

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	DPLUS179
Project title	Characterising pelagic biodiversity at South Georgia through novel sampling methods
Territory(ies)	South Georgia and the South Sandwich Islands
Lead Partner	British Antarctic Survey
Project partner(s)	Government of South Georgia and the South Sandwich Islands (GSGSSI) and Marine Biological Association (MBA)
Darwin Plus grant value	£336,538
Start/end dates of project	1 st October 2022 to 31 st August 2025
Reporting period (e.g. Apr 2022-Mar 2023) and number (e.g. Annual Report 1, 2)	October 2022 to March 2023, Annual Report 1
Project Leader name	Cecilia Liszka
Project website/blog/social media	https://www.bas.ac.uk/project/south-georgia-pelagic-biodiversity/
Report author(s) and date	Cecilia Liszka 27/04/2023

1. Project summary

The zooplankton community of South Georgia is a critical component of the Scotia Sea ecosystem, connecting primary producers, supporting globally important populations of higher predators, and sustaining valuable commercial fisheries. Zooplankton and ichthyoplankton are also key bioindicators of environmental change since they are small, have short life-cycles and respond rapidly to environmental changes. Establishing a pelagic biodiversity baseline at South Georgia is crucial to assess the stability of this system and its response to climate-related changes and species invasions. Whilst routine sampling of the plankton is regularly carried out, analysis is currently limited to a small range of taxa such as euphausiids, fish and *Themisto* spp. Detailed monitoring of a wider range of taxa, particularly the extremely abundant copepods, is vital if we are to understand and monitor changes to the ecosystem. However, achieving this through net sampling alone is costly and time-consuming, and it can miss important fractions of the plankton community, particularly gelatinous taxa that can be easily damaged in net retrievals.

Through this project, funded through Darwin Plus, and in partnership with the Government of South Georgia and South Sandwich Islands (GSGSSI) and the Marine Biological Association (MBA) we will address this by employing novel image-based and molecular analyses, validated

by conventional net sampling. We will analyse historically-collected zooplankton samples both microscopically and optically to construct a baseline and collect reference samples to improve the image classification algorithm. In the field, we will concurrently deploy zooplankton nets, a UVP6 optical profiler, GoFlo bottles to collect water for molecular analysis, and a CTD to collect contextual environmental data. Data generated by all three approaches will be used to develop indices of plankton biodiversity, enabling comparisons of the methods and their applications in understanding and monitoring zooplankton and ichthyoplankton communities.

Results will also feed into the management of the South Georgia and South Sandwich Islands Marine Protected Area (SGSSI MPA) by developing methods that enable the future collection and analysis of key zooplankton and ichthyoplankton biodiversity data, and metrics that will allow the monitoring of under-sampled and invasive taxa.

2. Project stakeholders/partners

British Antarctic Survey (BAS) is the lead partner in the project. Other key partners in the project are the Government of South Georgia and South Sandwich Islands (GSGSSI) and the Marine Biological Association (MBA). These partnerships were developed due to the roles and expertise of the respective partners, and their shared interest in the value of effective plankton monitoring delivered by the project in terms of conservation, management and methodological developments. Whilst BAS took the lead in project development, all partners were involved in the project design and planning. GSGSSI was key to ensuring that the project plan met the objectives of the conservation and management of the OT, that it can feed into the Research and Monitoring Plan, and that it can be logistically supported. The MBA were key to developing a robust method of analysing and verifying the data the project will obtain from the optical and molecular methods and adding to the project through their expertise in zooplankton taxonomy. Project partners are kept involved with project progress by email and meetings. The next full project team meeting which will be instrumental to planning the fieldwork and sample analysis is planned for Wednesday 17th May.

3. Project progress

3.1 Progress in carrying out project Activities

The key activity during this reporting period has been the recruitment of the PDRA who will be working full-time on the project (**Activity 1.1**). The recruitment activity was begun in October 2022 and was complete by December 2022 (end Y1Q3) with the acceptance of the preferred candidate, Dr Victoria Fowler (Vicky). Vicky could only start in April 2023 so a change request (CR2) was made to approve this and transfer the related salary costs from Y1 to Y2. Vicky started officially on the project on Monday 3rd April 2023 and has already made excellent progress in getting the project underway. This includes progress towards **Activity 2.2** by cataloguing the historical net samples already held at BAS and starting to analyse them for taxonomic composition using the ZooScan.

Good progress has also been made on other key activities. The optical profiler (UVP6) and protective frame for the zooplankton imaging work have both been purchased. The frame has been received (**Fig. 1a**) and the UVP6 is in transit with an expected arrival date of 2nd May 2023 (**Activity 1.2**). The GoFlo bottles for eDNA sampling, and miniBongo for the smaller zooplankton fraction have also been provided as matched funding by BAS (**Fig. 1b & c, Activity 1.2**). Over the next 2 months they will be tested and sent down to the OT by the end of Y2Q1 in time for fieldwork to begin.

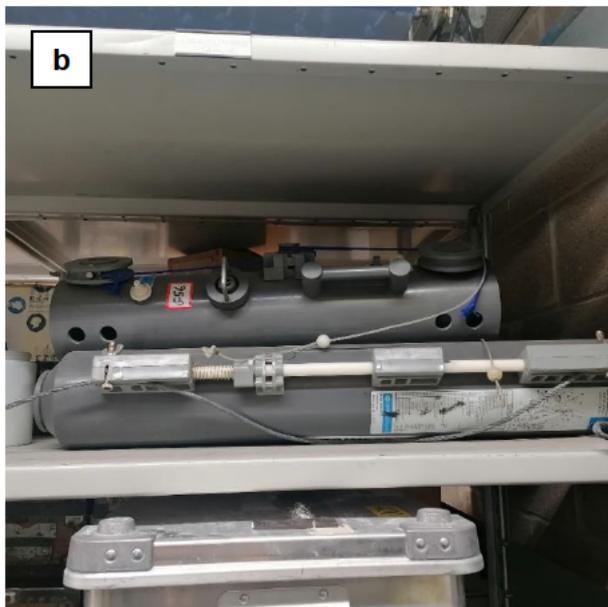


Figure 1: panel a (top) – frame for optical profiler, b (bottom left) – GoFlo bottles, c (bottom right) – miniBongo net with 100 um mesh net.

The remainder (Activities 1.3-1.4; 2.1-2.4; 3.1-3.3; 4.1-4.3; and 5.1-5.3) occur later in the project so will be reported more fully in future reports.

3.2 Progress towards project Outputs

Output 1: Capacity created for improved sensitivity and cost-effectiveness of zooplankton biodiversity monitoring at SG

Good progress has been made on this output through the recruitment of the PDRA who is working full-time on the project, the acquisition of the key pieces of equipment that will be used for the fieldwork, in planning for the fieldwork, and in starting work on the historical zooplankton samples.

Output 2: Acquisition of data on lower trophic level biodiversity and distribution, including zooplankton, ichthyoplankton and non-native taxa or parasites

Scanning of historical samples using a benchtop imager has been started and this will continue. Selected samples will also be analysed microscopically. Further progress on this output will continue once the fieldwork has started.

Output 3: New zooplankton and ichthyoplankton data and bioindicator assessment tools developed for direct application to monitoring and management

Progress on this output will be made as data from the historical and newly collected samples are acquired and methodologies are developed in line with this.

Output 4: Updates to GSGSSI monitoring and management activities to improve consideration of zooplankton and ichthyoplankton biodiversity and community composition as bioindicators (e.g. differences in species dominance) and to incorporate invasive or non-native species monitoring

Progress on this output will start in June 2023 with input into the MPA 5 Year Review process and continue by working closely with GSGSSI on feeding results into their research and monitoring activities.

Output 5: Publication and dissemination of results

Progress on this output will occur towards the end of the project as results become available and prepared for publication.

3.3 Progress towards the project Outcome

Outcome: Improved effectiveness of MPA management via development of technical and analytical tools for comprehensive zooplankton biodiversity and non-native species monitoring through three synergistic methods, and input into GSGSSI management activities.

Although the project has only recently started, good progress has been made on key indicators that are critical to the success of the project and to the completion of the remaining activities. This includes recruiting the PDRA who will take the lead on field and laboratory work, and acquiring the equipment that will be used in the data and sample acquisition. We have maintained good communication with GSGSSI throughout the development and inception of the project so far to ensure that the project is aligned with MPA management. We believe that the indicators we have are still adequate for measuring our achievement of the project outcome, and that we are on course to meet this by the end of the funding period.

3.4 Monitoring of assumptions

1.1 Recruitment process runs to schedule

Comment: This has completed and the PDRA is in post.

1.2 Manufacturer and shipping of equipment not held up by Covid-19 or other delays

Comment: The optical profiler and frame have been purchased. The profiler is in transit and expected to arrive on 2nd May 2023 and the frame has been received. The peristaltic pump, GoFlo bottles and miniBongo supplied through matched funding have also been provided. Other consumables and equipment necessary for fieldwork to begin have been purchased and received.

2.1 Bad weather or other logistical issues not disrupting the usual sampling regime

Comment: We will monitor and respond to this as necessary as we approach the start of fieldwork and as it progresses.

2.2 Data are provided on time by contractors and samples are effectively preserved and backed up at KEP and shipped back to Cambridge without issue

Comment: This will occur as the project progresses and we will monitor it accordingly. A number of external hard drives have been purchased to enable image data to be stored and backed up and can be returned in batches to Cambridge. Discussions are underway to

3.1 Data quality and quantity sufficient to be able to carry out adequate analyses in a timely manner

Comment: This will occur as the project progresses and we will monitor it accordingly.

4.1 Dependency on GSGSSI for updates to be made to relevant documents

Comment: This will occur towards the end of the project.

4.2 Next 5 Year review process is in 2023 so engagement and/or submissions will likely be based on interim data or initial findings

Comment: We are in communication with GSGSSI who are leading the review process to identify opportunities to engage with it. GSGSSI are holding a MPA Review Workshop in June 2023 and we have a slot to present our project and any initial results at this workshop. We will use this workshop to identify additional opportunities to feed results into the process following this.

5.1 Publication of peer-reviewed papers is likely to occur after the end of the project due to the time constraints of the review process

Comment: This will occur towards the end of the project. Whilst publication is likely to occur after the end of the project, we will aim to prepare and submit manuscripts before the end of the project.

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

The main ways in which the project has so far contributed to supporting the OT in their environmental/climate outcomes are i) through the progress we have made in preparing for the fieldwork that will start later this year and ii) by starting to analyse historical zooplankton samples from South Georgia waters. In respect of the first point, the PI has liaised closely with BAS Operations to prepare for the fieldwork, and flights and berths are reserved for the PI and PDRA to get the fieldwork underway in July 2023. The purchase of the optical profiler by the project will also provide the OT with ongoing capability for faster, lower cost and carbon monitoring zooplankton and ichthyoplankton beyond the scope of this project. In respect of the second point, this is the first step to building a detailed zooplankton baseline that will enable the OT to continue to monitor changes to biodiversity in the future, and to delivering their management and conservation strategies. We plan to build on this baseline with the new samples and data that we obtain from the fieldwork element.

5. Gender equality and social inclusion

Equality, diversity and inclusion (EDI) in all its forms is a core consideration in our project. As the lead partner, BAS has engrained EDI in its cultural values and is part of a community of international polar organisations, national science bodies and leading employer organisations working together to make Polar science more diverse and inclusive. BAS has also been a member of the Athena Swan Charter since 2014 and is proud to hold an Athena Swan Bronze Award.

The BAS project team has a good gender split, with 4 female team members and 3 male team members, all of whom represent diversity in terms of career stage. The science staff that assist the project at KEP have been recruited by BAS, in line with its policy on being an equal opportunities employer and embracing diversity and represent a 50:50 gender split. When recruiting for the PDRA we advertised the project across a range of professional and social media networks to attract a diverse range of applicants which was successful.

Please quantify the proportion of women on the Project Board ¹ .	60%
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 .	66%

6. Monitoring and evaluation

Monitoring and evaluation is carried out with direct reference to the log frame, checking the progress of each of the activities and indicators against the timeframe indicated in the implementation plan. This is led by the PI with input from other project members as required. So far this approach has worked well and has kept the project moving. In addition, staff from REDS (Research & Development Support) at BAS and Ops have helped to ensure that the project is planning fieldwork appropriately and is on track with the necessary permits and operational support. The financial management is carried out both by the PI and the BAS Finance team, for whom the key contact point is Abby Lawrence. Day to day financial management is carried out by the PI who monitors spend against the budget and requests expenditure reports from Finance periodically. Finance are responsible for checking that spend and claims are in line with what was forecast, and helping to manage the remaining budget.

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.

7. Lessons learnt

The main points of learning are the importance of good planning and contingencies. In general, judged against our implementation plan and logframe, the project has gone well so far this year. The project is on track with most activities and is preparing well for the coming fieldwork. However, there have been some delays which have had to be managed in order to keep the project on track. First of these was a delay to the recruitment timeline which was a result of staff changeover in HR and insufficient handover. This affected the advertisement of the post on the planned networks. The project team managed this by raising the issue with appropriate staff, extending the recruitment window and agreeing a new plan for promotion of the post. This was successful and resulted in a large number of excellent applicants, of which five were interviewed and all were deemed highly capable, resulting in our first choice candidate accepting the position. This delay ultimately didn't impact our project as contingency had been built into the timeline, however it did highlight the importance of clear communication and good planning.

Contingency for field preparations was also considered at the planning stage by building in time for unexpected logistical issues, which meant that we were able to accept the candidate starting a little later than planned, and good communication with Darwin Plus resulted in the related budget being transferred to the next FY.

We are currently facing a slight delay to receiving the UVP6 which we had been expecting at the start of April 2023. This has been held up due to Customs and is now expected on 2nd May 2023. We had been aware of the risk of this occurring and it was highlighted as one of our contingencies in our log frame. All other equipment and consumables have been received, so as long as we receive the UVP6 shortly we will still be able to meet our objectives of testing and sending it south in time for fieldwork. To manage this risk we have been in close and regular contact with the supplier, and are progressing other preparations in the meantime so that when it arrives we can focus on preparing it for the field.

Building on the learning from these points, we will continue to build contingencies into our planning and maintain communication throughout the project to minimise risks and manage them appropriately.

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

N/A – this is the first report.

9. Risk Management

Please see risk register.

10. Other comments on progress not covered elsewhere

N/A.

11. Sustainability and legacy

The project has only recently started so the main activities have been preparation for the fieldwork. However, since the full-time PDRA has started in her role the capacity of the project has been greatly increased and has made good progress on sample cataloguing and analysis. Preparations for the field data collection are well underway and close communications with the project partner in the OT (GSGSSI) have been maintained. The project is still on course to achieve what was originally proposed. We plan to ensure a legacy is left by providing the capacity (through equipment, training and knowledge) to continue future sampling, and by providing a zooplankton data baseline against which future changes can be monitored.

12. Darwin Plus identity

The Darwin Plus logo is prominently placed on our project website where they are also acknowledged as being the project funder: <https://www.bas.ac.uk/project/south-georgia-pelagic-biodiversity/>

Although there is no resident population in the OT, there is good familiarity of Darwin Plus within the Government of South Georgia and the South Sandwich Islands and the project is well-known to be funded by Darwin Plus.

The project is still in an early phase so other publicity/outreach materials or publications have not yet been produced. However, there are some talks and articles planned over the next few months and both funding acknowledgement and the Darwin Plus logo will be included on these.

The new Darwin Plus communications guidelines have been saved and any future social media activity will use the new BCF tags.

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?	<i>Yes we have a safeguarding lead across BAS</i>
Has the focal point attended any formal training in the last 12 months?	<i>Yes the lead has attended a formal training session on her role and responsibilities as safeguarding lead</i>
What proportion (and number) of project staff have received formal training on Safeguarding?	<i>25% of our total staff have been trained. They are primarily staff living and working on a research vessel. More training is planned this year.</i>
Has there been any lessons learnt or challenges on Safeguarding in the past 12 months? Please ensure no sensitive data is included within responses.	<i>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.</i>
Does the project have any developments or activities planned around Safeguarding in the coming 12 months? If so please specify.	<i>More training across all BAS personnel is planned this year.</i>

14. Project expenditure

Table 1: Project expenditure during the reporting period (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	17,115.28	16,785.79		

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).

Our project has already made good progress towards achieving our objective of creating a zooplankton biodiversity baseline for South Georgia, through three different yet complementary methods. We have purchased an optical profiler (UVP6) to enable us to obtain zooplankton image data alongside the taxonomic data we will obtain from traditional net samples. We are also well-equipped to collect eDNA material from the water column as an additional method of characterising the diversity of the pelagic environment. Plans are well underway for our upcoming fieldwork, and we have also made good headway on cataloguing and analysing historical zooplankton samples.

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
<p>Impact</p> <p>Improved management and climate change resilience of the SG MPA through improved technological and institutional capacity to monitor the SG pelagic community, and improved cost- and carbon-efficiency of biodiversity monitoring</p>		<p>In progress – recruitment is complete, analysis has begun, and planning for main fieldwork component is underway.</p>	
<p>Outcome Improved effectiveness of MPA management via development of technical and analytical tools for comprehensive zooplankton biodiversity and non-native species monitoring through three synergistic methods, and input into GSGSSI management activities.</p>	<p>0.1 Development of technical and analytical capacity to deploy novel optical and molecular sampling equipment by end Y3Q2</p> <p>0.2 First zooplankton and ichthyoplankton biodiversity baseline produced by end Y4Q1</p> <p>0.3 Development of molecular methodology by which to detect invasive, non-native or unknown species by end Y4Q1</p> <p>0.4 Update of management plans as required to take account of new information and methodologies by end Y4Q2</p>	<p>0.1 In progress. Equipment has been/is being acquired and fieldwork planning is well underway.</p> <p>0.2 In progress. Historical samples are in the process of being analysed and plans are well underway for the collection of new data.</p> <p>0.3 In progress. Methodological decisions have been made and consumables purchased. The methodology will be written before fieldwork starts and will be refined as it progresses.</p> <p>0.4 Will occur later in the project.</p>	<p>0.1 Test and calibrate instruments, send south, train staff on station, refine methods, and start sampling.</p> <p>0.2 Start collecting data during fieldwork.</p> <p>0.3 Write and test collection methodology and refine as necessary. Extraction and amplification methodology aspects will occur later in the project.</p> <p>0.4 Present project at MPA Review Workshop and subsequent engagement.</p>
<p>Output 1. Capacity created for improved sensitivity and cost-effectiveness of zooplankton biodiversity monitoring at SG</p>	<p>1.1 Recruitment of PDRA by end of Y1Q3</p> <p>1.2 Optical profiler, protective sampling frame, miniBongo net and GoFlo bottles for eDNA sampling purchased and sent to the OT by end of Y2Q1</p> <p>1.3 Mounting and testing of deployment of profiler and</p>	<p>1.1 Complete - the PDRA has been recruited and started in post.</p> <p>1.2 Almost complete – equipment has either been received already or is in transit to BAS (see section 3.1). It will be sent to the OT in time for fieldwork once testing is complete.</p> <p>1.3 Will take place during fieldwork.</p> <p>1.4 Will take place during fieldwork.</p>	

Project summary	SMART Indicators	Progress and Achievements April 2022 - March 2023	Actions required/planned for next period
	sampling bottles on the <i>Pharos SG</i> by end of Y2Q2 1.4 Science staff trained on use and deployment of the optical profiler and the collection and storage of samples obtained from net-based, optical and eDNA methods by end of Y2Q2		
Activity 1.1 Recruitment of PDRA by end of Y1Q3		Complete.	
Activity 1.2 Optical profiler, protective sampling frame, miniBongo net and GoFlo bottles for eDNA sampling purchased and sent to the OT by end of Y2Q1		In progress. All purchased; optical profiler in transit; all else received,	To be sent to OT in June 2023.
Activity 1.3 Mounting and testing of deployment of profiler and sampling bottles on the <i>Pharos SG</i> by end of Y2Q2			To start in July 2023.
Activity 1.4 Science staff trained on use and deployment of the optical profiler and the collection and storage of samples obtained from net-based, optical and eDNA methods by end of Y2Q2			To start in July 2023.
Output 2. Acquisition of data on lower trophic level biodiversity and distribution, including zooplankton, ichthyoplankton and non-native taxa or parasites	2.1 Successful participation in routine monitoring patrols on <i>Pharos SG</i> at 4-6 weekly intervals to collect a full year of samples by the end of Y3Q2 2.2 Taxonomic identification and quantification of historical and newly collected net samples, using light-microscopy and bench-top image analysis by end of Y3Q3 2.3 Classification and verification of images obtained with the optical profiler by end Y3Q4 2.4 Extraction, amplification and sequencing of eDNA metabarcodes from filtered water samples by end Y3Q4	Fieldwork is due to begin in July 2023 to collect net samples, eDNA material and image data. Taxonomic identification with bench-top image analysis has started on the historical samples and will continue throughout the coming year. Selected samples will also be analysed microscopically.	

Project summary	SMART Indicators	Progress and Achievements April 2022 - March 2023	Actions required/planned for next period
Activity 2.1. Participation in routine monitoring patrols on Pharos SG at 4-6 weekly intervals to collect a full year of samples by the end of Y3Q2		Plans have been made for fieldwork including applying for the relevant permits, liaising with Ops and purchasing equipment and consumables.	Embark on fieldwork, start collecting data, monitor data collection processes and refine methods and training as required.
Activity 2.2. Taxonomic identification and quantification of historical and newly collected net samples, using light-microscopy and bench-top image analysis by end of Y3Q3		In progress. Cataloguing and scanning of historical samples has begun.	Continue cataloguing and analysing historical samples, start analysing newly collected samples as they are available. Establish plan for transporting new samples back to the UK.
Activity 2.3. Classification and taxonomic analysis of images obtained with the optical profiler by end Y3Q4			Start collecting, storing and backing up data, start classifying images and establishing methods for analysis of image data.
Activity 2.4. Extraction, amplification and sequencing of eDNA metabarcodes from at the same sampling opportunities and comparison against published databases by end Y3Q4		This will occur later in the project.	This will occur later in the project.
Output 3. New zooplankton and ichthyoplankton data and bioindicator assessment tools developed for direct application to monitoring and management	3.1 Baseline zooplankton and ichthyoplankton biodiversity data (e.g. lowest taxonomic name, abundance, diversity, size-spectra) from the three methods (optical, net-based and molecular) cross-checked, calibrated and submitted to the UK Polar Data Centre (UK PDC) and the GSGSSI Data Portal (DPLUS069) by end Y4Q1 3.2 Development and refinement of novel optical methodology that can augment current net based monitoring capabilities by end Y4Q1 3.3 Development and refinement of eDNA methodology as 'early	This hasn't started yet as the project is in early stages.	

Project summary	SMART Indicators	Progress and Achievements April 2022 - March 2023	Actions required/planned for next period
	warning' system to detect non-native species and poorly sampled or other hitherto unknown species including fish eggs, by end Y4Q1		
Activity 3.1. Baseline zooplankton and ichthyoplankton biodiversity data (e.g. lowest taxonomic name, abundance, diversity, size-spectra) from the three methods (optical, net-based and molecular) cross-checked, calibrated and submitted to the UK Polar Data Centre (UK PDC) and the GSGSSI Data Portal (DPLUS069) by end Y4Q1		To occur later in the project.	To occur later in the project.
Activity 3.2. Development and refinement of novel optical methodology that can augment current net based monitoring capabilities by end Y4Q1			To start in May 2023.
Activity 3.3. Development and refinement of eDNA methodology as 'early warning' system to detect non-native species and poorly sampled or other hitherto unknown species including fish eggs, by end Y4Q1			To start in Y3.
Output 4. Updates to SGSSI monitoring and management activities to improve consideration of zooplankton and ichthyoplankton biodiversity and community composition as bioindicators (e.g. differences in species dominance) and to incorporate invasive or non-native species monitoring	<p>4.1 SGSSI MPA Research and Monitoring Plan (RMP) (Theme 2 specifically and others e.g. Themes 6 and 8 as appropriate) updated to incorporate ongoing plankton monitoring as a research need, and be reflected in relevant projects/ activities by end Y4Q2</p> <p>4.2 Engagement with 2023 MPA 5 Year Review assessment by end Y2Q3</p> <p>4.3 Contribute to GSGSSI priority activities on biosecurity and non-native species monitoring in partnership with SAERI by end Y4Q2</p>	This hasn't started yet as the project is in early stages.	
Activity 4.1. SGSSI MPA Research and Monitoring Plan (RMP) (Theme 2 specifically and others e.g. Themes 6 and 8 as appropriate) updated to incorporate ongoing plankton monitoring as a research need, and be reflected in relevant projects/ activities by end Y4Q2		In progress. Abstract submitted to GSGSSI MPA Review Workshop for June 2023.	Engagement to continue throughout project.

Project summary	SMART Indicators	Progress and Achievements April 2022 - March 2023	Actions required/planned for next period
Activity 4.2. Engagement with 2023 MPA 5 Year Review assessment by end Y2Q3		In progress. Abstract submitted to GSGSSI MPA Review Workshop for June 2023.	Presentation to be given to MPA Review Workshop in June 2023.
Activity 4.3. Contribute to GSGSSI priority activities on biosecurity and non-native species monitoring in partnership with SAERI by end Y4Q2			To start in Y4.
Output 5. Publication and dissemination of results	5.1 Preparation of paper(s) for publication in peer-reviewed journals: submission by end of Y4Q2; publication within 1 year of project completion 5.2 Accession of all data to image libraries, OA databases and the BAS PDC by end of Y4Q2 5.3 Workshop held to share outputs and learnings with partners, stakeholders e.g. CCAMLR, SAERI, other OTs and wider networks e.g. SCAR ANTOS (Antarctic Near-shore and Terrestrial Observation System) Working Groups, as appropriate at end of Y4Q2	This hasn't started yet as the project is in early stages.	
Activity 5.1. Preparation of papers for publication in peer-reviewed journals: submission by end of Y4Q2; publication within 1 year of project completion			To start later in the project.
Activity 5.2. Accession of all data to image libraries, OA databases and the BAS PDC by end of Y4Q2			To start later in the project.
Activity 5.3. Workshop held to share outputs and learnings with partners, relevant stakeholders e.g. Dissemination of results at relevant GSGSSI and CCAMLR, other OTs meetings, and wider networks e.g. SCAR ANTOS (Antarctic Near-shore and Terrestrial Observation System) Working Groups, as appropriate at end of Y4Q2			To happen at end of project.

Annex 2: Project’s full current logframe as presented in the application form (unless changes have been agreed)

Project Summary	SMART Indicators	Means of Verification	Important Assumptions
<p>Impact: Improved management and climate change resilience of the SG MPA through improved technological and institutional capacity to monitor the SG pelagic community, and improved cost- and carbon-efficiency of biodiversity monitoring</p> <p>(Max 30 words) 30 words</p>			
<p>Outcome: (Max 30 words) 30 words</p> <p>Improved effectiveness of MPA management via development of technical and analytical tools for comprehensive zooplankton biodiversity and non-native species monitoring through three synergistic methods, and input into GSGSSI management activities.</p>	<p>0.1 Development of technical and analytical capacity to deploy novel optical and molecular sampling equipment by end Y3Q2</p> <p>0.2 First zooplankton and ichthyoplankton biodiversity baseline produced by end Y4Q1</p> <p>0.3 Development of molecular methodology by which to detect invasive, non-native or unknown species by end Y4Q1</p> <p>0.4 Update of management plans as required to take account of new information and methodologies by end Y4Q2</p>	<p>0.1 New optical and molecular equipment, and training on use of equipment, provided to scientists and staff at KEP, GSGSSI and <i>Pharos SG</i></p> <p>0.2 Baseline data provided on plankton abundance, diversity, size-spectra and distribution provided to GSGSSI</p> <p>0.3 Method statement produced and shared with GSGSSI and stakeholders</p> <p>0.4 South Georgia Research and Monitoring Plan updated with new projects/activities and published on GSGSSI website</p>	
<p>Outputs: 1. Capacity created for improved sensitivity and cost-effectiveness of zooplankton biodiversity monitoring at SG</p>	<p>1.5 Recruitment of PDRA by end of Y1Q3</p> <p>1.6 Optical profiler, protective sampling frame, miniBongo net and GoFlo bottles for eDNA sampling purchased and sent to the OT by end of Y2Q1</p> <p>1.7 Mounting and testing of deployment of profiler and sampling bottles on the <i>Pharos SG</i> by end of Y2Q2</p> <p>1.8 Science staff trained on use and deployment of the optical profiler and the collection and storage of samples obtained from net-based, optical and eDNA methods by end of Y2Q2</p>	<p>1.1 PDRA in post and on payroll at BAS</p> <p>1.2 Audit trail, photographic documentation and equipment confirmed as received by BAS/ GSGSSI office in Stanley, Falkland Islands (FI)</p> <p>1.3 Photographic evidence and written protocols for installation, setup and deployment of equipment produced</p> <p>1.4 Production of training logs, successful trial deployments of equipment and written method statements</p>	<p>1.3 Recruitment process runs to schedule</p> <p>1.4 Manufacturer and shipping of equipment not held up by Covid-19 or other delays</p>

<p>2. Acquisition of data on lower trophic level biodiversity and distribution, including zooplankton, ichthyoplankton and non-native taxa or parasites</p>	<p>2.5 Successful participation in routine monitoring patrols on <i>Pharos SG</i> at 4-6 weekly intervals to collect a full year of samples by the end of Y3Q2</p> <p>2.6 Taxonomic identification and quantification of historical and newly collected net samples, using light-microscopy and bench-top image analysis by end of Y3Q3</p> <p>2.7 Classification and verification of images obtained with the optical profiler by end Y3Q4</p> <p>2.8 Extraction, amplification and sequencing of eDNA metabarcodes from filtered water samples by end Y3Q4</p>	<p>2.1 Samples acquired and catalogued, and reported to project lead at the end of every patrol</p> <p>2.2 Quality controlled microscopy data received by BAS from MBA and successful acquisition of images backed up on hard drives and shipped to BAS upon completion of surveys</p> <p>2.3 Dataset of classified images saved in EcoTaxa software for further analysis</p> <p>2.4 Successful acquisition and filtering of water samples for eDNA, and sequenced data received back from external contractor.</p>	<p>2.1 Bad weather or other logistical issues not disrupting the usual sampling regime</p> <p>2.2 Data are provided on time by contractors and samples are effectively preserved and backed up at KEP and shipped back to Cambridge without issue</p>
<p>3. New zooplankton and ichthyoplankton data and bioindicator assessment tools developed for direct application to monitoring and management</p>	<p>3.4 Baseline zooplankton and ichthyoplankton biodiversity data (e.g. lowest taxonomic name, abundance, diversity, size-spectra) from the three methods (optical, net-based and molecular) cross-checked, calibrated and submitted to the UK Polar Data Centre (UK PDC) and the GSGSSI Data Portal (DPLUS069) by end Y4Q1</p> <p>3.5 Development and refinement of novel optical methodology that can augment current net based monitoring capabilities by end Y4Q1</p> <p>3.6 Development and refinement of eDNA methodology as 'early warning' system to detect non-native species and poorly sampled or other hitherto unknown species including fish eggs, by end Y4Q1</p>	<p>3.1 Baseline data archived under embargo with BAS PDC and GSGSSI Data Portal</p> <p>3.2 Image analysis protocol developed and made available to GSGSSI staff, KEP scientists, <i>Pharos SG</i> crew</p> <p>3.3 Molecular analysis protocol developed and made available to GSGSSI staff, KEP scientists, <i>Pharos SG</i> crew</p>	<p>3.1 Data quality and quantity sufficient to be able to carry out adequate analyses in a timely manner</p>
<p>4. Updates to SGSSI monitoring and management activities to improve consideration of zooplankton and</p>	<p>4.4 SGSSI MPA Research and Monitoring Plan (RMP) (Theme 2 specifically and others e.g. Themes</p>	<p>4.1 Updated RMP document published on GSGSSI website</p>	<p>4.1 Dependency on GSGSSI for updates to be made to relevant documents</p>

<p>ichthyoplankton biodiversity and community composition as bioindicators (e.g. differences in species dominance) and to incorporate invasive or non-native species monitoring</p>	<p>6 and 8 as appropriate) updated to incorporate ongoing plankton monitoring as a research need, and be reflected in relevant projects/ activities by end Y4Q2</p> <p>4.5 Engagement with 2023 MPA 5 Year Review assessment by end Y2Q3</p> <p>4.6 Contribute to GSGSSI priority activities on biosecurity and non-native species monitoring in partnership with SAERI by end Y4Q2</p>	<p>4.2 Participation in 2023 MPA 5 Year Review process by attendance at relevant meetings/ workshops and submission of interim findings where appropriate</p> <p>4.3 Engagement via meetings and/or workshops with GSGSSI and SAERI on biosecurity and non-native species mitigation activities</p>	<p>4.2 Next 5 Year review process is in 2023 so engagement and/or submissions will likely be based on interim data or initial findings.</p>
<p>5. Publication and dissemination of results</p>	<p>5.4 Preparation of paper(s) for publication in peer-reviewed journals: submission by end of Y4Q2; publication within 1 year of project completion</p> <p>5.5 Accession of all data to image libraries, OA databases and the BAS PDC by end of Y4Q2</p> <p>5.6 Workshop held to share outputs and learnings with partners, stakeholders e.g. CCAMLR, SAERI, other OTs and wider networks e.g. SCAR ANTOS (Antarctic Near-shore and Terrestrial Observation System) Working Groups, as appropriate at end of Y4Q2</p>	<p>5.1 Paper(s) submitted to peer-reviewed journals</p> <p>5.2 Data made available Open Access via EcoTaxa, International Nucleotide Sequence Database Collaboration (INSDC) or other appropriate molecular database, and published with a DOI by the BAS PDC</p> <p>5.3 Report of workshop published on BAS and GSGSSI websites</p>	<p>5.1 Publication of peer-reviewed papers is likely to occur after the end of the project due to the time constraints of the review process</p>

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 Recruitment of PDRA by end of Y1Q3
- 1.2 Optical profiler, protective sampling frame, miniBongo net and GoFlo bottles for eDNA sampling purchased and sent to the OT by end of Y2Q1
- 1.3 Mounting and testing of deployment of profiler and sampling bottles on the Pharos SG by end of Y2Q2
- 1.4 Science staff trained on use and deployment of the optical profiler and the collection and storage of samples obtained from net-based, optical and eDNA methods by end of Y2Q2
- 2.1 Participation in routine monitoring patrols on Pharos SG at 4-6 weekly intervals to collect a full year of samples by the end of Y3Q2
- 2.2 Taxonomic identification and quantification of historical and newly collected net samples, using light-microscopy and bench-top image analysis by end of Y3Q3
- 2.3 Classification and taxonomic analysis of images obtained with the optical profiler by end Y3Q4
- 2.4 Extraction, amplification and sequencing of eDNA metabarcodes from at the same sampling opportunities and comparison against published databases by end Y3Q4
- 3.1 Baseline zooplankton and ichthyoplankton biodiversity data (e.g. lowest taxonomic name, abundance, diversity, size-spectra) from the three methods (optical, net-based and molecular) cross-checked, calibrated and submitted to the UK Polar Data Centre (UK PDC) and the GSGSSI Data Portal (DPLUS069) by end Y4Q1
- 3.2 Development and refinement of novel optical methodology that can augment current net based monitoring capabilities by end Y4Q1
- 3.3 Development and refinement of eDNA methodology as 'early warning' system to detect non-native species and poorly sampled or other hitherto unknown species including fish eggs, by end Y4Q1
- 4.1 SGSSI MPA Research and Monitoring Plan (RMP) (Theme 2 specifically and others e.g. Themes 6 and 8 as appropriate) updated to incorporate ongoing plankton monitoring as a research need, and be reflected in relevant projects/ activities by end Y4Q2
- 4.2 Engagement with 2023 MPA 5 Year Review assessment by end Y2Q3
- 4.3 Contribute to GSGSSI priority activities on biosecurity and non-native species monitoring in partnership with SAERI by end Y4Q2
- 5.1 Preparation of papers for publication in peer-reviewed journals: submission by end of Y4Q2; publication within 1 year of project completion
- 5.2 Accession of all data to image libraries, OA databases and the BAS PDC by end of Y4Q2
- 5.3 Workshop held to share outputs and learnings with partners, relevant stakeholders e.g. Dissemination of results at relevant GSGSSI and CCAMLR, other OTs meetings, and wider networks e.g. SCAR ANTOS (Antarctic Near-shore and Terrestrial Observation System) Working Groups, as appropriate at end of Y4Q2

Annex 3: Standard Indicators

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-A03	Science staff trained on use and deployment of the optical profiler and the collection and storage of samples obtained from net-based, optical and eDNA methods by end of Y2Q2	Number of local/national organisations with improved capability and capacity as a result of project	Number of organisations	Organisation type					2
DPLUS-C01	Development and refinement of novel optical methodology that can augment current net based monitoring capabilities by end Y4Q1 Development and refinement of eDNA methodology as 'early warning' system to detect non-native species and poorly sampled or other hitherto unknown species including fish eggs, by end Y4Q1	Number of best practice guides and knowledge products published and endorsed.	Number	Product typology					2
DPLUS-C03	Preparation of papers for publication in peer-reviewed journals: submission by end of Y4Q2; publication within 1 year of project completion	New assessments of habitat conservation action needs published	Number	Ecosystem					
DPLUS-C02	Baseline zooplankton and ichthyoplankton biodiversity data (e.g. lowest taxonomic name, abundance, diversity, size-spectra) from the three methods (optical, net-based and molecular) cross-checked, calibrated and submitted to the UK Polar Data Centre (UK PDC) and the GSGSSI Data Portal (DPLUS069) by end Y4Q1	Number of new conservation or species stock assessments published.	Number	Taxa					1

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-C05	SGSSI MPA Research and Monitoring Plan (RMP) (Theme 2 specifically and others e.g. Themes 6 and 8 as appropriate) updated to incorporate ongoing plankton monitoring as a research need, and be reflected in relevant projects/ activities by end Y4Q2	Number of projects contributing data, insights, and case studies to national Multilateral Environmental Agreements (MEAs) related reporting processes and calls for evidence.	Number	Information typology					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)

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?	Y
Is the report less than 10MB? If so, please email to BCF-Reports@niras.com putting the project number in the Subject line.	Y
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.	N
Have you included means of verification? You should not submit every project document, but the main outputs and a selection of the others would strengthen the report.	Y
Do you have hard copies of material you need to submit with the report? If so, please make this clear in the covering email and ensure all material is marked with the project number. However, we would expect that most material will now be electronic.	N
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	Y
Have you completed the Project Expenditure table fully?	Y
Do not include claim forms or other communications with this report.	