer continues within DoE to maintain the capacity to run this new project and other resources (eg. underwater survey equipment and cameras) have been transferred to the new project, after which they will remain within DoE.

Continued monitoring will be required once the enhanced MPA system is designated and implemented, and all partners are committed to continuing their partnership with DoE. The model of providing good Masters level students to work with DoE has proven robust, and will continue through private funding.

The stable end-point is an enhanced MPA system of representative habitats of coral reef and associated ecosystems, thereby helping to protect island biota, pelagic, reptile, seabird and sea mammal species at a time of increasing human impact and climate change. DOE will ensure that the MPA system is a central component of current and future planning, to be incorporated

into future national climate change response policy (including: Grand Cayman Development Plan, Disaster Risk Management Framework, National Conservation Act, Storm Atlas). Involvement of most DOE staff in field training and Marine Workshops will have enhanced institutional capacity and personal involvement in future planning. McCoy will have a doctorate, and is committed to working in DOE in Cayman in the long term. Collaborative partner TNC has established expertise in nurturing MPAs in the Caribbean region over the long term, through increasing funding, building support and improving management. A robust MPA system will need to be reviewed regularly and maintain flexibility with continued stakeholder consultation and representation in management. The establishment of financial mechanisms that drive funding to protected areas including endowment funds, and payments for natural resources and services that protected areas supply may be necessary in the future.

5 Lessons learned, dissemination and communication

Key lessons have been:

1. A modest project can achieve a major outcome by providing additional capacity to an organisation to undertake a major review of an existing system and add value by enhancing that system into something fit for the future. The change required resources, an increase in capacity, and a realistic goal of what could be achieved, and most importantly, the confidence to adhere to plans. A major strength was the ability to build upon an Existing Darwin Initiative project in the territory (Darwin Project 14-051: *In Ivan's Wake - Darwin Initiative BAP for the Cayman Islands*, Government of Cayman Islands and University of Exeter in Cornwall) <http://www.darwininitiative.org.uk/project/14051/>

and then to identify and successfully bid for a new Post Project to specifically to address important issues that arose during the project (EIDP0045 *Assuring Engagement in Cayman's Enhanced Marine Protected Area System*, DoE & Bangor University). <http://www.darwininitiative.org.uk/project/EIDP0045/>

2. Good communication between partners proved essential. Good partnerships were established and communication was good. Skype and Instant Messenger proved excellent for regular communication, but meeting person to person at Steering Group Meetings was essential to keep the project focussed and everyone motivated.

3. Establishing a dedicated Project Support Officer was crucial in the success of the project, because everyone else involved had other jobs to do beyond the project. However, it was also important to establish line management when embedding a person within DoE. This capacity building strategy generally worked extremely well, but there were occasions when line management was required that required joint solutions between Bangor and DoE.

4. Back up project organisation plans are needed in the case of unexpected events such as long term illness amongst key project personnel. The Project Leader was the only key staff member from Bangor, and when he became ill and that illness was prolonged by relapse, DoE had to manage the project themselves. Priority was given to completing the programme of research, for the project lacked the capacity to ensure that financial claims were chased through the University Finance Office, and that reports were submitted on time. This is difficult to achieve when only one member of University staff is engaged in running the project, and there is no one else who can provide cover from within the organisation. It is important to keep LTS International apprised of the situation.

5. It is important to remain focussed on objectives and adhere to the programme whenever possible, but to be sufficiently flexible to trial new techniques when the opportunity arises, and to have sufficient financial resources to achieve this.

6. It is important to appreciate Governments and policies can change, and that Government cannot be rushed into decisions; they have their own priorities and a new Government takes time to establish itself. Continually briefing Government is important.

7. A strong and consistent multimedia dissemination of information (see Annex 6 Table 2) regarding project achievements has meant that a wide and diverse audience has been targeted throughout the project, including key stakeholders in government, business and marine resource users in the wider community (represented by the Marine Conservation Board, Watersports Association and district communities). Information and updates have been extensively communicated via the Cayman Islands national press (Cayman Free Press, iNews, Cayman News Service) , radio stations (Radio Cayman, Rooster FM), television (Cayman27), online/social media (DOE website, Facebook), stakeholder/district community meetings, and the production and dissemination of two project videos. Project dissemination and outreach throughout the project will have widened the impact of the project and may be summarised as follows: 50 scientific outputs including 25 conference presentations, 81 stakeholder meetings, 43 national press articles, 40 TV programmes and 8 radio programmes, 16 online items, and 10 other outputs such as educational packs and promotions. See Annex 6 Table 2 for details of dissemination activities throughout the project. Associated with this Darwin project, the Cayman Islands celebrated 25 years of Marine Parks (MP25) in year 2 and 3 of the project, which has been actively promoted by DOE with a dedicated logo (featured on outgoing email correspondence from DOE, DOE website banners, MP25 web page on the DOE site and on mass distributed bumper stickers, t-shirts, pens and pins), on-going media coverage and public outreach events (Annex 6, Table 2) in particular, strong promotion of MP25 at the annual 'Pirates' Week' in project year 2. It was hoped that with promotion of the existing parks, this would feed well into the parks eventual proposed enhancement and expansion with the completion of this project. Press releases in the UK throughout the project will have also expanded the project impact on an international scale.

Dissemination will continue after project completion

All dissemination efforts will continue and develop with completion of this Darwin Initiative project with the immediate start of an 18 month Darwin Initiative Post-project involving all original project partners and the additional of others. The Post-project aims to develop dissemination of original project work and resulting MPA network enhancement with the development and complementary provision of a smart phone application to all of Cayman Islands residents and visitors. Its key functions will include interactive maps to inform users of MPA boundaries and regulations, and provide the facility for more convenient public stakeholder participation in regulation and enforcement of national Marine Park regulations and Marine Conservation Laws.

The DOE continues to actively promote their work and efforts with media dissemination, public outreach (meetings, receptions, community events e.g. Agricultural shows, school and educational visits) and through scientific research conducted and presented to the wider scientific community via national, regional and international conferences and published studies in scientific journals. As such, it is expected that DOE will continue such activities in relation to the enhanced MPA system that will result from this project. The active social media dissemination of project and Marine Parks information will also continue on the dedicated Facebook group which currently has almost 1,500 members.

Planned presentations accepted at international conferences on Main Project:

McCoy, C., Turner, J.R., EBanks-Petrie, G., Austin, T., Byrne, J., Richardson, L. (2014). Measuring MPA performance, "Fit or Unfit for purpose"; an evaluation of Caymanian MPAs after 27 years on target reef fish assemblages. In: Fisheries - In what circumstances do no-take zones produce benefits to surrounding fisheries? **3rd International Marine Conservation Congress, 14-18th August Glasgow, Scotland.** (A5/7)

Austin, T., Turner, J.R., McCoy, C., Richardson, L., Byrne, J., Ebanks-Petrie, G. (2014). Darwin Initiative to enhance an established marine protected area system, Cayman Islands. In: Climate change - To what degree can no-take or highly-protected MPAs provide resilience and/or a buffer against ecosystem disruption caused by climate change and ocean acidification? **3rd International Marine Conservation Congress, 14-18th August Glasgow, Scotland.** (A5/8)

Jeremy Olnik, DoE GIS officer will attend the **Esri International User Conference** in San Diego, California, from July 14-18, 2014 to take part in workshops and skills training.

<http://www.esri.com/events/user-conference>

Bradley Johnson DoE will be taking part in an ICRI Workshop organized by the Regional Lionfish Committee (RLC): **Lionfish, invasive exotic species: Management and Control** Mérida, Yucatán, Mexico, 11 October 2013 (as part of the 1st Pan-American Congress on coral reefs)

DoE will be hosting the **JNCC Lionfish Response Strategy Workshop II**, Cayman Islands, July 2013.

The DEFRA post project has continued to prepare articles for Darwin newsletters:

Articles on Multispecies SPAG monitoring: See page 15 of newsletter

<http://www.darwininitiative.org.uk/assets/uploads/2014/05/Darwin-Newsletter-Issue-24-Oct-2013.pdf>

Article on App development: See pages 5 & 6

<http://www.darwininitiative.org.uk/assets/uploads/2014/05/Darwin-Newsletter-Issue-26-Feb-2014.pdf>

5.1 Darwin identity

The Darwin Initiative has been publicised widely, mentioned at all presentations to the press, TV, radio, and at all project meetings with key stakeholders in government, business and marine resource users in the wider community (represented by the Marine Conservation Board, Watersports Association and district communities) and acknowledged in conference presentations. The Darwin Initiative logo is featured on the primary DOE research boat, on project bumper stickers (distributed country wide free of charge), on two large freestanding vertical banners (used at all stakeholder meetings/presentations), all emails sent by project support officer Laura Richardson, on the project Facebook group ([Cayman Islands Marine Parks - DOE and Darwin Initiative Review](http://www.facebook.com/groups/136939819748625/), <http://www.facebook.com/groups/136939819748625/>), and the dedicated project page on the DOE website (<http://www.DoE.ky/marine/marine-parks-review/25-years-of-marine-parks/>).

This project builds on the results of Darwin Project 14-051: *In Ivan's Wake - Darwin Initiative BAP for the Cayman Islands* which has also been mentioned during stakeholder meetings and in outreach and educational materials as a result.

The DOE actively and widely promotes its existing Marine Parks through the distribution of leaflets detailing the 'Marine Park Regulations and Marine Conservation Laws', at school talks, and complemented by the press, TV and radio features. In 2011 (project year 2), DOE publically celebrated 25 years of Marine Parks in the Cayman Islands (detailed above). In this wider context, this Darwin Initiative project has been well complemented by these activities. This project, however, has been promoted as its own initiative with a distinct identity and activities (see Annex 6/Table 2 for examples of project PR and outreach).

Most project PR and outreach within the Cayman Islands has featured the Darwin Initiative name and logo. This dissemination has targeted as broad an audience as possible, aimed at both key stakeholders in government and business, and the wider community as a whole. Information on the project and the Darwin Initiative has been delivered to each public district, the Ministry and members of the opposition, the Marine Conservation Board, the Commissioner's Office in Cayman Brac, the Land and Sea Cooperative, the Angling Club, the Seafarers' Association, the Cayman Islands Tourism Association, the Cayman Islands Department of Tourism, the Ministers' Association, the Human Right Commission, the National Trust, all government and public schools countrywide, other private education bodies, the prisons and environmental organizations that provide outreach to the public. To this extent, it is assumed that there is likely a good understanding of the Darwin Initiative amongst key stakeholders and the wider public.

6 Monitoring and evaluation

The project has been successfully monitored and evaluated through a series of Project Steering Group Meetings attended by the project partners: August 2010, September 2010, June 2011, January 2012, September 2012, and January 2013. In addition, the Marine Conservation Board (representing stakeholders in Cayman) evaluated the project (Sept 2010, May 2012) and granted permits for continued work following presentations on progress. The Project was also a finalist in the Bangor University Research Impact Awards (Best Cultural and Societal Impact), 2013.

The project has not been subject to evaluation by DAC, but DoE and aspects of the project have been visited by various UK Government Ministers and MPs: Lord Blencathra, Tara Mann and Bruce Morrissey of the Cayman Islands Government Office in London visited Bangor and were briefed on the project in February 2012, and subsequently visited the project in Cayman in March 2012. Henry Bellingham MP, Minister for the Overseas Territories at the Foreign and Commonwealth Office visited 18th-21st April, 2012, and was briefed by the Department of Environment on the environmental challenges facing the Cayman Islands. He learnt about the Department's Marine Park Review and visited its lionfish laboratory. The work of the project was highlighted in the Premier's speech at the Annual Cayman Islands Government Reception, in London, on the 4th of December, 2012. On 18th June 2013, Joan Walley MP (Chair) and Dr Matthew Offord MP of the Environment Audit Committee met with DoE to learn about the Marine Parks, and they visited the West Bay and Little Cayman MPAs on 19th and 20th June. Minister for Overseas Territories, Mark Simmonds MP visited DoE and discussed the project during his visit to the Cayman Islands on 5 November 2013. Project leader Dr John Turner gave a presentation about the project to Lord Dafydd Elis Thomas, President of Bangor University and spokesman on Rural Affairs, Fisheries and Food in the House of Lords.

The DI M&E system was used by the Steering Group to track the project and measure progress against indicators. The plan was adhered to and no changes were made to the project activities. A significant delay was experienced in being approved by Government to launch the second public consultation, and this resulted in subsequent delay in submitting the final report on the Enhanced Marine Protected Area proposals to Government. However, these delays were beyond the project team's control. The Cabinet is still to approve the proposals, but again this is beyond our control and is due to a new administration of Government following elections in May 2013.

The goal of the project was addressed by submission of an enhanced MPA system to Cabinet for approval. These enhancements propose to contribute significantly towards positive impact on biodiversity in the Cayman Islands as well as positive changes to the conditions of human communities through sustainable environmental management, particularly in the face of climate change. A further project bid to assure engagement in enhanced MPA and to address 4 challenges to the MPA has been won

The project purpose was to ensure coastal protection for human settlements and future tourism income by enhancing the protection of coral reefs thereby allowing rehabilitation of supporting ecosystems, through increased resilience to climate change. This was achieved by a review of the effectiveness of the Marine Protected Area system of the Cayman islands in maintaining resilience of coral reefs and shallow marine ecosystems in response to direct human impact and climate change, and if appropriate, to provide the information base to extend the system to increase that effectiveness. The resulting outcomes were: (1) An assessment of resilience: reef health was measured at 63 permanently established monitoring sites inside and outside of current MPA system, shows that MPAs generally provide local resilience. (Higher cover and coral recruitment, lower coral bleaching, disease prevalence and macroalgal cover). (2) An assessment of benefit: overspill of fish into surrounding waters is evident at some MPA boundaries. Number, size and biomass of 53 target fish species is greater in many MPAs than outside, and proportions of herbivorous and carnivorous fish are more balanced. However, invasive lionfish threaten the fish communities. (3) An assessment of fisheries impact: recreational, artisanal and illegal fishing are significant on Cayman reefs, and fishers exploit MPA boundaries. Fishing is an important part of Caymanian culture and understanding the incentives to fish legally and illegally must be included in conservation planning. Fish spawning aggregation sites (SPAGs) have been identified as being vulnerable to overexploitation. (4) A

stakeholder consultation, survey data and protected area planning tools have been used to plan an enhanced MPA system which increases No-take protection from 15 to 50% of the shelf, but provides access to fishable areas. A campaign of public awareness, education and consultation is maximising understanding and support for the new MPA system.

Baseline information was successfully collected by activities under each original output against the indicators set, and these addressed the project purpose and impact indicators and are fully described below:

OUTPUT 1: Map the reef and associated subtidal ecosystem habitats around the islands to assess habitat variation and examine representativeness

Indicators for Output 1: Marine Habitat classification and GIS from Darwin project 14051. Additional data from satellite, in situ acoustic surveys (multibeam) and Groundtruthing surveys from TNC Caribbean Challenge.

Means of Verification of Output 1: Accuracy assessment conducted under Darwin 14051 and by DOE. Additional assessment necessary to identify any change resulting from October 2009 bleaching event.

Important Assumptions for Output 1: That temperatures cool in November (2009) and that bleached corals recover rather than display mass mortality (signs of recovery are apparent).

Activities in Output 1:

Activity 1.1 Steering Group Meeting 1: to Establish Darwin project was held on 30th August 2010 at DOE (Gina Ebanks-Petrie, Tim Austin, Dr John Turner, Croy McCoy, James Byrne present) during which the following were discussed: steering committee composition and role; links and lessons from previous Darwin project; Darwin Initiative requirements reported by John Turner from the Darwin initiative Project Leader's workshop of 30th March London; review of overall objectives, log frame, activities, work plan and metrics; training and involvement by DOE staff and postgraduate students; post of Project Support Officer, the budget; publicity; and plans for the first Marine Conservation Board Stakeholder meeting.

Activity 1.2 Stakeholder meeting 1: Marine Conservation Board was held on 3rd September 2010 at DOE (Phil Bush (Chair), Richard Flowers, Capt. Chuckie Ebanks, Kenny Ryan, Bernard Watson, Bruce Eldemire, Capt. Andrew Pierson, Tim Austin, Dr John Turner, Croy McCoy) during which Turner and McCoy presented the Darwin Initiative, the objectives of this project, preliminary and underpinning results from pilot studies, and engaged the Board through consultation and ideas for participation.

Activity 1.3 The Marine Habitat Classification and GIS were reviewed on 6 September 2010 in DOE by DOE staff, current project and previous project (14-051) personnel in Grand Cayman (Ebanks-Petrie, Austin, McCoy, M. Cottam, J. Olynik, and Turner and with Byrne – TNC). The habitat mapping, based on ortho-corrected aerial mapping from 2004 and 2008 provided a robust classification for lagoons and shelf areas for each of the three islands, supported by an independent accuracy assessment. The Biodiversity Action Plans (BAP) for 18 marine habitats (eg sea grass areas, coral reef) and species were reviewed. It was agreed to aim to extend 'No Take Zones' (including Wildlife Interaction Zones) from 15% to 50% of the shelf of Cayman, and to ensure that the extended zones protect fish on reef walls and incorporate grouper spawning aggregation sites, which will require new bathymetric limits to the zones. It was agreed that the timing of the project is appropriate to inform the National Conservation Bill in these respects, and the Act will strengthen Marine Conservation Law.

Activity 1.4 Assess existing long term data sets (Photo image data sets from Ogden (1976) and Permanent photo quadrats by McCoy for 1997 and 2004 were identified as suitable raw data sets for analysis. Some early qualitative analysis was undertaken by Gall (Bangor) (A5/49).

Activity 1.5 Initial Ecological Gap Analysis assessment (EGA) was conducted during a Marine Conservation Workshop 1 between 6-16th April 2010, led by Steve Schill (TNC) collaborating with Jeremy Olynik (DOE GIS Officer). (A5/39). The focus was Grand Cayman. The objectives included: Finalizing the project extent, marine strata, and planning units;

creating a marine environmental risk surface; Compiling a list of biodiversity conservation features (targets) and associated conservation goals; training personnel in the use of the latest Marxan support software; and drafting and reviewing preliminary conservation portfolios . In addition Olynik attended the ESRI Users conference in July 2010 in San Diego for additional training in GIS tools, and Austin and McCoy attended the TNC Reef resilience workshop in June 2010 at TNC, Key Largo, Florida.

Activity 1.6 Steering Group Meeting 2: held 6th September 2010 at DOE (EBanks-Petrie, Austin, McCoy, Olynik, Cottam, Byrne, Turner) finalised the research objectives and methodologies.

In addition, the project was presented to a DOE staff meeting on 8th September 2010, to all scientists, enforcement officers, and support staff, and with Ministerial representatives present. Turner and McCoy explained the objectives of the Darwin Initiative, described the project and activities, and presented preliminary results. The main objective was to be inclusive and encourage involvement and participation in the project at all levels.

Further, the Governor of Cayman Islands Mr Duncan Taylor hosted a reception at the Governor's Residence on 26th October 2010. Presentations by Mr Duncan Taylor, Governor, Ebanks Petrie (DOE), Turner (PL -SOS Bangor), and James Byrne (TNC) <http://www.bangor.ac.uk/news/archive/bangor-scientist-to-help-protect-marine-biodiversity-in-the-caribbean-2401> (were followed by a media day, during which press and television interviews were given (see Annex 6 Table 2 for further verification).

Progress made on Project Output 1

All activities planned for Q1 were successfully completed and Output 1 has been completed in full. The main output is a Geographical Information System at DOE, based on accuracy assessed habitat maps, and linked via GIS tools to Marxan Marine Protected Area planning tools. Although initially based on Grand Cayman, Gap Analysis and Marine Environmental Risk Surface are now complete for the Sister islands. In addition, the project was launched In Grand Cayman by the Governor, Mr Duncan Taylor, with local press and television coverage, and press coverage in the UK.

The impact of the bleaching event of September 2009 was assessed by Jess Campbell in June-July 2010, and no mass mortality resulted, although bleaching had different effects around each island. No additional assessment beyond this survey at 55 sites around the three islands was therefore considered necessary: Campbell, J. (2010). Recovery of Caymanian reefs after a coral bleaching event. *MSc thesis, University of Bangor*. . (A5/47).

OUTPUT 2: a): Assessment of the current level of reef resilience within and outside the Marine Protected Areas of Grand Cayman, Little Cayman and Cayman Brac; b): An assessment of the extent of overspill of fish biomass from the No Take Zones into surrounding zones.

Indicators for Output 2 a): Measures of: Coral cover, coral species abundance, calcareous and fleshy macroalgae, coral recruits, frequency of coral diseases and bleaching, frequency of herbivorous fish, quantification of other impacts e.g. anchoring damage; b): Diving surveys of fish species abundance and size, to assess biomass at sites within and at increasing distances outside of No Take Marine Protected Zones.

Means of Verification of Output 2 a): Reef survey at 55 established permanent sites around islands using visual census and video techniques. Comparisons with old data and photographs for some sites from 1970s and 1980s (source Ogden). Comparisons with permanent photo quadrats from early 2000s by McCoy. Statistical comparisons with video and visual census by Gall, McCoy & Turner, 2009. Use of experienced team with species specific knowledge, and training for junior members; b): Regular tests of visual assessments of fish size and accuracy of species recognition, enforcement of No Take Zone by MPA patrols.

Important Assumptions for Output 2 a): Sites and techniques already established and old data and photographs archived so no expected problems. New video data archived; b): As

above, and assumes enforcement ensures No Take Zones are not transgressed. Bleaching event October 2009 means early comparison with pre bleaching survey of July 2009 essential. Will require additional training of junior staff in DOE to provide appropriate dive team size to satisfy health and safety requirements and ensure future monitoring capability. Assisted by MPA Darwin Fellow and Bangor MSc project students.

Activities in Output 2:

Activity 2.1 Reef resilience field training and surveys: Reef resilience video & photo surveys were conducted at 55 permanent sites within and outside of Marine protected areas on Grand Cayman, Little Cayman and Cayman Brac during June to August, 2010, led by McCoy, assisted by Natasha Pisani (Darwin Field support Officer from Bangor) and training was provided for DOE staff (Gibb and Chin), MSc research project students Jess Campbell (Bangor) and Adam Barton (St Andrews). 2 MSc dissertations produced: Campbell, J. (2010) Recovery of Caymanian reefs after a coral bleaching event. *MSc thesis, University of Bangor*. 89p; and Barton, A. (2010) An assessment of Caymanian coral reefs: are the long established marine no take zones enough? *MRes Thesis, University of St Andrews*. 102p. (A5/48), abstracts 5 & 6). The Campbell thesis was also presented as a poster at Reef Conservation UK, December 2010. (A5/47). Algal biomass surveys were conducted at selected sites on Grand Cayman between November and December 2010 by McCoy and Laura Richardson (Bangor Field Support Officer). Results described at various regional conferences (A5/11/24/25).

Activity 2.2 Fish biomass field training and surveys: Fish biomass surveys within and outside MPA at selected sites on Little Cayman and Cayman Brac were completed between March and May 2010, (to complete earlier pilot survey which was conducted on Grand Cayman only). The surveys were led by McCoy, with training for Charlotte Dromard (Intern, University of Gaudaloupe) and Natasha Pisani (Field Support Officer Bangor). The fish biomass surveys were repeated at sites on Grand Cayman, Little Cayman and Cayman Brac between January and March 2011, led by McCoy, with training for Monique Gral (University of Netherlands intern and Bangor Field Support Officer) and DOE staff Gibb and Blumenthal. Fish biomass surveys have been presented at the Gulf of Caribbean Fisheries Institutes Annual Meetings:

McCoy, M., Dromard, C., Turner, J.R. (2009). An evaluation of Grand Cayman Marine Protected Area Performance: a comparative study of coral reef fish communities. *Proceedings of the 62nd GCFI Gulf and Caribbean Fisheries Institute, Cumana Venezuela* (A5/3/32).

Dromard, C.R., McCoy, C., Turner, J. R. (2010) Evaluation of marine protected area's performances: the case of Little Cayman and Cayman Brac, Cayman Islands. *GCFI San Juan, Puerto Rico 1st -6th November 2010*. (A5/2/26)

Activity 2.3 ½ year reports Darwin Initiative (submitted October 2010)

Activity 2.4 Stakeholder meeting 2: Marine Conservation Board: to promote results illustrating the benefits of the MPA system, and to identify threats was combined with the meeting held on 3rd September 2010, (since it involved flying stakeholders in from sister islands, and preliminary results were already available from pilot studies). Major Stakeholder concerns on Marine Conservation Board identified were: Grouper fishing on Little Cayman and need to further protect Grouper spawning aggregation sites; illegal fishing from shores at night and in MPA at night; need for increased enforcement and prosecution; protection of channels at East end, where reef has eroded.

Activity 2.5 Reef resilience re-survey at 55 permanent sites, specifically to compare with previous surveys of July 2009, July 2010, and to assess medium term recovery from bleaching. Involvement of Bangor MSc students (July – Aug 2011). Surveys were completed with the addition of 8 new survey sites, increasing the total number of permanent sites from 55 to 63 to enable more robust analysis of MPA effects (McCoy, Gibb – DOE & Richardson- SOS Bangor, +Hillyer & Looker, NERC M.Sc. Bangor). M.Sc. theses submitted by Hillyer, K. (2011) Influence of marine protected areas on resilience to bleaching, disease and compromised health in Scleractinian and Milleporid corals, the Cayman Islands; Looker, E. (2011) Investigating coral reef resilience by analysing Scleractinian and Millepora Recruitment within Marine Protected Areas of the Cayman Islands, Caribbean). Surveys were completed on the invasive Indo-

Pacific lionfish *Pterois volitans* by Bangor M.Sc. students, Louisa Higby (2012) and Ciara McCarten (2012) during June- August 2012. Higby investigated the effects of culling on the behaviour, habitat preference and condition of lionfish, specifically on the north coast of Grand Cayman, 22 survey dives were conducted where culling/diving is permitted, and 25 survey dives were conducted at non-culled/dived sites. McCarten investigated the size/frequency distribution of lionfish between different shallow-water habitats: mangroves, seagrasses and reef patches, and 3 deep exposed reef habitats. Joe Marlow (2012) assessed the prevalence of *Aspergillus* disease in the gorgonian sea fans during June- August 2012 at 47 of the established sites + 9 extra sites around Grand Cayman and Little Cayman. The surveys were led by McCoy, with training provided for Higby, McCarten and Marlow. Survey and boat support was provided by DOE staff Gibb and Chin as well as Richardson. M.Sc. theses were submitted by Higby, L. (2012) Can a lionfish change its stripes? Investigating the effects of the culling initiative on the behaviour, habitat preference and condition of the invasive lionfish *Pterois volitans*, on the north coast of Grand Cayman (A5/4/43), McCarten, C. (2012) Invasive Indo-Pacific Lionfish (*Pterois volitans*) use of mangrove, seagrass and reef habitats in the Cayman Islands (A5/42) and Marlow, J. (2012) *Gorgonia* spp Abundance and Resilience to the *Aspergillus* Disease in the Cayman Islands (A5/44). In addition, Dr. Neal Haddaway (Bangor University, UK) visited DOE for 10 days in January 2012 to provide an introductory training workshop for DOE scientists in the statistical programme, R, and its application to marine environmental survey and monitoring, and Elayne Looker (ex. Bangor University M.Sc.), assisted with training Paul Chin of DOE in video transect analysis using the Coral Point image analysis program in December 2011, and February-April 2012.

Activity 2.6 Fish biomass survey within and outside MPA at selected sites - resurvey– all islands. Involvement of Bangor MSc students (scheduled Aug – Sept 2011). Activity was rescheduled from Aug. /Sept. 2011 to Feb-March 2012. (original plan was to sample at different times of year, but statistical variation in first 2 surveys suggested more robust analysis would require further surveys at the same time of year). Re-scheduling did not affect the budget or timetable of project activities significantly since the activity was undertaken within year 2 of the project. Surveys were completed within and outside MPAs at selected sites on Grand Cayman, Little Cayman and Cayman Brac between January and March 2012. The surveys were led by McCoy, with training for Gary Murphy (intern, Manchester Metropolitan University and University of Exeter) and DOE staff Gibb and Chin.

Activity 2.7 ½ year report to Darwin Initiative (scheduled Oct - Nov 2011). Submitted on time, October 2011.

Progress made on project output 2:

Completed in full. The impact of the bleaching event of September 2009 was assessed by Jess Campbell in June-July 2010, and no mass mortality resulted, although bleaching had different effects around each island: Campbell, J. (2010). Recovery of Caymanian reefs after a coral bleaching event. *MSc thesis, University of Bangor*. 89p. (A5/47). Though a mass bleaching event had not been recorded for 2010, a second assessment of coral bleaching was carried out by Katie Hillyer in June-July 2011 to assess progressive mortality and disease arising from the earlier bleaching event: Hillyer, K. (2011). Influence of Marine Protected Areas on Resilience to Bleaching, Disease and Compromised Health in Scleractinian and Milleporid Corals, the Cayman Islands, Caribbean. *MSc thesis, University of Bangor*. 91p. (A5/45)

OUTPUT 3: An assessment of the artisanal/recreational fishery

Indicators for Output 3: Socio-economic questionnaires directed at recreational fishers (visiting piers, and via patrol boat), tourists in departure lounge at airport and via hotel excursion operators, diving operators, charter boat skippers, and migrant workers. Report to DOE.

Means of Verification: Unbiased questionnaires and recorded interviews analysed from representative cross section. Questionnaires tested and trialled in 2009 by Henshall, McCoy & Turner (A5/50).

Important Assumptions for Output 3: May not get honest answers when recreational fishers approached in patrol boat, but in general, such fishers are compliant. Honesty and safety will be issue when interviewing migrant workers who tend to fish late evening/night.

Activities in Output 3:

Activities 3.1 & 3.2 Socioeconomic assessment of artisanal and migrant worker fishers and socioeconomic assessment of recreational fishers were completed by Rhiannon Meier (Bangor Field Support Officer) with support from Laura Richardson (Darwin Project Support Officer), and DOE Enforcement staff during February and March 2011 on Grand Cayman, Little Cayman and Cayman Brac. A total of 275 resident questionnaires were conducted on Grand Cayman from 29th February - 30th March 2011, 264 of which were used for analysis for fisheries quantification. The 11 questionnaires that were excluded from further analysis were those not deemed reliable after the face-to-face survey using a pre-determined criterion. All completed questionnaires were used for analysis of fishers' opinions on the marine environment and the current management system. A total of 63 resident questionnaires were conducted on Cayman Brac between the 6th–11th February 2011, 62 of which were used for further analysis. The two questionnaires not incorporated into analysis were conducted with fishers who were either not happy to engage in the survey, or from a source that was not deemed reliable by the analyst. A total of 16 fully completed resident questionnaires were conducted on Little Cayman between the 24th–28th February 2011. In addition, an analysis of DOE Enforcement report data of illegal fishing between 1993 and 2011 has been undertaken by Rhiannon Meier, showing frequency of warnings, arrests and intended prosecutions, and numbers of conch, lobster, fish and turtle caught illegally.

Activity 3.3 Interim report of fisher surveys. An interim report was produced: Meier, R., McCoy, C., Richardson, L., Turner, J.R. (2011). Quantifying Recreational and Artisanal Fisheries of the Cayman Islands. *Darwin Initiative Interim Report*. (A5/38) <http://www.darwininitiative.org.uk/documents/18016/22226/18-016%20Fisheries%20impact%20interim%20report.pdf>

Activity 3.4 Annual Reporting to Darwin Initiative: First Year annual report submitted on time April 2011 A5/37) <http://www.darwininitiative.org.uk/documents/18016/22029/18-016%20AR1%20-%20edited.pdf>; Second year annual report submitted on time in April 2012 (A5/36).

Progress made on output 3: Completed in full.

Outputs 4-7: Plan and promote an extension to the MPA system with full public consultation and involvement.

Indicators for outputs 4-7: Using data from objectives 1-4, plan extended MPA zones to cover all representative habitats, covering at least 30% shallow marine environment; Initial consultation to ensure public participation on all 3 islands, show benefits in terms of results of MPA effects on reef resilience; Ecological gap Analysis, and Protected Area Tools in GIS such as Environmental Risk Surface, Relative Biodiversity Index, and Marxan and Marzone protect area planning software; GIS data system to show revised boundaries and purpose of zones; Stakeholder workshops and public presentations on all 3 islands; Acceptance and implementation of extended MPA system.

Means of verification of outputs 4-7: MPA plans led by DOE to ensure local ownership, with overseas scientists maintaining behind the scenes advisory scientific role; Changes in legislation required, facilitated by Director, DOE through Government; Modified Management plan accepted; Modified Monitoring plans accepted; Modified enforcement plans accepted.

Important Assumptions for Outputs 4-7: *Unusually, there are few assumptions or risks here. Caymanians have been highly supportive of MPA system since benefits have been so obvious, especially in comparison with other Caribbean islands where reefs are substantially more degraded. Threats from climate change are widely recognised (especially increased intensity and frequency of hurricanes, sea level rise and mass coral mortality from bleaching and disease) because most have suffered effects. Coastal protection and income from tourism are recognised as being widely important and need to update MPA system is generally understood. Sensitization is already high due to existing MPA system, and education elements are already exceptionally strong.*

Activities in Output 4-7:

Activity 4.1 Ecological Gap Analysis (EGA) update and review: The EGA has been completed on schedule for all 3 islands by TNC (Byrne and Schill) with Olynik and Austin (DOE), between April 2010 and March 2011.

Activity 4.2 Steering Group Meeting 3: Identification of concerns and threats. This meeting was held at DOE offices in Grand Cayman on 20th June 2011, deferred to coincide with Turner's visit (Gina Ebanks-Petrie, Tim Austin, Croy McCoy, Laura Richardson, Jeremy Olynik, John Turner present). General project progress and Cayman's Environment Risk Surface for MARXAN was discussed and threats/concerns identified. (Minutes available on request.)

Activity 4.3 District community stakeholder meetings on Grand Cayman, Little Cayman and Cayman Brac to engage comments on perceived risks and benefits and to set conservation vision and goals. Meetings were successfully completed on Grand Cayman, Cayman Brac and Little Cayman. Twenty-three public district community and focussed group meetings were held in the first consultation, together with a press briefing and appearance of key project members on two popular, local radio call-in discussion shows. Detailed feedback was gained on perceived risks and conservation visions, and public awareness of the importance of the marine parks, of threats to reef resilience and the goals of the Darwin project were heightened greatly. There was significant media interest throughout the year (16 mini documentaries, 18 press items, 3 television news items, 2 radio phone ins, 1 radio interview; for full details see Annex 6/Table 2 . (Extensive photos, meeting minutes, feedback log and meeting invitations are available on request).

Activity 4.4 Environmental Risk Assessment (ERA) and mapping: ERA has been completed for all 3 islands by TNC (Byrne and Schill) with Olynik and Austin (DOE) between April and March 2011, and is therefore ahead of schedule (planned for July and August 2011. (A5/34)

Activity 4.5 Field survey to verify specific habitats: The original habitat classification and habitat maps have proven robust according to monitoring surveys at the 63 sites around the islands, and therefore there has been no further requirement to verify habitats prior to new MPA zone boundary designation.

Activity 5.1 Steering Group Meeting 4: Marine Protected Area Planning; Activity 5.2 Marine Conservation workshop 2 and training: Site Conservation Index and Relative Biodiversity Index Assessment calculation Workshop; and Activity 5.3 Marine Conservation Workshop 3 and training: Use of Marxan protected area modelling software.) Activities 5.1 to 5.3 were completed in Grand Cayman in January 2012, coinciding with Byrne's visit (Ebanks-Petrie, Austin, McCoy, Olynik, Richardson, Bothwell, Byrne, Schill, and with Turner Via Skype). General project progress was discussed with particular attention given to feedback and lessons learnt from the first stage of public consultation in September and October. Plans were considered for the second stakeholder round in which options for new MPAs will be presented. Workshops were conducted to select methodologies to include biological reef health data into the protected area planning models. Schill, Olynik McCoy and Richardson collated ecological survey data for use as a decision support tool for MPA planning (to guide application and use of Marxan output) (A/34). Marxan targets and goals were agreed and consideration was given to presentation of MPA options for the next stage of public

consultation at a subsequent series of meeting held in April 2012. (Minutes available on request.)

Activity 5.4 Review various conservation scenarios, determine optimal configuration of protected areas that meet user defined conservation goals. Marxan output for best solutions for MPAs, with different goals set (eg 50% of all important marine habitats, and existing MPAs included) were presented and discussed by DOE scientific staff and Enforcement Officers during a series of meetings in April 2012. (Annex 7 Supplementary information) <http://www.doe.ky/marine/marine-parks-review/>

Activity 5.5 Field verification of possible configurations (scheduled March - April 2012). This activity was deemed unnecessary due to the detailed knowledge acquired during the project of the habitats in the vicinity of the proposed MPA zones.

Activity 6.1 Marine Conservation Board and Community Stakeholder consultation (3) on MPA protected area optimal configuration. A meeting with Marine Conservation Board was held in 11th May 2012 with DoE representatives, Jeremy Olynik, Tim Austin, Croy McCoy and Laura Richardson and 10 members of the MCB detailing the Darwin Marine Parks draft proposal (A5/33). *Delayed approval from Cayman Islands Government to begin the second round of public consultation led to abbreviation of overall timeline for activity 6.1 through the removal of scheduled activities in the post-consultation phase and direct marketing scheduled to begin in May 2012 replaced with a mass marketing, media driven, public education programme over the months of October and November 2012.* Twenty-nine public- and focus-group meetings were held in Grand Cayman, Cayman Brac and Little Cayman (Annex 6, Table 2). Proposed MPA system enhancements discussed and feedback received.

Activity 6.2 Steering group meeting 5: Consideration of feedback and implementation planning. Steering committee meeting held on 25th January 2013 with Department of Environment representatives: Gina Ebanks-Petrie, Tim Austin, Croy McCoy, Laura Richardson, John Bothwell, John Turner and James Byrne (by Skype from The Nature Conservancy, USA). Details public feedback from twenty-nine public- and focus-group meetings on proposed Marine Park expansion were reviewed and comments incorporated into revisions of the plans where appropriate and possible.

Activity 6.3 Marine Conservation Law modifications. Required modifications to the existing Marine Conservation Law (2007, amended 2013) were identified and submitted to Cabinet with details of proposed MPA enhancements in May 2013. (A5/33)

IMPORTANT NOTE: A new Government was formed on 29th May 2013; and early meetings took place with the Hon. Wayne Panton, Minister for Financial Services, Commerce and Environment from the new administration to brief him on the status of the project for an enhanced system of Marine Protected Areas. While supportive and sympathetic, he advised that he would need to appraise Cabinet of the plans, and he asked us to postpone further public developments while Government considered the National Conservation Law Bill first. The Cabinet would require time to consider the proposals, and he advised that the delay would probably require a further public consultation phase. The Minister was reappraised of the project's position in January 2014 during a meeting at the Ministry. The Minister attended a public briefing on the launch of the Post Project in January 2013 and in response to questions from the press, stated that he needed time to hold appropriate meetings with the Ministers of Cabinet and the Legislative Assembly prior to Government being able to approve the new Marine Protected Area system and Marine Conservation Legislation.

Activity 6.4 Development of MPA management plan, monitoring plans, enforcement plans and education plans. These plans have been transferred into the work plan of the Post Project while we await approval of the enhanced MPA from Cabinet.

Activity 6.5 Presentations at international conferences & research paper submissions. 25 presentations have been made at national, regional and international conferences (A5 7-32)

Activity 6.6 ½ Year Project report to Darwin Initiative: Report was not submitted due to serious illness of Project Leader.

Activity 6.7 Finalisation of maps, signage and brochures: Proposed MPA enhancements have been mapped and titles and rubric for new signs and brochures have been prepared.

Activity 6.8 Acceptance and implementation of extended MPA system: The Enhanced MPA plans are pending approval from Government/Cabinet.

Activity 7.0 Final Steering group meeting and Final Report to Darwin Initiative: A final Steering Group Meeting was held in October 2013. Final Report (this document) submitted late due to (a) Government imposed delay in allowing initiation of second public consultation, and subsequent election of a new administration; priority for passing National Conservation Act, and delayed consideration of enhanced MPA and Marine Conservation Law, and (b) illness of Project Leader. Eilidh Young at LTS International has been appraised of the situation.

6.1 Actions taken in response to annual report reviews

Not applicable – there have been no DAC reviews of this project.

7 Finance and administration

7.1 Project expenditure

Project spend since last annual report	2012/13 Grant (£)	2012/13 Total actual Darwin Costs (£)	Variance %	Comments (please explain significant variances)
Staff costs (see below)				
Consultancy costs				
Overhead Costs				
Travel and subsistence				
Operating Costs				
Capital items (see below)				
Others (see below)				
TOTAL				

Staff employed (Name and position)	Cost (£)
Laura Richardson, Researcher 01 Apr 2012 to 31 Mar 13	
Alexandra Prebble, Researcher 01 Jan 13 to 31 Mar 13	
TOTAL	

Capital items – description	Capital items – cost (£)
n/a	
TOTAL	

Other items – description	Other items – cost (£)

n/a	
TOTAL	

7.2 Additional funds or in-kind contributions secured

Source of funding for project lifetime	Total (£)
NERC MSc Studentships (Gall, Henshall, Looker, Hillyer)	
Thomas Dunkley Memorial Fund MSc (student project) for Marlow	
Bangor University reduced tuition fees (from overseas to UK level) (McCoy PhD)	
Bangor University field equipment £9,500	
Cayman Island Government DOE salary costs £501,539 (includes TNC salary as regional partner)	
Cayman Island Government DOE institutional overheads (including provision of boats, vehicles, diving apparatus and NITROX 36 breathing gas)	
TNC overheads	
Bangor Salaries	
Bangor overheads	
TOTAL	

Source of funding for additional work after project lifetime	Total (£)
Darwin Initiative EIDP0045 Post Project	
Guy Harvey Ocean Foundation (satellite drifters)	
Thomas Dunkley Memorial Fund MSc (student project) for Hall.	
TOTAL	

7.3 Value of DI funding

It would not have been possible for DoE to have planned a scientific campaign to obtain the evidence to support an expansion in MPAs, nor would it have been possible for them to undertake the Marine Protected Area planning process, and run two campaigns of public consultations without the expertise of the partners, additional staff capacity, and assistance in research work by MSc project students. At a time of economic downturn, Government cut backs, and constraints on operations, DoE would not have been able to undertake this 3 year programme of work without the Darwin Initiative project funds. Value for money has been excellent, because the Darwin Funds of £ secured a further £ in additional funds and matched funds, and a further £ in funds for continuing the project beyond March 2013.

Annex 1 Report of progress and achievements against final project logframe for the life of the project

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

Scientific outputs are listed by publication and abstract in Annex 5, and cited in the text as 5/1 and 5/2 etc.

Project summary	Measurable Indicators	Progress and Achievements April 2010 - March 2013	Actions required/planned for next period
<p>Goal: To draw on expertise relevant to biodiversity from within the United Kingdom to work with local partners in countries rich in biodiversity but constrained in resources to achieve</p> <ul style="list-style-type: none"> • The conservation of biological diversity, • The sustainable use of its components, and • The fair and equitable sharing of the benefits arising out of the utilisation of genetic resources 		<p>Marine Park enhancements have been submitted to Cabinet for approval. These enhancements propose to contribute significantly towards positive impact on biodiversity in the Cayman Islands as well as positive changes to the conditions of human communities through sustainable environmental management, particularly in the face of climate change. Further project bid to assure engagement in enhanced MPA and to address 4 challenges to MPA won (EIDP0045)</p>	(n/a)
<p>Purpose To ensure coastal protection for human settlements and future tourism income by enhancing the protection of coral reefs thereby allowing rehabilitation of supporting ecosystems, through increased resilience to climate change.</p>	<p>A review of the effectiveness of the Marine Protected Area system of the Cayman islands in maintaining resilience of coral reefs and shallow marine ecosystems in response to direct human impact and climate change, and if appropriate, to provide the information base to extend the system to increase that effectiveness</p>	<p>(1) Assessment of resilience: reef health measured at 63 permanently established monitoring sites inside and outside of current MPA system, shows that MPAs generally provide local resilience. (Higher cover and coral recruitment, lower coral bleaching, disease prevalence and macroalgal cover).</p> <p>(2) Assessment of benefit: overspill of fish into surrounding waters is evident at some MPA boundaries. Number, size and biomass of 53 target fish species is greater in many MPAs than outside, and proportions of herbivorous and carnivorous fish are more balanced. However, invasive lionfish threaten fish communities.</p> <p>(3) Assessment of fisheries impact: recreational, artisanal and illegal fishing are significant on</p>	(n/a)

		<p>Cayman reefs, and fishers exploit MPA boundaries. Fishing is an important part of Caymanian culture and understanding the incentives to fish legally and illegally must be included in conservation planning. Fish spawning aggregation sites (SPAGs) have been identified as being vulnerable to overexploitation.</p> <p>(4) Stakeholder consultation, survey data and protected area planning tools have been used to plan an enhanced MPA system which increases No-take protection from 15 to 50% of the shelf, but provides access to fishable areas. A campaign of public awareness, education and consultation is maximising understanding and support for the new MPA system.</p>	
Output 1. Map the reef and associated subtidal ecosystem habitats around the islands to assess habitat variation and examine representativeness	Marine Habitat classification and GIS from Darwin project 14051. Additional data from satellite, in situ acoustic surveys (multibeam) and Groundtruthing surveys from TNC Caribbean Challenge	<p>Output 1 completed. The main output is a Geographical Information System at DOE, based on accuracy assessed habitat maps, and linked via GIS tools to Marxan Marine Protected Area planning tools. Although initially based on Grand Cayman, Gap Analysis and Marine Environmental Risk Surface are now complete for the Sister islands.</p> <p>Indicators remained appropriate and assumptions held.</p> <p>Chapter on biology and Ecology of the coral Reefs of Cayman prepared by team (A5/1)</p>	
Activity 1.1 Steering Group Meeting 1 to Establish Darwin project in DOE with project partners		Meeting held Aug 2010, excellent format for periodic project review – all key project members present. Topics covered included: project partnerships, links with previous Darwin project, review of project objectives, activities, work plan, training, budget, publicity and stakeholder liaison.	
Activity 1.2 Stakeholder meeting 1: Marine Conservation Board		Meeting held with key project members and seven key Marine Conservation Board representatives (Sept 2010). Topics discussed: project outline and objectives. Engagement and ideas exchange encouraged.	

Activity 1.3 Link with Darwin 14051 (Exeter) review of BAP and GIS Marine habitat maps (Cayman)	Completed with DOE project 14051 personnel in Grand Cayman and key current Darwin project personnel (Sept 2010). Habitat mapping from 2004 and 2008 is robust (supported by independent assessment). BAPs for marine habitats and species reviewed. Aimed expansion of current No Take Strict Marine Reserve zones from 15% of representative habitats on Cayman shelf to at least 30% and possible aim of 50% agreed.
Activity 1.4 Assess existing long term data sets	Data collated and assessed as suitable for analysis. Qualitative analysis undertaken, including photo quadrat datasets. Impact of 2009 bleaching event also assessed. 2 MSc submitted
Activity 1.5 Initial Ecological Gap Analysis assessment (EGA) (Marine Conservation Workshop 1)	EGA assessment completed for Grand Cayman during Marine Conservation Workshop 1 April 2010, resulting in creation of marine environmental risk surface, list of biodiversity conservation targets, and latest software training. The same has also been completed for Cayman Brac and Little Cayman following the workshop.
Activity 1.6 Steering Group Meeting 2: Objectives and methodologies	Meeting held Sept 2010 – all key project members present (including previous Darwin project staff from DOE). Research objectives and methodologies finalised.
Output 2. a) Assessment of the current level of reef resilience within and outside the Marine Protected Areas of Grand Cayman, Little Cayman and Cayman Brac; b): An assessment of the extent of overspill of fish biomass from the No Take Zones into surrounding zones	a) Measures of: Coral cover, coral species abundance, calcareous and fleshy macroalgae, coral recruits, frequency of coral diseases and bleaching, frequency of herbivorous fish, quantification of other impacts e.g. anchoring damage; b) Diving surveys of fish species abundance and size, to assess biomass at sites within and at increasing distances outside of No Take Marine Protected Zones Output 2 Complete. Results have been widely disseminated at regional, national and international conferences. A5 7-32. Indicators remain appropriate, although additional surveys undertaken to assess new threats of invasive lionfish and disease in gorgonian corals. Assumptions held true. 1 PhD in prep and 9 MSc & 1 BSc Thesis produced.
Activity 2.1 Reef resilience field training and survey 1	Training and surveys for year 1 completed at 55 sites: benthos, video and photo surveys for all islands; algal biomass survey carried out on Grand Cayman. 4 MSc theses produced
Activity 2.2 Fish biomass field training and survey 1	Repeated training and fish biomass surveys completed twice within reporting period: early 2010 and 2011.

Activity 2.3 ½ year reports Darwin Initiative		Submitted. http://darwin.defra.gov.uk/documents/18016/21837/18-016%20HY1.pdf
Activity 2.4 Stakeholder meeting 2: Marine Conservation Board		Meeting held Sept 2010: preliminary results of surveys discussed with stakeholders to promote benefits of MPA system. Key stakeholder concerns identified.
Activity 2.5 Reef resilience survey 2		Training and surveys for year 2 completed July 2011 Increased sites to 63 to balance survey design. Surveys assessed population of invasive lionfish <i>Pterios volitans</i> including diet, habitat and behavioural characteristics and the prevalence and severity of <i>Aspergillois</i> on gorgonian sea fans completed (June-august 2012). 3 MSc submitted
Activity 2.6 Fish biomass survey 2		Training and surveys for year 2 completed in January-March to remain consistent with previous surveys
Activity 2.7 ½ year report to Darwin Initiative		Submitted. http://darwin.defra.gov.uk/documents/18016/22354/18-016%20HY2.pdf
Output 3. An assessment of the artisanal/recreational fishery	Socio-economic questionnaires directed at recreational fishers (visiting piers, and via patrol boat), tourists in departure lounge at airport and via hotel excursion operators, diving operators, charter boat skippers, and migrant workers Report to DOE.	Completed. Interim report submitted. Additional analysis linking fishing pressure and current fish biomass carried out. http://darwin.defra.gov.uk/documents/18016/22226/18-016%20Fisheries%20impact%20interim%20report.pdf Indicators are appropriate
Activity 3.1 Socioeconomic assessment of artisanal and migrant worker fishers		Surveys completed successfully on all three Islands. Feb/March 2011
Activity 3.2 Socioeconomic assessment of recreational fishers		Surveys completed successfully on all three Islands. Feb/March 2011
Activity 3.3 Interim report of fisher surveys		Report submitted. http://darwin.defra.gov.uk/documents/18016/22226/18-016%20Fisheries%20impact%20interim%20report.pdf
Activity 3.4 Annual Reporting to Darwin Initiative		Submitted. First: http://darwin.defra.gov.uk/documents/18016/22029/18-016%20AR1%20-%20edited.pdf ; second: submitted (link unavailable); third: submitted (current report)
Output 4-7 Plan and promote an extension to the MPA system with full public consultation and involvement.	Using data from objectives 1-4, plan extended MPA zones to cover all representative habitats, covering at least 30% shallow marine environment; Initial consultation to ensure public participation on all 3 islands,	Proposal for an enhanced MPA system and changes to Marine Conservation Law were submitted to Government (A5/33). pdf attached. A new Government was formed on 29 th May 2013; and early meetings took place with the Hon. Wayne Panton, Minister for Financial Services, Commerce and Environment from the new administration to brief him on the status of the project for an enhanced system of Marine Protected Areas. While supportive and sympathetic, he advised that he would need to appraise Cabinet of the plans prior to a decision. Further public developments were postponed while Government considered the National Conservation Law Bill first. The Cabinet required more

	show benefits in terms of results of MPA effects on reef resilience; Ecological gap Analysis, and Protected Area Tools in GIS such as Environmental Risk Surface, Relative Biodiversity Index, and Marxan and Marzone protect area planning software; GIS data system to show revised boundaries and purpose of zones; Stakeholder workshops and public presentations on all 3 islands; Acceptance and implementation of extended MPA system.	time to consider the proposals, and delay may require further public consultation. The Minister was reappraised of the project's position in January 2014 during a meeting at the Ministry. The Minister attended a public briefing on the launch of the Post Project and in response to questions from the press, stated that he needed time to hold appropriate meetings with the Ministers of Cabinet and the Legislative Assembly prior to Government being able to approve the new Marine Protected Area system and Marine Conservation Legislation.
Activity 4.1 Ecological Gap Analysis update and review		Completed for all three Islands (A5/34).(pdf attached)
Activity 4.2 Steering Group Meeting 3: Identification of concerns and threats		Meeting held June 2011 – all key DOE and Bangor University project members present. Concerns and threats comprehensively identified.
Activity 4.3 District community stakeholder meetings on Grand Cayman, Little Cayman and Cayman Brac: engage comments on perceived threats and goals		22 different meetings held around all three Islands in September and October 2011 presenting data and discussing options for an enhanced marine parks system, including public meetings in each district, discussions with the Ministry and Caucus, members of the opposition, the Marine Conservation Board, the Commissioner's Office in Cayman Brac, four classes at University College of the Cayman Islands in Cayman Brac and Grand Cayman, the Land and Sea Cooperative, the Angling Club, the Seafarers' Association, the CITA board, the Ministers' Association and the Human Right Commission.
Activity 4.4 Environmental Risk Assessment and mapping		Completed ahead of schedule for all three Islands March-April 2011.
Activity 4.5 Field survey to verify specific habitats		Monitoring field surveys indicate classification and map robust, thus verification unnecessary until after new MPA boundary designation.
Activity 5.1 Steering Group Meeting 4: Marine Protected Area Planning		Meeting held Jan 2012 – all key project members present. Marine Protect Area planning and next stakeholder consultation discussed.
Activity 5.2 Marine Conservation workshop 2 and training: Site Conservation Index and Relative Biodiversity Index Assessment Calculation Workshop		Workshops and training successfully completed during the period December 2011-February 2012. Indices devised and employed alongside Marxan tools for MPA planning.
Activity 5.3 Marine Conservation Workshop 3 and training: Use of Marxan protected area modelling software		Workshops and training successfully completed during the period December 2011-February 2012.

Activity 5.4 Review conservation scenarios - determine optimal configuration of protected areas that meet user defined conservation goals	Review completed with MARXAN outputs, biological reef health data and user defined conservation goals in March 2012.
Activity 5.5 Field verification of possible configurations	Collective knowledge of MPA areas sufficient and no verifications were necessary
Activity 6.1 Marine Conservation Board and Community Stakeholder consultation (3) on MPA protected area optimal configuration	Meeting with MCB held in May 2012 – all key project members present with 10 members of the MCB. Delayed approval from CI Government to begin the second round of public consultation led to abbreviation of overall timeline for activity 6.1 through the removal of scheduled activities in the post-consultation phase and direct marketing scheduled to begin in May 2012 replaced with a mass marketing, media driven, public education programme over the months of October and November 2012. Twenty-nine public- and focus-group meetings were held in Grand Cayman, Cayman Brac and Little Cayman. Proposed MPA system enhancements discussed and feedback received.
Activity 6.2 Steering Group Meeting 5: Consideration of feedback and implementation planning	Meeting held in January 2013 – all key project members present. Details public feedback reviewed and incorporated where appropriate and possible.
Activity 6.3 Marine Conservation Law modifications	Required modifications identified and submitted to Cabinet with details of proposed MPA enhancements (May 2013) (A5/33)
Activity 6.4 Development of MPA management plan, monitoring plans, enforcement plans and education plans	Being undertaken as part of Post Project EIDP0045 due to rescheduling while awaiting approval of enhanced MPA plans.
Activity 6.5 Presentations at international conferences	25 Presentations made at national, regional and international conferences, including: Yr 1: Euro. ISRS Symposium Netherlands, Reef Conservation UK London, GCFI Puerto Rico, GCFI Venezuela; Yr 2: GCFI Mexico 2011, AMLC Costa Rica 2011, Benthic Ecology Meeting USA 2011, IMCC Canada 2011 (attendance and informal presentation on project only), and Reef Resilience Conference USA 2011; Yr 3: ICRS, Cairns 2012, and GCFI Colombia 2012 and RCUK 2012, and IMCC Glasgow in 2014. A5/7-32
Activity 6.6 ½ year report to Darwin Initiative on implementation	Report was not submitted due to serious illness of Project Leader at this time
Activity 6.7 Finalisation of maps, signage and brochures	Proposed MPA enhancements submitted and pending approval from Government/Cabinet.
Activity 6.8 Acceptance and implementation of extended MPA system	Pending approval from Government/Cabinet.
Activity 7.0 Final Steering Group Meeting and Final Report to Darwin Initiative	A final Steering Group Meeting was held in October 2013. Final Report (this document) submitted late due to (a) Government imposed delay in allowing initiation of second public consultation, and subsequent election of a new administration; priority for passing National Conservation Act, and delayed consideration of enhanced MPA and Marine Conservation Law, and (b) illness of Project Leader. Eilidh Young at LTS International has been appraised of the situation.

Commented [JRT1]: Need to attach details of proposal /link

Annex 2 Project's final logframe, including criteria and indicators

Scientific outputs are listed by publication and abstract in Annex 5, and cited in the text as 5/1 and 5/2 etc.

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.			
<p>Sub-Goal: To review the effectiveness of the Marine Protected Area system of the Cayman islands in maintaining resilience of coral reefs and shallow marine ecosystems in response to direct human impact and climate change, and if appropriate, to provide the information base to extend the system to increase that effectiveness to 30-50% of representative habitats as strict (No Take) Marine Reserve</p> <p>A5/8/10/14/15/20/27/28</p>	<p>Outputs 2-3 to assess success of current established MPAs</p> <p>Measures of resilience of reef & associated ecosystem species, communities and habitats</p> <p>Measures of extraction</p> <p>Measures of support for protection</p> <p>Increase from 15.01% to 48.2% of representative reef and associated habitats of Cayman Islands: Grand Cayman from 15.73% to 46.63%; Cayman Brac 15.31% to 41.23% and Little Cayman from 10.43% to 64.67%</p>	<p>Coral reef and associated ecosystem survey, including in water, acoustic and satellite data sets</p> <p>Geographical Information System</p> <p>Stakeholder consultations</p> <p>MPA campaign: education & awareness</p> <p>Proposal for Enhanced MPA system submitted to Government with high level of stakeholder support (A5/33)</p>	
<p>Purpose: To ensure coastal protection for human settlements and future tourism income by enhancing the protection of coral reefs thereby allowing rehabilitation of supporting ecosystems, through increased resilience to climate change.</p> <p>A5/8/10/14/15/20/27/28</p>	<p>Increases in species abundance diversity, biomass, size and fecundity of coral and fish and therefore resilience to major impacts both in and (through spillover) outside MPAs</p>	<p>Monitoring of 63 permanent sites to assess reef community resilience in the face of climate change and other impacts, especially when compared with inadequately protected sites in many degraded Caribbean locations</p> <p>Sites within MPAs will show greater resilience than sites outside MPAs, and spillover will ensure replenishment if MPAs of sufficient size</p>	<p>Major coral bleaching event during project could have severely impacted shallow reefs, resulting in change of emphasis to one of assessing reef resilience and recovery. Occurred October – November 2009 to 90m depth, but coral reef recovered</p> <p>In medium term, and due to time lag, ocean acidification will almost certainly result from high atmospheric carbon dioxide concentrations resulting in the catastrophic loss of coral reefs. Only the most resilient species will survive in a greatly modified habitat</p>

<p>Outputs</p> <p>1. Map the reef and associated subtidal ecosystem habitats around the islands to assess habitat variation and examine representativeness</p> <p>A5/1</p>	<p>Marine Habitat classification and GIS available in Cayman from Darwin project 14051.</p> <p>Additional data from satellite, <i>In situ</i> acoustic surveys (multibeam) & groundtruthing surveys from TNC Caribbean Challenge (Byrne).</p>	<p>Accuracy assessment conducted under Darwin 14051 and by DOE.</p> <p>Additional assessments showed changes in communities but no major change in habitat types characterised.</p>	<p>Temperatures cooled in November (2009) and bleached corals recovered rather than display mass mortality.</p> <p>A5/29/41/47</p>
<p>2. Assessment of the current level of reef resilience within and outside the Marine Protected Areas of Grand Cayman, Little Cayman and Cayman Brac</p> <p>A5/4/5/9/11/14/15/16/17/21/27/31/40/42/43/44/45/46/48/49</p> <p>An assessment of the extent of overspill of fish biomass from the No Take Zones into surrounding zones</p> <p>A5/2/3/7/19/26/32</p>	<p>Measures of:</p> <p>Coral cover</p> <p>Coral species abundance</p> <p>Calcareous and fleshy macroalgae</p> <p>Coral recruitment</p> <p>Frequency of coral diseases and bleaching</p> <p>Invasive lionfish</p> <p>Balance of herbivorous and carnivorous fish</p> <p>Diving surveys of fish species abundance and size, to assess biomass at sites within and at increasing distances outside of No Take Marine Protected Zones.</p>	<p>Reef survey at 55 (later extended to 63) established permanent sites around islands using visual census and video techniques.</p> <p>Comparisons with old data and photographs for some sites from 1970s and 1980s (source Ogden).</p> <p>Comparisons with permanent photo quadrats from early 2000s by McCoy.</p> <p>Statistical comparisons with video and visual census</p> <p>Use of experienced team with species specific knowledge, and training for junior members</p> <p>Regular tests of visual assessments of fish size and accuracy of species recognition</p> <p>MPA overspill detected</p> <p>Enforcement of No Take Zone by MPA patrols</p>	<p>Sites and techniques already established and old data and photographs archived. New video data archived.</p> <p>Bleaching event October 2009 meant early comparison with pre bleaching survey of July 2009 was essential.</p> <p>Additional training of junior staff in DOE to provide appropriate dive team size to satisfy health and safety requirements and ensure future monitoring capability. Assisted by Project Support Officer and Bangor M.Sc. project students working with DoE team.</p> <p>Threat of invasive lionfish became apparent</p> <p>As above.</p> <p>Assumes enforcement to ensure No Take Zones are not transgressed.</p>
<p>3. An assessment of the artisanal/recreational fishery</p> <p>A5/6/7/9/12/13/18/22/23/30/35/38/50</p>	<p>Socio-economic questionnaires directed at recreational fishers (at boat ramps, and via patrol boat), tourists in departure lounge at airport and via hotel excursion operators, diving operators, charter boat skippers, and migrant workers</p>	<p>Unbiased questionnaires and recorded interviews analysed from representative cross section of communities on each island</p> <p>~20,000 fish caught per month, ~90% reef fish</p>	<p>May not have got honest answers when recreational fishers approached in patrol boat, but in general, such fishers were compliant.</p> <p>Honesty and safety an issue when interviewing migrant workers who tend to fish late evening/night and are furtive</p>

		Higher extraction than expected	
<p>4 - 7 (subdivided below for clarity) Plan and promote an extension to the MPA system with full public consultation and involvement.</p> <p>A5/33/34/39/14/15/</p>	<p>Using data from 1-4, plan extended MPA zones to cover all representative habitats, covering at least 30% and preferably 50% shallow marine environment.</p> <p>Initial consultation to ensure public participation on all 3 islands. Show benefits in terms of results of MPA effects on reef resilience</p> <p>Ecological gap Analysis, and Protected Area Tools in GIS such as Environmental Risk Surface, Relative Biodiversity Index, and Marxan and Marzone protect area planning software</p> <p>GIS data system to show revised boundaries and purpose of zones</p> <p>Stakeholder workshops and public presentations on all 3 islands</p> <p>Acceptance and implementation of extended MPA system.</p>	<p>MPA plans led by Dept of Environment (DOE), Cayman Islands to ensure local ownership, with overseas scientists maintaining behind the scenes advisory scientific role.</p> <p>Changes in legislation facilitated by Director, DOE through Government</p> <p>Modified Management plan accepted</p> <p>Modified Monitoring plans accepted</p> <p>Modified enforcement plans accepted</p> <p>Pending Government approval</p>	<p>Caymanians have been highly supportive of MPA system since benefits have been so obvious, especially in comparison with other Caribbean islands where reefs are substantially more degraded</p> <p>National Conservation Bill became Law 2013 and provided framework for modifications to Marine Conservation Law</p> <p>Threats from climate change are widely recognised (especially increased intensity and frequency of hurricanes, sea level rise and mass coral mortality from bleaching and disease) because most have suffered effects. Coastal protection and income from tourism are recognised as being widely important and need to update MPA system is generally understood.</p> <p>Sensitization high due to existing MPA system, and education elements are already exceptionally strong amongst much of population, but less so older fishers</p> <p>This Project nearly undermined by another DEFRA project which aimed to undertake socioeconomic surveys to assess reef use (causing confusion and fatigue), and examine governance in ignorance of most of above</p> <p>Enhanced MPA system approval delayed due to election May 2013 and new administration.</p>

Original work plan followed:

Activities (detailed in work plan)	Monitoring Indicators
1.1 Steering Group Meeting 1 to Establish Darwin project 1.2 Stakeholder meeting 1: Marine Conservation Board 1.3 Link with Darwin 14051 (Exeter) review of BAP and GIS Marine habitat maps (Cayman) 1.4 Assess existing long term data sets 1.5 Initial Ecological Gap Analysis assessment (EGA) (Marine Conservation Workshop 1) 1.6 Steering Group Meeting 2: Objectives and methodologies	Existing data assessed and initial EGA completed to identify survey objectives. Stakeholders engaged with Darwin project. 2 Steering Group Meetings (1 & 2) 1 Marine Conservation Board (1) 1 Marine Conservation Workshop (1)
2.1 Reef resilience field training and survey 2.2 Fish biomass field training and survey 2.3 ½ year reports Darwin Initiative 2.4 Stakeholder meeting 2: Marine Conservation Board 2.5 Reef resilience survey 2 2.6 Fish biomass survey 2 2.7 ½ year report to Darwin Initiative and Final report on Benefits of extended MPAs	Darwin Fellows trained in specific methodologies to take part in field work Data on MPA effects on resilience attained and compared with pilot studies Impact of October 2009 bleaching event quantified in short term and medium term Papers on reef resilience presented at GCFI 2010, Euro ISRS 2010 and ICRS 2012 accepted Benefits of MPA system quantified, and communicated to stakeholders Importance of effective enforcement reinforced and Marine Conservation Officers informed/training enhanced 1 Marine Conservation Board (2) 2 x ½ year DI reporting
3.1 Socioeconomic assessment of artisanal and migrant worker fishers 3.2 Socioeconomic assessment of recreational fishers 3.3 Interim report of fisher surveys 3.4 Annual Reporting to Darwin Initiative 4.1 Ecological Gap Analysis update and review 4.2 Steering Group Meeting 3: Identification of concerns and threats 4.3 District community stakeholder meetings on Grand Cayman, Little Cayman and Cayman Brac: engage comments on perceived threats and goals 4.4 Environmental Risk Assessment and mapping 4.5 Field survey to verify specific habitats	Data on non-commercial fishing pressure attained & compared with pilot survey. Fisher impact compared with fish biomass study Papers on recreational fishing presented at GCFI 2010, Euro ISRS 2010 and ICRS 2012 accepted EGA reviewed in context of new field data Stakeholders views on threats and conservation goals assessed Environmental risks to specific habitats/species mapped and verified 1 Steering Group Meeting (3)

	3 Community Stakeholder meetings (3 islands) Annual DI reporting
5.1 Steering Group Meeting 4: Marine Protected Area Planning 5.2 Marine Conservation workshop 2 and training: Site Conservation Index and Relative Biodiversity Index Assessment Calculation Workshop 5.3 Marine Conservation Workshop 3 and training: Use of Marxan protected area modelling software 5.4 Review conservation scenarios - determine optimal configuration of protected areas that meet user defined conservation goals. 5.5 Field verification of possible configurations	Darwin Fellows trained in Protected Area tools Biodiversity Index for sites quantified Optimal configuration of protected areas that meet user defined conservation goals determined Verified by field assessment Papers on protected area enhancement based on quantitative assessment presented at IMCC Washington DC 1 Steering Group Meeting (4) 2 Marine Conservation Workshops (3 & 4)
6.1 Marine Conservation Board and Community Stakeholder consultation (3) on MPA protected area optimal configuration 6.2 Steering Group Meeting 5: Consideration of feedback and implementation planning 6.3 Marine Conservation Law modifications 6.4 Development of MPA management plan, monitoring plans, enforcement plans and education plans 6.5 Presentations at international conferences 6.6 ½ year report to Darwin Initiative on implementation 6.7 Finalisation of maps, signage and brochures 6.8 Acceptance and implementation of extended MPA system	Stakeholders consulted on proposed options for MPA area configuration Relevant changes in Marine Conservation Law made Monitoring plans, enforcement plans and education programs adopted Clear dissemination of new laws and areas Optimal configuration of enlarged MPA covering 30% - 50% Cayman shelf accepted if appropriate Increases in species abundance diversity, biomass, size and fecundity and therefore resilience to major impacts both in and (through spillover) outside MPAs ½ year DI reporting Marine Conservation Board (3) 3 Stakeholder Community Meetings (3 islands) 1 Steering Group Meeting (5)
7.0 Final Steering Group Meeting and Final Report to Darwin Initiative	Final Steering Group Meeting (6) Final DI Reporting

Annex 3 Project contribution to Articles under the CBD

Project Contribution to Articles under the Convention on Biological Diversity

Article No./Title	Project %	Article Description
6. General Measures for Conservation & Sustainable Use		Develop national strategies that integrate conservation and sustainable use.
7. Identification and Monitoring	20	Identify and monitor components of biological diversity, particularly those requiring urgent conservation; identify processes and activities that have adverse effects; maintain and organise relevant data.
8. In-situ Conservation	70	Establish systems of protected areas with guidelines for selection and management; regulate biological resources, promote protection of habitats; manage areas adjacent to protected areas; restore degraded ecosystems and recovery of threatened species; control risks associated with organisms modified by biotechnology; control spread of alien species; ensure compatibility between sustainable use of resources and their conservation; protect traditional lifestyles and knowledge on biological resources.
9. Ex-situ Conservation		Adopt ex-situ measures to conserve and research components of biological diversity, preferably in country of origin; facilitate recovery of threatened species; regulate and manage collection of biological resources.
10. Sustainable Use of Components of Biological Diversity		Integrate conservation and sustainable use in national decisions; protect sustainable customary uses; support local populations to implement remedial actions; encourage co-operation between governments and the private sector.
11. Incentive Measures		Establish economically and socially sound incentives to conserve and promote sustainable use of biological diversity.
12. Research and Training		Establish programmes for scientific and technical education in identification, conservation and sustainable use of biodiversity components; promote research contributing to the conservation and sustainable use of biological diversity, particularly in developing countries (in accordance with SBSTTA recommendations).
13. Public Education and Awareness	10	Promote understanding of the importance of measures to conserve biological diversity and propagate these measures through the media; cooperate with other states and organisations in developing awareness programmes.
14. Impact Assessment and Minimizing Adverse Impacts		Introduce EIAs of appropriate projects and allow public participation; take into account environmental consequences of policies; exchange information on impacts beyond State boundaries and work to reduce hazards; promote emergency responses to hazards; examine mechanisms for re-dress of international damage.
15. Access to Genetic Resources		Whilst governments control access to their genetic resources they should also facilitate access of environmentally sound uses on mutually agreed terms; scientific research based on a country's genetic resources should ensure sharing in a fair and equitable way of results and benefits.

Article No./Title	Project %	Article Description
16. Access to and Transfer of Technology		Countries shall ensure access to technologies relevant to conservation and sustainable use of biodiversity under fair and most favourable terms to the source countries (subject to patents and intellectual property rights) and ensure the private sector facilitates such assess and joint development of technologies.
17. Exchange of Information		Countries shall facilitate information exchange and repatriation including technical scientific and socio-economic research, information on training and surveying programmes and local knowledge
19. Bio-safety Protocol		Countries shall take legislative, administrative or policy measures to provide for the effective participation in biotechnological research activities and to ensure all practicable measures to promote and advance priority access on a fair and equitable basis, especially where they provide the genetic resources for such research.
Other Contribution		Smaller contributions (eg. of 5%) or less should be summed and included here.
Total %	100%	Check % = total 100

Annex 4 Standard Measures

Code	Description	Totals (plus additional detail as required)
Training Measures		
1a	Number of people to submit PhD thesis	1
1b	Number of PhD qualifications obtained	1
2	Number of Masters qualifications obtained	9
3	Number of other qualifications obtained	1
4a	Number of undergraduate students receiving training	530
4b	Number of training weeks provided to undergraduate students	10
4c	Number of postgraduate students receiving training (not 1-3 above)	86
4d	Number of training weeks for postgraduate students	30
5	Number of people receiving other forms of long-term (>1yr) training not leading to formal qualification(ie not categories 1-4 above)	Interns on project 12
6a	Number of people receiving other forms of short-term education/training (ie not categories 1-5 above)	lionfish culling training approx. 300-350 per year

Code	Description	Totals (plus additional detail as required)
6b	Number of training weeks not leading to formal qualification	13
7	Number of types of training materials produced for use by host country(s)	7
Research Measures		
8	Number of weeks spent by UK project staff on project work in host country(s)	166
9	Number of species/habitat management plans (or action plans) produced for Governments, public authorities or other implementing agencies in the host country (s)	1
10	Number of formal documents produced to assist work related to species identification, classification and recording.	2
11a	Number of papers published or accepted for publication in peer reviewed journals	5
11b	Number of papers published or accepted for publication elsewhere	1
12a	Number of computer-based databases established (containing species/generic information) and handed over to host country	0
12b	Number of computer-based databases enhanced (containing species/genetic information) and handed over to host country	5
13a	Number of species reference collections established and handed over to host country(s)	0
13b	Number of species reference collections enhanced and handed over to host country(s)	0
Dissemination Measures		
14a	Number of conferences/seminars/workshops organised to present/disseminate findings from Darwin project work	31
14b	Number of conferences/seminars/ workshops attended at which findings from Darwin project work will be presented/ disseminated.	25
15a	Number of national press releases or publicity articles in host country(s)	43
15b	Number of local press releases or publicity articles in host country(s)	43 (as above, Cayman small islands)
15c	Number of national press releases or publicity articles in UK	1
15d	Number of local press releases or publicity articles in UK	3
16a	Number of issues of newsletters produced in the host country(s)	

Code	Description	Totals (plus additional detail as required)
16b	Estimated circulation of each newsletter in the host country(s)	?
16c	Estimated circulation of each newsletter in the UK	?
17a	Number of dissemination networks established	1
17b	Number of dissemination networks enhanced or extended	3
18a	Number of national TV programmes/features in host country(s)	40
18b	Number of national TV programme/features in the UK	1
18c	Number of local TV programme/features in host country	40 (as above)
18d	Number of local TV programme features in the UK	1
19a	Number of national radio interviews/features in host country(s)	8
19b	Number of national radio interviews/features in the UK	1
19c	Number of local radio interviews/features in host country (s)	8 (as above)
19d	Number of local radio interviews/features in the UK	1
Physical Measures		
20	Estimated value (£s) of physical assets handed over to host country(s)	£
21	Number of permanent educational/training/research facilities or organisation established	0
22	Number of permanent field plots established	63
23	Value of additional resources raised for project	£
Other Measures used by the project and not currently including in DI standard measures		
	Number of electronic or printed education materials produced in host country (i.e. leaflets, education packs etc.)	4
	Number of stakeholder meetings, presentations or events in host country	81
	Number of meetings or presentations or events in UK or Internationally	13
	Number of project videos made in host country	2
	MPA review online survey responses	463

Ref No	18_016
Project Title	Darwin Initiative to Enhance an Established Marine Protected Area System, Cayman Islands
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