

## Project Endorsement Form

### 1. PROJECT TITLE

Full title	<b>OCEANOGRAPHIC DRIVERS OF ECOSYSTEM VARIABILITY IN THE CHAGOS ARCHIPELAGO: CONSERVATION STRATEGIES FOR BIODIVERSITY HOTSPOTS AND SAFE HAVENS IN A CHANGING CLIMATE</b>
Acronym	
Website	Under development
Keywords (up to 10, describing the project research)	Chagos Archipelago, internal waves, mesophotic reefs, Manta, shark aggregation, upwelling
New initiative or continuing programme?	New initiative

### 2. APPLICANTS

#### Lead applicant / Project Leader / key research contact person:

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#### Other key participants / research team leaders: (repeat as needed)

First name	Martin
Last name	Attrill
Role in the project	Coordinator
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First name	Kerry
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Institutional or personal website	<a href="https://www.plymouth.ac.uk/staff/kerry-howell-2">https://www.plymouth.ac.uk/staff/kerry-howell-2</a>
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*N.B.: Please note that all these names and contact details will be added to the IIOE-2 membership database.*

**3. ABSTRACT– Brief description of the project: (1/4 page maximum)**

*This will be placed on the IIOE-2 Website after endorsement.*

This interdisciplinary project will use the near-pristine Chagos Archipelago in British Indian Ocean Territory (BIOT), a very large (640,000 km<sup>2</sup>) marine protected area (MPA) in the central Indian Ocean, as a planetary-scale laboratory to learn how a thriving marine ecosystem develops in its natural state. Our work will focus on the oceanographic regime and mesophotic reef communities throughout BIOT to i) identify and understand the role played by dynamic physical oceanographic processes in driving biomass aggregation, especially sharks and manta, at seamounts and other topographic features and, ii) evaluate the connectivity between shallow water coral reefs subjected to bleaching and the deeper mesophotic reefs that reside in cooler water. The first phase of the project will focus observations at 2-3 discrete sites within BIOT to survey the mesophotic reefs and resolve the influence on biomass aggregation and reef zonation of dynamical processes that we know from previous research to be dominated by internal waves. Long-term moored observations will further highlight how these dynamical processes evolve in response to basin-scale forcing. The project has been funded by the Garfield Weston Foundation with match funding from the Bertarelli Foundation and involves oceanographers, marine biologists and hydrographic surveyors from the University of Plymouth, UK, and the Manta Trust. The work sits within the wider programme of research, conservation and communication delivered within BIOT through the Bertarelli Programme in Marine Science (BPMS) that has been funding research in BIOT since 2008 and aims to assess the efficacy of the BIOT MPA in sustaining the broader Indian Ocean ecosystem.

**4. LINKS TO IIOE-2 SCIENCE PLAN: (1/2 page maximum)**

How do you anticipate your project to contribute to the IIOE-2 strategy and science delivery, with reference to which (either one or more) of the six IIOE-2 Science Plan themes that your project responds. Please state the specific issues and questions addressed by your project in the context of the IIOE-2 Science Plan themes and key issues.

Our project will specifically consider the impact of physical processes on coral reef health, both shallow systems (through collaboration with our partners in the Bertarelli Programme in Marine Science (BPMS)) and the mesophotic reef environment to be studied explicitly within this project. As the physics are dominated by internal waves whose properties are directly influenced by basin-scale dynamics, our work will link with ST-4: Circulation, climate variability and change. Of particular interest will be the influence of, for example, the Madden Julian Oscillation on regional upper ocean properties such as stratification that sets the regional scale oceanographic environment in which internal waves evolve. Furthermore, the Chagos Archipelago sits to the north of the South Equatorial Current; modulations in the structure and position of the SEC due to mesoscale instability hold the potential to instigate ecological regime shifts in BIOT so we anticipate coordinating with ST-4 to understand the role of the basin-scale circulation on BIOT.

The sustained deployment of our moorings throughout at least the first 2 years of the project will enable us to identify the change in dynamics occurring throughout the monsoon and any related ecosystem impacts, particularly on reef systems. Our collaboration with other partners in the BPMS aims to provide insight into how the evolution of the physical processes further influences prey availability at higher trophic levels and apex predator distribution. This is relevant to the basin-scale fisheries research conducted within IIOE-2. We thus see considerable scope for interaction with ST-3: Monsoon variability and Ecosystem response.

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During the second phase of funding, we anticipate expanding our research into the regional, mesoscale dynamics that influence ecological processes throughout BIOT. For this we will benefit from collaborations with ST-2: Boundary current dynamics, upwelling variability and ecosystems impacts due to the influence of, in particular, the SCTR on the BIOT ecosystem. In light of the recent funding of KUDOS, we would welcome the opportunity to contribute to the observational programme directed towards a better understanding of the SCTR at the eastern edge of which lies BIOT.

### 5. INTERNATIONAL COLLABORATION(S):

Is the project part of a related multi-national activity? **YES**

If No, would you welcome international collaboration in your project? **YES/NO**

### 6. REGION(S) OF STUDY

Provide a description of 'where' the research is to be conducted (for field based activities) and/or the region or regions to which the research pertains (you are encouraged to consider providing either the coordinates of the area of studies or the coordinates of the planned cruise tracks, as well as a figure as an addendum to your proposal).

British Indian Ocean Territory (Chagos Archipelago) in the central Indian Ocean  
Specific locations within the archipelago are to be determined following discussions with BPMS colleagues but the first (of 4 planned) cruise is scheduled for November 2019.

### 6. TIMETABLE OF THE PROJECT

Start date: 1<sup>st</sup> April 2019

End date: 31<sup>st</sup> March 2021 (additional funding expected through to 2023)

### 7. LINKAGES WITH OTHER PROJECTS / PROGRAMMES / INITIATIVES

Is the project part of a related national or multi-national activity?

If yes, provide the related activity title and website for reference, if available:

Yes: The Bertarelli Programme in Marine Science, <https://marinescience.fondation-bertarelli.org/about-programme>

Is your project part of, or affiliated to, another SCOR, IOC or IOGOOS activity or project?

If "yes", please indicate which activity or project:

No

### 8. DATA MANAGEMENT AND SHARING

1. Will new data be collected as part of this project (yes or no?)

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Yes

2. Contact information if any, of the person in charge of the data management from whom the metadata can be accessed by interested IIOE-2 stakeholders.

*Please note that for all IIOE-2-endorsed projects, IIOE-2 will have developed its own metadata portal. Once the project is endorsed, the project leader will be asked to provide the metadata information of the project.*

Phil Hosegood, University of Plymouth, phil.hosegood@plymouth.ac.uk

3. Recognizing the need for an initial period of exclusive data use, would you be willing to provide timely access to all data generated under this project and associated metadata in accordance with relevant national and funding agency data sharing policies? **YES, subject to a suitable embargo period and appropriate collaborative working practices being followed.**

## 9. FUNDING

*Please note that IIOE-2 strongly encourages funded/resourced projects. However, IIOE-2 may endorse projects yet to receive funding/resourcing if IIOE-2 endorsement can be clearly shown to significantly aid in prospects for funding/resourcing.*

Has funding and resources to successfully achieve and undertake the project been obtained? Indicate the sources of funding and resources that have been approached and/or secured.

Yes, £1 million has been funded from the Garfield Weston Foundation with further support provided for field work by the Bertarelli Programme in Marine Science. New resources primarily include moored instrumentation to monitor the internal wave field and particle transport, and to complement our existing vessel-based equipment that includes a Seaeye ROV to be used for the mesophotic reef surveys. Match funding has also been provided by the Bertarelli Foundation with specific support for the cost of research vessels and communications to the scientific and wider community.

## 10. BENEFITS FROM IIOE-2 ENDORSEMENT (1/4 page maximum)

Specify why you are seeking endorsement and how the activity would benefit from endorsement, and how the IIOE-2 SC could assist in the implementation of your project.

BIOT sits within the central Indian Ocean and, when viewed from afar, appears isolated from the influence of basin-scale processes and anthropogenic influence. However, the processes occurring within BIOT are directly governed by basin-scale perturbations to oceanographic and atmospheric conditions such as the

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monsoon, IOD and MJO. Our work, which focusses on higher frequency processes such as internal waves on more localised ecological processes such as reef zonation and larvae dispersal, would therefore directly benefit from collaboration with partners conducting research into the larger scale dynamics within the Indian Ocean over interannual timescales. As we further aim to demonstrate the extent to which BIOT acts as a refuge for marine species in the heavily exploited Indian Ocean, we anticipate that our sustained observations will provide an additional reference point to partners working in, for example, the SCTR (as in KUDOS) and extend research on the regional dynamics to localised, high frequency processes that have direct ecological consequences. We note specifically that there is a distinct absence of observations planned for BIOT and the immediate surrounding ocean; we would welcome the opportunity to engage with the IIOE-2 community to bridge this gap in understanding with particular emphasis on the ecological implications of upwelling and the associated production arising in and around BIOT.

**11. OPTIONAL: OTHER COMMENTS/INFORMATION/MATERIAL** (*length and detail may be at the discretion of and as deemed necessary by the applicant*)

Please feel free to provide any other comments, information or materials that you feel relevant to your proposal for the IIOE-2 Steering Committee's information and benefit. You may provide this as general information or provide the additional comments/information/materials as relevant to any of the specific Sections above.

This project is funded for 2 years by the Garfield Weston Foundation but an additional £1 million is to be funded subject to satisfactory progress over the initial 2 year period. We thus anticipate that this project constitutes a 4 year study that further leverages the support of complementary projects throughout BIOT undertaken by BPMS partners. We will encourage our BPMS partners to be either directly apply for IIOE-2 endorsement if such a step is welcomed or we would be happy to act as conduit of information when appropriate. Overall, we would welcome the opportunity to develop collaborative opportunities where overlap arises between existing/future IIOE-2 activities in the surrounding ocean and our (and that of the BPMS more broadly) work.



(Signature of the PI)

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2nd International  
Indian Ocean  
Expedition  
2015-2020



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