Darwin Initiative Main: Final Report

It is expected that this report will be a **maximum of 20 pages** in length, excluding annexes.

Submission Deadline: no later than 3 months after agreed end date.

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Darwin Initiative Project Information

Project reference	DPLUS140
Project title	**Assessment and conservation of Cayman Islands' deep-water reefs and fishes**
Country(ies)	Cayman Islands
Lead Partner	Heriot-Watt University
Project partner(s)	Marine Conservation International, Beneath the Waves & Cayman Islands Dept. of Environment
Darwin Initiative grant value	£207,681
Start/end dates of project	01/10/2021 – 31/03/2024
Project Leader name	Mauvis [redacted] & Austin [redacted]
Project website/blog/social media	Doe.ky
Report author(s) and date	Mauvis [redacted] and Austin [redacted] March 2024

1 Project Summary

The Cayman Islands include Grand Cayman, Little Cayman and Cayman Brac and are located in the north-western Caribbean Sea (see Figure 1). Grand Cayman lies south-west, 110km away from the sister island Little Cayman and these two islands were the focus of the project.

The islands are low lying and have a fringing coral reef habitat on a narrow coastal shelf. The shelf gives way quickly and steeply to slopes down to >2000m and Grand Cayman is bordered in the south by the Cayman Trough, >7000m deep (Roberts, 1994). The shelf encompasses shallow sounds, mangrove forests and coral reefs. The three islands have Marine Protected Areas of 44% of the coastal shelf that provide distinct levels of protection in different sites (National Conservation Law, 2013. Law 24 of 2013. supplement No.1, Extraordinary Gazette No. 9 dated 5th February, 2014).

The Cayman's islands lie adjacent to deep ocean trenches, yet little is known of its marine life below 50m, or whether its deep reefs offer a refuge from climate change. During the project partners undertook surveys of Cayman seabed habitats down to 2000m and assessed species overlap between shallow-water and deep-reef communities. The work focussed on threatened and commercial fish species, including sharks, and mapped the distribution of deep-water coral and other biotopes with a view to designating additional protected areas.

In the last decade there has been a dramatic increase in awareness of the importance of mesophotic coral ecosystems (MCEs) and deeper reef and seabed zones (Lesser

et_al._2018), with new evidence of exceptional fish biomass in the mesopelagic zone (Irigoien et_al._2014). Surveys conducted in parts of the Caribbean and elsewhere have revealed that mesophotic and sub-mesophotic zones harbour a partially distinct fauna (Smith et_al._2010; Baldwin et_al._2018) and that many shallow-water species make extensive use of deep reefs.

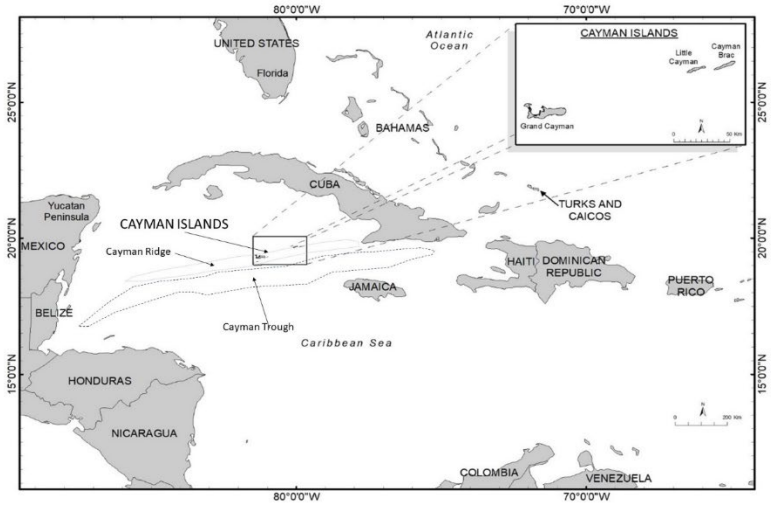

Figure 1. Map of the Cayman Islands in north-eastern Caribbean Sea, showing the relationship to the Cayman Trough and an inset of the position of the three Cayman Islands (Main map: reproduced with permission from Esri, USGS | Esri, TomTom, FAO, NOAA, USGS | Sources: Esri; Garmin International, Inc.; U.S. Central Intelligence Agency (The World Factbook); National Geographic Society. Map of the Cayman Islands: reproduced with permission from Department of Environment, Cayman Islands Government.).

Globally, MCEs are inadequately protected by fishery regulations or MPAs (Soares et al._2020) and in many regions under immediate threat of pollution from sea-bed mining for metalliferous nodules adjacent to ocean trenches (Churchyard et_al._2016; Tilot et_al._2018). Also, as traditional fish stocks become exhausted, deep-water species are threatened by unregulated, unsustainable fishing (Baker et_al._2016; Rocha et_al._2018). Commercial and recreational interests are targeting newly discovered deep reefs that are the spawning grounds or migration corridors of deep-water snapper and grouper (Sadovy-de-Mitcheson et_al._2013; Heileman_2011). Furthermore, the extent to which deep-reef habitats interact ecologically with shallow-reef areas or serve as a cooler refuge from ocean warming for shallow-water species has become a critical environmental issue (Muir et_al._2018, Semmler et_al._2016, Laverick et_al._2018).

The Cayman Islands has designated 44% of its shallow coastal shelf as Marine Protected Areas (MPAs), to protect its well-developed, economically important fringing coral reefs, mangrove stands and seagrass beds (Dromard et_al._2011). These MPAs have been effectively managed over 25 years, but only extend 0.5-1km offshore/25-45m deep.
Little is known in the Cayman Islands of the habitats or biota associated with deeper seabeds (Wind_2015) extending to 2000m within territorial waters (12nm from shore) and >6000m within Cayman's extensive (119,137km^2) Exclusive Economic Zone (EEZ). The Cayman Islands DOE is thus concerned to inform itself about its renewable deep-sea resources, and initiate measures to secure their sustainable use.

This work proposed here is now a priority for the Cayman Department of Environment since, while being tasked with promoting the biological diversity and sustainable use of natural resources throughout the Islands and their surrounding waters, almost no information is available from the Cayman Islands on the character of the deep reef and seabed below 50m, nor on the principal species present. Although a well-managed network of Marine Protected Areas (MPAs) effectively protects shallow-water coastal reefs and associated habitats such as mangrove forest and seagrass beds, as yet no planning is possible to protect or manage the greater part of Cayman territorial waters, let alone the huge extent of Cayman Islands' EEZ.

Protection of marine habitats and species throughout national waters is a requirement of both the Convention on Biological Diversity (CBD), which was extended to the Cayman Islands in 1992, and the Cayman Islands Environment Charter (2001), which includes a commitment (item 2) to “Ensure the protection and restoration of key habitats and species ….through legislation and appropriate management structures and mechanisms…”. Subsequently the National Strategic Plan (Vision_2008) stated an objective “to protect the coral reefs of the Cayman Islands from further adverse impacts,” while the Cayman National Biodiversity Action Plan (2009) had the goal of “no net loss of biodiversity”, to be achieved through a two-pronged approach, including the preservation of key species, through Species Action Plans, and of critical habitats through the establishment of Protected Areas.

In 2013 a further National Conservation Act (2013/24) was enacted in order *inter alia*: to promote and secure biological diversity and the sustainable use of natural resources in the Cayman Islands; to protect and conserve endangered, threatened and endemic wildlife and their habitats; and to provide for protected terrestrial, wetland and marine areas. The legislation established a new National Conservation Council (NCC) and gives protection (in Schedule_1) to all species of marine mammal (cetaceans), sharks and rays (elasmobranchs), sea-urchins and starfish (echinoderm) and hard and soft corals (Anthozoa), even though their occurrence outside near shore water is poorly known.

The Act was also established to give effect within the Cayman Islands to the provisions of a series of international agreements including not only the CBD, the Convention on the Migratory Species (CMS) and the United Nations Framework Convention on Climate Change, but also several regional agreements including a) the Protocol Concerning Specially Protected Areas and Wildlife (SPAW) and b) the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region.

However, although the Cayman NCC may designate any area of Cayman waters as a protected area, those established to date include only shallow-water environments, usually to a depth of 24m. The present project assessed biodiversity to a depth of 2000m, and recorded species, especially of elasmobranchs, included in the CMS Appendices (such as the hammerhead sharks *Sphyrna lewini* and *S. mokarran*).

Data obtained from surveys of the deep-sea around Grand Cayman and Little Cayman have informed the development of Species/Habitat Action Plans for two species of hammerhead shark. The 10+ year MCI– DOE (part Darwin-plus funded) Cayman Islands Shark Conservation Project resulted in a good understanding of the abundance and biology of sharks, rays, and other predatory fish in coastal waters, but no sampling was conducted at depths greater than 30m. Thus, none of the deep-water elasmobranch species likely to be present were detected. Three very deep-water sharks have been recorded in the Cayman Trench during oceanographic work (Ethier_2008, Messing et_al._2013), but no other information is available, and the protection and management of these species is not specifically addressed within the Cayman Islands.

2 Project Partnerships

The project was formed after a discussion between MCI, who have been working with the Cayman Islands DoE for over 10 years, to partner with BTW to study the Cayman Islands deep-sea waters. All partners were subsequently involved in project planning and decision making throughout the project. BTW had approached MCI with the suggestion. Both BTW and MCI have been working with novel technology to study the biodiversity of the deep-sea, leveraging customized and portable technologies which record video at depths previously inaccessible by small research teams doing work in the Caribbean. All partners were subsequently involved in project planning and decision making throughout the project, which we believe helped create positive working relationships between all partners, which generated a strong body of results with applied implications.

After the initial planning and application to DEFRA for a grant to help to support the project, the partners worked on key aspects and met regularly to discuss progress. Heriot-Watt University

(HWU) managed the funds from DEFRA and oversaw the running of the project. The Cayman Islands Department of Environment (DoE) provided local expertise and knowledge and managed the accommodation, office space and use of boats for surveys of both Grand and Little Cayman. Marine Conservation International (MCI) organised and ran deep-sea surveys to 200m around the two islands and liaised with Blue Abacus to collaborate on data analysis on the DEFRA BlueBelt project in relation to the Cayman Islands. MCI collaborated with the DoE to conduct fisher interviews on deep-sea fishing and MCI analysed these data. MCI wrote draft biodiversity action plans for the DoE and NCC to consider. Beneath the Waves (BTW) organised and ran deep-sea surveys between 500 and 2000m around the two islands, as well as taking deepwater samples for eDNA water quality analyses. All partners were involved in preparing the Final Report.

Engagement between all partners has been strong and professional. All partners are working well together and are engaged. To that end, over the last year, all project partners were involved in project planning, monitoring, evaluation, and decision-making. In particular, the teams from MCI, BTW, HWU have worked very well with the DoE, Cayman Islands, and in this way continuing to contribute strongly to their demand in using data from the project to inform their management strategies. The project stakeholders (i.e., external to project leads) have been very positive in response to and excited by the results we have produced to date, with regard to the fauna and types of habitat. The use of common resources, e.g. boats and office space, was resolved by using these at different periods, although this made working together directly more difficult. All partners, MCI, BTW and HWU will continue their working relationship with the DoE.

The deep-sea fishing community were very helpful with information on their catch and conditions related to different fish species [results of interviews]. We also had advice and discussions of the project and its methods and results with the DoE staff, the dive operators and community, including a technical diver on tackling depths. Our outreach programme brought us into the schools and public as well. All provided useful feedback on the project and allowed us to keep them informed of our progress and results.

3 Project Achievements

3.1 Outputs

The designated Outputs from this project contributed data, knowledge, and decision-making support tools, and have been identified in the logframe as databases, papers, reports, informing of management plans, and multimedia outputs. The creation and delivery of these Outputs were largely driven by planning, preparation, and the execution of fieldwork activities for data collection, analysis and interpretation of these data, incorporation of these data within GIS maps, as well as discussions and meetings between project partners and stakeholders.

Output 1 is a database of observations showing the diversity and abundance of significant deep-reef fish, sharks, hard and soft corals, and major biotopes. To create this database, considerable fieldwork and data collection were involved. We have deployed a significant number of deep BRUVS at 50-200m around the islands and offshore on the Cayman Bank (Activity 1.1), resulting in a cumulative 164 of the proposed 160 deployments throughout the year. Similarly, we have deployed drop-down camera rigs from 500-2000m in similar locations (Activity 1.2), resulting in 40 of 40 attempted deployments, of which 34 yielded successful data, from targeted expeditions occurring in March 2022, July 2022, September 2022, April 2023 and August 2023. Pelagic BRUV videos in 100-200m zones around the islands and offshore banks have also occurred (Activity 1.3), resulting in 20 drops with 5 more planned in May 2023. A total of 22 complementary eDNA samples were collected from surface waters (0-10 m) and twilight-zone depths (200 m), resulting in successful DNA extractions which facilitated analysis (sequencing) and end-point data for fish and shark biodiversity. Technical dives to 100m at focal areas did not take place (Activity 1.4), as local scuba divers from DiveTech were unexpectedly unable to assist (discussed in Annual Report 1). We had informal discussions with anglers and fishers on our results (Activity 1.5), who have advised us on areas of interest with deep-sea biodiversity and fish stock. Details of these activities are described below

(Output 5). All videos from the deep BRUVS (50-200m) have been analysed for fish species (including elasmobranchs) and the substrate categories and habitat classification have been analysed (Activity 1.6) and the extensive results are presented in a written report (Annex 5.6 DeepBRUVS_results_30IV24.pdf). For the deeper drop down camera BRUVS, analyses of videos yielded a total of 50 teleost observations, comprised of 14 successful species identifications and 11 observations which could not be confirmed to the Family level (note that these observations will undergo additional consultation with deep-sea experts in efforts to attempt to resolve them for final publications). A total of 25 shark observations were recorded, resulting in 8 unique species, including at least two very rare and poorly understood deep-sea sharks, which also comprise first-records for Cayman and the insular Caribbean Sea. For the eDNA component of the project, all collected water samples yielded marine fish DNA after extractions, which allowed for DNA sequencing using two different primer sets (MiFish and Shark150) to align any present DNA to the best available libraries for teleost fishes and sharks. A total of 35 fishes were detected at the Order level, 34 at the Family level, 28 at the Genus level, and 14 at the species level. At least two of the fish species detected using eDNA from deeper waters comprised extremely small and rare deep-sea fishes seen only in the mesophotic zone. A total of 5 sharks were detected at the Order, and Family level, respectively; and 4 sharks were detected at the species level. None of the teleost species detected in the eDNA samples were observed in the drop down BRUVs. Only one shark species seen on the drop down BRUVs was also seen on the eDNA. Taken together, these results suggest that two different approaches to yield slightly different estimates of biodiversity, although they sampled at different deep-sea depths.

1. Output 1 has the data from analyses of the deep BRUVS (50 – 200m) and deep drop-down camera rigs recorded in a digital database and shared with the DoE (Activity 1.7, Annex 5_8).

2. Output 2 has maps showing the distribution of species and biotopes including deep-water areas of conservation significance, with inclusions of coral rich biotopes and where fish and sharks were found. Data from analyses of the deep BRUVS (50 – 200m) and the deeper drop down BRUVS have been shared with the DoE GIS Officer and are now part of the DoE GIS system (Activity 2.1, Annex 5_7). Regular meetings with the DoE GIS Officer have resulted in data from the drift camera BRUVS (50 – 200m) being used to generate maps for fish and elasmobranchs at 50m, 100m and 200m at each site, as well as maps of substrate type and fauna (Activity 2.2, Annex 5_7).

3. Output 3 comprises scientific report(s) and/or paper(s) on the survey/research findings. Following analyses of both types of BRUV deployments, data have been collated and patterns have been viewed and analysed (Activity 3.1). We have examined patterns using GIS (Activity 3.2). We have successfully published three scientific papers with selected results from the project (Activity 3.3). The first manuscript documented and reported the first records of lantern sharks in the region, as detected using the drop down cameras in the project, which was published in the journal Frontiers in Marine Science in April 2023 (Activity 3.4). The second manuscript reported on the return of hammerhead sharks in Cayman waters, as detected using the drift cameras; this paper was published in the journal Frontiers in Marine Science in February 2024. A third paper, which described a depth range extension for the misty grouper, as observed using the drop down cameras, was published in the journal Fishes in March 2024. An additional manuscript documenting the first occurrence of the roughskin dogfish in the insular Caribbean has also been submitted to a journal and is in revision (Annex 5_1).

4. Output 4 has a Habitat Action Plan (HAP) for mesophotic and sub-mesophotic habitats areas and Species Action Plans (SAP) for deep-water fish. To that end, we held discussions with the DoE Manager of the Legislation, Implementation & Coordination Unit on developing the HAP for consideration by the NCC (National Conservation Council) and then by the public (Activity 4.1). We discussed developing SAPs, focusing on the management of deep-water fish stocks (Activity 4.2). We also held meetings with the Director and Deputy Director of the DoE to discuss our findings to date and how these can be best developed into management recommendations (Activity 4.3). From these

discussions, we prepared appropriate documents and submitted these to the DoE, and they will be considered by the NCC (Activity 4.4-4.7, Annex 5_6).

5. Output 5 is press, social media releases and presentations on the project aims and progress. These outputs were directed at strengthening stakeholder support for Action Plans and MPA recommendations. Media pieces were prepared released by project partners (see Table 1 and Annex 5_3, Activity 5.1). Media pieces have been released and posted by the partners' social media platforms (Activity 5.2, see Table 1). Talks describing the purpose, progress, and findings from the project have been prepared and delivered (Activity 5.3, see Table 2). Table 3 summarises the media disaggregated. Presentations were given to the Cayman's NCC (National Conservation Council) describing the purpose, progress and findings of the project and for feedback from the council (Activity 5.4). The response of the NCC was very positive. The DoE Director and Deputy Director remarked that the project is both timely and important for the work of the DOE, since it has become pressing to extend the project's objectives and activities further offshore. Lisa Hurlston-McKenzie, Senior Policy Advisor (Environment) in Cayman's Ministry of Sustainability and Climate Resiliency, noted that Cayman is working towards a climate change policy, and consultants on climate change risk assessment highlighted the deep sea and offshore environment as a knowledge gap for Cayman and that this project was providing information to help fill this gap.

There were a few problems encountered during the project. One was a hurricane in November 2022, and so we rearranged our fieldwork to concentrate on data input, as communication with stakeholders was not possible during this period. We lost some of our deep-sea drift gear near the end of the fieldwork. However, due to the design of the gear, we were able to reconfigure the remaining gear to complete the surveys. The MTR was unexpected and took a considerable amount of planning and time to provide the support and resources needed for the reviewer. This was not in the budget and took valuable field time from the project. To overcome these problems, one person (Mauvis Gore) oversaw and carried out the planning, overseeing and management needed for and by reviewer and paid for this out of her portion of the budget.

Table 1. A list of outreach activities, press and social media releases during the project

Outreach	Partner	Date	Darwin Plus mentioned
Facebook	DoE-MCI-BTW		yes
google drive	DoE-MCI-BTW		yes
Press	BTW	Oct-22	yes
Press	MCI	Sep-22	Yes
Press	HWU	Jul-22	yes
Press	BTW	Feb-24	yes
Magazine	MCI	Apr-24	yes
Radio	DoE-MCI-BTW	Nov-22	yes
Social Media posts	DoE-MCI-BTW	24/06/2022	yes
Social Media posts	DoE-MCI-BTW	31/03/2023	yes
Social Media posts	DoE-MCI-BTW	30/03/2023	yes
Social Media posts	DoE-MCI-BTW	25/03/2023	yes
Social Media posts	DoE-MCI-BTW	18/03/2023	yes
Social Media posts	DoE-MCI-BTW	11/03/2023	yes
Social Media posts	DoE-MCI-BTW	12/10/2023	yes
Video	BTW	Feb-23	yes
yoututbe	DoE-MCI-BTW		yes

Table 2. A list of presentations given during the project

Subject	Audience	Date	Darwin Plus mentioned
DeepSee Cayman	Cayman Island Brewery Public Event	15/02/2023	yes
	Cayman International School	16/02/2023	yes
	Little Cayman Beach Resort Public Talk	21/02/2023	yes
	Cayman Government Administration Talk	28/02/2023	yes
	Cayman Prep & High School	09/03/2023	yes
Assessment and Conservation of Cayman Islands' deep-water reefs and fishes	Marine Alliance for Science and Technology for Scotland Annual Science Meeting	05/12/2023	yes
	Heriot-Watt University Fisheries Workshop	10/03/2024	yes
	Cayman Islands National Conservation Council	26/09/2022	yes
	Cayman Islands National Conservation Council	06/02/2023	yes

Table 3. Media disaggregation

Media	2021	2022	2023	2024
Social media	1	7	12	
Press	1	3	2	
Presentations / Talks	1	1	7	1
Video			5	1
Radio		1		

3.2 Outcome

The project achieved its intended Outcome in the generation of species and habitat action plans for mesophotic and sub-mesophotic environments in the Cayman Islands. These were a species action plan for the management of endangered hammerhead shark species (following publication of a paper on the signs of recovery of these species in Cayman) and a habitat action plan, including recommendations for measures to prevent overfishing of deep-water snapper and grouper, and for further mapping of deep reef habitats with a view to the designation of new offshore MPAs or the extension of existing coastal MPAs in to deep water. The DoE and Cayman Islands' Government will use the data and conclusions provided in our discussions and the HAP/SAP reports, to inform future measures in-line with the DoE's marine spatial planning goals. We anticipate these plans being considered by the National Conservation Council (NCC) in the near future, though likely some revision will be required before they are adopted. Nevertheless the publication of these draft plans is a measurable indicator of our success.

The other main indicator of the progress towards this Outcome will be that our recommendations for one of more MPAs (or extensions of existing MPAs into deep ocean areas) will be presented to NCC and/or DoE by the end of the project (Annex 5_6).

3.3 Monitoring of assumptions

The Outcome and Output level assumptions were monitored throughout the project.

Assumption 01: We had the continuing support of DoE directorship and staff
Assumption 02: We had the use of DoE accommodation, vessels and vehicles available as agreed
Assumption 03: We had planned fieldwork periods for best weather periods of year. We endured a hurricane once and managed to work around this disruption.
Assumption 04: The Covid-19 epidemic was largely under control in UK and Cayman Island and the team were vaccinated.
Assumption 1.1: See Assumption 01 and 03.

Assumption 1.2: We acquired the scientific gear needed and it was operational for the surveys. One set of gear was lost in the final phase of survey work and we managed to work around this to fulfill our goals. We were not able to analyse any water samples for water quality parameters, as the integrity of the samples would have been sacrificed in the transport, and budget did not allow for the purchase of portable water quality probes or sensors.
Assumption 2.1: We were able to generate more than sufficient data from our fieldwork to permit formulation of policies and action plan
Assumption 2.2: The DoE GIS officer was available for mapping the data.
Assumption 3.1: MCI collected data from surveys and interviews and analysed the data and mapped results.
Assumption 3.2: Continuing availability and cooperation of relevant scientific staff held true
Assumption 3.3: We have no reason to assume that these will not be approved
Assumption 3.4: We have had three scientific papers published in scientific journals and one other in revision.
Assumption 4.1: Ample data has been generated by fieldwork to permit formulation of policies and action plans. This has been submitted to the DoE for their review and comment.
Assumption 4.2: The draft Action Plans are with the DoE and they will pass these on to the NCC.
Assumption 5.1: Stakeholders have continued to hold interest in participating, most notably in the fisher interviews.

3.4 Impact: achievement of positive impact on biodiversity and poverty reduction

The Cayman Islands' National Strategic Plan (Vision_2008) stated an objective "to protect the coral reefs of the Cayman Islands from further adverse impacts," while the Cayman National Biodiversity Action Plan (2009) had the goal of "no net loss of biodiversity", to be achieved through a two-pronged approach, including the preservation of key species, through Species Action Plans, and of critical habitats through the establishment of Protected Areas. We expected to impact on biodiversity through enhanced MPA protection of Cayman's deep reefs and seabed to 2000m, of fishes that are threatened (e.g. sharks) or of commercial interest (deep-water snappers), and of hard and soft corals.

As a part of this, sustained monitoring will be managed by the DOE and local partners, to ensure data collection will continue. An immediate, direct benefit of the increased knowledge and protection of deep-water areas will support sustainability of deep-water fish species such as snapper and grouper. In the medium-term wider benefits will include maintaining the health of the mesotrophic zone as a potential refuge for shallower coral reef species, enabling them to repopulate Cayman's economically important coral reefs following anticipated periods of coral bleaching and mortality. It will also enable the Cayman Islands' Government to fulfil its obligations under the CBD, CMS and other international and regional conventions, including increasing its overall percentage of Marine Protected Area towards the widely agreed target of 30% of national waters.

Working with fishers has helped to bring a better understanding of their catch. The monitoring and safe-guarding the quality of the environment throughout Cayman waters are protective buffers to coastal and deep waters, on whose health a significant proportion of Caymanians depend for both their income and recreation.

The ultimate beneficiaries will be present and future generations of Caymanians, pre-eminent among whom will be those involved in the tourism and fisheries sectors. At the end of a previous project in Cayman, we conducted a public consultation exercise which revealed overwhelming support for marine conservation measures, with for example 92% of respondents favouring protection of sharks.

It should be noted that while there is poverty in the Cayman Islands, the territory "has one of the highest levels of GDP per capita of any jurisdiction in the world, which stood at USD 88,432 per capita in current dollars in 2019" (www.undp.org/jamaica/countries-we-serve).

4 Contribution to Darwin Initiative Programme Objectives

The Government of The Cayman Islands has clearly demonstrated their commitment to improving the management of its marine resources, and the Department of the Environment supported and endorsed our project due to its potential to provide critical information on deep-sea fish biodiversity. They have also made clear their desire to use the findings from our project to assist with expanding their network of shallow water MPAs out into the adjacent deep waters. These actions will be supported by our deep-sea biodiversity data, and therefore this project should have a positive impact on biodiversity. As an island nation with a large reliance on healthy oceans and marine resources to support its GDP and the myriad jobs the maritime and tourism industries support, this project will also have a positive indirect impact on poverty reduction and human well-being.

4.1 Project support to the Conventions or Treaties (e.g. CBD, Nagoya Protocol, ITPGRFA, CITES, Ramsar, CMS, UNFCCC)

This project was a priority for the Cayman Department of Environment since, while being tasked with promoting the biological diversity and sustainable use of natural resources throughout the Islands and their surrounding waters, almost no information was previously available from the Cayman Islands on the character of the deep reef and seabed below 50m, nor on the principal species present. Although a well-managed network of Marine Protected Areas (MPAs) effectively protects shallow-water coastal reefs and associated habitats such as mangrove forest and seagrass beds, there was no planning as yet to protect or manage the greater part of Cayman territorial waters, let alone the huge extent of Cayman Islands' EEZ.

Protection of marine habitats and species throughout national waters is a requirement of both the Convention on Biological Diversity (CBD), which was extended to the Cayman Islands in 1992, and the Cayman Islands Environment Charter (2001), which includes a commitment (item 2) to "Ensure the protection and restoration of key habitats and species ….through legislation and appropriate management structures and mechanisms…". Subsequently the National Strategic Plan (Vision_2008) stated an objective "to protect the coral reefs of the Cayman Islands from further adverse impacts," while the Cayman National Biodiversity Action Plan (2009) had the goal of "no net loss of biodiversity", to be achieved through a two-pronged approach, including the preservation of key species, through Species Action Plans, and of critical habitats through the establishment of Protected Areas.

In 2013 a further National Conservation Act (2013/24) was enacted in order inter alia: to promote and secure biological diversity and the sustainable use of natural resources in the Cayman Islands; to protect and conserve endangered, threatened and endemic wildlife and their habitats; and to provide for protected terrestrial, wetland and marine areas. The legislation established a new National Conservation Council and gives protection (in Schedule_1) to all species of marine mammal (cetaceans), sharks and rays (elasmobranchs), sea-urchins and starfish (echinoderm) and hard and soft corals (Anthozoa), even though their occurrence outside near shore water is poorly known.

The Act was also established to give effect within the Cayman Islands to the provisions of a series of international agreements including not only the CBD, the Convention on the Migratory Species (CMS) and the United Nations Framework Convention on Climate Change, but also several regional agreements including a) the Protocol Concerning Specially Protected Areas and Wildlife (SPAW) and b) the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region.

However, although the National Conservation Council may designate any area of Cayman waters as a protected area, those established to date include only shallow-water environments, usually to a depth of 24m. The present project has made an assessment of the biodiversity to a depth of 2000m, and recorded species, especially of elasmobranchs, included in the CMS Appendices (such as the hammerhead sharks *Sphyrna lewini* and *S. mokarran*).

4.2 Project support to poverty reduction

Darwin Plus projects are not required to address poverty reduction issues, and indeed Cayman is regarded by the world bank as a High Income country. Nevertheless the project has successfully addressed issues relating to the management of sustainable resources that underpin the basic needs and quality of life of the people. The project has characterised the coastal reef habitats down to depths of 300m and assessed the abundance in different habitats of deep-water fishes including deep-water snappers and sharks and pelagic commercial species such as tuna. Not only do local fishers obtain a significant part of their catch from these species that may then be marketed through sea-food restaurants, but Cayman is also regarded as a notable deep-sea fishing destination for tourists from North America. Hence, to underpin the income of the employees in the sports fishing and restaurant sectors, it is critical that the relevant fish stocks be managed sustainably. Further, mesophotic and deeper water reef communities constitute a key resource in their own right. Apart from their high biodiversity these habitats provide important ecosystem services, serving as both productivity sources and reserve refugia for the wealth of coastal marine life that attracts a high proportion of the nearly half a million visitors arriving by air per year, as well many of the even greater number arriving on board cruise ships. Yet until now, despite the network of Marine Protected Areas established to conserve coastal coral reefs, no reef habitat is protected below a depth of 80 feet (about 25m), leaving the greater depth range of habitats vulnerable to such impacts as overfishing and sedimentation. To underpin the thriving and still growing marine tourism industry bit is key that its resource base be managed sustainably. For this it is essential to determine which deep reef areas are of the greatest importance as breeding and feeding areas for both commercial fish species and marine life more generally. Besides characterising Cayman Island deep water reef habitats, the project has identified three areas as potential candidate sights for further protection. The drift-cam and drop down camera survey methods developed through the project have enabled deep water surveys to be undertaken at minimal cost (compared to the usually prohibitive cost of hiring large oceanographic vessels capable of deploying deep-sea submersibles and ROVs), and methodology that should enable many other lower income states to undertake comparable surveys and so safeguard their deep water environments.

4.3 Gender equality and social inclusion

Please quantify the proportion of women on the Project Board[1].	100% TF
Please quantify the proportion of project partners that are led by women, or which have a senior leadership team consisting of at least 50% women[2].	*66%*

The project supported the local community with highly progressive attitudes to racial, sexual and cultural equality with benefit accruing to all. The project strongly supported the involvement of men and women of different cultural backgrounds and ages in marine science without regard to gender. A majority of the project staff, including the lead applicant and one of the two project leaders were women and the Director of the DoE, for example, is a Caribbean woman, with all project research assistants being women. At least 50% of dive industry staff, including dive guides, in the Cayman Islands, are women. Caymanian fishers, as elsewhere in the Caribbean, are almost entirely male, but women often play key roles in fish processing and marketing.

Project Lead: Teresa Fernandes
Project Partners: Mauvis Gore, Austin Gallagher (m), Tim Austin (m)
Project Assistants: Johanna Kohler, Annie Nguyen, Christina de Silva, Olivia Dixon, Shannon Aldridge
DoE: Gina Ebanks-Petrie, Tim Austin (m), John Bothwell (m), Claire Fletcher, Sabrina Douglas, Cody Panton (m), Paul Chin (m).

[1] A Project Board has overall authority for the project, is accountable for its success or failure, and supports the senior project manager to successfully deliver the project.

[2] Partners that have formal governance role in the project, and a formal relationship with the project that may involve staff costs and/or budget management responsibilities.

Key: (m): male

4.4 Transfer of knowledge

The project has resulted in significant transfer of knowledge:

Policy makers: DoE directors, NCC: We have met with the key DoE staff (Director Gina Petrie-Ebanks and Deputy Director Tim Austin) regularly. We have consulted on legislation with Legal, Implementation & Coordination Manager John Bothwell. We have met with the NCC twice, when their schedule permitted, presenting and discussing our progress.

Use of National platform: talks, social media: We have provided press releases, radio interview, published scientific papers, given talks to the community and contributed information and discussion on social media platforms. There are no print newspapers in Cayman any longer, but we used e-media.

4.5 Capacity building

Research Officers Claire Fletcher, Paul Chin and Cody Panton and Shark Officer Johanna Kohler worked with us on the boat and were trained in the use of the gear and the methodology for obtaining information at deep sea depths. Johanna Kohler was employed as a Graduate Research Assistant and gained considerable experience from the position. She is currently employed by the DoE and has gained considerable practical and presentation skills. HWU MSc students (25 in 2022, 27 in 2023 and 30 in 2024) in Marine Environmental Monitoring were taught by Mauvis Gore and Rupert Ormond, who incorporated the project as a case study in their lectures. One student, Annie Nguyen, worked with us on the project for her MSc thesis with Mauvis Gore supervising her. Annie also worked with us on the boat and were trained in the use of the gear and the methodology for obtaining information at deep sea depths. She too gained considerable experience from the position. The gender ratio was 33M:67F

5 Monitoring and evaluation

The project team and leaders involved held monthly planning meetings to monitor and evaluate our progress and the overall scope of activities against our logframe. This was a shared responsibility of all organisations. Furthermore, by facilitating frequent and close communication between stakeholders, namely those within DoE and Government, we were confident in our ability to delivering the intended project outputs and activities to leverage our intended outcome.

Prof. Fernandes was responsible for project strategy and quality and spent much more than the 5% of her time allocated on M&E. Prof. Ormond was also responsible for overall M&E with Prof. Fernandes and spent considerably more than 15% of the time allocated.

Project progress was reviewed regularly at formal meeting with the Cayman DOE Director (Ebanks-Petrie) and Deputy-Director (Austin) and between the project partners.

Prof. Gore & Dr. Gallagher (Co-PIs) provided overall management of the project and prepared half-yearly and annual reports in consultation with project partners. In Cayman, the Co-PIs were based in the DOE offices and liaised informally with Deputy-Director Austin on an almost daily basis and were out in the field leading and participating in fieldwork.
Project team members also communicated with the wider body of stakeholders through talks and use of the media. Prof. Gore and Dr. Gallagher used their time on the project to monitor and evaluate the work and team.

Monitoring the project's progress by the DoE's National Conservation Board (consisting of 6 appointed and elected members) was made twice at their meetings.

Using these systems in place, we were able to communicate with each other and outside people and organisations.

Simon Harding carried out a Mid Term Review of the project for NIRAS, resulting in a Full Report 30/03/2023. The following were the recommendations and how they were addressed.

- Recommendation 1: Ensure that the DoE GIS unit is allocated enough time in their work schedule by their managers to complete the production of the GIS maps and any other materials for use in the development of the action plans for selected species and the mesophotic habitats.
  The GIS Officer had many projects to handle and he did his best to engage with us.
- Recommendation 2: Discuss with NIRAS the change to Output 1.4 with the plan to use an ROV instead of divers for the technical dives survey activity.
  We had discussed in our report to NIRAS, pointing out that the Reviewer had not understood the situation, which had been described in a report to NIRAS previously (17/04/2023).
- Recommendation 3: Aim to ensure that the amount of data collected for deep water species and habitats is sufficient evidence to develop strong policy recommendations that are likely to result in changes to the National Conservation Act to protect deep water habitats and sustainably manage selected deep water species.
  The results expected were outlined in the application to Defra and were accepted. In fact, our results exceeded our expectations, as shown in this report.
- Recommendation 4: Maintain and possibly increase the level of outreach and stakeholder engagement to ensure the support for and compliance with deep water conservation measures by the public, the political decision makers, and the key stakeholders such as local fishers and dive operators (general recommendation to continue after the project end).
  The Reviewer had not understood the programme of outreach prepared. We gathered and analysed more than sufficient data to provide the stakeholders with enough information on the project for it to be useful for their consideration and to provide feedback, rather than a box-ticking exercise.

6 Actions taken in response to Annual Report reviews

There was no feedback from the Darwin team for our second year, only for our first year mid-term review. The points raised were discussed among the partners and collaborators and responses addressed to NIRAS.

7 Lessons learnt

Over the course of the last year, project partners held regular meetings throughout. Partners ensure clear communication always took place and decisions were jointly taken. The level of communication, planning and execution of field work, and overall collaboration were very positive. This approach has worked very well and was encouraging to see, given that the previous year's scope of activities was slightly truncated and delayed in the aftermath of the Covid pandemic. Monthly meetings kept all groups accountable and in good communication.

8 Risk Management

There are no new risks that have arisen in the last year, that were not previously accounted for.

9 Sustainability and Legacy

The local interest within the Cayman Islands public and private sector for this project has been consistently high and encouraging. This is evidenced by the large numbers of individuals from the public who attended our public talks, and in the responses and engagement to our social media posts and fisher surveys. We firmly believe that this project has had a positive impact on the legacy of marine conservation projects of this scale that will be conducted in Cayman in future years.

10 Darwin Initiative identity

The Darwin Initiative has a long history within the Cayman Islands and DoE. We have carried on this positive reputation by being good stewards of the Darwin brand and identity in all

aspects of the project, and we have been clear of Darwin support of the project in all outward-facing communications and publicity. This project is a single standalone project, but one which builds on previous projects led by some of the partners, and has clear links to other ongoing projects, leading to synergies. Project partners have used their social media accounts to publicise this joint work and project outcome.

11 Safeguarding

Has your Safeguarding Policy been updated in the past 12 months?		~~Yes/~~**No**
Have any concerns been investigated in the past 12 months		~~Yes/~~**No**
Does your project have a Safeguarding focal point?	**No**	
Has the focal point attended any formal training in the last 12 months?	**No**	
What proportion (and number) of project staff have received formal training on Safeguarding? **Not in our application submitted**		Past: 0% [0] Planned: 0% [0]
Has there been any lessons learnt or challenges on Safeguarding in the past 12 months? Please ensure no sensitive data is included within responses. **There were no issues at all during the project.**		

12 Finance and administration

12.1 Project expenditure

Project spend (indicative) since last Annual Report	2022/23 Grant (£)	2022/23 Total actual Darwin Costs (£)	Variance %	Comments (please explain significant variances)
Staff costs (see below)	[redacted]			
Consultancy costs				
Overhead Costs				
Travel and subsistence				
Operating Costs				
Capital items (see below)				
Others (see below)				
TOTAL	19,790	19,790	**0**	

Staff employed (Name and position)	Cost (£)
Mauvis Gore	[redacted]
Johanna Kohler	
Austin Gallagher	
Christine de Silva	
Teresa Fernandes	
TOTAL	**126245**

Capital items – description	Capital items – cost (£)

Drop Down Cameras Winch	[redacted]
TOTAL	20100

Other items – description	Other items – cost (£)
Bait Drift BRUVS setup Scientific publications	[redacted]
TOTAL	14134

12.2 Additional funds or in-kind contributions secured

Source of funding for project lifetime	Total (£)
WhiteTip Fund: DoE & MCI	79022
TOTAL	

Source of funding for additional work after project lifetime	Total (£)
DoE use of Cayman Conservation Fund for Johanna Kohler's lander	25,000
TOTAL	

12.3 Value for Money

The project was very good value for money - the equipment was designed and tailored to being easily repaired and replaced and could be deployed from small boats with few staff for a sustainable survey programme.

13 OPTIONAL: Outstanding achievements of your project (300-400 words maximum). This section may be used for publicity purposes.

We agree for the Biodiversity Challenge Funds Secretariat to publish the content of this section (please leave this line in to indicate your agreement to use any material you provide here).

The project has had outstanding achievements that have benefited the people of the Cayman Islands and the scientific community at large. We have new deep-water records, including the return of scalloped hammerhead sharks to Cayman waters after 50 years. Monitoring the return of the critically endangered hammerhead shark species was a highlight and showed the

success of surveying the deep reefs to complement work done in the shallower reefs. Our drift camera technology has revealed deep water communities at minimal cost. What is also incredible is the extent to which the drift camera methodology revealed previously unknown details of the Cayman deep reef habitats. Stakeholder engagement was strong and exciting with schools, government, fishers, the dive community and the general public. The number of scientific publications achieved is twice as many as planned, covering important species including critically endangered hammerhead species as well as blurred lantern shark, misty grouper and roughskin dogfish.

File Type (Image / Video / Graphic)	File Name or File Location	Caption, country and credit	Online accounts to be tagged (leave blank if none)	Consent of subjects received (delete as necessary)
image	Image 1	Sea whips, Halimeda, sponges, barracuda & jacks at 100m		Yes
image	Image 2	Sponges, sea whips, hard & soft coral at 100m		Yes
image	Image 3	Soft corals & sponges seen by bait arm of drift camera gear with fish school at 100m		Yes
image	Image 4	Caribbean reef shark by bait box at 100m		Yes
image	Image 5	Colourful assemblage of sea whips & sponges, at 100m		Yes
image	Image 6	Steep surface at 200m		Yes
image	Image 7	Great hammerhead shark by end of weight line		Yes
image	Image 8	Scalloped hammerhead and Caribbean reef shark at bait arm		Yes
image	Image 9	A kaleidoscope of colour and forms at 100m		Yes
image	Image 10	The eye of a tiger shark mouth the bait arm at 200m		Yes
video	Video 1	Fish and substrate on Drift Camera Deep BRUVS		Yes
video	Video 2	Sharks on Drift Camera Deep BRUVS		Yes
video	Video 3	Deep Drift Camera at 200m		Yes
video	Video 4	Return of Scalloped hammerhead sharks to Cayman Islands at 225m		Yes
video	Video 5	Roughskin shark in deep		Yes

Annex 1 Project's original (or most recently approved) logframe, including indicators, means of verification and assumptions.

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

Project summary	Measurable Indicators	Means of verification	Important Assumptions
Impact: Enhanced MPA protection of Cayman's deep reefs and seabed to 2000m, of fishes that are threatened (e.g. sharks) or of commercial interest (deep-water snappers), and of hard and soft corals			
Outcome: Species and habitat action plans for mesophotic and sub-mesophotic environments including recommendations for management of exploited fish stocks and for new offshore MPAs or offshore extensions of existing MPAs	0.1 Formal species and habitat action plans for mesophotic and sub-mesophotic environments submitted for approval to the National Conservation Council (NCC), by end of project (actual approval depending on timing of NCC meetings) 0.2 Recommendations for one of more additional Marine Protected Area(s) (MPAs) or extensions to existing MPAs presented to DoE and NCC by end of project 0.3 2 DoE staff will be trained in fieldwork and video analysis	0.1 Official copies of approved or draft species and habitat action plans available from National Conservation Council or from DoE directly or via respective websites 0.2 Recommendations for one of more additional Marine Protected Areas (MPAs) or extensions to existing MPAs available from National Conservation Council or from DoE, within Action Plans or as separate documents 0.3 DoE directorship will verify that training has been completed	0.1 Continuing support and availability of DoE directorship and staff 0.2 DoE accommodation, vessels and vehicles available as agreed 0.3 Weather conditions suitable for fieldwork during planned fieldwork periods (arranged for best weather periods of year) 0.4 Covid-19 epidemic under control in UK and Cayman Island open to visiting scientists (subject to vaccination) by late 2021 through to end of project
Outputs: **1.** Database of observations showing diversity and abundance of significant species of deep-reef fish, sharks, hard and soft corals, and of major biotopes	1.1 Formal copy of updated databases prepared by 6, 12, 18 and 24 months of start of project	1.1 Copy of database for each field season available from project lead or from DoE within 6 months of each field campaign	1.1 DoE vessels and crew available for fieldwork and weather conditions suitable 1.2 Scientific gear (deep water camera housings etc.) acquired and operational
2. Maps showing distribution of species and biotopes including deep-water areas of conservation significance including coral rich	2.1 Maps prepared by DoE GIS officer based on project data by 12 months (provisional maps) and 24 months after start of project	2.1 Copy of map(s) available from project lead or from DoE.	2.1 Sufficient data generated by fieldwork to permit formulation of policies and action plan 2.2 DoE GIS officer available to complete task

Project summary	Measurable Indicators	Means of verification	Important Assumptions
biotopes, and fish feeding and spawning areas			
1. Scientific report and / or paper on survey and / research findings	3.1 Draft scientific report completed by end of project (and scientific paper published)	3.1 Copy of report or paper available from project lead or from DoE	3.1 Provision of data and analyses by partner organisations 3.2 Continuing availability and cooperation of relevant scientific staff 3.3 Scientific report approved by DoE and NCC 3.4 Scientific paper accepted by journal for publication
1. Habitat Action Plan for mesophotic and sub-mesophotic habitats areas and Species Action Plan(s) for deep-water groupers, snappers and elasmobranchs	4.1 Draft Action Plans completed by end of final field phase; any necessary revision of Action Plan following consideration by NCC	4.1 Copy of Action Plans available from project lead or from DoE	4.1 Sufficient data generated by fieldwork to permit formulation of policies and action plan 4.2 Timetable of NCC meetings permits timely consideration of draft Action Plan and Recommendations
1. Press / social media releases and talks on project aims and progress directed at strengthening stakeholder support for Action Plans and MPA recommendations	1.1 A minimum of 4 per year media releases distributed and talks given	5.1 Copies of media releases available 5.2 Copy of talk available 5.3 Minutes of meetings with DoE and NCC 5.4 Examples of press, radio, TV, social media items retained and made available	5.1 Interest of stakeholders in participating (not an issue during previous projects)
Activities (each activity is numbered according to the output that it will contribute towards, for example 1.1, 1.2 and 1.3 are contributing to Output 1)			
1.1 Deployment of BRUVS at 50-200m around the islands and on offshore “Cayman Bank” on twice yearly basis			

Project summary	Measurable Indicators	Means of verification	Important Assumptions
1.2 Deployment of drop down camera rigs to 500–2000m around the islands and on offshore “Cayman Bank” 1.3 Video surveys by DoE RoV of 30-50m zones around the islands and on offshore “Cayman Bank” on twice yearly basis 1.4 Technical dives to 100m at focal areas around Grand Cayman 1.5 Angling groups and fishers discussion of results and interpretation of data collected 1.6 Viewing and analysis of video footage and annotating records of species and habitats observed 1.7 Entry of observations into digital database			
2.1 Entry of significant records and observations into pre-existing DoE GIS system 2.2 GIS work to generate appropriate outputs			
3.1 Collation and statistical analysis of data 3.2 Preparation of figures (graphs and images) to be used in scientific report or paper 3.3. Writing of scientific report within 3 months of end of project 3.4 Publication of scientific paper within 1 year of end of project			
4.1 Development of policy and recommendations for Habitat Action Plan, including for establishment or new MPA(s) or extensions into deep water of existing ones 4.2 Development of policy and recommendations for Species Action Plan(s) including for management of deep-water fish stocks 4.3 Discussions of proposed recommendations with DoE administrative and policy staff 4.4 Preparation of Habitat Action Plan for consideration by National Conservation Council (by end of project) 4.5 Preparation of Species Action Plan for consideration by National Conservation Council (by end of project) 4.6 Review of Habitat Action Plan(s) for consideration by National Conservation Council (by end of project) 4.7 Review of Species Action Plan(s) for consideration by National Conservation Council (by end of project)			
5.1 Preparation of press / media releases 5.2 Distribution of media / press releases and posting on DoE and other websites 5.3 Preparation of talk describing purposes, progress and findings of project 5.4 Arranging and giving of talks to relevant stakeholders (DoE, National Conservation Council, local communities and particularly fishers, dive centres)			

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

Please note: Standard Indicators were introduced at Round 12, not for a Round 9 report.

Project summary	Measurable Indicators	Progress and Achievements
Impact: Enhanced MPA protection of Cayman's deep reefs and seabed to 2000m, of fishes that are threatened (e.g. sharks) or of commercial interest (deep-water snappers), and of hard and soft corals		The project results were analysed and showed a need for protection of the endangered hammerhead sharks and an action plan was written and submitted to the DoE for comment and to request comment from the NCC. The data did not suggest that there was a need for MPA protection of other fish or substrate currently.
Outcome Species and habitat action plans for mesophotic and sub-mesophotic environments including recommendations for management of exploited fish stocks and for new offshore MPAs or offshore extensions of existing MPAs.	0.1 Formal species and habitat action plans for mesophotic and sub-mesophotic environments submitted for approval to the National Conservation Council (NCC), by end of project (actual approval depending on timing of NCC meetings) [DPLUS B01, DPLUS B02]. 0.2 Recommendations for one of more additional Marine Protected Area(s) (MPAs) or extensions to existing MPAs presented to DoE and NCC by end of project [DPLUS-D01]. 0.3 2 DoE staff will be trained in fieldwork and video analysis [DPLUS-A01, DPLUS-A03]	Formal species action plans were submitted to the DoE as noted in section above. Comment from the DoE and the NCC have not been received as yet for any further action or recommendation. Finalisation of the habitat action plan is awaiting completion of data analysis of the extensive video footage collected during the project. Two DoE staff have been trained, in fieldwork and video analysis Johanna Kohler and Claire Fletcher in both and Paul Chin and Cody Panton in the fieldwork.
1. Database of observations showing diversity and abundance of significant species of deep-reef fish, sharks, hard and soft corals, and of major biotopes	1.1 Formal copy of database for each field season prepared within 6 months of each field campaign	Surveys were completed and the data collated and entered into spreadsheets. These include databases for Fish, Sharks, Substrate and Fisher Interviews, as well as a copy of BlueBelt database, are provided in Annex 5_8 and have been provided to the DoE.
Activity 1.1 Deployment of BRUVS at 50 -200m around the islands and on offshore "Cayman Bank" on twice yearly basis		These BRUVS were deployed as planned and completed, with extra deployments added. The deployment data are provided in a database in Annex 5_8 and have been provided to the DoE.

Project summary	Measurable Indicators	Progress and Achievements
Activity 1.2. Deployment of drop down camera rigs to 500 – 2000m around the islands and on offshore "Cayman Bank"		Databases of results for drop down camera videos and eDNA have been provided to the DoE.
Activity 1.3. Video surveys by open-water BRUVS of zones adjacent to Activities 1.1 and 1.2 around the islands and on offshore "Cayman Bank" on twice yearly basis		During the deployment of the 50-200m BRUVS, 2h videos were recorded for each camera. These were catalogued and provided to the DoE (Annex 5_8).
Activity 1.4. Technical dives to 100m at focal areas around Grand Cayman		As noted in our first annual Report, our collaborator DiveTech had not been able to recruit a buddy for technical diving after the Covid lockdown in Cayman and while willing, has not been able to do any technical dives. Nor has anyone else qualified been found to do these dives. An activity had been added to increase our knowledge of the deep-sea by collaborating with the DEFRA BlueBelt project run by Blue Abacus, at the suggestion of the DoE (Annex 5_8).
Activity 1.5. Angling groups and fishers discussion of results and interpretation of data collected		Fisher interviews were conducted and the data entered into spreadsheets and analysed. A report was written on the activity and results. (Annex 5_6 & 8).
Activity 1.6. Viewing and analysis of video footage and annotating records of species and habitats observed		The video footage for the drift cameras was viewed, analysed and reviewed by 2-3 reviewers, and checked for reliability between viewers. Footage of the drop down camera videos and eDNA have been analysed. (Annex 5_8).
Activity 1.7. Entry of observations into digital database		The species and habitat variables were recorded in spreadsheets (Annex 5_8).
Output 2. Maps showing distribution of species and biotopes including deep-water areas of conservation significance including coral rich biotopes, and fish feeding and spawning areas	2.1 Maps prepared by DoE GIS officer based on project data: provisional map(s) after one year, final map(s) after two years	Following analyses of the data, collaboration with the DoE GIS Officer resulted in maps for fish and shark species at three depth levels, and for the rugosity, slope, cover type and cover species (Annex 5_7).
Activity 2.1. Entry of significant records and observations into pre-existing DoE GIS system		The records and observations of the analyses noted in the previous section were provided to the DoE GIS for entry into their GIS system in a format requested by the GIS Officer.
Activity 2.2. GIS work to generate appropriate outputs		Data from the deployments were used to generate extremely useful GIS maps, show the location, depth, fish or shark species, number of individuals per sighting as well the number of surveys. Similarly, the data for substrates

Project summary	Measurable Indicators	Progress and Achievements
		were mapped and provided information for each location at depth for the rugosity and slope angle of the site, the type of substrate and the cover species. These provide readily useable maps for the DoE for management of the areas (Annex 5_7).
Output 3. Scientific report and / or paper on survey / research findings	3.1 Scientific report completed within 3 months of final fieldwork phase; scientific paper published within 1 year of end of project [DPLUS C17, DPLUS C18].	We have completed and published three scientific papers resulting from the project, with one more in preparation (Annex 5_1). A report on the 50 – 200 m Deep BRUVS and on the fisher interviews are available in (Annex 5_6).
Activity 3.1 Collation and statistical analysis of data		This activity was completed for all data.
Activity 3.2. Preparation of figures (graphs and images) to be used in scientific report or paper		This activity was completed for publication.
Activity 3.3. Writing of scientific report within 3 months of end of project		This activity was completed in the form of scientific publications
Activity 3.4. Publication of scientific paper within 1 year of end of project		Three scientific articles have been published in journals with one more in preparation.
Output 4. Habitat Action Plan for mesophotic and sub-mesophotic habitats areas and Species Action Plan(s) for deep-water groupers, snappers and elasmobranchs	4.1 Draft Action Plans completed by end of final field phase; any necessary revision of Action Plan following consideration by NCC with 6 months of end of project [DPLUS B01, DPLUS D01].	From the analyses of data, it was apparent that the endangered hammerhead sharks needed to have a management plan to help protect them. Draft species action plans for two hammerhead species were submitted to the DoE ((Annex 5_6). Comment from the DoE and the NCC have not been received as yet for any further action or recommendation. Finalisation of the habitat action plan is awaiting completion of data analysis of the extensive video footage collected during the project.
Activity 4.1 Development of policy and recommendations for Habitat Action Plan, including for establishment or new MPA(s) or extensions into deep water of existing ones		Please see Section 4.1
Activity 4.2. Development of policy and recommendations for Species Action Plan(s) including for management of deep-water fish stocks		This was completed by November 2023.
Activity 4.3. Discussions of proposed recommendations with DoE administrative and policy staff		The DoE are still reviewing the action plans.
Activity 4.4. Preparation of Habitat Action Plan for consideration by National Conservation Council (by end of project		Please see Activity 4.1

Project summary	Measurable Indicators	Progress and Achievements
Activity 4.5. Preparation of Species Action Plan for consideration by National Conservation Council (by end of project)		The DoE are to submit the Action Plans to the NCC for their consideration.
Activity 4.6. Review of Habitat Action Plan(s) for consideration by National Conservation Council (by end of project)		Please see Activity 4.1
Activity 4.7. Review of Species Action Plan(s) for consideration by National Conservation Council (by end of project)		Please see Activity 4.5
Output 5. Press / social media releases and talks on project aims and progress directed at strengthening stakeholder support for Action Plans and MPA recommendations [DPLUS C15]	5.1 A minimum of 4 per year media releases distributed and talks given [DPLUS C15].	A large number of press and social media releases were distributed throughout the project and talks given. A list of these may be seen in (Annex 5_2 & 3).
Activity 5.1 Preparation of press / media releases		Please see Activity 5.1
Activity 5.2. Distribution of media / press releases and posting on DoE and other websites		Please see Activity 5.1
Activity 5.3. Preparation of talk describing purposes, progress and findings of project		Please see Activity 5.1
Activity 5.4. Arranging and giving of talks to relevant stakeholders (DoE, National Conservation Council, local communities and particularly fishers, dive centres)		Please see Activity 5.1

Annex 3 Standard Indicators

Table 1 Project Standard Indicators

Indicator number	Darwin Initiative Standard Indicator	Name of Indicator after adjusting wording to align with DI Standard Indicators	Units	Disaggregation	Year 1 Total	Year 2 Total	~~Year 3 Total~~	Total to date	Total planned during the project
DPLUS A01	Number of people from key national and local stakeholders completing structured and relevant training.	2 DoE staff will be trained in fieldwork and video analysis	2	Female	1	2		2	2
DPLUS A03	Number of local/national organisations4 with improved capability and capacity as a result of project.	DoE staff will be trained in fieldwork and video analysis	1	Public sector	1	1		1	1
DPLUS B01	Number of new/improved habitat management plans available and endorsed	Formal habitat action plans for mesophotic and sub-mesophotic environments submitted for approval to the National Conservation Council (NCC), by end of project (actual approval depending on timing of NCC meetings)	1	Habitat	0	1		0	0 [see Outcome above for comment]
DPLUS B02	Number of new/improved species management plans available and endorsed	Formal species action plans for mesophotic and sub-mesophotic environments submitted for approval to the National Conservation Council (NCC), by end of project (actual	1	Species	0	1		1	1

Indicator number	Darwin Initiative Standard Indicator	Name of Indicator after adjusting wording to align with DI Standard Indicators	Units	Disaggregation	Year 1 Total	Year 2 Total	~~Year 3 Total~~	Total to date	Total planned during the project
		approval depending on timing of NCC meetings)							
DPLUS D01	Hectares of habitat under sustainable management practices	Recommendations for one of more additional Marine Protected Area(s) (MPAs) or extensions to existing MPAs presented to DoE and NCC by end of project.	25 km	Protected area	0	0		0	1 [see Outcome above for comment]
DPLUS C15	Number of Media related activities.	Press / social media releases and talks on project aims and progress directed at strengthening stakeholder support for Action Plans and MPA recommendations	8	Media release	15	28		43	8
DPLUS C17	Number of unique papers submitted to peer reviewed journals	Scientific report and / or paper on survey / research findings	4	Scientific journals	0	4		4	2
DPLUS C18	Number of papers published in peer reviewed journals	Scientific report and / or paper on survey / research findings	3	Scientific journals	0	3		3	2

Table 2 Publications

Title	Type (e.g. journals, manual, CDs)	Detail (authors, year)	Gender of Lead Author	Nationality of Lead Author	Publishers (name, city)	Available from (e.g. weblink or publisher if not available online)
*First records of the blurred lantern shark *Etmopterus bigelowi* from the Cayman Islands, Western Atlantic.	Frontiers in Marine Science	Gallagher AJ, Shipley ON, De Silva C, Kohler JK, Fernandes TF, Austin T, Ormond RF and Gore MA; 2023	Male	USA	Frontiers in Marine Science (journal)	https://www.frontiersin.org/articles/10.3389/fmars.2023.1165207/full
*Renewed occurrence of schooling scalloped hammerhead (*Sphyrna lewini*) and of great hammerhead (*S. mokarran*) sharks in the Cayman Islands	Frontiers in Marine Science	Gore MA, Kohler J, Ormond R, Gallagher AJ, Fernandes T, Austin T, Pattengill-Semmens C	Female	UK	Frontiers in Marine Science (journal)	https://www.frontiersin.org/articles/10.3389/fmars.2024.1347285/full
*Depth Range Extension for the Misty Grouper *Hyporthodus mystacinus* Documented via Deep-Sea Landers throughout the Greater Caribbean	Fishes	Aldridge SE, Dixon OFL, De Silva C, Kohler JK, Shipley ON, Phillips BT, Fernandes TF, Austin T, Ormond RF, Gore MA, Gallagher AJ	Female	Canadian	Fishes	https://www.mdpi.com/2410-3888/9/4/114
First records of the roughskin dogfish *Centroscymnus owstonii* in the insular Caribbean Sea, Western Atlantic Ocean	Journal of Fish Biology	Olivia F. L. Dixon, Shannon E.Aldridge, Johanna Kohler, Anne Veeder, Paul Chin, Teresa F. Fernandes, Timothy Austin, Rupert F. Ormond, Mauvis A. Gore, Diego F. B. Vaz, Austin J. Gallagher	Female	USA	Journal of Fish Biology	Submitted 03/052024

Annex 5 Supplementary material (optional but encouraged as evidence of project achievement)

Annex 5:

1. Publications
2. Presentations / Talks
3. Media
4. Minutes of Partners Meetings
5. Photos & Videos
6. Reports
7. GIS Maps
8. Databases

Checklist for submission

	Check
Is the report less than 10MB? If so, please email to BCF-Reports@niras.com putting the project number in the Subject line.	No
Is your report more than 10MB? If so, please discuss with BCF-Reports@niras.com about the best way to deliver the report, putting the project number in the Subject line.	Yes
If you are submitting photos for publicity purposes, **do these meet the outlined requirements (see section 10)?**	Yes
Have you included means of verification? You should not submit every project document, but the main outputs and a selection of the others would strengthen the report.	Yes
Do you have hard copies of material you need to submit with the report? If so, please make this clear in the covering email and ensure all material is marked with the project number. However, we would expect that most material will now be electronic.	No
If you are submitting photos for publicity purposes, do these meet the outlined requirements (see section 10)?	Yes
Have you involved your partners in preparation of the report and named the main contributors	Yes
Have you completed the Project Expenditure table fully?	Yes
Do not include claim forms or other communications with this report.	