

EXECUTIVE COUNCIL

CONFIDENTIAL

Title of Report: South Atlantic Environmental Research Institute: A Progress Report
Paper No: 278/12
Date: 21 November 2012
Report of: Dr Paul Brickle, Director, South Atlantic Environmental Research Institute

1.0 Purpose

To provide Executive Council with an update on the progress and activities of the South Atlantic Environmental Research Institute (SAERI) since its creation in March 2012.

2.0 Recommendations

None

3.0 Summary of Financial Implications

None

4.0 Background

4.1 SAERI was born out of Falkland Islands Government's Economic Development Strategy, within the new industries section. The new industries section's objective was to try and move away from our reliance on the three main core areas of the economy; Fisheries, Agriculture and Tourism. Many first world countries have "knowledge economies" and it was agreed that an Environmental Research Institute could fill this gap in the Falkland Islands and other UK OTs. Shortly after this, in 2009, a Task and Finish Group was formed to take this forward.

It was agreed that the Institute would be uniquely positioned to focus its research on the natural environment of the South Atlantic, with benefits for the Falkland Islands, in terms of:

- localising work currently taking place overseas or undertaken by overseas contractors/researchers – retaining the economic value of the activity within the Islands;

- increasing the volume of scientific work undertaken in the Islands by gaining research funding directly or in collaboration with other institutions;
- reducing the costs of research activity by reducing the reliance on expensive overseas organisations;
- enhancing the value of local scientific activity through enabling academic activity to take place on the Islands, and improving efficiency through the co-ordination of existing facilities and assets;
- establishing a strong international identity for the Falklands Islands;
- increasing the Falklands' ability to leverage international environmental research funding and commercial consultancy contracts.

4.3 Through the Task and Finish Group the British Antarctic Survey (BAS) were commissioned to conduct a feasibility study. BAS's main findings were

- There are opportunities to pursue more environmental research in the Falkland Islands and the wider South Atlantic (and benefits to a combined strategy for co-ordinating research with South Georgia);
- Greater promotion of existing local research activity and potential is required in order to engage with collaborators and potential research funders around the world;
- There is a need for an umbrella organisation for the existing range of research groups operating in the Falklands. SAERI's role would be to expand on this base of activity (not compete with it) to lead to an overall increase in the volume of research being undertaken, and to increase international awareness of, and involvement in, environmental research in the Falkland Islands, South Georgia and wider South Atlantic;
- A phased approach to the establishment of the Institute is the most appropriate way forward, so as to minimise risks and financial commitments, and to enable on-going monitoring of the success of the Institute before formal commitment is given to progressing with the further development of the facility.

Following the recommendations by BAS a phased approach to its development was proposed.

4.2 In December 2011 Executive Council approved the phased approach to the development of SAERI with the creation of 1.5 FTE posts within the organisation. The organisation is funded by Falkland Islands Government, FCO and Government of South Georgia and the South Sandwich Islands.

4.3 SAERI's formation was marked by the employment of its Director in March 2012.

5.0 Progress

Summary

There is a great deal of interest in conducting research in the South Atlantic because the environment is little studied, pristine (especially with respect to the UK OTs) and offers unique research opportunities. There has been an enormous amount of interest in and support for SAERI from UK and European Universities and Institutes and indeed at a Ministerial level in the UK. Founded in March 2012, the institute has had a great start and has been quite successful, in partnership with other organizations, in being awarded grants. The institute has two PhD students starting in September/October. One studying mackerel icefish fisheries in South Georgia and the other studying algal biodiversity in the Falkland Islands. Another PhD studentship on shallow marine ecology around the Falkland Islands will start February 2013 subject to funding. The institute also has a number of project applications pending and in the concept phase with partners locally and overseas.

Detail

5.1 Progress for the institute in terms of institutional and political support started prior to its formation. SAERI Director had already gained the support and enthusiasm from the Alfred Wegner Institute (German Equivalent to BAS), BAS, University of Aberdeen and University of Otago.

5.2 UK Political support, outside of the Foreign and Commonwealth Office, was secured at a meeting in Stanley on the 15th of February with the Minister of State for Universities and Science, Rt Hon David Willets MP. Also present were Colin Roberts CVO (Director, Overseas Territories Directorate, Foreign & Commonwealth Office). Dr Steven Wilson (Director, Advisor to the CE, Natural Environmental Research Council (NERC)), Michael Pinnock (Board Member for Science Delivery, British Antarctic Survey) and Nigel Haywood (Governor, Falkland Islands). The Minister has asked NERC to help facilitate a UK Universities and Institutes tour in 2013. David Willets has subsequently requested that SAERI Director deliver a report on the institute's progress and development.

5.3 Encouragingly the institute was mentioned in the recent UK Overseas Territories White Paper

(<http://www.fco.gov.uk/resources/en/pdf/publications/overseas-territories-white-paper-0612/ot-wp-0612>).

5.4 Office Accommodation – Stanley Cottage (North).

The initial stages for the institute were to set up an office in Stanley Cottage adjacent to BAS's office. Stanley Cottage (North) used to be the Director of Education's residence and was a dwelling until the institute took up residence. There had to be great deal of redecoration before the site was fit for purpose. Planning permission was deferred on the 5th April due to the lack of parking. Planning permission was finally granted in late April.

A £30,000 office start-up grant came from Government House and this essentially paid for office furniture, IT, a vehicle and PB's first overseas trip.

5.5 Scope

The scope of SAERI has expanded to include the other UK South Atlantic Overseas Territories. Discussions with Governor of St Helena, MarkCapes, and the Administrator of Ascension Island, Colin Wells, secured their enthusiasm for the institute and they agreed that it will help secure funding and provide capacity in the environmental science for their OTs. The scope therefore includes all of the Atlantic from the equator to the ice in Antarctica.

5.6 UK/Germany Trip May/June 2012.

The aims of the trip were:

- Formalise partnerships with University of Aberdeen, Alfred Wegener Institute and the British Antarctic Survey with scientific collaboration, discuss MoUs and potential board membership
- Forge links with other institutes
- Follow up on extant and future projects with partners in the UK
- Meet with New Island Conservation Trust to discuss SAERI and how the organisations might collaborate
- Discuss SAERI ‘wish lists’ for physical facilities, investment and financial support with a potential benefactor
- Identify a potential UK Office for SAERI on the assumption that we will incorporate as a UK Charity and Company Limited by Guarantee

There seemed to be genuine overwhelming enthusiasm for the SAERI concept from everyone SAERI Director met with. The trip strengthened links/partnership and highlighted a number of willing board members and a number of suggested ones that could prove promising. A number of research projects were developed further and current ones strengthened/finalised.

The meeting with the potential benefactor was extremely encouraging and there is the potential that SAERI will be ahead of its development plan and be functioning as an academic institute quicker than we had hoped for. We were asked to provide a wish list which is now being considered.

5.7 Current and Developing Projects – **See Appendix 1**

6.0 Website Development

The SAERI website is live but still under development and can be viewed at www.south-atlantic-research.org

7.0 Next six months

The next six months will include another trip to the UK, in December 2012, to attend two funding workshops, meet with collaborators to discuss future projects and collaboration with SAERI partners. SAERI Director will also meet with the Director of the National Oceanographic Institute to arrange a formal UK Universities and Institutes tour. SAERI Director will visit St Helena during late January early February

2013 to formalise partnerships with the other South Atlantic UK Overseas Territories. Links are currently being forged with US and Chilean research institutes and these will be followed up by visits next year.

Other Activities include:

- Potential incorporation as a UK Registered Charity and Company Limited by Guarantee
- Formalise the South Atlantic Board
- Populate the potential UK/Overseas board
- Organise a Directors workshop to help design Strategic Science and Business direction over the next 5 years in order to inform the SAERI's formal business plan
- Continue engaging with potential benefactors

8.0 Concluding remarks

SAERI is seven months old and has progressed extremely well in that time, achieving a number of the milestones set out in Phase 1 (first three years) of its proposed development (see ExCo paper 264/11). This is down to the enthusiasm for the concept by the Falkland Islands community, political support locally and overseas and by overseas institutes wishing to conduct research in the South Atlantic.

SAERI will see its official opening by HRH Duke of Kent on the 12th November 2012.

9.0 Financial Implications

None

10.0 Legal Implications

None

11.0 Human Resources Implications

None

Appendix 1 – Current Projects

Ascension Island shallow Marine Biodiversity(International Partnership) This is a Darwin Initiative Challenge Award (<http://darwin.defra.gov.uk/>).

Ascension Island harbours globally important biodiversity, potentially representing a unique assemblage of western and eastern Atlantic flora and fauna. Previous biodiversity projects focused on sea-turtles, seabirds and plants (Darwin, RSPB, OTEP respectively). Marine biodiversity remains virtually unknown; a search on Google Scholar and Web of Science show few if any collective studies on the Island's benthic species, habitats or biogeography. A small Conservation Department comprising 3 core staff was created in 2001 and has carried out much work, however, critical work remains. The Island lacks a National Biodiversity Strategy.

Lacking are inventories of marine invertebrates, ichthyofauna and algae. Habitat inventories and mapping are needed to manage coastal zones. Additionally, corals and associated fauna are particularly sensitive to climate change. The status of marine endemic species is absent and redressing these will drive the formulation of species actions plans. We will generate baseline data, thus creating scope for future marine biodiversity conservation and management projects on the Island. We will train local divers and Conservation Professionals in sampling protocols such that the collection of baseline data and monitoring of key marine flora and fauna can continue.

The Challenge Fund supported a dedicated team of 17 local and international ecologists, taxonomists and divers. Many of the team have worked successfully together previously as project partners in the Falklands and South Georgia (SMSG, BAS, National MuseumsNorthern Ireland). Logistics of transporting personnel and equipment were developed with British Forces project partners. Stage One of the work was a meta-analysis of existing information on Ascension marine biodiversity and establishment of literature and georeferenced databases. These data will be linked to globally important open access databases such as the Open Biogeographic Information System (OBIS). From this, a key deliverable, the first peer-reviewed article reviewing the shallow marine biodiversity around Ascension, will be produced. These data formed the basis of a three week (21 day) expedition to the Islands to survey the intertidal and sub-tidal down to 30m depth.

Outputs from the survey will include faunal and floral species inventories, habitat descriptions and maps, a field guide to marine invertebrates, algae and fish, a report on the status of marine endemics, and a report on the potential impacts of climate change. These will inform Ascension Island Government of how they can fit their shallow marine environment into future biodiversity strategies and form CBD targets.

South Atlantic wilderness; assessment of Tristan da Cunha's seabed biodiversity(Partners: Shallow Marine Surveys Group, British Antarctic Survey, South Atlantic Environmental Research Institute). This is a Darwin Initiative Challenge Award (<http://darwin.defra.gov.uk/>).

There are not many temperate, mid ocean islands – just two archipelagos in the Southern Hemisphere; almost nothing is known of seabed biodiversity at either. The UK overseas territory of Tristan da Cunha (TC) is the only such archipelago in the Atlantic. With no airport and low human impact, TC is clearly important for terrestrial biodiversity but the state of its marine environment and native species is largely unknown. This proposal is to create an expert team that have worked regionally (on Falkland and South Georgia), adapt a successful protocol from the first polar Darwin project (18-019) to survey the region. The first half of the work would search, gather and check existing information and establish a new database. Linkage of this to globally open-access biodiversity databases would allow our work to be monitored and evaluated by experts across disciplines and furthermore to enable us to draft a peer reviewed article on the state of marine biodiversity at TC. We want to build a platform that strongly facilitates future work to establish meaningful system of protection for key areas of the seabed.

The award would see the conclusion of this which would be the diversion of the oceanographic research ship RRS James Clark Ross from its usual path of South Georgia-Falkland Islands-UK in March/April to pass TC and complete a first dedicated benthic survey. This would 1) map seabed structure using multibeam sonar and biological echosounder, 2) look at the physio-chemical nature of the water column using CTD and water samples, 3) take discrete samples using Agassiz trawl, Epibenthic sledge and Box core for morphological and genetic identification and finally 4) photocharacterise habitats with a camera lander system. This would provide a first full baseline survey of the region, establish a major collaboration, plan for meeting Convention on Biological Diversity for the seabed and underpin our later, full Darwin application.

Falklands Marine Biodiversity Archive(Partners: Marine Biological Association, Shallow Marine Surveys Group and South Atlantic Environmental Research Institute). This is a Darwin Initiative Challenge Award (<http://darwin.defra.gov.uk/>).

The project will deliver an electronic Web enabled archive service for marine species and habitat data for the Falkland Islands. The marine biodiversity of the Falkland's region is poorly understood. Progress is hindered by poor access to historic knowledge; making these data available in a georeferenced searchable database has been strongly recommended for this region. Historic sampling is a key foundation to our knowledge of Southern Hemisphere biodiversity and is important to current and future studies, especially with regard to environmental change.

Overall goals are to unlock existing poorly accessible data sources, develop pathways for new data to be entered using the international standards and best practice protocols of the Marine Environmental Data Information Network (MEDIN), and set up a data archiving model for other UK Overseas Territories' biodiversity inventories. The project will build on the skills and expertise of the UK accredited data archive for marine seabed species and habitats (DASSH) based at the Marine Biological Association (MBA) alongside UKOT partners in the Falklands.

We will establish the archive and populate it from; 1) existing electronic data and images and 2) the reports of the RRS Discovery Expeditions (1925-1927, 1930-1931), and the RRS William Scoresby Expeditions (1925-1927, 1929-1931) of the South Atlantic. High quality electronic versions and original reports are held in the Falklands Government Archives. Additionally, the Challenge Fund award will allow for scoping of Falklands data held in the UK National Marine Biological Library (NMBL) and other UK academic institutions and recommendations for their entry into the archive.

The project will disseminate the data through existing Web portals ensuring maximum access to the records. DASSH currently disseminates data to the Global Biodiversity Information Facility (GBIF) and Ocean Biogeographic Information System (OBIS) and will also release records to regional projects such as SCAR-MarBin (<http://www.scarmarbin.be/>).

Key outputs will be:

- A robust and future proof electronic archive to International standards of marine biodiversity of the Falklands region
- Data capture of key electronic and paper records
- Web interface integrated with regional and international portals
- Consolidation of UK research on Falkland's marine biodiversity data
- Data archiving model for other UK Overseas Territories' biodiversity inventories
- At least one Review paper in a peer-review journal describing the newly captured data

Project Proposals submitted

The Jason Islands: Developing a Marine Protected Area around the Western South Atlantic's most important biodiversity hotspot (South Atlantic Environmental Research Institute (lead), Shallow Marine Surveys Group, Falklands Conservation, Falkland Islands Government, New Island Conservation Trust)

This is an EU Best Grant Application – On reserve list.

http://ec.europa.eu/environment/funding/pdf/best/Call_2012.pdf

Project Summary

We propose the designation of a Marine Protected Area around the Jason Islands, the size of which to be determined by empirical data collection and analyses via a novel, highly integrated, and ecosystem approach based suite of studies. The Jason Islands Group (JIG) is a rocky spine of islands and reefs in the remote northwest Falkland Islands. Surrounding waters are the most productive in the western South Atlantic and exhibit an extremely complex oceanography. As a consequence, the area has global significance in terms of seabirds, marine mammals and benthic biodiversity. The Falkland Islands Conservation of Wildlife and Nature Ordinance permits ecosystems to be protected. However to date, no marine National Nature Reserves or Marine Protected Areas have been designated in the seas surrounding the Falkland Islands, meaning that key commuting corridors vital to marine bird and mammal survival and reproductive success receive no recognition or protection.

JIG represents the best initial candidate site for a MPA network in the Falklands. We propose a highly integrated 2 year study comprising a meta-analysis of extant data, seabird and pinniped surveys and remote tracking, intertidal and subtidal benthic faunal and floral surveys, and monitoring of fine scale inshore oceanographic data. Two annual research cruises will be carried out, plus a 3-4 week seabird monitoring program. These combined data will be reviewed in a planned MPA workshop, the outcome of which will be a recommended MPA designation and management plan for the JIG. These data will also provide a model for the establishment of MPAs in other Falkland locations and other Overseas Territories.

At a time of increasing shipping and tourist activity, and regional hydrocarbon exploration, this area is at increasing risk of both chronic disturbance and catastrophic pollution events. Furthermore, this region of the South Atlantic is predicted to be highly impacted by climate change. Due to the islands' global significance in terms of biodiversity and the sheer biomass of species the JIG supports, they must be afforded greater protection and long term management.

Regional Peat Science (NERC Consortium) (Partners: South Atlantic Environmental Research Institute, Natural History Museum, Imperial College, Nottingham University)

This project is in the concept phase and will look at peat cores regionally from southern South America, Falkland Islands and South Georgia. Five work packages have been identified and offer some really interesting practical blue sky research.

- *Past and present climate pattern (since the last glacial maxima or ice age)*
- *Iron seeding through dust off the Atacama. Iron is a limiting element in the southern ocean in terms of biological productivity and its concentration in layers of peak from wind-blown dusts will provide an insight into the productivity South Atlantic's section of the Southern Ocean over the last 8,000 – 10,000 years*
- *The re-construction of palaeo – grassland ecology using pollen and plant material*
- *Using biological markers in peat and recent census data, reconstruct seabird population indices since the last ice age. This is important in modelling how future potential climate change might impact on seabird populations in the South Atlantic.*

Near Shore Marine Resources of the Falkland Islands– subject to funding

Project Outline

*The Falklands shallow marine resources are one of the island nation's greatest assets, yet they are poorly understood in terms of commercial viability, sustainability, and wider biodiversity impacts. Very little of the archipelago's vast coastlines have been studied scientifically. There is increasing interest in the harvesting of marine fisheries resources. We propose to study a number of species for monthly ecological and fisheries biology studies with particular attention on the red sea urchin *Loxechinus albus*, the keyhole limpets *Fissurella* spp., striped clam, giant barnacles and ribbed mussels as these are high-value on regional and global markets.*

We will also explore the wider distribution and biology of 15 other potential commercial species. Currently, there is no scientific basis for stock assessment or development of management plans of these potential resources. This programme proposes to:

- 1) Provide baseline stock assessment data in five species
- 2) Provide baseline Falkland-wide distributions of other potential species
- 3) Establish standardised management techniques and stock monitoring framework
- 4) Assess the wider ecological impacts of commercial exploitation
- 5) Recommend a model for assessment and management strategy for near-shore fisheries in the Falkland Islands

GIS Centre for the UKSouthAtlanticTerritories (South Atlantic Environmental Research Institute, FIG and JNCC) -subject to funding

We have proposed the formation of a Geographical Information Systems servicehoused in the South Atlantic Environmental Research Institute, which will manage and ensure the security and integrity of wider environmental data. This facility will also redress the lack of capacity for GIS in the Falkland Islands and wider South Atlantic. GIS provides a very effective means for graphically conveying complex information and allows the user to analyse data geospatially and has uses in many disciplines from the environmental sciences to town planning. The centralised system will offer economic advantages in terms of cost sharing, effort and will help avoid of the potential for duplication.

In the Falkland Islands multiple government departments and non- governmental organisation have stand alone and independent GIS systems, which utilise a number of different programmes (e.g. ArcGIS, MapInfo, Manifold, Surfer, CAD and AutoCAD) using different datums for a number of different reasons including the analyses of oceanographic data, biomass calculation (Fisheries), relative abundance data (seabirds and pinnepeds), habitat mapping, Landsat (Agriculture) and aerial photography (Public Works Department). This has led to a number of issues:

- *Increased costs due to the duplication of hardware, software and human resources between FIG departments and other organisations in the Falkland Islands*
- *Differing datums result in non-uniform projections resulting in mapping inaccuracies*
- *Incompatibility of programmes and resources between departments*
- *Inability for any one organisation to have the whole picture and access to the range of data available*
- *All of the organisations in the Islands don't have a dedicated trained GIS specialist and the development and data security generally depends on the interests of short term staff*
- *The Environmental Planning Department (and town planning) does not have access to GIS for planning processes*

A centralised system of data storage and GIS facility across the Falkland Islands with data sharing agreements will provide an efficient, cost effective answer to geospatial and data storage issues. Many of the issues faced by the Falkland Islands are mirrored in the other SouthAtlanticOverseasTerritories and the resounding issue for all of them is the lack of GIS expertise/capacity.

5.8 Students

Two PhD students started with SAERI in October. Another PhD studentship on shallow marine ecology around the Falkland Islands will start February 2013 subject to funding.

Falkland Islands Seaweed biodiversity (Partners: SAERI, University of Aberdeen, SMSG)

The importance of marine algae is immediately noticeable from the vast swaths of kelp (Macrocystispyrifer) carpeting the coastline of the Falkland Islands. The giant kelps (Macrocystispyrifer and Lessoniatrabeculata) provide important nursery grounds for the commercially important squid Doryteuthisgahi and many fish species. They provide a number of habitats for both invertebrates and vertebrates within their holdfasts and in and around their canopies. They also provide habitats for diverse communities of red, brown and green algae within their forests that remain completely unstudied.

Specific objectives of this PhD project include

- Establish a state-of-the-art inventory of the brown, red and green algae of the Falkland Islands (in line with the latest nomenclature)
- Augmenting and improving existing herbaria
- Barcode the entire seaweed flora of the Falklands
- Establish the biogeographic affinities of the Falklands' seaweed species composition
- Identify any potential non-native / invasive seaweeds in the Falklands

Managing the recovery of fish stocks in an uncertain environment: the case of mackerel icefish around South Georgia (Partners: University of Aberdeen, Government of South Georgia and the South Sandwich Islands, SAERI)

A great number of fish stocks are currently classified as overfished, depleted or recovering (e.g. FAO, 2009). Recovery has been successful for many stocks but there are some stocks for which recovery appears very far off despite major reductions in fishing pressure including, for example, a moratorium on harvesting Canada's Grand Banks cod stocks (Shelton et al., 2006). Overexploited stocks of mackerel icefish (*Champsocephalus gunnari*) in the Southern Ocean exemplify this problem. The large fisheries that existed in the 1970s around South Georgia, Heard Island and Kerguelen Islands have all but disappeared. Relatively conservative harvest strategies are used to manage the remnant fisheries in these areas, but it is unclear whether the current harvesting rules can support recovery of the fish stocks. This project seeks to establish whether better management approaches are available, and to identify conditions under which these stocks can achieve full recovery.

The commercial fishery for mackerel icefish began in the late 1970's around South Georgia with large catches taken by eastern European (ex-Soviet bloc) vessels. Catches averaged 45,000 t between 1976 and 1989. Following the establishment of the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) in 1982, concerns were expressed about depletion of icefish stocks, which led to the closure of the fishery in 1989. The fishery was later reopened with strict controls including gear restrictions (to avoid impacts on non-target species) and much reduced catch limits (1,500 to 5,000 t), although the full quota has not always been caught.

Polar Ltd and Seaview Ltd., with the support of the South Georgia and the South Sandwich Islands (GSGSSI), obtained Marine Stewardship Council (MSC) certification for the mackerel icefish fishery around South Georgia in October 2010. However, the certification came with four conditions that need to be addressed to ensure the continued certification of the fishery. The proposed PhD will examine two of these conditions, specifically: (i) the establishment of a robust index of spawning biomass; and (ii) address uncertainties in the survey index.

Aim

To improve the stock assessment of mackerel icefish and explore how best to use this in management to assist recovery of the stock

Objectives

- To establish a robust index of spawning biomass for the mackerel icefish stock
- To address uncertainties in the survey index to ensure robustness for stock assessment
- To examine fish condition and its relationship with krill abundance and mackerel icefish diet
- To explore different harvest control rules for the mackerel icefish fishery and conduct a management strategy evaluation (MSE). This may be generalised to be applicable to other [related] stocks.

Falkland Islands' Shallow Benthic and Intertidal Ecology: The Effect of Spatial and Temporal Scales - A PhD Studentship for a Falkland Islands' graduate

To improve our understanding of the drivers for marine community ecology change around the Falkland Islands temporally and spatially in order to help underpin and ground truth hierarchical marine habitat classification.

Preliminary Objectives

- *Examine community structure from quadrat data taken around the Falkland Islands in order to examine community structure under differing substrates/environmental regimes, locations and at different times of the year*
- *Enhance the species inventory of intertidal habitats around the Falkland Islands and to examine their communities in space and time and to establish survey methodology for future intertidal habitat monitoring. This objective will also result in a scheme illustrating zonation of differing intertidal environments around the Falkland Islands*
- *Examine the effect of introduced mammal predators on community ecology in Falkland Islands intertidal environments*
- *The importance of nutrient subsidies (large seabird colonies) on adjacent communities in the littoral and sublittoral*

5.9 South Georgia Small Grants

On behalf of the Government of South Georgia and South Sandwich Islands SAERI are administering their small grants scheme. The small grants scheme is intended to diversify science undertaken in South Georgia. Applicants can apply for a maximum of £25K and grants are awarded on relevance to South Georgia's science strategy and the quality of application. Three applications were successful.

1. ***Hazard Forecasting for the South Georgia Locality*** - *The overall aim of this project to demonstrate that a state-of-the-art weather forecast model can be implemented and run locally on an inexpensive computer platform in SG to provide operationally accurate forecasts of hazardous conditions.*
2. ***Microbial biogeography of South Georgia soils: implications for nutrient enrichment of coastal waters*** - *This project will provide the first comprehensive assessment of bacteria and microbial eukaryotes in soils and coastal zones of South Georgia, which are key drivers in maintaining ecosystem processes. Our specific objectives are: 1) to map bacteria and microbial eukaryotic community composition and distribution in soils using massively parallel barcode sequencing; 2) to determine microbial diversity along nutrient and altitudinal gradients; 3) to compare soil microbes between soils within and beyond recent glacier ice limits; 4) to produce for the first time spatially and flow-weighted estimates of the concentration of key nutrients in runoff from South Georgia and into the coastal environment.*
3. ***Multiple species interactions: invasive species on South Georgia*** - *Recent surveys have described the distribution of non-native plants and invertebrates. However, apart from earlier studies which showed that invasive species such as *Poa annua* respond well to grazing by reindeer, and some evidence that non-native plants in turn influence invertebrates, relatively little is known about the interactions of non-native and native species across trophic levels. Similarly, while there are preliminary data on the occurrence of soil invertebrates on South Georgia there is little spatially explicit information and few data exist on relative abundances and diversity relationships within communities, or the impacts of species from other trophic levels. For effective ecosystem management, such quantitative spatially explicit data is essential.*

The project aims to address these questions

Q1. How do non-native species influence the abundance and distribution of other non-native species across trophic levels on South Georgia?

- a) *What is the impact of non-native plants on the soil invertebrate community assemblages?*
- b) *How does herbivore grazing impact on lower trophic organism community structure and abundance?*

Q2. What are the key drivers of invasive plants (*Poa annua*) and soil invertebrates on South Georgia: clarifying the impact of habitat, altitude and invasive species.