

Darwin Plus: Overseas Territories Environment and Climate Fund Annual Report

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

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

Submission Deadline: 30th April 2023

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

Darwin Plus Project Information

Project reference	DPLUS109
Project title	Initiating monitoring support for the SGSSI-MPA Research and Monitoring Plan
Territory(ies)	South Georgia and the South Sandwich Islands
Lead Partner	BAS - British Antarctic Survey
Project partner(s)	GSGSSI – Government of South Georgia and the South Sandwich Islands
Darwin Plus grant value	£283,417.00
Start/end dates of project	03/08/2020 to 10/11/2023
Reporting period (e.g. Apr 2022-Mar 2023) and number (e.g. Annual Report 1, 2)	01 May 2022 to 30 April 2023 Annual Report Year 3
Project Leader name	Philip Hollyman
Project website/blog/social media	https://www.bas.ac.uk/project/fixed-wing-wildlife-surveys-at-south-georgia/#about
Report author(s) and date	Philip Hollyman, Philip Trathan, Martin Collins, Nathan Fenney and Adrian Fox (BAS), Mark Belchier (GSGSSI)

1. Project summary

At South Georgia, the climate is changing. Further, species abundances are changing with the recovery of historically depleted species of seal, whale and finfish. In addition, the eradication of introduced non-native mammals from South Georgia is likely to lead to changes in terrestrial habitats, with consequent changes in species diversity. Taken together, these changes mean that large ecological changes are to be anticipated as species populations (and diets) alter.

Baseline estimates have been missed, due to a lack of resources before the eradication of non-native mammals. However, it is still feasible to establish recovery patterns if monitoring starts as soon as possible. Ecosystem change is likely to occur rapidly, so this project is now urgent.

We propose to initiate monitoring for a range of species and vegetation types in order to document change. Un-crewed aerial vehicles offer practical cost-effective solutions. This project will therefore introduce the use of new-generation fixed-wing survey drones, coupled with sophisticated analyses. This project will provide a step-change in ability for multi-species baseline reference surveys, while providing an established workflow into the SGSSI MPA Research and Monitoring Plan, facilitating updates for management policies. The resulting sample data will provide direct counts and trend information. They will also help ground-truth satellite remote-sensing data that cover a wider perspective than is feasible from ground surveys.

Future use of ground-truthed remote-sensing will ensure a lifetime beyond the scope of the current project. Such future-proofing, and legacy outputs will be vital for the SGSSI MPA Research and Monitoring Plan. Completing surveys of seabirds and marine mammals using traditional methods such as yachts is expensive and logistically challenging. Modern monitoring requires a different modus operandi.

This project will also contribute to the Blue Belt initiative currently underway by the UK Government, contributing to GSGSSI and potentially two other UKOTs - the Falkland Islands and the British Antarctic Territory. These Overseas Territories have surface breeding seabirds and marine mammals, so these UKOTs could also benefit from the project outcomes.

2. Project stakeholders/partners

Through DPLUS109, we have engaged with our key stakeholders and partners, GSGSSI and BAS. We have successfully completed two fieldwork seasons by engaging with GSGSSI Operations and Logistics Department to negotiate logistic capacity on the Pharos SG. This was initially agreed during Project development, as field access depends upon Pharos SG support. The relationship with GSGSSI is therefore vital for the success of the Project. Following the first fieldwork season (season 21/22) Nathan Fenney and Adrian Fox gave a presentation to GSGSSI to give them a summary of the completed work. The same talk was also given to BAS staff at the King Edward Point Station and BAS Cambridge on separate occasions. An invited talk reporting on the project to date will be presented at the upcoming SGSSI MPA workshop in June 2023.

We have also engaged with other stakeholders interested in the use of survey data obtained from UAVs. Related to this project, but funded separately, we have engaged with HiDef Aerial Surveying Ltd through a project funded by WWF (UK) to develop automated wildlife counting software for aerial imagery. This project will have great synergy with DPLUS109.

3. Project progress

We are making good progress on the project as envisaged under our log frame (Version dated 8 June 2020); see below.

3.1 Progress in carrying out project Activities

In Y1 a report detailing a list of high-priority, long-term monitoring sites for which baseline reference data should be collected was submitted to GSGSSI (Output 1, Activities 1.1 – 1.4). The list of sites was developed following consultation with experts from within BAS and externally. This report was used to plan the successful field trips undertaken in December 2021 - January 2022 and October 2022 (Activities 2.1 – 2.6.2). The order of fieldwork was changed due to logistical constraints of ship support in October 2021. Instead of the proposed field work in October 2021, January 2022 and December 2022, two trips were combined in the 2021/22 season representing the December and January field work. The October 2022 field trip was completed successfully, targeting the elephant seal breeding season in 2022. The change in timings of the three proposed field work seasons will not change the scope of any of the proposed work in the log frame.

Initial photogrammetric analysis of collected imagery including the production of high-resolution, georeferenced, orthorectified (geometrically corrected), aerial imagery mosaics for each monitoring site has been concluded and analysis of colony numbers is in progress (Activities 2.7 – 2.8.4 and output 3).

Population counts are currently being generated for all collected imagery (Activities 3.1 & 3.2). Based on these counts, two peer-reviewed papers are underway focussed on king penguins and southern elephant seals respectively (Activity 5.1). Initially, we were exploring an automated counting approach. However, several issues were encountered, principally that automated counting methods take an extended amount of time to 'train' to identify new species. The automated methods used by our collaborators have not been used on any of our target

species to date. We are also now collaboration with several other groups who are keen to develop automated counting methods for our target species (Activity 6.2). Work is ongoing to develop these algorithms to work with our species of interest. In the meantime, manual counting methods are being utilised to develop population counts based on the UAV imagery.

A methodology paper is underway outlining the process used during our surveys (Activity 4.1). The scientific staff at KEP already receive training in the use of quadcopter UAV platforms for their long-term monitoring work (Activities 4.2 & 4.3). We are currently in discussion with GSGSSI over the best person to complete the UAV pilot training (Activity 4.4).

In order to disseminate the work undertake during this project (Activity 6.1), talks have been given by the team at several points over the last 2 years:

- GSGSSI MPA workshop 2022 (Adrian fox)
- GIS Update – at the University of Edinburgh 2022 (Nathan Fenney)
- National Geographic Explorer 2022 (Nathan Fenney/Jamie Coleman)
- BAS internal – Innovation directorate 2022 (Nathan Fenney)

We will also be presenting an invited talk at the upcoming GSGSSI MPA Symposium (June 2023). Alongside in-person presentations, the project has submitted two articles to the South Georgia Association newsletter as well as a press release on the BAS news website (<https://www.bas.ac.uk/media-post/drones-survey-wildlife-populations-in-remote-sub-antarctic-island/>)

3.2 Progress towards project Outputs

Output 1 was successfully completed during year 2 of the project. For the fieldwork represented by Output 2, long discussions were undertaken with GSGSSI and Air Safety Support International (ASSI) to obtain permissions for beyond visual line of sight (BVLOS) operations. This was the first time this had been approved for flight at South Georgia, and the first time for UAV operations at BAS. The approval of BVLOS operations resulted in several sites with difficult boat landings now accessible via remote, easier landings (e.g. Figure 2). This resulted in another layer of consideration for each site in the site list, denoting where each flight would be flown from. For the October 2022 season, BVLOS was used for every flight. We also negotiated an increased maximum flying height of 600 feet from ASSI. Throughout the fieldwork, the maximum flight duration was 56 minutes and during that time we flew a distance of 42.8 km (at St Andrews Bay).

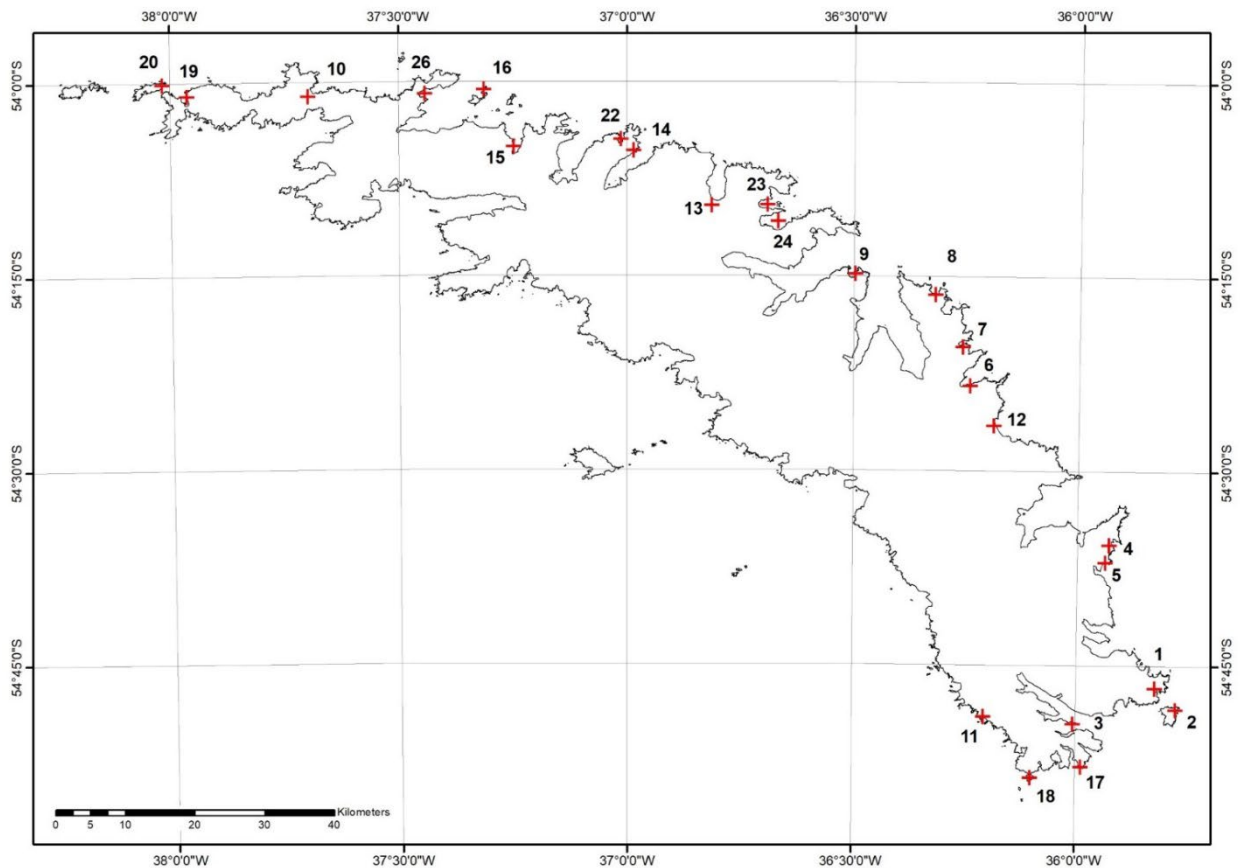


Figure 1. A map showing the location of 26 potential survey sites discussed with GSGSSI



Figure 2. Flight path from the survey of St Andrews Bay which captured both the elephant seal and king penguin colony's. This flight was possible due to BVLOS permissions, taking a total of 56 minutes during which the eBee X flew 42.8 km.

Output 2 has been completed with the success of an extended field season over December 2021 and January 2022 and a final season (focussed on southern elephant seals) in October 2022. Fourteen sites were surveyed representing all of the main species we were aiming to target over this time period (Gentoo penguins, Antarctic fur seals, king penguins, southern elephant seals and wandering albatross), several of these sites were flown multiple times during different seasons in order to survey different species (Activities 2.3 – 2.6).

Processing of imagery from both field seasons has progressed well resulting in the production of high-resolution, georeferenced, orthorectified (geometrically corrected), aerial imagery mosaics for each monitoring site (Activities 2.7 & 2.8) and population counts already available for many of the key species and sites (Activities 3.1 & 3.2).

Work is progressing towards the completion of output 4, with work started on a peer reviewed paper detailing the methods used during this study. A fieldwork report for both season is also currently being finalised for GSGSSI. The scientific staff at KEP are trained in the use of UAVs and will be able to help with future surveys using the fixed wing platform (although they will not be able to fly the platform themselves).

The imagery created during the survey is now resulting in population counts for key species (Output 3). Based on these results, two peer reviewed papers focussed on the populations of king penguins and southern elephant seals are currently being written for submission (Output 5.4). These papers will look at change over time of key colonies and will explore methodological approaches of both UAV and satellite imagery for wildlife counts. To this end, all available historical population data for these species has been collated from BAS data holdings as well as the (5.2) purchasing of satellite imagery to compare current populations to imagery from recent years.

Discussions are underway with several research groups to develop automated counting methods using the imagery collected during this project (Output 6.1). After several team discussions, it was decided that this was a better and more repeatable approach than citizen science methods as the counting could be conducted in-house, as opposed to uploading imagery to an online platform (Output 3.1).

3.3 Progress towards the project Outcome

Good progress has been made towards all outcomes. The list of sites agreed with GSGSSI will result in a final list of high priority sites once all imagery has been analysed (Outcome 0.1). Field data has been collected from fourteen sites representing five of the key higher predator species initially targeted, spanning two field seasons (Outcome 0.2). Once all the image processing and population counts from both fieldwork campaigns has been completed, a formal report will be submitted to GSGSSI and CCAMLR with associated detailed maps and imagery (Outcome 0.3).

3.4 Monitoring of assumptions

Assumption: Survey sites are accessible via land, IAATO vessel or via FPV Pharos.

Comment: we were able to access sites via a range of routes: via land, via the FPV Pharos and by small boat landing from King Edward Point, confirming the sites could be accessed using a range of approaches that would be site-dependant.

Assumption: Fieldwork deployment takes into account potential for weather related delays.

Comment: Weather caused UAV flights to be called off several times due to either excessive rain, wind or both. Even so, fourteen sites were fully surveyed over two field seasons. When based aboard the Pharos, weather was the deciding factor in making a small boat landing to attempt to survey a site.

Assumption: Field activities can be rescheduled if delayed by significant weather events / operational disruptions during grant period.

Comment: Operational issues that caused the original October 2021 season to be postponed were also encountered in October 2022. However, through prolonged engagement with GSGSSI and BAS, these issues were overcome (see section 9)

Assumption: Ability to determine population using automated methods. Penguins for example, make an ideal candidate due to the regular spacing between the nests*. However, elephant seals lie on top of each other, so in this case, counting may have to be undertaken manually, or by citizen science.

Comment: there are significant difficulties in training automated counting methods to count new species. This work is ongoing in collaboration with several other research groups. Manual counts of imagery are well underway in the event that the automated counting is not suitable for the collected imagery.

Assumption: To determine an accurate baseline population, surveys must have been undertaken during a specific time period for each species, otherwise data will not be representative.

Comment: effort was made to only survey populations at the correct time of year. Even so, there is a chance that the optimal time for each species/population was not utilized (as this may be a short window and there may be many sites to visit). This will be taken into account in any subsequent analysis/

Assumption: GSGSSI and KEP Project able to identify most appropriate personnel to receive training.

Comment: BAS have ensured that KEP staff are familiar with UAV survey techniques for their own long-term monitoring work. Discussions are ongoing with GSGSSI regarding the most appropriate staff member to engage with this project longer-term.

Assumption: Historical data available for long term monitoring sites. Not technically required, but would add value.

Comment: a good range of historical UAV, count and satellite imagery data is available for a wide range of the surveyed species.

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

The overall aim of this project is to 'Initiating monitoring support for the SGSSI-MPA Research and Monitoring Plan'. This monitoring plan is reviewed on a 5-year basis, with the next science symposium for the review to be held in June, 2023. The project was approached to present the work undertaken so far as GSGSSI recognise the potential contribution this project will have. This contribution will be established not only through the development of long-term monitoring sites for key higher predator species, but also via the development of UAV survey techniques at South Georgia.

At the end of the project we will propose a list of important sites for monitoring into the future using the fixed wing platform. We hope that if this monitoring is maintained, it will be of crucial importance for future 5-year MPA reviews at South Georgia, focussing on species that currently don't have established widespread population monitoring. The establishment of long-term monitoring of this type is of paramount importance, allowing scientists to detect impacts from environmental change (such as climate change) into the future.

5. Gender equality and social inclusion

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

Please quantify the proportion of women on the Project Board ¹ .	0
Please quantify the proportion of project partners that are led by women, or which	0

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.

have a senior leadership team consisting of at least 50% women ² .	
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6. Monitoring and evaluation

As part of the project we hold frequent team meetings to discuss different aspects of the implementation and future direction of work. These meetings include all scientists involved in the project. This ensures that all participants are aware of ongoing plans and any necessary changes. It gives participants opportunity to evaluate and comment on all decisions.

Some slight deviations to the log frame were made in relation to fieldwork due to logistical restrictions of ship availability. As stated above, the October 2021 field season was been moved to October 2022 and was completed successfully. The December 2021 field season was combined with the January 2022 season so that there was no change to the scope of the project. A report for this field season was completed and submitted to GSGSSI. In advance of this Nathan Fenney and Adrian Fox gave a summary report to GSGSSI in Stanley in the form of a presentation, following the completion of the 2021/22 field season.

A majority of meetings have been held virtually, liaison with GSGSSI and with others has also been virtual, or by email. Where possible meetings are undertaken in person as this often results in more fruitful discussions.

Financial oversight has been undertaken by the BAS Finance Team, who have communicated with the Project personnel through virtual meetings and email.

The use of virtual meetings has not been a barrier to progress, and all work has been completed. Although in-person meetings are preferable, virtual meetings have allowed work to continue and therefore have been a suitable approach. More recently, several in-person meetings of the team have taken place following the recent fieldwork trip.

The key indicators of achievement are those detailed in the log frame.

7. Lessons learnt

Regular contact with GSGSSI proved to be essential for both the planning and completion of fieldwork on both a scientific and operational level. The building of good working relationships in this regard was essential for the success of the project.

Last year, the significant effort spent planning the fieldwork and building in redundancy proved crucial. Despite encountering a number of significant challenges during the planning of fieldwork including but not limited to; lack of vessel support for science and a lack of vessels to transport staff to/from South Georgia, the season was successfully delivered.

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

One comment was raised at the last annual review for us to address:

In section 3.2. you mentioned having managed to survey all the species you were targeting but did you manage to survey all the sites you were hoping to survey? I.e. were you hoping to survey 13 of the 26 potential sites or more? Are there any site gaps?

We did not manage to survey every single site that was proposed in Figure 1. This represented all of the sites we would like to survey in an ideal world. In reality, for us to have surveyed all of those sites in the detail needed to capture all the species we wanted to survey, we would have been looking in the region of 40 days of survey time. With logistical issues (covered in this

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.

report and last year's report) as well as the regular inclement weather at South Georgia, this would not have been achievable. What we did instead was discuss all of these sites with GSGSSI to develop a priority list of what we knew were the large and important colonies of each species. We then added all of the sites from Figure 1 to our permit to allow for flexibility in the surveying. Both the project team and GSGSSI are happy with the coverage of sites achieved throughout the two field seasons.

9. Risk Management

One risk which caused a minor issue with budgeting was the increase in costs to stay aboard the Pharos SG during fieldwork by GSGSSI. These costs were communicated after all fieldwork had been planned and were backdated to cover the second field season. This did not have a large effect on the overall budget as only two staff members undertook the field work, when we had budgeted for three.

We also encountered significant difficulties during the planning stages of the October 2022 field season. The season had been postponed from 2021 due to logistical constraints, and the same issues were encountered in 2022. October is a busy time of year for the Pharos SG (the vessel supporting the project), due to large numbers of staff being moved between the Falkland Islands and bases on South Georgia. This meant there was no way to transport the field team to King Edward Point. Eventually, an extra trip to the Falkland Islands was organised to enable the BAS wintering staff team to be taken to Bird Island Station. Through close working relationships with GSGSSI and BAS operational teams, we were able to utilise this trip to get the field team to KEP. We encountered the same issue at the end of the season, with no scientific or government vessels available to transport staff. To fix this issue, we liaised with the International Association of Antarctic Tour Operators (IAATO), to secure passage aboard a cruise ship for the team.

10. Other comments on progress not covered elsewhere

Since the last reporting period, one of the senior staff members on the project retired (Adrian Fenney). To address the reduced staffing on the project, we submitted a change request to redistribute Adrian's salary costs in order to extend the project. This was approved and the project will now run until mid-November 2023, allowing for full completion of all outputs.

We have also developed a project web page, which was not planned in the original project (<https://www.bas.ac.uk/project/fixed-wing-wildlife-surveys-at-south-georgia/#about>).

During the field season we also had the opportunity to test a combined thermal + RGB payload in the project's eBee X and conduct a series of test flights over fur seals at KEP. Using traditional RGB imagery to identify fur seals in the tussock is challenging, however, the team was keen to test if thermal imagery would have more success. A series of repeat surveys were undertaken collecting both thermal and RGB imagery over a defined target area (Figure 3). Each of surveys was conducted at a different altitude allowing the team to investigate both the ideal ground sampling distance for detecting fur seals in tussock and consider the optimal specifications for undertaking large-scale thermal surveys on South Georgia.

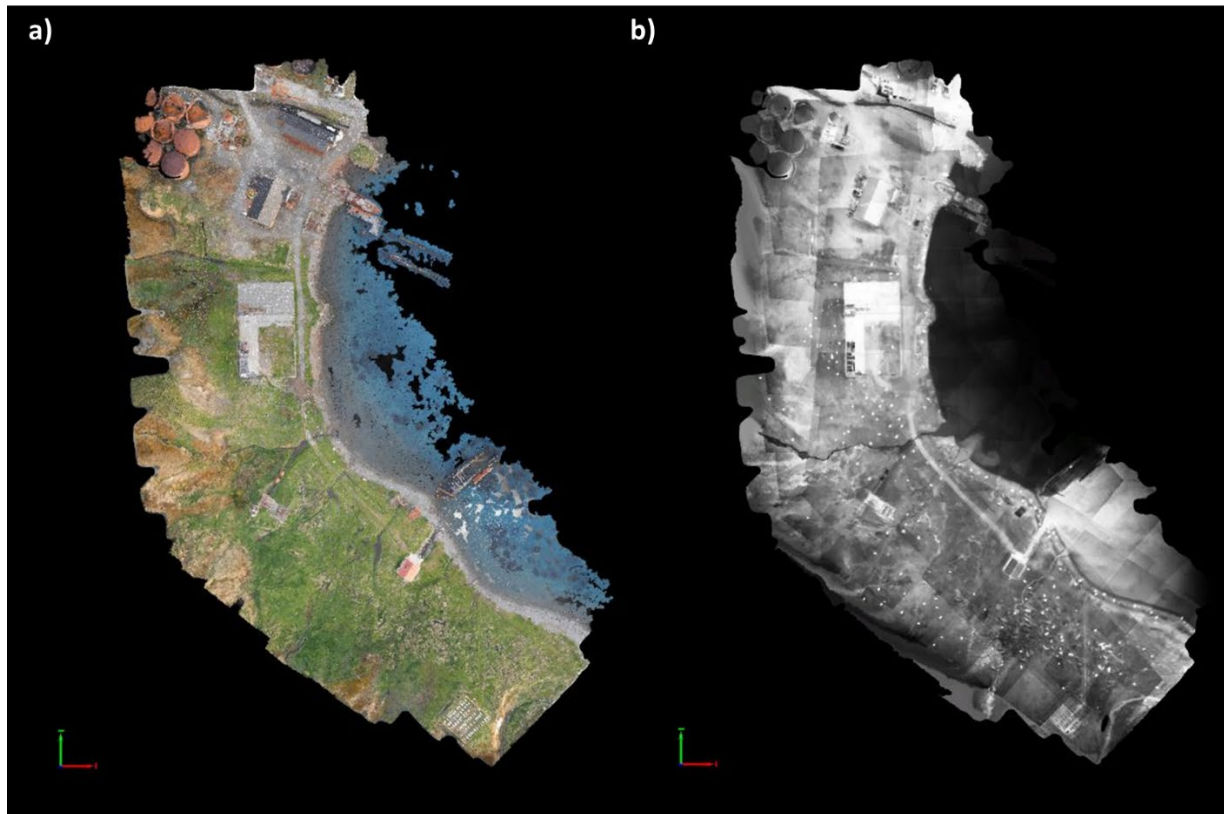


Figure 3. Side-by-side comparison of RGB imagery (a) and thermal imagery (b) from Grytviken, South Georgia. The white dots visible in b) represent individual fur seals which are not visible on the a) due to coverage of tussock grass.

11. Sustainability and legacy

When our Project was funded, other UK OTs interested in the use of UAVs contacted us for details. We plan to update interested OTs once we have successfully processed the imagery from the two field seasons and have some results to share.

Our planned exit strategy remains valid. At the end of the Project, we intend to pass control of the UAV to the KEP Project at BAS, so that work can continue into the future. Discussions with GSGSSI are ongoing to determine who might be best placed to get trained in fixed wing operations to ensure longevity of the project.

We have also participated in writing one peer-reviewed paper that includes details of our selected monitoring sites. This is so scientists external to the project, understand our objectives and can contribute where they have capacity. A methods paper focussed on the use of the fixed wing platform for wildlife monitoring at South Georgia is currently in production (Activity 4.2).

12. Darwin Plus identity

GSGSSI is very aware of the value of the Darwin Initiative.

When outputs from the Project become available, we will ensure they are promoted with the Darwin logo prominently displayed. As identified in our log frame, we will also undertake relevant outreach about the outputs that we deliver.

The Darwin logo is present on the project webpage and has been included in all talks resulting from the project.

13. Safeguarding

Has your Safeguarding Policy been updated in the past 12 months?	Yes
Have any concerns been investigated in the past 12 months	No
Does your project have a Safeguarding focal point?	<i>Yes we have a safeguarding lead across BAS</i>
Has the focal point attended any formal training in the last 12 months?	<i>Yes the lead has attended a formal training session on her role and responsibilities as safeguarding lead</i>
What proportion (and number) of project staff have received formal training on Safeguarding?	Past: 50 % (3 staff members. Collins, Hollyman & Fenney) Planned: n/a
<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 has been to engage staff who had an inaccurate idea of what safeguarding was and who affected. We do not employ staff working with children, however many of our staff live and work in isolated environments and under challenging conditions. These make them more vulnerable than others.</i></p>	
<p>Does the project have any developments or activities planned around Safeguarding in the coming 12 months? If so please specify.</p> <p><i>More training across all BAS personnel is planned this year.</i></p>	

14. Project expenditure

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

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

Capital items				
Others (Please specify)				
TOTAL	75,146.0	73,217.4		

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

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

15. OPTIONAL: Outstanding achievements or progress of your project so far (300-400 words maximum). This section may be used for publicity purposes

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

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

Annex 1: Report of progress and achievements against Logical Framework for Financial Year 2021-2022

Project summary	SMART Indicators	Progress and Achievements April 2021 - March 2022	Actions required/planned for next period
<p>Impact</p> <p>Strategic long-term scientific monitoring project addressing ecosystem change relationships for important land-based predator species, forming an important contribution to the SGSSI MPA Research and Monitoring Plan.</p>			
<p>Outcome</p> <p>Establishment of a rigorous, multi-species, baseline reference dataset for seabird and seal colonies at South Georgia, used to inform policy decisions by GSGSSI and CCAMLR.</p>	<p>0.1 Creation of a list by Q3Y1 of high priority, long-term monitoring sites, for which the baseline reference data will be collected.</p> <p>0.2 Completion of field data collection at each monitoring site. To be undertaken over three campaigns and completed by Q2Y3.</p> <p>0.3 Detailed description and maps / orthorectified imagery, defining spatial extent of each long-term monitoring site. To be complied by Q3Y3.</p>	<p>0.1 Formal report submitted to GSGSSI. We delivered our fieldwork plans, including maps showing proposed monitoring sites (completed in Y1 and reported in 2021 annual report)</p> <p>0.2 First year of fieldwork completed with a successful extended field season (two proposed field campaigns combined in to one).</p> <p>0.3 Image processing from the first set of field work has begun and will continue over the next few months.</p>	<p>0.2 Second field season planning underway for Oct 2022. The generation of a fieldwork report, detailing sites visited and data collected will begin within the next year to be completed by Q2Y3.</p> <p>0.3 Following the completion of the second field season and resulting image analysis, a formal report and supplementary maps and image data will be submitted to both GSGSSI and CCAMLR.</p>
<p>Output 2.</p> <p>High resolution, georeferenced, fixed-wing UAV aerial survey of each of the monitoring sites identified in Output 1 for the purpose of creating baseline reference datasets.</p>	<p>2.1 Completion of aerial survey / field data collection at each monitoring site. Three periods of fieldwork have been defined based on the requirements of the species being</p>	<p>Good progress has been made towards Output 2 with the completion of the final field season between mid-October and mid-November 2022. All five elephant seal colonies were successfully surveyed along with a series of flights at KEP testing a new combined RGB + thermal payload for the eBee X platform. These flights were undertaken to investigate the potential of using a thermal sensor to detect fur seals who have moved up into the tussock from the beach.</p>	

	<p>monitored, October 2021, January 2022 and December 2022.</p> <p>2.2 Initial photogrammetric analysis to be undertaken after data collection. To be completed by Q2Y3*.</p> <p>4.4 High resolution (2.5 cm), georeferenced, orthorectified (geometrically corrected), aerial imagery mosaics for each monitoring site to be created. To be completed by Q2Y3*.</p>	<p>Processing of imagery from both seasons has been completed, resulting in the production of high-resolution, georeferenced, orthorectified (geometrically corrected), aerial imagery mosaics for each monitoring site. The fieldwork report for both seasons is underway to be completed within the next month; this has been delayed due to staff leave and other work priorities. A report of the fieldwork was presented to both GSGSSI and BAS in the form of an in-person presentation (two separate occasions).</p>	
<p>Activity 2.2</p> <p>Produce fieldwork plan.</p>		<p>Detailed fieldwork plan produced and shared with GSGSSI – this plan was used to undertake the second field season and contained many contingencies in the event of inclement weather.</p>	<p>NA</p>
<p>Activity 2.3</p> <p>Work with GSGSSI and BAS to arrange logistics.</p>		<p>Early discussions were had with BAS to arrange logistics for shipment of equipment and GSGSSI to arrange logistics for ship support and the use of KEP resources.</p>	<p>NA</p>
<p>Activity 2.4</p> <p>Ship equipment for fieldwork.</p>		<p>All equipment was shipped on time and arrived in advance of fieldwork.</p>	<p>NA</p>
<p>Activity 2.5</p> <p>Deploy staff to South Georgia to undertake fieldwork.</p>		<p>All staff were deployed in good time in advance of the fieldwork.</p>	<p>NA</p>
<p>Activity 2.6</p> <p>Undertake data collection (for each monitoring site).</p>		<p>Five elephant seal sites were successfully surveyed representing a 100% success rate for sites we were aiming to target over this time period.</p>	<p>NA</p>
<p>Activity 2.6.1</p> <p>Run GNSS base station.</p>		<p>The project used Trimble geodetic GNSS receivers provided by MAGIC / BAS to operate as base stations</p>	<p>NA</p>

	throughout the fieldwork. For redundancy a pair of receivers was shipped to South Georgia. The receivers operated without issue.	
Activity 2.6.2 Undertake UAV survey.	The project operated two SenseFly eBee X fixed-wing RPAS platforms during the course of the second field season. For redundancy the platforms were an identical pair. All flight operations were conducted BVLOS with the platform reaching distances of up to 3 km from the pilots. This allowed the field team to successfully survey large areas from a single take-off / landing position. For example, one flight over St Andrews Bay lasted 56 minutes with a total flight distance of 42.8 km. . The SenseFly eBee X excelled over the largest sites due to its speed and efficiency during data capture, allowing the team to take advantage of small breaks in the weather. This 'ability' has proven decisive especially given the extreme nature of South Georgia's weather allowing us to for example survey 4.3 km of shoreline around Husvik Harbour in just over 15 minutes. As with the first season, both the weather and topography in South Georgia provided a significant challenge at times, however, a combination of the experience of the field team (especially the local knowledge) and excellent support provided by FPV Pharos SG and KEP ultimately lead to a series of successful RPAS surveys.	NA
Activity 2.6.3	Both the RPAS survey and GNSS data was reviewed after each flight.	NA

Review data for quality control.	Operating in higher wind speeds while trying to make the most of the limited gaps occasionally necessitated re flying a site to ensure data was of an acceptable quality.	
<p>Activity 2.7</p> <p>Undertake GNSS processing (for each monitoring site).</p>	<p>GNSS processing has been completed all sites surveyed. The processing is undertaken in two stages; first by determining the an accurate position for the base station using PPP (precise point positioning) and then using the position calculated to undertake PPK (post-processed kinematic) processing of the on-board RPAS GNSS receiver. The processing conducted so far has been undertaken without issue. Due to the more precise GNSS receiver carried by the SenseFly eBee X, data collected by the platform can be used to post-process earlier aerial surveys of the sites which has the potential to unlock older datasets.</p>	NA
<p>Activity 2.7.1</p> <p>PPK processing of on-board UAV GNSS unit.</p>	<p>The PPK processing undertaken on the data collected by the on-board RPAS GNSS receiver has met expectations with the positional accuracy of the unprocessed image centre data reported to be in the order of several metres, improved to 3 – 5 cm after processing.</p>	NA
<p>Activity 2.8</p> <p>Undertake photogrammetric analysis (for each monitoring site).</p>	<p>The photogrammetric analysis of the data collected at the monitoring sites visited during the first field season has been completed. The initial outputs from the analysis are promising and appear to closely match what was expected.</p>	NA

<p>Activity 2.8.1 Import and alignment of photos collected during the UAV survey.</p>		<p>Photogrammetry projects for all of the sites surveyed have been established.</p> <p>NA</p>
<p>Activity 2.8.2 Import PPK GNSS output to provide georeferencing.</p>		<p>Photogrammetry projects for all of the sites surveyed have been established.</p> <p>NA</p>
<p>Activity 2.8.3 Generate digital elevation model (DEM).</p>		<p>DEM's from all of the sites surveyed have been established.</p> <p>NA</p>
<p>Activity 2.8.4 Generate orthophoto.</p>		<p>Orthophotos from all of the sites surveyed have been created. Please note, the orthophotos generated represent initial outputs and will be refined to meet the requirements of the image analysis algorithms over the coming months.</p> <p>NA</p>
<p>Output 3. Population counts for each of the monitoring sites identified in Output 1 using the aerial survey datasets and input into the relevant national and international governing bodies (such as GSGSSI and CCAMLR).</p>	<p>3.1 Investigate most appropriate method for deriving population counts for each species (either automated image processing software or citizen science platform). This is to account for the different spatial distributions exhibited by penguins and seals while on land. To be determined by end of Q2Y2.</p> <p>3.2 Determine baseline populations for each of the monitoring sites, using the orthorectified imagery acquired during the aerial surveys. To be completed by Q3Y3.</p>	<p>3.1 Discussions are ongoing with several research groups on the best approach to apply automated counting techniques to the imagery. Whilst this is being developed, we have proceeded with manual counting methods to estimate population counts for the species we surveyed. Alongside this we are investigating methods for analysing spatial distributions and densities of populations.</p> <p>3.2 Good progress has been made towards this indicator with population counts available for several sites for each species surveyed.</p>
<p>3.1. Determine optimal counting method for each species.</p>		<p>Several automated counting platforms are being considered for this project. Whilst this is being developed, we have proceeded with manual counting methods to estimate population counts for the species we surveyed.</p> <p>Continue to engage with collaborators regarding automated counting methods.</p>

<p>3.2. Determine specific software to undertake image analysis / platform for citizen science count if required.</p>	<p>Several automated counting platforms are being considered for this project. In the meantime, ArcMap, Metashape and Pix4D are being used to process imagery and count the animal populations.</p>	
<p>3.3. Process the prepared orthophotos to determine population counts.</p>	<p>Good progress has been made on this indicator for several of the key species and sites.</p>	<p>This will progress until all sites are counted, resulting in population estimates.</p>
<p>3.4. Produce a report detailing the final counts at each of the sites for GSGSSI and input into CCAMLR.</p>		<p>This report will be produced upon the completion of the activities above.</p>
<p>Output 4. Documented workflow provided to GSGSSI to allow repeat surveys of monitoring sites to be undertaken on a regular basis into the future.</p>	<p>4.1 Produce a methodology paper documenting the workflow developed to both undertake the aerial surveys and determine the population. This is key as it would also allow for the methodology to be applied to other UKOT's. To be completed by Q4Y3.</p> <p>4.2 Train at least two GSGSSI field assistants regarding the data collection and data analysis aspects of the project, to allow GSGSSI to maintain long-term monitoring of the sites. To be completed by Q4Y3.</p> <p>4.3 Train at least one GSGSSI field assistant to operate the fixed-wing UAV / flight planning software. To be completed by Q4Y3.</p> <p>4.4 At least one GSGSSI field assistant to undertake the Remote Pilot Qualification – small (RPQ-s) for fixed-wing UAV's (<20 kg), to allow GSGSSI to maintain long-</p>	

	term monitoring of the sites. To be completed by Q4Y3.		
4.1. Document methodology used to undertake aerial survey and determine population at each site.		Detailed notes have been kept of all surveys with the aim of developing a methodological paper.	
4.2. Produce a methodology paper and submit to peer reviewed journal.		A methods paper is in progress, based on the work undertaken during both field seasons.	Methods papers will be developed for completion by the end of the project
4.3. Train GSGSSI KEP Project field assistant to undertake data collection and analysis.		KEP marine biologists are currently already trained to undertake UAV surveys using quadcopter UAVs.	
4.4. Arrange for GSGSSI KEP Project field assistant to undertake RPQ-s qualification.		All KEP marine biologists undertake the A2CofC and GVC qualifications (successor to the RPQ-s qualification).	
4.5. Train GSGSSI field assistant to operate fixed-wing UAV and flight planning software.		There are currently no GSGSSI staff available to train on the use of the fixed wing platform. The KEP marine biologists are trained to use other types of UAV, but are only on short term contracts. Several detailed discussions have taken place regarding the training of GSGSSI staff and they will continue until a suitable person is identified. One main obstacle to this is the contract length and workload of the GSGSSI staff who could potentially be trained.	Continue discussions with GSGSSI regarding this matter
Output 5. Increased scientific understanding of change at South Georgia.	5.1 Produce peer-reviewed scientific papers to consider what the project outputs tell us about South Georgia. To be completed by Q4Y3. The solution proposed (for undertaking large-scale, high resolution, repeatable aerial surveys using fixed-wing UAV's) has significant application across a number of UKOTs and as such, the intention is to publish separate methodology	Good progress is being made to produce two separate scientific papers based on the results of the two field seasons, with the possibility of a third. The first paper will look at counting methods for King penguin colonies, comparing several types of manual counts (of UAV imagery) against satellite imagery. The second, will look at inter-annual variability of elephant seal populations at key sites around South Georgia, including St Andrews where a time series of satellite imagery had been obtained, extending back to the year 2010. Good progress is also being made on a separate methodological paper.	

	papers for both the geomatics (aerial survey) and image analysis aspects.	
5.1. Review outputs.		
5.2. Consider other historical datasets for the sites where available.	All historical data for king penguin and elephant seal populations contained within BAS archives has been obtained in order to look at changes in key sites over time. We have also purchased a time series of satellite imagery to look at the elephant seal population at St. Andrews bay between 2000 and 2022.	Historical datasets and satellite data will be incorporated into ongoing analyses for peer reviewed outputs.
5.3. Produce a scientific paper and submit to GSGSSI and CCAMLR.	Two scientific papers are currently being developed. One looking at the counting methods and inter-annual variability for king penguin populations and one looking at inter-annual variability in elephant seals.	These papers will be developed for submission by the end of the project.
5.4. Submit papers to peer reviewed journal.	This will be completed upon finalization of the papers	
Output 6. Outreach to other UK OTs and to interested scientists	<p>6.1 Undertake seminars / talks to further disseminate methods and lessons learned with colleagues (both internal and at least 4 external to BAS) who undertake science at the UKOTs through Blue Belt and through ODA.</p> <p>6.1 Follow up initial approach from both Norwegian and US colleagues who are interested in the methods we are developing for this project. Potential collaborations include using fishing vessels to access remote penguin colonies, otherwise inaccessible from existing national</p>	

	infrastructure in the Antarctic / BAT.		
6.1. Outreach activities.		<p>The work was presented to GSGSSI following the first field season (2021/22). This talk was also delivered at King Edward Point research station and at BAS Cambridge.</p> <p>Two articles updating the progress of the project have been submitted to the South Georgia Association newsletter, most recently in November 2022.</p> <p>A website for the project has also been developed.</p>	<p>Nathan Fenney will present work from this project at the upcoming GSGSSI MPA workshop in June.</p> <p>Discussions are ongoing with several international groups in order to develop collaborations for future work utilizing these platforms. We are also in discussion with several research groups regarding the automated counting approaches for the imagery.</p>

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
Impact: Strategic long-term scientific monitoring project addressing ecosystem change relationships for important land-based predator species, forming an important contribution to the SGSSI MPA Research and Monitoring Plan.			
<p>Outcome:</p> <p>Establishment of a rigorous, multi-species, baseline reference dataset for seabird and seal colonies at South Georgia, used to inform policy decisions by GSGSSI and CCAMLR.</p>	<p>0.1 Creation of a list by Q3Y1 of high priority, long-term monitoring sites, for which the baseline reference data will be collected.</p> <p>0.2 Completion of field data collection at each monitoring site. To be undertaken over three campaigns and completed by Q2Y3.</p> <p>0.3 Detailed description and maps / orthorectified imagery, defining spatial extent of each long-term monitoring site. To be compiled by Q3Y3.</p>	<p>0.1 Formal report submitted to GSGSSI.</p> <p>0.2 The generation of a fieldwork report, detailing sites visited and data collected.</p> <p>0.3 Formal report and supplementary maps and image data submitted to both GSGSSI and CCAMLR.</p> <p>0.4 Formal report submitted to both GSGSSI and CCAMLR.</p> <p>0.5 Methodology provided to GSGSSI. Methodology paper submitted to an</p>	<p>Expert knowledge from BAS scientists.</p> <p>Expert knowledge from BAS Mapping and Geographic Information Centre.</p> <p>Successful access to each of the proposed long-term monitoring sites.</p>

	<p>0.4 Baseline count data derived for each species at each monitoring site. To be completed by Q4Y3.</p> <p>0.5 Documentation of the methodology / workflow used to undertake surveys to allow future monitoring to be conducted by GSGSSI as part of a long-term monitoring programme. To be completed by Q4Y3.</p>	open-access peer reviewed journal and receipt received.	
<p>Output 1</p> <p>Creation of a list of high priority, long-term monitoring sites at South Georgia for species targeted as ecosystem indicators (king, macaroni and gentoo penguins, elephant and fur seals, and albatross species).</p>	<p>1.1 Discussion with GSGSSI and members of the wider South Georgia scientific community to consider potential sites or long-term monitoring. Discussion to be undertaken during Q2Y1.</p> <p>1.2 Final list of proposed long-term monitoring sites to be compiled Q3Y1. To include information such as location, access information, species, priority and temporal requirements (optimum period for data collection).</p> <p>1.3 Working paper justifying species / sites selected, including important ecological aspects underpinning choice of species to be documented. To be completed before end of Y1.</p>	<p>1.1 Evidence of communication such as emails and minutes from meetings.</p> <p>1.2 Formal report submitted to GSGSSI.</p> <p>1.3 Formal report submitted to GSGSSI.</p>	<p>Expert knowledge from BAS scientists.</p> <p>Buy-in from GSGSSI both during this process and of the resulting output is key as they will ultimately be responsible for maintaining the monitoring programme after the project has ended.</p>
<p>Output 2</p> <p>High resolution, georeferenced, fixed-wing UAV aerial survey of each of the monitoring sites identified in Output 1 for the purpose of creating baseline reference datasets.</p>	<p>2.1 Completion of aerial survey / field data collection at each monitoring site. Three periods of fieldwork have been defined based on the requirements of the species being monitored, October 2021, January 2022 and December 2022.</p> <p>4.4 Initial photogrammetric analysis to be undertaken</p>	<p>2.1 Fieldwork report to be completed for each deployment.</p> <p>4.4 3D models (output by the photogrammetric processing) available for each site.</p> <p>2.3 Orthophotos available for each site.</p>	<p>Survey sites are accessible via land, IAATO vessel or via FPV Pharos.</p> <p>Fieldwork deployment takes into account potential for weather related delays.</p>

	<p>after data collection. To be completed by Q2Y3*.</p> <p>2.3 High resolution (2.5 cm), georeferenced, orthorectified (geometrically corrected), aerial imagery mosaics for each monitoring site to be created. To be completed by Q2Y3*.</p> <p>2.4 Georeferenced outlines defining the current spatial extent of each colony / site. To be completed by Q2Y3*.</p> <p>*Q2Y3 represents when the data collected during the last deployment will need to be processed by. Data collected during the earlier deployments will be processed as soon as possible upon return to the UK.</p>	<p>2.4 Georeferenced outlines for each site available.</p>	<p>Field activities can be rescheduled if delayed by significant weather events / operational disruptions during grant period.</p> <p>BAS will have the same or an equivalent platform to the proposed fixed-wing UAV (SenseFly Ebee X) that can be used as a backup system while operating in the field.</p> <p>BAS will provide GNSS base stations to enable Post processed kinematic (PPK) processing.</p>
<p>Output 3</p> <p>Population counts for each of the monitoring sites identified in Output 1 using the aerial survey datasets and input into the relevant national and international governing bodies (such as GSGSSI and CCAMLR).</p>	<p>3.1 Investigate most appropriate method for deriving population counts for each species (either automated image processing software or citizen science platform). This is to account for the different spatial distributions exhibited by penguins and seals while on land. To be determined by end of Q2Y2.</p> <p>3.2 Determine baseline populations for each of the monitoring sites, using the orthorectified imagery acquired during the aerial surveys. To be completed by Q3Y3.</p>	<p>3.2 Report progress to GSGSSI.</p> <p>3.2 Outputs submitted in a formal report to both GSGSSI and CCAMLR.</p>	<p>Each monitoring site identified in Output 1 was successfully surveyed during the fieldwork.</p> <p>Ability to determine population using automated methods. Penguins for example, make an ideal candidate due to the regular spacing between the nests*. However, elephant seals lie on top of each other, so in this case, counting may have to be undertaken manually, or by citizen science.</p> <p>To determine an accurate baseline population, surveys must have been undertaken during a specific time period</p>

			for each species, otherwise data will not be representative. *Although this does vary between different species.
<p>Output 4</p> <p>Documented workflow provided to GSGSSI to allow repeat surveys of monitoring sites to be undertaken on a regular basis into the future.</p>	<p>4.1 Produce a methodology paper documenting the workflow developed to both undertake the aerial surveys and determine the population. This is key as it would also allow for the methodology to be applied to other UKOT's. To be completed by Q4Y3.</p> <p>4.2 Train at least two GSGSSI field assistants regarding the data collection and data analysis aspects of the project, to allow GSGSSI to maintain long-term monitoring of the sites. To be completed by Q4Y3.</p> <p>4.3 Train at least one GSGSSI field assistant to operate the fixed-wing UAV / flight planning software. To be completed by Q4Y3.</p> <p>4.4 At least one GSGSSI field assistant to undertake the Remote Pilot Qualification – small (RPQ-s) for fixed-wing UAV's (<20 kg), to allow GSGSSI to maintain long-term monitoring of the sites. To be completed by Q4Y3.</p>	<p>4.1 Methodology provided to GSGSSI. Methodology paper submitted to a peer-reviewed journal and receipt received.</p> <p>4.2 GSGSSI field assistants able to demonstrate ability to undertake the required data collection and data analysis steps. Training report submitted to GSGSSI, which will include an assessment of the field assistants ability to implement the data collection and analysis aspects of the project.</p> <p>4.3 GSGSSI field assistant able to demonstrate ability to use flight planning software. Training report submitted to GSGSSI, which will include an assessment of the field assistants ability to operate the UAV flight planning software.</p> <p>4.4 GSGSSI field assistant successfully acquires RPQ-s for fixed-wing platforms weighing <20 kg. Please note, this qualification is the same level as the qualification required to fly mutli-copter UAVs, which GSGSSI already operate.</p>	<p>GSGSSI have already included project in KEP 2019-2024 science plan.</p> <p>Expert knowledge from BAS scientists.</p> <p>Expert knowledge from BAS mapping team.</p> <p>GSGSSI and KEP Project able to identify most appropriate personnel to receive training.</p>
<p>Output 5</p> <p>Increased scientific understanding of change at South Georgia.</p>	<p>5.1 Produce peer-reviewed scientific papers to consider what the project outputs tell us about South Georgia. To be completed by Q4Y3. The</p>	<p>5.1 Submitted to peer-reviewed journal and received receipt of submission.</p>	<p>Historical data available for long term monitoring sites. Not technically required, but would add value.</p>

	<p>solution proposed (for undertaking large-scale, high resolution, repeatable aerial surveys using fixed-wing UAV's) has significant application across a number of UKOTs and as such, the intention is to publish separate methodology papers for both the geomatics (aerial survey) and image analysis aspects.</p>		<p>Selected journal approves paper.</p>
<p>Output 6 Outreach to other UK OTs and to interested scientists.</p>	<p>6.1 Undertake seminars / talks to further disseminate methods and lessons learned with colleagues (both internal and at least 4 external to BAS) who undertake science at the UKOTs through Blue Belt and through ODA.</p> <p>6.2 Follow up initial approach from both Norwegian and US colleagues who are interested in the methods we are developing for this project. Potential collaborations include using fishing vessels to access remote penguin colonies, otherwise inaccessible from existing national infrastructure in the Antarctic / BAT.</p>	<p>6.1 Evidence seminars / talks have taken place, e.g. listing in agendas for Blue Belt symposium series (if such coordinated symposia again take place in the future).</p> <p>List of seminars included in annual project reports to Darwin Plus, and in reports to GSGSSI. We anticipate at least 4 seminars external to BAS, including one at a Blue Belt symposium, assuming one takes place."</p> <p>6.2 Report to CCAMLR detailing any resulting collaboration with the Norwegians.</p>	<p>Collaborations with either US or Norwegian colleagues actually develop.</p>
<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)</p> <p>Output 1</p> <p>1.1. Identify list of potential reference sites to be included in the monitoring programme.</p> <p>1.2. Discuss proposed sites with GSGSSI and scientists in the wider South Georgia community.</p> <p>1.3. Determine final list and submit to GSGSSI for signoff.</p> <p>1.4. Produce a report detailing final list of long-term monitoring sites along with justification.</p> <p>Output 2</p> <p>2.1. Determine requirements for aerial survey (species / site dependant).</p> <p>2.2. Produce fieldwork plan.</p> <p>2.3. Work with GSGSSI and BAS to arrange logistics.</p> <p>2.4. Ship equipment for fieldwork.</p> <p>2.5. Deploy staff to South Georgia to undertake fieldwork.</p>			

- 2.6. Undertake data collection (for each monitoring site).
- 2.6.1. Run GNSS base station.
- 2.6.2. Undertake UAV survey.
- 2.6.3. Review data for quality control.
- 2.7. Undertake GNSS processing (for each monitoring site).
- 2.7.1. PPK processing of on-board UAV GNSS unit.
- 2.8. Undertake photogrammetric analysis (for each monitoring site).
- 2.8.1. Import and alignment of photos collected during the UAV survey.
- 2.8.2. Import PPK GNSS output to provide georeferencing.
- 2.8.3. Generate digital elevation model (DEM).
- 2.8.4. Generate orthophoto.
- 2.9. Prepare orthophotos for population count.

Output 3

- 3.1. Determine optimal counting method for each species.
- 3.2. Determine specific software to undertake image analysis / platform for citizen science count if required.
- 3.3. Process the prepared orthophotos to determine population counts.
- 3.4. Produce a report detailing the final counts at each of the sites for GSGSSI and input into CCAMLR.

Output 4

- 4.1. Document methodology used to undertake aerial survey and determine population at each site.
- 4.2. Produce a methodology paper and submit to peer reviewed journal.
- 4.3. Train GSGSSI KEP Project field assistant to undertake data collection and analysis.
- 4.4. Arrange for GSGSSI KEP Project field assistant to undertake RPQ-s qualification.
- 4.5. Train GSGSSI field assistant to operate fixed-wing UAV and flight planning software.

Output 5

- 5.1. Review outputs.
- 5.2. Consider other historical datasets for the sites where available.
- 5.3. Produce a scientific paper and submit to GSGSSI and CCAMLR.
- 5.4. Submit papers to peer reviewed journal.

Output 6

- 6.1. Outreach activities.

Annex 3: Standard Indicators

Table 1 Project Standard Indicators

DPLUS Indicator number	Name of indicator using original wording	Name of Indicator after adjusting wording to align with DPLUS Standard Indicators	Units	Disaggregation	Year 1 Total	Year 2 Total	Year 3 Total	Total to date	Total planned during the project
DPLUS-C17	Produce peer-reviewed scientific papers to consider what the project outputs tell us about South Georgia. To be completed by Q4Y3. The solution proposed (for undertaking large-scale, high resolution, repeatable aerial surveys using fixed-wing UAV's) has significant application across a number of UKOTs and as such, the intention is to publish separate methodology papers for both the geomatics (aerial survey) and image analysis aspects.	Number of unique papers submitted to peer reviewed journals	Number				3	0	3
DPLUS-C08	3.2 Determine baseline populations for each of the monitoring sites, using the orthorectified imagery acquired during the aerial surveys. To be completed by Q3Y3.	Areas of importance for biodiversity identified	Number						This will depend on the results of output
DPLUS-C01	4.1 Produce a methodology paper documenting the workflow developed to both undertake the aerial surveys and determine the population. This is key as it would also allow for the methodology to be applied	Number of best practice guides and knowledge products published and endorsed	Number				1	1	

DPLUS Indicator number	Name of indicator using original wording	Name of Indicator after adjusting wording to align with DPLUS Standard Indicators	Units	Disaggregation	Year 1 Total	Year 2 Total	Year 3 Total	Total to date	Total planned during the project
	to other UKOT's. To be completed by Q4Y3.								

Table 2 Publications

Title	Type (e.g. journals, manual, CDs)	Detail (authors, year)	Gender of Lead Author	Nationality of Lead Author	Publishers (name, city)	Available from (e.g. weblink or publisher if not available online)
Fixed-wing UAV surveys South Georgia's wildlife.	South Georgia Association Quarterly newsletter. May 2022.	Hollyman, Fenney	Male	British	South Georgia Association	South Georgia Association
Update on Darwin plus science project 'Initiating monitoring support for the SGSSI-MPA Research and Monitoring Plan'	South Georgia Association Quarterly newsletter. November 2023.	Fox, Fenney, Coleman	Male	British	South Georgia Association	South Georgia Association

Checklist for submission

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