

DPLR2\1028

Emergency Recovery Plan for the world's rarest coral, *Ctenella chagius*

The Chagos brain coral, *Ctenella chagius*, is endemic to BIOT and on the brink of extinction, likely due to ocean heatwaves. The imminent El Niño climate event is predicted to be severe, with potential for mass bleaching of coral reefs across the region. Based on expert assessments, an Emergency Recovery Plan is the recommended response. We will recover live colonies of *Ctenella*, transport them to London, and establish a safety net population in aquaria as part of that response.

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Section 1 - Project Title & Contact Details

Q1. Project Title

Emergency Recovery Plan for the world's rarest coral, *Ctenella chagius*

Q2. Please select whether you are applying as an organisation or as an individual (Guidance section 3 and Guidance Glossary)

Organisation

PRIMARY APPLICANT DETAILS

Title	Dr
Name	Bryan
Surname	Wilson
Website (Work)	[REDACTED]
Tel (Mobile)	[REDACTED]
Email (Work)	[REDACTED]
Address	[REDACTED]

CONTACT DETAILS

Title Mr
Name Adam
Surname Shelton
Tel (Work) [REDACTED]
Email (Work) [REDACTED]
Address [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

CONTACT DETAILS

Title Ms
Name Zoe
Surname Lee
Organisation University of Oxford
Website (Work) [REDACTED]
[REDACTED]
Tel (Work) [REDACTED]
Email (Work) [REDACTED]
Address [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

GMS ORGANISATION

Type	Organisation
Name	University of Oxford
Phone (Work)	[REDACTED]
Email	[REDACTED]
Website (Work)	[REDACTED]
Address	[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

Section 2 - Overseas Territory(ies)

Q3. Overseas Territory (Guidance section 1.3):

Which UK Overseas Territory(ies) will your project be working in? Please note that in case of a non-permanent resident population you need to demonstrate a clear, meaningful, long-term link to

the territory.

British Indian Ocean Territory (BIOT)

*** if you have indicated a territory group with an asterisk, please give detail on which territories you are working on here:**

No Response

In addition to the UKOT(s) you have indicated, will your project directly benefit any other UK OT(s) or country(ies)?

No

Section 3 - Project Partners

Q4. Project partners (Guidance section 3.2)

In this section, please give details of all the partners involved (including the Lead Partner) and provide a summary of their roles.

Project Leader name (Guidance section 3.1):	Bryan Wilson
Lead Partner name (if applying as an organisation; Guidance section 3.1):	University of Oxford
Lead Partner Website (if applicable):	https://www.biology.ox.ac.uk/
Is the Lead Partner based in a UKOT where the project is working (Guidance section 3.1)?	<input checked="" type="radio"/> No
Please explain why this project is led from outside the UKOT:	The only inhabited island in BIOT is Diego Garcia, a US Naval Support Facility comprised of military personnel and contractors. The proposed project to rescue Critically Endangered living corals and bring them safely into an aquarium environment requires specialist expertise, facilities and equipment not available in BIOT. However, the project is being delivered in close collaboration with BIOTA and will benefit from the operational and logistical skills within this UKOT
List other partners involved and where are they based (Guidance section 3.2):	Zoological Society of London (ZSL), UK - Heather Koldewey (HK), Rachel Jones (RJ) and Paul Pearce-Kelly (PPK) Horniman Museum and Gardens (HM), UK - Jamie Craggs (JC) Centre Scientifique de Monaco (CSM), Monaco - Olivier Brunel (OB) and Didier Zoccola (DZ) BIOTA, UK - George Balcombe (GB) and Environment Officers (EO)

UO: Bryan Wilson (BW) will coordinate project partners and facilitate project to completion. BW will also lead fieldwork and perform genomic analyses in situ.

ZSL: ZSL team has worked in UKOTs for >20 years and delivered two Darwin projects in BIOT (19-027), Pitcairn Islands (20-006), with current Darwin Plus in St Helena and Ascension and Darwin Local in BIOT. ZSL coordinates the Bertarelli Foundation's Marine Science Programme, with HK leading in BIOT; HK and RJ will assist with expeditionary logistics, liaison with BIOTA. RJ will also assist with fieldwork and coral aquarium husbandry (in BIOT and en route to UK). HK, PPK and RJ will advise on the Emergency Recovery Plan.

Summary of roles and responsibilities of each partner in the project:

HM: JC and HM team will lead the coral aquarium husbandry (in BIOT and en route to UK)

CSM: OB and DZ will assist in the coral aquarium husbandry and proper use and maintenance of the aquarium equipment provided by CSM.

BIOTA: GB and EO will provide support based on their expert knowledge of BIOT to ensure plans are robust and reliable.

I confirm that all listed partners are aware of this application and have indicated support:

Checked

Attach a Cover Letter for your application (Guidance section 4.2).

 [CoverLetter BW 260623](#)

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Section 4 - Project Summary & Description

Q5. Project Summary (Guidance section 3.8)

Please provide a brief summary of your project. This may be used in communication activities and/or published online, if your application is successful.

The Chagos brain coral, *Ctenella chagius*, is endemic to BIOT and on the brink of extinction, likely due to ocean heatwaves. The imminent El Niño climate event is predicted to be severe, with potential for mass bleaching of coral reefs across the region. Based on expert assessments, an Emergency Recovery Plan is the recommended response. We will recover live colonies of *Ctenella*, transport them to London, and establish a safety net population in aquaria as part of that response.

Q6a. Description (Guidance section 2.1 and 6)

Please provide a description of your project, including:

- the overall objective
- the current situation and the problem the project is trying to address
- what success will look like and how you will measure it

Please be as specific as possible when describing the project, using quantified data and evidence where available. You may wish to consider: what are the specific threats to the environment that the project will attempt to address, and what should we know about these threats? What does your successful project look like? And how will you demonstrate whether and how your project has been successful?

Recent decades have seen periodic extreme warming of surface seawaters in BIOT (most significantly in 1998 and 2015-16), resulting in widespread bleaching and mortality of corals (1). Whilst coral cover at many sites recovered, species composition was significantly negatively impacted (2,3), the most notable being the Chagos brain coral, *Ctenella chagius* (Figures; Fig.1). *Ctenella* is a monotypic genus within the family Euphylliidae, and an unusual scleractinian coral considered evolutionarily distinct from other species (4). Importantly, it is also thought to be endemic to BIOT, but due to its location and status, research on the species is limited. The coral was one of the most common species present in the MPA (5), but in the last decade, populations have been decimated and it was recently feared functionally extinct, with no colonies reported in 2018 surveys.

In 2019, remnants of six colonies were discovered in Peros Banhos and Salomon Atolls, but showed signs of physiological stress (Figure; Fig. 2). Fortunately, in April 2021 (and again, on a follow-up expedition in October 2022), a population of apparently healthy colonies (N=40) were found in Middle Brother lagoon (Figures; Fig. 3), including a single juvenile (Figures; Fig. 4); a small number (N=5) were also observed in limited surveys around Diego Garcia (6). These tantalising data suggest refugia exist in the MPA which might enable *Ctenella* to be rescued from the brink of extinction. However, remaining populations are scattered and the few remaining fecund colonies may be too widely dispersed to cross-fertilise. Its IUCN Red List Threat Status is currently in the process of being reassessed (led by BW, involving RJ, PPK and JC) and uplisted (from "Endangered") to "Critically Endangered". This is part of this team's existing research and conservation project to better understand this species and initiate a Species Recovery Plan.

Several years of a global La Niña climate pattern has recently ended, and National Oceanic and Atmospheric Administration (NOAA) models now predict a moderate to severe El Niño in coming months, with the potential for it to persist into next year (7). Multi-decadal climate modelling predictions (SSP 5-8.5 [CMIP6]) capture the trends likely to be observed in the upcoming El Niño this year (Figures; Fig 5), suggesting that much of the reef area will undergo extreme warming during this period. The likely result of this will be the repeated mass bleaching of coral reefs in the Indo-Pacific, to which we know *Ctenella* is particularly vulnerable. Indeed, bleaching has already recently been observed for corals in the southern Chagos Archipelago (Figures; Fig. 6), which is feared is a precursor of much worse to come.

Based on this evidence, this proposal was developed as an emergency response to prevent the extinction of this species. Our established team of researchers and conservationists have world-leading expertise in coral biology, genetics and conservation (UO, ZSL, HM, and CSM) to carry out the first stage (collection) of an Emergency Recovery Plan for the species. We propose an expedition to the Chagos Archipelago to visit two sites (Middle Brother and Diego Garcia) with extant populations of *Ctenella* (Figures; Fig. 7). Following a preliminary population genetics analysis of surveyed corals, genetically diverse live colonies (N=12, six each from Middle Brother and Diego Garcia) will be collected for export to the UK, for maintenance in aquariums at HM and ZSL. These will ultimately be integrated into the World Coral Conservatory under the guidance of CSM (8), such that a genetically diverse population can be maintained ex situ should the species become extinct in the wild. This project specifically addresses the Darwin Plus themes relating to

Q6b. Long-term sustainability (Guidance section 2.1 and 6)

Please describe the long-term benefits of the project and the change it will bring about. How will the outcomes of the project be sustained after the funding is finished?

This short-term project is a crisis management response to reduce the risk of extinction of *Ctenella*. The immediate change is therefore to ensure the survival of the species. Subsequently, we will progress implementation of the next stages of the Emergency Response Plan where we aim to secure the ex situ population and conduct research that informs recovery in the wild. This will be combined with ongoing surveys in BIOT to understand the impact of warming on this species over the coming years. While we have some funding to support this work through the Bertarelli Foundation and in-kind support from collaborating institutions (ZSL, HM and CSM), we will develop further funding proposals to support the full plan, e.g., Darwin Plus Main. We will also build on existing linkages with reef researchers and the public aquarium in Mauritius to ensure continuity through any changes in sovereignty. Ultimately, the major change that we expect to be able bring about is the avoided extinction and ongoing conservation of a high-priority species (4) that is endemic to one of the UKOTs. Should we be successful, the cutting-edge techniques trialled during this work could then also be applied to conserve other threatened coral species worldwide.

(Optional) Please upload any additional and supporting materials or files (such as maps of project sites, etc) below. Maximum of 5 pages:

 [Figures](#)

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 [References](#)

 26/06/2023

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Section 5 - Project Outcome(s)

Q7. Project Outcome(s) (Guidance section 1.2)

Successful Darwin Plus Local projects must demonstrate measurable outcomes in at least one of the themes of Darwin Plus, either by the end of the project or soon after through a credible plan.

Please tick which theme(s) of Darwin Plus your project contributes to:

Biodiversity: improving and conserving biodiversity, and slowing or reversing biodiversity loss and degradation;

Climate change: responding to, mitigating and adapting to climate change and its effects on the natural environment and local communities;

Environmental quality: improving the condition and protection of the natural environment

Unchecked **Capability and capacity building: enhancing the capacity within OTs, including through community engagement and awareness, to support the environment in the short- and long-term.**

Please justify your selection. Please use quantitative information where possible here.

This project aligns with themes of both Biodiversity and Climate Change, by way of its urgent response to the upcoming El Niño event, which is likely to result in significant biodiversity loss. The recovery and maintenance of Ctenella colonies in aquaria, and potential re-introduction of colonies to BIOT (or other regional reefs within its historic range), should populations in the wild become extinct, would directly address the effects of climate change on the environment, and reverse that biodiversity loss.

Section 6 - Workplan

Q8. Workplan (Guidance section 2.2)

Please provide anticipated dates for the start and end of your planned project here. Please use the Darwin Plus Local Project Workplan (available at: <https://darwinplus.org.uk/apply>) to provide a list of the individual activities you have planned for this project, a brief description of what each activity entails, and the months in which the activities will be carried out. If the project involves only one activity (e.g. a purchase), please still provide project start and end dates (noting estimated times for procurement). Please note that your project must be completed by 31 March 2024.

Start date:	End date:	Duration (e.g. 3 months):
01 October 2023	31 October 2023	1 month

Please upload the completed Darwin Plus Local Project Workplan with your proposed project activities here

-  [R2-DPlus-Local-Project-Workplan-FINAL BW 1 80623](#)
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Section 7 - Costs

Q9. Costs (Guidance section 2.2 and please read the Finance Guidance)

Please provide a breakdown of costs to be funded through Darwin Plus Local (in GBP).

Are you seeking any matched funding for this project? (Please note that this is optional and there is no requirement to seek matched funding for Darwin Plus Local projects).

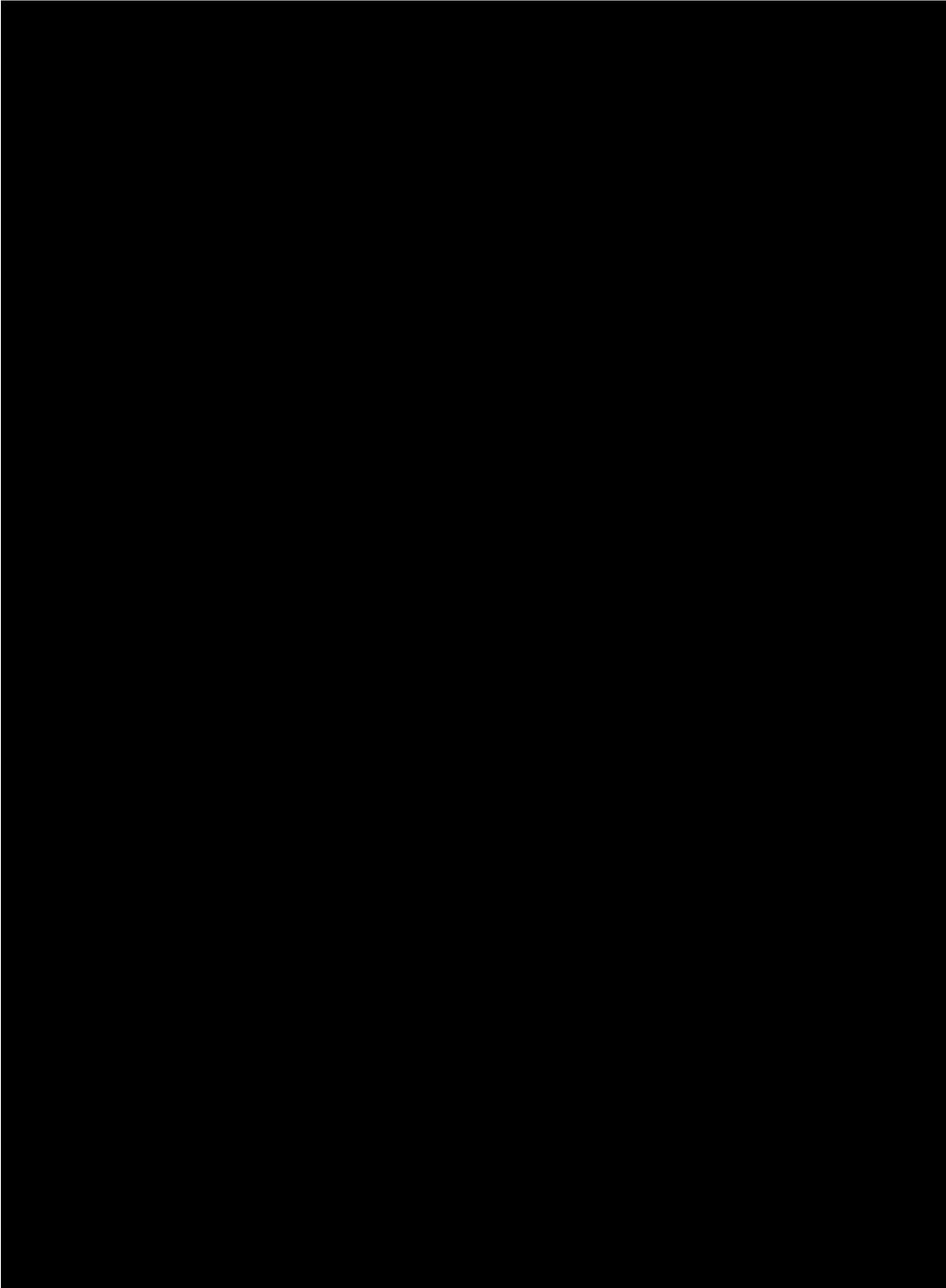
Yes

How much matched funding are you seeking and where from?

Travel and subsistence expenses, diving medical examination, diving kit service and insurance for RJ and BW will be matched by funding from the Bertarelli Foundation (£ [REDACTED])

BW will also be supported by a Percy Sladen Memorial Fund Grant (£ [REDACTED]) and Cynthia Griffiths Fund (Jesus College, University of Oxford) (£ [REDACTED])

BIOT Patrol Vessel fuel costs will be matched by BIOTA (£ [REDACTED])

Budget line	Explanation	Cost in GBP	
Staff costs:			
Consultancy costs:			
Overhead costs:			
Travel & subsistence costs:			
Operating costs:			
Capital equipment:			
Other Costs			
Total:			49,576.00

This section provides more information on the budget to help evaluators understand how you will use the funds you are requesting. You do not need to list all costs, but please list and detail costs of more than £1,000 per item below, under the appropriate budget line.

Details of staff costs over £1,000 (if relevant)

NA

Details of overhead costs over £1,000 (if relevant):

Direct and indirect costs (FEC) of any University of Oxford research activities are usually charged at [REDACTED] however, this project is being charged only [REDACTED] at the discretion of the Head of the Department of Biology.

Details of travel and subsistence costs over £1,000 (if relevant):

Travel and accommodation options for expeditions to BIOT are extraordinarily limited, and alternatives unfortunately cannot be competitively priced or sourced. However, subsistence costs are included within accommodation ones on the BIOT Patrol Vessel, and as a heavily subsidised US Naval Support Facility, subsistence costs on Diego Garcia are very low.

Details of operating costs over £1,000 (if relevant):

Return freight costs (£[REDACTED] for shipping of aquarium equipment (loaned freely by CSM for the duration of the expedition) from Monaco-Male are significantly less than combined purchase of aquarium equipment (estimated £[REDACTED] and freight costs (estimated £[REDACTED] from UK-Male.

Details of capital equipment costs over £1,000 (if relevant):

NA

Details of consultancy costs over £1,000 (if relevant):

The primary goal of this expedition is the collection of live colonies from <25m depth by SCUBA. The site of Middle Brother Island is a remote location, several days' sail from the nearest hospital, and so the planning and undertaking of safe diving practices is of the utmost priority. For this reason, we request salary and a stipend for a DSO and Expedition Doctor, respectively, to mitigate against the inherent risks of such remote fieldwork.

Details of other costs over £1,000 (if relevant)

NA

If your project budget was prepared in another currency and converted to GBP, please provide the exchange rate, its source, and the date it was accessed:

Other currency:	Exchange rate:	Source of this exchange rate:	Date exchange rate accessed:
<i>No Response</i>	<i>No Response</i>	<i>No Response</i>	<i>No Response</i>

Darwin Plus Local has been created to build capacity and contribute to local economies in-territory.

What % of the total will be spent in the OTs? 15

If less than 80% of the total project spend is to be spent within the OT(s), please explain why.

As discussed previously, the only inhabited island in BIOT is Diego Garcia, a US Naval Support Facility. As such, it is unfortunately not possible to base a project of this nature in the UKOT, as much of the proposed research requires expertise, facilities and equipment not available there. Therefore the only proportion of the budget spend within BIOT is accommodation and subsistence (aboard the BIOT Patrol Vessel, and on Diego Garcia) for the expedition team. We are working in close cooperation with the BIOT EO and Administration, who will be an integral part of the successful delivery of the project, particularly relating to operations and administration.

Section 8 - Local and National Priorities

Q10. Local and national priorities

Please explain how this project aligns with local and national priorities? You may wish to consider the project in the context of national environmental laws, objectives, strategies, territory specific agreements, action plans or policies.

- 1) Whilst the UKOT and CD implementation of the Convention Of Biological Diversity (CBD) has not currently been extended to BIOT, research here still contributes to the UK's obligations to the convention.
- 2) This project addresses targets defined by Sustainable Development Goal 14 (Life Below Water), in particular Targets 14.2 (Protect and restore ecosystems) and 14.8 (Increase scientific knowledge, research and technology for ocean health).
- 3) The project aligns with DEFRA's "25 Year Environment Plan", specifically under "Thriving Plants and Wildlife", by "reversing the loss of marine biodiversity and, where practicable, restoring it"
- 4) Finally, BIOT Administration has identified eleven conservation and environmental priorities. This proposal addresses two of these: understanding and mitigating against the effects of global climate change where possible; and studying our key species and habitats to ensure we are providing the best protection and stewardship.
- 5) Ctenella has been highlighted as part of the ongoing development of the new UKOT biodiversity strategy being led by JNCC.

Will the project take place on Government owned land or water or involve biocontrol, invasive alien species control or eradication?

Yes

Please attach evidence that you have Government support for this project i.e. a Letter of Support. Applications which indicate that they do not take place on Government land or water, but which propose work that appears to the reviewers would be difficult/impossible to carry out without working on government land or waters may be ineligible if no Letter of Support is provided.

 [BIOTA Support Letter - Coral Recovery Plan](#)

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Section 9 - Project Risks

Q11. Project Risks

Please demonstrate your consideration of any risks involved in this project and how you intend to manage them. Please note the importance of health and safety and environmental risk assessment in the design of your project. If there is any possibility that your project may have negative impacts on the environment or human health, it is important that you provide a comprehensive analysis of potential environmental and human health risks, and the prevention measures you will take to ensure the work does not cause harm.

Depending on your project, you may wish to consider:

- Biosecurity risks – particularly for projects involving external equipment.
- Safeguarding risks – particularly for projects involving vulnerable groups such as children, older people or people with disabilities.

Risk	Mitigation
Timing of oceanic warming events – we aim to mobilise as soon as possible but there is a risk that corals will already be compromised.	Only select healthy corals and adjust the number of colonies if necessary.
Survival of corals – one live transport of this species was done forty years ago (from the reef to flow-through aquaria on Diego Garcia) and this was unsuccessful.	Using cutting-edge methods, equipment and global leaders in the marine field, including coral husbandry and aquarium experts. As a caveat to the risk listed, the original collector (in the 1980s transport attempt) was not a trained aquarist.
Transport unreliability – flights are inherently unreliable from BIOT and can be impacted by other demands of the base and weather conditions.	A dedicated flight off the base is planned.

Do you require more fields?

Yes

Risk	Mitigation
Weather – the average wind speed in the territory is highest from June-October peaking in August. This increases the chance of losing diving days to poor conditions preventing deployment of small boats.	Contingency days built into programme. A professional DSO will support the team throughout each dive.
Coral colonies within Middle Brother lagoon may be closely-related (offspring) to each other, thereby increasing the future risks of genetic bottlenecks and inbreeding in harvested individuals.	Genetic diversity of colonies will be assessed in situ for greatest variability in individuals prior to collection.
<i>No Response</i>	<i>No Response</i>

No Response

No Response

No Response

No Response

Section 10 - Terms & Conditions

Q12. Terms and conditions (Guidance section 3.10)

By applying for Darwin Plus Local you are adhering in full to the grant Terms and Conditions in full (available at: <https://dplus.darwininitiative.org.uk/apply> and as referenced in the Guidance at section 3.10). For information, the Terms and Conditions include requirements for all applicants to (amongst other requirements as per the full Terms and Conditions):

- Uphold a zero tolerance for inaction approach to tackling sexual exploitation, abuse, and harassment.
- Where appropriate, make all reasonable and adequate efforts to address gender inequality and other power imbalances.
- Notify all cases of fraud and theft (whether proven or suspected) relating to the project to the Grant Administrator as soon as they identified.

Please indicate you have read, and understood, and will adhere to the Terms and Conditions.

Checked

Supporting documents list (please have these ready to attach with application)

- Cover Letter of no more than two A4 pages. (Guidance section: 4.2 has information on what this cover letter should include).
- If the project takes place on public land or water or is addressing invasive alien species, a Letter of support from OT Government.
- Project Workplan in the template provided for Darwin Plus Local (available at: <https://darwinplus.org.uk/apply>).
- Map and additional information (optional) maximum five additional pages.

If your application is successful

If your project application is successful, the Fund Administrator (NIRAS) will ask you to provide some financial evidence for due diligence checks before you receive your project grant. (Please see section 3.3 of the Darwin Plus Local Finance Guidance). Please be ready to provide this evidence promptly.

- **Financial evidence for organisations:** Year-end financial statements, the latest management accounts or audited accounts (if you have these).
- **Financial evidence for individuals:** Proof of identity such as a passport, ID card or driving licence and solvency (such as bank statements) and a police check.

Section 11 - Certification

Certification

I certify that, to the best of my knowledge and belief, the statements made in this application are true and the information provided is correct.

Checked

I have the authority to submit an application on behalf of my organisation.

Checked

Name:	Bryan Wilson
Position in the organisation: (if applicable)	Research Fellow
Signature (please upload e-signature)	 <u>Signature</u>  26/06/2023  19:47:05  jpg 17 KB
Date:	26 June 2023

Section 12 - Submission Checklist

Checklist for submission

	Check
I have read the Guidance documents, including the “Darwin Plus Local Guidance” and the “Darwin Plus Local Finance Guidance”.	Checked
If my proposed project takes place on public lands or water or is addressing alien invasive species, I have uploaded a Letter of Support from Government.	Checked
I have uploaded a cover letter that details the information requested in the guidance (Guidance section 4.2 has information on what this cover letter should include).	Checked
I have read, and can meet, the current Terms and Conditions for this fund.	Checked
I have provided actual start and end dates for my project that fit this Round.	Checked
I have provided my summary budget based on UK government financial years i.e. 1 April – 31 March and in GBP in the application form.	Checked
I have uploaded my project workplan using the specific template provided.	Checked
(If copying and pasting into Flexi-Grant) I have checked that all my responses have been successfully copied into the online application form.	Checked
The application has been signed by a suitably authorised individual (clear electronic or scanned signatures are acceptable).	Checked
I have checked the Darwin Plus website immediately prior to submission to ensure there are no late updates.	Checked

I have read and understood the Privacy Notice on the Darwin Plus website.

Checked

We would like to keep in touch!

Please check this box if you would be happy for the lead applicant (Flexi-Grant Account Holder) and project leader (if different) to be added to our mailing list. Through our mailing list we share updates on upcoming and current application rounds under Darwin Plus. We also provide occasional updates on other UK Government activities related to biodiversity conservation and share project news. You are free to unsubscribe at any time.

Checked

Data protection and use of personal data

Information supplied in the application form, including personal data, will be used by Defra as set out in the **Privacy Notice**, available from the [Forms and Guidance Portal](#).

This **Privacy Notice must be provided to all individuals** whose personal data is supplied in the application form. Some information may be used when publicising Darwin Plus including project details (usually title, lead partner, project leader, location, and total grant value).

Project Title:

Darwin Plus Local

Provide a **Project Workplan** that shows the key milestones in project activities. Complete the following table as appropriate to describe the intended workplan for your project. Round 2 is for a **maximum of six months** with activities starting from 1 October 2023 and all projects must be completed by 31 March 2024.

Please add/remove columns to reflect the length of your project. For each activity (add/remove rows as appropriate) indicate the number of months it will last, and shade only the months in which an activity will be carried out. The workplan can span multiple pages if necessary.

Activity #	Description (max 25 words)	No. of months	UK Financial Years 2023/24											
			Calendar Year 2023											
			Oct											
Emergency Recovery Plan	Collection of live Chagos brain coral colonies from Middle Brother and Diego Garcia in BIOT and export to UK	1												