

## Darwin Plus: Final Report

To be completed with reference to the “Project Reporting Information Note”:  
(<https://darwinplus.org.uk/resources/information-notes/>).

It is expected that this report will be a **maximum of 20 pages** in length, excluding annexes.

**Submission Deadline: no later than 3 months after agreed end date.**

**Submit to:** [BCF-Reports@niras.com](mailto:BCF-Reports@niras.com) including your project ref in the subject line.

### Darwin Plus Project Information

Project reference	DPLUS148
Project title	Climate change resilience in the Falkland Islands fisheries and marine ecosystem
Territory(ies)	Falkland Islands
Lead Partner	South Atlantic Environmental Research Institute (SAERI)
Project partner(s)	Falkland Islands Government, Directorate of Natural Resources, Fisheries Department (FIFD) Falkland Islands Government, Directorate of Policy and Economic Department (DEPD) Falkland Islands Fishing Companies Association (FIFCA) Oregon State University (OSU) British Antarctic Survey (BAS) Shallow Marine Surveys Group (SMSG)
Darwin Plus Grant value	£316,882.00
Start/end date of project	1 July 2021 – 31 March 2024
Project Leader name	Dr Paul [REDACTED] Dr Jesse [REDACTED] - Project Manager
Project website/Twitter/blog etc.	Organisation: <a href="https://www.south-atlantic-research.org/">https://www.south-atlantic-research.org/</a> SAERI twitter: @SAERI_FI SAERI facebook: <a href="https://facebook.com/SAERI/">https://facebook.com/SAERI/</a> SAERI blogs: <a href="https://www.south-atlantic-research.org/news">https://www.south-atlantic-research.org/news</a>
Report author(s) and date	Dr Jesse [REDACTED], Dr Al [REDACTED], Dr Paul [REDACTED] (26/3/2024)

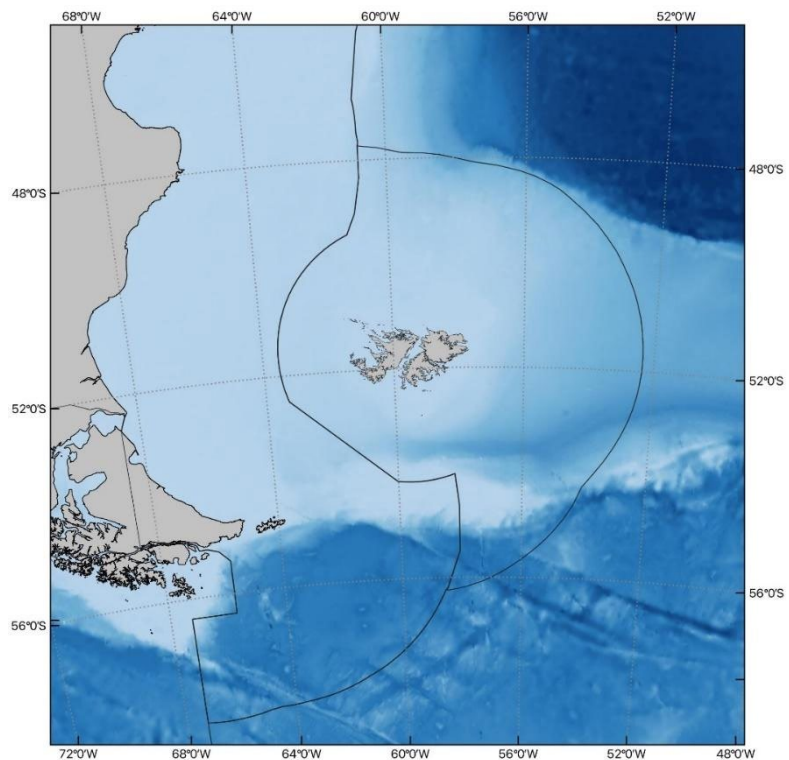
## 1 Project Summary

Falkland Islands economy, like many other small islands, is heavily reliant on its marine environment, particularly from fisheries, but also from tourism, shipping, and potentially hydrocarbons. Indeed, the Falklands' coastal landscapes and seascapes are central to its economic success. The introduction of a fisheries conservation zone and management regime in 1986 transformed the economy from what was previously a solely agro-economy. Falkland Islands Government (FIG) revenue increased by 500%, securing self-sufficiency in all areas except military defence and external affairs. The fishery today is not large in global terms; total catches are about a third of those taken in the UK, for example. However, the fishery is unusual in that two species of squid account for 75% of catches. This makes the Falklands economy particularly susceptible to climate change.

An aim of FIG is long-term sustainability of the fishery and marine environment to benefit of current and future generations. This includes sustainable catches of commercial target species, reducing harmful impacts on bycatch species while maintaining ecosystem function. The Falkland Islands has not undertaken an assessment of the impacts that climate change will have on its fisheries and marine ecosystems and is therefore unable to mainstream climate change adaptation (CCA) into fisheries and oceans governance. Nor is there currently an ecosystem-based (approach to) fisheries management (EAF; sometimes also referred to in literature as EBFM). Recognising the need to sustain the Falklands economy, and for holistic marine management across all sectors, there is a pressing need to understand climate change impacts to fisheries and marine ecosystems to inform CCA. The project will address these issues through 1) the generation of baseline data, by conducting literature reviews and surveys, to better understand key inshore species that support fisheries and ecosystems; 2) by conducting physiological tolerance and acclimation experiments of key species to understand the winners and losers; 3) through workshops that explore CCA interventions which could inform decisions on whether to mainstream CCA and EAF into sustainable fisheries, conservation of marine ecosystems, governance, and policy.

## 2 Project Partnerships

Our key stakeholders and main partners in this project were the Falkland Islands Government (FIG), Falkland Islands Fishing Companies Association (FIFCA), Shallow Marine Surveys Group (SMSG), British Antarctic Survey (BAS), and Oregon State University and they have been directly involved in the project's formulation from its conception. The key stakeholders have worked together previously on other projects, and will work together in the future. In addition, representatives from the local tourism industry and the Falklands community have direct interest as the marine environment is key to the Falklands economy, their



businesses and social well-being.

The active engagement with the various project partners and stakeholders, and the collaborations have enhanced the project greatly, and were essential at the various key areas of the project. below, we outline how each main partner enhanced project areas:

- The collaboration with SMSG has been vital for the collection of animals, both for the regular zooplankton survey work (**Indicator 2.3**) and for animal collection for the physiology work (**Indicator 3.1**), by providing access and support on the boat and SCUBA divers. SMSG was also key in ensuring that the Loligo egg surveys could be conducted in deeper waters (**Indicator 2.4**), both via the support in obtaining and analysing side-scan data necessary for deciding which area to target, and conducting the video imagery surveys.
- The collaboration with BAS has been vital for the physiology (**Indicator 3.1**). Dr Simon Morley (BAS) visited the Falkland Islands in July and August 2022, where he trained and worked with the Project Manager (PM; Dr Jesse van der Grient) to set-up and conduct physiological experiments on coastal species. Our BAS partner continued to provide advice on project planning and delivery via email and calls on the experiments, which ran until January 2024. Two large datasets were created, which provide new insights into how coastal species can respond to short- and long-term ocean warming, with implications for the Patagonian squid fisheries and food-web dynamics. These datasets are a first of its kind for the Falkland Islands. In February 2024, Dr Morley again visited the Falkland Islands to participate in Workshop 2 (**Indicator 5.3**) as well as support the analyses and writing of the physiological papers (2 manuscripts, more details below).
- The collaboration with OSU has been vital for the ecosystem modelling (**Indicators 4.2, 4.3**) and policy discussions regarding ecosystem-based fisheries management (**Indicators 5.1, 5.2**). Dr Will White supported the PM in the development of the ecosystem model and hosted her in April 2023 for a month in Newport, Oregon, as part of the collaboration and for hosting the first workshop of this project (**Indicators 4.1**). The PM also participates in weekly online lab meetings with Dr White's lab. Dr White provided advice on project planning and delivery via email and calls. Dr Michael Harte has been greatly involved in organising the second workshop, focused on ecosystem-based fisheries management planning and implementation in the Falkland Islands. As part of this work, he visited the Falkland Islands in February 2024 to aid in the preparation, development, and delivery of the second workshop (**Indicator 5.3**).
- The collaboration with FIFCA has been vital for the physiological experiments (**Indicator 3.1**), as one of their partners, Fortuna Ltd. provided the facility (Falklands Fish Farming Ltd.) necessary to conduct the experiments. Barend Stadler who manages the facility continuously provided advice for the experimental setup and maintenance of the various animals. This was essential for some of the trouble-shooting issues, including for creating the best tank set-up and system building based on the resources we had available. Stakeholders from the various fishing companies in FIFCA visited the facilities in September 2022 for a demonstration of the experiments, allowing the PM to talk about the importance of this work. This was very well received by the various representatives. In addition, various members of FIFCA actively participated in the second workshop (**Indicator 5.3**), and some FIFCA members contacted either Dr Harte or the PM for further discussions related to ecosystem-based fisheries management. Fortuna Ltd is also supporting the PhD student that is working up the zooplankton samples collected in this project (**Indicator 2.3**).
- The collaboration with FIG has been vital in various work packages. A member of the Falkland Islands Fisheries Department (FIFD) provided training in zooplankton taxonomy

*Figure 1. Falkland Islands in relation to southern South America.*

to the PhD student working up the zooplankton data (**Indicator 2.3**). The PM worked closely with another person in FIFD on ecosystem modelling and provided training and advice within FIFD for their ecosystem-model project. A member of the FIG Environmental Office worked with the PM in some of the experiments to demonstrate what we do. FIFD provided support in organising and delivering the second workshop of this project, including by being active participants (**Indicator 5.3**).

- The main partners representatives actively participated in the quarterly project management group (PMG) meetings (**Indicator 1.3**), where they provided support and advice for the progress. Meeting notes are available on <https://www.south-atlantic-research.org/dplus148-climate-change-resilience-in-the-falkland-islands-fisheries-and-marine-ecosystem/>. All project partners were co-authors on a published literature review paper on the seasonal dynamics and trophic interactions across the food web in the Falkland Islands marine ecosystem in the [Advances in Marine Biology](#) (**Indicators 2.1, 2.2**).
- The project was promoted to the public via various social media posts, newsletters, school activities (e.g., zooplankton talks, Careers Day, Biology Week, CREST Award Field Trip for Year 7), hosting local students for work experience, hosting exhibitions during Farmers Week, as an invited speaker for Falkland Islands Women Association, speaking with the Falkland Islands TV, and Falkland Islands radio. These activities allowed the project to engage with the wider public of the Falkland Islands.



*Figure 2. Project partner Dr Simon Morley from BAS builds the Loligo system with PM Jesse van der Grient (left). Dr S Morley presents on his work on Antarctic physiology to local schoolchildren*

### 3 Project Achievements

#### 3.1 Outputs

##### Output 1: Project management structure, monitoring and evaluation and communication tools established

Output 1 was established to ensure and support the smooth delivery of the project administration by clearly establishing a project management structure. This management structure was established early on in the project and remained in effect throughout the project. MoUs were signed and these contracts are available upon request (**Indicator 1.1**). The project manager (PM) was recruited, and her contract is available upon request. She started working on 1<sup>st</sup> April 2022 till 31<sup>st</sup> March 2024 (**Indicator 1.2**). The project management group (PMG) was created, and quarterly PMG meetings were held throughout the project. The notes of these meetings are available on the [project website](#) (**Indicator 1.3**). [A project website](#) was created (**Indicator 1.4**), providing an overview of the project, regular posts on the project's progress, and for hosting several documents, including the PMG notes, reports created in this project, and the monitoring and evaluation (M&E) plan. The PM created the [M&E plan](#), which is available on the project

website (**Indicator 1.5**). Regular half yearly and yearly reports were submitted to BCF (**Indicator 1.6**). Overall, output 1 was successfully achieved within the project.

Output 2: New environmental baselines understood and created by the synthesis of local and scientific knowledge surveys conducted

Output 2 harnessed the availability of both newly generated information and previously published scientific information to generate new environmental baseline data on the Falkland Islands marine environment. Within the project, we synthesized 49 datasets, achieving higher than the aimed 20 datasets as stated in the logframe. The synthesized dataset is available on the SAERI [IMS-GIS/FIG data portal](#) (**Indicator 2.1**). These data covered trophic interactions in the Falkland

Islands marine food web, ranging from zooplankton, cephalopods, to fishes, and higher trophic-level vertebrates. The synthesized dataset was used to inform the literature review, which was published in the [Advances in Marine Biology](#) (**Indicator 2.2**). This work further provided the baseline for the ecosystem model described in output 4.

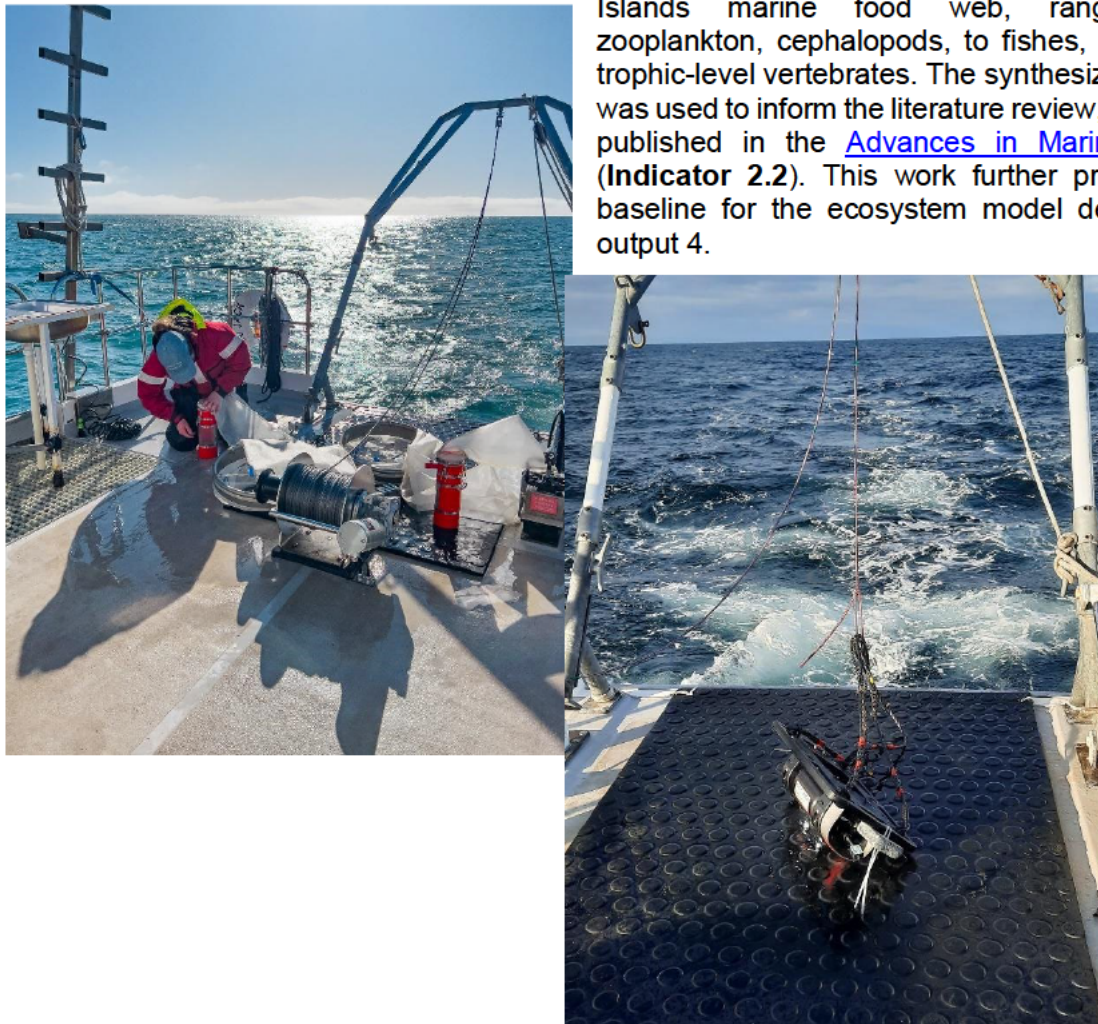


Figure 3. PM is reattaching the cod end back to the net for another zooplankton survey (left). The camera is ready to conduct another video imagery survey to look for squid eggs (right).

We have successfully completed 15 fieldwork days, involving sampling three stations in triplicate, totalling 135 survey tracks, exceeding the 20 surveys aimed for in the logframe (**Indicator 2.3**), with the support of our project partner SMSG. These data are still being worked up in a PhD studentship in partnership with the University of Aberdeen, focusing on identifying seasonal patterns in macrozooplankton communities, identifying fish larvae to understand the use of offshore species using the inshore environment as nursery, and generating information on energy flow within the zooplankton community. An [initial report](#) on the progress of the zooplankton data

collection can be found on the project website. This work provides baseline information on the lower trophic-level parts of the food web at a level of detail not previously available for the Falkland Islands. In addition, the changes in fish larvae presence and body sizes will provide clearer understanding of how the inshore and offshore areas are linked via ontogenetic migrations.

Figure 4. Fish larvae is being sampled (left). Fish larvae are being prepared for photographing under a microscope (middle). Fish larvae are processed in the Falkland Islands and ready to be barcoded in Aberdeen, UK (right).



We have conducted 15 inshore Loligo egg surveys, achieving higher than the 10 surveys aimed for in the logframe (**Indicator 2.4**), with the support of our project partner SMSG. [A report](#) on the finding of two squid egg masses in 45-46 m water depth, and identified benthic fauna, including unique bryozoans, is available on the project website. The findings of the two egg masses in these deeper waters extends our knowledge on the squid spawning behaviour, indicating a higher plasticity in the use and selection of habitat for laying their egg masses.

Overall, output 2 was successfully achieved to a higher standard than initially conceived.

### Output 3: Understanding physiological tolerances and acclimation responses of FI foundation species with current and project rates of climate change

Two large experiments were conducted for output 3 to understand how marine fauna may respond to climate change conditions (**Indicator 3.1**). With 8 species tested overall, we have exceeded the 7 species we aimed for in the logframe. Our project partners BAS, SMSG, and Fortuna Ltd (via FIFCA), were essential for this work as described in section 2. Previously, no physiological experiments have been conducted in the Falkland Islands, thus this work provides

a first generation of knowledge towards potential change in inshore communities in response to ocean warming.

One experiment focused on how inshore fauna from within and outside kelp forests respond to short-term (e.g., marine heatwaves) and long-term warming. This experiment provided insight into how species may acclimate to climate change, and what the differences are in warming tolerance between these species. We tested 7 species in this experiment, with one species (lobster krill; *Grimothea gregaria*) including two different life stages (an early pelagic stage and an older benthic stage), for three different rates of warming, noting the critical maximum temperature for each individual in each treatment. The results were investigated against species, habitat, feeding guild and mobility, which indicated that filter feeders and predators were more tolerant of marine heatwaves than other feeding guilds, and that tolerance to marine heatwaves did not differ depending on mobility or habitat. However, tolerance and acclimation potential to long-term warming was lower for sessile filter feeders, while benthic organisms and especially those outside of kelp forests were most resilient to long-term warming.



The second experiment focused on the Patagonian squid (*Doryteuthis gahi*), which has two spawning peaks, which are referred to as the autumn-spawning cohort (ASC) and spring-spawning cohort (SSC). The squid use the kelp forests to attach their egg masses on. The ASC spawns in the autumn, while the SSC spawns in spring, and thus both cohorts' embryos develop under very different thermal regimes. As cephalopod development is known to be influenced by temperature, we investigated if and how the two cohorts respond differently to warming temperatures. We found differences between the two cohorts, which reflect plasticity in their development, with the ASC responding stronger than the SSC to warming waters. This has implications for their hatching timing, and more specifically for matching the zooplankton peaks which provide food for the paralarvae. A [report](#) describing the physiology experiments is available on the project website. The final results of the experiments are being submitted to peer-reviewed scientific journals.

Overall, output 3 was successfully achieved to a higher standard than initially conceived.

Figure 5. Squid eggs (close up top left; overview bottom left) used in the experiment. Squid eggs enclosed in respiratory chamber for respiration measurement (right).

Output 4: an ecosystem model for the FI shelf developed in collaboration with local and international expertise.

The aim of output 4 was the development of an ecosystem model, using the Ecopath with Ecosim (EwE) platform. The synthesized information from output 2 provided the basis for the design of the functional groups and food-web interactions. An initial model (based on information from 2020-2022) was developed prior to a workshop hosted in Hatfield, Oregon with partners in the Falkland Islands. A group of experts on ecosystem modelling, and specifically on EwE attended the workshop and provided guidance on improving the model (**Indicator 4.1**). The workshop report is available on the [project website](#). The EwE model that was generated from the workshop improved the realism and capabilities of the model. Based on the provided guidance by the workshop participants, the ecosystem model was recalibrated using historical information (2001-2005), which provided a basis to calibrate time-dynamic solutions using historical biomass, catch and environmental information as fit, which is presented in a [report](#) (**Indicator 4.2, 4.3**). A calibrated EwE model against historical data provides more confidence in model simulation results, thus making it more useful as a decision-support tool for fisheries managers. Currently, historical and future scenarios are worked up. The PM aims to have the final results ready to present at the EwE 40<sup>th</sup> Years Conference in Belgium in June 2024. The final results will be submitted to a peer-reviewed scientific journal.

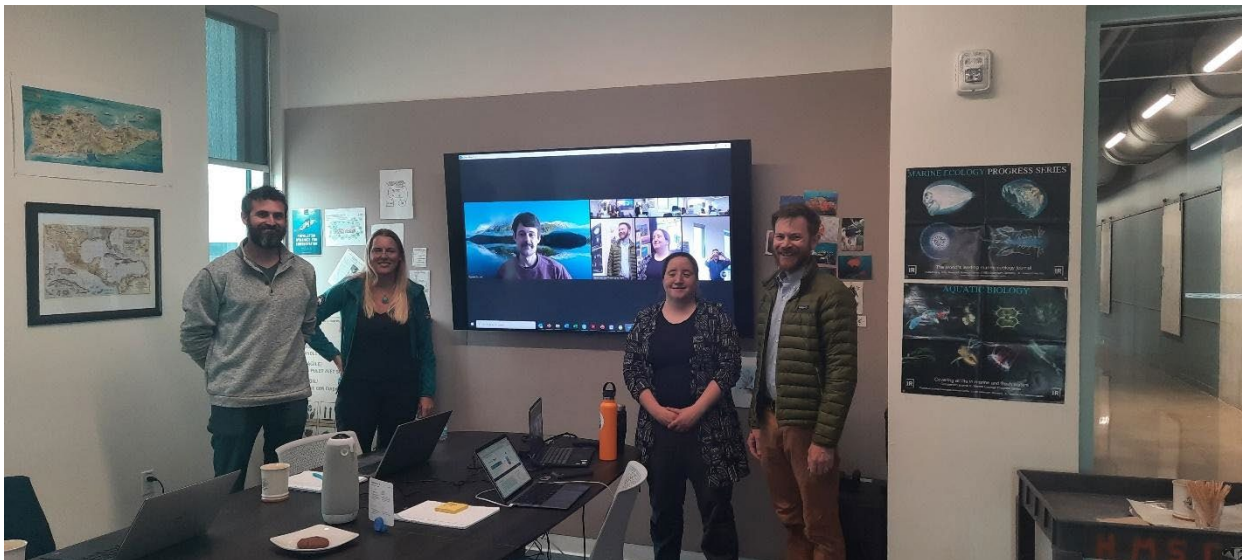


Figure 6. Workshop participants during the hybrid workshop on ecosystem modelling of high-latitude environments.

To provide further knowledge exchange, Indicator 4.4 initially outlined how training workshops would be created and delivered. However, it was recognised that a free online graduate course has been made available during the COVID-19 pandemic, with lecture slides, exercises, and videos freely available for interested people. This course, which contains 10x more lectures than aimed for in the logframe, in more detail than could be provided within this project and given by EwE experts that have been driving the EwE development and promotion, is a much better resource. Instead, the PM created a seminar which provided an overview of what EwE is and using this opportunity to showcase the Falkland Islands EwE model she created and pointing people to the graduate course for people to follow at their own pace by sharing this information during and after the seminar. This seminar was delivered in hybrid form to include interested people from other overseas territories. Therefore, the spirit of Indicator 4.4 was maintained. See annex 5 for the flyer that was circulated.

Overall, output 4 was successfully achieved within the project.



Output 5: EAF framework agreed by partners and stakeholders. CCA and EAF proposals submitted to FIG to inform decisions on whether to mainstream CCA and EAF into sustainable fisheries, conservation of marine ecosystems, governance and policy.

A best-practice review for EAF was conducted (**Indicator 5.1**), noticing that the term ecosystem-based fisheries management (EBFM) is used instead to be more in line with academic sources. The [review](#) was circulated to FIFCA members and FIFD, and it can also be found on the project website, including a [non-technical summary](#). Within the review, climate change adaptation principles were discussed, although note that many proposed CCA options available in the scientific and grey literature focus on tropical islands with much higher population densities and were not always applicable to the Falkland Islands, indicating a data gap (**Indicator 5.2**). A workshop was conducted that focused on ecosystem-based fisheries management in a changing environment, supported by the Falkland Islands Government Fisheries Department (**Indicator 5.3**). Several people from various fishing companies, attended, FIFD, science and a FIFCA representative participated in the workshop. In addition, a project partner from Oregon State University, Dr Michael Harte, and BAS, Dr Morley, visited the Falkland Islands to support and participate in the workshop. A [workshop report](#) and [workshop presentations](#) ([presentation 1](#), [presentation 2](#)) are available on the project website. Based on the workshop reports and the literature review and gap analyses, recommendations regarding streamlining ecosystem-based fisheries management were submitted to relevant FIG Directorates for consideration (Indicator 5.4, 5.5).

Overall, output 5 was successfully achieved within the project.



Figure 7. Workshop participants listen to Dr M Harte as he walks through the different attributes of ecosystem-based fisheries management.

Other achievements

The DPLUS148 project managed to build on top of its success by supporting the studentship of a PhD student, partnering with the University of Aberdeen. She is investigating seasonal and local spatial patterns in zooplankton, with a special focus on fish larvae. To further her work, the PM and the student applied to the Shackleton Fund for a grant to conduct stable isotope analyses on the zooplankton, to understand seasonal changes in isotope values, and establish how varied the feeding guilds or energy flows are within this group. In further support of the fish larvae barcoding, the project also obtained a grant from the Environmental Studies Budget from FIG. Last, the John Cheek Fund provided a grant to the PM to barcode the gelatinous zooplankton caught in the zooplankton nets. The literature review conducted, as well as confirmation from gelatinous zooplankton experts at JAMSTEC, Japan, indicated that there is a data gap in the Falklands. Last, the physiological rates of warming experiments provided the opportunity to support the undergraduate thesis of a student from the University of Portsmouth, who specifically visited the Islands for this work. Our work on the physiological experiments was highlighted on the Falkland Islands TV: <https://fitv.co.fk/news-and-events/how-climate-change-could-affect-the->

[falklands-marine-ecosystems/](#)). Our BAS project partner visited the Falkland Islands Community School to explain the importance of studying the physiology of Antarctic invertebrates.

### 3.2 Outcome

The project outcome stated 'proposed CCA and environmental variability and an ecosystems approach to fisheries management mainstreaming for fisheries governance/policy document, submitted to FIG Directorates for consideration'. Three indicators were established to assess achievement of this outcome, which include that proposed adaptation to climate change, variability and EAF approaches is submitted to FIG Directorates for consideration (**Indicator 0.1**), the adaptive capacity and resilience to climate change of FIFCA members is strengthened by the end of the project (**Indicator 0.2**), and the impact of climate change on fisheries and the Falkland Islands ecosystem is better understood by the end of the project through data synthesis, reports and papers, adding baseline information which informs future research (**Indicator 0.3**). The indicators were relevant and appropriate for achieving the overall outcome, but they are discussed in reversed order below.

Starting with understanding climate change impacts, it was important to first understand the available data. While much research has been conducted on various components of the marine environment, these efforts tend to focus heavily on charismatic animals and species of commercial interest, and the data were not collated in one place. The literature and data review conducted within this project has brought this information together to provide a baseline on trophic interactions and ontogenetic migration patterns across the marine environment and identified gaps in our understanding. This work provided the basis for the ecosystem modelling to assess how historical patterns in the marine environment have been influenced by fishing and oceanographic dynamics. It also provided a basis for the selection of focal species for the physiological work to assess the effects of ocean warming on inshore animals, including the commercially important Patagonian squid. This work fed into completing **Indicator 0.3**. In addition, the work provided an assessment of what climatic factors (e.g., ocean warming, changes in primary productivity, etc.) may affect the Falklands marine environment and what is known about the trends of these factors or where there may be data gaps. This was presented to and discussed with FIFCA members in a workshop (described in section 3.1), which indicated that there is a need for further work in understanding the influence of environmental change (**Indicator 0.2**). Last, collating all the comments and data provided the basis for recommendations made to FIG via a Fisheries Committee paper (**Indicator 0.1**). Overall, the outputs provided the necessary support to complete the outcome for this project.

### 3.3 Monitoring of assumptions

The outcome and output level assumptions were monitored throughout the course of the project. The PMG met regularly and discussed issues that arose and jointly found solutions. This allowed the group to monitor the assumptions for the project. Most assumptions made were inconsequential and most outputs could be completed without any necessary adjustments.

#### Outcome assumptions

The assumptions for the outcome of this project relate to the involvement of stakeholders and partners, as their involvement was required to successfully deliver this project. Across the duration of this project, FIFCA and FIFD members were engaged for various parts of the project and continued to be open to discuss concepts of climate change adaptation and ecosystem-based fisheries management (**Assumption 0.1 and 0.2**). Via meetings, reports, and workshops, it was highlighted, and generally agreed, that monitoring and understanding the effects of environmental change on fisheries is essential for the sustainability of the Falklands fisheries. Building upon this was also the realisation during the workshop and via the recommendations made to government that the Falklands already incorporated many elements of EAF, and that it is more a formality in stating that EAF implementation is occurring (**Assumptions 0.1, 0.2, and 0.3**). The duration of the project was appropriate to highlight potential climate change impacts and provide the platform to discuss and recommend CCA and EAF actions, although it is appropriate to say that the project also has highlighted many areas that require further work

**(Assumption 0.4).** Most of the international covid-19 pandemic restrictions were lifted prior to the commencement of this project, and were further lifted during the project, and therefore did not place restrictions on travel **(Assumption 0.5).**

#### Output assumptions

##### Output 1: Project management structure, monitoring and evaluation and communication tools established

The recruited PM was appropriate to lead and deliver this multi-faceted project within the given timeframe **(Assumption 1.1)**. All project partners involved in this project remained engaged and available for discussion and support during the whole of the project **(Assumption 1.2)**. Covid-19 restrictions were lifted and did not create issues for travel **(Assumption 1.3)**.

##### Output 2: New environmental baselines understood and created by the synthesis of local and scientific knowledge surveys conducted

Various requirements were needed within output 2, given its focus on both synthesizing available data and collecting baseline data. Partners were available to provide support these efforts, including collaborating on the literature review that synthesized existing data **(Assumption 2.1)**. The generation of new baseline information required the availability of a ship, and an inshore survey vessel was available throughout the project, which it was **(Assumption 2.2)**. An important assumption related to this is that weather conditions allow for the fieldwork to proceed. While some fieldwork days were adjusted because of weather conditions, it did not prohibit the fieldwork from being carried out **(Assumption 2.3)**. Covid-19 restrictions were lifted and did not create issues for travel **(Assumption 2.4)**.

##### Output 3: Understanding physiological tolerances and acclimation responses of FI foundation species with current and project rates of climate change

No local marine technician was retained within the project, although this was solved via the support, where necessary, provided by technicians from the aquaculture facility where the experiments were conducted **(Assumption 3.1)**. This included support in the building of the flow-through system and providing advice on husbandry. The experiments could be accommodated at the only locally available aquaculture facility **(Assumption 3.2)**. Covid-19 restrictions were lifted and did not create issues for travel **(Assumption 3.3)**.

##### Output 4: an ecosystem model for the FI shelf developed in collaboration with local and international expertise.

Both partners and stakeholders were engaged prior and during the workshop, which was hosted by one of the project partners, that proved critical for the development of the model **(Assumption 4.1)**. In addition, the workshop participants continued to provide support during the project for model development and assessment, alongside project partners **(Assumption 4.2)**. Covid-19 restrictions were lifted and did not create issues for travel **(Assumption 4.3)**.

##### Output 5: EAF framework agreed by partners and stakeholders. CCA and EAF proposals submitted to FIG to inform decisions on whether to mainstream CCA and EAF into sustainable fisheries, conservation of marine ecosystems, governance, and policy.

Key FIG officials and FIFCA members were available for the workshop on EAF and CCA, and actively participated in the discussions **(Assumption 5.1, 5.3)**. The workshop provided the basis, alongside the literature review on EAF and CCA, to make recommendations for working towards implementing EAF including CCA, which was supported by FIG **(Assumption 5.2)**. Covid-19 restrictions were lifted and did not create issues for travel **(Assumption 5.4)**.

## 4 Contribution to Darwin Plus Programme Objectives

### 4.1 Project support to environmental and/or climate outcomes in the UKOTs

The data generated within this project and shared through workshops, reports, publications (including upcoming publications), presentations, and direct communications are important for the following national and international pieces:

- Falkland Islands/UK Environmental Charter 2001
- Falkland Islands 'Islands Plan 2022-2026'
- Environment Strategy Falkland Islands Biodiversity Framework
- Convention on Biological Diversity
- United Nations Convention for the Law of the Sea (UNCLOS)

Guiding principles have been established within the Falkland Islands / UK Environmental Charter 2001: 1) To recognise that all people need a healthy environment for their well-being and livelihoods and that all can help to conserve and sustain it; 2) To use our natural resources wisely, being fair to present and future generations; 3) To identify environmental opportunities, costs and risks in all policies and strategies. 4) To seek expert advice and consult openly with interested parties on decisions affecting the environment; 5) To aim for solutions which benefit both the environment and development; 6) To contribute towards the protection and improvement of the global environment; and 8) To encourage activities and technologies that benefit the environment. The work within this project has relevance for principle 1 as it informs on healthy environments, including effects on livelihoods via fisheries and its contributions to the Falklands economy. The project has provided important data and insights for principle 2) and 3) as well as providing mechanisms to assess if and how future environmental change may impact the marine environment and its natural resources.

The 'Islands Plan' is a Falkland Islands Legislative Assembly document that represents a shared vision and priorities for the Falkland Islands over four years. It articulates ambition for improvements and the actions we will take to deliver positive results, across a range of key areas, for the benefit of every resident. It connects our community's aspirations for protecting the environment, improving transport and communications links, and modernising our infrastructure, with the possibilities that exist to improve our prosperity, health, and wealth for current and future generations. Relevant sections and priorities of the Plan, which are directly important for this project include:

#### Fisheries

- Ensure responsible marine management including the implementation of new maritime legislation;
- Lead the development of a long-term plan, working with the fishing sector to ensure the right conditions to encourage development, sustainability and growth
- Make progress on regional fisheries conservation and management to ensure better sustainability and conservation of fish stocks, and improve ecosystem understanding;
- Work in partnership with our Falkland Islands fishing companies to ensure the fishery is responsibly managed and widely promoted, and to improve product visibility and reputation internationally

#### Environment

- Develop and implement a comprehensive environmental strategy including necessary regulations; Implement the 2030 Biodiversity Framework to preserve our natural environment;
- Encourage research into the Falkland Islands environment to provide greater understanding of ecosystems, biodiversity and wider influences;
- Fulfil our commitments under international treaties and agreements such as climate change accords and strive to mitigate our carbon footprint.

The project has delivered information and promoted a change in management style that would support the Falklands in its ambition for responsible marine management, and ability to develop long-term plans for the fishing sector. The project also made a significant contribution to the

ecosystem understanding of the marine environment. The work on climate resilience has obvious relevance for the natural environment beyond the fishing sector.

The Falkland Islands Environment Strategy (2021-2040) outlines the priorities required with regards the wider Falkland Islands environment. The Strategy is underpinned by the implementation of Strategies and Action Plans. Climate change implications run through all elements of the threats identified in the Strategy.

UK’s ratification to CBD was extended to the Falkland Islands in 2016. The project has addressed the following targets: Aichi 4 (Natural Resources); 6 (Sustainable fisheries); 10 (Vulnerable Marine Ecosystems); 10 (Protected Areas); 14 (Essential Ecosystem Services).

UNCLOS61(2), stating ‘coastal states take ‘into account the best scientific evidence available to it’ in determining conservation and management measures’ has relevance for this project, as the new and synthesized information generated within the project has increased the available scientific information to the Falklands, allowing the Falklands to take these new perspectives into account in their management practices.

#### 4.2 Gender equality and social inclusion

Please quantify the proportion of women on the Project Board <sup>1</sup> .	50%
Please quantify the proportion of project partners that are led by women, or which have a senior leadership team consisting of at least 50% women <sup>2</sup> .	20%

### 5 Monitoring and evaluation

A monitoring and evaluation (M&E) plan was developed for the project and is available on the project website. No major changes were made to the project design, apart from a delayed start because of trouble in recruitment. The project was governed through a PMG which was formed by all project partners, and which had regularly meetings. The PM updated the PMG on the progress of the project and used the meetings as an opportunity to discuss issues and next steps when relevant. The PM was responsible for the successful delivery of the project within the project duration and within budget, and to ensure the quality of the deliverables. The point of involvement of the various project partners depended on the expertise, which maintained the high standard of the project delivery across the board. It also allowed project partners, which represented different stakeholders, to incorporate their interests and views. The completion of all indicators and full project delivery highlights how this process worked very well.

All reports were internally reviewed within the project. Several manuscripts have been developed or are being developed from this project (one published, one submitted, at least three more in development), which have been submitted or will be submitted to a peer-reviewed journal for external evaluation.

SAERI maintains a high standard of its work and has an annual external audit as part of this to maintain this standard.

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<sup>1</sup> A Project Board has overall authority for the project, is accountable for its success or failure, and supports the senior project manager to successfully deliver the project.

<sup>2</sup> Partners that have formal governance role in the project, and a formal relationship with the project that may involve staff costs and/or budget management responsibilities.

## **6 Actions taken in response to Annual Report reviews**

Four comments were received on the previous annual report, one which required a response. The comments mostly related to how evidence was presented, and a greater care has been taken in this project to highlight the evidence.

Comment 1 (no comment required). A greater care has been taken that the PMG notes are now available on the website, although the MoUs are not shared as they contain financial information.

Comment 2 (no comment required). The PMG notes have been updated and doubly-checked that they are all available on the website.

Comment 3. Section 3.1 contains more detail on the experimental protocols used. In addition, more details are provided in a physiology report that is present on the project's website.

Comment 4 (no comment required). Greater care has been taken on providing evidence of the activities executed within this project. As part of the project's timeline, several reports have been created, which were not possible in the previous reporting period as insufficient progress had been made.

## **7 Lessons learnt**

The importance of conducting this work 'locally', that is within the UKOT, cannot be overstated. Value has been added by having the PM (and SAERI) based in the Falkland Islands to create and maintain relationships and share results more easily with the local community and stakeholders. More importantly, on the ground experience provides an insight into the challenges that are present in small island nations, which cannot be appreciated with this experience. Further, a PM present, in the UKOT, allowed for several outreach activities that the PM could organise or participate in, including facilitating work experience for local students, talks to the general public or schools, and representing the project and SAERI at local events, including Farmers' Week and Career Day, and the Falkland Islands Radio and TV. These activities are very important as they strengthen the breadth of outreach and awareness.

There are challenges, however, that are part of this, mainly because expertise may not always be present in the Falkland Islands. This project did well in facilitating experts coming to the Falkland Islands for training, or the PM being able to travel to the experts, to then come back and share the lessons learned. When experts come from overseas to the Falkland Islands, often SAERI asks them to present their work to the local community or host a talk within the local schools, providing opportunities for people and especially young people, to hear from world experts about things they can do in their own backyard. This is not always appreciated or known (or realised), but many young people can get very excited about these prospects. This is important, as it may stimulate them to study in these fields and work on their own island rather than continuously sourcing outside experts for this work.

Relationships are important in working in the UKOTs, and while people in the Falkland Islands are generally welcoming, a certain level of trust is necessary to work on these problems. This is a challenge for projects that run 2 or less years, and much more value could be added if projects could run for longer, or if follow-on projects are easier generated. This would also mean that a greater momentum and community buy-in would be maintained.

The physiology experiments were challenging both in terms of logistics and collecting a sufficient number of individuals for each species for experimental purposes. These individuals often had to be obtained by divers, but of course there is never a guarantee that you will find the species of interest. In hindsight, it would have been useful to build-in more time and opportunity for sample collection. This came especially apparent when trying to collect squid egg masses from the spring spawning cohort. Normally, this cohort starts laying in October, but in 2023 it took three trips and finally in mid-November egg masses were found, at a place further away than the normal place we collect the egg masses from. It is likely that the switch from a La Niña to an El Niño condition, which results in colder and longer winters in the Falklands, played a role here (e.g., we saw

strong changes in the phytoplankton bloom and zooplankton communities, with much more kelp detritus for longer in the water column), but this was generally not well known or understood, and it had not been advised to sample later than intended. The sensitivity of heaters was also a cause of much stress. While equipment failure in physiological experiments is not unheard of, if there had been an opportunity to have spare heaters, it would have allowed for less delay in some of the experiments than waiting for new heaters to arrive from the UK to the Falkland Islands. It leaves little room for error. Last, the lack of temperature-controlled rooms in the Falkland Islands means that certain experiments, which are needed to further our understanding of ocean warming responses in other species including species of commercial interest, different life stages, and comparative analyses with a smaller temperature differential, is currently not possible. It does, however, a clear pathway to improve on this work in the Falkland Islands if, for example, a temperature-controlled container lab could be obtained, as it available in other UKOTs.

## **8 Risk Management**

No new risks have arisen in the last 12 months in the project. No adaptations to the project design were necessary.

## **9 Sustainability and Legacy**

There has been a good deal of interest in the project from the government and the fishing industry. This is evidenced by the financial contribution to the PhD studentship, support through the provision of space of the aquaculture facility, and participation through workshops, for example.

The ecosystem model is made available to the Falkland Islands, via the IMS-GIS/FIG data portal, and will be made available on Ecobase data depository, which is a dedicated platform to share EwE models on. Further, the PM has provided a pathway for obtaining training, or exploring further interest, into EwE, which is archived and remains available for those coming after her that might be interest in working with it. FIFD has been especially interest in this. The idea of ecosystem modelling is not relatively new to the Falklands, but there is no clearly identified person within, for example, FIFD, who will keep this work up. However, there are opportunities to keep sharing this knowledge, including for example via the PM collaborating with another PM on a different DPLUS project.

The data from the zooplankton surveys and physiological work is available upon request now, and the restriction will be changed to open when the data have been published. The data manager of SAERI is aware of these restrictions and needed updates in the future, but by providing the files already in restricted form, it is guaranteed that the data can be shared in the future if the accessibility identified is by accident not updated.

The project has submitted a Fisheries Committee paper, containing recommendations for implementing EAF, which would also be a pathway for implanting a framework that would allow the incorporation of CCA strategies more easily.

Overall, the project's exist strategy, remains valid. The project has provided FIG with baseline information, training and knowledge that contributes to understanding the marine environment and management, and specifically contributes to the sustainable development of the marine environment. Further, FIFCA members remain interested in the EAF framework, and agree that more work on climate change is necessary, indicating that there is a lot of will and interest for further work in this.

The PM will be leaving the Falkland Islands at the end of the contract, but she is interested in further working with SAERI on climate change impacts in the Falkland marine environment and for their fisheries, including obtaining further baseline information in those groups that are understudied in the marine environment, but identified in the modelling work to potentially play a larger role than previously recognised. Further, the work on marine heatwaves in the physiology is providing some further promising lines of work that can provide insights into adaptive management for the fisheries.

## 10 Darwin Plus Identity

The Darwin Plus funding was recognised in every communication and public engagement event. The Darwin Plus logo was consistently displayed in presentations and newsletters. The funding (through the UK government) was explained in presentations and meetings with stakeholders.

The project was presented as a distinct project, with a clear identity attached to the Darwin Plus as main funding donor. Building upon the success of this project has already resulted in the support of a PhD studentship (working zooplankton data), and two small funds to further investigate trophic positioning in zooplankton and gelatinous zooplankton discovery (Shackleton Fund and John Cheek Fund, respectively). In these additional projects, the support of Darwin Plus remains recognised.

The Darwin Plus logo was displayed or Darwin Plus funding was orally acknowledged in the following:

- Project website
- Project presentations, for FI Women Association, and within workshop 1 and 2 (annex)
- Project reports: workshop 1, workshop 2, zooplankton, squid eggs, physiology, ecosystem modelling, EAF review
- SAERI newsletter entries
- Social media tags
- Scientific manuscripts
- Farmers week
- FITV Interview

The Darwin Initiative from BCF is an important funding source for SAERI and the Falkland Islands, and it is known within the community. Most familiar with the initiatives are people involved in science and/or conservation projects, as well as people in government. The name is promoted in industry by SAERI as well via partnerships to consistently include stakeholders in the project.



Figure 8. Darwin Initiative funding was prominently acknowledged in all talks given related to this project. When a visual aid was not possible (e.g., via radio or tv interviews), funding was orally acknowledged.



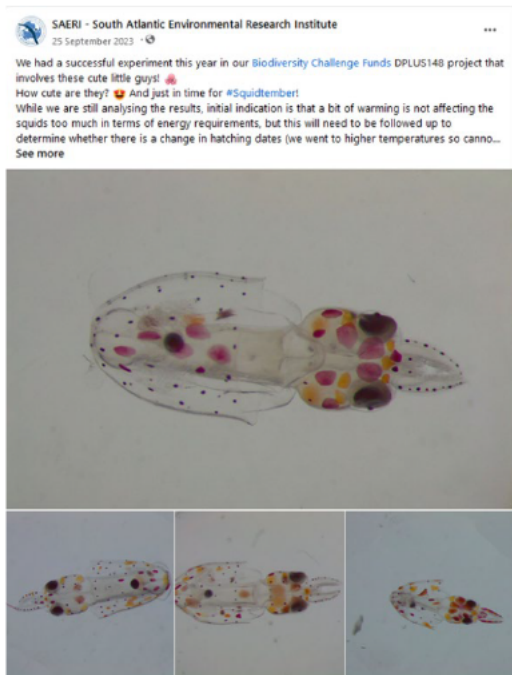


Figure 9. An example selection of social media posts, where the DPLUS148 project is mentioned and Darwin Initiative is acknowledged or tagged to highlight their profile.

## 11 Safeguarding

Has your Safeguarding Policy been updated in the past 12 months?	No
Have any concerns been investigated in the past 12 months	No
Does your project have a Safeguarding focal point?	Yes – Arlene [REDACTED]
Has the focal point attended any formal training in the last 12 months?	In progress – Designated child safeguarding lead level 3 and Level 3 safeguarding adults
What proportion (and number) of project staff have received formal training on Safeguarding?	Past: 25% [1] Planned: 0% [0]
Has there been any lessons learnt or challenges on Safeguarding in the past 12 months? Please ensure no sensitive data is included within responses. n/a	

## 12 Finance and administration

### 12.1 Project expenditure

Project spend (indicative) since last Annual Report	2023/24 Grant (£)	2023/24 Total actual Darwin Plus Costs (£)	Variance %	Comments (please explain significant variances)
Staff costs				Costs budgeted for OSU delivery in Q4 U3 did not materialise
Consultancy costs				
Overhead Costs				Higher than budgeted relocation costs
Travel and subsistence				
Operating Costs				Workshop costs were lower than expected.
Capital items				
Others				Conference attendance for PM to present project modelling used net underspend from other lines
<b>TOTAL</b>	84,409	84,510	0.12%	

Staff employed (Name and position)	Cost (£)
Project manager – Jesse van der Grient	
SAERI Dep Dir. Business – Teresa Bowers	
SAERI Director – Paul Brickle	
Project partner – Paul Brewin	
Project partner – Michael Harte	
<b>TOTAL</b>	

Consultancy – description and breakdown of costs	Other items – cost (£)
n/a	0
<b>TOTAL</b>	0

Capital items – description	Capital items – cost (£)
n/a	0
<b>TOTAL</b>	0

Other items – description	Other items – cost (£)
M&E	
HSBC Bank Fee - Account fee	
SCB - Transaction Fee	
SCB - Transaction Fee	
HSBC - Oregon state transfer fee	
HSBC Bank Fee - Account fee	
SCB - Transaction Fee	
HSBC Bank Fee - Account fee	
HSBC Bank Fee - Transaction fee for J268801	
SCB - Transaction Fee	
SCB - Half Yearly charges	
HSBC Bar bank fee	
SCB - Transaction Fee	
SCB - Transaction Fee	
HSBC Bank Fee - Account fee	
HSBC Bank Fee - Account fee	
SCB - Transaction Fee	
HSBC Bank Fee - Account fee	
SCB - Transaction Fee	
HSBC Bank Fee - Account fee	
SCB - Transaction Fee	
SCB - Transaction Fee	
HSBC Bar Bank fee	
HSBC Bar Bank fee	
HSBC Bar Bank Fee	
August_Electricity charge physiology experiment	
September_Electricity charge physiology experiment	
October_Electricity charge physiology experiment	
November_Electricity charge physiology experiment	
December_Electricity charge physiology experiment	
February_Electricity charge physiology experiment	
March_Electricity charge physiology experiment	
April_Electricity charge physiology experiment	
May_Electricity charge physiology experiment	
June_Electricity charge physiology experiment	
July_Electricity charge physiology experiment	
Installation of new consumer units and sockets	
Boat hire zooplankton survey	
Boat hire squid egg collection	
<b>TOTAL</b>	<b>8,158</b>

## 12.2 Additional funds or in-kind contributions secured

Source of funding for project lifetime	Total (£)
Falkland Islands Government Environmental Studies Budget	
BAS in-kind	
OSU in-kind	
<b>TOTAL</b>	<b>33,880</b>

Source of funding for additional work after project lifetime	Total (£)
John Cheek Fund	
Shackleton Fund	

<b>TOTAL</b>	<b>5,625</b>

### 12.3 Value for Money

More scientific work has been performed under this project than initially conceived. For example, we conducted more zooplankton surveys, more Loligo egg surveys, more physiological experiments, and have a more robust model (with both historical fits and future projections although the latter bit is still being worked up) than anticipated. In addition, we have been able to support a PhD student thesis and a bachelor thesis within the project. The data generated within the project also allowed us to attract further funding to take analyses further, as outlined in section 3.3 Other Achievements. The project has benefitted from in-kind time provided by project partners and SAERI staff. Last, via the underspent in the operating cost, the project is able to support the PM to join a conference to present the ecosystem model of the Falkland Islands.

Overall, the project was excellent value for money, because it not only completed its initial objectives, but also carried out fieldwork beyond the original scope, and supported closely related PhD and bachelor projects.

In addition, due to an underspend on the staff line, we were able to sponsor a portion of the attendance of the PM at a conference where the modelling work done on this project will be showcased.

### 13 OPTIONAL: Outstanding achievements of your project (300-400 words maximum). This section may be used for publicity purposes.

I agree for the Biodiversity Challenge Funds Secretariat to publish the content of this section (please leave this line in to indicate your agreement to use any material you provide here).

- We have conducted for the first time in the Falkland Islands physiological experiments and have significantly improved our knowledge on ocean warming tolerances, resilience, and vulnerabilities.
- We have conducted an almost-monthly zooplankton survey for ~1.5 years, allowing us to significantly improve our knowledge on the zooplankton community seasonal patterns and fine-scale spatial patterns. A special focus is on the fish larvae in this community, which will provide a valuable dataset on identifying which fish species use the inshore areas as nursery.
- We have observed squid egg masses attached to rocks on the seafloor in deeper waters than before observed in the Falkland Islands.
- We have conducted a literature review on migration patterns and prey-predator interactions in the Falklands marine food web which was published in *Advances in Marine Biology*.
- We hosted two successful workshops, one on ecosystem modelling with a focus on environments that are data limited which was held in Oregon, USA, and a second on ecosystem-based fisheries management in the Falkland Islands, showing that the Falklands have already implemented many attributes of this holistic management style.
- We have created an ecosystem model that can replicate historical patterns and we use it to understand what potential future changes may occur in the Falklands marine environment in response to climate change.

<b>File Type (Image / Video / Graphic)</b>	<b>File Name or File Location</b>	<b>Caption, country and credit</b>	<b>Online accounts to be tagged (leave blank if none)</b>	<b>Consent of subjects received (delete as necessary)</b>
				Yes / No
				Yes / No
				Yes / No
				Yes / No
				Yes / No

## Annex 1 Project’s full current logframe as presented in the application form (unless changes have been agreed)

Please insert your project’s logframe (if your project has a logframe), including indicators, means of verification and assumptions. N.B. if your application’s logframe is presented in a different format in your application, please transpose into the below template. Please feel free to contact [BCF-Reports@niras.com](mailto:BCF-Reports@niras.com) if you have any questions regarding this.

Project Summary	Measurable Indicators	Means of Verification	Important Assumptions
<p><b>Impact:</b> EAF capacity in FI developed, CCI to fishery and ecosystems better understood with advice and recommendations for CCA Policy for fisheries and ocean governance/policy submitted to FIG Directorates for consideration. (Max 30 words)</p>			
<p><b>Outcome:</b> (Max 30 words) Proposed CCA and environmental variability and an ecosystems approach to fisheries management mainstreaming for fisheries governance/policy document, submitted to FIG Directorates for consideration.</p>	<p>0.1 Proposed adaptation to climate change, variability and EAF approaches submitted to FIG Directorates for consideration. 0.2 Adaptive capacity and resilience to climate change of FIFCA members strengthened by the end of the project. 0.3 Impact of climate change on fisheries and FI ecosystem better understood by the end of the project through data synthesis, reports and papers adding a baseline informing future research/work.</p>	<p>0.1 Reports on data synthesis and ecosystem model circulated to stakeholders 0.2 Proposals and suggested approaches for the fisheries sector and FIG on CCA and EAF. 0.3 Annual reports to FIG Directorates responsible for fisheries management and policy. CCI on fisheries and ecosystems included in FI Fisheries Science Strategy and considered for Environmental and Fisheries Policy via proposal to relevant FIG Directorates</p>	<p>Relevant FIG Directorates continue to be open to the concept of mainstreaming CCA into fisheries using an EAF approach and remain fully engaged in the project. FIFCA members and stakeholders committed to the project and engage in project activities. Increased awareness and understanding results in positive action for fisheries and environmental management and governance. That the duration of the project is appropriate to inform policy and the implementation of EAF and CCA actions. Covid-19 impacts don’t place restrictions on national and international travel.</p>
<p><b>Outputs:</b> 1. Project Management structure, monitoring and evaluation and communication tools established</p>	<p>1.1 MoU signed and agreed by partners. 1.2 PM Recruited. 1.3 PMG meeting held every Q. 1.4 Webpage create on SAERI and partners’ websites. 1.5 M&amp;E Plan created in. 1.6 Regular DPLUS reports (half yearly/yearly).</p>	<p>1.1 MoU signed, filed adhered to by partners. Y1Q4 JAN2022 1.2 Interim PM employment contract signed. Y1Q3. OCT2021 Permanent PM employment and contract signed by Y2Q1. APR2022 1.3 PMG meeting notes available on common platform. Starting Y2Q1. APR2022</p>	<p>Recruitment results in appropriate candidates being appointed and available on island within given timeframe. Continued resource from project partners available to engage with the project for its duration.</p>

		<p>1.4 Webpages live and public facing. Y2Q1. APR2022</p> <p>1.5 M&amp;E plan available on common online platform. Y2Q1 APR2022.</p> <p>1.1 DPLUS Reports available to project partners.</p>	<p>Covid-19 impacts do not place restrictions on national and international travel.</p>
<p><b>2.</b> New environmental baselines understood and created by the synthesis of local and scientific knowledge surveys conducted (WPK2)</p>	<p>2.1 At least 20 data sets synthesised to inform current knowledge and informs further data collection.</p> <p>2.2 1 literature review conducted and database increasing current baseline knowledge.</p> <p>2.3 20 Inshore zooplankton/ichthyoplankton surveys conducted to augment the role of nearshore offshore connectivity.</p> <p>2.4 10 inshore loligo egg survey conducted on eastern coasts to determine the spatial (bathymetric) extent of loligo spawning areas. This is key to fisheries management as the range (geographical and bathymetric) are not fully understood.</p>	<p>2.1 Project data platform created with a public facing webGIS within the SAERI IMS-GIS/FIG data portal by Y2Q1 APR2022</p> <p>2.2 Synthesis report to the PMG and stakeholders by Y2Q1 APR2022</p> <p>2.3 Detailed report on the spatial and temporal variation in the plankton community structure quantifying the importance of the near shore ecosystem to the offshore and FI fisheries as nurseries and trophic linkages between Y2Q1 APR2022 and Y3Q1 APR2023. This provides further empirical evidence that the near shore environment and proposed MMA is key to sustaining fisheries and ecosystem function. Report re-focused for a scientific journal Y3Q2,Y3Q3.</p> <p>2.4 Loligo egg survey report delivered to PMG and stakeholders Y2 Q4/Y3Q1 APR2023. Report re-focused for a scientific journal.</p>	<p>Partners have the capacity and resource to contribute data and collaborate in the data synthesis report.</p> <p>Inshore survey vessel available at the required time.</p> <p>Weather conditions enable data collection within the proposed time periods.</p> <p>Covid-19 impacts do not place restrictions local activities.</p>
<p><b>3.</b> Understanding Physiological tolerances and acclimation responses of FI foundation species with current and projected rates of climate change (WPK3).</p>	<p>3.1 7 key species capacity to cope with and acclimatise to the current and projected rates of climate change assessed experimentally at a FI aquaculture facility allowing un understanding of 'winners' and 'losers' to environmental change.</p>	<p>3.1 Results capture in a report and circulated to PMG and then stakeholders Y3Q2/OCT2023. Report re-focused for a scientific journal.</p> <p>Reports on project website</p>	<p>Partner organisation remains able to contribute and train locally retained marine technician.</p> <p>Partner organisation accommodates experimental equipment at a FI aquaculture facility.</p> <p>Covid-19 impacts do not place restrictions on national and</p>

			international travel and local activities
<p>4. An Ecosystem Model for the FI shelf developed in collaboration with local and international expertise (WP4).</p>	<p>4.1 A workshop with local and international experts (ecologists and modellers) will create a framework for the first ecosystem model for FI.  4.2 PM in collaboration with partners build Ecosystem model in software Ecopath with Ecosim enhancing understanding of ecosystem function.  4.3 Develop the model to examine ecosystem effects of fishing, impacts of environmental change with data produced in WPK1&amp;2 creating a tool to inform fisheries management.  4.4 Training package created and 3 training seminars given to partners and scientists within FIFD and SAERI. Training video with worked example created building capacity in the FI and other OTs.</p>	<p>4.1 Workshop report and recommendations circulated to PMG and stakeholders. Workshop report also uploaded to Project website Y2Q4/JAN2023.  4.2 Ecosystem model development showcased to partners and stakeholders by presentation and demonstration seminars Y2Q4, Y3Q1/JAN.APR2023.  4.3 Model presented to partners and stakeholders through a report and demonstration seminar. Report uploaded to project website Y3Q2, Y3Q3/JUN.OCT2023. Report re-focused for a scientific journal.  4.4 Training seminars given and training video uploaded to the Project website Y3Q4, Y4Q1/JAN.MAR2024.</p>	<p>Partner and Stakeholders engage in the workshop within the given timeframe  Partners continue to contribute WPK in a timely manner and collaborate with model development.  Covid-19 impacts do not place restrictions on national and international travel.</p>
<p>5. EAF framework agreed by partners and stakeholders. CCA and EAF proposals submitted to FIG to inform decisions on whether to mainstream CCA and EAF into sustainable fisheries, conservation of marine ecosystems, governance and policy (WP5).</p>	<p>5.1 Conduct best practice review for EAF and explore gaps that may impede adoption in FI.  5.2 Review CCA principles and actions in fisheries Governance globally with a focus on small island nations.  5.3 Conduct workshop in FI to a) present best practice review for EAF b) explore options from gap analyses for improvement c) explore potential management/policy interventions to mitigate CC on fisheries and ocean management e) CCA and EAF recommendations submitted to FIG for consideration.  5.4 Submit EAF proposals to FIG's Fisheries Committee.</p>	<p>5.1 EAF best practice review report circulated to PMG, Stakeholders and uploaded to project website Y3Q3/OCT2023 Report re-focused for a scientific journal.  5.2 CCA review report circulated to PMG, Stakeholders and uploaded to project website by Y3Q4/JAN2024.  5.3 Workshop report produced and report circulated to PMG, Stakeholders and uploaded to project website Y3Q4/JAN2024.  5.4 EAF paper submitted prepared for DNR to consider submitting to Fisheries Committee Y4Q1/APR2024.  5.5 Written acknowledgement by DPED that it has received and</p>	<p>Key FIG official and stakeholders available for the workshop.  FIG continues to engage and contribute to discussion and considerations around how to incorporate EAF and CCA in policy and governance.  Buy-in secured through continuous engagement and workshops. Active FIG engagement.  Covid-19 impacts do not place restrictions on national and international travel.</p>



	5.5 Submit EAF and CCA proposals to relevant FIG Directorates for consideration.	reviewed the relevant reports and that the contents and recommendations will inform policy development Y4Q1/APR2024.	
<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)</p> <ul style="list-style-type: none"> <li>1.1 MoU signed and agreed by partners.</li> <li>1.2 PM and PO Recruited.</li> <li>1.3 PMG meeting held every.</li> <li>1.4 Webpage create on SAERI and partners' websites</li> <li>1.5 M&amp;E Plan created.</li> <li>1.6 Regular DPLUS reports (half yearly/yearly).</li> <li>2.1 Desk top review establish current knowledge and informs further data collection.</li> <li>2.2 Review report and metadata catalogue delivered to Project partners</li> <li>2.3 Inshore zooplankton/ichthyoplankton surveys undertaken</li> <li>2.4 Inshore Loligo survey conducted using ROV</li> <li>3.1 Specimens collected and species capacity to cope and acclimatise to projected rates of change ascertained</li> <li>3.2 Results capture in a report and circulated to PMG and then stakeholders. Report re-focused for a scientific journal.</li> <li>4.1 Host workshop in FI to create a framework for ecosystem model</li> <li>4.2 Partners and PM build ecosystem model in relevant modelling environment (e.g. Ecopath with Ecosim)</li> <li>4.3 PM and partners use model to examine the ecosystem effects of fishing, impacts of environmental change</li> <li>4.4 Training package created and seminars given to partners and scientists in DNR</li> <li>5.1 Conduct EAF best practice review and explore gaps that may impede adoption in FI</li> <li>5.2 Review CCA principles and actions in fisheries governance with an emphasis on small Island nations</li> <li>5.3 Conduct 2<sup>nd</sup> workshop in FI to present a) best practice review, b) explore options from gap analyses for improvement c) explore management/policy interventions to mitigate CC on fisheries and ocean management e) CCA and EAF submitted to FIG for consideration</li> <li>5.4 Submit EAF and CCA proposals to FIG's Fisheries Committee</li> <li>5.5 Submit EAF and CCA proposals to relevant FIG Directorates for consideration</li> </ul>			

## Annex 2 Report of progress and achievements against final project logframe for the life of the project (if your project has a logframe)

Project summary	Measurable Indicators	Progress and Achievements for the life of the project
<p><b>Impact:</b></p> <p>EAF capacity in FI developed, CCA to fishery and ecosystems better understood with advice and recommendations for CCA Policy for fisheries and ocean governance/policy submitted to FIG Directorates for consideration.</p>		<p>Via the gathered and synthesized data from the observational surveys, experimental physiology, and modelling efforts, more is known about the Falklands marine environment structure and diversity, and how this ecosystem may respond to climate change. Both baseline and experimental/simulated results provided vital knowledge to explore and discuss the potential for climate change adaptation and ecosystem-based fisheries management. This work has provided policy recommendations to the FIG directorates for their consideration.</p>
<p><b>Outcome</b> Proposed CCA and environmental variability and an ecosystems approach to fisheries management mainstreaming for fisheries governance/policy document, submitted to FIG Directorates for consideration.</p>	<p>0.1 Proposed adaptation to climate change, variability and EAF approaches submitted to FIG Directorates for consideration.</p> <p>0.2 Adaptive capacity and resilience to climate change of FIFCA members strengthened by the end of the project.</p> <p>0.3 Impact of climate change on fisheries and FI ecosystem better understood by the end of the project through data synthesis, reports and papers adding a baseline informing future research/work.</p>	<p>The overall project purpose and outcomes were achieved via:</p> <ol style="list-style-type: none"> <li>1) The synthesized, experimental and simulated data provided new insights into the vulnerabilities to climate change in the Falkland Islands</li> <li>2) Through workshop discussions, reports and policy recommendations a greater awareness of potential trophic effects and climate change impacts on the marine environment and fisheries has been created, with a greater appreciation that this a high priority area for consideration in management.</li> </ol>
<p><b>Output 1.</b> 1. Project Management structure, monitoring and evaluation and communication tools established.</p>	<p>1.1 MoU signed and agreed by partners.</p> <p>1.2 PM Recruited.</p> <p>1.3 PMG meeting held every Q.</p> <p>1.4 Webpage create on SAERI and partners' websites.</p>	<p>1.1 MoUs were finalised and signed by partners by the end of 2022. These are available upon request. Indicator is appropriate.</p> <p>1.2 The PM was recruited and started work on the project on 1<sup>st</sup> April 2022. The contract is available upon request. Indicator is appropriate.</p>

Project summary	Measurable Indicators	Progress and Achievements for the life of the project
	1.5 M&E Plan created in. 1.6 Regular DPLUS reports (half yearly/yearly).	1.3 Quarterly PMG meetings were held throughout the project. The meeting minutes are available on <a href="#">the project website</a> . Indicator is appropriate.  1.4 A <a href="#">webpage</a> was created on the SAERI website.  1.5 The monitoring and evaluation plan was completed and is available on the <a href="#">project website</a> . Indicator is appropriate.  1.6 DPLUS half yearly and yearly reports were submitted to BCF. Indicator is appropriate.
Activity 1.1 MoU signed and agreed by partners		Completed
Activity 1.2. PM and PO recruited		Completed
Activity 1.3 PMG meeting held every quarter		Completed
Activity 1.4 Webpage created on SAERI and partners' websites		Completed
Activity 1.5 M&E plan created		Completed
Activity 1.6 Regular DPLUS reports (half yearly/yearly)		Completed
<b>Output 2.</b> New environmental baselines understood and created by the synthesis of local and scientific knowledge surveys conducted	2.1 At least 20 data sets synthesised to inform current knowledge and informs further data collection. 2.2 1 literature review conducted and database increasing current baseline knowledge. 2.3 20 Inshore zooplankton/ichthyoplankton surveys conducted to augment the role of nearshore offshore connectivity. 2.4 10 inshore loligo egg survey conducted on eastern coasts to determine the spatial (bathymetric)	2.1 More than 20 data sets were synthesized to inform current knowledge and inform further data collection. These data can be found on the <a href="#">IMS-GIS/FIG data portal</a> . Indicator is appropriate.  2.2 A literature review was conducted, based on the datasets collated in 2.1, and this literature review is published in <a href="#">Advances in Marine Biology</a> . Indicator is appropriate.  2.3 More than 20 inshore zooplankton and ichthyofauna surveys have been conducted. A PhD student is currently working up the data. A report on preliminary results is available on the <a href="#">project website</a> . Indicator is appropriate.  2.4 More than 10 Loligo egg surveys were conducted to inform on the spatial (bathymetric) extent of Loligo spawning grounds. A report detailing the results is available on the <a href="#">project website</a> . Indicator is appropriate.

Project summary	Measurable Indicators	Progress and Achievements for the life of the project
	extent of Loligo spawning areas. This is key to fisheries management as the range (geographical and bathymetric) are not fully understood.	
Activity 2.1. Desk top review establish current knowledge and informs further data collection.		Completed
Activity 2.2. Review report and metadata catalogue delivered to Project partners		Completed
Activity 2.3 Inshore zooplankton/ichthyoplankton surveys undertaken		Completed
Activity 2.4 Inshore Loligo survey conducted using ROV		Completed
<b>Output 3.</b> Understanding Physiological tolerances and acclimation responses of FI foundation species with current and projected rates of climate change	3.1 7 key species capacity to cope with and acclimatise to the current and projected rates of climate change assessed experimentally at a FI aquaculture facility allowing an understanding of 'winners' and 'losers' to environmental change.	3.1 More than 7 species were investigated for their capacity to cope with and acclimatise to ocean warming in a FI aquaculture facility. A <a href="#">report</a> on the physiology methodology and results is available on the project website. Indicator is appropriate.
Activity 3.1 Specimens collected and species capacity to cope and acclimatise to projected rates of change ascertained		Completed
Activity 3.2 Results capture in a report and circulated to PMG and then stakeholders. Report re-focused for a scientific journal.		Completed
<b>Output 4.</b> An Ecosystem Model for the FI shelf developed in collaboration with local and international expertise	4.1 A workshop with local and international experts (ecologists and modellers) will create a framework for the first ecosystem model for FI. 4.2 PM in collaboration with partners build Ecosystem model in software Ecopath with Ecosim	4.1 A workshop was held in Oregon, US, building upon local and international expertise on the Falklands marine environment, to create an ecosystem model for the Falkland Islands. A <a href="#">workshop report</a> is available on the project website. Indicator is appropriate.  4.2 The PM collaborated with partners to build an ecosystem model, using the Ecopath with Ecosim platform. A <a href="#">report</a> on the model is available on the project website. Indicator is appropriate.

Project summary	Measurable Indicators	Progress and Achievements for the life of the project
	<p>enhancing understanding of ecosystem function.</p> <p>4.3 Develop the model to examine ecosystem effects of fishing, impacts of environmental change with data produced in WPK1&amp;2 creating a tool to inform fisheries management.</p> <p>4.4 Training package created and 3 training seminars given to partners and scientists within FID and SAERI. Training video with worked example created building capacity in the FI and other OTs.</p>	<p>4.3 The ecosystem model was used to examine the effects of fishing and environmental change on the marine food web, providing a decision support tool to inform fisheries management. The report detailing the initial results is the same report as per Indicator 4.2. Indicator is appropriate.</p> <p>4.4 A training seminar was delivered online where the Ecopath with Ecosim platform was introduced and linked to a training course. Further information was shared with seminar participants to direct them to existing materials on training courses. The seminar was attended by people from different OTs. Indicator is appropriate.</p>
Activity 4.1 Host workshop in FI to create a framework for ecosystem model		Completed
Activity 4.2 Partners and PM build ecosystem model in relevant modelling environment (e.g. Ecopath with Ecosim)		Completed
Activity 4.3 PM and partners use model to examine the ecosystem effects of fishing, impacts of environmental change		Completed
Activity 4.4 Training package created and seminars given to partners and scientists in DNR		Completed
<p><b>Output 5.</b> EAF framework agreed by partners and stakeholders. CCA and EAF proposals submitted to FIG to inform decisions on whether to mainstream CCA and EAF into sustainable fisheries, conservation of marine ecosystems, governance and policy</p>	<p>5.1 Conduct best practice review for EAF and explore gaps that may impede adoption in FI.</p> <p>5.2 Review CCA principles and actions in fisheries Governance globally with a focus on small island nations.</p> <p>5.3 Conduct workshop in FI to a) present best practice review for EAF b) explore options from gap</p>	<p>5.1 An EAF review was conducted and many attributes required for EAF are already present, suggesting that stating EAF is implemented would be more a formality. The <a href="#">EAF review</a> and <a href="#">non-technical summary</a> are available on the project website. Indicator is appropriate.</p> <p>5.2 A review of CCA principles was conducted, and many actions available in literature are focused on small tropical island nations with different challenges than in the Falkland Islands. The link between EAF and CCA was incorporated in the report from Indicator 5.1. Indicator is appropriate.</p>

Project summary	Measurable Indicators	Progress and Achievements for the life of the project
	<p>analyses for improvement c) explore potential management/policy interventions to mitigate CC on fisheries and ocean management e) CCA and EAF recommendations submitted to FIG for consideration.</p> <p>5.4 Submit EAF proposals to FIG's Fisheries Committee.</p> <p>5.5 Submit EAF and CCA proposals to relevant FIG Directorates for consideration.</p>	<p>5.3 A workshop was conducted to discuss the results of the EAF and CCA reviews and explore options for EAF implementation. A <a href="#">workshop report</a> is available on the project website, as are the <a href="#">two presentations</a>. Indicator is appropriate.</p> <p>5.4 A fisheries paper was submitted to the FIGs fisheries committee. This paper is available here. indicator is appropriate.</p> <p>5.5 Proposals are ready to share with relevant FIG Directorates for consideration</p>
Activity 5.1 Conduct EAF best practice review and explore gaps that may impede adoption in FI		Completed
Activity 5.2 Review CCA principles and actions in fisheries governance with an emphasis on small Island nations		Completed
Activity 5.3 Conduct 2 <sup>nd</sup> workshop in FI to present a) best practice review, b) explore options from gap analyses for improvement c) explore management/policy interventions to mitigate CC on fisheries and ocean management e) CCA and EAF submitted to FIG for consideration		Completed
Activity 5.4 Submit EAF and CCA proposals to FIG's Fisheries Committee		Completed
Activity 5.5 Submit EAF and CCA proposals to relevant FIG Directorates for consideration		Completed

# Annex 3 Standard Indicators

▪ **Table 1 Project Standard Indicators**


<b>DPLUS Indicator number</b>	<b>Name of indicator using original wording</b>	<b>Name of Indicator after adjusting wording to align with DPLUS Standard Indicators</b>	<b>Units</b>	<b>Disaggregation</b>	<b>Year 1 Total</b>	<b>Year 2 Total</b>	<b>Year 3 Total</b>	<b>Total to date</b>	<b>Total planned during the project</b>
E.g. DPLUS-A01	E.g. People who attended training on CBD Reporting Standards	E.g. Number of officials from national Department of Environment who attended training on CBD Reporting Standards	People	Men	20			20	60
E.g. DPLUS-C17	E.g. Articles published by members of the project team	E.g. Number of unique papers published in peer reviewed journals	Number	None	1			1	4



**Table 2      Publications**

<b>Title</b>	<b>Type</b> (e.g. journals, manual, CDs)	<b>Detail</b> (authors, year)	<b>Gender of Lead Author</b>	<b>Nationality of Lead Author</b>	<b>Publishers</b> (name, city)	<b>Available from</b> (e.g. weblink or publisher if not available online)
The Falkland Islands marine ecosystem: A review of the seasonal dynamics and trophic interactions across the food web	Journal	2023 Jesse Van der Grient Simon Morley Alexander Arkhipkin James Bates Alastair Baylis Paul Brewin Michael Harte , J. Wilson White Paul Brickle	Female	Dutch	Elsevier	Advances in Marine Biology <a href="https://www.sciencedirect.com/science/article/abs/pii/S0065288123000019">https://www.sciencedirect.com/science/article/abs/pii/S0065288123000019</a>

# Annex 5 Supplementary material (optional but encouraged as evidence of project achievement)



## ECOSYSTEM MODELLING WITH ECOPATH WITH ECOSIM: AN INTRODUCTION


The Falkland Islands, similar to other small island nations, depend on their marine environment to support their economy, making them susceptible to environmental changes like climate change. Marine Ecosystems are complex, with interconnected components and dependencies, and Fisheries are part of this. Ecosystem management is challenging, but ecosystem models like Ecopath with Ecosim can help understand and manage ecosystems holistically.

This talk will provide an introduction into ecosystem modelling, demonstrating what goes into design and building such a model, showing that even in data-limited environments such models can be useful, and highlighting the many applications this platform has for the management of the marine environment. Whilst this is an introductory session, the talk will also offer additional details for those keen on pursuing in-depth courses in this area.

**DATE**  
26 March 2024

**TIME**  
11am - 12pm FKST

**LOCATION**  
Locally held at Falkland College or online via Teams link. Register interest and get your teams link with Jesse at [jvandergrint@saeri.ac.fk](mailto:jvandergrint@saeri.ac.fk).



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## Checklist for submission

	Check
<b>Is the report less than 10MB?</b> If so, please email to <a href="mailto:BCF-Reports@niras.com">BCF-Reports@niras.com</a> putting the project number in the Subject line.	X
<b>Is your report more than 10MB?</b> If so, please discuss with <a href="mailto:BCF-Reports@niras.com">BCF-Reports@niras.com</a> about the best way to deliver the report, putting the project number in the Subject line.	X
If you are submitting photos for publicity purposes, <b>do these meet the outlined requirements (see section 10)?</b>	X
<b>Have you included means of verification?</b> You should not submit every project document, but the main outputs and a selection of the others would strengthen the report.	X
<b>Do you have hard copies of material you need to submit with the report?</b> 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.	X
If you are submitting photos for publicity purposes, do these meet the outlined requirements (see section 13)?	X
Have you involved your partners in preparation of the report and named the main contributors	X
Have you completed the Project Expenditure table fully?	X
Do not include claim forms or other communications with this report.	