

Darwin Plus: Overseas Territories Environment and Climate Fund Annual Report

To be completed with reference to the "Writing a Darwin/IWT Report" Information Note: (<https://dplus.darwininitiative.org.uk/resources/reporting-forms-change-request-forms-and-terms-and-conditions/>). It is expected that this report will be a **maximum** of 20 pages in length, excluding annexes)

Submission Deadline: 30th April 2022

1. Darwin Plus Project Information

Project reference	DPLUS089
Project title	Integrating genetic approaches into sub-Antarctic deep sea research and management
Country/ies	South Georgia and the South Sandwich Islands
Lead organisation	University of Essex (UoE)
Partner institution(s)	Cefas
Darwin grant value	£278,231.00
Start/end dates of project	Start date : 1 st April 2019
Reporting period (e.g. Apr 2019 – Mar 2020) and number (e.g. Annual Report 1, 2, 3)	Year 3
Project Leader name	Michelle Taylor
Project website/blog/social media	NA
Report author(s) and date	Michelle Taylor, Rui Vieira, Maria Belen Arias

1. Project summary

South Georgia & South Sandwich Islands Marine Protected Area is one of the world's largest protected areas, protecting vast deep-ocean areas that harbour diverse vulnerable marine ecosystems. Understanding if the MPA is a source or sink of juvenile benthic organisms, and its role regionally, is important for conservation management and only possible to groundtruth with genetic approaches. This project investigates deep-sea diversity and the genetic connectivity of habitat-forming organisms within the SGSSI MPA and across the wider South Atlantic region.

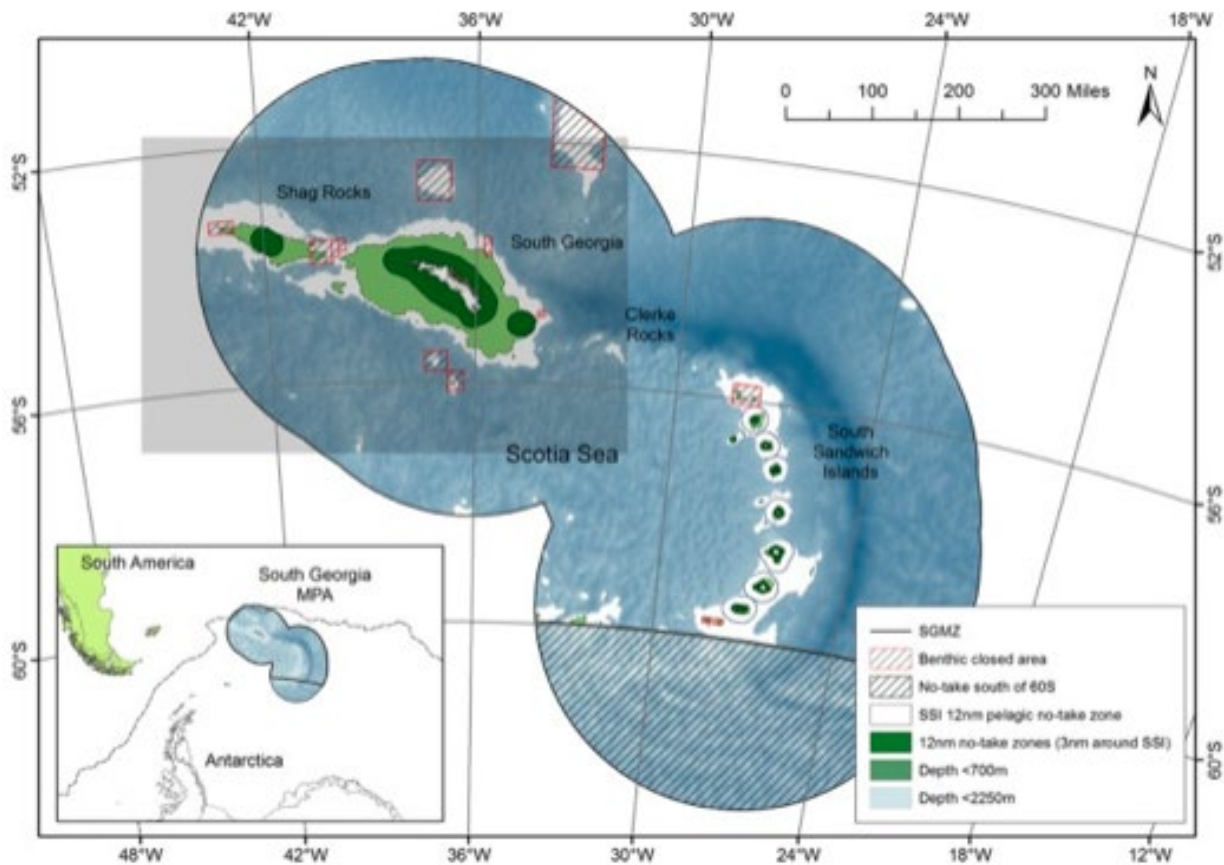


Figure 1. Map of South Georgia & South Sandwich Islands Marine Protected Area.

2. Project stakeholders/partners

Stakeholder 1 - Government of SGSSI (GSGSSI)

Cefas consulted GSGSSI in the preparation of the original project proposal and they have endorsed this project, the outcomes of which will feed into SGSSI MPA research and monitoring plans through reports. Cefas is in a strong position to do this as it regularly provides the GSGSSI with technical and scientific advice and support, including research and monitoring within the SGSSI MPA.

Stakeholder 2 - Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR)

Since 2012, Cefas have been providing the Foreign and Commonwealth Office (FCO) with technical and scientific advice in relation to the Antarctic fisheries managed internationally by CCAMLR. Cefas and UoE will be engaging with the GSGSSI by providing a report of project results. Cefas also heads the UK's scientific delegation to CCAMLR, with Dr Chris Darby serving as the UK Chief Scientist to CCAMLR, meaning this project will engage with CCAMLR through this route.

Due to constraints related to Covid-19 in years 1 and 2, progressing in laboratory work, data analysis and associated reporting has faced some delays. However, stakeholders have been kept informed on the mitigation measures in place and progress of this project via informal meetings.

3. Project progress

3.1 Progress in carrying out project Activities

Due to previously reported covid-19 delays we were granted an extension. The grant will now finish in November 2022.

The outputs are:

2. Better informed management of SGSSI MPA with the provision of deep-sea connectivity information.

Within the lifetime of the project, and particularly during year-3, the project team has carried out activities towards this objective (see below, 3.2). A total of 384 samples have been sequenced for genetic

connectivity analysis, which is twice the initially planned number. The genetic analysis focused on 4 species (there are two others however we are undertaking separate analysis to see if they are actually the same species) of deep-sea corals in and around SGSSI, and across the wider Southern Ocean (see Figure 2). Due to activities carried out by the project team, we achieved a far greater number of samples available for this project, e.g. by sampling additional specimens from museum collections (e.g. Paris, US collaborators collections) and bycatch samples originated from regular monitoring activities carried out by the British Antarctic Survey. This project hired a postdoctoral scientist, Dr Maria Belen Arias, to undertake the extensive population genomics and bioinformatic analyses. This role is a 1-year position which is currently (Mar 2022) in its 4th month (finishing at the end of Nov 2022). Through savings in consumables and travel we have extended this from the 9 months that were noted in the year-2 report.

3. Genetic data and species identification freely available.

The genomic data described above has been backed up, catalogued, quality controlled, and is currently being analysed on the supercomputing server at University of Essex (provided in kind). A total of four species are clearly identified by genomic data, two of them have so far been analysed at population genomic level.

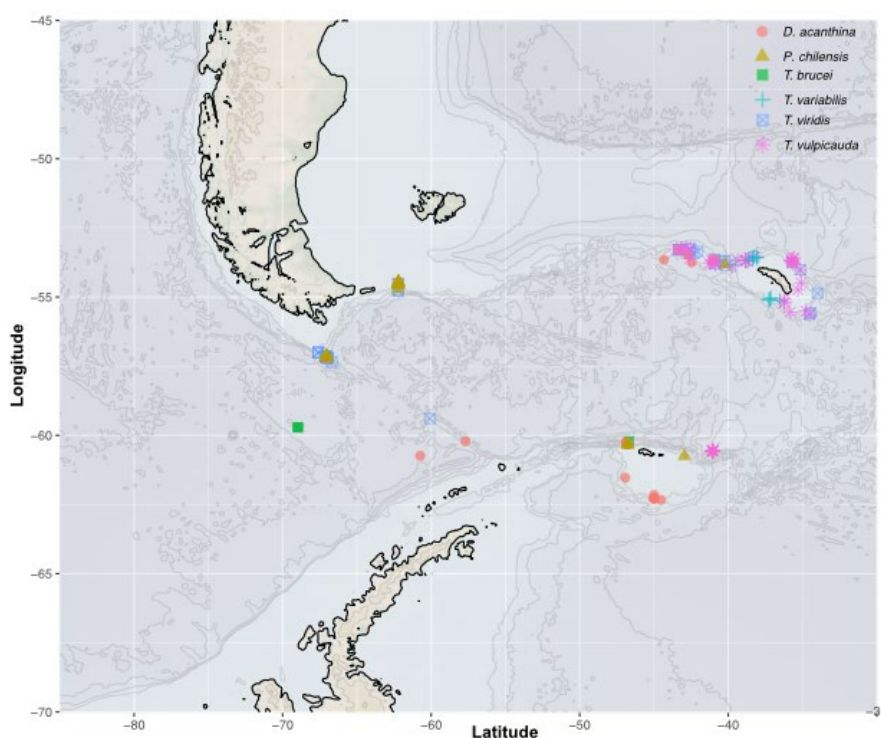


Figure 2. Map showing the locations of samples collected for genetic analysis.

4.

5. Understanding the role of habitat heterogeneity in shaping deep benthic biodiversity.

The data acquired through the Blue Belt Programme RRS Discovery Expedition 99 in the South Sandwich Islands allowed the aims set under this Darwin Plus project to be addressed. The full science report of the Expedition was delivered to the Foreign, Commonwealth & Development Office (FCDO) and to the GSGSSI and will be made available together with the final project report.

An analysis of multibeam echosounder (MBES) data and drop camera imagery data collected in selected locations around the South Sandwich Islands (Fig. 3) was conducted to identify the distribution of benthic communities and their diversity. This work addressed a knowledge gap in the distribution of benthic biodiversity in the South Sandwich Islands, a remote data poor region, which forms a large part of the South Georgian and South Sandwich Islands Marine Protected Area (MPA). The study spans a geographical gradient from the north to the south of the archipelago and a depth gradient that covers MPA management zones from the no-take zone to the zone open to long-line fisheries, providing valuable material for data-driven management. The wider coverage of the archipelago increases understanding of the region's benthic diversity and its potential vulnerability to human impacts.

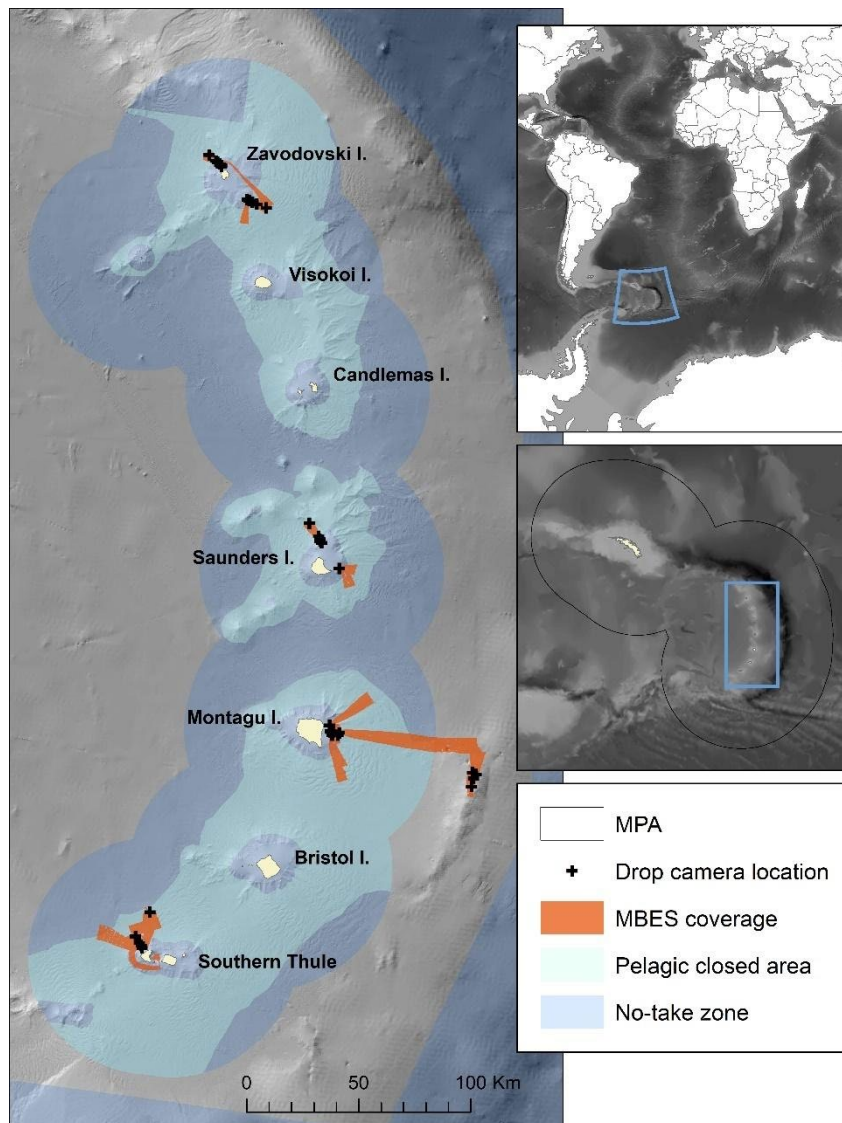


Figure 3. Map of the study area showing the locations visited, with multibeam echosounder (MBES) coverage acquired during the RRS *Discovery* Expedition and the locations of drop-camera transects. The extent of no-take zones and pelagic closed areas are also indicated. The inset covering South Georgia and South Sandwich Islands shows the boundary of the South Georgia and South Sandwich Islands Marine Protected Area (SGSSI-MPA).

The combination of high-resolution multibeam echosounder (MBES) acoustic data with deep-water camera imagery used to extrapolate the distribution of VME indicator taxa, at seven study locations through the archipelago giving further insight into the more fine-scale distribution patterns relating to topography and bottom substrate types at the islands enabling assessment of the current MPA zonation. A total of eight VME indicator morphotaxa were mapped, showing a substantial variation in taxon composition and frequency of occurrence, both along bathymetric and latitudinal gradients.

This working package led to the publication of two manuscripts in *Frontiers of Marine Science* under the Special Issue *Working Towards a Blue Future: Promoting Sustainability, Environmental Protection and Marine Management: Examples from the UK Government Blue Belt Programme and Current International Initiatives*:

Hogg, O. T., Downie, A. L., Vieira, R. P., & Darby, C. (2021). Macrobenthic Assessment of the South Sandwich Islands Reveals a Biogeographically Distinct Polar Archipelago. *Frontiers in Marine Science*, 1173.

Downie, A. L., Vieira, R. P., Hogg, O. T., & Darby, C. (2021). Distribution of vulnerable marine ecosystems at the South Sandwich Islands: results from the Blue Belt Discovery Expedition 99 deep-water camera surveys. *Frontiers in Marine Science*, 652.

The Darwin Plus grant is appropriately acknowledged in all publications (see Section 9). A third manuscript is currently in preparation and expected to be submitted for peer-reviewed publications within the lifetime of the project.

The *Discovery 99* collections have been donated to the Natural History Museum who will ensure the curation, long-term storage, and access sharing of biological collection resources. These materials include representative sample of the invertebrate species and molecular voucher specimens. They are housed as a collection at the Natural History Museum in London and are available to the wider scientific community

to undertake further studies to improve our knowledge of these remote habitats. Currently, six active research projects and PhD studentships have developed the use of this material in various ecological, taxonomic and biogeographic studies, including Bryozoa, pycnogonids, asteroids, crinoids and Cephalopoda.

The grant project team has built relationships through collaboration at various international fora through the Deep Ocean Stewardship Initiative (DOSI), contributing in the production of peer-review publications and helping to shape the direction and focus of activities to deliver for the Decade of Deep-Ocean Science:

Howell et al (2020). A blueprint for an inclusive, global deep-sea ocean decade field program. *Frontiers in Marine Science*, 7:584861. (Dr Taylor and Dr Vieira as co-authors)

Rogers et al (2021). Marine genetic resources in areas beyond national jurisdiction: Promoting marine scientific research and enabling equitable benefit sharing. *Frontiers in Marine Science*, 8, 600. (Dr Taylor as co-author)

Howell et al (2021). A decade to study deep-sea life. *Nature Ecology & Evolution*, 5(3), 265-267. (Dr Taylor and Dr Vieira as co-authors)

Ingels et al (2021). [Antarctic ecosystem responses following ice-shelf collapse and iceberg calving: Science review and future research](#). Wiley Interdisciplinary Reviews: WIREs Climate Change. 12 (1) (Dr Taylor as co-author).

6. Dissemination of information about deep-sea habitats around SGSSI and the wider sub-Antarctic.

- Dr Vieira attended (in person) and presented available results at the XIII Portuguese Polar Sciences Conference, Portugal, December 2021. Additional conference attendance in 2022 is expected to disseminate results to a wider audience, including at the 2nd International Symposium on Marine Science and Technology for Young Scientists and Postgraduates to be held by the Hong Kong Branch of the Southern Marine Science and Engineering Guangdong Laboratory (Guangzhou) – July 2022.
- Challenger Society 150th anniversary Symposium, September 2022, London.
- Deep-sea Coral symposium – Edinburgh, December 2022.

Dr Taylor and Dr Vieira are also engaging with undergraduate and postgraduate students, via guest lectures and other science communication activities, such as active dissemination about Antarctic deep-sea habitats via social media e.g. Twitter (@Dr_MTaylor, @rui_vieira19, @AntSci_Ltd) and Instagram (@Dr_MTaylor).

a. 4.1 Progress towards the project Outcome

Overall project outcome:

A better understanding of the genetic connectivity of deep-sea coral communities across the SGSSI and sub-Antarctic region.

At present we feel confident that the overall outcome is entirely achievable. Bioinformatic analysis is well underway for two with the remaining analyses en route.

We used Ultra Conserved Elements (UCEs) data to screen for single nucleotide polymorphisms (SNPs) and investigate the genetic diversity, structure, and molecular connectivity of the cold-water corals, *Primnoella chilensis*. Over 90 specimens were collected from five areas covering different bathymetrical ranges, spanning ca. 10,000 km over their distribution in the sub-Antarctic and Indian Ocean (from the Drake Passage to Kerguelen Island). We obtained 2,663 SNPs, which identified a clear genetic structure separating the populations into two distinct genetic clusters segregated by depth. Specimens inhabiting areas between 310 to 700 m formed a single cluster (Shallow-cluster), while those dwelling in depths from ~730 to 1,257 m formed another (Deep-cluster). The strongest potential barrier was identified at ~900 m isobath. Noteworthy is the molecular connectivity between samples within the genetic clusters, far distance sampling sites such as Drake Passage and South Georgia are somehow genetically connected (Fig 4.) The nucleotide diversity also reflects differences between depth, suggesting that Drake Passage samples are less resilient to environmental changes due to their low genetic diversity (0.037 ± 0.0147) (Table 1).

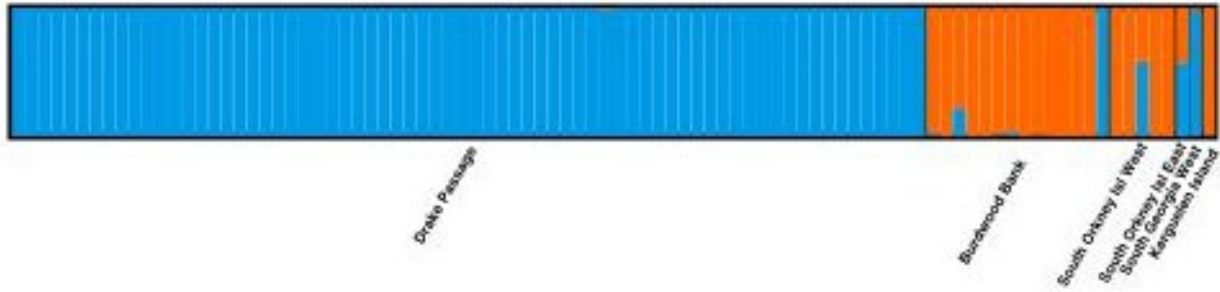


Figure 4. Individual genotype assignment for *Primnoella chilensis* inferred by STRUCTURE with optimal $K=2$. Each bar corresponds to an individual assigned proportionally to each genetic cluster. Names of the sampling sites are at the bottom. Orange represents samples collected <700 m (shallow cluster) and Blue represents samples collected >730 m (deep cluster).

In terms of *Dasytenella acanthina*, 86 samples collected in eight sample sites were analysed. We obtained 2,434 SNPs which identified genetic structure among the locations, the main genetic driven factors are associated with geography and depth. The geographic break was identified between West and East samples. The samples collected in Terre Adelie and Kerguelen Island (Indian Ocean) were clustered together while the other samples collected in the South Atlantic Ocean remain in different genetic clusters. At the same time, these genetic clusters presented substructure associated with depth. For the West Clusters we identify population structure between shallow and deep water at a pivotal depth > 1300 m, meanwhile for the East Cluster (e.g. Terre Adelie and Kerguelen Island) the break isobath was identified at >1000 m. The highest nucleotide diversity for *D. acanthina* were identified in South Orkney Island, Terre Adelie and Drake Passage (Table 1) indicating potential resilience for the species in these locations to environmental changes. Noteworthy is the different nucleotide diversity observed between the two species in Drake Passage (Table 1).

Table 1. Measures of nucleotide diversity for *P. chilensis* and *D. acanthina*. The sampling sites are order from West to East.

Sampling Site (W-E)	<i>Primnoella chilensis</i>		<i>Dasytenella acanthina</i>	
	N	Nucleotide diversity	N	Nucleotide diversity
Drake Passage	70	0.0307 ± 0.0147	6	0.1480 ± 0.07672
Burdwood Bank	14	0.2242 ± 0.1098	1	0.0583 ± 0.0585
South Orkney Island West	5	0.1933 ± 0.1022	14	0.2013 ± 0.1003
South Orkney Island East	1	0.0101 ± 0.0103	33	0.1142 ± 0.0549
South Georgia West	1	0.0221 ± 0.0223	14	0.0862 ± 0.0423
South Georgia West Deep	---	---	2	0.0728 ± 0.0477
South Georgia East	---	---	7	0.0760 ± 0.0389
South Georgia East Deep	---	---	1	0.0698 ± 0.0700
Terre Adelie	---	---	7	0.1821 ± 0.0930
Kerguelen Island	1	0.0349 ± 0.0351	1	0.0283 ± 0.0285

Further investigation and analyses need to be performed and factors such as geographic distance and marine current patterns have to be included for further conclusions. Our results highlight the strong gene flow occurring across isobaths in the deep-sea, and at the same time, we identified populations with limited connectivity and low genetic diversity, which is crucial information to make effective management decisions.

b. 4.2 Monitoring of assumptions

Our original identified risks were:

- RSS *Discovery* survey work will be reviewed, and risk assessed as part of Cefas' HSEQ policy and UoE safety whilst working abroad policy to ensure the safety of staff at all times. A standard operating procedure (SOP) will be produced for the survey and the vessel will have safety checks undertaken by a qualified member of Cefas staff.
- Considerations regarding weather in the survey region will be monitored as part of the check list for off-shore operations. Other technical risks will be considered and where necessary, suitable mitigation put in place.

The RRS *Discovery* expedition went ahead as planned and collected specimens for this project, weather did not unduly impact outputs.

Naturally, the project did not originally consider a global pandemic. Our team liaised with all the stakeholders to mitigate the impacts on the project and managed budgets and time as tightly as possible to ensure the successful and timely delivery of outputs, the efforts of which are now coming to fruition.

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

As UK OT are a source of a lot of UK biodiversity our project supports the UK in meeting many of its core biodiversity and climate change targets.

The Sustainable Development Goal 14 specifically relates to marine biodiversity and its sustainable use. The knowledge acquired during the duration of this project, and its legacy, will form the basis of information needed to inform and support implementation of regional management strategies and high-level policy processes, including the Sustainable Development Goals and Aichi 2030 Targets.

Final project outputs will be shared with the UKOT Governments and the UK Delegation to CCAMLR. The outcomes of this project will feed directly to CCAMLR to better inform MPA designation and management processes and into wider regional management decisions, such as the SGSSI MPA 5-year review process through reports submitted to the government of SGSSI.

Such information will further enable GSGSSI in making informed decisions on vulnerability of local deep-sea benthic habitats and their protection. This project will also support UK government commitments under the Convention on Biological Diversity to establish "comprehensive, effectively managed and ecologically representative networks" of MPAs.

The project team has held regular meetings with GSGSSI during years 1-3. As results are coming through now further updates will be given to relevant stakeholders in due time, and a final report will be delivered at the end project.

8. 6. OPTIONAL: Consideration of gender equality issues

Not applicable.

9. 7. Monitoring and evaluation

Please, refer to table of progress and achievements against Logical Framework, as shown in Annex 1.

Some activities were postponed from 2021 due to the consequences of Covid-19 delays.

The involvement of Dr Downey and Dr Barnes was not possible as much of this required in-person specimen identifications.

At the moment the link between the project activities and outcomes is being created with the genomic analyses currently ongoing. There are no results to facilitate the necessary report writing, presentations, discussions etc but they are imminent.

However the team progressed with some other proposed activities, including wider engagement and science communication activities and contribution to peer-reviewed publications.

Work schedule and time management is monitored through regular meetings with project partners (UoE and Cefas) to ensure the maintenance of data and information flow between partners.

The Research & Enterprise Office (UoE) supports the PI (Dr Taylor) throughout the lifecycle of the grant, which includes administering the grant, contracts, monitoring grant expenditure and reporting to the funder, knowledge exchange and maximising impact of research findings.

Cefas project managers operate in accordance with Cefas's ISO 9001 certified quality management system. The project manager is providing support to Cefas Principal Investigator (Dr Vieira) by holding regular reviews to monitor progress against milestones.

10. 8. Lessons learnt

Cefas and the Natural History Museum also have a Memorandum of Understanding to encourage, develop and extend cooperation in the natural sciences. The *Discovery 99* collections have been donated to the Natural History Museum to ensure the curation, long-term storage, and access sharing of biological collection resources. These materials include representative sample of the invertebrate species and molecular voucher specimens. They are housed as a collection at the Natural History Museum in London and available to the wider scientific community to undertake further studies to improve our knowledge of these remote habitats.

This has proven to be a successful collaboration. At the present, a number of PhD students (including UK, France and Ireland) are undertaking their studies using material donated to the NHM under the scope of this project. These data will form the basis of a series of published thesis and manuscripts ensuring the legacy of this Darwin project and the Discovery Expedition. Our recommendation for future projects would be to include Natural History museums as partner organisation to ensure a long-lasting legacy of the collections.

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

No.	Comment	Action
1	Please provide any evidence of Darwin Initiative identity being acknowledged on materials and outputs produced by or linked to the projects. Social media outreach should be considered where necessary and relevant.	Darwin Initiative identity has been used in dissemination materials and activities. See section 9.
2		
3		

1) 12/04/2021 - Change Request submission for a revised carried forward figure for the 2021-22 year at £99,194 (as below). Approved by Darwin on 10/05/2021.

CR20-193v2	2019-20	2020-21	2021-22	Start/end dates/ Comments
Original	██████	██████	██████	01/04 /2019 to 31/03/2022
Revised	██████	██████	██████	01/04/2019 to 30/09/2022
<i>Difference</i>	█	██████	██████	

2) 18/08/2021 - Submission of Q4 Actual Claim form for 2020-21 year. Acknowledged and paid by Darwin on 01/09/2021

3) 22/12/2021 - Submission of Forecast Reply slip at £42,203 for year to 31/03/2022 and Change request form to revise the budgets and extend to 31/12/2022. Revised budgets requested as follows. Approved by Darwin on 31-01-2022.

	2019-20	2020-21	2021-22	2022-23	Start/end dates/ Comments
Original	██████	██████	██████	█	01/04/2019 to 31/09/2022
Revised	██████	██████	██████	██████	01/04/2019 to 31/12/2022
<i>Difference</i>	█	█	██████	██████	<i>Note request to extend from 31/09/2022 to 31/12/2022</i>

12. 10. Other comments on progress not covered elsewhere

Nothing further to add.

13. 11. Sustainability and legacy

The project team liaised with the industry and GSGSSI to ensure an effective data collection programme until the end of the project, and revised existing protocols to target opportunistic sampling of corals onboard commercial fisheries vessels. In addition, through our collaboration with BAS, Dr Taylor has also identified dozens of deep-sea corals from Antarctica from BAS activities, expanding the knowledge of these VMEs and their diversity around the Antarctic region.

Specimens collected during the RRS *Discovery* expedition in the South Sandwich Islands (as part of the Blue Belt Programme) were donated to the Natural History Museum. The collected genetic material also included samples to the museum biobanking, forming the basis of future research, ensuring the good use and legacy of this Darwin Project.

As part of this research, an AIREs DTP proposal entitled “Seascape genomics of Antarctic deep-sea corals” commenced (Oct 2020). The student has already created an up-to-date oceanographic model for the Scotia Sea (SGSSI border this area) that will be published in the coming years. This is an important step as the genomic outputs from this Darwin Plus project will be used in the next sections of this PhD to undertake seascape genomic analyses. These analyses combine the genomic population structures created with this grant with environmental factors to tease apart the drivers of the genomic structure we are seeing across the Scotia Sea, and wider Southern Ocean. This student’s outputs will contribute to the ongoing legacy of the Darwin Plus project and maximise the outputs representing added value for money for the sought aims of the project.

14. 12. Darwin identity

Due to limited opportunities during this and previous reporting year, our outreach activities couldn’t be conducted as expected (University and Cefas travel restrictions were in place until very recently).

So far there have been few other opportunities to disseminate our project activities and outputs. Below is presented evidence of use of Darwin Initiative identity in dissemination materials.

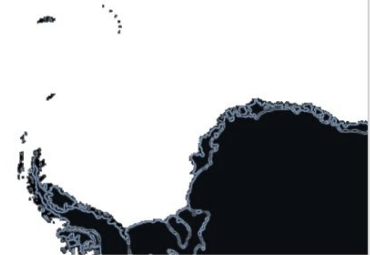
- Presentation at the XIII Portuguese Polar Sciences Conference (first and last PowerPoint slides):

Integrating biodiversity and genetic approaches into sub-Antarctic deep sea research

Rui Vieira, Kerry-Lee Etsebeth, María Belén Arias, Michelle Taylor



UK Government



Together we are working for
a sustainable blue future



Cefas



Collaborative Centre for Sustainable Use of the Seas



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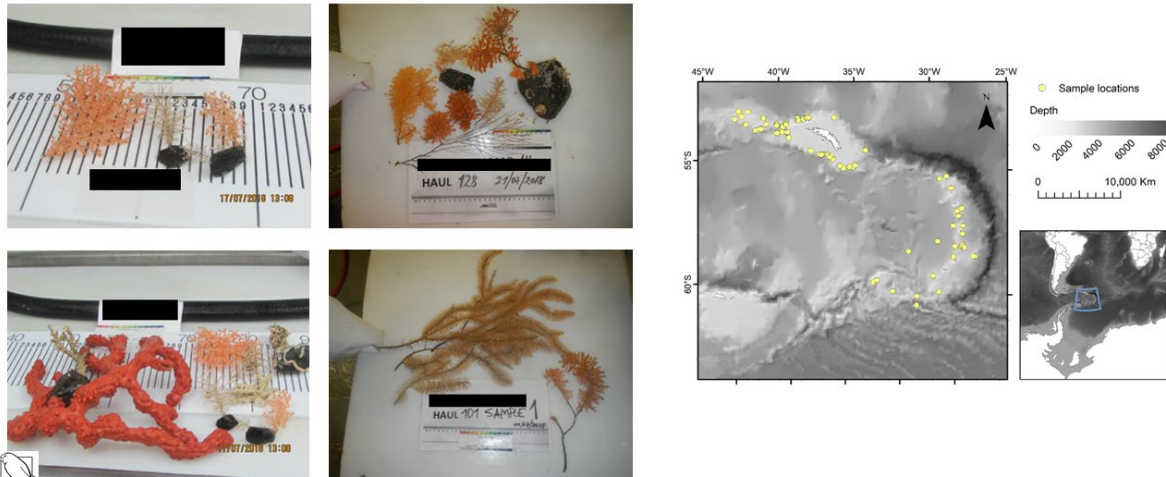


Collaborative Centre for Sustainable Use of the Seas



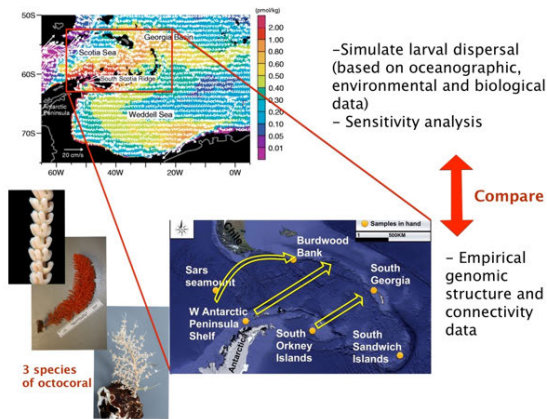
- Slide example of a guest lecture presentation, showing Darwin identity, at University of Aveiro (Portugal):

Better informed management of SGSSI MPA with the provision of deep-sea connectivity information



- Slide example of a guest lecture presentation, showing Darwin identity, at University of Aveiro (Portugal):

Seascape genomics of Antarctic deep-sea coral: Groundtruthing larval dispersal models with genetic connectivity data



Oenone Scott
PhD student

CASE studentship to investigate **connectivity of Southern Ocean deep-sea corals**; a very rare opportunity to verify larval dispersal models with genomic data.

Data products will help to **inform ecosystem-based management** decisions, ensuring an ecologically representative network of MPAs across the Atlantic sector of the Southern Ocean.

ARIES
DOCTORAL TRAINING PARTNERSHIP

University of Essex Cefas

British Antarctic Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Ross et al., 2016; 2019

- Darwin Plus funding acknowledgement in peer-review publications:

Downie, A. L., Vieira, R. P., Hogg, O. T., & Darby, C. (2021). Distribution of vulnerable marine ecosystems at the South Sandwich Islands: results from the Blue Belt Discovery Expedition 99 deep-water camera surveys. *Frontiers in Marine Science*, 652. Available at: <https://doi.org/10.3389/fmars.2021.662285>

Author Contributions

A-LD participated in data collection, conducted the statistical analysis, prepared the figures, and compiled the manuscript. RV participated in data collection, conducted the image analysis, and contributed manuscript text. OH provided wider context and contributed to the manuscript text. CD conceived and led the DY99 research expedition and its objectives and contributed to manuscript text. All authors contributed to the writing and reviewing of the manuscript.

Funding

This work was funded by the UK Government through the Blue Belt Programme (<https://www.gov.uk/government/publications/the-blue-belt-programme>). RV was supported by a Darwin Plus Award (DPLUS089).

Hogg, O. T., Downie, A. L., Vieira, R. P., & Darby, C. (2021). Macro-benthic Assessment of the South Sandwich Islands Reveals a Biogeographically Distinct Polar Archipelago. *Frontiers in Marine Science*, 1173. Available at: <https://doi.org/10.3389/fmars.2021.650241>

Author Contributions

OH conducted the statistical analysis, wrote the manuscript text, and prepared the figures. A-LD led gradient forest analysis, provided conceptual and analytical assistance, and was involved in the DY99 research expedition data collection. RV provided conceptual assistance and was involved in the DY99 research expedition data collection. CD was scientific lead on the South Georgia and South Sandwich Islands Blue Belt Programme and led the DY99 research expedition. All authors reviewed the manuscript.

Funding

This work was funded by the UK Government through the Blue Belt Programme (<https://www.gov.uk/government/publications/the-blue-belt-programme>). RV was supported by a Darwin Plus Award (DPLUS089).

Under the scope of this project, we have contributed to the Britain's Distant Seas book, with information on marine biodiversity of South Georgia and the South Sandwich Islands. The Britain's Distant Seas film is also available on YouTube (<https://www.youtube.com/watch?v=B3GF3kguAV0>). The Darwin Initiative is adequately acknowledged.



15. 13. Impact of COVID-19 on project delivery

Due to constraints related to Covid-19 in years 1 and 2, progressing in laboratory work, data analysis and associated reporting has faced many months of delays (this the requested and secured extension). Stakeholders have been kept informed on the mitigation measures in place and progress of this project via informal online meetings.

Thankfully overall we are now confident that covid-19 will have a minimal impact to the project's successful delivery, despite requiring paperwork and budget changes.

16.

17. 14. Safeguarding

Please tick this box if any safeguarding violations have occurred during this financial year.

If you have ticked the box, please ensure these are reported to ODA.safeguarding@defra.gov.uk as indicated in the T&Cs.

UoE has a comprehensive safeguarding policy:
<https://www.essex.ac.uk/information/safeguarding/safeguarding-policy-and-guidance>

Safeguarding was top of our minds in recent months as we battled with online work, isolation at home, and returning to the laboratory (and the plethora of risk assessments that involved). We had regular meetings through this time and checked staff and student wellbeing very regularly.

As an Executive Agency of Defra, Cefas complies with UK Government safeguarding policies and the Equality Act 2010.

18. 15. Project expenditure

i. Table 1: Project expenditure during the reporting period (1 April 2021 – 31 March 2022)

Current Year's Costs	2021/22 Grant (£)	2021/22 Total actual Darwin Costs (£)	Variance %	Comments (please explain any variance)
Staff costs (from Section 5)				Lower resources availability at CEFAS
Consultancy Costs				No variance
Overhead Costs				Reflects lower actual staff costs incurred
Travel and subsistence				Restrictive travel at CEFAS due to COVID
Operating Costs				No variance
Capital items (from Section 6)				No variance
Others (from Section 7)				No variance
Audit costs				No variance

22. Checklist for submission

	Check
Is the report less than 10MB? If so, please email to Darwin-Projects@ltsi.co.uk putting the project number in the Subject line.	Y
Is your report more than 10MB? If so, please discuss with Darwin-Projects@ltsi.co.uk about the best way to deliver the report, putting the project number in the Subject line.	Y
Have you included means of verification? You should not submit every project document, but the main outputs and a selection of the others would strengthen the report.	Y
Do you have hard copies of material you need to submit with the report? If so, please make this clear in the covering email and ensure all material is marked with the project number. However, we would expect that most material will now be electronic.	N
Have you involved your partners in preparation of the report and named the main contributors	Y
Have you completed the Project Expenditure table fully?	Y
Do not include claim forms or other communications with this report.	