

Darwin Plus Main: 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 2024

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 2023-Mar 2024) and number (e.g. Annual Report 1, 2)	October 2023 to March 2024, Annual Report 2
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, Victoria Fowler

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, Niskin 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 on 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 have been, and continue to be, key to developing robust methods of analysing and verifying collected data from optical and molecular methods as well as adding to the project through their expertise in zooplankton taxonomy. Project partners are kept involved with project progress through emails and meetings. There have been regular full project team meetings to inform all partners of progress and plan fieldwork and sample analysis. These meetings have taken place on Wednesday 17th May 2023 and Monday 5th February 2024. Future meetings will be scheduled throughout the course of the project.

3. Project progress

3.1 Progress in carrying out project Activities

Within this reporting period a key activity has been the participation in routine monitoring patrols every 4-6 weeks on *Pharos SG* (**Activity 2.1**). The fieldwork began in July 2023 (Y2Q2) with a number of project members participating in this initial sampling campaign. Fieldwork has continued with sampling campaigns taking place on a near monthly basis and regular sampling will take place until June 2024 (Y3Q2), to complete a full year of sampling efforts. During the initial sampling campaign, the testing and deployment of the optical profiler (UVP6), Niskin bottles and zooplankton nets was carried out on the *Pharos SG* (**Activity 1.3**). This was done through liaising with the crew members to refine mounting processes for each piece of equipment, before testing all equipment on the *Pharos SG* at a shakedown station prior to any sampling taking place. Following this testing and in line with DPLUS-C01 a number of best practise guides were created prior to sampling commencing and have been revised throughout the fieldwork. These guides have been shared internally and will be made publicly available towards the end of the project. During this campaign, science staff were trained in the collection and storage of samples through the deployment of fieldwork equipment (**Activity 1.4**) and protocols were written for the deployment of all equipment, and subsequent sample collection and storage. A report detailing the fieldwork carried out in July 2023 and an interim report detailing progress made towards activity 2.1 have been published on the project website (<https://www.bas.ac.uk/project/south-georgia-pelagic-biodiversity/#data>).

Continued progress has also been made towards other key activities. Taxonomic identification of historical samples through light-microscopy and bench top image analysis (**Activity 2.2**) is underway. Six historical samples have been microscopically analysed in full and a further six are in progress. 52 historical samples have been processed through the bench-top imager (ZooScan) ready for analysis. Newly collected samples will be returning to Cambridge in June 2024 and will be analysed using the ZooScan during July and August 2024 (Y3Q2). Data collected using the UVP6 is sent to Cambridge regularly allowing the classification of images to

be ongoing (**Activity 2.3**). Images collected from July to December 2023 have been classified and will be subject to validation process. It is expected that UVP data from January to June 2024 will be classified by the end of 2024 (Y3Q4), in line with the expected activity timeline.

Activities 1.1;1.2 and 4.2 have been completed in line with the timeline set out in the project logframe and have been reported on within previous reports. Discussions have been held with SAERI around our complementary approaches towards invasive species monitoring (**Activity 4.3**).

Activities 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 purchase of fieldwork equipment and the training of science staff at SG in the use and deployment of the optical profiler, zooplankton nets and Niskin bottles. Several staff have now been trained and will be able to continue using the techniques beyond the scope of this project, increasing capacity to carry out similar work. The optical profiler will remain the property of the OT beyond the end of the project, allowing cost effectiveness zooplankton biodiversity monitoring to take place (DPLUS-A03).

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

Fieldwork began in July 2023 and is ongoing with successful participation in monitoring patrols on *Pharos SG*. This is central to the acquisition of net samples, image data and molecular data. Scanning of historical samples using a benchtop imager has been started and this will continue throughout the next year. Selected samples have been analysed microscopically with more samples identified to be analysed microscopically. Image classification of both historical samples and those obtained from the UVP6 has been started and will be continued as data is collected.

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. New samples have been collected during the fieldwork and are in transit to the UK. These will be analysed over the coming year, progressing this output and contributing to DPLUS indicators C01 and C02.

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

Progress has been made towards this output through the PI presenting an update on the project and future plans at the 5 Yearly SGSSI MPA Review Workshop in June 2023 (DPLUS-C05). An article about the Symposium (including a link to the talk on the SG Pelagic Biodiversity project) was posted on the GSGSSI website. This included direct and online engagement with key project stakeholders from the science, NGO and government sectors who were present at the workshop. The project continues to be in regular communication with GSGSSI to feed into their research and monitoring plans.

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 (DPLUS-C03).

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.

The project is making good progress towards all key indicators ensuring the project remains on track to be successful and allow the completion of ongoing and remaining activities. This has mainly been through the ongoing fieldwork being successful in data and sample acquisition, allowing laboratory and data analysis to take place during summer 2024. The development of technical and analytical tools is in progress with protocols having been developed for all fieldwork equipment. These protocols are reviewed regularly, and in the case of the eDNA water filtration methodology, developed further to ensure zooplankton biodiversity monitoring remains practical. 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: This has been completed. The optical profiler and frame were received in May 2023 and were able to be shipped to The Falklands prior to fieldwork starting in July 2023. The peristaltic pump, GoFlo bottles and miniBongo supplied through matched funding were also received ahead prior to fieldwork beginning.

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

Comment: The sampling regime has been carried out every 4-6 weeks since July 2023, with little disruption. There have been some logistical issues including the *Pharos SG* being required to respond to the avian influenza outbreak and going into dry dock during February 2024. This resulted in the *Pharos SG* not being able to carry out any routine monitoring in February. However, these issues were communicated well, and fieldwork was able to resume quickly following these events, resulting in a period of 6 weeks between the January and March 2024 sampling campaigns. While this is the longest period between sampling campaigns the project has experienced, it is still within the planned 4-6 week sampling regime. Sampling is ongoing and we are continuing to monitor and respond to this as necessary.

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 continue to be monitored as the project progresses. A number of external hard drives are in use to back up and store image data and are returned to Cambridge regularly. These hard drives are backed up onto internal systems. Discussions are underway with the Polar Data Centre (PDC) to develop a data pathway for appropriate data management and storage solution for all data collected. Samples, consisting of preserved net catches and filter papers for eDNA extraction, collected during sampling campaigns carried out by the *Pharos SG* to date are currently in transit to Cambridge via the RRS Sir David Attenborough. These are expected to be available for further analysis in June 2024. Samples collected after March 2024 will be freighted back to the UK once the fieldwork has finished and options are currently being discussed with the BAS Stanley Office.

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

Comment: Data analysis will occur as the project progresses and we will monitor it accordingly. Image data collected using the UVP6 has been received in Cambridge regularly and has been backed up internally and on an external image processing site, leading to a large volume of high-quality image data. This data is currently being processed, in preparation for analysis to be carried out over the next year.

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

Comment: While this will become more of a focus towards the end of the project, we are in regular communication with GSGSSI to ensure we are able to feed into relevant documents they are preparing. GSGSSI regularly attend project meetings and provide updates. At our last project team meeting, GSGSSI communicated that they had received appropriate information from the project that would be useful when producing their upcoming outputs from the MPA review. We will continue to work closely with them to provide relevant information as may be required for the update of their MPA and associated Research & Monitoring documents.

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 held a MPA Review Workshop in June 2023 and we presented our project and initial results at this workshop.

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 towards sample and data acquisition, and protocol development during regular sampling regimes and ii) by starting to analyse historical zooplankton samples from South Georgia waters. Throughout the project fieldwork, protocols have been developed and revised. Within this period, protocols have been developed for the deployment of the UVP6, Niskin bottles and zooplankton nets along with the filtration methodology to allow eDNA extraction. The filtration methodology has required revisions due to the original methodology proving to be impractical once on the *Pharos* SG. Working with KEP staff and other colleagues within BAS, alternative equipment was sourced, and a new methodology was developed, resulting in an increase in the volume of water filtered and data collected as well as modifications to the protocol. The development of robust and practical protocols will allow sampling to be continued in a relatively easy and comparable manner beyond the project. Project members are working closely with members of GSGSSI to ensure that the project can contribute to current monitoring and have recently fed into a workshop to develop the next phase of the King Edward Point science plan which is directly relevant to GSGSSI management. 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. The analysis of historic zooplankton samples 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 obtained from the fieldwork element of this project.

5. Gender Equality and Social Inclusion (GESI)

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%

GESI Scale	Description	Put X where you think your project is on the scale
Not yet sensitive	The GESI context may have been considered but the project isn't quite meeting the requirements of a 'sensitive' approach	
Sensitive	The GESI context has been considered and project activities take this into account in their design and implementation. The project addresses basic needs and vulnerabilities of women and marginalised groups and the project will not contribute to or create further inequalities.	
Empowering	The project has all the characteristics of a 'sensitive' approach whilst also increasing equal access to assets, resources and capabilities for women and marginalised groups	X
Transformative	The project has all the characteristics of an 'empowering' approach whilst also addressing unequal power relationships and seeking institutional and societal change	

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 has been Abby Lawrence. Day to day financial management is carried out by the PI who monitors spend against the budget and requests regular expenditure reports from Finance. 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

In line with our previous reports, the main points of learning from this project have been to build in contingency and establish good communication between relevant partners. In general, the project has gone well this year when judged against the implementation plan and logframe. The project is on track with the majority of activities and is preparing to complete fieldwork and move onto sample processing and data analysis. The fieldwork element has, thus far, been very successful. However, there have been a few minor unexpected challenges. Firstly, external factors such as bad weather, the *Pharos SG* being required to respond to the avian influenza outbreak at South Georgia and spending several weeks in dry dock in February 2024 threatened to delay sampling regimes. However, whilst there may have been some minor delays as a result of these factors, we have not deviated from the original plan of carrying out sampling campaigns every 4-6 weeks. In general, campaigns have taken place every month, with the exception of February 2024 when the *Pharos SG* was in dry dock. This led to the longest period between regular patrols being 6 weeks between the January 2024 and March 2024. However, contingencies were considered when planning the fieldwork and the frequency of sampling regimes was planned to be flexible, with the aim of a sampling regime taking place every 4-6 weeks, which was maintained. The project team have been able to manage changes in schedules through regular communication with members of the GSGSSI and science staff based at South Georgia to ensure relevant project members were informed of any potential delays.

A further risk that has arisen is problems with equipment whilst carrying out fieldwork. During the July 2023 sampling campaign, it was found that the water filtration system for the eDNA samples was not as effective as required and this was taking longer than expected. We anticipated potential teething problems with equipment and protocols so had planned for the July campaign to focus on testing and reiterating methodologies, although with the exception of the eDNA filtration, everything worked well. To address the issues with the eDNA filtration, the project team worked with science staff at South Georgia and BAS colleagues experienced in similar techniques, to trial alternative systems, settling on a different type of pump. Further to this, one of the Niskin bottles used to collect water for eDNA analysis broke whilst in use (detailed in the Field and Laboratory report <https://www.bas.ac.uk/project/south-georgia-pelagic-biodiversity/#data>). This was communicated back to the project team, who were able to source a replacement. In the meantime, the South Georgia team were able to repair the broken bottle ahead of the next sampling regime and this is still working well.

Building on the learning from this and the points in our previous annual report, we will continue to build contingencies into our planning and maintain communication throughout the project to minimise risks and manage any that arise appropriately.

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

The previous annual review highlighted that although indicators had been selected, they had not been reported against and more detail on when they would be expected to be completed was required. We interpreted this comment to refer to the Darwin Plus Standard indicators. We have endeavoured to highlight progress towards these indicators throughout this report through indicating where project activities and outputs are contributing to DPLUS indicators and by filling in the table in Annex 3. These indicators were developed retrospectively, as they were introduced after the start of our project. We selected indicators from those suggested that we felt best match our intended outputs, but note that they may not all be the best way of reporting the project's achievements. Nevertheless, we aim to achieve them by the end of the project.

It was also noted that a risk management narrative would be a good addition to accompany the risk register. We have provided a brief narrative within section 9 and attach our risk register which includes the new risks highlighted in section 3.4.

A further comment within the previous annual review feedback was that comments made within the award letter needed to be addressed:

1. There was concern that it was not clear how the project would feed into the 2023 Review of the MPA.

Reply: The project has done this through partnering with GSGSSI, maintaining regular communication with them on project development, and contributing to their MPA review workshop and follow-up in June 2023 as described in section 3.4 of this report. Through regular contact with GSGSSI we are able to provide information as required to contribute to the review output.

2. It was noted that there was a lack of local UKOT involvement in sampling and taxonomic development.

Reply: While BAS are the leads in these aspects of the project, project development and delivery involved all partners. In particular, during the development phase meetings were held with Mark Belchier and Sue Gregory (GSGSSI) to align our sampling efforts with needs of the OT, for example including ichthyoplankton due to its direct application to supporting sustainable fishery management. The fieldwork component is also carried out by the BAS Marine Biologists in the OT with the logistical support of the *Pharos SG* in order to deliver the sampling. This is an OT asset and as such represents the direct involvement of the OT in the acquisition of data.

3. It was not clear how capacity would be built within the UKOT and who would continue monitoring beyond the end of the project.

Reply: This is an ongoing effort. However, through the project we have purchased a UVP6 that will remain the property of the OT at the end of the project, representing a direct legacy and increasing its technological capacity. In addition, through the project we have trained a number of science staff within the OT to deploy the sampling equipment and developed protocols that will allow sampling to be continued. We are currently in discussions with the KEP Science Manager to look for opportunities for monitoring of the pelagic community to be developed beyond this project as they actively develop the new KEP Science Plan.

4. The M&E budget appears high. Outline what this budget includes and why it is needed

Reply: This comprises an estimate of the time to be spent by the PI on monitoring and financial management throughout the project, and is an estimate of the proportion of the overall salary costs that may be allocated to this task. In addition, there are audit costs included in the budget. The final budget for M&E may end up being lower than this.

5. The logframe sets out the key steps but many of the assumptions/risks associated with some of these key tasks do not appear to have been fully considered (e.g. 1.3 and 1.4 use of profilers).

Reply: These have already been completed.

6. The number of beneficiaries could be defined more clearly

Reply: The principal direct beneficiary will be the GSGSSI as outlined in the proposal. BAS is another beneficiary due to the development of new technical and analytical protocols. Additional possible beneficiaries were suggested and are still relevant, but as this project is developing novel techniques, it is by its nature part of an evolving field, and not all beneficiaries were (or are yet) known. As the project generates data and results, the number of wider beneficiaries is likely to become clearer.

7. Although the project identifies the benefits of the project, it would be worth exploring if this can be replicated or scaled-up beyond this project

The methodologies being developed in this project absolutely have the potential to be scaled up and replicated beyond the project and discussions are already underway within BAS to develop work around image analysis as a result of the developments this project has made. We will also explore options to share our learnings with other OTs.

9. Risk Management

A small number of new risks have arisen in the last 12 months. All of these have related to the fieldwork component of the project. Project fieldwork is reliant on the *Pharos SG*, which has

faced logistical challenges following the avian influenza outbreak at South Georgia. This did not result in any changes to the project due to effective communication.

Risk register attached.

10. Sustainability and legacy

During fieldwork we have trained science staff within the OT, increasing the capacity to carry out similar work (DPLUS-A03). Throughout the project we have maintained close communications with the project partner in the OT (GSGSSI). 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. As the project is nearing the end of fieldwork completion, project members are working with partners to devise long term monitoring methods as well as exploring opportunities for long-term funding to aid in this monitoring programme leading to the project having a long-term legacy.

11. 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/>. The logo and funding acknowledgement is also present in reports uploaded to the project website is also placed on all reports uploaded to the website and was prominent in the presentation given at the SGSSI 5 Year MPA review workshop.

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

12. Safeguarding

Has your Safeguarding Policy been updated in the past 12 months?	Yes
Have any concerns been reported in the past 12 months	Yes
Does your project have a Safeguarding focal point?	<i>Yes we have a safeguarding lead across BAS plus a Health and Wellbeing Manager who will work with the safeguarding lead</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>30% 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>
<p>Has there been any lessons learnt or challenges on Safeguarding in the past 12 months? Please ensure no sensitive data is included within responses.</p> <p><i>The most challenging part continues to be developing a clear understanding of safeguarding and who is affected. We do not employ staff working with children, however many of our staff</i></p>	

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.

Please describe any community sensitisation that has taken place over the past 12 months; include topics covered and number of participants.

N/A

Have there been any concerns around Health, Safety and Security of your project over the past year? If yes, please outline how this was resolved.

No

13. Project expenditure

Table 1: Project expenditure during the reporting period (1 April 2023 – 31 March 2024)

Project spend (indicative) in this financial year	2023/24 D+ Grant (£)	2024/25 Total actual D+ Costs (£)	Variance %	Comments (please explain significant variances)
Staff costs				
Consultancy costs				
Overhead Costs				
Travel and subsistence				Higher than expected due to flight cancellations for fieldwork and associated additional costs.
Operating Costs				
Capital items				
Others (Please specify)				
TOTAL	£142,599	£144,417.33		

Table 2: Project mobilised or matched funding during the reporting period (1 April 2023 – 31 March 2024)

	Secured to date	Expected by end of project	Sources
Matched funding leveraged by the partners to deliver the project (£)			BAS, MBA and GSGSSI
Total additional finance mobilised for new activities occurring outside of the project, building on evidence, best practices and the project (£)			

14. Other comments on progress not covered elsewhere

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 to edit and use the following for various promotional purposes (please leave this line in to indicate your agreement to use any material you provide here).

Through our project so far, we have been pleased with the successful deployment of a range of instruments and sampling technologies including two types of net, an imaging profiler, Niskin bottles for water collection, and CTDs for contextual environmental information at 4-6 week intervals throughout the year so far. This significantly enhances our capabilities for monitoring the pelagic environment from new platforms and to acquire new types of data that can help inform our understanding of the South Georgia pelagic community. It also provides us with lots of new data that we are working up to gain new insights into the structure of the marine community from numerous perspectives. This work has required a high level of communication and collaboration between BAS Cambridge, the Marine Biologists at KEP in South Georgia, GSGSSI staff and the captain and crew of the MV *Pharos SG*. Our fieldwork so far has resulted in protocols being developed that can be used to maintain such sampling into the future, and the physical capacity to continue this via the purchase of the UVP6 image profiler for GSGSSI.

File Type (Image / Video / Graphic)	File Name or File Location	Caption including description, country and credit	Social media accounts and websites to be tagged (leave blank if none)	Consent of subjects received (delete as necessary)
Image	IMG-20230716-WA0032 Deployment of mini bongo nets	Garry Taylor		No
Image	IMG-20230718-WA0002 Deployment of Niskin bottle for eDNA water collection	Garry Taylor		No
Image	IMG-20230718-WA0005 Deployment of UVP6	Garry Taylor		No
Image	IMG-20230718-WA0012 Deployment of Niskin bottle for eDNA water collection	Garry Taylor		N/A

Annex 1: Report of progress and achievements against logframe for Financial Year 2023-2024

Project summary	Progress and Achievements April 2023 - March 2024	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. Fieldwork is underway and due to be completed by June 2024.</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>Outcome indicator 0.1</p> <p>Development of technical and analytical capacity to deploy novel optical and molecular sampling equipment by end Y3Q2</p>	<p>In progress. Science staff have been trained to deploy sampling equipment.</p>	<p>Science staff at South Georgia will continue to deploy fieldwork equipment and revise methods and protocols when necessary.</p>
<p>Outcome indicator 0.2,</p> <p>First zooplankton and ichthyoplankton biodiversity baseline produced by end Y4Q1</p>	<p>In progress. Processing of historical samples has started. New samples are being collected and plans to analyse these are underway.</p>	<p>Further processing of historical and new samples will take place during summer 2024. Image analysis will take place within the next reporting period which will be the first step towards building a biodiversity baseline.</p>
<p>Outcome indicator 0.3</p> <p>Development of molecular methodology by which to detect invasive, non-native or unknown species by end Y4Q1</p>	<p>In progress. Samples for molecular analysis have been collected and plans to carry out analysis have been made.</p>	<p>Samples will be returned to the UK in June 2024. Laboratory analysis will take place in summer 2024 with the aim to develop a molecular methodology through eDNA extraction.</p>
<p>Outcome indicator 0.4</p> <p>Update of management plans as required to take account of new information and methodologies by end Y4Q2</p>	<p>Will take place later in the project</p>	

Output 1 Capacity created for improved sensitivity and cost-effectiveness of zooplankton biodiversity monitoring at SG.		
Output indicator 1.1 Recruitment of PDRA by end of Y1Q3	Complete. The PDRA has been recruited and started in post.	
Output indicator 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	Complete. Equipment has been received and sent to the OT for fieldwork.	
Output indicator 1.3 Mounting and testing of deployment of profiler and sampling bottles on the <i>Pharos SG</i> by end of Y2Q2	Complete. The profiler and sampling bottles were mounted and tested on the <i>Pharos SG</i> in July 2023	
Output indicator 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	Complete. Science staff have been trained in the use of equipment and sample collection and storage.	
Output 2. Acquisition of data on lower trophic level biodiversity and distribution, including zooplankton, ichthyoplankton and non-native taxa or parasites		
Output indicator 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	In progress. Field work began in July 2023 and samples have been collected every 4-6 weeks to date.	Participation in routine monitoring to collect samples will continue until June 2024, when a full year of samples will have been collected.
Output indicator 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. Analysis of historic samples using light microscopy and the ZooScan has been started and is ongoing.	Over the next period, more historic samples will be analysed through light microscopy and ZooScan analysis.

Output indicator 2.3 Classification and verification of images obtained with the optical profiler by end Y3Q4	In progress. Images obtained with the optical profiler from July to December 2023 have been classified. The verification process has been agreed upon and will be carried out over the next year.	Images obtained from January to June 2024 will be classified as data is received.
Output indicator 2.4 Extraction, amplification and sequencing of eDNA metabarcodes from filtered water samples by end Y3Q4	Will take place shortly. Preparations have been made to begin eDNA extraction in July 2024.	Training in extraction, amplification and sequencing of eDNA metabarcodes has been arranged to take place in July 2024, with sample processing taking place straight after.
Output 3. New zooplankton and ichthyoplankton data and bioindicator assessment tools developed for direct application to monitoring and management		
Output indicator 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	This element of the project will commence later once all data has been collected and processed.	Data collected from the three methods will to be collated and analysed over the next 12 months.
Output indicator 3.2. Development and refinement of novel optical methodology that can augment current net based monitoring capabilities by end Y4Q1	In progress. The methodology of deploying the optical profiler has been developed.	Analysis of data collected from optical profiler needs to take place.
Output indicator 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	This element of the project will commence later once all data has been collected and processed.	Training and methodology development will take place over the next reporting period.
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		
Output indicator 4.1.	Ongoing. A presentation describing the project was given at the GSGSSI MPA Review Workshop in June 2023.	Engagement to continue throughout project.

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		
Output indicator 4.2. Engagement with 2023 MPA 5 Year Review assessment by end Y2Q3	Ongoing. A presentation describing the project was given at the GSGSSI MPA Review Workshop in June 2023.	Communication will be maintained with GSGSSI and any further information required will be supplied promptly.
Output indicator 4.3. Contribute to GSGSSI priority activities on biosecurity and non-native species monitoring in partnership with SAERI by end Y4Q2	Engagement with GSGSSI and SAERI has been initiated to align work and identify potential to collaborate.	Engagement to continue throughout project.
Output 5. Publication and dissemination of results		
Output indicator 5.1. Preparation of paper(s) for publication in peer-reviewed journals: submission by end of Y4Q2; publication within 1 year of project completion	This has not started yet.	Discussions will take place following data analysis to plan and begin preparing papers with submission likely happening after the project has been completed.
Output indicator 5.2. Accession of all data to image libraries, OA databases and the BAS PDC by end of Y4Q2	In progress. Initial discussions have taken place to create a data pathway and ensure data are managed appropriately.	Data management plans need developing.
Output indicator 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 has not started yet.	Preparations will start to take place in the next reporting period, with a workshop to share findings taking place in Summer 2025.

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>1.1 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 sampling bottles on the <i>Pharos SG</i> by end of Y2Q2</p> <p>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</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>Output 2. Acquisition of data on lower trophic level biodiversity and distribution, including zooplankton, ichthyoplankton and non-native taxa or parasites</p>	<p>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</p> <p>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</p> <p>2.3 Classification and verification of images obtained with the optical profiler by end Y3Q4</p> <p>2.4 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>Output 3. New zooplankton and ichthyoplankton data and bioindicator assessment tools developed for direct application to monitoring and management</p>	<p>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</p> <p>3.2 Development and refinement of novel optical methodology that can augment current net based monitoring capabilities by end Y4Q1</p> <p>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</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>Output 4. Updates to SGSSI monitoring and management activities to improve consideration of zooplankton</p>	<p>4.1 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>and 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>4.2 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>	<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>Output 5. Publication and dissemination of results</p>	<p>5.1 Preparation of paper(s) for publication in peer-reviewed journals: submission by end of Y4Q2; publication within 1 year of project completion</p> <p>5.2 Accession of all data to image libraries, OA databases and the BAS PDC by end of Y4Q2</p> <p>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</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	Units	Disaggregation	Year 1 Total	Year 2 Total	Year 3 Total	Total to date	Total planned during the project
DPLUS-A03	Number of local/national organisations with improved capability and capacity as a result of project	Number of organisations	Organisation type		1		1	2
DPLUS-C01	Number of best practice guides and knowledge products published and endorsed.	Number	Product typology		3		3	2
DPLUS-C03	New assessments of habitat conservation action needs published	Number	Ecosystem					1
DPLUS-C02	Number of new conservation or species stock assessments published.	Number	Taxa					1
DPLUS-C05	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, best practice manual, blog post, online videos, podcasts, 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?	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
If you are submitting photos for publicity purposes, do these meet the outlined requirements (see section 15)?	Y
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.	