Darwin Plus:
Overseas Territories Environment and Climate Fund
Annual 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: 30th April 2023

Submit to: BCF-Reports@niras.com including your project ref in the subject line

Darwin Plus Project Information

Project reference	DPLUS166
Project title	Improving identification of fish bycatch in the Antarctic krill fishery
Territory(ies)	British Antarctic Territory and South Georgia and The South Sandwich Islands
Lead Partner	BAS-British Antarctic Survey
Project partner(s)	Newcastle University, Scottish Association for Marine Science, MRAG, Government of South Georgia and the South Sandwich Islands,
Darwin Plus grant value	£308,263
Start/end dates of project	01/11/2022 to 16/06/2025
Reporting period (e.g. Apr 2022-Mar 2023) and number (e.g. Annual Report 1, 2)	Annual Report Year 1
Project Leader name	Philip Hollyman
Project website/blog/social media	https://www.bas.ac.uk/project/fish-by-catch-in-the-antarctic-krill-fishery/
Report author(s) and date	Philip Hollyman, Lorena Romero Martinez, Martin Collins (BAS), William Goodall-Copestake (SAMS), William Reid (NCU), Susan Gregory (GSGSSI)

1.   Project summary

Fish bycatch is a global problem requiring accurate information to develop conservation and management strategies. Within the Antarctic krill fishery, fish and larval fish are regularly observed as bycatch. Improved understanding of where, when and which fish are caught is essential. This project will develop enhanced identification material for scientists on board fishing vessels and refine our knowledge of fish species distributions at different life stages. It will translate into improved fisheries management for the benefit of BAT and GSGSSI.

The territories covered in this project are in Area 48 of the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), where krill is actively fished over three sub-areas (48.1 to 48.3) extending from the Antarctic Peninsula and South Shetland Islands (48.1), South Orkney Islands in the Southern Scotia Sea (48.2) and South Georgia in the Northern Scotia Sea (48.3).

2.   Project stakeholders/partners

Through DPLUS166 we have engaged with our key stakeholders and partners, GSGSSI, BAS, MRAG, Newcastle and SAMS. The first 5 months of the project have been successful, both in terms of the work undertaken to date, and the development of working relationships between the project partners. During the recruitment process for the project PDRA (Dr Lorena Romero Martinez), representatives from two of the partners were able to sit on the interview panel, with several other partners consulted on the final shortlist for interview. In the first month of the project (29th of November) we had a project kick-off meeting, with representatives from all of the partners (and GSGSSI) travelling to BAS to discuss the initial steps of the work. This was a good opportunity for all team members to discuss the project in detail. Since this initial meeting, LRM has travelled to spend time developing several of the different outputs at both Newcastle University (Dr Will Reid) and SAMS (Dr Will Goodall-Copestake).

Upon completion, this annual report will be shared with our main stakeholders GSGSSI and BAT to ensure they are fully briefed on the progress of the project.

3.   Project progress

The project has only been running for 5 months and it is developing well. The progress on the project is in line with the log frame, approaching completion of Output 1 and advancing progress towards Output 2 and 3.

3.1   Progress in carrying out project Activities

The ichthyological records held at BAS were extensively scanned using key terms such as *fish, larvae, myctophid*. A total of 271 samples make up the fish and larval fish collections available at BAS. Of these, 94 samples are stored in ethanol or Formaldehyde, 82 samples stored at -80 ˚C, 92 stored at -20 ˚C and 3 stored at 4 ˚C (Activities 1.1-1.1.1)

The morphological identification of the available fish material is ongoing. Thus far 26 samples have been analysed. A total of 21,095 fish and larval fish have been identified to the lowest taxonomic level. The information is currently summarised into a catalogue that will be made available once all the samples have been checked and specimens morphologically identified.

For the genetic identification of available fish material, 126 specimens have already been sub-sample for tissue and fin-clips for a total of 42 species thus far. DNA extraction is currently in progress (Activities 1.1.3-1.1.6).

Alongside the molecular work, the bioinformatic design of species-specific primers is ongoing. We aim to design and test 70 primer sets for the amplification of COX1, NDS and control regions and the barcoding of 1000 samples. By June 2023 the first set of primers will be used for the amplification of COX1 gene for 22 species (Activity 1.1.2).

Photographic material is continuously produced in parallel to the morphologically identification of species from the archived material. Photographs will be used for the development of enhanced identification guides, outline all life history stages from egg (whenever possible) to larvae, juvenile and adult (1.2.4).

Lastly, we are waiting for the newly collected fish and larval samples for the 2022-2023 season, due to arrive in July 2023 (Activities 1.2-1-1.2.8).

For Output 2 (Activities 2.1-2.1.5), a list of the most common by-catch species was compiled to be used as a baseline for the systematic search of the existing literature. To facilitate data collation, a database was developed detailing biological and ecological traits that cover habitat, development, and reproduction. We have clear biological and ecological definitions of the traits we are collecting which means we are collating information in a consistent manner and will allow for transparency when we publish these results. The information is summarised into a master database that is shared among the collaborators, and a weekly working session is held for progressing towards completion of this output (Activities 2.1.1-2.1.4).

3.2 Progress towards project Outputs

Output 1 is developing well with the progress towards the activities outlined above. The BAS sample archive has been searched for all specimens that are available to this project, which have now been catalogued. This includes a large number of fish collected directly from the krill fishery in previous seasons, from all three CCAMLR sub-areas of interest (48.1, 48.2 & 48.3). Samples collected from the 2022 fishery season have also recently been collated at King Edward Point Station, South Georgia, and shipped back to the UK (arrival June 2023). Work has begun on the molecular analysis of the samples in Cambridge, with the initial primer design stage well underway. This output is progressing on time and is likely to be fully completed by the end 2024.

Work has started towards output 2, with information being collected from the literature regarding the life history parameters of fish bycatch species. This effort is being led by Dr Reid at Newcastle, in collaboration with Dr Romero Martinez who have weekly working meetings via zoom. As this work progresses there will be additional input from other partners to develop the literature searching effort into a peer-reviewed publication.

3.3 Progress towards the project Outcome

There has been good progress towards the overall project outcome 'Improved understanding of where, when and which fish are caught as bycatch in the krill fisheries, translating into improved species monitoring practice for the benefit of SGSSI and BAT'. With the cataloguing and analysis (morphological and molecular) of krill bycatch samples and larval fish samples currently in Cambridge, coupled with the collection of more samples from the 2022 and upcoming 2023 fishery seasons ensuring the best possible coverage of bycatch species. This will be enhanced with the development of outcome 2, which will improve our understanding fish life history strategies and how these may change across the Atlantic sector of the southern ocean. As the project develops over the next year, commercial fishery data will be analysed to look spatial and temporal trends in bycatch species, and improved ID guides for fishery observers will be developed (outcomes 3 and 4 respectively).

3.4 Monitoring of assumptions

Assumption 1 (Output 1): New samples successfully shipped to UK in good enough condition for integrative taxonomy.

Comments: So far, all the samples we have received in BAS Cambridge from the krill fishery have been of sufficient quality to undertake molecular and morphological analysis. This has been enhanced with the use of fish specimens collected during a western core box survey at South Georgia which have all been stored at -80°C, enhancing their preservation.

Assumption 2 (Output 2): Sufficient baseline information is available for collation.

Comments: We are over half way into collating life history data for bycatch species. We are finding considerable information on a number of species but there are other species where little information is available. We are generating key information about timings of key biological traits but with the research mainly focussed around research stations, there is less fisheries-independent information in areas where krill fishing occurs. This in itself is a really important finding. As this output develops we will need to account for this when assessing the collated information, by possibly adjusting the focus of the review to be more broadly applicable.

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

As this project has only been running for 5-months we have had little opportunity to undertake work that will support environmental outcomes outlined in our original application. Over the following 2 years as data is produced, we will start to address this.

5. Gender equality and social inclusion

BAS are committed to equality, diversity and inclusion see (https://www.bas.ac.uk/jobs/working-for-bas/our-cultural-values-equality-and-diversity/) and aims to embrace diversity in all its forms and provide staff with a sense of belonging regardless of their characteristics, culture, experience, education or economic background.

Please quantify the proportion of women on the Project Board[1].	33%
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[2].	25%

6. Monitoring and evaluation

Regular meetings held between the PL and collaborators, as well as weekly meetings between the PL and the PDRA help to monitor the progress and assess risks to ensure these are managed proactively.

Visits by the PDRA to the collaborators' institutions for training and advance ongoing activities have helped to progress towards completion of output 1 and progression of output 2.

7. Lessons learnt

As the project is only 5-months in and so far, is running to plan, there have only been minor issues for us to learn from. Namely, delays in procurement that can lead to issues with end-of-year finances. Last financial year the project was significantly underspent on a budget line relating to molecular costs. This was due to a protracted discussion between BAS procurement and the supplier regarding the best approach to complete the transaction which ran past the end of the financial year. This will not affect the outputs of the project as there are sufficient funds in the same budget line in this financial year, and the issue has now been resolved.

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

Not applicable

9. Risk Management

As the project is only 5-months in and so far, is running to plan, we have not yet encountered any risks above those identified in the original application. We will be vigilant of any risks that do arise and detail them at the next reporting round.

10. Other comments on progress not covered elsewhere

There was a delay to the start of the project due to a delay in the recruitment of Dr Romero Martinez. A change request was submitted to move the salary costs for the first month of the project (October 2022) to the end of the project, extending to the end of April 2025.

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[1] 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.

[2] 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.

11. Sustainability and legacy

There has been good engagement with GSGSSI during the development of this project with two representative attending the initial project kick off meeting in November 2022. There will also be an invited talk about the project at the upcoming South Georgia & the South Sandwich Islands Marine Protected Area (MPA) Science Symposium. Work from the project will also be presented at the upcoming Fishery Society of the British Isles (FSBI) conference in July 2023.

As the project develops several legacy outputs will be developed, including peer reviewed and grey literature, as well as improved identification guides for fishery observers.

12. Darwin Plus identity

As the project has only been running for 5 months there have not yet been any opportunities to publicise the project. There are two symposium presentations over the next 6 months (see section 11), at which we will ensure the Darwin logo is visible on all presentation materials.

13. Safeguarding

Has your Safeguarding Policy been updated in the past 12 months?	Yes
Have any concerns been investigated in the past 12 months	No
Does your project have a Safeguarding focal point?	*Yes we have a safeguarding lead across BAS*
Has the focal point attended any formal training in the last 12 months?	*Yes the lead has attended a formal training session on her role and responsibilities as safeguarding lead*
What proportion (and number) of project staff have received formal training on Safeguarding?	Past: 50% [and number] Planned: 100% [and number]
Has there been any lessons learnt or challenges on Safeguarding in the past 12 months? Please ensure no sensitive data is included within responses. *The most challenging part has been to engage staff who had an inaccurate idea of what safeguarding was and who affected. We do not employ staff working with children, however many of our staff live and work in isolated environments and under challenging conditions. These make them more vulnerable than others.*	
Does the project have any developments or activities planned around Safeguarding in the coming 12 months? If so please specify. *More training across all BAS personnel is planned this year.*	

14. Project expenditure

Table 1: Project expenditure <u>during the reporting period</u> (1 April 2022 – 31 March 2023)

Project spend (indicative) in this financial year	2022/23 D+ Grant (£)	2022/23 Total actual D+ Costs (£)	Variance %	Comments (please explain significant variances)
Staff costs				
Consultancy costs				
Overhead Costs				
Travel and subsistence				
Operating Costs				
Capital items				
Others (Please specify)				

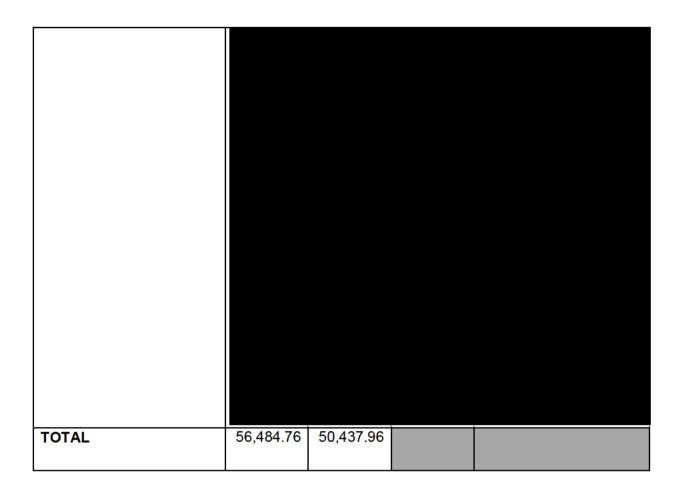|				
	██████████████████████████			
TOTAL	56,484.76	50,437.96		

Table 2: Project mobilising of matched funding during the reporting period (1 April 2022 – 31 March 2023)

	Matched funding secured to date	Total matched funding expected by end of project
Matched funding leveraged by the partners to deliver the project.	████████████████████	
Total additional finance mobilised by new activities building on evidence, best practices and project (£)		

15. OPTIONAL: Outstanding achievements or progress of your project so far (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).

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

Annex 1: Report of progress and achievements against logframe for Financial Year 2022-2023 – if applicable

Project summary	SMART Indicators	Progress and Achievements April 2022 - March 2023	Actions required/planned for next period
Impact The ecosystem-based management and conservation of biodiversity within SGSSI and BAT waters is enhanced by an improvement in the precision of reporting of Antarctic krill fishery bycatch.			
Outcome Improved understanding of where, when and which fish are caught as bycatch in the krill fisheries, translating into improved species monitoring practice for the benefit of SGSSI and BAT	0.1 Baseline assessment of fish bycatch in the krill fishery occurring in SGSSI and BAT waters completed by October 2024 0.2 Fisheries observers better informed on bycatch identification by March 2025	A comprehensive catalogue of the ichthyological records for fish and larvae held at BAS Cambridge was compiled. This forms the basis of the morphological analysis of by-catch fish species that will be used to produce enhance identification guides for the fisheries observers. A photographic library has already been started and is continuously expanded in parallel with the identification of selected samples. A list of by-catch species was compiled, drawing from published literature pertaining the krill fishery; this forms the baseline for working towards completing outputs 1 and 2.	Complete the morphological analysis of the 271 samples of fish and larval fish compile in the catalogue. Put together a draft for the identification guides using the photographic library of fish and larval fish. Develop graphical material showcasing the results of the project to be use in scientific reports and outreach events. Complete the DNA extraction and barcoding of samples collected in 2022, 2023 and suitable samples from the BAS archives.
Output 1. Identification of which life history stages of which fish species are present in SGSSI and BAT waters and potentially caught by the krill fishery	1.1 Genetically underpinned taxonomic designations available for all fish life history stages stored in BAS archives for specimens collected in GSGSSI and BAT waters by July 2023 1.2 Genetically underpinned taxonomic designations available for newly acquired samples collected by	Thus far, samples collected by the fishery observers in 2022 have already been sub-sampled for tissue and fin-clips, making a total of 126 samples for DNA extraction covering 42 species from the list of by-catch species. DNA extraction is ongoing but aiming to genetically underpinned taxonomic identification of 2022 and 2023 samples by winter 2023.	

Project summary	SMART Indicators	Progress and Achievements April 2022 - March 2023	Actions required/planned for next period
	observers in the krill fishery by October 2024 1.3 Resource archives are established to ensure post-project longevity of collected materials and data by December 2024 1.4 Data generated submitted to publicly accessible databases by December 2024	The design of species-specific primers for barcoding sequencing has already started and by June 2023, we aimed to test the first COX1 primers on 22 species. To progress towards completion of Output 1, the work will be focused on primer design for all the targeted mitochondrial genes, and the start of the bioinformatic analysis of sequencing data.	
1.1 Collation and cataloguing of all currently archived fish and larval fish samples held at BAS		Completed collation and cataloguing of samples held at BAS, the catalogued will be made available once all samples have been checked and identified.	NA
1.1.1 Training of PDRA in morphological identification of available fish material		Training completed in November 2022, but support is always available if needed.	NA
1.1.2 Development of mitochondrial DNA genetic identification toolbox for fish bycatch species		Ongoing, the first species-specific primers will be tested in June 2023	Complete the design of primers for Control region, NDS and ITS mitochondrial genes
1.1.3 DNA extraction from tissue sub-samples		Ongoing, but all samples from 2022 have already been sub-sample for DNA extraction	Sub-sample for tissue and fin-clips samples from 2023. Complete DNA extractions for 2022 and 2023 samples and selected samples from BAS archives
1.2 Collection of new fish and larval fish samples by observers within the krill fishery		Completed and awaiting arrival of material to BAS Cambridge for processing and sub-sampling	NA
1.2.1 Collation and cataloguing of all newly collected fish samples from the krill fishery		Awaiting samples arrival	Samples will be collaged upon arrives at BAS Cambridge in June 2023.
1.2.2 All unidentified specimens identified to the finest taxonomic level		Ongoing	

Project summary	SMART Indicators	Progress and Achievements April 2022 - March 2023	Actions required/planned for next period
1.2.4 Photographs of all available specimens from 1.1 and 1.2	Ongoing		The photographic library will be completed once the 2023 samples arrive and are processed.
Output 2. Baseline information assembled for fish life history stages caught as bycatch during krill fishery operations.	2.1 Baseline information on life history stages of 20 fish species caught in GSGSSI and BAT waters established via a systematic review, completed by September 2023.		
2.1.1 Define objectives and write protocol for systematic review	Completed. Following a meeting with the collaborators. The objectives were defined and a search protocol for the collation of published literature was defined.	NA	
2.1.2 Search for scientific papers using a series of bibliographic databases	Ongoing, the work was split among collaborators and a list of key search terms has been compiled for thoroughly searching bibliographic databases	Ongoing	
2.1.3 Collate relevant scientific papers and read	Ongoing, collaborators are actively working on searching bibliographic databases and collating a catalogued of relevant scientific papers	We aim to collate and read all the selected papers by July 2023.	
2.1.4 Extract information on larval hatching timings, larval duration, growth rates and spatial distribution of larvae and juvenile fish and create database to store data	Ongoing, collaborators are actively working on extracting the information from publish literature, collating all information into a shared data matrix	We aim to structure a written draft of the review using the shared data matrix by September 2023.	

Project Summary	SMART Indicators	Means of Verification	Important Assumptions
Impact: The ecosystem-based management and conservation of biodiversity within SGSSI and BAT waters is enhanced by an improvement in the precision of reporting of Antarctic krill fishery bycatch. (Max 30 words)			
Outcome: (Max 30 words) Improved understanding of where, when and which fish are caught as bycatch in the krill fisheries, translating into improved species monitoring practice for the benefit of SGSSI and BAT	0.1 Baseline assessment of fish bycatch in the krill fishery occurring in SGSSI and BAT waters completed by October 2024 0.2 Fisheries observers better informed on bycatch identification by March 2025	0.1 Results fed to GBAT/GSGSSI for annual stakeholder meeting review 0.1.1 Results communicated to GSGSSI and GBAT via CCAMLR working group papers and Darwin Plus reports 0.1.2 Results undergo peer review as part of scientific publication process 0.2 Implementation of new fish bycatch identification materials by MRAG, which will be used by fisheries observers in BAT and SGSSI waters	**Data generated at an appropriate resolution to understand spatial and temporal as well as species level differences for bycatch to allow for informed management** As data are collected on a haul-by-haul basis within the fishery, we don't anticipate this will be a large issue.
Outputs: 1. Identification of which life history stages of which fish species are present in SGSSI and BAT waters and potentially caught by the krill fishery	1.1 Genetically underpinned taxonomic designations available for all fish life history stages stored in BAS archives for specimens collected in GSGSSI and BAT waters by July 2023 1.2 Genetically underpinned taxonomic designations available for newly acquired samples collected by observers in the krill fishery by October 2024 1.3 Resource archives are established to ensure post-project longevity of collected materials and data by December 2024 1.4 Data generated submitted to publicly accessible databases by December 2024	1.1, 1.2 and 1.3 Database of metadata and morphological data lodged in BAS Polar Data Centre for samples that have been identified to species 1.1, 1.2 and 1.3 Physical DNA bank established for successfully extracted DNA samples 1.1, 1.2 and 1.3 Database of DNA sequences established for all successfully sequenced samples 1.1 and 1.2 Submitted working group paper containing details on the diversity of finfish bycatch to CCAMLR working group in September 2024 (WG-FSA) 1.4 Species abundances submitted to GBIF 1.4 DNA sequence data submitted to GenBank 1.4 All specimen images and metadata submitted to the Polar Data Centre	**New samples successfully shipped to UK in good enough condition for integrative taxonomy.** There are several options available for sample preservation including conventional freezing, blast freezing and ethanol. We are confident that with the breadth of sample collection options and preservation methods we will obtain enough samples in good condition.

2. Baseline information assembled for fish life history stages caught as bycatch during krill fishery operations.	2.1 Baseline information on life history stages of 20 fish species caught in GSGSSI and BAT waters established via a systematic review, completed by September 2023.	2.1 Submitted working group paper containing the results of the systematic review to GSGSSI and CCAMLR working groups in June and September 2024	**Sufficient baseline information is available for collation.** This relies on the depth of the existing literature. As studies of fish ecology in this region have been conducted for several decades we anticipate that sufficient data should exist, if not for all species, then at least for the most abundant bycatch species.
3. Statistical analysis of CCAMLR bycatch and BAS larval and juvenile fish data and assessment of overlap between fish life history stages and krill fishing operations	3.1 Location characteristics and fisheries operational variables assessed to understand fish bycatch and abundance in space and time from CCAMLR and BAS data, completed by August 2024. 3.2 Statistical analysis results and archived and current samples integrated into baseline information and assessment made of life history stage overlap with the krill fisheries that indicates risk of capture, completed by September 2024.	3.1 Submitted working group paper containing the results of statistical analysis to GSGSSI and CCAMLR working groups in September 2024 or June 2025. 3.2 Submitted open access peer reviewed scientific paper (by March 2025)	**Bycatch data is released by CCAMLR after a data request.** Should any CCAMLR member state refuse to release its data, we will simply run the same analysis with a reduced data set (CCAMLR will still release the data of all countries that do agree). As vessels tend to all operate in similar areas we don't anticipate any issues with this.
4. Updated species identification materials for fisheries observers, vessel operators and other end users	4.1 Morphological and genetics results from output 1 used to update identification materials prior to MRAG observer training in 2025	4.1 Identification materials freely available via the Polar Data Centre 4.1.1 Submitted working group paper containing details of the identification materials submitted to CCAMLR working group in June 2025 (WG-EMM)	**Genetic analysis has successfully improved species assignments in the original (morphology only) identification materials.** We are aware of several instances where morphological identification is extremely difficult, and where previous molecular work has revealed incorrect species assignments. Accordingly, we believe the molecular work proposed in output 1 will successfully improve species assignments.
5. Training event for identification materials end users	5.1 All krill observers employed by MRAG ahead of fishing activities in 2025 trained to use updated identification materials in March 2025.	5.1 Training attendance list compiled by MRAG 5.2 Checklist of learning outcomes completed by krill observers 5.3 Training summary report completed by June 2025.	**All observers will be able to attend training sessions given international travel restrictions due to the COVID-19 pandemic.**

			Should travel to MRAG be unfeasible, the training will be moved to a virtual format

Activities (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)

1.1 Collation and cataloguing of all currently archived fish and larval fish samples held at BAS by Dr Hollyman, Prof. Collins and the PDRA.

1.1.1 Training of PDRA in morphological identification of available fish material by Dr Hollyman and Prof. Collins.

1.1.2 Development of mitochondrial DNA genetic identification toolbox for fish bycatch species by Dr Goodall-Copestake with training for PDRA.

1.1.3 DNA extraction from tissue sub-samples by PDRA and Dr Goodall-Copestake also providing training as required.

1.1.4 Amplification, cleaning, sequencing and quality editing of mitochondrial DNA by PDRA and Dr Goodall-Copestake (providing training as required).

1.1.5 DNA sequence database cross referencing and species assignment by PDRA and Dr Goodall-Copestake (providing training as required).

1.1.6 Collation of sample morphological and meta- data, formatting and submission for archiving in the Polar Data Centre by PDRA, Dr Hollyman, Dr Goodall-Copestake.

1.2 Collection of new fish and larval fish samples by observers within the krill fishery, observers to be briefed via MRAG.

1.2.1 Collation and cataloguing of all newly collected fish samples from the krill fishery by PDRA and KEP Biologist.

1.2.2 All unidentified specimens identified to the finest taxonomic level by Dr Hollyman and the PDRA.

1.2.3 Trialling of double staining using alcian blue and alizarin red as a tool to aid identification by PDRA and Dr Hollyman.

1.2.4 Photographs of all available specimens from 1.1 and 1.2 will be taken for activity 4.1 by PDRA and Dr Hollyman.

1.2.5 DNA extraction of samples by PDRA and Dr Goodall-Copestake.

1.2.6 Mitochondrial DNA amplification-cleaning-sequencing-editing by PDRA and Dr Goodall-Copestake.

1.2.7 DNA sequence database cross referencing and species assignment by PDRA and Dr Goodall-Copestake.

1.2.8 Collation of sample images (from 1.2.4), morphological and meta- data, formatting and submission for archiving in the Polar Data Centre by PDRA, Dr Hollyman, Dr Whitelaw and Dr Goodall-Copestake.

1.3 Samples used in activities 1.1.4 and 1.2.6 will be archived to produce a DNA bank by PDRA and Dr Goodall-Copestake.

1.4 Genetic data and metadata formatted for Genbank, and species identification and metadata formatted for GBIF by PDRA and Dr Goodall-Copestake.

1.4.1 Genetic data submitted to Genbank by PDRA and Dr Goodall-Copestake.

1.4.2 Species distribution data submitted to GBIF by PDRA and Dr Hollyman.

1.4.3 Submission of data collated in 1.2.8 submitted to the Polar Data Centre by Dr Whitelaw and the PDRA

1.5 Paper on fish bycatch diversity prepared for CCAMLR working groups by Dr Hollyman, Dr Goodall-Copestake, Prof. Collins and PDRA.

1.5.1 Papers submitted to and presented at WG-EMM (Y3) and WG-FSA (Y3) by Dr Hollyman.

2.1 Systematic review of all available literature (grey and peer-reviewed) focussed on early life history stages of known bycatch species within the krill fishery in order to make a baseline assessment of information by Dr Reid, Dr Hollyman and PDRA.

2.1.1 Define objectives and write protocol for systematic review by Dr Reid, Dr Hollyman and PDRA.

2.1.2 Search for scientific papers using a series of bibliographic databases by PDRA.

2.1.3 Collate relevant scientific papers and read by Dr Reid, Dr Hollyman and PDRA.

2.1.4 Extract information on larval hatching timings, larval duration, growth rates and spatial distribution of larvae and juvenile fish and create database to store data by Dr Reid, Dr Hollyman and PDRA.

2.1.5 Write review for CCAMLR working group (WG-FSA) by Dr Reid, Dr Hollyman and PDRA.

3.1 Statistical modelling of fish bycatch and fish larval data from CCAMLR and BAS archives by Dr Reid, Dr Hollyman and PDRA

3.1.1 Request fish bycatch and associated metadata data from CCAMLR by Dr Hollyman.

3.1.2 Extract fish larval and juvenile data from BAS databases by Dr Phil Hollyman and PDRA.

3.1.3 Undertake spatial and temporal modelling of CCAMLR fish bycatch data and BAS larval and juvenile data in association with other key variables including sea surface temperature, fishing depth, seafloor depth, season, time of day and catch location by Dr Reid.

3.1.4 Write CCAMLR working group paper Dr Reid, Dr Hollyman, Dr Young, Mr Chapman and PDRA.

3.2 Integrate data generated during Output 1 into the systematic review database generated during activity 2.1 by PDRA.

3.2.1 Use results of modelling exercise and systematic review to assess overlap of timings and life history stage of fish with krill fisheries operation to understand which species are at risk of being caught, when and at what stage by Dr Reid, Dr Hollyman, Prof. Collins and MRAG.

3.2.2 Write peer reviewed publication, Dr Reid assisted by all other team members.

4.1 Production of identification materials for fisheries observers. PDRA, assisted by all other team members

4.1.1 Visual identification aids developed by synthesising the information generated from all previous activities. These identification materials will cover the various early life history stages of each available fish, the location and month when fish may be found and subtleties of distinguishing between similar species that are often confused. PDRA, assisted by all other team members.

4.2 Paper summarising newly developed identification materials prepared for CCAMLR working groups by PDRA assisted by all investigators.

4.2.1 Papers submitted to and presented at WG-FSA (Y3) by PDRA and Dr Hollyman.

5.1 Deliver training on newly developed identification guides to observers at annual pre-season observer training at MRAG London. by Dr Young, Mr Chapman and Dr Hollyman

5.1.1 Production of training summary report by MRAG.

Annex 3: Standard Indicators

No standard indicators have yet been achieved during the initial few months of this project. As the project develops we will work on indicators relating to improvement of understanding biodiversity (e.g. DPLUS-C07, DPLUS-C08), development of reference collections and publically available databases (e.g. DPLUS-C09, DPLUS-C16) and the production of peer reviewed and grey literature papers (e.g. DPLUS-C17, DPLUS-C18, DPLUS-C19).

Table 1   Project Standard Indicators

DPLUS Indicator number	Name of indicator using original wording	Name of Indicator after adjusting wording to align with DPLUS Standard Indicators	Units	Disaggregation	Year 1 Total	Year 2 Total	Year 3 Total	Total to date	Total planned during the project
DPLUS-C09	1.3 Resource archives are established to ensure post-project longevity of collected materials and data.	Species reference collections made	Number				2	0	2
DPLUS-C16	1.4 Data generated submitted to publicly accessible databases by December 2024	Number of records added to accessible databases	Number						This will be dependent on the results of output 1.
DPLUS-C17	3.1 Location characteristics and fisheries operational variables assessed to understand fish bycatch and abundance in space and time from CCAMLR and BAS data	Number of unique papers submitted to peer reviewed journals	Number				2	0	2
DPLUS-C08	3.2 Statistical analysis results and archived and current samples integrated into baseline information and assessment made of life history stage overlap with the krill fisheries that indicates risk of capture,	Areas of importance for biodiversity identified	Number						This will be dependent on the results of output 3.
DPLUS-C19	4.1 Morphological and genetics results from output 1 used to update identification materials	Number of other publications produced	Number				1	0	1

Table 2   Publications

Title	Type (e.g. journals, manual, CDs)	Detail (authors, year)	Gender of Lead Author	Nationality of Lead Author	Publishers (name, city)	Available from (e.g. weblink or publisher if not available online)

Annex 4: Onwards – supplementary material (optional but encouraged as evidence of project achievement)

Checklist for submission

	Check
Different reporting templates have different questions, and it is important you use the correct one. Have you checked you have used the **correct template** (checking fund, type of report (i.e. Annual or Final), and year) and **deleted the blue guidance text** before submission?	X
Is the report less than 10MB? If so, please email to BCF-Reports@niras.com putting the project number in the Subject line.	Yes
Is your report more than 10MB? If so, please discuss with BCF-Reports@niras.com about the best way to deliver the report, putting the project number in the Subject line.	No
Have you included means of verification? You should not submit every project document, but the main outputs and a selection of the others would strengthen the report.	Yes
Do you have hard copies of material you need to submit with the report? If so, please make this clear in the covering email and ensure all material is marked with the project number. However, we would expect that most material will now be electronic.	n/a
If you are submitting photos for publicity purposes, do these meet the outlined requirements (see section 15)?	n/a
Have you involved your partners in preparation of the report and named the main contributors	Yes
Have you completed the Project Expenditure table fully?	Yes
Do not include claim forms or other communications with this report.	