# Darwin Plus Main: Annual Report

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

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

**Submission Deadline: 30th April 2024**

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

## Darwin Plus Project Information

| | |
|---|---|
| Project reference | DPLUS189 |
| Project title | Evaluating climate change risks to Patagonian and Antarctic toothfish |
| Territory(ies) | South Georgia and South Sandwich Islands |
| Lead Partner | British Antarctic Survey |
| Project partner(s) | Centre for Environment, Fisheries and Aquaculture (Cefas)<br>Government of South Georgia and the South Sandwich Islands (GSGSSI) |
| Darwin Plus grant value | £241,145.00 |
| Start/end dates of project | 1 June 2023 – 31 May 2025 |
| Reporting period (e.g. Apr 2023-Mar 2024) and number (e.g. Annual Report 1, 2) | 1 June 2023 – 31 Mar 2024<br>Annual Report 1 |
| Project Leader name | Rachel [redacted] |
| Project website/blog/social media | https://www.bas.ac.uk/project/evaluating-climate-change-risks-to-patagonian-and-antarctic-toothfish/ |
| Report author(s) and date | Rachel [redacted] (BAS), Oliver [redacted] (Cefas), Sue [redacted] (GSGSSI)<br>30th April 2024 |

## 1. Project summary

This project brings together an experienced multi-disciplinary science team with relevant stakeholders to support the Government of South Georgia and the South Sandwich Islands (GSGSSI) in addressing the need to integrate climate change considerations into fisheries management. Climate change is altering marine ecosystems around the world yet is conspicuously absent from fisheries management policy and implementation. This project is focused on South Georgia and the South Sandwich Islands (SGSSI), a rapidly changing area within the Southern Ocean, and on high value toothfish caught in this region. This project will synthesise relevant environmental and biological information and use this to undertake a risk assessment of climate-driven change to toothfish in SGSSI. Together with project stakeholders, we will translate the risk assessment into recommendations for fisheries management to reduce and manage the risks that climate change presents to toothfish and the wider ecosystem of which they are part. We will develop an evaluation framework that will also be applicable to other species and regions, addressing the challenge of integrating climate change into fisheries management more widely.

The results are relevant to, and will directly inform, SGSSI toothfish fishery management and the SGSSI Marine Protected Area (MPA) and enhance the Marine Stewardship Council (MSC) certification of the South Georgia fishery, with broader biodiversity benefits for the region in line with the SGSSI Biodiversity Action Plan (BAP). The outcomes will also be highly relevant to the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) for whom this area of work is a high priority.

SGSSI are an archipelago of sub-Antarctic islands that form part of the Scotia Arc, a predominantly submarine ridge that extends from South America to the Antarctic Peninsula (Fig 1). The two island groups are distinctly different with South Georgia experiencing large inter-annual variability in temperatures and the South Sandwich Islands are more Antarctic in character, with lower, more stable, annual temperature ranges and the presence of seasonal sea ice for up to ~200 days per year at the southern end. SGSSI are a globally important site of abundant and diverse marine fauna, including vast colonies of penguins, seals, nesting seabirds and recovering whale populations. The region's waters are protected by the 1.24 million km$^2$ SGSSI Marine Protected Area (MPA) established by the Government of SGSSI (GSGSSI) (Fig 2), which aims to conserve marine biodiversity, as well as allowing some sustainable fishing. Fisheries are managed by GSGSSI within the framework of CCAMLR.

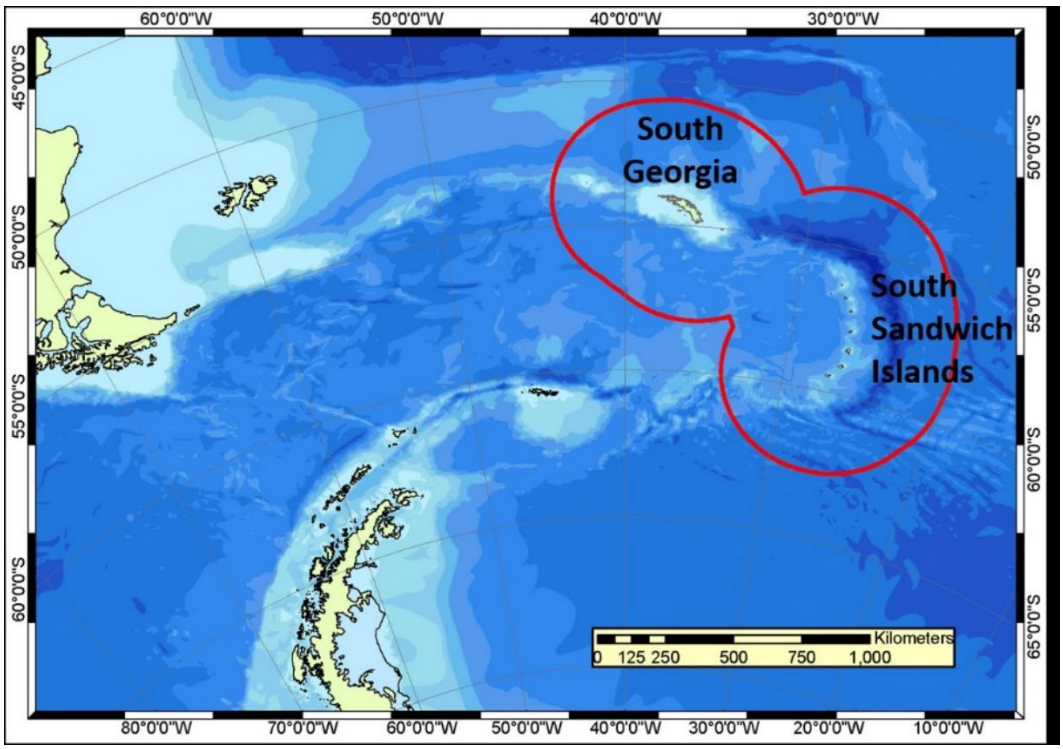

Fig. 1 SGSSI in a regional context


Fig. 2 SGSSI MPA including additional new closed areas announced in 2024 following a 5-yearly MPA review.

## 2. Project stakeholders/partners

Together with the lead organisation British Antarctic Survey (BAS) the project has two partners: Centre for Environment, Fisheries and Aquaculture (Cefas) and Government of SGSSI (GSGSSI). Given the importance of this conservation and fisheries management issue, the focal region, and the expertise required, this partnership is critical to the success of the project. BAS has well-established links with both organisations and all were closely involved in the project development. This close involvement has continued since the project launch, including in the project kick-off workshop (via keynote presentations providing important background and context; contributing knowledge and expertise on data sources; contributing to the workshop report); in monthly project meetings to progress the science; and through representation on the Project Board.

Achievements include the engagement of the partners in the project kick-off workshop[1], particularly the pooling of information that led to the establishment of the knowledge base[3], the foundation for the entire project. A strength of the partnership, in addition to the combined expertise and commitment to the project, is that all are represented on the UK delegation to CCAMLR, enabling us to ensure that progress and outputs from this project are presented to CCAMLR in a timely manner. To date this has included the CCAMLR Climate Change Workshop convened by the PL (WS-CC-2023)[2],[5], the Working Group on Fish Stock Assessment (WG-FSA)[6] and Scientific Committee (SC)[7]. The project was also presented at the SGSSI Marine Protected Area Review Science Symposium in June 2023[4] and highlighted in an invited presentation on climate change and ecosystem management at the BlueBelt Programme Symposium in February 2024[9]. All partners have access to the project's collaborative space in Microsoft Teams and all our meetings are hybrid.

Key stakeholders have been involved since the project development stage and actively contributed to the kick off workshop and report. A relevant project[10] has been initiated with one of the stakeholders (Marine Stewardship Council - MSC) in which our project will form a case study in considering key elements to account for climate change within the MSC Fishery Standard. Our project is being enhanced through our links with external scientists, including those working on toothfish in other regions such as the Ross Sea. Many of these researchers provided input to the kick-off workshop and collaborations are underway, some of which were initiated through WS-CC-2023, ensuring that our project is connected to, and in some aspects driving, a wider international effort.

## 3. Project progress

## 3.1 Progress in carrying out project Activities

Activities under Output 1 to date:

Prior to the start of the project (1 June 2023), the project post-doctoral research assistant (PDRA) was appointed (1.1). An internal collaborative space in Microsoft Teams has been set up for the project team and public-facing project webpages created (1.2, see https://www.bas.ac.uk/project/evaluating-climate-change-risks-to-patagonian-and-antarctic-toothfish/). A kick-off workshop for the project team and stakeholders was convened (1,3, 1.4), to launch the project, discuss the objectives and identify required information and sources for the project knowledge-base. Relevant information has been sourced and collated to establish the project knowledge-base (1.5). Currently the knowledge-base is an internal version for use by the team, with an initial summary of the information available on the project webpages (1.6)[3], to be further developed in due course. The kick-off workshop report has been finalised and published on the project webpage (1.7)[1]. A paper "Evaluating climate change risks to Patagonian and Antarctic Toothfish" led by the PL with co-authors from the project team was presented at the CCAMLR Climate Change Workshop[2] (WS-CC-2023) in 2023 rather than to WG-FSA. This is a minor change from the proposal because the Climate Change Workshop was a new development since the proposal was written, it was co-convened by the PL, and the paper was very relevant to this workshop. The work fed into WG-FSA[6] via the Workshop Report[5] which was also submitted to CCAMLR's SC[7] (1.8). This work is being further developed for papers that we are preparing for WG-FSA (2024) and a peer-reviewed journal. Relevant information will be subsequently provided for the SGSSI MPA Data Portal (1.9). The latter (1.9) will occur a little later than planned in the logframe but will be provided in conjunction with the papers.

Activities under Output 2 to date:

The knowledge-base[3] has been used to identify variables recognised as being influential in driving patterns in the distribution and abundance of key life stages of both species (2.1). We have identified candidate predictor variables for species-environment modelling (2.2). Data sources for these variables at appropriate temporal and spatial scales have also been identified. This work will be presented in a paper to CCAMLR WG-FSA this year and an associated journal paper, both of which are in preparation (i.e. the first paper noted in 2.12). Since successfully compiling and summarising the biological data available for both toothfish species (i.e within the knowledge-base), a candidate species distribution modelling approach has been determined (2.3). The other activities under this output will be completed later in the project as per the logframe.

Activities under Output 3 to date:

The data acquisition, analyses and visualisation aspects of the evaluation framework are underway (3.1). The other activities under this output will be completed later in the project as per the logframe.

## 3.2 Progress towards project Outputs

Output 1 - Knowledge base of relevant environmental, biological and fishery information for both species of toothfish created, providing the basis for understanding toothfish sensitivity to environmental parameters.

The baseline condition was a range of disparate, difficult to access environmental, biological and fishery information for toothfish. We have changed this by establishing a comprehensive knowledge base synthesising relevant information for toothfish. In the short-term this resource is for internal use, serving as the foundation of this project, facilitating analyses on the relationships between toothfish and environmental parameters. In due course this resource will

also be of value for related research on toothfish occurring beyond the timeframe and/or scope of this project. In addition, much of the information will be useful for similar studies on other species in the region and beyond. The indicators for this output are being measured directly by the corresponding means of verification, the current status of which are almost complete (as noted in the reporting of activities 1.1-1.8 above). Information has not yet been provided to the MPA Data Portal (as noted above in the reporting of activity 1.9), but we are in the process of further developing the external summary, including summary graphics. We will determine and extract what is useful and relevant for the MPA Data Portal. Apart from this, Output 1 is complete.

Output 2 - Ecological risk assessment of the effects of climate change on toothfish.

The baseline condition was that the effects of climate change on toothfish in SGSSI are largely unknown. The analyses undertaken by the project will drive a shift from this position to an evaluation of risks. The indicators for this output are being measured directly by the corresponding means of verification, the current status of which are incomplete. We are in the early stages of progress with this output (as noted in the reporting of activities 2.1-2.3 above) as per the logframe and implementation plan, with the papers associated with indicator 2.1 under this output currently in preparation.

Output 3 - Climate change evaluation framework for toothfish fishery management.

The baseline condition was a lack of guidance on integrating climate change into management of toothfish fisheries in SGSSI (and elsewhere). Later in the project we will provide a framework for GSGSSI for incorporating measures to reduce climate change risks. The indicators for this output are being measured directly by the corresponding means of verification, the current status of which are incomplete. We are in the early stages of progress with this output, as noted in the reporting of activity 3.1 above, and as per the logframe and implementation plan. However, the role of the PL in co-convening CCAMLR WS-CC-2023[5], and of members of the project team, stakeholders and collaborators in contributing to that workshop and in subsequently delivering the outputs and recommendations into CCAMLR WG-FSA[6] and SC[7], has meant that consideration of appropriate frameworks has begun, helping to shape the development of this output.

### 3.3 Progress towards the project Outcome

Outcome – An evaluation of the risks that climate change poses for toothfish in SGSSI informs ecosystem-based fishery management such that it can incorporate measures to reduce these risks.

Progress has been made towards the Outcome as follows:

Indicator 0.1. Baseline conditions: lack of documented information on the relationship between toothfish and climate change. Progress to date: initial reports/papers have been prepared[1,2] and subsequent papers are in preparation.

Indicator 0.2. Baseline condition: lack of guidance on integrating climate change into management of toothfish fisheries. Progress to date: not due until later in the project, however, progress has been made with some components, specifically data acquisition[3], modelling approach, and in consideration of potential frameworks (as noted above).

Indicator 0.3 – Baseline condition: existing Toothfish Fishery Management Plan needs to incorporate climate change considerations. Progress to date: not due until the end of the project, however, since CCAMLR WS-CC-2023[5] and WG-FSA[6] there has been progress on consideration of this for toothfish fisheries more widely, involving members of the project team, and of relevance to this project.

Indicator 0.4 – Baseline condition: no consideration of this work in the SGSSI MPA. Progress to date: an information presentation was given at the SGSSI MPA Review Science Symposium in

June 2023[4] and was included in a summary document that fed into the SGSSI MPA Review in December 2023.

Indicator 0.5 – Baseline condition: no information on this work in the MPA Data Portal. Progress to date: we are in the process of developing the external summary of the knowledge-base further as well as preparing journal papers on toothfish and climate change. We will extract what is useful and relevant for the Data Portal.

### 3.4 Monitoring of assumptions

Assumption 1.2. Paper prepared on time for submission to WG-FSA.

Comments: Minor change: this paper was instead submitted to the CCAMLR Climate Change Workshop, which then fed into WG-FSA (as explained above).

All other assumptions still hold true.

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

The project will contribute to the overarching objective more so at later stages in the project. At this stage we have brought together an experienced multi-disciplinary science team and relevant stakeholders to support GSGSSI in addressing the pressing need to integrate climate change considerations into fisheries management in the UKOTs. Through our initial work, including establishment of the knowledge-base to better understand toothfish-environment relationships and initial steps towards an ecological risk assessment of the effects of climate change, we have begun to directly address research needs in the SGSSI MPA Research and Monitoring Plan, particularly Themes 5 (Harvested species – fish) and 9 (Climate change and variability); the SGSSI Biodiversity Action Plan (https://gov.gs/document/sgssi-nbap-2016-2020/), particularly the objective "enhance knowledge of the biodiversity and habitats of SGSSI through research, monitoring and review, including the establishment of scientific baselines from which to assess environmental change, including the potential effects of climate change", which is mapped onto the Convention on Biological Diversity (CBD). GSGSSI has ratified CBD and the project has the potential to make a longer- term contribution to how GSGSSI delivers on relevant aspects of the Global Biodiversity Framework. Progress so far has included the input of preliminary project information via papers and presentations to relevant fora including CCAMLR[2] (e.g. CCAMLR WS-CC-2023[5] and WG-FSA[6]); the SGSSI MPA Review Science Symposium[4]; BlueBelt Programme Symposium[9]; and collaboration on an associated side-project on climate change and the MSC Fishery Standard[10].

## 5. Gender Equality and Social Inclusion (GESI)

| | |
|---|---|
| Please quantify the proportion of women on the Project Board[1]. | 50% |
| Please quantify the proportion of project partners that are led by women, or which have a senior leadership team consisting of at least 50% women[2]. | Yes for BAS and GSGSSI, and 6/13 of the Cefas Senior Leadership are women. |

| GESI Scale | Description | Put X where you think your project is on the scale |
|---|---|---|

[1] A Project Board has overall authority for the project, is accountable for its success or failure, and supports the senior project manager to successfully deliver the project.

[2] Partners that have formal governance role in the project, and a formal relationship with the project that may involve staff costs and/or budget management responsibilities.

| | | |
|---|---|---|
| **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 | |

We are committed to equality, diversity and inclusion see https://www.bas.ac.uk/jobs/working-for-bas/our-cultural-values-equality-and-diversity/ and https://www.cefas.co.uk/about-us/careers/equality-statement/. BAS has been a member of the Athena Swan Charter since 2014. Athena Swan is used across the globe to support and transform gender equality within higher education and research. BAS holds an Athena Swan Silver Award (https://www.bas.ac.uk/media-post/athena-swan-silver/). Cefas is committed to draw on talent from the widest possible range of backgrounds, holds an Athena Swan bronze accreditation and is a signatory of the BiTC Race at Work Charter. During the development of this project, assembling of the project team and consulting with stakeholders, we considered gender equality and achieved a good balance, and are committed to ensuring equality in workshop participation and involvement in outputs.

## 6. Monitoring and evaluation

Our project M&E plan remains the same aside from minor changes for improvement, e.g. rather than expanding the Project Board meetings every three months to include the wider team, instead we have both regular Project Board meetings (to assess progress against lograme, implementation plan and budget) and monthly team meetings (to discuss progress and advance ongoing activities). The M&E work is led by the PL and therefore the lead organisation (BAS), including BAS Finance Office, but this work is shared with the partners via their engagement on the Project Board. Progress is shared with the project team via the Teams site, with priority activities and outputs (aligned with the logframe and implementation plan) highlighted at team meetings. Meeting minutes are shared on the project Teams site. We update stakeholders informally (in person and email) and formally, the latter includes sharing reports. To date, the partial completion of the Outcome indicators (0.1 and 0.4) demonstrates the clear relationship between undertaking the Activities to deliver the Outputs to achieve the Outcome. For example, completing Activities 1.1-1.8 (steps to launch the project and develop the knowledge-base) led to Output 1 (establishing the knowledge-base) which forms part of the Outcome indicators 0.1 (papers and reports), 0.2 (evaluation framework) and 0.4 (contribution to the MPA review). We measure achievements via Output and Outcome indicators, together with aspects that add value to these such as presentations associated with findings and papers. There are also qualitative aspects, for example the role that members of the project team have in related fora such as CCAMLR in this area of work.

## 7. Lessons learnt

Elements that have worked well include project team engagement and input via regular meetings and Teams; the kickoff workshop to bring everyone together, including the pooling of expertise to source information for the knowledge base; establishing subgroups to work on specific aspects in more detail e.g. modelling; coordinating input to CCAMLR and other relevant fora. Elements that needed improvement included involving too many people in the early stages of paper writing. We addressed this by establishing a smaller focused subgroup for initial drafting, although the whole team can see the drafts via Teams. Stakeholder engagement was high during the project development and early stages, and this aspect will increase as we discuss findings from the analyses and work to develop the framework. We will also increase our outreach. A key recommendation to others tackling the same issues/working in the same area is to connect where possible to share relevant knowledge and add value. Given our multidisciplinary team, stakeholders and collaborations with external scientists, we have made a good start with this. Examples to date include sharing our work with other UKOTs at the BlueBelt Programme Symposium, with CCAMLR, with climate change scientists (e.g. such that they understand the spatial and temporal scales we are working on), and with the wider Antarctic research community (e.g. the Scientific Committee on Antarctic Research - SCAR).

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

Feedback received when the project was funded:

"*Clarity is needed on how the benefits to the environment can be measured and how the findings will be taken into account for ecosystem-based fishery management in the region*."

Response: Benefits to the environment can be measured as a change in the SGSSI Toothfish Fisheries Management Plan i.e. if this is revised according to project findings and recommendations, to ensure ecosystem-based fishery management measures are robust to future change. This will be beneficial for the species and the wider ecosystem of which they are a part. This will be a measure of the contribution of the project to sustainable fisheries management in the face of climate change. It is also our aim that the findings will be applicable to other fisheries/other regions, with the benefits measured in a similar way.

"*The logframe would be strengthened by ensuring indicators are less descriptive and more specific. At present, indicators 1.1 and 3.1 are formulated more as means of verification. For indicator 0.1, be clearer what will be measured*."

Response:

- Suggested improvement to Indicator 1.1: "Project kick-off workshop for scientists and stakeholders to take place and to identify available information and sources for relevant environmental, biological and fishery data for the knowledge base."
- Suggested improvement to Indicator 3.1: "Final workshop for scientists and stakeholders to take place to discuss project results, consider current management, refine framework and develop recommendations."
- Indicator 0.1: What will be measured will be the publication of the required set of reports and papers, specifically: reports from the two project workshops; two scientific papers for peer-reviewed journals (one on present day toothfish-environment relationships; one on projections of change); and papers to CCAMLR.

## 9. Risk Management

The risk register will be submitted with this report.

## 10. Sustainability and legacy

The profile within the OT is high, particularly as the GSGSSI are a partner in the project. The work has been promoted within and outside of the OT including:

- Presented at the SGSSI MPA Review Science Symposium[4] (June 2023) and included in the Benchmarking Report submitted to the MPA Review (December 2023).
    - One of the MPA Review outputs was that climate change needs to be considered more explicitly in the revised Research and Monitoring Plan.

- Blue Belt Programme Symposium[9]
    - The project was part of an invited presentation (by the PL) on integrating climate change considerations into management of marine living resources in the OT. This is an example of interest and knowledge transfer within and across the OTs at the Symposium, collectively representing a marine estate of over 4 million $km^2$.

- BAS Science Symposium
    - The project was highlighted in an invited presentation on sustainable fishing by a project team member.

- CCAMLR meetings
    - A paper about the project was presented at CCAMLR WS-CC-2023[2]
        - This led to wider recognition of the importance of this work; improved connections with related work in other regions, with the potential for collaborations; and contributed to the Workshop Report[5]. Many of the recommendations are relevant/linked to the work of this project, and progress with these will increase the profile of this work within the OT as well as connect it to similar work elsewhere, including:
            - Development of a template for monitoring the potential effects of environmental variability and climate change on stock assessments and key stock productivity parameters[5,6,7]
            - Consideration of appropriate frameworks for integrating climate change into fisheries management[5,6,7]
            - Proposal for a Scientific Committee on Antarctic Research Action Group on fish, to include a focus on climate change, and involving members of the project team[11].

The intended sustainable benefits post-project as per the original proposal are still valid.

## 11. Darwin Plus identity

The Darwin Plus logo has been used in relevant presentations and on the project webpages, and Darwin Plus has been acknowledged as funder in written material including the kick off report and the paper into the CCAMLR Climate Change Workshop. BAS and Cefas continue to promote Darwin Plus funding opportunities and projects. Darwin Plus was acknowledged as a key funder of high-impact Southern Ocean and UKOT research at both the SGSSI MPA Science Symposium and the Blue Belt Programme Symposium. Within GSGSSI there is a high level of understanding and appreciation of Darwin Plus. We will increase outreach associated with the project as it progresses.

## 12. Safeguarding

| | |
|---|---|
| Has your Safeguarding Policy been updated in the past 12 months? | Yes |
| Have any concerns been reported in the past 12 months | No |
| Does your project have a Safeguarding focal point? | Yes, we have a safeguarding lead across BAS plus a Health and Wellbeing Manager who will work with the safeguarding lead |

| | | |
|---|---|---|
| Has the focal point attended any formal training in the last 12 months? | Yes, the lead has attended a formal training session on her role and responsibilities as safeguarding lead | |
| What proportion (and number) of project staff have received formal training on Safeguarding? | | 30% of BAS staff have been trained. More training is planned this year. |
| Has there been any lessons learnt or challenges on Safeguarding in the past 12 months? Please ensure no sensitive data is included within responses.<br><br>The most challenging part continues to be developing a clear understanding of safeguarding and who is affected. We do not employ staff working with children, however many BAS staff live and work in isolated environments and under challenging conditions. These make them more vulnerable than others, however this particular aspect is not relevant to our project which is based in Cambridge with no remote fieldwork. | | |
| Does the project have any developments or activities planned around Safeguarding in the coming 12 months? If so please specify.<br><br>More training across all BAS personnel is planned this year. | | |
| Please describe any community sensitisation that has taken place over the past 12 months; include topics covered and number of participants.<br><br>Not relevant to this project. | | |
| Have there been any concerns around Health, Safety and Security of your project over the past year? If yes, please outline how this was resolved.<br><br>No | | |

## 13. Project expenditure

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

| Project spend (indicative) in this financial year | 2023/24 D+ Grant (£) | 2024/25 Total actual D+ Costs (£) | Variance % | Comments (please explain significant variances) |
|---|---|---|---|---|
| Staff costs | [redacted] | | | |
| Consultancy costs | | | | |
| Overhead Costs | | | | |
| Travel and subsistence | | | | |
| Operating Costs | | | | |
| Capital items | | | | |
| Others (Please specify) | | | | |
| **TOTAL** | | | **-4** | |

Travel and Subsistence, operating costs and capital items are different from those in the original proposal budget for 2023/24. These changes were agreed via a Change Request in December 2023.

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

| | Secured to date | Expected by end of project | Sources |
|---|---|---|---|
| Matched funding leveraged by the partners to deliver the project (£) | [redacted] | | BAS and Cefas overhead costs, and staff costs for contributions from GSGSSI. |
| Total additional finance mobilised for new activities occurring outside of the project, building on evidence, best practices and the project (£) | | | |

## 14. Other comments on progress not covered elsewhere

[redacted]

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

| 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 2023-2024

| Project summary | Progress and Achievements April 2023 - March 2024 | Actions required/planned for next period |
|---|---|---|
| ***Impact***<br>Potential risks of climate-driven change to toothfish in South Georgia and the South Sandwich Islands (SGSSI) are better understood and made available to inform ecosystem-based fisheries management in the region. | Contributions of the project to ecosystem management in the face of climate change include contributions to:<br>• SGSSI MPA Review[4]<br>• CCAMLR Climate Change Workshop[2] and subsequent recommendations into CCAMLR for integration into their work[5,6,7] | [redacted] |
| ***Outcome***<br>An evaluation of the risks that climate change poses for toothfish in SGSSI informs ecosystem-based fishery management such that it can incorporate measures to reduce these risks. | | |
| Outcome indicator 0.1<br>Scientific papers and reports on the ecological risk assessment of the effects of climate change on both species of toothfish will be prepared at regular intervals during the project (2023, 2024, 2025). Scientific papers will be submitted for publication in peer-reviewed literature (Dec 2024; Mar 2025). Papers will be submitted to the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR; Oct 2023, 2024). Reports will be made available on the project and GSGSSI websites (Sep 2023, May 2025). | A number of papers/reports available or in prep:<br>• Kick-off workshop report available on project website[1]<br>• Paper[2] presented at the CCAMLR Climate Change Workshop (September 2023)<br>• Paper on the relationship between toothfish and the environment in preparation for CCAMLR WG-FSA (October 2024) and a peer-reviewed journal.<br>• Elements of paper on projected change are in the early stages of consideration. | Completion of papers and reports on toothfish and climate change |
| Outcome indicator 0.2<br>Stakeholder workshop report presenting the climate change evaluation framework encompassing data acquisition, analyses and visualisation, and management recommendations (Apr 2025). | • Elements underpinning this are underway - data acquisition completed[3]; model approach determined; initial consideration of appropriate frameworks. | Completion of Output 2 to underpin the evaluation framework |

| | | |
|---|---|---|
| | | Consideration of existing frameworks and how they might be adapted for our project |
| Outcome indicator 0.3<br>Revised SGSSI Toothfish Fishery Management Plan that includes consideration of climate change and addresses the outcome of this project (May 2025). | • Contribution to work through the CCAMLR Climate Change Workshop[2,5] and WG-FSA[6,7] for toothfish fisheries more widely, e.g. development of template for monitoring the potential effects of environmental variability and climate change on stock assessments and key stock productivity parameter | Stakeholder workshop to review the project findings and make recommendations for the Toothfish Fishery Management Plan |
| Outcome indicator 0.4<br>Preliminary project results considered in the upcoming review of the SGSSI Marine Protected Area (MPA) (potentially end 2023, to be determined). | • Presented at the SGSSI MPA Review Science Symposium[4] (June 2023) and included in a benchmark document for the SGSSI MPA Review Workshop (December 2023). | |
| Outcome indicator 0.5<br>Project outputs provided for inclusion in the MPA Data Portal (Dec 2023; Mar; May 2025). | | Extract useful and relevant project findings and visuals for the MPA Data Portal |
| **Output 1**<br>Knowledge base of relevant environmental, biological and fishery information for both species of toothfish created, providing the basis for understanding toothfish sensitivity to environmental parameters. | | |
| Output indicator 1.1<br>Project kick-off workshop report (Jun 2023). | • Kick-off workshop report available on project website[1]. | |
| Output indicator 1.2,<br>Information paper submitted to CCAMLR Working Group on Fish Stock Assessment (WG-FSA) (Oct. 2023). | • Paper submitted to and presented at the CCAMLR Climate Change Workshop[2] (September 2023), contributing to the Workshop Report[5] which | |

| | | |
|---|---|---|
| | subsequently went to WG-FSA[6] and SC[7] (October 2023). | |
| Output indicator 1.3<br>Project knowledge base established for both species of toothfish (Dec 2023). | • Knowledge base established[3]. | |
| Output indicator 1.4<br>Relevant information provided for inclusion in the SGSSI MPA Data Portal (Dec 2023). | • Work is underway to determine what is useful, and in what format, for the MPA Data Portal. | Extract useful and relevant findings and visuals from the knowledge-base for the MPA Data Portal |
| **Output 2.**<br>Ecological risk assessment of the effects of climate change on toothfish. | | |
| Output indicator 2.1.<br>Scientific paper submitted to CCAMLR WG-FSA (Oct 2024) on toothfish life history, identifying life-stages that may be particularly susceptible to changing climate, also prepared for submission to peer-reviewed journal (Dec 2024). | • Paper in preparation | Complete and submit the paper (CCAMLR WG-FSA and a peer-reviewed journal) |
| Output indicator 2.2.<br>Scientific paper that considers projected climate change impacts to both species of toothfish submitted to peer-reviewed journal, describing the model projections and the risk assessment (Mar 2025). Note this will also be submitted to CCAMLR WG-FSA (*Oct 2025). | • Initial steps underway | Complete and submit the paper (CCAMLR WG-FSA and a peer-reviewed journal) |
| Relevant outputs from the risk assessment provided for inclusion in the SGSSI MPA Data Portal (Dec 2024, Mar 2025). | • Initial steps to underpin the risk assessment are underway, including data acquisition and determination of modelling approach | Undertake the risk assessment and determine relevant information for the MPA Data Portal |
| **Output 3.**<br>Climate change evaluation framework for toothfish fishery management. | | |
| Output indicator 3.1. | | |

| | | |
|---|---|---|
| Report from stakeholder workshop, presenting evaluation framework for climate change risk for both species of toothfish which encompasses data acquisition, analyses and visualisation, to management recommendations (Apr 2025). | • Initial stages for the evaluation framework, including data acquisition, modelling approach. Initial consideration of appropriate frameworks. | Hold workshop and prepare report including recommendations for toothfish management |
| Output indicator 3.2<br>Project outputs and recommendations incorporated into the SGSSI Toothfish Fishery Management Plan (May 2025). | | Provide relevant findings and recommendations for the Toothfish Fishery Management Plan |
| Output indicator 3.3<br>Paper submitted to CCAMLR WG-FSA that presents project outputs and recommendations (prepared May 2025, *submitted Oct 2025). | | Complete and submit the paper |

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

Please note there are minor changes to some of the dates in the logframe as the start date was changed from 1 April to 1 June 2023. The new dates are shown in bold. Inclusion of Standard Indicators are also shown in bold.

| Project summary | SMART Indicators | Means of verification | Important Assumptions |
|---|---|---|---|
| **Impact:** Potential risks of climate-driven change to toothfish in South Georgia and the South Sandwich Islands (SGSSI) are better understood and made available to inform ecosystem-based fisheries management in the region. | | | |
| **Outcome:** An evaluation of the risks that climate change poses for toothfish in SGSSI informs ecosystem-based fishery management such that it can incorporate measures to reduce these risks. | 0.1 Scientific papers and reports on the ecological risk assessment of the effects of climate change on both species of toothfish will be prepared at regular intervals during the project (2023, 2024, 2025). Scientific papers will be submitted for publication in peer-reviewed literature (**Dec** 2024; **Mar** 2025). Papers will be submitted to the Commission for the Conservation of | 0.1 Project reports will be made publicly available via the project website and the Government of South Georgia & the South Sandwich Islands (GSGSSI) website as appropriate. Scientific papers will be published as open access. Papers submitted to CCAMLR will be cited in the CCAMLR meeting | 0.1 Successful appointment of a PDRA with the required skillset.<br>0.1 Reports and papers are prepared and submitted on time.<br>0.2 Engagement and feedback from stakeholders to ensure the outputs are relevant and useable. |

| Project summary | SMART Indicators | Means of verification | Important Assumptions |
|---|---|---|---|
| | Antarctic Marine Living Resources (CCAMLR; Oct 2023, 2024). Reports will be made available on the project and GSGSSI websites (**Sep** 2023, **May** 2025). **[DPLUS C18; C19]**<br><br>0.2 Stakeholder workshop report presenting the climate change evaluation framework encompassing data acquisition, analyses and visualisation, and management recommendations (**Apr** 2025). **[DPLUS-A07]**<br><br>0.3 Revised SGSSI Toothfish Fishery Management Plan that includes consideration of climate change and addresses the outcome of this project (**May** 2025). **[DPLUS-B02]**<br><br>0.4 Preliminary project results considered in the upcoming review of the SGSSI Marine Protected Area (MPA) (potentially end 2023, to be determined). **[DPLUS-B01]**<br><br>0.5 Project outputs provided for inclusion in the MPA Data Portal (**Dec** 2023; **Mar**, **May** 2025). | reports and made available on the project website.<br><br>0.2 Workshop report will be published on project webpage and GSGSSI webpage.<br><br>0.3 Approved updated fishery management plan published on the GSGSSI website.<br><br>0.4 MPA review report includes preliminary project results (potentially end 2023, date of review to be determined).<br><br>0.5 MPA Data Portal includes project outputs (**May** 2025). | 0.3 Stakeholders engage in management discussions to incorporate scientific advice into future fishery management decision-making.<br><br>0.4 SGSSI MPA review is completed on schedule, with an opportunity for preliminary project results to be submitted for consideration.<br><br>0.5 Outputs are suitable for inclusion in the MPA Data Portal. |
| **Output 1**<br><br>Knowledge base of relevant environmental, biological and fishery information for both species of toothfish created, providing the basis for | 1.1 Project kick-off workshop report (Jun 2023).<br><br>1.2 Information paper submitted to CCAMLR Working Group on Fish Stock Assessment (WG-FSA) (Oct 2023). | 1.1 Report published on project website[1]<br><br>1.2 Paper included in WG-FSA report, and also made publicly available on project website[2]. | 1.1 Availability of key scientists and stakeholders to engage in the kick-off workshop.<br><br>1.2 Paper prepared on time for submission to WG-FSA. |

| Project summary | SMART Indicators | Means of verification | Important Assumptions |
|---|---|---|---|
| understanding toothfish sensitivity to environmental parameters. | 1.3 Project knowledge base established for both species of toothfish (**Dec** 2023).<br><br>1.4 Relevant information provided for inclusion in the SGSSI MPA Data Portal (**Dec** 2023). | 1.3 Knowledge base for both species made available via project website[3].<br><br>1.4 Information accessible via the SGSSI MPA Data Portal. | 1.3 Relevant restricted information made available (e.g., toothfish occurrence data on request to CCAMLR).<br><br>1.4 SGSSI MPA Data Portal updated in timely manner. |
| **Output 2**<br><br>Ecological risk assessment of the effects of climate change on toothfish. | 2.1 Scientific paper submitted to **CCAMLR WG-FSA (Oct 2024)** on toothfish life history, identifying life-stages that may be particularly susceptible to changing climate, also **prepared for submission to peer-reviewed journal (Dec 2024).**<br><br>2.2 Scientific paper that considers projected climate change impacts to both species of toothfish submitted to peer-reviewed journal, describing the model projections and the risk assessment (**Mar** 2025). Note this will also be submitted to CCAMLR WG-FSA (*Oct 2025).<br><br>2.3 Relevant outputs from the risk assessment provided for inclusion in the SGSSI MPA Data Portal (**Dec** 2024, **Mar** 2025). | 2.1 Scientific paper will be published in a journal as open access. Paper mentioned in WG-FSA report.<br><br>2.2 Scientific paper will be published in a journal as open access. Paper mentioned in CCAMLR/WG-FSA report (verifiable after project end date due to timing of WG-FSA meeting*).<br><br>2.3 Outputs made available via the SGSSI MPA Data Portal. | 2.1 Available predictor variables usefully explain observed variance in species distribution.<br><br>2.2 Prognoses of key predictor variables are available at the appropriate scale.<br><br>2.3 Dependent on Indicators 2.2 and 2.3 |
| **Output 3** | 3.1 Report from stakeholder workshop, presenting evaluation framework for climate change risk for both species of toothfish which encompasses data acquisition, analyses and visualisation, to management recommendations (**Apr** 2025).<br><br>3.2 Project outputs and recommendations incorporated into the | 3.1 Stakeholder workshop report published on project and GSGSSI websites.<br><br>3.2. Approved updated fishery management plan published on the GSGSSI website.<br><br>3.3 *Paper cited in CCAMLR WG-FSA meeting report, proposing incorporation | 3.1 Availability of key scientists and stakeholders, engagement in the final workshop.<br><br>3.2 Stakeholders engage in management discussions to incorporate scientific advice into future fishery management decision-making. |

| Project summary | SMART Indicators | Means of verification | Important Assumptions |
|---|---|---|---|
| | SGSSI Toothfish Fishery Management Plan (**May** 2025).<br><br>3.3 Paper submitted to CCAMLR WG-FSA that presents project outputs and recommendations (prepared **May** 2025, *submitted Oct 2025). **[DPLUS-B12]** | of outputs into CCAMLR Conservation Measures (CMs) (verifiable after project end date). Paper will also be made publicly available on project website. | 3.3: Project Leader (PL) submits CCAMLR WG-FSA paper after the end of the project. *Note that the CCAMLR 2025 annual meetings will take place after the end of the project, but the papers will be prepared during the project and submitted by the PL to CCAMLR WG-FSA in Oct 2025. Note that CCAMLR CMs are agreed by consensus, therefore there is no guarantee that they will be adopted, even if most Members are supportive. |

**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)

**Output 1 Relevant environmental, biological and fishery information for toothfish synthesised, providing the basis for understanding toothfish sensitivity to environmental parameters**

1.1 Advertise, interview and appoint a PDRA for the project.
1.2 Establish project webpage to keep partners and stakeholders informed of progress and create appropriate online collaborative space for the project team.
1.3 Organise and prepare for kick-off workshop, finding suitable date for workshop to enable maximum participation.
1.4 Convene workshop with scientists and stakeholders to co-design objectives and identify required information and sources for the knowledge base, together with timeframes and reference points.
1.5 Source and collate information into useable format to establish knowledge base.
1.6 Determine how the information needs to be synthesised, summarised and visualised.
1.7 Prepare and disseminate workshop report, including making available on the project website.
1.8 Prepare and submit information paper to CCAMLR WG-FSA.
1.9 Provide relevant information for inclusion in SGSSI MPA Data Portal.

**Output 2 Ecological risk assessment of the effects of climate change on toothfish**

2.1 Interrogate knowledge base to identify appropriate dependent variables representing distribution and abundance of key life stages of both species.
2.2 Interrogate knowledge base to identify candidate predictor variables for species-environment modelling.
2.3 Determine candidate analytical and modelling approaches for species-environment relationship modelling.
2.4 Identify the most suitable approaches based on objectives and variables.
2.5 Identify an appropriate way to represent uncertainties in climate change projections in the results of the chosen species-environment modelling approach.
2.6 Apply approach from 2.4 to develop species-environment models.
2.7 Extract prognoses of predictor variables from the knowledge base representing timeframes identified in consultation with stakeholders.
2.8 Use the results of 2.5, 2.6 and 2.7 to project the change in suitable habitat within the identified timeframes, and associated uncertainties.
2.9 Develop method (simple model/calculation) to translate projections of the distribution of key life stages into estimates of population size for both species.

| Project summary | SMART Indicators | Means of verification | Important Assumptions |
|---|---|---|---|
| 2.10 Apply results of 2.8 in combination with the approach in 2.5 to assess climate change risk to species distributions based on the distribution reference points identified in 1.4.<br>2.11 Apply results of 2.9 in combination with the approach in 2.5 to assess climate change risk to species abundance based on the population reference points identified in 1.4.<br>2.12 Prepare two scientific papers, one on present-day, one on projections.<br>2.13 Provide relevant information (e.g., maps of predicted present/future habitat) and the risk assessment for inclusion in the SGSSI MPA Data Portal.<br><br>**Output 3 Climate change evaluation framework**<br>3.1 Develop a framework to evaluate climate change for toothfish (encompassing data acquisition, analyses and visualisation, management recommendations).<br>3.2 Stakeholder workshop held to discuss project results, consider current management, refine framework and develop recommendations.<br>3.3 Prepare workshop report.<br>3.4 Input to SGSSI Toothfish Fishery Management Plan.<br>3.5 Provide recommendations to CCAMLR. | | | |

## Annex 3: Standard Indicators

.

## Table 1 Project Standard Indicators

| DPLUS Indicator number | Name of indicator | Units | Disaggregation | Year 1 Total | Year 2 Total | Year 3 Total | Total to date | Total planned during the project |
|---|---|---|---|---|---|---|---|---|
| DPLUS-C18 | Number of papers published in peer reviewed journals | Number | | 0 | | | 0 | 2 |
| DPLUS-C19 | Number of other publications produced | Number | | 2 | | | 2 | 6 |
| DPLUS-B02 | Number of new/improved species management plans available and endorsed | Number | | 0 | | | 0 | 1 |

## Table 2 Publications

| Title | Type (e.g. journals, best practice manual, blog post, online videos, podcasts, CDs) | Detail (authors, year) | Gender of Lead Author | Nationality of Lead Author | Publishers (name, city) | Available from (e.g. weblink or publisher if not available online) |
|---|---|---|---|---|---|---|
| [1]Project kick-off report: Evaluating climate change risks to Patagonian and Antarctic toothfish | Online report | Brunner O, Cavanagh R and Waluda C (Eds). 2023 | Male | British | N/A | https://www.bas.ac.uk/project/evaluating-climate-change-risks-to-patagonian-and-antarctic-toothfish/ |
| [2]Evaluating climate change risks to Patagonian and Antarctic toothfish | Paper to CCAMLR (grey literature) | Cavanagh, R, O. Brunner, M.A. Collins, T. Earl, J. Freer, S. Hill, O. Hogg, P. Hollyman, H. Peat, M. Soeffker, S. Thorpe, C. Waluda and M. Whitelaw | Female | British | N/A | https://www.bas.ac.uk/project/evaluating-climate-change-risks-to-patagonian-and-antarctic-toothfish/ |

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

| Title | Type of output | *No. | Direct output or contribution | Further information |
|---|---|---|---|---|
| Project kick-off report: Evaluating climate change risks to Patagonian and Antarctic toothfish | Report | 1 | Direct | Attached an Annex<br>https://www.bas.ac.uk/project/evaluating-climate-change-risks-to-patagonian-and-antarctic-toothfish/ |
| Evaluating climate change risks to Patagonian and Antarctic toothfish | Grey literature – paper to CCAMLR | 2 | Direct | Abstract below:<br>https://www.bas.ac.uk/project/evaluating-climate-change-risks-to-patagonian-and-antarctic-toothfish/ |
| Summary of project knowledge base | Online summary | 3 | Direct | Abstract below:<br>https://www.bas.ac.uk/project/evaluating-climate-change-risks-to-patagonian-and-antarctic-toothfish/ |
| Evaluating climate change risks to Patagonian and Antarctic toothfish | Presentation | 4 | Direct | Abstract below |
| Report of the Workshop on Climate Change 2023 (WS-CC-2023) | CCAMLR Report | 5 | Contribution | https://meetings.ccamlr.org/system/files/meeting-reports/e-sc-42-rep.pdf |
| Report of the Working Group on Fish Stock Assessment 2023 (WG-FSA-2023) | CCAMLR Report | 6 | Contribution | https://meetings.ccamlr.org/system/files/meeting-reports/e-sc-42-rep.pdf |
| Report of the forty-second meeting of the Scientific Committee | CCAMLR Report | 7 | Contribution | https://meetings.ccamlr.org/system/files/meeting-reports/e-sc-42-rep.pdf |

*The numbers are represented in superscript throughout this report for cross-referencing

Abstracts

[2]Evaluating climate change risks to Patagonian and Antarctic toothfish

Cavanagh, R, O. Brunner, M.A. Collins, T. Earl, J. Freer, S. Hill, O. Hogg, P. Hollyman, H. Peat, M. Soeffker, S. Thorpe, C. Waluda and M. Whitelaw

This paper provides an overview of a new research project to evaluate climate change risks to toothfish in subareas 48.3 and 48.4. The CCAMLR Convention Area is one of the world's most rapidly changing oceanic regions, with major impacts both observed and expected on marine ecosystems due to climate change and consequences for the conservation and management of marine living resources. Focusing on Patagonian and Antarctic toothfish (*Dissostichus eleginoides* and *D. mawsoni*) this project will synthesise and review relevant environmental, biological and fishery information, undertake analyses for an ecological risk assessment of climate change effects on the species, and use this to provide information for decision-makers. Project findings will be submitted to CCAMLR meetings during 2024-25.

[3]Summary report of the project "knowledge-base": a synthesis of information on Patagonian and Antarctic toothfish in the waters of South Georgia and the South Sandwich Islands

Climate change is altering marine ecosystems yet is mostly absent from fisheries management policy and implementation. The effects of climate change on high value toothfish caught in Southern Ocean longline fisheries remain largely unknown. This Darwin Plus funded project has synthesised environmental, biological, and fishery information necessary to undertake a risk assessment of climate-driven change to toothfish in South Georgia and the South Sandwich Islands (SGSSI). Understanding the relationships between Patagonian (*Dissostichus eleginoides*) and Antarctic (*Dissostichus mawsoni*) toothfish and environmental parameters is foundational for considering the potential effects of climate change. Therefore, as a first step, we have sourced and synthesised information representing the existing state of knowledge relevant to toothfish-environment relationships into a "knowledge-base", encompassing available literature and data. The knowledge-base consolidates a range of previously disparate information, providing a solid basis from which to understand the sensitivity of both species of toothfish to environmental conditions. This project will use the knowledge-base to provide novel insights into toothfish-environment relationships and enhance our understanding of the risks of climate-driven change to toothfish populations in SGSSI. This understanding will then inform ecosystem-based fisheries management in the region.

[4]Evaluating climate change risks to Patagonian and Antarctic toothfish

Rachel Cavanagh, Martin Collins, Jennifer Freer, Simeon Hill, Oliver Hogg, Philip Hollyman, Marta Soeffker, Sally Thorpe, Claire Waluda

Presented at the SGSSI MPA Review Science Symposium, June 2023

This presentation will provide an overview of a new Darwin Plus project to evaluate climate change risks to Patagonian and Antarctic toothfish in the waters surrounding South Georgia and the South Sandwich Islands (SGSSI). Climate change is altering ecosystems and fisheries around the world, affecting the ability of fisheries management to deliver their objectives, with consequences for the conservation and management of marine living resources. Patagonian and Antarctic toothfish (*Dissostichus eleginoides* and *D. mawsoni*) are high-value deep-water species caught by longline fisheries in the Southern Ocean, including SGSSI. Given the longevity and complex life history of these species, their integral role in the ecosystem, and their value, understanding potential impacts of climate change on stocks, and developing management strategies and measures that take account of these, is essential. This project will synthesise relevant environmental, biological and fishery information and use this to undertake a risk assessment of climate-driven change to toothfish in SGSSI. The results will inform toothfish fishery management and the SGSSI Marine Protected Area.

## 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. | X |
| **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. | |
| **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. | X |
| 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 | X |
| Have you completed the Project Expenditure table fully? | X |
| Do not include claim forms or other communications with this report. | |