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# **DPR12S2\1013**

## **Tracking terns for conservation in BIOT**

Seabirds play a vital role in tropical oceans but are declining. Terns represent ~88% of breeding seabirds in BIOT but are understudied. This project will study tern ecology and develop a citizen science project (with long-term aspirations) with direct biodiversity conservation relevance. Enhancing BIOT's capability to support good environmental monitoring and, given the crucial role seabirds play in coral reef resilience, this project offers wider dividends for habitat regeneration in the face of climate change.



# DPR12S2\1013

Tracking terns for conservation in BIOT

## Section 1 - Contact Details

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### PRIMARY APPLICANT DETAILS

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<b>Title</b>	Prof
<b>Name</b>	Steve
<b>Surname</b>	Votier
<b>Tel (Work)</b>	[REDACTED]
<b>Email (Work)</b>	[REDACTED]
<b>Address</b>	[REDACTED]
	[REDACTED]
	[REDACTED]
	[REDACTED]
	[REDACTED]

### GMS ORGANISATION

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Type	Organisation
<b>Name</b>	BIOT Administration
<b>Phone (Fax)</b>	n/a
<b>Email (Work)</b>	george.balcombe@fcdo.gov.uk
<b>Website (Work)</b>	[REDACTED]
<b>Address</b>	[REDACTED]
	[REDACTED]
	[REDACTED]
	[REDACTED]
	[REDACTED]
	[REDACTED]
	[REDACTED]
	[REDACTED]

Type	Organisation
<b>Name</b>	Zoological Society of London
<b>Phone (Work)</b>	[REDACTED]
<b>Email (Work)</b>	[REDACTED]
<b>Website (Work)</b>	[REDACTED]
<b>Address</b>	[REDACTED]
	[REDACTED]
	[REDACTED]
	[REDACTED]
	[REDACTED]
	[REDACTED]

## Section 2 - Title & Summary

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### Q3. Title:

Tracking terns for conservation in BIOT


### What was your Stage 1 reference number? e.g. DPR12S1\1123


DPR12S1\1032


Please attach a cover letter as a PDF document.

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 [Stage 2\\_Cover letter\\_Votier\\_Darwin+](#)

 02/10/2023

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 pdf 143.44 KB

## Q4. Summary of project

Please provide a brief non-technical summary of your project: the problem/need it is trying to address, its aims, and the key activities you plan on undertaking.

Successful Darwin Plus Main projects must demonstrate substantial measurable outcomes in at least one of the themes of Darwin Plus either by the end of the project's implementation or via evidenced mechanisms for post-project delivery.

Preference will be given to discrete projects implementing existing identified environmental solutions on the ground.

The broad themes of Darwin Plus Main are:

- **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;
- **Capability and capacity building:** enhancing the capacity within UKOTs to support the environment in the short- and long-term.

Seabirds play a vital role in tropical oceans but are declining. Terns represent ~88% of breeding seabirds in BIOT but are understudied. This project will study tern ecology and develop a citizen science project (with long-term aspirations) with direct biodiversity conservation relevance. Enhancing BIOT's capability to support good environmental monitoring and, given the crucial role seabirds play in coral reef resilience, this project offers wider dividends for habitat regeneration in the face of climate change.

## Section 3 - UKOT(s), Dates & Budget Summary

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### Q5. UKOT(s)

Which UK Overseas Territory(ies) will your project be working in?

- 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 UKOTs you have indicated, will your project directly benefit any other Territories or country(ies)?

- No

### Q6. Project dates

<b>Start date:</b>	<b>End date:</b>	<b>Duration (e.g. 2 years, 3 months):</b>
01 April 2024	30 September 2026	2 years 6 months

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**Q7. Budget summary**

Year:	2024/25	2025/26	2026/27	Total request
Amount:	£123,091.61	£123,091.61	£61,545.81	£307,729.03

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**Q8. Do you have matched funding arrangements?**

Yes

Please ensure you clearly outline your matched funding arrangement in the budget.

**Q9. If you have a significant amount of unconfirmed matched funding, please clarify how you will fund the project if you don't manage to secure this?**

The Bertarelli Programme for Marine Science have offered logistical support from Rachel Jones throughout the project (equivalent total [redacted]) and access to field equipment (bird ringing/catching equipment, PPE, and optics of approximate value [redacted]). In addition, the BIOT Administration will provide logistical support from George Balcombe (Strategic Environmental Officer for BIOT) and the two Environment Officers based on Diego Garcia during fieldwork planning and implementation worth [redacted].

**Q10. Have you received, applied for or plan to apply for any other UK Government funding for the proposed project or similar?**

No

**Section 4 - Problem statement**

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**Q11. Problem the project is trying to address**

Please describe the problem your project is trying to address in the UKOTs, relating to at least one of the themes of Darwin Plus:

For example, what are the specific threats to the environment that the project will attempt to address? Why are they relevant, for whom? How did you identify the need for your project? Please cite the evidence you are using to support your assessment of the problem.

Restoring impoverished seabird communities is essential for conserving UKOT biodiversity and, in the tropics, has profound implications for coral reef restoration in the face of climate change (Graham et al. 2018). But

understanding how best to protect tropical seabirds requires answers to important outstanding ecological questions such as: What do they eat? Where do they forage? When do they breed? What drives their breeding success? How does guano production vary over time? Research has answered many of these questions at higher latitudes, but tropical species are woefully understudied.

Since 2017 we (Pete Carr, Ruth Dunn, Robin Freeman, Alice Trevail, Malcolm Nicoll, Steve Votier) have been studying seabird ecology in BIOT, gathering information on community composition, breeding phenology and movement ecology using red-footed boobies *Sula sula* and wedge-tailed shearwaters *Ardenna pacifica* as model taxa (Carr et al. 2021; Carr et al. 2023). However, >88% of BIOTs breeding seabirds are terns or noddies (Sterninae), for which we know little except for their approximate population sizes and breeding distributions. We propose redressing this imbalance by establishing a new research programme focussed on terns which also utilises bio-logging developments, digital imaging and the large island workforce.

Seabirds are probably the most conspicuous component of native biodiversity on Diego Garcia (the only inhabited island in the archipelago), with ~400 breeding pairs of common noddies *Anous stolidus* and ~200 white terns *Gygis alba*. Many of these nest in trees and on building in Downtown Diego Garcia (Carr et al. 2021) often within a few feet of where people live and work. We have received many comments (and some unusual views) about these birds and it is these interactions that we hope to use for inspiration to engage the serving military (~40 from the UK armed forces and ~1,000 US Marines), a primarily Filipino workforce (~2,000), and others (e.g. administrative and scientific visitors). Moreover, by focussing our research on Diego Garcia this obviates the need for logistically challenging and expensive expeditions and thus helping to widen participation.

Our work is also significant for understanding seabird guano impacts on coral reef resilience and recovery (Graham et al. 2018). By quantifying the breeding cycle accurately for terns, we will be able to accurately estimate rates of nitrogenous waste production and how this might influence the condition of reefs on Diego Garcia.

Finally, this project is also important at a time of change in BIOT. Discussions about the sovereignty of BIOT are taking place between the UK and Mauritius, making it politically urgent to have a more complete understanding of the Chagos MPA biodiversity and its significance for seabirds. Mauritius is a key part of these discussions - including Mauritian scientists joining research expeditions - we would hope a seabird monitoring programme in Down Town Diego Garcia might be a natural complement to this.

## **Section 5 - Environmental Conventions, Treaties and Agreements**

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### **Q12. Environmental Conventions, Treaties and Agreements**

**Please detail how your project will contribute to the aims of the national and/or international agreement(s) your project is targeting. What key UKOT Government priorities and themes will it address and how? You should also consider local, territory specific agreements and action plans here. Letters of support from UKOT Government partners/stakeholders should also make clear reference to the agreements/action plans your project is contributing towards.**

Developing scientific criteria for ecological or biologically significant marine areas is at the heart of the United Nations Convention on Biological Diversity and understanding the significance and functionality of the Chagos MPA is linked with this. Our work also has relevance for biodiversity conservation and sustainable use of Areas Beyond National Jurisdiction, the RAMSAR convention (much Diego Garcia is a RAMSAR site) and the Convention on the Conservation of Migratory Species of Wild Animals.

Locally, our work will contribute towards BIOT's Interim Conservation Management Plan (CMP) by supporting responsible stewardship, protection, and conservation of the natural environment. It is also linked with

objectives to better understand climate change impacts and to communicate widely the unique value of the Territory as one of the last marine wildernesses and foster its status as a reference site for global conservation efforts.

## Section 6 - Method, Project Stakeholders, Gender, Change Expected, Pathway to Change & Exit Strategy

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### Q13. Methodology

**Describe the methods and approach you will use to achieve your intended Outcome and contribute towards your Impact. Provide information on:**

- how you reflected on and incorporated **evidence and lessons learnt** from past and present similar activities and projects in the design of this project.
- the specific approach you are using, supported by **evidence** that it will be effective, and **justifying why you expect it will be successful** in this context.
- how you will undertake the work (activities, materials and methods).
- how the **main activities** will be and where these will take place.
- how you will **manage the work** (governance, roles and responsibilities, project management tools, risks etc.).

We have been conducting seabird research in BIOT since 2016 (two grants from the Bertarelli Foundation for Marine Science 2017-21 and 2021-2025) during which time we have learnt much about the challenges of working at this remote location. For example, while travel to Diego Garcia is relatively straightforward, working on off islands has proved challenging and costly with several aborted expeditions and issues with conducting long-term research. Downtown Diego Garcia offers the chance to overcome this and to successfully refine our understanding of seabird ecology, plus their wider ecosystem benefits.

Terns are important components of tropical seabird communities and crucial in terms of nutrient flow from pelagic to reef systems, but remain understudied. This therefore aligns well with Nick Graham's (Lancaster University) work on managing degraded reefs and the importance of seabird guano elsewhere in BIOT and beyond. Project co-investigator Ruth Dunn is a joint PDRA with Lancaster and will provide expertise on calculating nutrient flow based on revised information on tern phenology, population size and foraging ecology.

Activities, Materials & Methods:

1. Quantify tern (common noddy and white tern) breeding biology:

We will map tern breeding sites in DownTown before establishing monitoring walks to be conducted by the PDRA or Environment Officers (EOs) at consistent and convenient times. Care will be taken to minimise disturbance, but these birds are very used to people walking past daily.

2. Analyse tern diet:

We will use digital photography to quantify diet. Terns and noddies are single-prey loaders, carrying food in their bill for courtship or chick provisioning - images of these feeds will enable us to identify prey type and size (relative to bill length) as has been done successfully with terns (Gaglio et al. 2017) and puffins (Puffarazi Project). The PDRA will take the lead establishing an image gallery (using <https://www.zooniverse.org>) and then facilitate the EOs and island residents to collect and upload images. Making this part of the EOs job description will sustain this monitoring long-term as residents of Diego Garcia change.

3. Map and quantify tern foraging behaviour and distribution:

Terns will be caught during change-over (to ensure nests are not left unattended) with a mist-net or noose pole

and equipped with a miniaturised GPS transmitters (2.9g Pathtrack nanoFix(R) GEO+RF). Devices will be attached to the back feathers using Tesa tape and tags will fall-off naturally, usually after a few weeks. Data will be downloaded remotely using a fixed or hand-held base-station and used to identify where and when terns forage. For instance, it is unclear whether white terns are nocturnal foragers or not (their large eyes would suggest they are). Establishing where terns forage will also be beneficial for understanding possible threats at-sea, such as from the local recreational fishing or, in the event they travel long distances, whether they stay within the MPA and the possible threat of illegal fishing. Tracking smaller seabirds like terns in this way has proved successful for a number of similar sized species (Seaward et al. 2021, Yu et al. 2022).

Long-term monitoring:

We hope that tern monitoring will become an integral part of the 2 environment officers work on Diego Garcia - in much the same way that coral reef and turtle surveys are conducted. Moreover, by integrating as widely a possible with other stakeholders on the island, they will become a community activity capable of running for many years.

Links between seabirds, guano and coral reefs:

By understanding more about the foraging and breeding biology of seabirds we can do more to reveal how guano benefits coral ecosystems. For example, collating detailed information on the timing of breeding will enable us to quantify rates of nitrification more accurately and how this may shape the patterns of resilience and recovery in reefs beside seabird colonies.

Communicating project outcomes:

We will communicate our findings at several scales. First, results of island counts and tracking work will be presented to the EOs and on- island workforce via accessible oral presentations during field expeditions, and produce a 1-page bi-monthly project update. Second, we will report to the BIOT Administration and ZSL via detailed end of year reports. Third, we will write 2-3 peer-reviewed publications on breeding and foraging ecology (possibly 2-papers) and one integrating this information to generate nutrient flows and model possible benefits for coral reefs. Finally, we hope to incorporate our findings into the BIOT management plan.

## Q14. Project Stakeholders

**Who are the stakeholders for this project and how have they been consulted (include local or host government support/engagement where relevant)? Briefly describe what support they will provide and how the project will engage with them**

The BIOT Administration have been consulted about the project through initial conversations in the field to planning and writing the proposal. The Environment Officers input into all BIOT conservation initiatives and being based in Diego Garcia have a good understanding of the associated logistical complications of operating through a remote US Naval Support Facility, as well as the ability to help the the project to run long-term. We would like the current project to become part of the Environment Officers role in the long-term.

ZSL have been invaluable during project discussion and design. Rachel Jones manages the Bertarelli Programme in Marine Science in BIOT - a multiyear programme of research delivered by tens of scientists that aims to inform and improve management efforts in the MPA. Therefore, they have excellent oversight on logistics and politics relevant to working in BIOT, which they are willing to impart for the Tracking terns for conservation in BIOT project.

The BIOT workforce (Filipino, UK/US Military) who will be consulted extensively if the project gets the go ahead.

## Q15. Gender equality and social inclusion



**All applicants must consider whether and how their project will contribute to promoting equality between persons of different gender and social characteristics. Explain your understanding of how individuals may be excluded from equal participation within the context of your project, and how you seek to address this. You should consider how your project will proactively contribute to ensuring individuals achieve equitable outcomes and how you will engage participants in a meaningful way.**

Heriot-Watt takes a one university approach offering equivalence in academic standards and operations no matter an individuals' gender. In ecology and conservation gender inequality is most pronounced higher up the pay scale – by appointing named PDRA Hannah Wood this would help, in a very small way to balance this. Moreover, the population on Diego Gracia is disproportionately male (~80%) but we will try to balance this with our citizen science involvement by actively reaching out to female participants.

On Diego Garcia, the Filipino workforce are doing primarily unskilled work and there is a clear hierarchy as a consequence. We will proactively seek to recruit Filipino's to join the seabird minoring project. Working together with military personnel (UK and US) on this natural history project may be a useful way to build linkage and reduce social exclusion.

## **Q16. Change expected**

**Detail the expected changes this work will deliver. You should identify what will change and who will benefit a) in the short-term (i.e. during the life of the project) and b) in the long-term (after the project has ended). Please describe the changes for the environment and, where relevant, for people in the OTs, and how they are linked.**

**When talking about how people will benefit, please remember to give details of who will benefit, differences in benefits by gender or other layers of diversity within stakeholders, and the number of beneficiaries expected. The number of communities is insufficient detail – number of households should be the largest unit used.**

1. Understanding seabird at-sea distribution and foraging habitat across the Chagos archipelago MPA. This has benefits in the short-term as it fills an important knowledge gap about the threats and opportunities faced by terns - this understudied but most numerous component of the seabird assemblage in BIOT. This also has potential for long-term benefits since terns provide vital nutrient inputs to threatened reef ecosystems and may inform management decisions. For instance, tracking will reveal how much time terns spend on land and where they catch fish – depending on the results might triage island restoration programmes to favour terns above other seabirds.

2. Widening participation for conservation in BIOT and beyond.

Ongoing public-facing projects studying sea turtle ecology and reducing plastic pollution have successfully engaged with the BIOT community including people in the Armed Forces (UK and US) and civilians (such as the primarily Filipino work force) enhancing the dialogue surrounding biodiversity conservation. By extending this to include seabirds – many of which are on their doorstep – we hope to widen participation and draw attention to the plight of seabirds worldwide. Moreover, the 'Insterngram' project studying diet has the potential to engage an audience much more widely than BIOT and highlight the value of this UKOT for tropical biodiversity. This is especially valuable given the transient nature of people working in BIOT. By equipping them with citizen science tools (e.g. iBird, iNaturalist) they can continue to contribute to future deployments and in their home countries.

## **Q17. Pathway to change**

**Please outline your project's expected pathway to change. This should be an overview of the overall project logic and outline why and how you expect your Outputs to contribute towards your overall Outcome and, in the longer term, your expected Impact.**

1. Understanding seabird at-sea distribution and phenology.

Quantifying breeding phenology and foraging in terns will provide evidence as to their potential value via guano inputs to coral reef function and how it might change in the face of global environmental change. We will also be better placed to conserve and improve seabird status in BIOT. Outputs in terms of peer-reviewed papers (towards the end of the project), 6-monthly informal reports and regular oral presentations will enable the BIOT Administration to refine their management plan.

2. Widening participation for conservation in BIOT and beyond.

We will engage with the BIOT community via advertised guided walks (e.g. to monitor breeding success) and use these opportunities to present our work and importantly its wider relevance to the tropical Indian Ocean. We will develop citizen science tools to collate and analyse seabird dietary images to widen our reach across the region and globally – the RSPB’s Puffarazzi project received ~3,500 images from >1000 people over an 18-month period.

## Q18. Sustainable benefits

**How will the project reach a sustainable point and continue to deliver benefits post-funding? Will the activities require funding and support from other sources, or will they be mainstreamed in to “business as usual”? How will the required knowledge and skills remain available to sustain the benefits? If relevant, how will your approach be scaled? How will you ensure your data and evidence will be accessible to others?**


Post-funding we would wish to see seabird monitoring as part of current biodiversity measures in BIOT - establishing a low-cost, logistically straightforward but biological relevant programme as outlined in this proposal could deliver benefits for many years to come. Specifically, the UK Government's commitment to responsible stewardship of BIOT biodiversity requires indicators of change. We propose that seabird breeding performance and diet could provide just such an indicator.


Looking forward, we hope the Environment Officers would be able to maintain this monitoring programme. We would pass-on our knowledge of seabird monitoring to them to ensure continuity and rigour and without the need for additional funding. It would be less straightforward to provide training for seabird tracking (because of the licensing restrictions, for instance) but this might be an option depending on the appropriate appointments made.


As well as the Environment Officers, we will impart our monitoring skills to Filipino and military workforce. There is a degree of uncertainty about how this may develop post-project, but given the limited scope for entertainment on the island, this could become an integral part of life if the right people are engaged. One island resident already keeps a record of when the white terns nest outside church - engaging with people like this is crucial to make our project as accessible as possible.


**If necessary, please provide supporting documentation e.g. maps, diagrams, references etc., as a PDF using the File Upload below:**

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 [Darwin\\_refs\\_stage2](#)

 02/10/2023

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## Section 7 - Risk Management

### Q19. Risk Management

Please outline the 6 key risks to achievement of your Project Outcome and how these risks will be managed and mitigated, referring to the Risk Guidance. This should include at least one Fiduciary, one Safeguarding, and one Delivery Chain Risk.

Risk Description	Impact	Prob.	Inherent Risk	Mitigation	Residual Risk
<p><b>Fiduciary (Financial)</b></p> <p>Flights and accomodation are costly - price increases and unforeseen lay-overs could stretch the budget.</p>	unlikely	moderate	moderate	We have included a generous budget based on the past 5 years of fieldwork in BIOT - this contingency makes this risk unlikely.	minor
<p><b>Safeguarding</b></p> <p>The two female PDRAs will be working in a heavily male-biased environment harassment is possible.</p>	unlikely	major	major	We will establish a safe working protocol in association with the BIOT Administration and the UK Military. This will include (but not be limited to) discussion with the local police about working practicalities Down Town including whether a buddy system is required.	moderate
<p><b>Delivery Chain</b></p> <p>Maintaining the citizen science in our absence may be at risk.</p>	Unlikely	moderate	minor	Starting the project strongly and encouraging engagement across the BIOT Administration, military and Filipino workforce is key. Moreover, we will make at least 3 in-person visits to steer the project to something that should become self-sustaining.	minor
<p><b>Risk 4</b></p> <p>Mauritius has claimed sovereignty over BIOT, with support from the interntional community. Transfer of sovereignty could create logistical issues around fieldwork and long-term monitoring.</p>	possible	minor	moderate	It seems likely that Mauritius will have a greater involvement in BIOT management. However, Mauritius are keen to support conservation in the Chagos MPA. Mauritian scientists will be joining current research helping to foster a more collaborative relationship and reducing the potential for issues.	minor
<p><b>Risk 5</b></p> <p>Tag deployment could go wrong either because of technical issues or if the devices do not stay on the birds for lonmg enough to collect useful data.</p>	unlikely	minor	minor	Follow best practice on bird capture, handling and device attachment. Finally, while the tagging provides us with valuable knowledge about tern ecology, the project does not live or die by this.	minor

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**Risk 6**

Finally, while the tagging provides us with valuable knowledge about tern ecology, the project does not live or die by this.

unlikely moderate moderate

Covid-19 mitigation measures should be followed and careful monitoring of change. It seems unlikely that covid-19 will have such a profound impact as during 2020-21 because of vaccination development and greater awareness of the virus

moderate

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## Q20. Project sensitivities

Please indicate whether there are sensitivities associated with this project that need to be considered if details are published (detailed species location data that would increase threats, political sensitivities, prosecutions for illegal activities, security of staff etc.). Please note your response to this question won't influence the outcome of your application.


No


## Section 8 - Workplan


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### Q21. Workplan

Provide a project workplan that shows the key milestones in project activities. Complete the Word template as appropriate to describe the intended workplan for your project.

 [BCF\\_Workplan\\_Template\\_2023-24\\_FINAL](#)

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## Section 9 - Monitoring and Evaluation (M&E)

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### Q21. Monitoring and evaluation (M&E) plan

Describe how the progress of the project will be monitored and evaluated, making reference to who is responsible for the project's M&E.

Darwin Plus projects will need to be adaptive and you should detail how the monitoring and evaluation will feed into the delivery of the project including its management. M&E is expected to be built into the project and not an 'add' on. It is as important to measure for negative impacts as it is for positive impact.

Additionally, please indicate an approximate budget and level of effort (person days) to be spent on M&E (see Finance Guidance).

Votier will take the lead on M&E, comprising ~10 days throughout the duration of the project.

Expedition planning and execution: Based on 7 previous expeditions to the archipelago (3 led by Votier, 4 by Wood, named PDRA) we expect some challenges, but anticipate M&E will be fairly light given our experience.

Data collection on tern biology: This will first be monitored on the basis of how easy it is for the PDRA and EOs to

collect the data. For instance, how long does it take to visit all nest sites in Downtown and do we want to sub-sample or monitor all nests? These information are important in terms of assessing the feasibility of the project being maintained at the end of funding. We will review the time commitment and number of people required to complete this work with a view to streamlining the process - is it more the merrier, or do we need to keep numbers of a minimum?

Tracking tern movements: The PI will lead bird catching and tagging and monitor the efficacy of approach in real time. We will evaluate whether there are any deleterious device effects (could they be attached differently?) and how long devices remain attached. Moreover, we will assess how effective remote downloads are - previous projects suggest that a hand-held device can gather such information effectively, but will that work in this instance?

Increased engagement from the BIOT community in seabird conservation research: The PI will speak with the EOs and BIOT Administration regularly to evaluate the extent to which different members of the island community are engaging with the project and what their feedback is. Depending on the evaluation, we might wish to adjust advertising in response to uptake. For instance, how many people are joining the walks? How many images are being uploaded? What is the feedback from those joining the walks?

Improved management strategy for seabird conservation in BIOT: As the project progresses, we will seek to understand how the seabird monitoring programme may fit into the management strategy for BIOT. We will reflect on what is needed by the BIOT Administration and also consider how our work might fit into a future where the archipelago is managed by Mauritius. Indeed, we may well seek to include Mauritius more directly with the project at time goes on.

<b>Total project budget for M&amp;E (£)</b>	[REDACTED]
<b>(this may include Staff and Travel and Subsistence Costs)</b>	
<b>Total project budget for M&amp;E (%)</b>	2
<b>Number of days planned for M&amp;E</b>	10

## Section 10 - Logical Framework

### Q23. Logical Framework (logframe)

**Darwin Plus projects will be required to monitor and report against their progress towards their Outputs and Outcome. This section sets out the expected Outputs and Outcome of your project, how you will measure progress against these and how we can verify this.**

- [BCF\\_St2\\_and\\_Single\\_Stage\\_Logical\\_Framework\\_Template\\_Votier](#)
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Impact:

Seabird biodiversity and the services they provide in BIOT will be maintained or improved, facilitated by people working there.

**Outcome:**

Development of an effective seabird monitoring programme on Diego Garcia and engagement with island workers to improve conservation engagement and tropical seabird biodiversity.

**Project Outputs**

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**Output 1:**

Data collection on tern breeding biology on Diego Garcia

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**Output 2:**

Data on tern diet composition

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**Output 3:**

Spatial information on tern foraging distribution and habitat choice.

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**Output 4:**

Increased engagement from the BIOT community in seabird conservation research.

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**Output 5:**

Improved management strategy for seabird conservation in BIOT.

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**Do you require more Output fields?**

**It is advised to have fewer than 6 Outputs since this level of detail can be provided at the Activity level.**

No

**Activities**

**Each activity is numbered according to the Output that it will contribute towards, for example, 1.1, 1.2, 1.3 are contributing to Output 1.**

1. Data collection of tern breeding biology on Diego Garcia
  - 1.1. Plan and execute fieldwork expeditions and stakeholder meetings in Diego Garcia
  - 1.2. Collect and map data on tern breeding distribution in Downtown DG
  - 1.3. Collect and map data on tern roost sites in Downtown DG
  - 1.4. Quantify tern on breeding population size by month and by year
  - 1.5. Collect data on tern breeding tern breeding success using standard methods
  
2. Data on tern diet composition
  - 2.1. Take digital images of prey items brought to the nest by breeding terns and upload to Zooniverse
  - 2.2. Collate digital images from stakeholders of prey items brought to the nest by breeding terns which have been uploaded to Zooniverse
  - 2.3. Identify fish images to lowest possible taxon
  - 2.4. Measure fish in relation to bill length
  
3. Spatial information on tern foraging distribution and habitat choice.





- 3.1. Catch and deploy tags on breeding terns
- 3.2. Remotely download movement data
- 3.3. Plot species-specific at-sea distribution and model habitat choice
- 3.4. Use outputs from 3.3. to plot tern at-sea distribution based on remotely-sensed environmental conditions
  
- 4. Increased engagement from the BIOT community in seabird conservation research.
  - 4.1. Establish regular monitoring walks in conjunction with EOs and monitoring numbers attending
  - 4.2. Conduct regular outreach via presentations and bird catching demonstrations and monitor numbers
  - 4.3. Add tern monitoring into long-term EO roles in BIOT.
  
- 5. Improved management strategy for seabird conservation in BIOT.
  - 5.1. Provide guidance to the BIOT Administration on tern conservation in Downtown Diego Garcia
  - 5.2. Quantify guano production and potential benefits for reefs locally and beyond.
  - 5.3. Encourage tern monitoring in Downtown DG to become a part of standard monitoring, while looking for citizen champions to have their involvement.

## Section 11 - Budget and Funding

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### Q24. Budget

**Please complete the appropriate Excel spreadsheet which provides the Budget for this application and ensure the Summary page is fully completed. Some of the questions earlier and below refer to the information in this spreadsheet.**

- 
-  [BCF Budget over 100k MASTER Aug23-2](#)
  -  02/10/2023
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  -  xlsx 98.13 KB

### Q25. Alignment with other funding and activities

**This question aims to help us understand how familiar you are with other work in the geographic/thematic area, and how this proposed project will build on or align with this to avoid any risks of duplicating or conflicting activities.**

**Q25a. Is this new work or does it build on existing/past activities (delivered by anyone and funded through any source)?**

- Development of existing work

**Please provide details:**

The current project is a bit of both - we aim to create a stand-alone project to engage the Diego Garcia community with seabird conservation, but on the back of our Bertarelli funded work in the Chagos since 2017.

Our research funded by the Bertarelli Programme for Marine Science runs until December 2025 and has seen us build-up a research programme from scratch to start to address some important applied questions in the region. Therefore, if successful, the current project will be able to draw on the expertise from the BPMS team members, as well as providing the chance to widen the discussion about seabird conservation from island to archipelago level.

**Q25b. Are you aware of any current or future plans for work in the geographic/thematic area to the proposed project?**

No

## **Q26. Balance of budget spend**

**Defra are keen to see as much Darwin Plus funding as possible directly benefiting UKOT communities and economies. While it is appreciated that this is not always possible every effort should be made for funds to remain in-Territory.**

**Explain the thinking behind your budget in terms of where Darwin Plus funds will be spent. What benefits will the Territory/ies see from your budget? What level of the award do you expect will be spent locally? Please explain the decisions behind any Darwin Plus funding that will not be spent locally and how those costs are important for the project.**

The majority of our budget spend is on a named PDRA (Hannah Wood) who will be based in the UK and visit Diego Garcia for 3 month-long expeditions - her expertise in seabird tracking combined with >6 months previous experience in the Chagos make this integral to the project success.

Other significant spend that will not remain in territory are seabird trackers and travel - there is no other realistic alternative.

Therefore, only a modest amount of Darwin Plus funding will directly benefit the local Chagos community. However, looking forward, we would hope to be able to develop local special interest groups who might be eligible for funding in the near future.

## **Q27. Value for Money**

**Please describe why you consider your application to be good value for money including justification of why the measures you will adopt will secure value for money.**

Establishing and running a project to better understand the ecology of tropical seabirds is a costly endeavour - this cost is likely to have played a key role in why we know so little about this threatened group of birds. However, but attempting to establish a monitoring project which could be run over the long-term utilising the BIOT Environment Officers together with the transit working community on the island we may be able to achieve something that would have cost many thousands of dollars if centred on one of the off-islands.

## **Q28. Capital items**

**If you plan to purchase capital items with Darwin Plus funding, please indicate what you anticipate will happen to the items following project end. If you are requesting more than 10% capital costs, please provide your justification here.**

We anticipate that the digital camera and lens for photographing seabird prey items will either be retained by the BIOT Administration Environmental Officers or to members of the island Filipino community who take a special interest in the project.

## **Section 12 - Safeguarding and Ethics**

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### **Q29. Safeguarding**



**All projects funded under the Biodiversity Challenge Funds must ensure proactive action is taken to promote the welfare and protect all individuals involved in the project (staff, implementing partners, the public and beneficiaries) involved in the project from harm. In order to provide assurance of this, projects are required to have specific procedures and policies in place.**

**Please upload the following required policies:**

- **Safeguarding Policy:** including a statement of commitment to safeguarding and a zero tolerance statement on bullying, harassment and sexual exploitation and abuse.
- **Whistleblowing Policy:** which details a clear process for dealing with concerns raised and protects whistle blowers from reprisals.
- **Code of Conduct:** which sets out clear expectations of behaviours – inside and outside the workplace – for all involved in the project and makes clear what will happen in the event of non-compliance or breach of these standards.

**If any of these policies are integrated into a broader policy document or handbook, please upload just the relevant or equivalent sub-sections to the above policies, with (unofficial) English translations where needed.**

**Please outline how (a) beneficiaries, the public, implementing partners, and staff are made aware of your safeguarding commitment and how to confidentially raise a concern, (b) safeguarding issues are investigated, recorded and what disciplinary procedures are in place when allegations and complaints are upheld, (c) you will ensure project partners uphold these policies.**

**If your approach is currently limited or in the early stages of development, please clearly set out your plans address this.**

Policy Awareness: In addition to providing details of Heriot-Watt Policies, a series of meetings will take place between the PI & PDRAs and project stakeholders. We will also engage with the UK Military and Filipino workforce to increase their awareness of codes of conduct and good practice.

Documenting issues: During meetings with the BIOT Administration and Military personnel we will establish a code of conduct for reporting issues, based around the guidelines set-out in HWUs code of conduct.

Upholding policies: By establishing a code of conduct, we will also establish a mechanism by which policies are upheld.

## **Q30. Ethics**

**Outline your approach to meeting the key principles of good ethical practice, as outlined in the guidance.**

Seabird disturbance and handling.

During 30 years of seabird handling experience the PI has developed excellent ethical practice for bird handling. As well as the relevant licences from BIOT and the British Trust for Ornithology, the PI has also held a UK Home Office Project Licence under the UK Home Office Animals (Scientific Procedures) Act 1986 for 15 years ensuring an excellent knowledge of the ethics of working with wild birds. The named PDRA (Hannah Wood) also has >5 years experience of marine mammal handling (primarily in South Georgia, but also Scotland) and 4-years experience handling and deploying tags on seabirds in BIOT.

Social ethics.

Data on participants should preferably include information on gender and ethnicity to disaggregation of people who might be engaging with the project. We will make them aware of this, with the option to opt-out of this part of the process. No data at an individual level will be gathered.

## Section 13 - Project Staff

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### Q31. Project staff


Please identify the core staff (identified in the budget), their role and what % of their time they will be working on the project.


Name (First name, Surname)	Role	% time on project	1 page CV or job description attached?
Stephen Votier	Project Leader	5	Checked
Hannah Wood	PDRA	100	Checked
Ruth Dunn	PDRA	5	Checked
No Response	No Response	0	Unchecked


Do you require more fields?


No

Please provide 1 page CVs (or job description if yet to be recruited) for the project staff listed above as a combined PDF.


 [Ruth Dunn - CV - Sept2023](#)


 19/09/2023


 21:04:45

 pdf 99.34 KB

 [VotierCV\\_Sep\\_2023\\_1page](#)


 19/09/2023


 21:04:45

 pdf 44.54 KB

 [Hannah Wood CV Darwin](#)

 19/09/2023

 21:04:45

 pdf 36.35 KB

Have you attached all project staff CVs and job descriptions?

Yes

## Section 14 - Project Partners

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### Q32. Project partners

Please list all the Project Partners (including the Lead Partner who will administer the grant and coordinate delivery of the project), clearly setting out their roles and responsibilities in the project including the extent of their engagement so far.

**This section should demonstrate the capability and capacity of the Project Partners to successfully deliver the project. Please provide Letters of Support for all project partners or explain why this has not been included.**

<b>Lead partner name:</b>	Stephen Votier
<b>Is the Lead Partner based in a UKOT where the project is working?</b>	<input checked="" type="radio"/> No
<b>Please explain why this project is led from outside the UKOT</b>	The project ideas were formulated by the seabird research team funded by the Bertarelli Programme for Marine Science, guided by their skills and experience. Therefore they are best placed to lead the project in BIOT, although in close collaboration with the BIO administration and ZSL.
<b>Why is this organisation the Lead Partner, and what value to they bring to the project? (including roles, responsibilities and capabilities and capacity):</b>	Heriot-Watt is the the Lead Partner for intellectual property reasons and their wealth of seabird research experience.
<b>Allocated budget (proportion or value):</b>	£0.00
<b>Representation on the Project Board (or other management structure)</b>	<input checked="" type="radio"/> No
<b>Have you included a Letter of Support from the Lead Partner?</b>	<input checked="" type="radio"/> Yes

**Do you have partners involved in the Project?**

Yes

<b>1. Partner Name:</b>	BIOT Administration
<b>Website address:</b>	<a href="https://www.biot.gov.io">https://www.biot.gov.io</a>
<b>What value does this Partner bring to the project? (including roles, responsibilities and capabilities and capacity):</b>	The BIOT Administration manage the archipelago and are essential to the efficacy of this project. As well as granting access and permissions to work in the territory, they are also responsible for managing biodiversity, which is the central focus of this application. Their role is to offer logistical support with travel to the islands, connections with the two Environment Officers and also with the wider community in Diego Garcia (the only inhabited island in the archipelago).
<b>UKOT-based/other Partner</b>	<input checked="" type="radio"/> UKOT-based
<b>Allocated budget (proportion or value):</b>	██████████

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**Representation on the Project Board (or other management structure)**  Yes

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Have you included a Letter of Support from this organisation?  Yes

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**2. Partner Name:** ZSL

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**Website address:** <https://www.zsl.org>

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What value does this Partner bring to the project? (including roles, responsibilities and capabilities and capacity): Our contact at ZSL (Rachel Jones) is manager of the Bertarelli Foundation for Marine Science research programme in BIOT, which sees tens of researchers travelling to the archipelago each year to conduct biodiversity research. Therefore, Rachel very much has her finger on the pulse of what is happening in BIOT, including who works there, and what the latest challenges or opportunities might be.

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**UKOT-based/other Partner**  Other

---

**Allocated budget (proportion or value):** ██████████

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**Representation on the Project Board (or other management structure)**  Yes

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Have you included a Letter of Support from this organisation?  Yes

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**3. Partner Name:** *No Response*

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**Website address:** *No Response*

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What value does this Partner bring to the project? (including roles, responsibilities and capabilities and capacity): *No Response*

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**UKOT-based/other Partner** £0.00

---

**Allocated budget (proportion or value):**  Other

---

**Representation on the Project Board (or other management structure)**  Yes  
 No

---

Have you included a Letter of Support from this organisation?  Yes  
 No

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**4. Partner Name:** *No Response*

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**Website address:** *No Response*

---

What value does this Partner bring to the project? (including roles, responsibilities and capabilities and capacity): *No Response*

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**UKOT-based/other Partner**  Other

---

**Allocated budget (proportion or value):** £0.00

---

**Representation on the Project Board (or other management structure)**  Yes  
 No

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Have you included a Letter of Support from this organisation?  Yes  
 No

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**5. Partner Name:** *No Response*

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**Website address:** *No Response*

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What value does this Partner bring to the project? (including roles, responsibilities and capabilities and capacity): *No Response*

---

**UKOT-based/other Partner**  Other

---

**Allocated budget (proportion or value):** £0.00

---

**Representation on the Project Board (or other management structure)**  Yes  
 No

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Have you included a Letter of Support from this organisation?  Yes  
 No

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**6. Partner Name:** *No Response*

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**Website address:** *No Response*

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What value does this Partner bring to the project? (including roles, responsibilities and capabilities and capacity): *No Response*

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**UKOT-based/other Partner**  Other

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Allocated budget (proportion or value): £0.00

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Representation on the Project Board (or other management structure)  Yes  No





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Have you included a Letter of Support from this organisation?  Yes  No

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Please provide a combined PDF of all letters of support.

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 [Votier\\_Darwin\\_terns\\_ZSL letter of support\\_2023 \[86\]](#)  
 02/10/2023  
 13:04:30  
 pdf 252.41 KB

 [LOS\\_Votier\\_Darwin+\[69\]](#)  
 28/09/2023  
 19:38:46  
 pdf 150.33 KB

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 [BIOTA LoS - Tracking terns for conservations in BIOT](#)  
 27/09/2023  
 10:37:39  
 pdf 279.69 KB

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## Section 15 - Lead Partner Capability and Capacity

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### Q33. Lead Partner Capability and Capacity

Has your organisation been awarded Biodiversity Challenge Funds (Darwin Plus, Darwin Initiative or Illegal Wildlife Trade Challenge Fund) funding before?

Yes

If yes, please provide details of the most recent awards (up to 6 examples).

Reference No	Project Leader	Title
DPLUS140	Professor Teresa Fernandez	Assessment and conservation of Cayman Islands' deep-water reefs and fishes
No Response	No Response	No Response
No Response	No Response	No Response
No Response	No Response	No Response
No Response	No Response	No Response
No Response	No Response	No Response

Have you provided the requested signed audited/independently examined accounts?

Yes

## Section 16 - Certification

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### Certification

#### On behalf of the

Company

#### of

Heriot-Watt University

#### I apply for a grant of

£307,729.03

**I certify that, to the best of our knowledge and belief, the statements made by us in this application are true and the information provided is correct. I am aware that this application form will form the basis of the project schedule should this application be successful.**

(This form should be signed by an individual authorised by the applicant institution to submit applications and sign contracts on their behalf.)

- I enclose CVs for key project personnel, a cover letter, letters of support, a budget, logframe, Safeguarding and associated policies, and project workplan.
- Our last two sets of signed audited/independently verified accounts and annual report (covering three years) are also enclosed.

Checked





**Name** Stephen Votier

---

**Position in the organisation** Professor

---

**Signature (please upload e-signature)**

 Signature  
 25/09/2023  
 14:14:12  
 jpg 11.11 KB


**Date** 25 September 2023


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**Please attach the requested signed audited/independently examined accounts.**

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 [annual-accounts-2021](#)


 28/09/2023


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 [annual-accounts-2020](#)

 28/09/2023


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### Please upload the Lead Partner's Safeguarding Policy as a PDF

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 [DisciplinaryCode](#)


 27/09/2023


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 [safeguarding-of-vulnerable-groups-policy](#)

 25/09/2023

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## Section 17 - Submission Checklist

### Checklist for submission

	Check
<b>I have read the Guidance, including the "Guidance Notes for Applicants", "Monitoring Evaluation and Learning Guidance", "Standard Indicator Guidance", "Risk Guidance", and "Finance Guidance".</b>	Checked
<b>I have read, and can meet, the current Terms and Conditions for this fund.</b>	Checked
<b>I have provided actual start and end dates for the project.</b>	Checked
<b>I have provided my budget based on UK government financial years i.e. 1 April – 31 March and in GBP.</b>	Checked
<b>I have checked that our budget is complete, correctly adds up and I have included the correct final total at the start of the application.</b>	Checked
<b>The application been signed by a suitably authorised individual (clear electronic or scanned signatures are acceptable).</b>	Checked
<b>I have attached the below documents to my application:</b>	
<ul style="list-style-type: none"><li><b>a cover letter from the Lead Partner, outlining how any feedback received at Stage 1 has been addressed where relevant and referencing any potential conflicts of interest, as a single PDF.</b></li></ul>	Checked
<ul style="list-style-type: none"><li><b>my completed logframe as a PDF using the template provided and using "Monitoring Evaluation and Learning Guidance" and "Standard Indicator Guidance".</b></li></ul>	Checked
<ul style="list-style-type: none"><li><b>my budget (which meets the requirements above) using the template provided.</b></li></ul>	Checked
<ul style="list-style-type: none"><li><b>a signed copy of the last 2 annual report and accounts for the Lead Partner, or provided an explanation if not.</b></li></ul>	Checked
<ul style="list-style-type: none"><li><b>my completed workplan as a PDF using the template provided</b></li></ul>	Checked



<ul style="list-style-type: none"> <li>• a copy of the Lead Partner's Safeguarding Policy, Whistleblowing Policy and Code of Conduct (Question 28).</li> </ul>	Checked
<ul style="list-style-type: none"> <li>• 1 page CV or job description for each of the Project Staff identified at Question 30, including the Project Leader, or provided an explanation of why not, combined into a single PDF.</li> </ul>	Checked
<ul style="list-style-type: none"> <li>• a letter of support from the Lead Partner and partner(s) identified at Question 31 and relevant OT Governments, or an explanation of why not, combined into a single PDF.</li> </ul>	Checked
My additional supporting evidence is in line with the requested evidence, amounts to a maximum of 5 sides of A4, and is combined as a single PDF.	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
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 the Darwin Initiative and our sister grant scheme, the IWT Challenge Fund. We also provide occasional updates on other UK Government activities related to biodiversity conservation and share our quarterly project newsletter. You are free to unsubscribe at any time.

Unchecked

### 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 the Darwin Initiative including project details (usually title, lead partner, project leader, location, and total grant value).

Professor Stephen Votier  
Lyell Centre  
Heriot-Watt University  
Edinburgh, UK  
Tel: +44 (0) 07817 435095  
Email: [s.votier@hw.ac.uk](mailto:s.votier@hw.ac.uk)



28<sup>th</sup> Sep 2023

**Tracking terns for conservation in BIOT DPR12S2\1013 – Darwin+ Stage 2 Application**

To Whom It May Concern:

We hope you find the submitted stage 2 proposal of interest and may also consider it for funding.

As outlined in our stage 1 submission, the purpose of this proposed work is to better understand the ecology of understudied terns in the British Indian Ocean Territory, while also engaging the island workforce to establish a sustainable monitoring programme.

Many thanks for the chance to submit a stage 2 application and for the helpful comments on strengthening our proposal. The main changes are summarised below:

- Long-term project sustainability – we have provided more information on this aspect of the project. Key to this is making tern monitoring a part of the BIOT Environment Officers role – if they can oversee integration with the island community, we believe this has the potential to run long-term with only modest investment of time.
- Communicating outcomes – we have provided more detail on how we will disseminate our findings to the scientific community and elsewhere.
- Gender Quality and Social Inclusion – thanks for highlighting this, we have provided more detail on how we will engage more with the island workforce.
- Justification and context – Throughout the text, we have tried to articulate better the risks, conservation rationale and links between the proposed research and wider ecological benefits. This includes highlighting the significance of ongoing sovereignty discussions with Mauritius and how having a sustainable seabird monitoring programme in place could ensure this component of biodiversity is part of the narrative about conservation.
- Logframe has been updated, including the appropriate indicators.

- Budget – the overall costs has increased slightly from £288,942 to £307,728. This is primarily a result of reducing the overall project length from 36 to 30 months but increasing the duration of the named PDRA from 24 to 30 months. We felt it was important to increase the amount of time we employed the PDRA given the workload, but by reducing the overall project duration is helped to keep costs down.

We sincerely hope that you still find this project of interest and worthy of funding. Given our experience of working in BIOT we are acutely aware that some of the small pockets of well-preserved seabird colonies are among the most intact in the region, if not the entire tropics. We hope to do more to preserve as much of the seabird assemblage in this part of the world as possible.

Hopefully the above and the application provides you with the information you require about our project, but please do not hesitate to let us know if there is anything else we can do to help.

Kind regards,

Steve Votier (on behalf of the applicants)



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## Darwin+ References

Carr, P., Votier, S., Koldewey, H., Godley, B., Wood, H., & Nicoll, M. A. (2021). Status and phenology of breeding seabirds and a review of Important Bird and Biodiversity Areas in the British Indian Ocean Territory. *Bird Conservation International*, 31(1), 14-34.

Carr, P., Trevail, A. M., Koldewey, H. J., Sherley, R. B., Wilkinson, T., Wood, H., & Votier, S. C. (2023). Marine Important Bird and Biodiversity Areas in the Chagos Archipelago. *Bird Conservation International*, 33, e29.

Gaglio, D., Cook, T. R., Connan, M., Ryan, P. G., & Sherley, R. B. (2017). Dietary studies in birds: testing a non-invasive method using digital photography in seabirds. *Methods in Ecology and Evolution*, 8(2), 214-222.

Graham, N. A., Wilson, S. K., Carr, P., Hoey, A. S., Jennings, S., & MacNeil, M. A. (2018). Seabirds enhance coral reef productivity and functioning in the absence of invasive rats. *Nature*, 559(7713), 250-253.

Seward, A., Taylor, R. C., Perrow, M. R., Berridge, R. J., Bowgen, K. M., Dodd, S., ... & Bolton, M. (2021). Effect of GPS tagging on behaviour and marine distribution of breeding Arctic Terns *Sterna paradisaea*. *Ibis*, 163(1), 197-212.

Yu, X., Fan, P., Wu, Y., Chang, Y., Jia, C., & Lei, F. (2022). GPS tracking data reveal the annual spatiotemporal movement patterns of Bridled Terns. *Avian Research*, 13, 100065.

Project Title: Tracking terns for conservation in BIOT

	Activity	No. of months	Year 1 (24/25)				Year 2 (25/26)				Year 3 (26/27)			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2		
<b>Output 1</b>	<b>Data collection on tern breeding biology on Diego Garcia</b>	30												
1.1	Plan and execute fieldwork expeditions + stakeholder meetings	9												
1.1	Distribution map of breeding terns	30												
1.2	Distribution map of roosting terns	30												
1.3	Breeding population size by month	30												
1.4	Breeding population size by year	30												
1.5	Measures of tern breeding success	30												
<b>Output 2</b>	<b>Data on tern diet composition – as above, data collection throughout project but regular reporting</b>	30												
2.1	Collate images of prey items brought to the nest and upload to Zooniverse	30												
2.2	Identify fish to lowest possible taxon	30												
2.3	Measure fish in relation to bill length	30												
<b>Output 3</b>	<b>Spatial information on tern foraging distribution and habitat choice.</b>	6												
3.1	Catch and deploy tags	4												
3.2	Remote download data (include as part of citizen science)	6												
3.3	Plot species-specific at-sea distribution and habitat choice	12												

Project Title: Tracking terns for conservation in BIOT

	Activity	No. of months	Year 1 (24/25)				Year 2 (25/26)				Year 3 (26/27)			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2		
<b>Output 4</b>	<b>Increased engagement from the BIOT community in seabird conservation research.</b>	30												
4.1	Establish regular monitoring walks in conjunction with EOs	30												
4.2	Regular outreach via presentations and bird catching demonstrations	15												
4.3	Factoring tern monitoring into long-term EO roles in BIOT.	6												
<b>Output 5</b>	<b>Improved management strategy for seabird conservation in BIOT.</b>	30												
5.1	Guidance on tern conservation in Downtown Diego Garcia	30												
5.2	Quantify guano production and potential benefits for reefs locally and beyond	12												

Project Title: Tracking terns for conservation in BIOT

Project Summary	SMART Indicators	Means of Verification	Important Assumptions
<b>Impact:</b> <b>Seabird biodiversity and the services they provide in BIOT will be maintained or improved, facilitated by people working there.</b>			
<b>Outcome:</b> Development of an effective seabird monitoring programme on Diego Garcia and engagement with island workers to improve conservation engagement and tropical seabird biodiversity.	0.1. The number of seabirds breeding in Downtown Diego Garcia gradually increases with awareness and reduced disturbance. 0.2. Engagement with environmental meetings and online increases throughout the course of the project. 0.3. Understanding of seabird nutrient transfer and movements feed into island restoration projects in BIOT and beyond, specifically how guano might influence coral reefs at the local scale.	0.1. Monthly records of breeding numbers, success and phenology gathered each year of the project. 0.2. Seabird monitoring becomes part of the regular island activities. 0.3. Peer-reviewed publications on tern breeding biology, foraging ecology, guano production and importance for the region.	
<b>Outputs:</b> <b>1. Tern breeding biology on Diego Garcia</b>	1.1. DIC03 New assessments of habitat conservation action needs published. 1.2. DIC03. 1.3 – 1.5. DI-D18 Drivers of biodiversity loss assessed to have been reduced or removed.	1.1. Distribution maps published and linked with management plan. 1.2. Ditto 1.3 – 1.5. Counting the number of breeding birds and how successful they are will enable us to see change.	
<b>2. Data on tern diet composition</b>	2.1. DI-C11 Average monthly number of Website Visitors. 2.2. DI-C09 Species reference collections made. 2.3. DIC02 Number of new conservation or species stock assessments published.	2.1. How many images of tern diet items are uploaded to Zooniverse? 2.2. Classification of fish species that form diet of terns. 2.3. Size distribution of prey species and how this changes with time.	

Project Title: Tracking terns for conservation in BIOT

<p><b>3. Spatial information on tern foraging distribution and habitat choice.</b></p>	<p>3.1. n=20 individuals of brown noddy and white tern caught, and devices attached. 3.2. PDRA/Eos download data and explore feasibility of training citizens to do the same. 3.3. DI-B11 Area identified as important for biodiversity.</p>	<p>3.1. As well as record keeping, record the fate of tagged individuals. 3.2. How many tracks per individual are downloaded? 3.3. Where do terns travel to during foraging and what is the size of the area used?</p>	
<p><b>4. Increased engagement from the BIOT community in seabird conservation research.</b></p>	<p>4.1. DIB05 Number of people with increased participation in local communities' local management organisations (i.e., participation in Governance/citizen engagement). 4.2. DIB05 4.3. DID03 Number of policies with biodiversity provisions that have been enacted or amended.</p>	<p>4.1. Record number of people (their gender and ethnicity) at each event – how do numbers and composition change over time? 4.2. Ditto. 4.3. Is tern monitoring a part of the job description for EOs in BIOT?</p>	
<p><b>5. Improved management strategy for seabird conservation in BIOT.</b></p>	<p>5.1. DIB02 Number of new/improved species management plans available and endorsed. 5.2. DI-D08 Value of ecosystem services generated or protected as a result of project support. 5.3. DIB02 Number of new/improved species management plans available and endorsed.</p>	<p>5.1. Is a long-term tern monitoring project feasible beyond the end of the project? 5.2. Having quantified guano production and its possible value to coral reef functioning, how has this changed during the course of the project? 5.3. Do terns feature in the management plan both as a feature of downtown and consideration elsewhere in the archipelago?</p>	<p>Seabird guano enhancement of coral reef ecosystems based on models in Graham et al. (2018) is representative of the situation on DG.</p>
<p><b>Activities</b> (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. Each activity should start on a new line and be no more than approximately 25 words.)</p> <p><b>1. Data collection of tern breeding biology on Diego Garcia</b> 1.1. Plan and execute fieldwork expeditions and stakeholder meetings in Diego Garcia</p>			



Project Title: Tracking terns for conservation in BIOT

- 1.2. Collect and map data on tern breeding distribution in Downtown DG
- 1.3. Collect and map data on tern roost sites in Downtown DG
- 1.4. Quantify tern on breeding population size by month and by year
- 1.5. Collect data on tern breeding tern breeding success using standard methods

**2. Data on tern diet composition**

- 2.1. Take digital images of prey items brought to the nest by breeding terns and upload to Zooniverse
- 2.2. Collate digital images from stakeholders of prey items brought to the nest by breeding terns which have been uploaded to Zooniverse
- 2.3. Identify fish images to lowest possible taxon
- 2.4. Measure fish in relation to bill length

**3. Spatial information on tern foraging distribution and habitat choice.**

- 3.1. Catch and deploy tags on breeding terns
- 3.2. Remotely download movement data
- 3.3. Plot species-specific at-sea distribution and model habitat choice
- 3.4. Use outputs from 3.3. to plot tern at-sea distribution based on remotely-sensed environmental conditions

**4. Increased engagement from the BIOT community in seabird conservation research.**

- 4.1. Establish regular monitoring walks in conjunction with EOs and monitoring numbers attending
- 4.2. Conduct regular outreach via presentations and bird catching demonstrations and monitor numbers
- 4.3. Add tern monitoring into long-term EO roles in BIOT.

**5. Improved management strategy for seabird conservation in BIOT.**

- 5.1. Provide guidance to the BIOT Administration on tern conservation in Downtown Diego Garcia
- 5.2. Quantify guano production and potential benefits for reefs locally and beyond.
- 5.3. Encourage tern monitoring in Downtown DG to become a part of standard monitoring, while looking for citizen champions to have their involvement.