

Darwin Plus: Overseas Territories Environment and Climate Fund Annual Report

To be completed with reference to the “Project Reporting Information Note”
(<https://darwinplus.org.uk/resources/information-notes>)

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

Submission Deadline: 30th April 2023

Submit to: BCF-Reports@niras.com including your project ref in the subject line

1. Darwin Plus Project Information

Project reference	DPLUS127
Project title	Improving reef resilience through sustainable fishery management on Diego Garcia
Territory(ies)	British Indian Ocean Territory (BIOT)
Lead Partner	Zoological Society of London
Project partner(s)	Bangor University and University of Guam
Darwin Plus grant value	314,020
Start/end dates of project	01/08/2021 – 30/06/2024
Reporting period (e.g. Apr 2022-Mar 2023) and number (e.g. Annual Report 1, 2)	01/04/2022 – 30/03/2023 Annual Report 2
Project Leader name	Dr David Curnick
Project website/blog/social media	N/A
Report author(s) and date	Dr David Curnick (ZSL) Dr Claire Collins (ZSL) Dr Brett Taylor (University of Guam) Dr Ronan Roche (Bangor University) Kathryn Dawson (Tritonia Scientific) 27/04/2023

1. Project summary

Coral reefs are threatened by localised fishing pressure, pollution and disease, in addition to global climatic change. Effective management of local threats has been shown to significantly improve reef resilience to climate change impacts.

The Morale, Welfare and Recreation Department (MWR) of the US Military provides daily fishing opportunities to personnel on Diego Garcia, targeting ecologically important and vulnerable coastal predators, such as groupers, and removing over 20t of fish annually. The fishery is poorly documented, and its impact on reef health is unknown, as is the sustainability of current extraction rates. Furthermore, current fishing guidelines lack clarity and are too complicated to be effectively enforced (Spalding 2018). In addition, there is a larger shore-based (creel) fishery primarily undertaken by the ~2,000 support staff. This fishery remains poorly understood and unregulated. Stakeholders across both fisheries are generally disengaged with conservation and science work in the territory. It is imperative that both fisheries are conducted sustainably, recognising the ecological importance and rarity of the British Indian Ocean Territory's (BIOT) near-pristine reefs; whilst providing opportunities for the community on Diego Garcia to engage and become active stakeholders in reef conservation.

This project aims to: systematically review the impact of the fisheries on Diego Garcia's reefs; identify spatial and temporal hotspots for biodiversity across the atoll (e.g. spawning behaviour); and ascertain the understanding of existing fisheries regulations and marine conservation amongst island personnel. It will also determine the societal importance of both fisheries, and how the social benefits differ between island stakeholder groups. This project will therefore provide the ecological and social baselines needed to develop implementable guidelines to improve fishery management. These will benefit all island personnel as a more sustainable fishery model safeguards long-term fishery persistence and the provision of social benefits, whilst minimising impacts to local marine biodiversity.

Spalding M (2018). 2018 Annual Report, Chief Science Advisor, BIOT Administration. 27th September 2019.

2. Project stakeholders/partners

The BIOT administration (BIOTA)

The BIOTA has been a key partner since the project's inception, with the initial project proposal reviewed by the Chief Science Advisor and the BIOT Environment Officers at the time. The key liaison between the project and the BIOTA over the last year of the project has been through Milly Fellows, the standing Environment Officer in the BIOT.

Military and contractors

We have been working closely with key personnel on Diego Garcia and given opportunities to engage with the project, highlighting positive ways their efforts can make a difference to the environment in which they live. These have included the British Representative, British Office staff, managers within the Morale, Welfare and Recreation Department within the US Military, the marina staff and their contractors, the Harbour Master, and the broader island community. Engagement activities thus far have included meetings, presentations, focus groups, questionnaires, and informal interactions at social events on-island.

Other researchers

This project was developed to be highly complementary to the broader research activities being undertaken across BIOT by the Bertarelli Foundation supported Marine Science programme.

3. Project progress

3.1 Progress in carrying out project Activities

We were able to complete our first expedition in November 2022 (Y2Q3) after multiple delays to the project due to Covid, geopolitics and logistical constraints (see previous Annual Report and Budget Change Request) (Figure 1). Within this document, we report on the activities undertaken during and since that expedition. It should also be noted that we spent most of Y2Q4 preparing for a second expedition in March/April 2023 (as per the plan in our most recent Budget Change Request). However, shortly before we were due to fly to Diego Garcia, it was announced that the

Air Mobility Command route from Bahrain to Diego Garcia was due to close for service and repair from the 11th April. This left us with few exfil options (see Risk Management for more information). Given existing commitments amongst team members, it meant we were only able to send a small team (Dr Claire Collins and Anna Patel) to continue the social science components of the project and collect the valuable biological data from the fisheries landing. We are now planning for the second SCUBA survey to be completed in September/October 2023, after the windy season which is prohibitive for boat-based activities.

Where possible, we have denoted which Means of Verification (MOV) are available. These will be submitted alongside the report.



Figure 1. DPLUS127 team at the marina during the successful November 2022 expedition

Output 1: Characterisation of the ecological impact of the two fisheries on DG.

1.1 Review and analyse existing MWR logbook data and protocols.

This has been completed as part of an MSc project in Y2 Q1-2 (MOV1; MOV2). A follow-up analysis will be carried out in Y3 to include the most recent fisheries data.

1.2 Update and co-develop logbook data entry protocols with key MWR fishery and marina staff.

Through consultation with the Environment Officer, MRAG and marina staff, an additional column was added to the data sheet to detail the number of fish caught. Previously, only the gross weight of catch was reported by species/groups (Figure 2). This small but valuable additional detail is crucial to better understanding catch rates, fish population demographics and ecological impact.

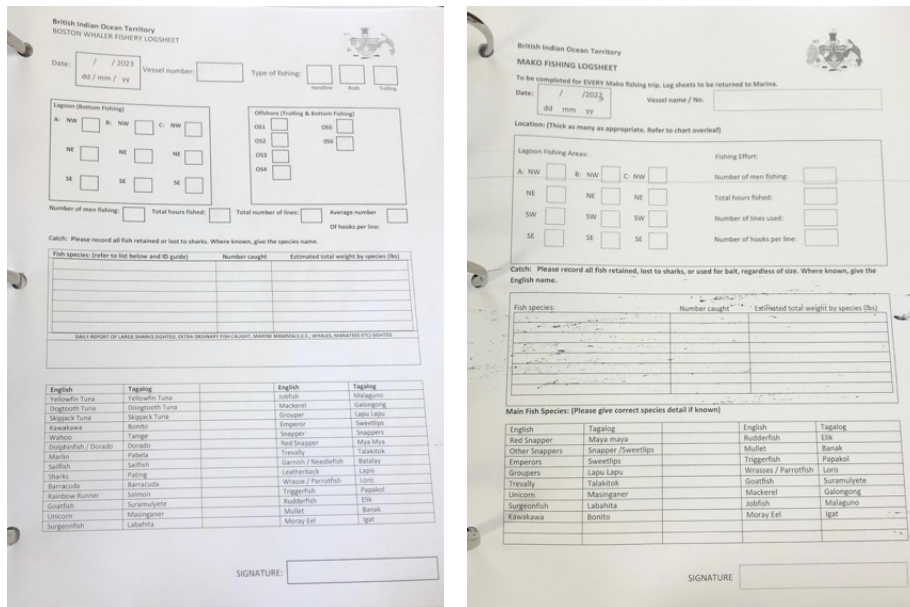


Figure 2. New datasheets in operation at the marina for the Boston Whaler (left) and Mako (right) fishing vessels. Crucially, these updated logsheets request data on the number of each species caught as well as the weight (in lbs).

1.3 Train MWR staff and boat captains in new logbook reporting protocols (establish in year 1 and undertake reviews in year 2 and 3).
As minimal changes have been required, no formal training was deemed necessary.

1.4 Review, analyse, and report on existing creel survey data.
This activity was completed in Y2 Q2. A report and standardised database were produced based on the (albeit limited) shore-based creel fisher survey data collected in 2016 and 2017 by the then Environment Officer (MOV3; MOV4). This review also informed our subsequent approach to the participatory mapping and interviews undertaken during our first expedition in Y2Q3 and our successful application to Darwin Plus Local titled 'Achieving long-term recreational fisheries sustainability through community-led data collection'.

1.5 Participatory mapping approach designed, trialled and implemented for each fishery.
Participatory mapping was undertaken during our expedition in Y2 (Figure 3; MOV5).

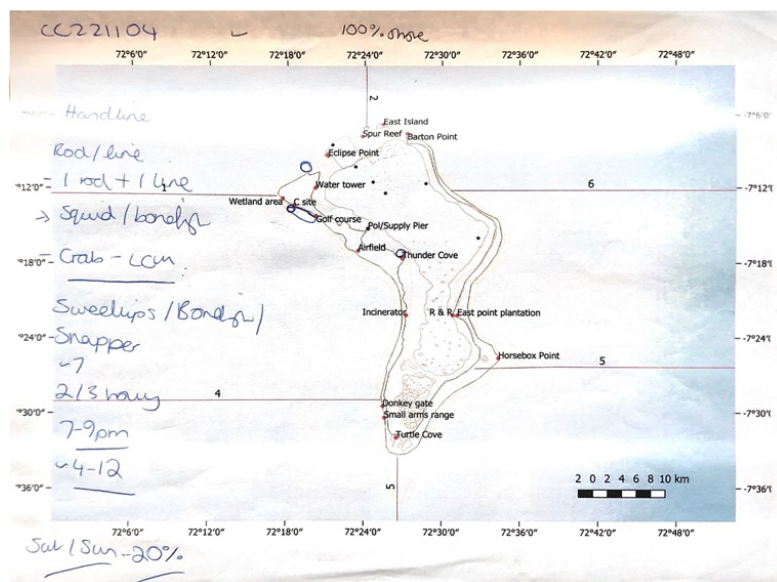


Figure 3. An example output from a participatory mapping exercise with a fisher on Diego Garcia in November 2022

1.6 Conduct stereo-DOV and benthic transects across 24 sites around DG across two postulated spawning seasons for target fish species.

During our first expedition in Y2Q3, we conducted stereo-DOV and benthic transects at 27 sites around Diego Garcia using the MWR and Ports Ops vessels (Figure 4). During the November 2022 expedition, our team conducted dive surveys at 27 sites around Diego Garcia to characterize reef fish communities and benthic habitats. Fish and benthic surveys were conducted using diver-operated stereo-video (DOVS; Figure 5). This technique is a non-invasive method to quantify abundance and biomass of fish species, lengths of individual fishes, and accurate benthic rugosity and cover metrics. Despite considerable post-processing time, the advantage of diver-operated stereo-video is that field surveys can be completed rapidly and cover larger areas (thereby delivering higher resolution data than visual census), fish lengths can be recorded with high precision and accuracy (thereby enabling accurate biomass estimates), and survey imagery can be stored indefinitely for retrospective use. Sites on Diego Garcia were initially selected across a gradient of environmental (variable habitat cover and wave exposure) and anthropogenic pressures (e.g., fishing pressure). -At each site, we conducted stereo-video surveys during 20-minute timed swims at an approximate depth of 9-10m. The distance covered by each survey was measured by a GPS unit towed at the surface using a floating marker buoy. Within any video frame, fish within 8 m in front and 2.5 m either side of the camera trajectory will be identified to species, categorized by colour phase (where applicable), and measured to the nearest millimetre (fork length) using the EventMeasure software (www.seagis.com.au).



Figure 4. DPLUS127 team members preparing to dive from BW-4 during the November 2022 expedition.

We had been planning to return in Y3Q1 to re-run the survey, however, the cancellation of flights in April and May meant that our expedition had to be postponed. We are now targeting an expedition around October 2023. Unfortunately, this will no longer be in a different spawning season than the first expedition. However, the longitudinal data is still valuable as we will be able to document the impacts of the predicted bleaching event in Summer 2023 on reefs along a recreational fishing pressure gradient around Diego Garcia.

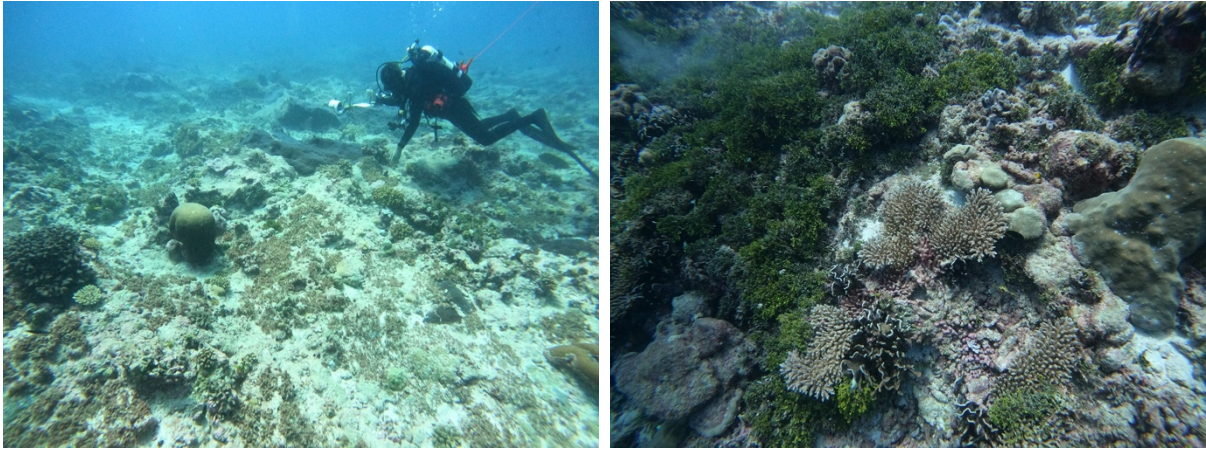


Figure 5. An expedition team member conducting the stereo-DOV survey on Diego Garcia in November 2022 (left) and an example of the benthic imagery collected (right).

1.7 Recruit MSc/MRes student to support analysis of stereo-DOV footage.

A fourth year Royal Veterinary College MSci student started a research project with the team in January 2022 (Y2Q4). They are due to hand in their thesis, which is based on the stereo-DOV footage (Figure 6) and focuses on grouper and snapper abundance and diversity around DG, in May 2023 (Y3Q1). A second MSc student has also been recruited from University College London. They will start their project in Y3Q1 (hand in in Y3Q2), again based on the stereo-DOV imagery but more broadly assessing reef community diversity and function.



Figure 6. Two bohar snapper (*Lutjanus bohar*) and two humphead snapper (*Lutjanus gibbus*) within an example frame from the stereo-DOV footage taken around Diego Garcia.

1.8 Analysis of stereo-DOV imagery for all sites.

This activity is tied to 1.7 and thus pending in Y3Q2.

1.9 Analysis of benthic photo transects for all sites.

Following the expedition in Y2Q3, the following datasets and 3-D models were created from benthic phototransects: models sparse cloud (alignment), dense cloud, textured mesh, orthomosaic and DEMs (digital elevation models), and an outer boundary for each site (MOV6). Of the 27 sites surveyed we have obtained full orthomosaics and digital elevation models from 25 sites. Digital elevation models were converted to raster datasets within the R statistical language. Raster datasets were reprojected into universal transverse mercator (UTM)

geographic projection, which facilitates consistent measurement of reef feature size in metres. Numerical data was collected to obtain 2-D planar area of reef surveyed, 3-D surface area of reef surveyed, reef slope, reef curvature and fractal dimension of reef at across two scales of magnitude (64 and 128). Processing of DEMs at the combination of large scales and high resolutions to obtain quantitative data is highly demanding in computer processor time requirements, with each site requiring approximately 7 hours of processing time. Data processing is progressing well and full quantitative data have been obtained from 17 of 25 sites.

1.10 Preparation and submission of two scientific papers to peer-reviewed journals.
To be completed in Y3.

Output 2: Classification of ecologically significant periods and locations for vulnerable reef fish

2.1 Combine MWR and participatory mapping data to estimate spatial and temporal distributions of vulnerable reef fish across DG.

Updated MWR data has been requested from MRAG Ltd, to include data available up to and including March 2023. Participatory mapping interviews (60) completed with fishers (incorporating shore-based and boat-based fisheries) during November 2022 trip (MOV2). These data sources will be combined with data from MWR boat captains to understand spatial and temporal distribution in Y3Q1.

2.2 Design fish sampling protocols for MWR and marina staff.

An objective of the November 2022 expedition was to develop biological reference points for key harvested species. In total, 48 specimens of 10 piscivorous species were biologically surveyed from the recreational fishery (MOV7). These included the humpback snapper *Lutjanus gibbus*, the red snapper *Lutjanus bohar*, the yellowstripe emperor *Lethrinus obsoletus*, the coral trout *Plectropomus laevis*, the foursaddle grouper *Epinephelus spilotoceps*, the lyretail grouper *Variola louti*, the blacktip grouper *Epinephelus fasciatus*, and the island trevally *Caranx orthogrammus*. From each specimen, we collected body size information (fork length and weight), measurements of gonad weight, and voucher photos (Figure 7). For specimens that were filleted at the MWR fish filleting station, body weight will be estimated from length based on established length-weight relationships.



Figure 7. Voucher photo of a foursaddle grouper *Epinephelus spilotoceps* caught in the Diego Garcia lagoon and filleted and sampled by the team at the MWR fillet station in November 2022 (left). Gonads have been removed to weigh on the balance in the top of the photo. Sampling a bohar snapper *Lutjanus bohar* at Moody Brook upon the return of the LMC fishing trip (right).

2.3 Train MWR/marina staff to collect and store samples and morphometric data from landed focal species.

In an effort to continue monitoring fish spawning seasonality, initial training sessions were held with local MWR staff and other Diego Garcia residents to assist in identifying species,

successively dissecting gonads, and taking voucher specimens (Figure 8) to record reproductive information across time. In total, nine staff and residents received training in November 2022.



Figure 8. Training MWR and marina staff (left) and BIOT Administration (including the Environment Officer) and Royal Military Police (right) during two training sessions led by Dr Brett Taylor in November 2022.

2.4 Analysis of morphometric, gonad and otolith samples ex-situ.
To be completed in Y3.

2.5 Calculation of age, growth rate, spawning season and size at maturity for target species.
To be completed in Y3.

2.6 Preparation and submission of two scientific papers to peer-reviewed journals.
To be completed in Y3.

Output 3: Recommendations of best management options made available through application of a risk-based mitigation framework

3.1 Recruit MSc/MRes student to support the social science survey delivery and analysis.

A research assistant was recruited to assist with the April 2023 field trip instead of an MSc/MRes student due to timings of trip, the need for quick mobilisation, but the need for additional assistance during data collection.

3.2 Develop and conduct focus group sessions to assess awareness and perceptions of existing regulations, and relevant behaviours.

Initial fieldwork, including data collection processes, indicated that semi-structured interviews generated sufficient qualitative data to understand awareness and perceptions of rules so that focus groups may have duplicated understanding. In addition, initial fieldwork suggested that discussion of rules in an open group setting may have generated substantial response and non-response bias.

3.3 Develop and conduct follow-up sessions to review possible management options and identify social-ecological goals for the fisheries.

During fieldwork in November 2022, key informant interviews (n=10) collected substantial understanding regarding management options. Transcripts of these interviews are held by the research team but are not being more widely shared as it may be easy to identify each participant which violates anonymity requirements of the project's ethical permit. For fieldwork in April 2023, short (10-15 minute) surveys which are self-completed on iPads have been designed to collect awareness and attitudes towards existing and potential future management options. These will

be completed with 100 recreational fishers to identify feasibility and potential impact of management. Combined with data from interviews and surveys, social-ecological goals for the fisheries will be set as well as possible management options. During Y3Q2, these findings will be presented to key stakeholders (see 3.5)

3.4 Conduct technical and feasibility assessments of the possible management options.

Technical and feasibility assessments of possible management options will be conducted Y3Q1-2 based on semi-structured interview and survey data coupled with behavioural observational data and informal stakeholder outreach.

3.5 Gauge stakeholder support of management options through final focus group discussions and attitude and awareness surveys.

Follow-up attitude and awareness surveys will be conducted in September/October 2023 (Y3Q2).

3.6 Preparation of management recommendation report and presentation of options to BIOTA and DG officials.

Planned for fieldwork in September/October 2023 (Y3Q2).

3.7 Submission of one scientific paper to a peer-reviewed journal.

To be completed in Y3.

Output 4: Raised awareness, understanding and appreciation of marine biodiversity and conservation among the DG community.

4.1 Baseline ecological awareness and understanding survey carried out on the first expedition.

Overall, 60 semi-structured interviews were conducted during fieldwork 1 to identify key salient issues surrounding fisheries and help design subsequent 'attitudes and awareness' surveys (MOV5).

4.2 Deliver project presentations on DG to base personnel in accessible venues across the DG society on each expedition (i.e. in the cinema, church and contractor community centre).

Dr Ronan Roche gave an interview on project aims and objectives to the local AFN Radio in November at the start of our expedition in November 2022. Informal presentations and discussions were then had with members of the island community during social events at the marina and contractor community centre. During the October 2023 expedition, we plan to deliver a series of presentations and create a short project video with underwater imagery from our surveys that can be broadcast across Diego Garcia.

A 'Fish Bingo' event was run in Y3Q1 which involved distribution of flyers designed to explain more about the project and basic species identification cards (Figure 9). In addition, A3 laminated posters have been put up at the marina to a) explain activities and purpose of the wider project and, b) biological sampling activities (Figure 10).



Figure 9. Leaflet about the project in Tagalog distributed at the Fish Bingo event in April 2023.



Figure 10. Posters displayed at the marina to inform personnel of biological sampling activities (left) and wider project purpose and activities (right).

4.3 Print project t-shirts and/or caps for island personnel who actively engage in the project and contribute data.

A set of project t-shirts were printed in Y2Q4 and paired with some fishing related merchandise (buffs, lures and gloves) instead of hats. These were taken out by the social science team in Y3Q1 and distributed to island personnel engaging in the project (Figure 11 & 12). A number of activities are planned for the expedition to engage stakeholders, such as presentations, fish bingo, participatory mapping exercises and fish sampling training.



Figure 11. Project team members Dr Claire Collins and Anna Patel with the MWR marina staff donning the project T-shirts in April 2023.



Figure 12. 'Fish bingo' event organised with recreational fishers at the Filmau club in April 2023, with t-shirts distributed to attendees

4.4 Produce target species identification key cards and give a copy to each MWR fishing vessel and to the tackle shop.

Data collection to verify commonly caught species commenced in April 2023 as well as collection of information around Tagalog and English names. This data will be used to produce target species identification key cards and deliver species ID assessment to 100 people using MWR fishing facilities.

4.5 Design and deliver species ID assessment to 100 people before and after they use MWR fishing facilities.

See 4.4

4.6 Repeat attitudes and awareness survey on the second and final expeditions to assess change in knowledge and behaviour.

Follow-up attitude and awareness surveys will be conducted in October 2023.

3.2 Progress towards project Outputs

Progress towards all outputs has been hampered by the delays to the expeditions. Nonetheless, we have made good progress in many areas and have made up much of the ground lost in year 1. Here, we report the activities under each output.

Output 1: Characterisation of the ecological impact of the two fisheries on DG.

We have made good progress on this output, with the MWR data and creel survey data both compiled and analysed. We have also completed the first ecological survey, with the analysis of those data due to be completed in Y3Q2. One round of participatory mapping has also been completed, with the second round being undertaken in Y3Q1 (ongoing at the time of writing). Due to the various expedition postponements, we now plan to conduct our final expedition in October 2023 (Y3Q3), before bringing all the data streams together afterwards to deliver this output.

Output 2: Classification of ecologically significant periods and locations for vulnerable reef fish

This output is linked to many of the same data streams as detailed in Output 1 and will therefore follow a similar timeframe. Additionally, good progress has been made in training and obtaining fish gonad and otolith samples. During the first expedition, we collected samples from 47 fish, mainly grouper and snapper and ran two training sessions for local marina staff, British Office representatives (including the Environment Officer) and interested stakeholders on fish sampling. A total of nine people were trained across the two sessions. We hoped and planned that the Environment Officer would lead the sampling and collect data periodically from the fishery in the times between expeditions. However, due to a combination of bad weather (boats not fishing), logistical challenges (vehicle breakdowns) and other engagements at the weekends (which is when the boats go out), this hasn't been possible. However, data collection started in earnest again in March 2023 when an associated colleague from ZSL visited DG and helped support fish sampling. We also planned for the social science team to train more individuals, run refresher courses, and collect more data during the upcoming expedition in April and May 2023 (currently running and activities going to plan).

Output 3: Recommendations of best management options made available through application of a risk-based mitigation framework

All activities under this output will take place on or after the second and third expeditions in Y3.

Output 4: Raised awareness, understanding and appreciation of marine biodiversity and conservation among the DG community.

The project has been very well received on the island. Through active and passive engagement with the fishery, we have built an engaged network of stakeholders and partners. We have encountered challenges with formal assessments and activities, as MWR staff have limited scope to engage during working hours and, understandably, are keen to relax outside of this. We have therefore had to get creative with our engagement and communication. Although outside of this

reporting period, the project t-shirts that were printed in Y2Q4 were handed out in Y3Q1 as part of expedition activities and have been very well received by island personnel (e.g. Figure 9)

3.3 Progress towards the project Outcome

Outcome: Improved socio-ecological understanding of Diego Garcia's reef fisheries to inform sustainable fishery management, supported by island stakeholders.

Through our engagement of island personnel and the success of our first expedition, we have made some good progress to the overall outcome. However, all the SMART Indicators (listed below) are due in the final year of the project and therefore no specific deliverables have been achieved thus far.

- 0.1 Project findings are published within a policy advisory document and management recommendations presented to BIOTA by Y3Q4.
- 0.2 BIOT fisheries ordinance revised by BIOTA including project findings by Y3Q4.
- 0.3 Proposed fishery management recommendations are supported by >75% of island stakeholders measured through an attitude and awareness survey on the third expedition in Y3Q3.
- 0.4 Three peer-reviewed publications submitted to journals by Y3Q4

We remain confident that, despite the continued delays, we will achieve our Outcome by the end of the project.

3.4 Monitoring of assumptions

Outcome level assumptions

1. *Management recommendations correctly identify and address the main threats, capacity needs and resources to achieve fishery sustainability and reef resilience.*

This still holds true and we believe that the project activities will deliver the information required.

2. *That the fisheries ordinance is revised by BIOTA within the lifetime of the project.*

Given the ongoing sovereignty discussions with Mauritius, the relevance of the Fisheries Ordinance in the future management of the territory is now unclear. However, we still hope that the findings of this project will be incorporated in any future management regime change. We also believe that the engagement and awareness we are building amongst the island stakeholders will achieve a high degree of self-governance and management without the requirement for formal changes to the regulations.

Output 1 assumptions

1. *Accurate reporting of historical fisheries data and landings records, reliant on correct species identification.*

Still true. It is difficult to retrospectively correct the historical fishing record. However, as they usually report groupers and snappers (the focus of this project) to family/group level, we are confident that the historical data are a fair reflection of the catch. Moving forward, we open our engagement and training with the marina staff will further improve identification skills, which will be possible to species level in many instances.

2. *Project outreach and incentives ensure personnel are willing to participate in interviews.*
Still true. However, we have had limited resistance to interviews thus far.

3. *MWR or military boats will be available for diving activities (as already discussed with island personnel). If this changes, then the available budget will be put towards the use and maintenance of the BPMS project boats in the science store.*

Still true. We are very thankful to the MWR team for supporting diving operations in November 2022. We were also able to use some of the Port Operations vessels out of Moody Brook. We are confident that we will be able to operate in a similar manner on our next expedition.

4. *Timely provision of creel survey data from BIOTA/Chief Science Officer.*

No longer an issue as these data were ultimately provided.

5. *Weather conditions will not prevent us visiting each site during each expedition (we are visiting during the least windy season which significantly minimise this risk. Expedition plans and logistics are also flexible to accommodate weather patterns).*

Still true. Weather on Diego Garcia can always scupper plans. We mitigate this by planning our expedition timelines by assuming we will only get out on the boats on 50% of days.

6. *Travel to access DG is not significantly restricted due to COVID-19 related restrictions (beyond those outlined in our cover letter and COVID impact statement).*

This isn't currently an issue as all Covid-19 travel restrictions were lifted in November 2022. However, we remain vigilant as they could be reinstated. Covid-19 has had major implications on the fieldwork plans thus far and we are confident that lessons learned could be applied effectively to any deterioration in the situation.

7. *MWR staff accept and adopt new logbook protocols.*

Still true. MWR staff are highly engaged in the project and the additional data requested in the log books has been completed.

Output 2 assumptions

2. *Willingness and capacity amongst MWR staff and fishers to collect biological samples.*

Still true. During our expedition, we decided that the Environment Officer was the best placed individual to collect these data in the intervening months between expeditions. However, they haven't had the capacity they expected to undertake this task. During our second and third expeditions, we will collect samples ourselves and also explore whether other individuals may be able to fill this project need.

3. *Personnel are willing and able to participate in multiple surveys.*

Still true. Yet to be tested as the second expedition hasn't been completed yet.

4. *Major field activities can be rescheduled if extreme weather events occur during proposed fieldwork season.*

Still true. We mitigate this by avoiding travel during the windy season between May and August.

Output 3 assumptions

1. *Personnel are willing and able to participate in multiple surveys.*

Still true. Yet to be tested as the second expedition hasn't been completed yet.

2. *Personnel on short rotations can be contacted once off DG for follow-up surveys.*

Still true. Yet to be tested as the second expedition hasn't been completed yet.

Output 4 assumptions

1. *DG personnel willing to attend presentations, workshops and training sessions.*

Still true. Project activities have been well received and attended thus far.

2. *The MWR team will allow the project poster to be displayed at the marina (others already exist there for other projects).*

Still true. MWR staff have expressed an interest in displaying the poster, subject to co-development.

4. Project support to environmental and/or climate outcomes in the UKOTs

This project aims to address a key conservation management concern in the BIOT – the poorly understood fisheries on Diego Garcia and their impact on this important Ramsar site (1077) – and will contribute significantly to the BIOTA’s conservation priorities (<https://biot.gov.io/environment/>). The project also directly addresses the BIOT Biodiversity Action Plan for shallow coral reefs, which identifies a pressing need for assessment of Diego Garcia’s recreational fisheries and suggests a precautionary approach to management in the absence of existing data and maintaining or increasing current fishery restrictions. The data collected thus far will, once analysed and summarised, directly feed into these processes and inform these key management strategies and priorities.

5. Gender equality and social inclusion

All partners are committed to providing equal opportunities in the fields of science, technology, engineering, and mathematics (STEM). This will be particularly considered when recruiting students and providing training opportunities. Thus far, the project has supported two MSc students through the Royal Veterinary College, both have been women. Further, an MSc student through University College London has been recruited and will join the project in April 2023.

Several aspects of Diego Garcia’s social structures impact on participant representativeness and the accuracy of data collected. As a military base, the hierarchical system in place affects all elements of inhabitants’ work and social lives. We are adopting strategies to ensure that participation is not restricted by rank or gender. For example, we use both formal and informal channels (e.g. snowball sampling between contractors) to recruit participants for our surveys whilst on Diego Garcia. Second, for all methods, we consider the potential inclusion of bias driven by these social structures. For example, focus groups and interviews with participants from similar military ranks will be conducted by facilitators trained in recognising issues arising from power imbalances, e.g. the halo effect (Nyumba et al. 2018). We also ensure that tools and study locations are suited to participants. For example, engagement activities will be held within local community villages.

The team will regularly evaluate the methods and outputs and actively work to ensure no harm arises from either.

O. Nyumba, T., Wilson, K., Derrick, C.J. and Mukherjee, N., 2018. The use of focus group discussion methodology: Insights from two decades of application in conservation. *Methods in Ecology and evolution*, 9(1), pp.20-32.

Please quantify the proportion of women on the Project Board ¹ .	The project board is effectively the project team, plus Kathryn Dawson, who is our Diving Officer. Thus, the proportion of women on the “Project Board” is 0.4.
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 .	As above Additionally, Milly Fellows (BIOT Environment Officer) is a key project partner.

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.

6. Monitoring and evaluation

As previously reported, we have continued regular team meetings where project progress has been routinely reviewed and project decisions made through consultation with all team and stakeholder partners.

Within our original project outline, we planned to evaluate (i) changes in ecoliteracy and awareness through attitude and awareness surveys on each expedition, (ii) the impact of new logbook reporting protocols, and (iii) changes in fisher behaviour (logbooks) and reef condition (SCUBA surveys). However, these evaluations were contingent on baseline data being collected during the first expedition. For the most part, the data required to complete these evaluations were collected, although the ecoliteracy and awareness through attitude and awareness surveys were ultimately amalgamated into the participatory mapping and interviews. Follow up data will be collected during the second and third expeditions to assess any changes.

7. Lessons learnt

The project experienced difficulties due to staff turnover within the MWR team on Diego Garcia. Arrangements and agreements regarding the ability to utilise MWR facilities had been made with previous staff. We had incorrectly assumed that this had been institutionally/formally approved. However, the new post holders were unaware of these agreements in principle and reluctant to initially provide the vessels. The agreement obtained to utilise MWR recreational fishing boats for scientific data collection activities was ultimately resolved following a series of meetings during the first expedition. Thankfully, due to good weather and the contingency days we factored into the expedition plan, this did not ultimately impact project activities. Ahead of future expeditions, we will ensure that all personnel on the island are fully briefed on our work plan two weeks ahead of our planned travel and have meetings planned in advance with key personnel on the first two days on-island.

8. Actions taken in response to previous reviews (if applicable)

We received a few comments on our last report, here we respond to the feedback we received:

No evidence was supplied with the AR. Please include some form of evidence wherever possible to back up statements of progress.

Wherever possible, evidence has been supplied to support our statements.

It would be useful if the project could provide a short description of how, in practice, BIOTA and the US military admin work together. Are there processes or agreements in place whereby BIOTA transfers environmental management plans and regulations to the US military, who then implement them? Are US personnel involved in drafting management guidelines and plans?

This is a difficult question to answer as the project isn't privy to most of those details. For the most part, the Exchange of Notes is the framework under which everything operates. However, in practice the management of the boat-based fishery is led by the MWR Department.

Was consideration given at any point to accessing Diego Garcia by ship?

We always consider ship access as a possible route, but it is rarely logistically feasible. Unfortunately, access via the BIOT Patrol Vessel is limited and needs to be aligned with crew changes in Male, Maldives. These only occur every 6-8 weeks. Chartering our own boat is beyond the scope of the project's budget and is unlikely to be granted DG access permission.

9. Risk Management

Changes in sovereignty and management

Over the last year, the UK government has entered formal negotiations with Mauritius over the sovereignty and future management of the territory. Whilst this has not directly impacted the project thus far, it has understandably taken up much of the focus and attention of people within BIOTA and the FCDO. As we understand it, the negotiations continue but are due to conclude towards the end of the year. This may have implications for the final year of the project and the proposed expedition in October 2023. ZSL is continuing to work closely with the FCDO and BIOTA to ensure that environmental issues are considered during any discussions.

Lack of access to Diego Garcia via the Bahrain military flight route

As previously mentioned, we had planned to conduct a second full (both ecological and social surveys) expedition in April 2023. However, in mid-March we were told that the military flight route from Bahrain to Diego Garcia was to be suspended between mid-April and at least mid-May. This unexpected change to flight schedules as a result of aircraft repair and servicing meant we were still able to fly out on 11th April, but that we had no guarantee when we would be able to leave. For most members of the team, this was not possible, due to work and personal commitments. We remained flexible as long as possible whilst ZSL and the FCDO explored the possibility of flying team members through Singapore instead. Sadly, it was not possible to obtain the Note Verbale required between the UK and Singaporean authorities needed to open this route. The crew change schedule for the BIOT Patrol Vessel was also not congruent with the expedition timelines. Thus, we made the difficult decision to postpone most of the diving-based activities to later in 2023, once the windy season has passed. However, we were able to mobilise two team members who had more flexible work schedules, Claire Collins and a research assistant, to continue the social science components of the project and collect valuable fish samples and data at the marina over April and May.

Adaptation

The project has adapted to the risk to project activities and outputs resulting from the lack of regular military flight access by splitting fieldwork activities into components that are achievable by smaller project team groupings. The project has also adapted by changing the timing of some planned activities. Remaining fieldwork activities relating to the *in-situ* collection of biological parameters from fish populations on coral reefs around Diego Garcia have been rearranged for the next upcoming dry season (starting October to November).

Risk register

The project does not currently have a risk register as this was not a requirement when the project started. However, we will aim to develop one during Y3Q1.

10. Other comments on progress not covered elsewhere

Not applicable

11. Sustainability and legacy

As a result of project activities working with MWR staff and island personnel who engage in recreational fishing activities there has been increased awareness of the existing distribution in fishing activities around the atoll within these groups (e.g., Figures 3, 8-9). Specifically there has been an increased focus on size limits within the recreational fishery, and an improved understanding of fish species identification. In particular there has been an understanding of the multiple names or nicknames (in both English and Tagalog) which are assigned to fish species. Radio interviews with project team members have been arranged as a means to promote the activities of the project. These interviews which are broadcast live to all island personnel have resulted in high levels of engagement with the project and in island personnel bringing fish catches to project team members for sampling.

The benefits which will be sustained post-project are still valid. The recommendations that the project will submit will have been co-developed by stakeholders (MWR marina staff, military personnel and contractors on Diego Garcia who engage in recreational fishing). Measures such as changes in how fish landed are recorded are already being incorporated into standard operating procedures by MWR marina staff.

Whilst it is unclear if a formal revision of the Diego Garcia fisheries ordinance will take place, we are confident that recommended procedures will be adopted in practice on the island, even in the absence of formal enforceable regulations. The data collected can form the basis of any future fisheries regulations which might be implemented following the conclusion of sovereignty negotiations and several of the institutions involved in the project (ZSL and Bangor University) have existing links to Universities and conservation organisations in Mauritius, which would likely be involved in either a practical or advisory capacity in regulations developed by Mauritius, which will ensure the project contributes to long-term sustainable management of the fishery.

One key pathway through which project legacy will be sustained is through the participation and engagement of key stakeholders in the MWR staff (Figure 9). Whilst there is staff changeover at the highest managerial levels of MWR, the MWR marina staff composition is remarkably consistent and contains several individuals who have been working within the recreational fishery for timeframes of over a decade. These MWR marina staff have a high degree of influence on where boat-based fisheries activities take place, what species are targeted, what species are landed and on how fisheries activities are recorded.

Further, through being actively and collaboratively involved in scientific data collection for the project a social legacy is being created by the increased levels of understanding of recreational fisheries management issues amongst this stakeholder group. A technical and ecological legacy is also being created by the unique datasets of fish size, growth and spawning maturity that are being generated through collection of gonads and otoliths from fish landed in the recreational fishery. These datasets form the biological reference points underpinning sustainable management.

12. Darwin Plus identity

This project has a clear identity on the island as the only fisheries-based project. Whilst there are other Darwin Plus projects which have run or are running concurrently with this project, the focus of these projects is very different (e.g. Plastic pollution, terrestrial invasive species). Project posters will be printed and placed at important locations around the island (Y3Q1). One key location is the MWR marine fish weighing and filleting station. Further, Darwin Plus branding and acknowledgement has been included in MSc thesis produced, PI David Curnick's Ocean Predator Lab website (www.oceanpredatorlab.com), and Marine.Science programme circular updates.

The BIOTA staff at several levels from the political head (British Representative) to the Executive (Executive Officer) and administrative (Environment Officer) understand Darwin Plus. This project has held in-person meetings with the British Representative at the start of project activities during fieldwork on the island, as well as debriefings following fieldwork activity completion.

Due to sensitivities around operating on a high-profile military base and the ongoing sovereignty negotiations, we were advised to keep social media posts to a minimum. Thus, we intend to save such posts to promote key project deliverables, such as papers and poster outputs. These will be focussed in Y3 but we will ensure to link the Biodiversity Challenge Funds and Darwin Plus social media channels and in any upcoming posts.

13. Safeguarding

Has your Safeguarding Policy been updated in the past 12 months?	Yes
Have any concerns been investigated in the past 12 months?	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?	Past: 75% [3]
Has there been any lessons learnt or challenges on Safeguarding in the past 12 months? Please ensure no sensitive data is included within responses.	No
Does the project have any developments or activities planned around Safeguarding in the coming 12 months? If so, please specify.	No

14. Project expenditure

i. Table 1: Project expenditure during the reporting period (1 April 2022 – 31 March 2023)

Project spend (indicative) in this financial year	2022/23 D+ Grant (£)	2022/23 Total actual D+ Costs (£)	Variance %	Comments (please explain significant variances)
Staff costs (draft)				
Consultancy costs (draft)				
Overhead Costs (draft)				
Travel and subsistence (draft)				
Operating Costs (draft)				
Capital items (draft)				
Consumables (draft)				
TOTAL (draft)	162485	101308		

Table 2: Project mobilising of matched funding during the reporting period (1 April 2022 – 31 March 2023)

	Matched funding secured to date	Total matched funding expected by end of project
Matched funding leveraged by the partners to deliver the project.		
Total additional finance mobilised by new activities building on evidence, best practices and project (£)		

15. OPTIONAL: Outstanding achievements or progress of your project so far (300-400 words maximum). This section may be used for publicity purposes

Not applicable at this stage as most of the key deliverables are still in progress. We hope to have a set of materials worthy of promotion throughout Y3.

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)
				Yes / No
				Yes / No
				Yes / No
				Yes / No
				Yes / No

5. Annex 1: Report of progress and achievements against logframe for Financial Year 2022-2023 – if applicable

Project summary	SMART Indicators	Progress and Achievements April 2022 - March 2023	Actions required/planned for next period
<p>Impact Fishery management regulations on Diego Garcia are revised to a more sustainable model supporting a healthier coral reef ecosystem, with increased fish biomass, and enhanced ecosystem resilience to climate change</p>		<p>Progress continues to be hampered by expedition delays. However, we have collected the first sets of ecological and social data needed to inform future management and engaged island personnel in the project</p>	
<p>Outcome Improved socio-ecological understanding of Diego Garcia's reef fisheries to inform sustainable fishery management, supported by island stakeholders.</p>	<p>0.1 Project findings are published within a policy advisory document and management recommendations presented to BIOTA by Y3Q4.</p> <p>0.2 BIOT fisheries ordinance revised by BIOTA including project findings by Y3Q4.</p> <p>0.3 Proposed fishery management recommendations are supported by >75% of island stakeholders measured through an attitude and awareness survey on the third expedition in Y3Q3.</p> <p>0.4 Three peer-reviewed publications submitted to journals by Y3Q4</p>	<p>0.1 Still dependent on ongoing data gathering phase</p> <p>0.2 Still dependent on ongoing data gathering phase</p> <p>0.3 Still dependent on data gathering phase</p> <p>0.4 Draft manuscripts will be prepared after the collection of field data</p>	<p>Conduct second expedition to collect social science data streams and continue fish gonad sampling at the marina (Y3Q1)</p> <p>Conduct third expedition to conduct second underwater reef survey and complete fish gonad sampling at the marina (Y3Q2/3)</p> <p>Analyse data sets and draft scientific papers (by Y3Q4)</p>
<p>Output 1. The ecological impact of the DG fisheries under the current regulations is quantified and an improved logbook collection methodology established.</p>	<p>1.1 Historical annual and monthly MWR catch and effort statistics generated for all MWR grid cells by Y1Q3.</p> <p>1.2 The spatial and temporal footprint of the shore-based fishery characterised through participatory mapping conducted with at least 100 members of the DG community by Y2Q4.</p>	<p>1.1 Completed. Evidence provided in section 3.1 of report and MOV1 and MOV2.</p> <p>1.2 Interviews and participatory mapping carried out with 60 individuals in Y2Q3. Evidence provided in section 3.1 of report and MOV5. Activity will continue during the expedition in Y3Q1. However, after 60 respondents, we had reached data saturation, a concept used frequently in social science to describe where no new meaning is gathered from additional collection of qualitative data. Thus, we stopped at 60 and will collect further quantitative data from the attitude and awareness surveys completed in Y3Q1 and Q2. In addition, 20 creel surveys are being completed in Y3Q1 to understand spatial</p>	

Project summary	SMART Indicators	Progress and Achievements April 2022 - March 2023	Actions required/planned for next period
	<p>1.3 Reef fish richness and biomass quantified at 24 sites across a fishing pressure gradient around DG by Y3Q2.</p> <p>1.4 Reef habitat characterisation metrics quantified at 24 sites across a fishing pressure gradient around DG by Y3Q2.</p> <p>1.5 Over 75% of the daily logbook records have the relevant catch data to species level, numbers, weights and GPS locations by Y3Q2.</p>	<p>and temporal footprint by collecting data on fisher effort and catch during 2 hour observational studies.</p> <p>1.3 The first round of reef fish biomass and richness data were collected in Y2Q3 and are being analysed at the time of writing this report. Evidence of the data produced has been provided in MOV8. Two MSc theses will be further evidence and will be produced in Y3Q1 and Q2. The second survey is planned for Y3Q2/3 and will be analysed by Y3Q4.</p> <p>1.4 The first round of reef habitat data were collected in Y2Q3 and are being analysed at the time of writing this report. Evidence of the data produced has been provided in MOV6. The second survey is planned for Y3Q2/3 and will be analysed by Y3Q4.</p> <p>1.5 To be analysed after the expedition in Y3Q1. However, due to the delays to the project, it has not been possible yet to include GPS location data or increase species resolution (as training activities were delayed as a result of the expedition delays).</p>	
Activity 1.1 Review and analyse existing MWR logbook data and protocols.		Completed	Completed
Activity 1.2 Update and co-develop logbook data entry protocols with key MWR fishery and marina staff.		Completed	Assessment of logbook change impact to be undertaken in Y3Q2.
Activity 1.3 Train MWR staff and boat captains in new logbook reporting protocols (establish in year 1 and undertake reviews in year 2 and 3).		Completed	Completed
Activity 1.4 Review, analyse, and report on existing creel survey data.		Completed	Completed
Activity 1.5 Participatory mapping approach designed, trialled and implemented for each fishery.		Designed, trialled and delivered to 60 people on Diego Garcia.	Complete 100 attitude and awareness surveys
Activity 1.6 Conduct stereo-DOV and benthic transects across 24 sites around DG across two postulated spawning seasons for target fish species.		Completed for first season	Second survey to be undertaken in Y3Q2/3

Project summary	SMART Indicators	Progress and Achievements April 2022 - March 2023	Actions required/planned for next period
Activity 1.7 Recruit MSc/MRes student to support analysis of stereo-DOV footage.		Completed - two students recruited	Supervise students to completion in Y3Q1 and Y3Q2, respectively
Activity 1.8 Analysis of stereo-DOV imagery for all sites.		As with activity 1.7	As with activity 1.7
Activity 1.9 Analysis of benthic photo transects for all sites.		Digital elevation models (DEMs) and orthomosaics generated from 25 sites. Data on 6 metrics of reef rugosity and complexity collected from analysis of 17 sites with highest quality data.	Complete analysis of 8 second level priority sites with medium data quality. These sites are planned as focus survey sites during expedition 3 (Y3Q2/3). Generation of DEMS, orthomosaics and collection of data from these 8 sites in Y3Q3.
Activity 1.10 Preparation and submission of two scientific papers to peer-reviewed journals.		Primary data collected	Collect additional data required and draft two manuscripts in Y3Q3/4
<p>Output 2. Key biological reference points derived for vulnerable reef fish to inform sustainable management options.</p>	<p>2.1 Seasonal variation in the spatial distribution of reef fish biomass collected by Y2Q2 through stereo-DOV assessments at 24 sites around DG across two postulated spawning seasons and participatory mapping.</p> <p>2.2 Temporal patterns of reproductive activity in target species established with the spawning status of 300 fish assessed by Y3Q3.</p> <p>2.3 Size-at-maturity, profiles of lifetime growth, and minimum landing size recommendations produced for target species by Y3Q3.</p>	<p>2.1 One round of fieldwork has been completed. Indicator contingent on collecting additional datasets during expedition 2 (Y3Q1) and 3 (Y3Q2/3)</p> <p>2.2 One round of fieldwork has been completed. Indicator contingent on collecting additional datasets during expedition 2 (Y3Q1) and 3 (Y3Q2/3)</p> <p>2.3 Data collection ongoing. Recommendations to be produced by Y3Q3 after the 3rd and final expedition.</p>	
2.1 Combine MWR and participatory mapping data to estimate spatial and temporal distributions of vulnerable reef fish across DG.		Participatory mapping has been completed with 60 fishers and boat captains.	Extrapolate and combine data to create understanding of overall temporal and spatial footprint

Project summary	SMART Indicators	Progress and Achievements April 2022 - March 2023	Actions required/planned for next period
2.2 Design fish sampling protocols for MWR and marina staff.		Completed and delivered in Y2Q2	Completed
2.3 Train MWR/marina staff to collect and store samples and morphometric data from landed focal species.		9 people trained in Y2Q2	Additional training and refresher sessions to be run in Y3Q1.
2.4 Analysis of morphometric, gonad and otolith samples ex-situ.		48 samples collected thus far	Further data collection Y3Q1-3 and analysis in Y3Q3 and 4.
2.5 Calculation of age, growth rate, spawning season and size at maturity for target species.		48 samples collected thus far	Further data collection Y3Q1-3 and analysis in Y3Q3 and 4.
2.6 Preparation and submission of two scientific papers to peer-reviewed journals.		Primary data collected	Collect additional data and draft two manuscripts in Y3Q3/4
Output 3. The best sustainable fishing regulation options agreed through a risk-based mitigation framework.	3.1 A 25% improvement in the awareness and understanding of fishery regulations (versus baseline established in Y1Q4) measured through the attitude and awareness survey by Y3Q3. 3.2 Socio-ecological goals established through focus group discussions with island stakeholders by Y3Q2. 3.3 A technical and feasibility assessment of potential management options conducted by Y3Q2.	3.1 First attitude and awareness survey to be completed in Y3Q1. Follow up survey in Y3Q3. 3.2 Pending analysis collected on the 2nd expedition in Y3Q1. 3.3 Pending analysis collected on the 2nd expedition in Y3Q1.	
3.1 Recruit MSc/MRes student to support the social science survey delivery and analysis.		Research assistant (Anna Patel) recruited for April/May Y3Q1 trip instead of MSc/MRes student	Completion of Y3Q1 trip and analysis of survey data
3.2 Develop and conduct focus group sessions to assess awareness and perceptions of existing regulations, and relevant behaviours.		Focus groups were replaced with semi-structured interviews and Key Informant Interviews as initial fieldwork suggested that focus groups would generate bias and wouldn't generate	Complete attitude and awareness surveys in Y3Q1 (n=100) and follow-up surveys in Y3Q2/3 (n=100).

Project summary	SMART Indicators	Progress and Achievements April 2022 - March 2023	Actions required/planned for next period
		additional understanding through qualitative data.	
3.3 Develop and conduct follow-up sessions to review possible management options and identify social-ecological goals for the fisheries.		Key Informant Interviews (n=10) with key stakeholders to discuss current and potential future management options and goals for the fisheries have been completed.	Organise informal discussions and presentations with key stakeholders, such as military personnel, to gauge impact and feasibility of suggested management options.
3.4 Conduct technical and feasibility assessments of the possible management options.		Data collected to understand feasibility and impact of management options includes key informant interviews (n=10) and semi-structured interviews with fishers (n=60).	Finalise attitude and awareness surveys (n=100) for Y3Q1. Analyse data from fieldwork trips in Y2Q4 and Y3Q1 to understand feasibility and impact of potential management options.
3.5 Gauge stakeholder support of management options through final focus group discussions and attitude and awareness surveys.		To be completed in Y3Q2/3	Final options presented in Y3Q2/3 during the final expedition.
3.6 Preparation of management recommendation report and presentation of options to BIOTA and DG officials.		Primary data collected	Collect additional data and draft and deliver report and presentation by Y3Q4
3.7 Submission of one scientific paper to a peer-reviewed journal.		To be completed	Analyse data from final fieldwork and prepare paper early 2024.
Output 4. Raised awareness, understanding and appreciation of marine biodiversity and conservation amongst the DG community.	4.1 At least a 50% increase in understanding of 1) reef ecology and the importance of vulnerable reef predators in maintaining ecosystem health, and 2) of marine conservation issues and the value of BIOT MPA in island personnel by Y3Q3 (versus baseline established in year 1).	4.1 / 4.2 Raised profile of the project during April 23 fieldwork trip with 'fish bingo' event attended by 75 fishermen. Baseline attitudes and awareness surveys completed. 4.3 Project posters posted at marina. The project team is currently working with MMO to design species identification boards at the marina by collecting data and pictures of key species and Tagalog and English names. Distribution of species identification cards.	

Project summary	SMART Indicators	Progress and Achievements April 2022 - March 2023	Actions required/planned for next period
	<p>4.2 Project presentations attended by 600 people by the end of the project.</p> <p>4.3 Stakeholder species identification skills and knowledge improved by 25% through project posters and species identification key cards, measured through ID quiz before and after use of MWR fishing facilities.</p> <p>4.4 Ten individuals demonstrate increased capacity in scientific sampling methodologies (50% improvement on pre-training assessment) by participating in training courses on the first (Y1Q3) and second expeditions (Y2Q2).</p>	<p>4.4 Second training event ran with 10 marina staff to cover fish identification, data collection for boat-based fisheries and biological sampling.</p>	
<p>Activity 4.1 Baseline ecological awareness and understanding survey carried out on the first expedition.</p>		<p>To be conducted in Y3Q1</p>	<p>To be conducted in Y3Q1</p>
<p>Activity 4.2 Deliver project presentations on DG to base personnel in accessible venues across the DG society on each expedition (i.e. in the cinema, church and contractor community centre).</p>		<p>Key Informant Interviews completed with key personnel including military during Y2Q3 to introduce the project.</p>	<p>Project presentation delivered to recreational fishers at outreach events in Y3Q1 and Y3Q3.</p>
<p>Activity 4.3 Print project t-shirts and/or caps for island personnel who actively engage in the project and contribute data.</p>		<p>T-shirts printed before Y3Q1 April/May fieldwork.</p>	<p>Distribution of 100 t-shirts during Y3Q1 April/May fieldwork.</p>
<p>Activity 4.4 Produce target species identification key cards and give a copy to each MWR fishing vessel and to the tackle shop.</p>		<p>Data collection on key target species through biological sampling and semi-structured interviews.</p>	<p>Analyse biological sampling and MWR data to identify key target species. Development of species identification boards with MMO.</p>
<p>Activity 4.5 Design and deliver species ID assessment to 100 people before and after they use MWR fishing facilities.</p>		<p>As above.</p>	<p>Species ID assessment/quiz to be completed in Y3Q3 based on analysis of data from fisheries</p>

Project summary	SMART Indicators	Progress and Achievements April 2022 - March 2023	Actions required/planned for next period
			collected during 2 previous fieldworks.
Activity 4.6 Repeat attitudes and awareness survey on the second and final expeditions to assess change in knowledge and behaviour.		To be completed	Attitude and awareness surveys to be completed in Y3Q1 April fieldwork. To be repeated in Y3Q2 on the final fieldwork trip.

6. Annex 2: Project’s full current logframe as presented in the application form (unless changes have been agreed)

Project summary	SMART Indicators	Means of verification	Important Assumptions
<p>Impact: Fishery management regulations on Diego Garcia are revised to a more sustainable model supporting a healthier coral reef ecosystem, with increased fish biomass, and enhanced ecosystem resilience to climate change.</p>			
<p>Outcome: Improved socio-ecological understanding of Diego Garcia’s reef fisheries to inform sustainable fishery management, supported by island stakeholders.</p>	<p>0.1 Project findings are published within a policy advisory document and management recommendations presented to BIOTA by Y3Q4.</p> <p>0.2 BIOT fisheries ordinance revised by BIOTA including project findings by Y3Q4.</p> <p>0.3 Proposed fishery management recommendations are supported by >75% of island stakeholders measured through an attitude and awareness survey on the third expedition in Y3Q3.</p> <p>0.4 Three peer-reviewed publications submitted to journals by Y3Q4</p>	<p>0.1 Policy advisory document, presentation slides and presentation attendee list.</p> <p>0.2 BIOT fisheries ordinance (or equivalent) document.</p> <p>0.3 Attitudes and awareness survey report.</p> <p>0.4 Journal submission confirmation emails and PDF proofs.</p>	<p>Management recommendations correctly identify and address the main threats, capacity needs and resources to achieve fishery sustainability and reef resilience.</p> <p>That the fisheries ordinance is revised by BIOTA within the lifetime of the project.</p>

<p>Outputs:</p> <p>1. The ecological impact of the DG fisheries under the current regulations is quantified and an improved logbook collection methodology established.</p>	<p>1.1 Historical annual and monthly MWR catch and effort statistics generated for all MWR grid cells by Y1Q3.</p> <p>1.2 The spatial and temporal footprint of the shore-based fishery characterised through participatory mapping conducted with at least 100 members of the DG community by Y2Q4.</p> <p>1.3 Reef fish richness and biomass quantified at 24 sites across a fishing pressure gradient around DG by Y3Q2.</p> <p>1.4 Reef habitat characterisation metrics quantified at 24 sites across a fishing pressure gradient around DG by Y3Q2.</p> <p>1.5 Over 75% of the daily logbook records have the relevant catch data to species level, numbers, weights and GPS locations by Y3Q2.</p>	<p>1.1 Standardised historical catch and effort database and statistical summaries within report.</p> <p>1.2 Participatory mapping database and a paper submitted for peer review.</p> <p>1.3 A summary report with key reef fish community metrics for each reporting cell will be produced. This will include estimates of fish biomass and richness across Diego Garcia atoll through georeferenced stereo-DOV transects for each site.</p> <p>1.4 A summary report with key reef health metrics for each reporting cell will be produced. This will include estimates of hard coral cover and reef complexity across Diego Garcia atoll through georeferenced benthic photo transects at each site surveyed.</p> <p>1.5 Logbooks and annual progress reports summarising the completion rate of key fields.</p> <p>1.6 Fisheries impact paper submitted for peer-review publication; journal confirmation email; draft manuscript.</p>	<p>Accurate reporting of historical fisheries data and landings records, reliant on correct species identification.</p> <p>Project outreach and incentives help ensure that personnel are willing to participate in interviews.</p> <p>MWR or military boats will be available for diving activities (as already discussed with island personnel). If this changes, then the available budget will be put towards the use and maintenance of the BPMS project boats in the science store.</p> <p>Timely provision of creel survey data from BIOTA/Chief Science Officer. Agreement in principle.</p> <p>Weather conditions will not prevent us visiting each site during each expedition (we are visiting during the least windy season which significantly minimises this risk. Expedition plans and logistics are also flexible to accommodate weather patterns).</p> <p>Travel to access DG is not significantly restricted due to COVID-19 related restrictions (beyond those outlined in our cover letter and COVID impact statement).</p> <p>MWR staff accept and adopt new logbook protocols.</p>
--	---	--	--

<p>2. Key biological reference points derived for vulnerable reef fish to inform sustainable management options.</p>	<p>2.1 Seasonal variation in the spatial distribution of reef fish biomass collected by Y2Q2 through stereo-DOV assessments at 24 sites around DG across two postulated spawning seasons and participatory mapping.</p> <p>2.2 Temporal patterns of reproductive activity in target species established with the spawning status of 300 fish assessed by Y3Q3.</p> <p>2.3 Size-at-maturity, profiles of lifetime growth, and minimum landing size recommendations produced for target species by Y3Q3.</p>	<p>2.1 Target species biomass estimates from stereo-DOV transects for each of the 24 sites across two seasons. Community perception maps of spatial-temporal fish distributions. Combined summary report with focal species biomass metrics mapped across DG.</p> <p>2.2 Gonad size and egg development stage data from each fish caught are collected and collated into a central database.</p> <p>2.3 Biometric data from otoliths and morphometrics are collected and collated into a central database. These will then be used to inform a short policy briefing document produced summarising the thresholds for landing sizes.</p> <p>2.4 Two papers submitted for peer-review publication; journal confirmation emails; draft manuscripts.</p>	<p>Willingness and capacity amongst MWR staff and fishers to collect biological samples.</p> <p>Personnel are willing and able to participate in multiple surveys.</p> <p>Major field activities can be rescheduled if extreme weather events occur during the proposed fieldwork season.</p>
--	--	---	---

<p>3. The best sustainable fishing regulation options agreed through a risk-based mitigation framework.</p>	<p>3.1 A 25% improvement in the awareness and understanding of fishery regulations (versus baseline established in Y1Q4) measured through the attitude and awareness survey by Y3Q3.</p> <p>3.2 Socio-ecological goals established through focus group discussions with island stakeholders by Y3Q2.</p> <p>3.3 A technical and feasibility assessment of potential management options conducted by Y3Q2.</p>	<p>3.1 Final attitudes and awareness survey statistical summaries in report.</p> <p>3.2 Minutes and proceedings from focus group sessions.</p> <p>3.3 Feasibility assessment review document.</p> <p>3.4 One paper submitted for peer-review publication; journal confirmation email; draft manuscript.</p>	<p>Personnel are willing and able to participate in multiple surveys.</p> <p>Personnel on short rotations can be contacted once off DG to complete follow-up surveys.</p>
---	---	---	---

<p>4. Raised awareness, understanding and appreciation of marine biodiversity and conservation amongst the DG community.</p>	<p>4.1 At least a 50% increase in understanding of 1) reef ecology and the importance of vulnerable reef predators in maintaining ecosystem health, and 2) of marine conservation issues and the value of BIOT MPA in island personnel by Y3Q3 (versus baseline established in year 1).</p> <p>4.2 Project presentations attended by 600 people by the end of the project.</p> <p>4.3 Stakeholder species identification skills and knowledge improved by 25% through project posters and species identification key cards, measured through ID quiz before and after use of MWR fishing facilities.</p> <p>4.4 Ten individuals demonstrate increased capacity in scientific sampling methodologies (50% improvement on pre-training assessment) by participating in training courses on the first (Y1Q3) and second expeditions (Y2Q2).</p>	<p>4.1 Before and after intervention attitudes and awareness survey summarised in behaviour change report.</p> <p>4.2 Attendance registers and PowerPoint format presentations. A 15-minute project video containing findings, management importance and imagery from diver surveys and research across the territory.</p> <p>4.3 Identification assessment reports at start and end of project</p> <p>4.4 Training materials, training register, and pre- and post-training assessment reports.</p>	<p>DG personnel willing to attend presentations, workshops and training sessions.</p> <p>The MWR team will allow the project poster to be displayed at the marina (others already exist there for other projects).</p>
--	--	--	--

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)

Output 1: Characterisation of the ecological impact of the two fisheries on DG.

- 1.1 Review and analyse existing MWR logbook data and protocols.
- 1.2 Update and co-develop logbook data entry protocols with key MWR fishery and marina staff.
- 1.3 Train MWR staff and boat captains in new logbook reporting protocols (establish in year 1 and undertake reviews in year 2 and 3).
- 1.4 Review, analyse, and report on existing creel survey data.
- 1.5 Participatory mapping approach designed, trialled and implemented for each fishery.
- 1.6 Conduct stereo-DOV and benthic transects across 24 sites around DG across two postulated spawning seasons for target fish species.
- 1.7 Recruit MSc/MRes student to support analysis of stereo-DOV footage.
- 1.8 Analysis of stereo-DOV imagery for all sites.
- 1.9 Analysis of benthic photo transects for all sites.
- 1.10 Preparation and submission of two scientific papers to peer-reviewed journals.

Output 2: Classification of ecologically significant periods and locations for vulnerable reef fish

- 2.1 Combine MWR and participatory mapping data to estimate spatial and temporal distributions of vulnerable reef fish across DG.
- 2.2 Design fish sampling protocols for MWR and marina staff.
- 2.3 Train MWR/marina staff to collect and store samples and morphometric data from landed focal species.
- 2.4 Analysis of morphometric, gonad and otolith samples ex-situ.
- 2.5 Calculation of age, growth rate, spawning season and size at maturity for target species.
- 2.6 Preparation and submission of two scientific papers to peer-reviewed journals.

Output 3: Recommendations of best management options made available through application of a risk-based mitigation framework

- 3.1 Recruit MSc/MRes student to support the social science survey delivery and analysis.
- 3.2 Develop and conduct focus group sessions to assess awareness and perceptions of existing regulations, and relevant behaviours.
- 3.3 Develop and conduct follow-up sessions to review possible management options and identify social-ecological goals for the fisheries.
- 3.4 Conduct technical and feasibility assessments of the possible management options.
- 3.5 Gauge stakeholder support of management options through final focus group discussions and attitude and awareness surveys.
- 3.6 Preparation of management recommendation report and presentation of options to BIOTA and DG officials.
- 3.7 Submission of one scientific paper to a peer-reviewed journal.

Output 4: Raised awareness, understanding and appreciation of marine biodiversity and conservation among the DG community.

- 4.1 Baseline ecological awareness and understanding survey carried out on the first expedition.
- 4.2 Deliver project presentations on DG to base personnel in accessible venues across the DG society on each expedition (i.e. cinema, church and community centre).
- 4.3 Print project t-shirts and/or caps for island personnel who actively engage in the project and contribute data.
- 4.4 Produce target species identification key cards and give a copy to each MWR fishing vessel and to the tackle shop.
- 4.5 Design and deliver species ID assessment to 100 people before and after they use MWR fishing facilities.
- 4.6 Repeat attitudes and awareness survey on the second and final expeditions to assess change in knowledge and behaviour.

7. Annex 3 Standard Indicators

i. Table 1 Project Standard Indicators

DPLUS Indicator number	Name of indicator using original wording	Name of Indicator after adjusting wording to align with DPLUS Standard Indicators	Units	Disaggregation	Year 1 Total	Year 2 Total	Year 3 Total	Total to date	Total planned during the project
DPLUSA01	Train MWR/marina staff to collect and store samples and morphometric data from landed focal species. Baseline – no training	Number of people from key national and local stakeholders competing structured and relevant training	People	Men / Women		5 men / 4 women		5 men / 4 women	5 men / 5 women

ii. 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)
Investigating the Impact of Recreational Fishing on Lutjanid Species in Diego Garcia, Chagos Archipelago, with Implications for Management	MSc Thesis	Hannah L ntott, David Curm ck, Brett Tay or, Ruby Chang 2022	Female	British	Royal Veterinary College	Royal Veterinary College

9. Checklist for submission

	Check
Different reporting templates have different questions, and it is important you use the correct one. Have you checked you have used the correct template (checking fund, type of report (i.e. Annual or Final), and year) and deleted the blue guidance text before submission?	YES
Is the report less than 10MB? If so, please email to BCF-Reports@niras.com putting the project number in the Subject line.	YES
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.	NO
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.	YES
If you are submitting photos for publicity purposes, do these meet the outlined requirements (see section 15)?	N/A
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.	