

Scottish Affairs Committee

Scotland and the High North Enquiry

Written Submission by:

Scottish Association for Marine Science (SAMS)
Scottish Marine Institute
Oban
Argyll
PA37 1QA

www.sams.ac.uk
01631 559000

Prepared by:

Dr Finlo Cottier (finlo.cottier@sams.ac.uk)
Senior lecturer in Polar Oceanography at SAMS
Adjunct Professor at UiT, The arctic University of Norway

Professor Mark Inall
Professor of Physical Oceanography at SAMS
Director of Scottish Alliance for Geoscience, Environment and Society (SAGES)

Dr Raeanne Miller
Knowledge Exchange and Communications Manager, SAMS

Professor David Pond, SAMS
Professor of Biological Oceanography, SAMS

Professor Ben Wilson
Professor of Mammalogy and Marine Renewables, SAMS and UHI

Professor Nicholas Owens
SAMS Director

Background Material:

1. SAMS

The Scottish Association for Marine Science (SAMS) based in Oban, Argyll has been at the forefront of UK research into the arctic marine environment for over twenty years. Since 2002 they have led 4 major research expeditions to this region and they participate in field expeditions each year across the arctic. SAMS is actively engaged in research to monitor and understand the impact of climate change on the arctic and consequences for the ecosystem and the implications for resource management. SAMS has an international reputation for developing and deploying autonomous and robotic platforms in the arctic to measure changes to the ice and ocean. This has led to spin-off products sold world-wide that are capable of measuring ice growth and melt year round. We also develop a predictive understanding of sentinel species in the arctic and how they are likely to be impacted by the many simultaneous effects of ice loss and warming. This will allow us to explore how the productivity and biogeochemistry of the Arctic Ocean will change in the future. This information will be interfaced with the UK's Earth System Model that directly feeds into international efforts to understand global feedbacks to climate change and inform governments on future policy.

SAMS delivers its arctic research through extensive and mature collaborations with institutes in many nations, notably Norway, Denmark, Canada, USA, Germany and South Korea. SAMS' scientists have recently been awarded £5 million under a UK research Council initiative, 'Changing arctic Ocean' programme to head-up science programmes that will run between 2017-2020 and involve collaborations between 9 UK science organisations and international groups. SAMS also provides training within Scotland in arctic sciences through degree level study with the University of the Highlands and Islands in collaboration with Norway's University Centre in Svalbard (UNIS).

As one of 40 organisations in the €7.5 million EU H2020 Blue Action project, the SAMS Group has taken on a role in knowledge exchange and science communication of arctic science and climate services to key stakeholders across the Northern Hemisphere.

2. Scottish arctic expertise listing:

Unlike Antarctic science, Arctic expertise has no natural institutional home in the UK. Rather, the considerable international expertise in arctic science is dispersed throughout the UK and is promoted and supported through the UK Arctic Office, based in Cambridge. HEIs in Scotland have widespread arctic research activity and associated expertise. There are very distinct contributions to arctic knowledge, notably the University of the Highlands and Islands (UHI) are a member of the University of the Arctic (an international consortium of academic institutes in the High North) and UHI also support the Centre for Nordic Studies. To give a sense of this distribution we provide the following listing based on research publications in *Web of Science*, using search term "arctic", for the years 2013-2016

U. Edinburgh: Greenland ice sheet/glaciology, snow physics, marine chemistry/nutrients, terrestrial ecology/carbon/CO₂ fluxes

U. Aberdeen: Geomorphology, glacial environments, climate histories/proxies, terrestrial ecology, marine biodiversity, arctic policy and governance

U. St Andrews: Marine ecosystems, marine geology, glaciology

U. Strathclyde: Ecosystem modelling, marine optics and remote sensing

U. Glasgow: Glacial environments, climate proxies

U. Stirling: Glacial geology, seabed mapping, terrestrial gas fluxes

Heriot Watt: terrestrial ecology/tundra

UHI (SAMS): Oceanography, ecology, technology, marine geology, biogeochemistry

3. Scottish Scientific Alliances

The Scottish Funding Council has funded pooling activities between institutes. SAGES (Scottish Alliance for Geoscience Environment and Society) is a partnership between the Universities of Aberdeen, Abertay, Dundee, Edinburgh, Glasgow, St Andrews, Stirling, SAMS UHI, SUERC, and the West of Scotland. SAGES hosts Europe's largest glaciology research group, SURGE (Scottish University Research in Glacial Environments). SURGE provides a coordinated international network for advances in glaciology, with particular focus on the Greenland Ice Sheet and glaciers of Svalbard.

4. The Power of Scotland: Key Fact

According to the UK Research Excellence Framework (REF2014) the Scottish HEIs which comprise SAGES (Scottish Alliance of Geophysics Environment and Society) have a combined research POWER in Earth and Environmental Sciences exceeding that of the combined Oxbridge/London power base by a factor of 1.6 (160%). Source: Times Higher Education

Response to Enquiry:

We base our responses around the Terms of Reference for the enquiry and on the questions posed.

What is the UK's possible role in encouraging the protection of the natural environment?

From a marine science perspective, the UK should be able to demonstrate an important supporting role to the arctic nations in the protection of the natural environment. The UK has world leading capabilities in remote sensing of the arctic to characterise the environment and to detect change. The UK also has a strong track-record and an ambition to develop and deploy autonomous and robotic technologies to measure *in situ* conditions with live data streams. Predicting change and the impacts of change in the arctic require sophisticated, high resolution models that couple together the atmosphere, ice, ocean and terrestrial regions of the arctic. The UK has both the computational expertise to develop and run such models but crucially also the investigative and fundamental science on which the models are based.

Such expertise in the UK has been dispersed, often visible only at an institutional level, rather than being considered a national strength. Arctic research in the UK has been supported from a range of sources. Most recently these have included the Natural Environment Research Council, EU funding frameworks, other research councils (often from arctic nations) and other governmental support – eg the US Office of Naval Research. UK funding has recently received a boost over the next 4 years with a £16 million investment in biological and biogeochemical investigations of the changing arctic.

The UK is well placed to support the environmental research priorities of arctic nations. Such bilateral research partnerships between Scotland and arctic nations could provide a strong platform for Scottish engagement in arctic affairs through advisory work and scientific collaboration.

How open should the UK be to the exploitation of natural resources or should it be working harder to protect the unique arctic environment?

Exploitation of resources in the arctic is on-going and is likely to increase as sea ice retreats and the economics of resource extraction and transport shift. This is something that will be dictated primarily by the arctic nations yet the UK can have important input in areas such as shipping and environmental impacts of resource extraction. SAMS has a strong track record of advising and monitoring extractive industries on how to minimise impacts. We have consulted for governments and major international companies in both shallow and deep waters.

If oil and gas extraction continues at the current pace will Scottish firms provide the machinery and expertise?

SAMS has also been at the forefront of developing technologies to monitor the distribution of spilled oil in ice-covered waters.

Should the UK look to protect the Arctic Sea from industrial fishing?

Management of natural resources requires evidence based decision making and the UK has considerable expertise in understanding the functioning of marine ecosystems and how to link this with sustainable exploitation of fisheries.

What are the key challenges facing the High-North and what should Scotland's role in addressing these challenges be?

There are many challenges facing the High-North and we set out some here that have relevance to Scottish communities and industries.

- Increased shipping due to reduced sea ice cover. There are important aspects relating to ship design, routing and biosecurity.
- Migration and northward expansion of key marine species from sub-polar waters to the Arctic. There are potential impacts on the resilience of regional food webs, local economies based on particular fish stocks and invasive nature of some species. Underwater sound pollution is also destined to increase.
- Coastal erosion due to reduced sea ice cover, enhanced storminess, greater fetch and thawing of coastal permafrost.
- Integrity of the Greenland ice sheet and the potential impact of sea-level rise and coastal flooding.
- Increase in frequency and severity of extreme weather events (e.g. Polar lows), and associated risk to marine operations, flooding and coastal erosion.

However, the full assessment of challenges can be found in the *The Arctic Resilience Report* commissioned by the Arctic Council which provides 'a novel assessment of arctic change and resilience, including factors that appear to support or weaken resilience' (Stockholm Environment Institute).

Are there benefits to Scotland and the UK further developing their relationships with Arctic nations?

One area where there will be great mutual benefit is in the sphere of arctic education. It is clear that arctic affairs are going to continue to dominate economic, geopolitical and scientific activities in the medium to long term. An educated, informed and well trained generation able to appreciate, understand and act on the challenges in the arctic is essential. To this end the UK, and Scotland particularly, could develop significant alliances with arctic nations to enhance educational opportunities. One vehicle for this is The University of the Arctic, of which the University of the Highlands and Islands is a member. Another is through arctic focused training programs in the UK run in partnership with arctic institutes – an example being the BSc Marine Science with Arctic Studies delivered by SAMS-UHI.

Integrated arctic observing networks are also becoming an increasingly important tool for improving climate and weather forecasting models and services on which many industries rely. Scotland already makes an important contribution to these observing networks through autonomous systems, satellite applications and regular ship-based research. However, the greatest benefit from these science investments is in combination with the efforts of other nations, and particularly arctic nations. The sum of efforts in arctic observing benefits not only arctic nations, with whom we collaborate, but also the UK and Scotland, in the form of improved climate and weather forecasting and prediction. In turn, this improves the UK provision of climate services (for example from the UK Met Office, and ECMWF) which can help to identify operational, financial, and insurance risk for UK industry and policymakers.

What role should the UK play in defence for the High-North?

No response

What commercial opportunities exist in the High-North for Scottish industry?

No response

What are the opportunities and risks of the UK increasing energy interconnectivity in the High-North?

No response