DP\100031

Developing the risk assessment framework for the Antarctic krill fishery

Trathan, Philip | British Antarctic Survey

Funding sought   £132,599.00
Project start/end   1 Sep 2018 - 31 Aug 2020

1. Contact Details

Q1. Lead applicant contact details

Please enter the contact details for the lead application. The lead applicant is the same as the Flexi-Grant account holder. Please note that the Flexi-Grant account holder will be the only contact point for the application.
Additionally, please add contact details for the Project Leader if this is different from the lead applicant.

Philip Trathan

Project Leader
Primary Applicant

British Antarctic Survey, Madingley Road,
Cambridge, Cambridgeshire, CB3 0ET,
United Kingdom (Work)

Ms Christina Chatzela

Senior finance officer
British Antarctic Survey

British Antarctic Survey, High Cross,
Cambridge, CB3 0ET, United Kingdom
(Work)

Q2. Lead organisation contact details

Please enter the applicant organisation details

British Antarctic Survey

British Antarctic Survey, Madingley Road,
Cambridge, Cambridgeshire, CB3 OET,
United Kingdom (Work)

Q3. Lead organisation type
Please select one of the below options.

UK Government

Please add any 'Committee Feedback' to the field below:

Please add any 'Specific Ineligibility' feedback to the field below:

Please add any 'Conditions' to the field below:

Please add any 'Positive Feedback to the field below:

2. Title, Dates & Budget Summary

Q4. Project title

Developing the risk assessment framework for the Antarctic krill fishery

Q5. Project dates

Start date:	End date:	Duration (e.g. 2 years, 3 months):
01/09/2018	31/08/2020	2 years

Q6. UKOT(s)

(See Guidance Notes)
Which UK Overseas Territory(ies) will your project be working in? You may select more than one UKOT from the options below.

British Antarctic Territory (BAT)

South Georgia and The South Sandwich Islands (SGSSI)

* if you have indicated a territory group with an asterisk, please give detail on which territories you are working on here:

In addition to the UKOTs you have indicated above, will your project directly benefit any other country(ies)? If so, list here.

This will contribute to the Blue Belt initiative currently underway by the UK Government, contributing to 2 UKOTs. In addition the project will benefit all of the Member states of the Commission for the Conservation of Antarctic Marine Living Resources.

Q7. Budget summary

Year:	2018/19	2019/20	2020/21	Total request
Amount:	£38,549.00	£64,299.00	£29,751.00	£132,599.00

Q7b. Proposed (confirmed and unconfirmed) co-financing as % of total project cost	80%

3. Lead Organisation Summary

Q8. Lead organisation summary

Please provide the following information on the lead organisation

What year was your organisation established/ incorporated/ registered?	1962
What is the legal status of your organisation?	⦿ Government
How is your organisation currently funded?	Department for Business, Energy and Industrial Strategy (BEIS) via the Natural Environment Research Council (NERC)
Have you provided the requested signed audited/independently examined accounts? If you select "yes" you will be able to upload these. Note that this is not required from Government Agencies.	⦿ Yes

Please attach the requested signed audited/independently examined accounts. The limit for any single file uploaded as supporting materials with your application is 6MB. Please ensure documents are saved in PDF form where possible in order to minimise size.

_____ _____	

Q9. Has your organisation been awarded Darwin Initiative funding before (for the purposes of this question, being a partner does not count)?

Yes

If yes, please provide details of the most recent awards (up to 6 examples)

Reference no.	Project leader	Title
DPLUS 009	Philip Trathan	Antarctic and Sub-Antarctic Marine Protected Areas: using penguin tracking data to identify candidate areas
DPLUS 054	Philip Trathan	Managing Antarctic Krill Fisheries; identifying candidate marine areas for protection
DPLUS 057	Jennifer Jackson	Where are they now? Right whales in South Georgia waters
DPLUS 069	Susie Grant	Building data resources for managing the SGSSI Marine Protected Area

4. Project Partners

Q10. Project partners

Please list all the partners involved (including the Lead Organisation) and explain their roles and responsibilities in the project. Describe the extent of their involvement at all stages, including project development. This section should illustrate the capacity of partners to be involved in the project, and how local institutions, local communities, and technical specialists are involved as appropriate.
Please provide written evidence of partnerships. Please add fields for more partnerships, if required. Details on roles and responsibilities in this project must be given for the Lead Organisation and all project partners.

Lead Organisation name:	British Antarctic Survey

Details (including roles and responsibilities and capacity to engage with the project):	BAS has a sophisticated science and management infrastructure with expertese in different disciplines relevant to this project. BAS also has a track record of delivering high quality peer reviewed science, as well as science that is policy-relevant. It also has a sophisticated budgeting and financial management system to ensure funds are tracked and are accountable. Management: Christina Chatzela will oversea financial management. Phil Trathan will manage the science and overall running of the project, including linkages with CCAMLR. Victoria Warwick-Evans will lead the scientific analyses, coordinating with appropriate scientists with relevant data. The main science functions relevant to this project are: 1. Analyse catch data from the krill fishery and outputs from an existing ocean current model in order to identify predictable krill hotspots and address krill flux; 2. Liaise with other groups developing similar oceanographic models that could also be used to address krill flux, for comparitive purposes; 3. Incorporate information from existing penguin habitat models (DPLUS054); 4. Liaise with others to obtain data relevant to the krill risk assessment, particularly data on flying seabirds and cetaceans; 5. Advise on data inputs for habitat modelling/or habitat models 6. Develop manuscripts for CCAMLR and for peer-reviewed journals, liaising with collabirators.

Do you have partners involved in the Project?

No

5. Project Staff

Q11. Project staff

Please identify the core staff on this project, their role and what % of their time they will be working on the project.
These should match the names and roles in the budget spreadsheet.
Please provide 1 page CVs for these staff.

Name (First name, Surname)	Role	% time on project	CV attached below?
Philip Trathan	Project Leader	10%	☑
Victoria Warwick-Evans	Researcher	100%	☑
			☐
			☐

Do you require more fields?

No

Please provide 1 page CVs (or job description if yet to be recruited) for the Project staff listed above. Ensure the file is named clearly, consistent with the named individual and role above.
The limit for any single file uploaded as supporting materials with your application is 6MB. Please ensure documents are saved in PDF form where possible in order to minimise size.

Have you attached all Project staff CVs?

Yes

6. Background & Methodology

Q12. Summary of Project

Please provide a brief summary of your project, its aims, and the key activities you to undertake. Please note that if you are successful, this wording may be used by Defra in communications e.g. as a short description of the project on GOV.UK. Please bear this in mind, and write this summary for a non-technical audience.

> This project will advise the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) on methods to subdivide krill catch limits within the Scotia Sea, especially the Antarctic Peninsula, in order to minimise risk to krill-dependent predators, and develop sustainable fisheries. This will be achieved via the implementation of a risk assessment framework, which will integrate existing spatial data relating to krill stocks, predator foraging and krill fisheries into data-layers at spatial and temporal scales relevant to ecosystem dynamics.

Q13. Background

What is the current situation and the problem that the project will address? How will it address this problem? What key OT Government priorities and themes will it address?

> The Southern Ocean provides critical breeding and foraging habitats for numerous marine predators, many of which rely on Antarctic krill (Euphausia superba) as their main prey source. An ongoing priority for CCAMLR is to set catch limits in a way that minimises the risk to dependent predator populations, whilst also accounting for the needs of the fishery. Currently, concentration of catches occurs at spatial scales smaller than CCAMLR Small Scale Management Units (SSMUs). It is therefore fundamental to determine how catch limits can be spatially and temporally apportioned within and between SSMUs to avoid negative impacts on dependent populations. The Scientific Committee has advised the Commission that the program of work is urgent, as previous work has shown that risks to the ecosystem associated with the fishery are increasing, particularly in SubArea 48.1. CCAMLR has endorsed the use of a risk assessment framework which integrates spatial data relating to krill stocks, predator foraging and fisheries in order to compute the relative spatial and temporal risks associated with proposals to subdivide the regional catch limits. However CCAMLR has noted potential limitations to the approach. Thus, the aim of this proposal is to initiate work to address some of these limitations.

Q14. Methodology

Describe the methods and approach you will use to achieve your intended outcomes and impact. Provide information on how you will undertake the work (materials and methods) and how you will manage the work (roles and

responsibilities, project management tools etc). Give details of any innovative techniques or methods.

We will use existing spatial datasets in order to apply state-of-the-art analytical approaches to generate spatially and temporally explicit data-layers to be integrated into the risk assessment framework. Development will initially be applied to the CCAMLR SSMUs in Subarea 48.1 (please see attached map), although data-layers will be easily adaptable for other Subareas in Area 48. Specifically, we will:

i) Develop a suite of preference models in order to investigate the variability in the spatial distribution of the krill fishery, and to identify the desirability criteria. We will build statistical models to investigate how the fisheries use the Southern Ocean in relation to bathymetry, sea ice cover, proximity to the shelf break and fine-scale water movement, both over historic (1981/82 to 2016/17) and recent timescales (2009/10 to 2016/17). We will use these outputs to predict desirable areas for krill fisheries at spatial and temporal scales in accordance with ecosystem dynamics.
ii) Investigate proxies for the oceanographic flux and movement (import and export) of krill by utilising fine-scale ocean models to estimate relative water movement rates at spatial scales relevant to predator consumption and fisheries usage.
iii) Integrate habitat preference models previously developed for Pygoscelis penguins (DPLUS009 and DPLUS054) and humpback whales, with krill consumption estimates in order to generate spatially and temporally explicit resource demand estimates for key predator groups, including penguins, whales and flying seabirds, at relevant spatial and temporal scales in accordance with predator phenology and behaviour.
iv) Integrate existing and novel data-layers and apply the risk assessment framework, focussing primarily on Subarea 48.1, at a variety of spatial scales which we will identify based on bathymetry, predator distribution, current flow, and distance from the shelf-edge, and at temporal scales according to predator life-history and movement constraints. This will allow us to identify the relative risks when the framework is applied at various spatial and temporal scales, and enable the identification of an appropriate scale at which to apportion the catch limit. We will focus initially on Subarea 48.1 as this is where the fishery is most constrained by catch limits and where it operates in close proximity to the breeding colonies of dependent predators, especially penguins.
v) Utilise the risk assessment to identify the areas of increased risk to predator populations or krill, and to focus research and monitoring in those areas.
vi) Present the methodologies utilised in the production of the data layers used in the risk assessment, allowing for the addition of new information by other Members as it becomes available.
vii) Present a series of maps which detail the data layers to be included in the risk assessment.
viii) Present a tables of risk indices and catch-limit proportions under different krill fishing scenarios.

We propose that this work is undertaken within BAS by the named Researcher and the PL, but that we liaise extensively with relevant dataholders within the CCAMLR community. US AMLR hold most data for Subarea 48.1 and they have agreed to work with us.

If necessary, please provide supporting documentation e.g. maps, diagrams etc., using the File Upload below.
The limit for any single file uploaded as supporting materials with your application is 6MB. Please ensure documents are saved in PDF form where possible in order to minimise size.

Q15. Project Objectives

How does this project:

- Deliver against the priority issues identified in the assessment criteria
- Demonstrate technical excellence in its delivery
- Demonstrate a clear pathway to impact in the OT(s)

This proposal delivers against many of the priority issues identified within the Darwin Plus guidance notes. Thus, our proposal is designed to help build sustainable fisheries in an area that is warming more rapidly than the global ocean as a whole. For much of the twentieth century the climate of the west Antarctic Peninsula region warmed at an unprecedented rate. These conditions have resulted in significant trends in seasonal sea ice with a later autumn advance ($+1.9\pm0.5$ days per year) and an earlier spring retreat (-1.2 ± 0.4 days per year), such that the winter duration of sea ice is -3.1 ± 0.10 days per year shorter over the period 1979/80 to 2010/11. This is important because sea ice is a critical habitat for parts of the krill life cycle. Reduced sea ice is also critical as it potentially facilitates new harvesting strategies for the krill fishery. A series of years in the early part of this century with longer ice free conditions in the Bransfield Strait probably contributed towards the development of a new harvesting strategy, leading krill fishing vessels to explore within the Bransfield Strait. Once established, this new spatial pattern of harvesting has persisted and is now the dominant strategy. Overall, it appears that the observed seasonal change in sea ice duration has probably facilitated change and variability in krill fishing locations. As krill fishing locations have changed, the cumulative number of predator populations where competitive interactions potentially might occur has also increased. Competitive interactions between fisheries and predators may occur at any time, but are most likely when predators are highly constrained. For example, penguins in Area 48 usually forage within 50 to 100km of their colonies, during brood and crèche, which coincides with areas of increased krill fishing. Additionally, humpback whales (Megaptera novaeangliae) forage in near-shore areas and are at risk of negative interactions from harvesting. Thus, spatial overlap potentially occurs with most predator populations, but harvesting impacts are not quantified. Managing competitive interactions will be vital as Adélie and chinstrap penguin populations are declining across the Antarctic Peninsula and South Orkney Islands. It is therefore crucial that CCAMLR determine how to apportion krill catch limits, at relevant temporal and spatial scales, in order to mitigate impacts on predator populations. This proposal builds on previous work undertaken by the same group of researchers. It will link penguin habitat models with krill consumption data, to gain spatially explicit consumption estimates. Furthermore, it will link research undertaken by collaborators including using oceanic flow models to understand the flux in krill distribution, and identify predictable krill hotspots. Developing the necessary scientific understanding and providing ecosystem-based initiatives to ensure the Antarctic krill fishery is sustainably managed, is critical. The krill fishery currently operates in the Antarctic Peninsula and Scotia Sea region, so falls within two UKOTs (GSGSSI and GBAT). Thus, to improve the conservation,

protection and management of the marine environment in these UKOTs requires that CCAMLR use the best available scientific evidence to develop innovative solutions to protect krill and its predators.

Q16. Project Stakeholders

Who are the stakeholders for this project and how have they been consulted (include local or host government support/engagement where relevant)? Briefly describe what support they will provide and how the project will engage with them.

The stakeholders for this work are all CCAMLR Member states actively engaged in developing a new management framework for Antarctic krill. This project will therefore help expedite the process. Other stakeholders include tourist companies and NGOs that value the natural status of the Antarctic ecosystem. Two UKOTs (GSGSSI and GBAT) are also key stakeholders as the Antarctic krill fishery operates within their areas of interest; it will therefore also contribute to the UK Blue Belt initiative. The PL has engaged with CCAMLR over many years and is currently the senior ecological adviser to the UK Delegation to CCAMLR; he regularly attends Working Group meetings, the Scientific Committee and Commission. He is active in the science of developing a new management framework for krill, working with NGOs and fishing nations. He submitted 4 papers to CCAMLR this year linked to the objectives of this proposal. The CCAMLR CEMP Special Fund is also actively considering a proposal by the PL that should be considered as additional co-funding for this Darwin Plus proposal. Within CCAMLR, the debate on krill management needs to be revitalised through a collaborative approach that better involves fishing nations and conservation-minded nations. The panel of advisors linked to this project include scientists from both fishing and conservation-minded nations. The PL has communicated with GBAT and GSGSSI officials who all are extremely supportive of this proposal. The PL will continue to work with them ensuring that scientific papers submitted to CCAMLR also meet the needs of the respective UKOTs.

Q17. Institutional Capacity

Describe the lead organisation's capacity (and that of partner organisations where relevant) to deliver the project.

BAS/NERC has a long history of working in the Antarctic. More specifically, Trathan, the PL specialises in penguin and ecosystem research and leads a team that involves penguin, other seabird, seal and whale specialists. The PL has a high profile internationally and is a member of the steering committee for the 10th International Penguin Conference; he is also part of the IUCN Species Survival Commission Penguin Specialist Group. The PL is also the Chair of the Science Advisory Group for the Antarctic Wildlife Research Fund, a new collaboration between the krill fishing industry, NGOs and scientists. Consequently, the PL has a wide network of contacts that will help facilitate engagement with the penguin research community, the research

communities focused on other krill predators, as well as the krill fishing industry. The PL also has extensive firsthand experience of working within both national and international political environments. He was the lead scientist working on the development of the South Georgia MPA and the lead scientist working on the UK's proposal to establish the world's first MPA in areas beyond national jurisdiction and within CCAMLR waters. Most recently he drove the UK science that led to the CCAMLR Conservation Measure that facilitates protection of new areas of ocean revealed by collapsed ice shelves. The PL has been involved with CCAMLR for over 20 years and is a senior adviser to the UK Delegation to CCAMLR. He has extensive experience of working with multiple stakeholders, including fishing companies and NGOs. CCAMLR relies on Member contributions, but has asked the PL to liaise with experts in predator tracking to facilitate the development of research tools that will benefit ecosystem management and monitoring related to spatial and temporal management of the krill fishery. The proposed project fulfils this requirement. Warwick-Evans, the named Researcher, has considerable experience in the requisite analysis methods and data management routines needed to successfully deliver this project. Though she recently finished her PhD she has specialised in the analysis of spatial data, investigating spatial interactions between seabirds and anthropogenic activities. Current projects include creating habitat models in order to predict the at-sea distribution of chinstrap penguins breeding at the South Orkney and South Shetland Islands, and identifying potential interactions with krill fisheries. She is also investigating the behaviour of chinstrap and Adélie penguins in the pre-moult period of their breeding phase in order to provide scientific advice for the forthcoming CCAMLR review of the South Orkney southern shelf MPA in 2019.

Both the PL and named Researcher have a wide network of contacts that will facilitate delivery of this project, both nationally and internationally with CCAMLR. They have already secured the agreement of the US AMLR program to share relevant data for Subarea 48.1.

Q18. Sustainability

How will the project ensure benefits are sustained after the project has come to a close? If the project requires ongoing maintenance or monitoring, who will do this and how will it be funded?

One of the priorities for CCAMLR is to support research that will inform its management approach for the krill fishery. This proposal provides an initial step towards establishing local catch limits using a scientific basis, so is of considerable importance for management of the Antarctic krill fishery. The CCAMLR Scientific Committee recognises that the risk assessment framework contributes towards the development of management and has endorsed it as a framework for development. As a result, Members have been encouraged to participate in further development of the risk assessment method. However, due to the scale of work involved to initiate the project there has been no progress for Area 48 in the last year. Thus, this proposal provides the UK with a chance for leadership of this vital CCAMLR project. The outputs from this project alone will be sufficient for initial advice to CCAMLR on how to subdivide the catch limits in Subarea 48.1 in order to minimise risk to krill-dependent

predators. The flexible approach of the risk assessment allows for integration of new data-layers as they become available. However, the timeframe for the revision of CCAMLR CM 51-07 necessitates the initiation of further development as soon as possible.

8. Funding and Budget

Q19. Budget

Please complete the appropriate Excel spreadsheet linked below, which provides the Budget for this application. Some of the questions earlier and below refer to the information in this spreadsheet. Note that there are different templates for projects requesting over and under £100,000 Darwin Plus budget.
R6 D+ Budget form for projects under £100,000
R6 D+ Budget form for projects over £100,000
Please refer to the Finance Guidance for more information.
N.B.: Please state all costs by financial year (1 April to 31 March) and in GBP. Budgets submitted in other currencies will not be accepted. Use current prices – and include anticipated inflation, as appropriate, up to 3% per annum. The Darwin Initiative cannot agree any increase in grants once awarded.
Please upload your completed Darwin Plus Budget Form Excel spreadsheet using the field below.

Q20. Co-financing

Are you proposing co-financing?

Yes

Secured
Provide details of all funding successfully levered (and identified in the Budget) towards the costs of the project, including any income from other public bodies, private sponsorship, donations, trusts, fees or trading activity, as well as any your own organisation(s) will be committing.
(See "Finance for Darwin & IWT" and the "Guidance for Applicants" documents)

BAS will support this project in kind, including through reduced overhead rates that have been agreed. BAS will also support this project through the inkind salary and travel costs of the PL, Trathan. This amounts to £122,144.

Unsecured
Provide details of any co-financing where an application has been submitted, or that you intend applying for during the course of the project. This could include

co-financing from the private sector, charitable organisations or other public sector schemes.

Date applied for	Donor Organisation	Amount	Currency code	Comments
01/10/2017	CEMP Special Fund	123599	£	The proposal is focussed on a request for analyses made by the CCAMLR Scientific Committee, so has a good chance of success.

Please give brief details including when you expect to hear the result. Please ensure you include the figures requested in the Budget Spreadsheet as Unconfirmed funding.

Result should be known by 1 November 2017, or shortly thereafter.

Do you require more fields?

No

9. Financial Controls, Value for Money & Open Access

Q21. Financial Controls

Please demonstrate your capacity to manage the level of funds you are requesting. Who is responsible for managing the funds? What experience do they have? What arrangements are in place for auditing expenditure?

BAS/NERC will control finances through the fully audited RCUK Shared Business Services Centre (SBS). A separate budget cost centre will be created for the project. The project PL will oversee the strategic spending of funds, with day-to-day oversight and authorisation by the named Researcher. The PL will be ultimately accountable for managing the budget.
The PL has successfully managed budgets for both BAS/NERC projects and externally funded project for over 20 years. Some of these budgets have been considerably larger than the budget requested for this project.
BAS/NERC also employs staff within a dedicated Finance Department. These staff will also monitor spend to ensure that the budget is managed appropriately.

Q22. Financial Management Risks

Explain how you have considered the risks and threats that may be relevant to the success of this project, including the risks of fraud or bribery.

The majority of funds associated with this project will be for salaries and so will be controlled through the BAS/NERC SBS system.

The only other expense will be to bring together external advisors for a workshop to discuss the risk assessment framework. Planning for this, together with booking of travel and accommodation will be through the BAS/NERC SBS system, again reducing the risk of fraud. Applications for travel and subsistance for workshop attendees will be through BAS/NERC SBS, again minimising the risk of fraud.

The BAS/NERC SBS system requires that all non-salary costs have associated receipts, again minimising the risk of fraud.

Q23. Value for money

Please explain how you worked out your budget and how you will provide value for money through managing a cost effective and efficient project. You should also discuss any significant assumptions you have made when working out your budget.

To provide an appropriate level of expertise, we will use an early career scientist with extensive experience of spatial analyses. The named Researcher has worked on

DPLUS054 and will be committed to the current project proposal until complete. BAS will complement support with additional staff-time and resources necessary for the project.

The project shall also benefit from use of systems and analyses that have already been developed (DPLUS009 and DPLUS054). In doing so, we will avoid considerable development costs.

We shall also make use of existing data, including telemetry data and ship-based data that are very costly to collect and also require considerable logistic effort, all of which has already been expended.

The krill fishery risk assessment is based on an internationally agreed plan of action by CCAMLR. Therefore, we are also seeking additional co-funding from CCAMLR; early indications about this are positive.

Thus, this project proposal represents exceptional value for money, particularly as the very real political difficulties associated with this kind of project are being gradually eroded, meaning that the project has a high probability of generating important conservation outcomes.

Q24. Outputs of the project and Open Access

All outputs from Darwin Plus projects should be made available on-line and free to users whenever possible. Please outline how you will achieve this and detail any specific costs you are seeking from Darwin Plus to fund this.

All data are currently held in international databases and data can be readily requested by any individual, subject to existing widely accepted data access rules (BirdLife http://seabirdtracking.org/?q=termsofuse; CCAMLR https://www.ccamlr.org /en/data/access-and-use-ccamlr-data). All analytical methods, computer routines and results will be published as part of the project's submission to CCAMLR.

The computer software routines themselves will also be made available as open-source code so other Subareas, Areas and Divisions within the CCAMLR Convention Area can make use as appropriate. The analysis routines will also have general applicability to other fisheries outside the Antarctic where penguins, or other seabirds, forage and are in potential competition with fisheries.

In addition to submitting all project outputs to CCAMLR, we will also publish our results in the scientific peer-reviewed literature. Publication in high-impact journals also often requires that data and analysis routines are made available in open access databases.

We also commit to making results available to the general public by giving presentations at appropriate meetings and events. For example, the 10th International Penguin Conference will attract many different media representatives. We will also provide media press releases about significant scientific results and important management initiatives resulting from the project.

Finally, results and analysis routines will also be made available to the UK Blue Belt community, for use in similar sustainable fishing situaltions.

10. Logical Framework

Q25. Logical Framework

Darwin Plus projects will be required to report against their progress towards their expected outputs and outcome if funded. This section sets out the expected outputs and outcome of your project, how you expect to measure progress against these and how we can verify this.
Annex D and Annex E in the Guidance Notes provides helpful guidance on completing a logical framework, including definitions of the key terms used below.

Impact:

To ensure that the Antarctic krill fishery is managed sustainably, by establishing an economically viable fishery that has minimal impacts on the stock and on key krill dependent predators.

Project Summary	Measurable Indicators	Means of Verification	Important Assumptions
Outcome: To identify the relevant spatial and temporal scales for management of the krill fishery and to develop a risk assessment in order to apportion catch limits at sustainable levels.	Engagement across the CCAMLR community, including with CCAMLR Domain 1 Planning for Marine Protected Areas.	That CCAMLR Conservation Measure 51-07 is continued but in a revised form that accounts for dependent predators at appropriate spatial and temporal scales.	That ongoing discussions within CCAMLR continue along the lines anticipated with regard to the krill risk assessment and MPAs. We will revise our plans after each Commission meeting to account for potential changes in direction.

Output 1: Investigate variability in the spatial distribution of the krill fishery in relation to bathymetry, sea ice cover, proximity to the shelf break and fine-scale water movement, over both historical (1981/82 to 2016/17) and recent timescales (2009/10 to 2016/17). To use these outputs to predict desirable areas for krill fisheries at spatial and temporal scales in accordance with ecosystem dynamics.	Working paper to WG-EMM-19	Report text from CCAMLR including from WG-EMM-19 and SC-CAMLR-XXXVIII	Analyses begin 1 September 2018

Output 2: Investigate proxies for the oceanographic flux and movement (import and export) of krill by utilising a fine-scale ocean model to estimate relative water movement rates at spatial scales relevant to predator consumption and fisheries usage.	Working paper to WG-EMM-20	Report text from CCAMLR including from WG-EMM-20 and SC-CAMLR-XXXIX	We will use the existing oceanographic model developed by BAS, but will include comparison and consideration of other relevant models if they are completed within an appropriate timescale.

Output 3: Integrate habitat preference models previously developed for Pygoscelis penguins (DPLUS009, DPLUS054) and humpback whales, with krill consumption estimates in order to generate spatially and temporally explicit resource demand estimates for key predator groups, including penguins, whales and flying seabirds, at relevant spatial and temporal scales in accordance with predator behaviour.	Working paper to WG-EMM-19	Report text from CCAMLR including from WG-EMM-19 and SC-CAMLR-XXXVIII	Analyses begin 1 September 2018

Output 4: Integrate existing and novel data-layers and apply the risk assessment framework, focussing primarily on Subarea 48.1, at a variety of spatial scales which we will identify based on bathymetry, predator distribution, current flow, and distance from the shelf-edge, and at temporal scales according to predator life-history and movement constraints. This will allow us to identify the relative risks when the framework is applied at various spatial and temporal scales, and enable the identification of an appropriate scale at which to apportion the catch limit. We will focus	Output from workshop. Working paper to WG-EMM-20	Report text from CCAMLR including from WG-EMM-20 and SC-CAMLR-XXXIX	We achieve engagement from CCAMLR Members at our workshop.

initially on Subarea 48.1 as this is where the fisheries is most constrained by catch limits and where it operates in close proximity to the breeding colonies of dependent predators, especially penguins.			

Output 5: Utilise the risk assessment to identify the areas of increased risk to predator populations or krill, and to focus research and monitoring in those areas. Present the methodologies utilised in the production of the data layers used in the risk assessment, allowing for the addition of new information by other Members as it becomes available. Present a series of maps which detail the data layers to be included in the risk assessment. Present tables of risk indices and catch-limit proportions under different krill fishing scenarios.	Working paper to SC-CAMLR-XXXIX	Report text from CCAMLR including from WG-EMM-20 and SC-CAMLR-XXXIX	We achieve engagement from CCAMLR Members at our workshop.

Do you require more Output fields?
It is advised to have less than 6 Outputs since this level of detail can be provided at the Activity level.

Yes

Project summary	Measurable Indicators	Means of verification	Important Assumptions
Output 6: Peer-reviewed papers submitted to scientific journals developed from other Outputs.	Papers in scientific journals.	Papers in scientific journals.	Normal submission and editorial control by journal editors.
Output 7:			
Output 8:			

Activities
Each activity is numbered according to the output that it will contribute towards, for example 1.1, 1.2 and 1.3 are contributing to Output 1. Each new activity should start on a new line.

Rigorous scientific analysis is critical for identifying important predator habitats, especially when also justifying associated changes in access for fisheries, and particularly where economic imperatives have held a strong voice. For the first time in 35 years, we are in a position to build the necessary habitat models for predators that have the potential to persuade CCAMLR of the need to manage the Antarctic krill fishery at spatial and temporal scales relevant to krill-dependent predators. The deliverables listed below are all necessary to generate the results needed for management, as well as those for spatial and temporal protection.
1.1 Working paper to WG-EMM-19 on variability in the spatial distribution of the krill fishery in relation to bathymetry, sea ice cover, proximity to the shelf break.
2.1 Working paper to WG-EMM-20 on proxies for the oceanographic flux and movement at spatial scales relevant to predator consumption and fisheries usage.
3.1 Working paper to WG-EMM-19 on Integrated habitat preference models for Pygoscelis penguins and humpback whales.
4.1 Workshop on the risk assessment framework, focussing primarily on Subarea 48.1, at a variety of spatial scales which we will identify based on bathymetry, predator

distribution, current flow, and distance from the shelf-edge, and at temporal scales according to predator life-history and movement constraints.

4.2 Working paper to WG-EMM-20 on output from workshop.

5.1 Working paper to SC-CAMLR-XXXIX on maps and tables of risk indices and catch-limit proportions under different krill fishing scenarios.

6.1 Peer reviewed papers based on each activity.

11. Implementation Timetable

Q26. Provide a project implementation timetable that shows the key milestones in project activities

Please complete the Excel spreadsheet linked below to describe the intended workplan for your project.
Darwin Plus Implementation Timetable XLS
Please add columns to reflect the length of your project.
For each activity (add/remove rows as appropriate) indicate the number of months it will last, and fill/shade only the quarters in which an activity will be carried out.

_____ _____	

12. Monitoring and Evaluation

Q27. Monitoring and evaluation (M&E) plan

Describe, referring to the Indicators above, how the progress of the project will be monitored and evaluated, making reference to who is responsible for the project's M&E.
Darwin Initiative projects are expected to be adaptive and you should detail how the monitoring and evaluation will feed into the delivery of the project including its management. M&E is expected to be built into the project and not an 'add' on. It is as important to measure for negative impacts as it is for positive impact.

A project steering committee will be created that will include (i) both project staff, that is, the PL and the named Researcher; (ii) scientific experts in oceanography, and penguin and marine mammal tracking; and (iii) individuals from amongst CCAMLR Members that are interested in the implementation of the risk assessment framework, includling scientists from Argentina, Australia, Chile, Norway and the USA. Relevant experts who are also key data holders have already agreed to participate in the steering committee; these are a.) Dr Mercedes Santos, Argentina; b.) Dr Dirk Welsford, Australia; c.) Dr Cesar Cardinas, Chile; d.) Dr Andrew Lowther; and e.) Dr Jefferson Hinke, and Dr George Watters (USA).

The project steering committee will meet as soon as is feasible before the project commences, saving costs by use of the videoconference facilities at BAS, or by Skype or by email. They will develop a detailed implementation plan with specific and detailed project objectives, timelines and project outputs, building upon the details described in this proposal. During this first meeting the steering committee will define clear milestones and delivery dates for implementation.

We have not budgeted for any face-to-face meeting for the steering committee, as we will meet at least once a year in association with regular CCAMLR meetings. Project meetings in association with CCAMLR meetings will save T&S costs, so we plan to meet at each available opportunity. These regular meetings will be used to review progress and examine the project milestones and delivery dates. Our first face-to-face meeting will be in association with the CCAMLR WG-EMM-18 meeting which will be held in Cambridge prior to the project start date.

A project implementation group comprising the PL and named Researcher will convene every month to monitor project delivery. During these formal meetings we will review outputs, outstanding goals and any obstacles or challenges to delivery. We will also review the detailed spend and remaining budget.

CCAMLR Scientific Committee and Working Group reports will provide an unbiased independent evaluation of the project's progress.

Number of days planned for M&E	31

Total project budget for M&E (this may include Staff and Travel and Subsistence Costs)	£10,497.45
Percentage of total project budget set aside for M&E (%)	4.75

13. Certification

Q28. Certification

On behalf of the

company

of

British Antarctic Survey, a consituent part of the Natural Environment Council

I apply for a grant of

£132,599.00

in respect of all expenditure to be incurred during the lifetime of this project based on the activities and dates specified in the above application.
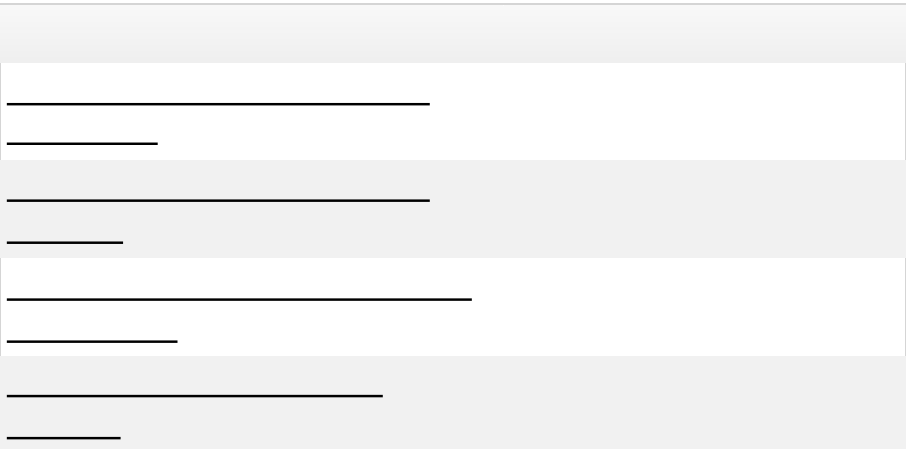
I certify that, to the best of our knowledge and belief, the statements made by us in this application are true and the information provided is correct. I am aware that this application form will form the basis of the project schedule should this application be successful.
(*This form should be signed by an individual authorised by the applicant institution to submit applications and sign contracts on their behalf.*)

- I have uploaded CVs for project principals and letters of support.
- I have uploaded our most recent signed audited/independently verified accounts and annual report (if appropriate).

☑

Name	Philip Neil Trathan
Position in the organisation	Head of Conservation Biology

Signature (please upload e-signature)	
Date	02/10/2017

If this section is incomplete the entire application will be rejected.

14. Submission Checklist

Checklist for submission

	Check
Have you read the Guidance documents, including the '<u>Guidance Notes for Applicants</u>' and '<u>Finance Guidance</u>'?	☑
Have you read, and can you meet, the current <u>Terms and Conditions</u> for this fund?	☑
Have you provided actual start and end dates for your project?	☑
Have you provided your budget based on UK government financial years i.e. 1 April – 31 March and in GBP?	☑
Have you checked that your budget is complete, correctly adds up and that you have included the correct final total at Q7?	☑
Has your application been signed by a suitably authorised individual?	☑
Have you uploaded a 1 page CV for all the Project Staff (listed at Q11) on this project, including the Project Leader?	☑
Have you included a letter of support from the applicant organisation, <u>main</u> partner(s) organisations and the relevant OT Government?	☑
Have you uploaded a signed copy of the last 2 years annual report and accounts for the lead organisation, or provided an explanation if not?	☑
Have you checked the <u>Darwin Plus website</u> to ensure there are no late updates?	☑