Darwin Plus Main & Strategic: 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 2025

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

Darwin Plus Project Information

Scheme (Main or Strategic)	Main
Project reference	DPLUS214
Project title	South Atlantic Elephant Seal Population Assessment (SAESPA)
Territory(ies)	South Georgia and the British Antarctic Territories
Lead Organisation	British Antarctic Survey
Project partner(s)	Government of South Georgia and the South Sandwich Islands Sea Mammal Research Unit (SMRU), University of St Andrews University of Exeter (UoE)
Darwin Plus grant value	£432,459
Start/end dates of project	July 2024 – June 2026
Reporting period (e.g. Apr 2024-Mar 2025) and number (e.g. Annual Report 1, 2)	July 2024 – March 2025: Annual Report 1
Project Leader name	[redacted]
Project website/blog/social media	@elephatnseasurvey - Instagram
Report author(s) and date	[redacted]

1. Project summary

Southern elephant seal population data in the southwest Atlantic is limited, and at South Georgia is 30-years out-of-date. Consequently, our understanding of how these marine predators are faring, particularly given the impact of climate change, is lacking. This project aims to use satellite imagery, automated RPAS (Remotely Piloted Aerial Systems) and machine learning methods to census breeding populations on South Georgia, the South Orkney and the South Shetland Islands (Figure 1). This will establish modern baselines and investigate possible southward shifts in populations since the mid-1990s.

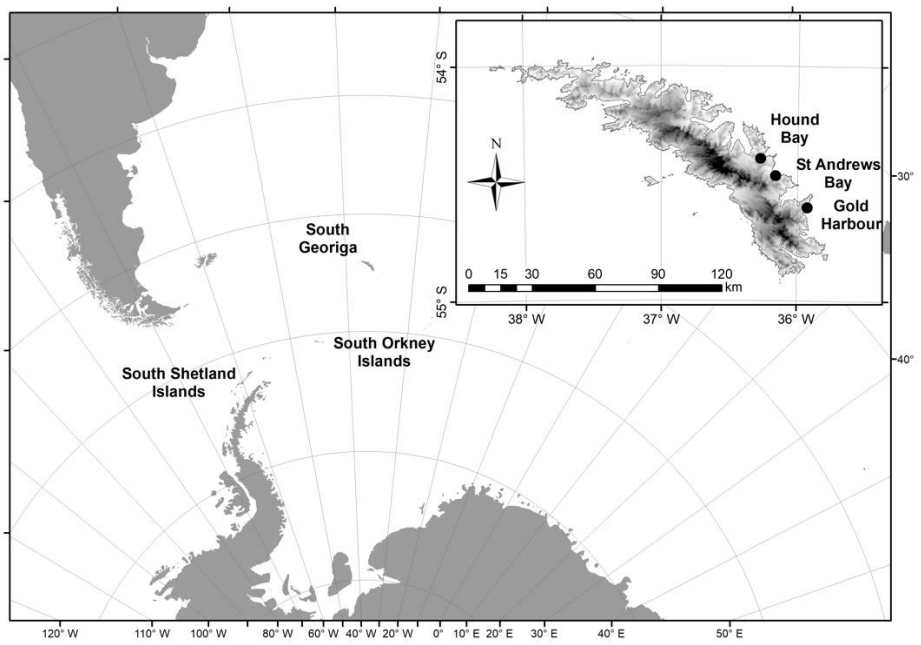

Figure 1 – South Atlantic study area for DPLUS214. Zoom panel depicts South Georgia and the sites where the October 2024 fieldwork took place.

2. Project stakeholders/partners

Through this project, we have engaged with our three external project partners (PP): (i) Government of South Georgia and the South Sandwich Islands (GSGSSI); (ii) Sea Mammal Research Unit (SMRU); and (iii) University of Edinburgh (UoE), during the planning and completion of the field season in October 2024. Details pertaining to fieldwork survey design and overall scope were discussed with PP's at UoE and SMRU specifically, although this discussion was extended to all PP's. Project engagement with GSGSSI was primarily focussed on the logistical and operational aspects of their support to the October 2024 field season, which were vital to the success of the field season. Indeed, whilst in the field, GSGSSI went above and beyond to provide logistical support to aid the field team, and facilitated modifications to permits, which enabled additional data to be collective and the field team to react to developing conditions on the ground.

3. Project progress

3.1 Progress in carrying out project Activities

Output 1: **Development of an automated approach to scan acquired VHR satellite imagery.**

1.1: Identification and review of the most appropriate automation methods leading to selection of a single method to implement
1.2: Review existing DPLUS109 satellite imagery and create a training dataset for machine learning methods
1.3: Supplement training dataset from imagery acquired over the 2024 breeding season (if required).
1.4: Train and refine final automation algorithm.

Progress against the activities listed against Output 1 is on target with where we expected to be at this stage of the project. A broad literature review has been conducted for 1.1 and we are now testing possible machine learning (ML) options, utilising the training data produced from DPLUS109's imagery under activity 1.2. Under activity 1.3. PP [redacted] who is leading the implementation of the ML approach, and PP [redacted] who was brought on as a Research Software Engineer (following the acceptance of CR24_030), have been experimenting with the use of RPAS data from the 2024 field season to supplement the satellite training data aiming to address. Progress towards activity 1.4 is ongoing and will continue to be made throughout 2025.

Output 2: **Production of a UAV-based ground truthing survey to validate the acquired VHR population estimates.**

2.1: Identify survey locations for UAV flights.
2.2: Finalise fieldwork plans for Austral summer 2024.
2.3: UAS ground validation and peak of breeding survey design
2.4: Fieldwork – UAV ground validation and peak of breeding survey
2.5: Produce orthorectified image mosaics and analyse UAV imagery from field surveys
2.6: Incorporate metrics from UAV surveys into population assessment 3.6

Activities 2.1 to 2.5 under Output 2 were fulfilled as part of the successful delivery of the October 2024 field season. Work towards 2.6 is ongoing and will continue throughout 2025. Processing of the data from the 2024 field season is now complete and it is now being incorporated into the wider population assessment which forms the backbone of the work to be carried out for the rest of the project.

Output 3: **An island-wide population censuses of SES using VHR satellite imagery for each sub-Antarctic archipelagos: (i) South Georgia; (ii) the South Orkney Islands; and (iii) the South Shetland Islands.**

3.1: Identify AOIs for satellite imagery tasking.
3.2: Arrange image (including tendering, if needed) with satellite imagery supplier.
3.3: Acquire satellite images from supplier
3.4: Apply automation developed in 1.4 to all acquired imagery
3.5: Extract island-wide counts, adjust for temporal displacements form SES breeding peak and for ground validation metrics.
3.6: Calculate final census estimates for each sub-Antarctic Island.
3.7: Production of peer-reviewed publication detailing the updated population censuses of each of the three sub-Antarctic islands examined.
3.8: Adaptation of publications into a more accessible and inclusive format (e.g., Frontiers for Young Minds article).

Progress under Output 3 has been good with our headway being where we would expect at this point in the project. Activities 3.1 to 3.3 have been successfully completed. However, during the tasking and acquisition of the satellite imagery for 3.3, cloud cover inhibited 30cm WorldView-3 tasking for many targeted areas, and as such we have been provided with 50cm WorldView-2 imagery. This will likely complicate the automation process. PP's [redacted] and [redacted] are currently working on this and testing the use of different resolution imagery. In addition to the resolution difference, due to some regions being under clouds for the entire tasking window some AOIs were not captured (Figure 2), and funds were underutilised leaving a surplus in the budget. A change request (CR024_084) was approved, and these funds have been transferred into FY 2025/26. These funds will be used to re-task areas aiming to acquire imagery where cloud cover (Figure 2) prohibited it in 2024. PP's [redacted] and [redacted] are working towards the development of the automated approach associated with activity 3.4. Efforts towards activities 3.5 to 3.8 are expected to begin in the summer of 2025 and continue until the end of the project.

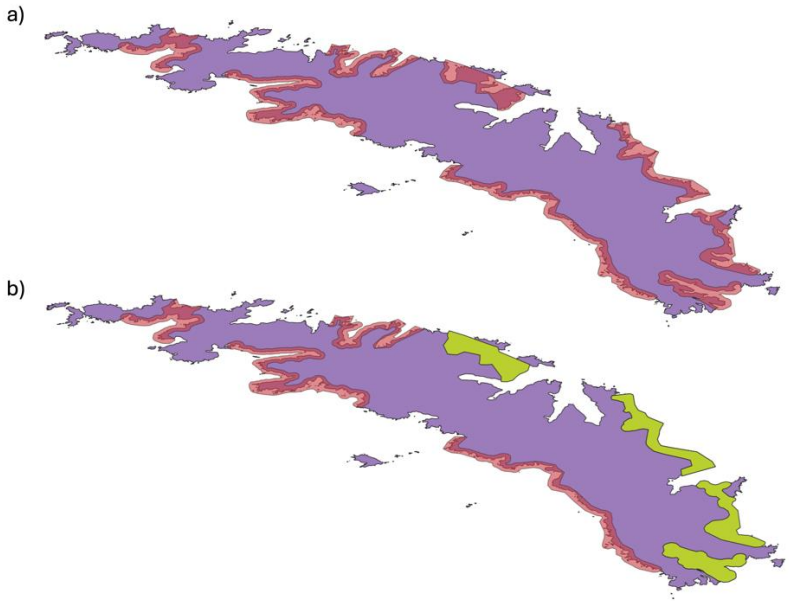

Figure 2 - a) Areas of Interest (AOIs) identified shaded in red which, of which images were tasked during the window 18th October 2024 – 18th November 2024. b) AOIs where images were acquired shaded in green.

Output 4: **M&E, Provision of training and the dissemination of project findings and results**

4.1: **M&E: Conduct regular assessments throughout the lifetime of the project: weekly & monthly meetings.**
4.2: M&E: Conduct bi-annual project meeting with all project partners and stakeholders.
4.3: Prepare and submit findings report and deliver summary training workshop to GSGSSI and invited internal/external parties.
4.4: Deposit satellite census data and ground-truthed UAV imagery into a publicly available repository.
4.5: Report detailing the updated population assessments provided to SCAR CAPS Action Group.
4.6: Non-technical communication of research findings to the public via social media. Ongoing through the lifetime of the project.
4.7: Communication of results at international conference.
4.8: Provide UAV training to one person based at King Edward Point, South Georgia to enhance capacity on OT.

Progress towards Outputs 4's activities, specifically 4.1 and 4.2 are on track and are as expected to date. However, due to staff deployments on fieldwork (both related and not related to DPLUS214) and other non-project commitments it has been difficult to arrange whole PP meetings regularly (highlighted in the HYR). However, in lieu of this, regular small-group meetings have been conducted, and each PP has been updated on progress throughout. This has worked as a suitable compromise. A whole project annual meeting is planned for summer 2025 to provide an update on the first year's work and outline the trajectory of the rest of the project along with PP expectations.

Activity 4.4 has been completed with UAV imagery deposited with the Polar Data Centre (PDC) and DOIs issued: St Andrews Bay at https://doi.org/10.5285/e238f84e-63b2-4019-8308-7398a8ea204f; for Hound Bay at https://doi.org/10.5285/85de16ff-a3b2-42b4-a898-aea94ee47b83; and for Gold Harbour at https://doi.org/10.5285/47d0718d-7146-44d3-965c-60e62a48b8cc.). Following the completion of the population assessment later in 2025, the remaining data will also be published and deposited with the PDC and modelling approached made available via GitHub (or similar).

Progress is ongoing against activity 4.6 and will continue over the tenure of the project with regular posts being made to the project's Instagram account (@elephantsealsurvey). To date, we have accumulated 204 followers and posted on 31 occasions. Over the last 90-days (date 5th March 2025) we have reached 310 accounts (124 followers and 186 non-followers) with 63 profile visits. We originally aimed to achieve an average of '25 likes' per post and are currently achieving an average of 18.1 ±12.6 per post,

with our reel/video posts being the most popular (average of 40 ±8 likes per post), followed by picture posts (average of 21 ±10 likes per post) and then infographics (average of 10 ±6 likes per post).

Activity 4.8 has also been completed ahead of schedule, with the King Edward Point Science Manager being trained as a A2 CofC and GVC drone pilot, which has enhanced capacity within the OT.

Progress towards activities 4.3, 4.5 and 4.7 has not yet begun as we are not yet at the correct stage in the project; progress towards these is due to commence later in 2025.

3.2 Progress towards project Outputs

1: Development of an automated approach to scan acquired VHR satellite imagery.
2: Production of a UAV-based ground truthing survey to validate the acquired VHR population estimates.
3: An island-wide population censuses of SES using VHR satellite imagery for each sub-Antarctic archipelagos: (i) South Georgia; (ii) the South Orkney Islands; and (iii) the South Shetland Islands.
4: M&E, Provision of training and the dissemination of project findings and results

Progress towards Output 1 is on track for full delivery and we are where we would expect to be at this stage of the project. Data from DPLUS109 was compiled and a training dataset for the ML methods was created in the summer of 2024, this has enabled PP's [redacted] o make quick progress with the initial phases of developing the automated approach. A full literature review has been conducted by PP [redacted] with initial testing into appropriate methods being conducted in Q1 2025. PP [redacted] is exploring the possibility of utilising RPAS imagery alongside the satellite imagery acquired during the 2024 field season to supplement the volume of training data available for the development of the automated approach. Additionally, PP [redacted] has been working towards creating an open-access repository where the developed models can be stored alongside documentation for ease of re-use by future researchers. We expect the progress on this output to increase exponentially throughout 2025, but we are on track at this point in time.

To date, progress towards Output 2 has exceeded expectations following the successful completion of the field season in October 2024. Historical census data was obtained from BAS records and digitized by PP [redacted] during the summer of 2025, with this informing the design and scope of the October 2024 field season. These digitized data are on track to be published as a complimentary output. Plans for the 2024 field season were successful, with forward contingency planning proving to be very useful in the successful delivery of this deployment. All data collected during this field season has been processed, analysed and deposited with the Polar Data Centre (see 3.1). These data will contribute to the development of the model-based population assessment conducted later in 2025.

Initial progress towards Output 3 is continuing as expected. Targets AOIs were defined by PP [redacted] by reviewing BAS archival data and previous records of elephant seal surveys from South Georgia. Satellite imagery tasking was set up and reviewed by PP's [redacted] and [redacted] during the October 2024 tasking window with delivery of these data to BAS completed in November/December 2024. PP's [redacted] and [redacted] working towards developing an automated and reproducible ML methodology for processing satellite imagery. The initial tasking window in 2024 was successful, however, cloud cover did prove to be disruptive in some of the targeted areas. Underspend funds have been shifted into the FY 2025/26 and re-acquisition will be attempted again in October 2025. Planned work over the summer of 2025 will push forward delivery of this output.

Progress towards Output 4 is again on track with where we anticipated to be at this stage in the project. Originally it was planned that weekly meetings would be helped between the PI and co-lead, along with monthly all-PP meetings. However, staffing commitments to other non-DPLUS214 projects and fieldwork commitments has meant that it is difficult to gather all PPs. As a compromise the PI has been keeping various subsets of the project staff appraised of progress made. An annual all-PP meeting is being planned for summer 2025, where a thorough outdate will be provided and PP expectations for the delivery of the project will be outlined. We are on track with delivering a publicly available repository of data with the ground-truthed UAV imagery having been deposited with the Polar Data Centre already (see above). Work is on track to the delivery of peer-reviewed publications and the dissemination of research findings to multiple interest groups (SCAR CAPS), GSGSSI, and CCAMLR Overlap Analysis (formally Risk Assessment) by the end of the project. We have already provided the planned UAV

operator training (A2CofC and GVC) to a member of King Edward Point staff ahead of schedule; her training was completed in Q4 of 2024.

3.3 Progress towards the project Outcome

Provide census data, distribution maps and establish imagery-based monitoring protocols for SES over South Georgia, the South Orkney, and South Shetland Islands, improving species management, conservation policy and species advocacy.

Following the start of the project in July 2024, efforts throughout the first two months were focussed on preparing for the upcoming field season, for which the team departed in mid-September and were deployed south until the end of November. During this period work was focussed on: (i) creating a training dataset from data provided by DPLUS109 for the automated machine learning methods, which are planned to be applied to analysing satellite imagery; (ii) arranging cargo and transport logistics south; (iii) organising fieldwork specific logistics (i.e., organising GPS routes for on-foot access to field sites on South Georgia, precuring food and safety equipment, etc.); (iv) reviewing existing literature to plan the satellite imagery tasking and arranging the satellite order to be placed by PP [redacted] whilst the PI and PP [redacted] were on South Georgia; and (v) designing of the RPAS surveys and arranging the necessary data layers (i.e., digital elevation models for the Barff Peninsula and King Edward Point region) required for these to be conducted safely. Following the successful completion of the 2024 field season, work shifted focus to processing and analysis of the collected data. Satellite data were provided by Maxar to BAS by early November and work on these data has begun. The RPAS imagery from all surveys has been deposited with the Polar Data Centre (see 3.1) and has been counted providing precise information on when breeding numbers peaked on St Andrews and Hound Bay in 2024. This will be used to underpin the corrections made to the satellite imagery counts conducted later in 2025. PP's have also started work on developing the automated methods for processing the acquired satellite imagery. This begun in the autumn of 2024 with a comprehensive literature review and has progressed into testing of different training data, specifically whether the collected RPAS imagery can be down-sampled to replicate the resolution and spectral characteristics of the satellite data, thus greatly enhancing the volume of training data available to the project. The development of open-source python libraries and pipelines from PP [redacted] will ensure the image analysis protocols can be reproduced and easily reapplied for future satellite surveys.

Following the success of the 2024 field season and the rapid analysis of the collected data, we have developed an additional output avenue for the project, which focusses on reporting the observed impact of highly pathogenicity avian influenza viruses (HPAIV) on southern elephant seals. This work uses comparative counts taken from DPLUS109 and combines them with those collected by DPLUS214 to demonstrate the dramatic impact that HPAIV has had on this population. A research paper has been submitted which details our findings (see Table 2).

Overall, we believe that the Standard Indicators identified in the logframe are suitable for monitoring our progress. We believe that we are on track with our project milestones and are making good progress towards the delivery of the project's outcome by July 2026.

3.4 Monitoring of assumptions

Data acquired at an appropriate scale as to be able to produce a representative census on each of the three targeted sub-Antarctic islands.

Progress to date has collected data at two scales: (i) Local RPAS surveys and (ii) larger scale satellite imagery acquisitions. During the October 2024 field season 19 RPAS surveys were flown and data collected at St Andrews Bay and Hound Bay (Figure 1). In addition to this a single flight was flown at Gold harbour (Figure 1), providing valuable data which will be used to answer a new project outcome focussed on the impact of Highly Pathogenicity Avian Influenza Viruses (HPAIV) on southern elephant seals raised in the October HYR. The volume of data collected from the RPAS exceeded all expectations, with lessons learned from DPLUS109 being crucial to this success. These data will be fundamental in being able to accurately assess when the peak of breeding occurred in 2024, which in turn will inform the population census based on the satellite imagery.

Regarding satellite data acquisition, we initially tasked for 30cm resolution WorldView-03 imagery. However, due to our short tasking window (over the presumed peak of breeding) and satellite orbital timings, we were only successful in acquiring several 30cm resolution images, the rest were provided by Maxar at 50cm. In terms of locations, we were successful at acquiring imagery at 50% (4 of 8) of the tasked Areas of Interest (AOI) on mainland South Georgia (see Figure 2); and 100% (4 of 4) of the AOIs on the South Shetland Islands; and regrettably no acquisitions were made on the South Orkney Islands, where cover prevented successful acquisition. Whilst it was disappointing that more imagery was not acquired, the funds for these have been transferred into the next FY and re-tasking will be conducted in October 2025 in line with our proposed contingency plans. We will endeavour to collect imagery in 2025 of the South Orkney Islands, to facilitate the provision of data to support the investigation into the latitudinal movement of the population. Notwithstanding this, these available data will facilitate the timely development the automated ML method, which can then be applied to new data thereafter.

Data acquired at a suitable volume to facilitate the development and training of an automated scanning algorithm.

As discussed above, cloud cover prohibited the acquisition of a number of the tasked AOIs and the resolution of the acquired imagery was lower than anticipated. However, a suitable volume of imagery was acquired, supplementing the imagery already available from DPLUS109, to begin the development and training of the ML methods. In addition to this, PP's [redacted] are working at down-sampling and applying the vast quantities of RPAS imagery collected during the 2024 field season for use in the training of the automated methods.

Underlying data for both ground truthing and peak of breeding timing collected successfully at South Georgia.

The field season in 2024 was successfully implemented with a total of 19 RPAS flights being flown at St Andrews and Hound Bay. We were not expecting to be able to fly this many times and attribute this success to the lessons learned from DPLUS109. Consequently, we have collected data at a higher temporal resolution than expected, which will be highly valuable for determining peak breeding times for the wider population census.

Delay in the publication of projects findings due to slow peer review times at many journals.
This has not yet impacted the project.

Difficulty attending training event leading to lower than desired attendance.
This has not yet impacted the project.

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

It is expected that outputs of this project will contribute to the ongoing development of both the South Georgia and South Sandwich Island marine and terrestrial protected area plans. The likely route for this upon successful completion of the project and the transfer of key findings from the published papers into new iterations of the management plans. To date we have maintained open lines of communication between project staff and the UKOT, ensuring that that all parties are aware of results as they develop and are involved in output dissemination.

5. Gender Equality and Social Inclusion (GESI)

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	

The project team truly values diversity. We understand that having a broad range of perspectives increases creativity, enhances problem solving, and improves performance. Our team encompasses a variety of ages, genders, cultures, customs, attitudes, educational backgrounds, and specialised areas. We are also proudly neurodiverse. We partner with women-led institutes. We also champion diversity in career stages within our board; early-career researchers (ECRs) hold pivotal roles as the PI and PPs responsible for crucial aspects of the workflow and all collaborate effectively with senior researchers and professionals. Furthermore, we integrate local knowledge from the OT and have actively collaborated with non-PP experts to refine our design and implementation strategies for the recent field season. Holistic diversity is crucial for the effective execution of our project plan.

In addition to prioritising diversity at the recruitment and project-design phase, we prioritise inclusivity throughout our project's implementation. In preparation for project meetings, we ensure all participants have ample time to familiarise themselves with the meeting topics in advance. Stakeholder meeting agendas will be distributed beforehand, with invitations extended to contribute additional discussion points. At these meetings we welcome feedback and review any provided with an eye on how future efforts can be improved particularly to enhance social inclusion.

To ensure that our findings are accessible, we commit to publishing in Open Access journals and will adapt the findings of this project into an age-accessible journal, such as 'Frontiers for Young Minds'. This approach ensures that governments, NGOs, the scientific community and the public can equally benefit from and expand upon our work. We are also publishing our project, its methods, and initial results (as they emerge) via the project's social media page (@elephantsealsurvey – Instagram), which aids in the accessibility and dissemination of the project's work and widens its impact footprint. This format of project output reaches multiple age brackets and genders (Project Standard Indicators Table 1). Additionally, all resources generated by our project will be publicly available and archived at the UK Polar Data Centre (https://www.bas.ac.uk/data/uk-pdc/), allowing our data and models to be easily accessed and further developed by future researchers.

6. Monitoring and evaluation

Regular project monitoring has been conducted since the start of the project and will continue throughout. Our M&E indicators were originally designed so that they were SMART (specific, measurable, achievable, relevant and time-bounded). On reflection, the attainability of our M&E goals relating to the monthly all PP meetings was slightly ambitious as it has proven difficult to gather all PPs this regularly, with both staffing commitments to non-DPLUS214 activities alongside PP availability being a constraining factor. However, as an adaptive workaround, and to ensure that the project plan is still met, the PI has conducted regular meetings with each PP individually to keep everyone appraised of the project's progress and to address any issues in a timely manner. Minutes of these individual meetings have been kept and are provided with this report and provide informative disaggregation metrics (Annex 4). Reflecting on the 'SMART' nature of this M&E indicator, we plan to continue with the current

meeting format as it's proven to be highly effective, enabling targeted meetings to be conducted and actions implemented. Furthermore, following on from the first half of the project, which was disrupted by the 3-month long field season and took up much of the projects focus, full stakeholder and PP meetings will be held in the summer of 2025. This will provide a thorough update on project progress so far and set out plans and expectations for the remainder of the project. To date, much of the progress of the project has been logistical in nature and

7. Lessons learnt

The composition of our PPs has worked very well, with in-house expertise being complimented by external PPs who have provided a greater breadth of experience particularly regarding South Georgia. To future projects that may rely on early-season fieldwork, planning ahead-of-time and having contingencies is crucial. Here, the initial delay in the announcement of the funding could have caused issues but this was offset by PP expertise in conducting fieldwork in this region, which facilitated a smooth implementation of the project's plans. However, unexpected disruptions to fieldwork deployments, namely delays to cargo shipping and military transportation, could have significantly derailed the project. We were fortunate that, in this instance, they did not . Here we would recommend that future projects, who work in similar geographic regions and with similar logistical pathways consider factoring in capacity for such events into their plans. For instance, projects should increase buffer times between key arrival and departure dates; increase budget allocations to match the most expensive pathway into a region (i.e., opt to budget for commercial vs military cargo even if the latter is the most cost-effective); and communicate with all in supply/logistic chains well in advance. However, we do recognise that (i) not all factors can be accounted or planned for, and (ii) it isn't always financially feasible or competitive to budget for high-cost pathway alternatives.

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

Not applicable

9. Risk Management

No significant unexpected risks have arisen during the first year of the project, therefore we have not had to adapt the project design or plan. Cargo and transport logistics for the 2024 field season came close to disrupting the project plan (see Annex 6 – risk register). However, these risks did not reach an insurmountable level, and thus no change to the project plan was required.

10. Scalability and durability

The primary future adopters of the outcome of this project have been made aware of the progress through direct involvement during its first year. GSGSSI are the main beneficiary of the outcome of the work and have been routinely updated on the findings and progress throughout the year, particularly during the fieldwork season. Further beneficiaries will be reached once the outputs, namely the peer-reviewed publications are published during at the end of the project. Over the lifetime of the project, and more specifically once the census work is more advanced, we anticipate that this will feed information into several species and habitat management policies currently under development by GSGSSI.

To ensure that the project's outputs, outcome and impacts are durable, we will publish all results in open access journals, therefore not limiting access to the findings and developed analysis protocols. To date, we have submitted one paper for publication and have another contributory paper that we hope to be submitted by the end of April (Table 2). We anticipate that the final censes paper will be submitted nearing the end of the second year. Alongside this we will ensure that all data are made publicly available and are hosted with the UK's Polar Data Centre. Stakeholders will be invited to. A final way in which this project is ensuring its legacy is in knowledge provision, development and training. Here, we

are utilising research staff and methods (i.e., [redacted] which were trained/developed under previous Darwin Plus projects (DPLUS109), which increases both project's durability, and have, this year, provided UAV training to a permanent member of staff in the OT, thus increasing on-island capacity.

11. Darwin Plus identity

We have publicised the Darwin Plus logo through the project's Instagram account (@elephantsealsurvey) and have link this account to the official BCF pages. We ensure that the logo is featured on slides used within stakeholder meetings and when presenting to external audience. To date, we have conducted three outreach talks, each to audiences between 100-300 people each time. All publications, both planned and underway, credit Darwin Plus as the primary funder of this work, which will enhance its recognition externally to the OTs. Within the OT, it's safe to say that there is a high degree of familiarity with Darwin Plus with this program having supported 37 projects in South Georgia, and 10 within the British Antarctic Territory. However, we hope that the efforts of this project will further enhance the familiarity and positive reputation of this funding scheme.

12. Safeguarding

[redacted]

Project expenditure

Table 1: Project expenditure during the reporting period (1 April 2024 – 31 March 2025)

Project spend (indicative) in this financial year	2024/25 D+ Grant (£) DRAFT	202/25 Total actual D+ Costs (£) DRAFT	Variance %	Comments (please explain significant variances)
Staff costs	[redacted]			
Consultancy costs				
Overhead Costs				
Travel and subsistence				
Operating Costs				
Capital items				
Others (Please specify)				
TOTAL	***208,856***	***189,698***		

Table 2: Project mobilised or matched funding during the reporting period (1 April 2024 – 31 March 2025)

	Secured to date	Expected by end of project	Sources
Matched funding leveraged by the partners to deliver the project (£)	[redacted]		BAS field equipment, DPLUS109 satellite data & RPAS, and matched overheads by all partners.
Total additional finance mobilised for new activities occurring outside of the project, building on evidence, best practices and the project (£)	-	-	-

13. Other comments on progress not covered elsewhere

None.

14. 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).

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)
				Yes / No
				Yes / No
				Yes / No
				Yes / No
				Yes / No

Annex 1: Report of progress and achievements against logframe for Financial Year 2024-2025

Project summary	Progress and Achievements April 2024 - March 2025	Actions required/planned for next period
Impact Sustainable and cost-effective satellite remote sensing enables the population status of southern elephant seals (SES) on sub-Antarctic Islands to be updated, updating baselines, and informing long-term conservation and management actions.	Collection of overhead imagery to estimate when the peak of breeding occurred successful. Satellite imagery acquisition of the breeding season partially successful (see 3.1). Progress towards automated processing of imagery on track for this point in the project. Incorporation of project findings with region conservation management and long-term conservation on track.	[redacted]
Outcome Provide census data, distribution maps and establish imagery-based monitoring protocols for SES over South Georgia, the South Orkney, and South Shetland Islands, improving species management, conservation policy and species advocacy.		
Outcome indicator 0.1 Counts from VHR satellite imagery provide a means of estimating abundance at breeding sites across the three island groups leading to the publication of three island-wide population censuses for southern elephant seals by March 2026 (Y2Q4). **[DPLUS-C02]**	0.1: Underway – PP EB & MG are working on automating the processing of the acquired satellite imagery and trialling new methods for generating training data. Work started on testing methods for the required predictive model for the population census.	0.1: Further image tasking for the 2025 breeding season to supplement those acquired during 2024. Continued development of automated workflow and model development for population census.
Outcome indicator 0.2: New satellite imagery analysis protocols will be developed and published in peer reviewed journals to enhance the longevity of the project's impacts post completion, ensuring long-term uptake of the developed methods at other sites. Paper to be submitted for publication by December 2025 (Y2Q3). **[DPLUS-C02, DPLUS-C06 & DPLUS-C17].**	0.2: Underway – PP's are working towards delivery of this outcome. Revised timeline likely puts the delivery of the publication into early 2026 (following the initial delay in the project's start date).	0.2: Completion of this work by late 2025, with outputs being incorporated into the wider population census.
0.3: Stakeholder engagement throughout will feed the results into regional conservation management. Aim to enhance the species-specific provisioning in a minimum of one national level policy or management plan for the Governed OT's (South Georgia) and recommendations published for OT's south of 60°S (South	0.3: Underway – PI is in communication with regional stakeholders, which are aware of the findings and progress of the project to date. All PP (including main stakeholder) meeting will be held in summer 2025.	0.3: annual PP meeting to be held in summer 2025.

Orkney and Shetland Islands) by the end of the project in March 2026 (Y2Q4) **[DPLUS-B02, DPLUS-D03** & **DPLUS-C19]**		
0.4: Stakeholder engagement throughout will feed the results into regional conservation management. Aim to enhance the species habitat provisioning in a minimum of one national level policy or management plan for the Governed OT's (South Georgia) and recommendations published for OT's south of 60°S (South Orkney and Shetland Islands) by the end of the project in March 2026 (Y2Q4) **[DPLUS-B01, DPLUS-C02, DPLUS-D03** & **DPLUS-C19]**	0.4: *ibid*	0.4: *ibid*
0.5: Enhancing understanding of species specific biodiversity at government institutions, both in the OT and the UK **[DPLUS-A07]**, and with the wider community via social media channels **[DPLUS-C12]** by the end the project in March 2026 (Y2Q4)**.**	0.5: Underway: Regional Governments have been kept appraised of the projects findings and have been very accommodating in extending additional permits so that the field team could react to the HPAIV situation on the ground. Social media channels up and running. Project featured on BAS website (Annex 5).	0.5: Ongoing updates provided, and communication maintained with the regional authorities. Social media presence maintained and emphasised during the publication of project papers.
Output 1 Development of an automated approach to scan acquired VHR satellite imagery.		
Output indicator 1.1 1.1: Scoping of most appropriate automation methods, likely to be a UNET CNN (based on previous experience and efficacy with similar species). Y1Q1.	1.1: Completed – now trialling identified methods.	1.1: Implementation of tested methods during 2025.
1.2: Review existing imagery available from DPLUS109 and create expert training dataset for the development of the automated approach to image scanning. Y1Q1.	1.2: Completed – now testing the application of the UAV imagery as an additional source of training data.	1.2: Implementation of training data into model development.

1.3: If needed, supplement training data from imagery acquired over the 2024 breeding season. Y1Q4.	1.3: To date, not applicable.	1.3: To date, not applicable.
1.4: Training and refinement of final method of automation. Collation of code to open-source repository. Y2Q1 to Y2Q1.	1.4: Structure of repository under development by PP MG – method development and resultant depositing not yet complete.	1.4: Continue to develop methodology ahead of implementation.
Output 2. 2. Provide counts of SES on one or more breeding beaches over the presumed breeding peak at the end of October to: (i) better understand arrival and peak breeding times on South Georgia, and (ii) to validate acquired VHR population estimates and correctly adjust for any temporal misalignment.		
Output indicator 2.1. 2.1: Identification of survey locations (i.e., known breeding beaches) informed by published data and BAS' internal records. Y1Q1.	2.1: Completed – BAS archival records examined, and historical data extracted (which has been incorporated into a new data publication to be submitted shortly), survey beaches identified, and fieldwork planned accordingly.	2.1: n/a
2.2: Finalise fieldwork planning (begun pre-grant in January 2024). Y1Q1 to Y1Q2.	2.2: Completed – October 2024 fieldwork successful. 23 flights flown and data analysed.	2.2: n/a
2.3: Design surveys in flight software, assess the frequency of flights needed and prepare UAV for transportation to South Georgia. Y1Q2.	2.3: Completed.	2.3: n/a
2.4: Conduct ground-count and peak of breeding validation surveys. Y1Q3.	2.4: Completed.	2.4: n/a
2.5: Produce orthorectified image mosaics and analyse imagery acquired during 3.3 and produce adjustment recommendations for final population estimates (see 3.4). Y1Q4 to Y2Q2.	2.5: Completed.	2.5: n/a
2.6: Incorporation of outputs into analyses and peer-reviewed publication outlined in more detail below (3.5 to 3.7).	2.6: Underway – all processing completed, awaiting incorporation into publication once next stages of project are completed.	2.6: integrate arrival curves into population census.

Output 3. Etc. Produce island-wide population censuses for SES using VHR satellite imagery for each sub-Antarctic archipelagos: (i) South Georgia; (ii) the South Orkney Islands; and (iii) the South Shetland Islands.		
3.1: Identification of Areas of Interest (AOIs) for VHR satellite imagery tasking. These AOIs will detail (i) the locations where SES are known to breed, which will ascertained from a literature search; as well as including (ii) the identification of candidate AOIs from understudied regions. These are likely to include speculative taskings of regions where SES maybe expected to come ashore based on topographic data and historic sealing records. Y1Q2.	3.1: Completed – see red shaded areas in Figure 2.	3.1: Follow-up image tasking for the 2025 breeding season over the same breeding beaches / AOIs.
3.2: Set up the image tasking order (including tendering process, if needed) with imagery provider for the 2-week window either side of the known peak in SES breeding. Y1Q1 to Y1Q2.	3.2: Completed.	3.2: Process to be replicated for the 2025 breeding season.
3.3: Acquire VHR satellite images from active tasking for SES breeding peak at the end of October. Y1Q3.	3.3: Completed.	3.3: Process to be replicated for the 2025 breeding season.
3.4: Apply automation methodology developed in 1.4 to all VHR satellite imagery acquired for the three islands. Y1Q4 to Y2Q2.	3.4: Underway – PP EB & MG are working towards this deliverable and are currently testing identified methodologies.	3.4: Continue testing and implementation.
3.5: Extract island-wide counts and account for temporal displacement from SES breeding peak and adjust for ground validations (2.6) to produce final counts. Y2Q2.	3.5: Not started.	3.5: Continue as planned.
3.6: Calculate final census estimates for each sub-Antarctic Island. Y2Q2 to Y2Q3.	3.5: Not Started.	3.6: Continue as planned.
3.7: Production of at least one open access peer-reviewed journal article detailing the updated population estimates from the censuses at South Georgia, the South Orkney Islands, and the	3.6: Unexpected output of field season has led to the submission of a peer review paper about the impact of HPAIV on southern elephant seals alongside the incorporation of the identified archival	3.6: Complete the peer-review process for both submitted papers and work towards the submission of

South Shetland Islands. To be submitted by Y2Q3. **[DPLUS-C02, DPLUS-C06 & DPLUS-C17]**.	data into another data paper, which is due to be submitted for review shortly.	the main census paper output of the project.
3.8: Adapt aspects of the publication(s) outlined in 3.7 for publication in a more accessible format (e.g., Fronters for Young Minds article: https://kids.frontiersin.org/) to enhance the reach and increase the social inclusivity of the research. To be submitted during Y2Q3 to Y2Q4 after the scientific paper/papers outlined in 3.7.	3.7: Underway – discussions to be had with the editor of Fronters for Young Minds as to the suitability of adapting the HPAIV impact paper for this scope – concerns of the depressing nature of the findings and the audience.	3.7: Likely workaround will be to develop the findings of the project into a FYM paper.
Output 4. M&E, Provision of training and the dissemination of project findings and results		
4.1: Project M&E: weekly meetings held between the project lead and co-lead to monitor the fine details of the project; monthly meetings held with all project staff to appraise progress and refine mid-to-long term objectives. Minutes taken at all meetings, shared between participants and reviewed at the start of the following meeting.	4.1: Individual meetings held, and minutes supplied in attached log (Annex 5).	4.1: Ongoing recording of individual meeting minutes.
4.2: Twice yearly meetings held will all project partners to assess overall progress. Minutes taken at all meetings, shared between participants and reviewed at the start of the following meeting.	4.2: Whole PP meetings difficult to implement due to fieldwork deployments and non-project commitments by PPs / stakeholders.	4.2: Annual meeting to be held in summer 2025.
4.3: Reports delivered, and project summary training workshop provided to 25% (n = 3) of GSGSSI staff along with invited internal/external parties (i.e., BAS, NGOs). This workshop will detail the following pre-publication findings: (i) UAV survey procedures, (ii) adaption of lessons learned from DPLUS109; (iii) satellite image analysis protocols; (iv) automation protocols; and (v) signposting to where these open access resources can be found for future reference after the lifetime of this project. This summary training workshop will be conducted before the end of the project in Y2Q2 to Y2Q4. **[DPLUS-A01, DPLUS-A03, DPLUS-C14]**	4.3: Not started.	4.3: Implementation towards the end of the project, likely Y2Q4.

4.4: Publicly available repository of satellite census data and ground-truthed UAV imagery finalised by Y2Q4. **[DPLUS-C16]**	4.4: Completed – all 2024 UAV data available at the PDC (see 3.1)	4.4: Further deposits to be made once automated methods developed.
4.5: Report detailing updated population estimates from all monitored sub-Antarctic islands provided to SCAR CAPS Action Group by Y2Q4. Population estimates communicated to CCAMLR's krill risk assessment for sub-Area 48.3. **[DPLUS-C19]**	4.5: Not started.	4.5: To be implemented once census has been finalised.
4.6: Non-technical communication of research findings to the public via social media channels (i.e., Twitter and Instagram) and institute's website. Ongoing throughout the project, with reporting milestones taken monthly and annually during the tenure of the grant. **[DPLUS-C12** & **DPLUS-C19]**	4.6: Ongoing.	4.6: Emphasis on this during the publication of main project findings – likely Y2Q1 and Y2Q4.
4.7: Communication of key findings and results at least one international conference during the tenure of this proposal Y2Q3 to Y2Q4.	4.7: Not Started.	4.7: Completion of main findings required – these will then be communicated at a major conference.
4.8: Enhancing capacity available in the OT through providing formal UAV operator training and an official qualification (A2 CofC and GVC) to one member of the King Edward Point Research Station Science Staff by Y2Q1. **[DPLUS-A01]**	4.8: Completed – training provided to science manager in OT enhancing on-island capability.	4.8: n/a

Project Summary	SMART Indicators	Means of Verification	Important Assumptions
Impact: Sustainable and cost-effective satellite remote sensing enables the population status of southern elephant seals (SES) on sub-Antarctic Islands to be updated, updating baselines, and informing long-term conservation and management actions.			
Outcome: Provide census data, distribution maps and establish imagery-based monitoring protocols for SES over South Georgia, the South Orkney, and South Shetland Islands, improving species management, conservation policy and species advocacy.	0.1: Counts from VHR satellite imagery provide a means of estimating abundance at breeding sites across the three island groups leading to the publication of three island-wide population censuses for southern elephant seals by March 2026 (Y2Q4). **[DPLUS-C02]** 0.2: New satellite imagery analysis protocols will be developed and	0.1.1: Data detailing the counts and distribution of SES breeding sites located in the satellite images of the three island groups published in Open Access peer-reviewed journals measured by journal confirmation email and journal metrics (e.g., access counts, citations, etc.) accessed from publisher or 3rd party (e.g., Altmetric) after publication. Aiming for 5 citations within a year of publication, and >1,000 downloads of the publication. 0.1.2: Data on new breeding locations, specifically in the southeast of South Georgia provided directly to GSGSSI as key deliverable to SGSSI MPA Research and Monitoring Plan Theme 3. Measured by email acknowledgement. 0.2: Analyses protocols and code published in Open Access peer-reviewed journals or suitable code-repository (e.g., GitHub). Measured by	**Data acquired at an appropriate scale as to be able to produce a representative census on each of the three targeted sub-Antarctic islands.** Satellite data acquisition will be tasked to coincide with known peaks in seal numbers on the islands. As a contingency for poor weather, which would limit data acquisition, satellites will be tasked with a higher permissible cloud cover threshold and for a week either side of the peak for each island group to maximise the likelihood of successful data collection.

	published in peer reviewed journals to enhance the longevity of the project's impacts post completion, ensuring long-term uptake of the developed methods at other sites. Paper to be submitted for publication by December 2025 (Y2Q3). **[DPLUS-C02, DPLUS-C06 & DPLUS-C17].** 0.3: Stakeholder engagement throughout will feed the results into regional conservation management. Aim to enhance the species-specific provisioning in a minimum of one national level policy or management plan for the Governed OT's (South Georgia) and recommendations published for OT's south of 60°S (South Orkney and Shetland Islands) by the end of the project in March 2026 (Y2Q4) **[DPLUS-B02, DPLUS-D03** & **DPLUS-C19]** 0.4: Stakeholder engagement throughout will feed the results into regional conservation management. Aim to enhance the species habitat provisioning in a minimum of one national level policy or management plan for the Governed OT's (South Georgia) and recommendations published for OT's south of 60°S (South Orkney and Shetland Islands) by the end of the project in March 2026	journal confirmation email and journal metrics (e.g., access counts, citations, etc.) accessed from publisher or 3rd party (e.g., Altmetric) after publication. Aiming for 5 citations, >1,000 downloads of the paper and >100 pages access on GitHub (if used). 0.3: Findings seminar/workshop (attendance disaggregated by gender, age group, etc.) provided alongside reports to GSGSSI detailing species-specific provisioning recommendations to be included in both the 5-yearly MPA review and the development of site-specific management plans for the Terrestrial Protected Areas process. 0.4: Findings seminar/workshop (attendance disaggregated by gender, age group, etc.) provided alongside reports to GSGSSI detailing species habitat provisioning recommendations to be included in both the 5-yearly MPA review and the development of site-specific management plans for the Terrestrial Protected Areas process.	

	(Y2Q4) **[DPLUS-B01, DPLUS-C02, DPLUS-D03** & **DPLUS-C19]** 0.5: Enhancing understanding of species specific biodiversity at government institutions, both in the OT and the UK **[DPLUS-A07]**, and with the wider community via social media channels **[DPLUS-C12]** by the end the project in March 2026 (Y2Q4)**.**	0.5.1: Dissemination of findings via stakeholder reports providing diagnostic metrics disaggregated by age/gender where available. 0.5.2: Dissemination of findings via online social media channels (e.g., Twitter & Instagram) providing diagnostic metrics (e.g., number of followers, accounts reached and post interactions) disaggregated by gender/age group where available. 0.5.3: Aiming for 500 to 1,000 followers between both social media platforms, with an average of 25 interactions (e.g., 'likes', 'comments', or 'reactions') per post by the end of the project in 2026.	
Outputs: **1**. Development of an automated approach to scan acquired VHR satellite imagery.	1.1: Scoping of most appropriate automation methods, likely to be a UNET CNN (based on previous experience and efficacy with similar species). Y1Q1. 1.2: Review existing imagery available from DPLUS109 and create expert training dataset for the development of the automated approach to image scanning. Y1Q1.	1.1: Internal project staff review at monthly M&E meeting to review automation options (attendance disaggregated by gender, age group, etc.). 1.2: Internal project staff review of existing data. Status of training dataset reviewed at monthly project M&E meeting to assess validity (i.e., is the overall size of the dataset suitable as a stand-alone training dataset, or does it need supplementing with new imagery?). 1.3: *ibid* (if required)	**Data acquired at a suitable volume to facilitate the development and training of an automated scanning algorithm.** To expedite this output existing data from DPLUS109 will be used, fast-tracking the establishment of a training dataset. This will enable concurrent progress to be made on both the automation development and the acquisition of the data for the 2024 census year. If additional training data are required, these can be sourced from the acquired census data, supplementing, and enhancing the pre-established training dataset.

	1.3: If needed, supplement training data from imagery acquired over the 2024 breeding season. Y1Q4. 1.4: Training and refinement of final method of automation. Collation of code to open-source repository. Y2Q1 to Y2Q1.	1.4: Internal review of proposed methods among project staff; results assessed on test images; test statistics reported at weekly and monthly M&E project meetings (attendance disaggregated by gender, age group, etc.).	
2. Provide counts of SES on one or more breeding beaches over the presumed breeding peak at the end of October to: (i) better understand arrival and peak breeding times on South Georgia, and (ii) to validate acquired VHR population estimates and correctly adjust for any temporal misalignment.	2.1: Identification of survey locations (i.e., known breeding beaches) informed by published data and BAS' internal records. Y1Q1. 2.2: Finalise fieldwork planning (begun pre-grant in January 2024). Y1Q1 to Y1Q2. 2.3: Design surveys in flight software, assess the frequency of flights needed and prepare UAV for transportation to South Georgia. Y1Q2. 2.4: Conduct ground-count and peak of breeding validation surveys. Y1Q3. 2.5: Produce orthorectified image mosaics and analyse imagery acquired during 3.3 and produce adjustment recommendations for final population estimates (see 3.4). Y1Q4 to Y2Q2.	2.1: Internal review between project staff at monthly M&E meeting to review site selection (attendance disaggregated by gender, age group, etc.). 2.2.1: Receive confirmation email signing off on fieldwork plans from BAS Operations. 2.2.2: Receipt of permits from GSGSSI. 2.3: Internal review at monthly M&E meeting, and receipt of consignment note for UAV shipment (attendance disaggregated by gender, age group, etc.). 2.4: Successful acquisition of UAV imagery over at least one breeding beach at regular intervals spanning SES' presumed breeding peak. 2.5: Internal review at monthly M&E meeting between expert project staff	**Underlying data for both ground truthing and peak of breeding timing collected successfully at South Georgia.** The field team will make in situ decisions, considering local and forecasted weather conditions when finalising survey site selection to maximise the likelihood of successful data collection. Backup platforms (i.e., quadcopter UAV's) and spare parts will be taken to safeguard against mechanical failure in the primary system. Multiple qualified pilots will be present in the field to safeguard against illness or injury disrupting data collection. However, safe operation and both human and animal safety will always precede data acquisition.

	2.6: Incorporation of outputs into analyses and peer-reviewed publication outlined in more detail below (3.5 to 3.7).	(attendance disaggregated by gender, age group, etc.). 2.6: Internal review at monthly M&E meeting between expert project staff (attendance disaggregated by gender, age group, etc.).	
3. Produce island-wide population censuses for SES using VHR satellite imagery for each sub-Antarctic archipelagos: (i) South Georgia; (ii) the South Orkney Islands; and (iii) the South Shetland Islands.	3.1: Identification of Areas of Interest (AOIs) for VHR satellite imagery tasking. These AOIs will detail (i) the locations where SES are known to breed, which will ascertained from a literature search; as well as including (ii) the identification of candidate AOIs from understudied regions. These are likely to include speculative taskings of regions where SES maybe expected to come ashore based on topographic data and historic sealing records. Y1Q2. 3.2: Set up the image tasking order (including tendering process, if needed) with imagery provider for the 2-week window either side of the known peak in SES breeding. Y1Q1 to Y1Q2. 3.3: Acquire VHR satellite images from active tasking for SES breeding peak at the end of October. Y1Q3. 3.4: Apply automation methodology developed in 1.4 to all VHR satellite imagery acquired for the three islands. Y1Q4 to Y2Q2.	3.1: AOIs reviewed by expert project staff and feedback obtained from GSGSSI for AOIs on South Georgia. 3.2: Order confirmation received from satellite company and order ID generated. 3.3: Images downloaded from provider and quality verified by experts. 3.4: Results assessed internally at monthly project M&E meeting (attendance disaggregated by gender,	**Delay in the publication of projects findings due to slow peer review times at many journals.** Journal article detailing population censuses will be prepared ahead of the end of the project, thus maximising the likelihood that results are disseminated in a timely fashion once the project reaches its conclusion. Primary stakeholders (GSGSSI and BAT) will be informed and consulted ahead of submission. Additionally, the communication of results via formal twice-yearly reports to GSGSSI alongside online social media post and reports to the SCAR CAPS Action Group will expedite the delivery of the project's findings to stakeholders and wider audiences.

		age group, etc.); test statistics detailing accuracy and thresholding used for each site on each of the sub-Antarctic Islands targeted.	
	3.5: Extract island-wide counts and account for temporal displacement from SES breeding peak and adjust for ground validations (2.6) to produce final counts. Y2Q2.	3.5: Internal review of final counts at monthly and weekly M&E meetings (attendance disaggregated by gender, age group, etc.).	
	3.6: Calculate final census estimates for each sub-Antarctic Island. Y2Q2 to Y2Q3.	3.6: Internal review of final counts at monthly and weekly M&E meetings (attendance disaggregated by gender, age group, etc.).	
	3.7: Production of at least one open access peer-reviewed journal article detailing the updated population estimates from the censuses at South Georgia, the South Orkney Islands, and the South Shetland Islands. To be submitted by Y2Q3. **[DPLUS-C02, DPLUS-C06 & DPLUS-C17]**.	3.7.1: Internal review of manuscript during its projection at weekly M&E meetings (attendance disaggregated by gender, age group, etc.). 3.7.2: Final draft provided to GSISSI and BAT (via FCDO) prior to journal submission to receive feedback. 3.7.3: Journal submission confirmation email. 3.7.4: Journal metrics (e.g., access counts, citations, etc.) accessed from publisher or 3rd party (e.g., Altmetric) after publication. Aim of >1,000 article access records, and 5 citations by the end of the project in spring 2026.	

	3.8: Adapt aspects of the publication(s) outlined in 3.7 for publication in a more accessible format (e.g., Fronters for Young Minds article: https://kids.frontiersin.org/) to enhance the reach and increase the social inclusivity of the research. To be submitted during Y2Q3 to Y2Q4 after the scientific paper/papers outlined in 3.7.	3.8.1: Internal review of manuscript at monthly M&E meetings (attendance disaggregated by gender, age group, etc.). Final draft circulated with all project partners and stakeholders for feedback prior to submission. Initial confirmation email from the journal. 3.8.2: Access metrics available from publisher's site. However, the scope of these metrics are greatly reduced compared to those available for a full journal article. Here we will instead promote the article via social media (e.g., Twitter, Instagram), with an aim of receiving >50 interactions with each respective post.	
4. M&E, Provision of training and the dissemination of project findings and results	4.1: Project M&E: weekly meetings held between the project lead and co-lead to monitor the fine details of the project; monthly meetings held with all project staff to appraise progress and refine mid-to-long term objectives. Minutes taken at all meetings, shared between participants and reviewed at the start of the following meeting. 4.2: Twice yearly meetings held will all project partners to assess overall progress. Minutes taken at all meetings, shared between participants and reviewed at the start of the following meeting.	4.1: Minutes appended to Darwin Plus reports. 4.2: Minutes appended to Darwin Plus reports.	**Difficulty attending training event leading to lower than desired attendance.** Not all project members may be able to attend project meetings due to scheduling and time zone differences (e.g., UK, Falkland Islands, France). Monthly and bi-annual meetings will be held at oscillating times, to enable full participation. Minutes will be shared to all members. Hybrid meetings will also be implemented to enable all working patterns to be accommodated. Findings and training workshop will be held virtually to facilitate maximum

	4.3: Reports delivered, and project summary training workshop provided to 25% (n = 3) of GSGSSI staff along with invited internal/external parties (i.e., BAS, NGOs). This workshop will detail the following pre-publication findings: (i) UAV survey procedures, (ii) adaption of lessons learned from DPLUS109; (iii) satellite image analysis protocols; (iv) automation protocols; and (v) signposting to where these open access resources can be found for future reference after the lifetime of this project. This summary training workshop will be conducted before the end of the project in Y2Q2 to Y2Q4. **[DPLUS-A01, DPLUS-A03, DPLUS-C14]** 4.4: Publicly available repository of satellite census data and ground-truthed UAV imagery finalised by Y2Q4. **[DPLUS-C16]** 4.5: Report detailing updated population estimates from all monitored sub-Antarctic islands provided to SCAR CAPS Action Group by Y2Q4. Population estimates communicated to	4.3.1: Project reports submitted to GSGSSI and acknowledgment of their receipt. 4.3.2: Project workshop delivered to GSGSSI and internal/external parties, attendance recorded (disaggregated by gender and age group) and post course feedback. 4.4: Census data and UAV imagery added to publicly accessible repository held by the Polar Data Centre at BAS and the GSGSSI MPA data portal. Verified by obtaining a DOI for this data repository and confirmation of online accessibility for the GSGSSI MPA data portal. 4.5: Submission acknowledgement email.	attendance and will be scheduled at times sympathetic to parental responsibilities (i.e., daytime and outside of school holidays), accounting for different time zone / educational schedules between the UK and the Falklands (GSGSSI Offices).

	CCAMLR's krill risk assessment for sub-Area 48.3. **[DPLUS-C19]**		
	4.6: Non-technical communication of research findings to the public via social media channels (i.e., Twitter and Instagram) and institute's website. Ongoing throughout the project, with reporting milestones taken monthly and annually during the tenure of the grant. **[DPLUS-C12** & **DPLUS-C19]**	4.6.1: Social media analytics summarised at monthly and annual intervals. Social media analytics include metric such as number of followers (disaggregated by gender where possible), total and growth, along with engagement interactions (i.e., likes, shares or reactions), and reach of posts. Institute website traffic also reported. 4.6.2: Aiming for 500 to 1,000 followers between both social media channels and for an average engagement of 25 interactions per post by the end of the project in 2026.	
	4.7: Communication of key findings and results at least one international conference during the tenure of this proposal Y2Q3 to Y2Q4.	4.7.1: Acceptance email from international conference. 4.7.2: Enhanced interaction with social media posts released during conference (above average aim of 25 interactions per post, see 4.6.2).	
	4.8: Enhancing capacity available in the OT through providing formal UAV operator training and an official qualification (A2 CofC and GVC) to one member of the King Edward Point Research Station Science Staff by Y2Q1. **[DPLUS-A01]**	4.8: Email confirmations for: (i) enrolment on the UAV exam training course; (ii) booking of the drone training courses; (iii) booking of the flight assessment; and (iv) the final confirmation of successful award of qualifications (copies of certificates	

		appended to M&E reporting at the appropriate stage).	

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. Each activity should start on a new line and be no more than approximately 25 words.)

Output 1: **Development of an automated approach to scan acquired VHR satellite imagery.**
1.1: Identification and review of the most appropriate automation methods leading to selection of a single method to implement
1.2: Review existing DPLUS109 satellite imagery and create a training dataset for machine learning methods
1.3: Supplement training dataset from imagery acquired over the 2024 breeding season (if required).
1.4: Train and refine final automation algorithm.

Output 2: **Production of a UAV-based ground truthing survey to validate the acquired VHR population estimates.**

2.1: Identify survey locations for UAV flights.
2.2: Finalise fieldwork plans for Austral summer 2024.
2.3: UAS ground validation and peak of breeding survey design
2.4: Fieldwork – UAV ground validation and peak of breeding survey
2.5: Produce orthorectified image mosaics and analyse UAV imagery from field surveys
2.6: Incorporate metrics from UAV surveys into population assessment 3.6

Output 3: **An island-wide population censuses of SES using VHR satellite imagery for each sub-Antarctic archipelagos: (i) South Georgia; (ii) the South Orkney Islands; and (iii) the South Shetland Islands.**

3.1: Identify AOIs for satellite imagery tasking.
3.2: Arrange image tasking (including tendering, if needed) with satellite imagery supplier.
3.3: Acquire satellite images from supplier
3.4: Apply automation developed in 1.4 to all acquired imagery
3.5: Extract island-wide counts, adjust for temporal displacements form SES breeding peak and for ground validation metrics.
3.6: Calculate final census estimates for each sub-Antarctic Island.
3.7: Production of peer-reviewed publication detailing the updated population censuses of each of the three sub-Antarctic islands examined.
3.8: Adaptation of publications into a more accessible and inclusive format (e.g., Frontiers for Young Minds article).

Output 4: **M&E, Provision of training and the dissemination of project findings and results**

4.1: M&E: Conduct regular assessments throughout the lifetime of the project: weekly & monthly meetings.
4.2: M&E: Conduct bi-annual project meeting with all project partners and stakeholders.
4.3: Prepare and submit findings report and deliver summary training workshop to GSGSSI and invited internal/external parties.
4.4: Deposit satellite census data and ground-truthed UAV imagery into a publicly available repository.
4.5: Report detailing the updated population assessments provided to SCAR CAPS Action Group.
4.6: Non-technical communication of research findings to the public via social media. Ongoing through the lifetime of the project.
4.7: Communication of results at international conference.
4.8: Provide UAV training to one person based at King Edward Point, South Georgia to enhance capacity on OT.

Table 1 Project Standard Indicators

Please see the Standard Indicator guidance for more information on how to report in this section, including appropriate disaggregation.

DPLUS Indicator number	Name of indicator	If this links directly to a project indicator(s), please note the indicator number here	Units	Disaggregation	Year 1 Total	Year 2 Total	Year 3 Total	Total to date	Total planned during the project
DPLUS-A01	Number of people in eligible countries who have completed structured and relevant training	4.8	People	Women	1			1	1
DPLUS-A01	Number of people in eligible countries who have completed structured and relevant training	4.8	People	Men	0			0	1
DPLUS-A03	Number of local or national organisations with enhanced capability and capacity.	4.8	Institutions	n/a	1			1	1
DPLUS-A07	Number of government institutions/departments with enhanced awareness and understanding of biodiversity and associated local community issues		Institutions	n/a	2			2	2
DPLUS-C12	Social Media presence	4.6	Followers (n=205)	Women	70.1%			144 individuals	n/a
DPLUS-C12	Social Media presence	4.6	Followers (n=205)	Men	29.8%			61 individuals	n/a
DPLUS-C12	Social Media presence	4.6	Age (n=205)	18-24	6.3%			13 individuals	n/a
DPLUS-C12	Social Media presence	4.6	Age (n=205)	25-34	49%			100 individuals	n/a
DPLUS-C12	Social Media presence	4.6	Age (n=205)	35-44	20.5%			42 individuals	n/a
DPLUS-C12	Social Media presence	4.6	Age (n=205)	45-54	10.7%			22 individuals	n/a
DPLUS-C12	Social Media presence	4.6	Age (n=205)	55-64	9.8%			20 individuals	n/a
DPLUS-C12	Social Media presence	4.6	Age (n=205)	65+	3.4%			7 individuals	n/a
DPLUS-C16	Number of records added to accessible databases	4.4	Number	n/a	3			3	4
DPLUS-C17	Number of unique papers submitted to peer-reviewed journals	2.6; 3.7	Number	n/a	2			2	2

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)
Dramatic decline in the world's largest population of southern elephant seals attributed to the arrival of High Pathogenicity Avian Influenza Viruses (HPAIV) on South Georgia	Journal	Bamford, C.C.G.; Fenney, N.; Coleman, J.; Fox-Clarke, C.; Dickens, J.D.; Fedak, M.; Fretwell, P.; Hückstädt, L.; Hollyman, P.	Male	British	Communication Biology	In review
The South Georgia Ecological Atlas: A dataset of biological and human activity from the 20th Century	Journal	Marie R.G. Attard; Sally Poncet; Jérôme Poncet, Francis Daunt; Fran Prince; Mari Whitelaw; Alysa Fisher; Connor C G Bamford; Philip Trathan	Female	British	Scientific Data	In prep
Drones and images from space count elephant seals	Website	BAS Comms Team & Connor Bamford	Female	British	BAS Website	Annex 5 or https://www.bas.ac.uk/media-post/scientists-use-drones-and-images-from-space-to-count-elephant-seals/

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, scheme, type of report (i.e. Annual or Final), and year) and **deleted the blue guidance text** before submission?	
Is the report less than 10MB? If so, please email to BCF-Reports@niras.com putting the project number in the Subject line.	
Is your report more than 10MB? If so, please consider the best way to submit. One zipped file, or a download option, is recommended. We can work with most online options and will be in touch if we have a problem accessing material. If unsure, please discuss with BCF-Reports@niras.com about the best way to deliver the report, putting the project number in the Subject line.	
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.	
Have you provided an updated risk register? If you have an existing risk register you should provide an updated version alongside your report. If your project was funded prior to this being a requirement, you are encourage to develop a risk register.	
If you are submitting photos for publicity purposes, do these meet the outlined requirements (see section 15)?	
Have you involved your partners in preparation of the report and named the main contributors	
Have you completed the Project Expenditure table fully?	
Do not include claim forms or other communications with this report.	