Biodiversity Challenge Funds Projects
Darwin Initiative, Illegal Wildlife Trade Challenge Fund, and Darwin Plus
Half Year Report

Note: If there is any confidential information within the report that you do not wish to be shared on our website, please ensure you clearly highlight this.

Submission Deadline: 31st October 2023

Project reference	DPLUS148
Project title	Climate change resilience in Falkland Island fisheries and marine ecosystems
Country(ies)/territory(ies)	Falkland Islands
Lead partner	South Atlantic Environmental Research Institute (SAERI)
Partner(s)	Falkland Islands Government, Directorate of Natural Resources, Fisheries Department (FIFD) Falkland Islands Government, Directorate of Policy and Economic Department (DEPD) Oregon State University (OSU) British Antarctic Survey (BAS) Shallow marine Surveys Group (SMSG) Falkland Islands Fisheries Companies Association (FIFCA)
Project leader	Dr Paul Brickle; Dr Jesse van der Grient (PM and author)
Report date and number (e.g. HYR1)	*HYR3*
Project website/blog/social media	*Project: www.south-atlantic-research.org/dplus148-climate-change-resilience-in-the-falkland-islands-fisheries-and-marine-ecosystem/* *Organisation: www.south-atlantic-research.org/* *SAERI twitter: @SAERI_FI* *SAERI facebook: www.facebook.com/SAERI/* *SAERI blogs: www.south-atlantic.research.org/news/*

Outline progress over the last 6 months (April – Sept) against the agreed project implementation timetable (if your project has started less than 6 months ago, please report on the period since start up to end September).

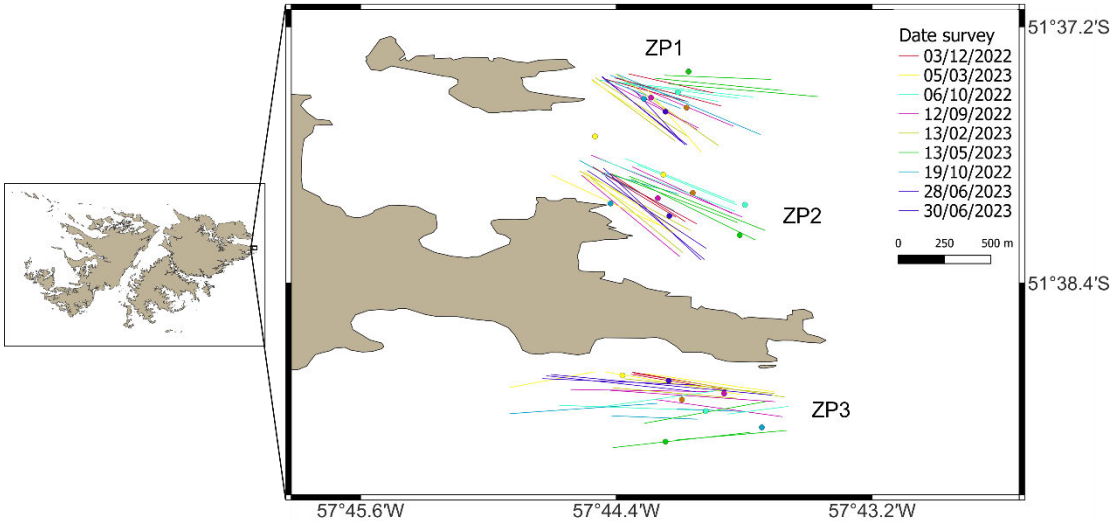
The project has made great progress and is on track with its deliveries for all work packages, which are outlined below against the log frame indicators (identified in brackets).

Work package 1. Project management

To ensure adequate management of this complex project, there is a specific work package for project management. Several items of the log frame were completed last year and will not be addressed here. Quarterly meetings (indicator 1.3) continue to occur, and two meetings occurred in this period of reporting. The delivery of regular DPLUS reports (indicator 1.6) continues, and two half yearly reports were completed and delivered in October 2021 and 2022-, and two-yearly reports in April 2022 and 2023. The project continues to engage with its various stakeholders.

Work package 2. Baseline data generation and synthesis

Several items of the log frame were completed last year and will not be addressed here. We currently have conducted 1 year of surveys, or 162 net samples, which also supports a PhD student who is working up the data via traditional and genetic taxonomic analyses. She has been making great progress, given the challenge of splitting her time between the Falkland Islands (traditional taxonomy) and the University of Aberdeen, UK (genetic analyses). She has been sorting through many samples, identifying species, and counting and weighing them. She further has taken size measurements of lobster krill and an amphipod species (*Themisto gaudichaudii*) to understand life history changes throughout the year of these two important species in the food web. In addition, she has been photographing and identifying fish larvae to understand the inshore/offshore connection of fishes and thereby the energy transfer from inshore to offshore communities. A student from the local school helped count copepods for several months to gain work experience in marine biology. The initial data that have been sorted on the Falkland Islands have been captured in a short report (indicator 2.3), which has been circulated amongst the project management group (PMG) in support of completing indicator 2.3. The materials we have been collecting with these surveys have provided support for obtaining two local grants to study the zooplankton food web via stable isotope analyses (Shackleton Fund) and genetic analyses of the gelatinous zooplankton of the Falkland Islands compared to the Southern Ocean (John Cheek Fund), the latter one in collaboration with JAMSTEC, Japan.



An inshore Loligo survey (indicator 2.4) has been conducted in the south of Berkeley Sound, East Falkland Islands, using a drop camera. The aim of this survey was to study whether the Patagonian squid (*Doryteuthis gahi*) limits its egg laying to kelp or whether it also uses hard substrates in deeper waters. The latter egg-laying behaviour is more common in loliginid squid, and the Patagonian squid's use of

kelp is an unusual behaviour in this group. Prior to the survey we conducted a side-scan survey to identify hard substrate in this area which we targeted in the drop camera survey. We completed 15 transects, and the imagery data were inspected for habitat (different types of soft and hard substrate), morphospecies (presence/absence) and the presence of squid egg masses. We found different community assemblages that were strongly influenced by transect. We further observed diverse biological communities and identified a frame-building bryozoan (*Microporella* sp.), similar to one recently identified in the UK that indicates an area of potential scientific interest. Last, we found two squid egg bundles attaches to hard substrate, indicating the species is likely more variable in its egg-laying behaviour than previously recognised. The results have been captured in a report which has been circulated to the PMG. The aim is to produce a short note paper on the presence of the squid egg masses and frame-building bryozoan for submission to a scientific journal.

With these latest results, all indicators of work package 2 have been met, and work package 2 is concluded.

<u>Work package 3. Physiological experiments</u>

We are drafting a report and manuscript on the data we collected on a 'rates of change' experiment (indicator 3.1), where the final dataset included 7 species (lobster krill, pencil urchin, scythe-edged serolis (an isopod), kelp isopod, kelp limpet, kelp bivalve, whelk), including two size groups for the lobster krill, in support of indicator 3.2.

Further physiological experiments are being continued. We recently successfully completed a warming experiment using squid egg masses to understand changes in respiration rates in response to warming (indicator 3.1). We looked at respiration rates as this is an energy metric. The egg masses that were being warmed showed an exponential increase in respiration rate, although the respiration rates for +6 and +9 °C compared to baseline (5°C) did not show significant differences, indicating that warming may not result is large energetic changes. However, hatchling size and mass does differ between the treated and control group, where the treated group is smaller and lighter compared to the control group, consistent with other cephalopod studies.

These results are being further analysed and will be combined with a repeated experiment for squid egg masses from a different spawning cohort. This experiment is currently ongoing. The results will determine whether the two spawning cohorts in the Falkland waters may respond differently to warming. This would not be surprising, as one cohort needs to survive winter during their egg and hatchling life stage, while the other late spring/early summer. It is possible they have adapted to different temperature regimes, or that the spring spawning cohort is closer to its maximum temperature limit. We are eagerly awaiting the results. These data will be prepared for a scientific manuscript and report in support of indicator 3.2.

Overall, this work package is on track for complete delivery by the end of this year.

Work package 4. Ecosystem modelling

We have constructed an Ecopath model, which is a static model representing a snapshot of energy flows in the Falkland Islands marine ecosystem. This Ecopath model has been informed with information (biomass and diet data) from 2000-2005 surveys as much as possible. We are currently calibrating this model as an Ecopath with Ecosim model against historical time series. Once this has been done, there can be more trust in results from future scenarios, thereby making this model more useful for our stakeholders in preparation for and in support of an ecosystem-based approach for fisheries management. This model is in support of indicator 4.2 and 4.3 and has not been completed yet.

The project manager spent one month working with our partner at Oregon State University in Hatfield, Oregon on the ecosystem model. We also hosted a 2-day workshop (indicator 4.1), where we had participants joining in person and online, from University of Washington, University of Alaska Fairbanks, and the University of Southern Mississippi. This workshop focused on the challenges of modelling data-poor high-latitude ecosystems and discussed the initial Ecopath model version for the Falkland Islands that had been prepared prior to the workshop. Based on the feedback during the workshop the Falkland Ecopath model was significantly improved. Further, the participants are continuing to collaborate with the project manager on the ecosystem model and regularly provide feedback and support in this work, they will be co-authors on the scientific paper that will derive from this work, and they are working with the project manager to submit a conference abstract for June 2024 in Belgium for the Ecopath 40th Anniversary Conference. In addition, based on the discussion on the modelling challenges, this workshop group is preparing a second manuscript that is an opinion piece concerning best practice for these ecosystems.

Workshop Report

Ecosystem modelling for data-limited high-latitude ecosystems

A training package for ecosystem modelling using Ecopath with Ecosim is being created, and training seminars are planned for November (indicator 4.4).

Overall, this work package is on track for complete delivery by the end of this project.

Work package 5. Management/policy evaluation

A literature review on best practices and opportunities for climate change adaptation and an ecosystem-based approach to fisheries management has started (indicator 5.1, 5.2) and is ongoing. This work will form the basis for the design of workshop 2 (indicator 5.3), where the results of the review will be shown, and discussions will be held about options to implement some of the recommendations. The results of the workshop and review will be finalised in a proposal with best recommendations to be submitted to the Falkland Islands Government Fisheries Committee (indicator 5.4) and Directorates (indicator 5.5). This work package is on track for complete delivery by the end of this project.

Outreach

The DPLUS148 project has promoted the project and STEM in various ways, locally and internationally. The project demonstrated the importance of zooplankton during the Falkland Islands 40th Competition, which saw students from South America and UK come to the Falkland Islands to learn about the Islands' history, and culture, amongst other things. On Ocean Day (8th June 2023), the project manager and PhD student talked about the importance of the ocean for the world and the Falkland Islands on the Falkland Islands radio. The project was promoted during Farmers week, an important week for Falkland farmers who come to Stanley for talks and discussions, and one day of outreach for the general public. We again had our zooplankton with us, a poster on the project, and a game dedicated to the ocean for young children. The PhD student has presented her latest results to Fortuna in October, an important fishing company who is also supporting her PhD, showing preliminary results of the traditional and genetic taxonomic analyses, and fish larval identification. The project has promoted its adventures on social media and acknowledged the Biodiversity Challenge Fund in these posts.

2. Give details of any notable problems or unexpected developments/lessons learnt that the project has encountered over the last 6 months. Explain what impact these could have on the project and whether the changes will affect the budget and timetable of project activities.

This project has matured over the progress of 1.5 years, and the majority of the lessons were learnt especially in the first year of the project. This meant that the second year of the project issues that could become a problem were picked up on time. There was one major problem with equipment failure (heaters for the tanks), but via the connections and teamwork at SAERI and the benefit of people travelling down south, we managed to get a new heater delivered in the Falkland Islands within two weeks, thereby avoiding a significant issue in the project delivery. We further had a broken pipe in the tank system, but because of regular visits that were occurring at the time, this was picked up within 2 hours, thereby avoiding mortality effects in the tank. In all, running physiology experiments is a

challenging endeavour, not just in the Falkland Islands, with the main lesson being not to give up as it can be done. In all, the project has been running well, which is likely because of the support of the many partners and stakeholders we have and who are all invested in the project. The main lesson from this is that this work is standing strong because of its continued teamwork.

3. Have any of these issues been discussed with NIRAS and if so, have changes been made to the original agreement?

Discussed with NIRAS:	No
Formal Change Request submitted:	No
Received confirmation of change acceptance	Yes/No
Change request reference if known:	

4a. Please confirm your actual spend in this financial year to date (i.e. from 1 April 2023 – 30 September 2023)

Actual spend: [redacted]

4b. Do you currently expect to have any significant (e.g. more than £5,000) underspend in your budget for this financial year (ending 31 March 2024)?

Yes ☐ **No** ☒ Estimated underspend: £

4c. If yes, then you need to consider your project budget needs carefully. Please remember that any funds agreed for this financial year are only available to the project in this financial year.

If you anticipate a significant underspend because of justifiable changes within the project, please submit a re-budget Change Request as soon as possible. There is no guarantee that Defra will agree a re-budget so please ensure you have enough time to make appropriate changes if necessary. Please DO NOT send these in the same email as your report.

NB: if you expect an underspend, do not claim anything more than you expect to spend this financial year.

5. Are there any other issues you wish to raise relating to the project or to BCF management, monitoring, or financial procedures?

No, we do not have any other issues to raise relating to this project.

If you are a new project and you received feedback comments that requested a response, or if your Annual Report Review asked you to provide a response with your next half year report, please attach your response to this document.

All new projects (excluding Darwin Plus Fellowships and IWT Challenge Fund Evidence projects) should submit their Risk Register with this report if they have not already done so.

Please note: Any planned modifications to your project schedule/workplan can be discussed in this report but should also be raised with NIRAS through a Change Request. Please DO NOT send these in the same email.

Please send your **completed report by email** to BCF-Reports@niras.com. The report should be between 2-3 pages maximum. **Please state your project reference number, followed by the specific fund in the header of your email message e.g. Subject: 29-001 Darwin Initiative Half Year Report**