Day 1 – Monday 11th June 2018

09:30 - 09:45 Welcome and introductions

The second workshop of the MPA review advisory group opened with a welcome to returning participants, new participants (who were substituting for previous representatives) and invited speakers. It was noted that the International Association of Antarctica Tour Operators had sent their apologies that they were unable to send a representative to this meeting.

The agenda for the meeting had been circulated prior to the workshop, and included the list of the four key Terms of Reference (TORs) for the advisory group (Appendix 1). The TORs were read out to remind participants and it was explained that the intention was to use them to focus discussions, and that structuring the debates around the TORs should assist in the development of the final report.
The record of the first MPA Review workshop held in November 2017 was circulated in April 2018, allowing the opportunity for feedback from group members. Only two points were raised in relation to whether (i) marine noise and (ii) krill by-catch would be considered as part of the review. It was felt that marine noise fell under the summary category of ‘other changes and threats’ discussed on day one of the first workshop, and that krill by-catch, in terms of larval fish and other krill species, would be considered during the review of TORs during this second workshop. The group had no further comments or edits to the record of the first meeting, and it was agreed by all participants that the record would now be made publicly available on the GSGSSI website1.

The group was advised that the format of the workshop would remain the same as the first meeting held in November 2017, whereby social media postings stating that the workshop was underway were acceptable, but that there should be no discussion of content or sharing of views expressed until the final report was published. All participants agreed to this.

It was explained that further relevant evidence had become available since the last meeting which may be beneficial for the group to consider, and therefore several additional speakers had been invited to present their research at this workshop. In addition, GSGSSI had received correspondence from 5 UK members of the International Union for Conservation of Nature (IUCN) World Commission on Protected Areas (WCPA) relating to the designation of the SGSSI MPA.

The group members all confirmed that they had received copies of the supporting documentation from the invited speakers and a link to the IUCN letter, which is publicly accessible on the GSGSSI website2. A round-table introduction of all participants and their affiliations allowed the invited speakers to be introduced to the group.

09:45 - 13:30 Presentations by invited experts and additional updates

Invited speakers were each asked to give a presentation on their area of expertise, followed by a Q&A on the issues they raised. Summaries of the presentations have been recorded, along with the discussions they generated. Copies of the presentations can be viewed via the GSGSSI website3.

Dr Andrew Fleming – Remote sensing for monitoring shipping

Dr Fleming provided a summary of the use of remote sensing technologies as a tool for detecting and monitoring shipping movements and activity. Several key points were highlighted:

- Automatic Identification System (AIS), which was primarily developed for collision avoidance, is currently the main publicly available method of monitoring shipping. Historically there was a need for a terrestrial base to detect an AIS signal, however it is now possible to use satellite monitoring from satellites.

1 The record of the first meeting can be viewed at: http://www.gov.gs/docsarchive/Environment/Marine%20 Protected%20Area/180619%20MPA%20Workshop%20Record%20approved.pdf

2 The letter from the UK members of the IUCN WCPA can be viewed at: http://www.gov.gs/docsarchive/Environment/Marine%20Protected%20Area/FINAL%20submission%20to%20 Nigel%20Phillipssdocx.docx

3 Presentations by invited speakers at the June 2018 MPA Review Workshop can be viewed at: http://www.gov.gs/docsarchive/environment/#tab-2
technology for this purpose. In addition to AIS, VMS is also used for monitoring fishing vessels in National waters and in the Southern Ocean.

- Direct detection of targets from satellites is via blanket imagery. Optical satellites are basically cameras in space (e.g. Landsat) and so can only provide images in the visible range. Synthetic Aperture Radar (SAR) however is not limited by daylight and can see through cloud cover.

- **Global Fishing Watch (GFW)** and **Project Eyes on the Seas** are the two main repositories of fishing vessel monitoring information. GFW is easier to access but both portals supply the same data, with AIS/VMS providing data on locations of vessels and patterns of effort. It is possible to run video on the GFW website to illustrate vessel movement.

- Gaps in signals are common and can be for a variety of reasons – drop out, lack of satellite coverage, or deliberate evasion. Gap analysis can be used to identify why a signal may have been lost.

- Ships coming together can be indicative of transhipment activity. Artificial Intelligence methods can learn to pick up patterns and behaviour, although there can be some confusion when there are lots of vessels in the same area.

- Remote sensing can be used for target detection, for example targeting via AIS to link a vessel to an oil slick.

- SAR has irregular timing; it isn’t on a 24-hour cycle. Imagery can also be affected by factors such as sea state, as the ship has to bounce back the radar signal. The level of resolution affects the size of the vessel you are able to see.

- It can be challenging to distinguish objects, for example ships vs icebergs, however new technology is increasingly able to discriminate between ships and ice based on the volume of scatter. Currently detection methods are 84-85% reliable, new methods are 95-96% reliable but they are not online yet. Detection of vessels is almost impossible in pack ice.

- Optical imaging technology, e.g. the Moderate Resolution Imaging Spectrometer (MODIS), needs cloud-free conditions, but it orbits regularly and can provide daily pictures, and it is possible to combine different spectral bands to distinguish objects. NASA are developing methods for low light detection at night using the Visible Infrared Imaging Radiometer Suite (VIIRS), which can detect vessels and show the pattern of locations, but this technology can’t be used to identify the vessel.

**Discussion**

There are public sources of vessel monitoring data, although it’s not necessarily free. Legal vessels use VMS whereas IUU tend to have AIS. For commercial vessels, VMS is required at all times unless it is a commercially sensitive pathway. Development is underway to enable monitoring of vessels which “go dark”, filling in gaps and assigning activity during that time.

VMS is generally a flag state requirement, or requested for a given area (e.g. the GSGSSI requirement). AIS however can be turned on and off at will by a vessel, and legal vessels will do this for commercial advantage, for example to prevent other vessels following their route through ice or learning where
their fishing hotspots are located. AIS can be used by IUU vessels to identify productive areas to fish illegally.

There is a project in Ascension using SAR/VMS tracking to monitor vessel activity, and the monitoring is acting as a deterrent to vessels, for example ships are avoiding transiting through areas where they have free rite of passage to avoid any implication that they might be fishing somewhere illegally. Using a combination of VMS, AIS and SAR you know which vessels are licenced. There is currently a paper in submission to Marine Policy - Satellite surveillance of the Ascension Island Exclusive Economic Zone and Marine Protected Area by Rowlands et al describing the project. Alternative methods are also being developed to locate IUU vessels, for example broadband detection of mobile phone signals.

Pew helped set up Eyes on the Sea, and now run Global Fishwatch (GFW). SAR coverage is expensive so layering of technology is a good option, no one method works 100% so a combination of evidence is optimal. Pew also pay for monitoring of the 200nm EEZ at Pitcairn and have access to the GFW vessel movement data in that region, evidence thus far is that the monitoring is working as a deterrent in a similar way to that seen in the Ascension project.

AIS has the potential to attract IUU vessels to areas where they can see legal vessels are aggregated as it highlights productive fishing grounds. Many vessels operate on the high seas at the boundaries of EEZs and MPAs, which may impact stocks inside but isn’t illegal. Monitoring could give some context to the potential impact of that fishing activity.

Detecting a vessel does not necessarily lead to an arrest. Additional satellite coverage from the point of infraction to arrival in port would be required as evidence. Blue Belt has funded Catapult satellite monitoring at SGSSI, although there have been some technical challenges.

**Dr Tom Hart – … and the South Sandwich Islands: marine predators and threats**

Dr Hart presented a summary of a recently published synthesis paper on the biodiversity of the South Sandwich Islands ([https://www.tandfonline.com/doi/full/10.1080/14888386.2018.1464952](https://www.tandfonline.com/doi/full/10.1080/14888386.2018.1464952)). The key points of the presentation were:

- **The history of the SSI shows that it is not a pristine environment.** There were 3-4 years of heavy sealing, particularly in the north of the islands, before the industry crashed, along with additional impact from whaling in the region. The remnants of the former Argentine station on Thule still pose a hazard to wildlife. There is some marine pollution evident on the islands with a strong westerly current causing mainly fishing floats and fenders to be deposited on the islands.

- **The SSI are not sub-Antarctic islands, they are strongly Antarctic in character, although with a clear split between the northernmost three islands and seven southerly islands in terms of invertebrate and plant diversity.** The islands are heavily glaciated except on thermally heated areas, and flora is restricted to these heated areas whilst wildlife is mainly on the coast. There are very few beaches so few seals, but with a rich supply of krill and a relatively small landmass large penguin colonies have formed, and there are likely to be recovering populations of certain whale species at SSI.

- **Penguin populations at the SSI are unstable in the long term, with volcanism affecting populations and meta communities being mobile over ecological timeframes.** There is strong evidence of periodic volcanic activity driving penguin populations, e.g. at Saunders Island, and
recent eruptions at Zavodovski, Montague and Saunders Islands mean the current status of certain colonies is unknown.

- There is 2 years of phenology data from remote cameras looking at penguin colonies, but it is hard to predict anything with certainty with such a short timeframe.

- The 12nm No-Take Zone (NTZ) from the MPA doesn’t fit with penguin foraging patterns and extending the NTZ to 40nm for chinstrap and Adélie penguins would have the added effect of linking the protection around the islands. A larger buffer may be required in the northern islands to protect other species with larger foraging ranges.

- The SSI are at the eastern end of the krill flux in the Scotia Sea. Upstream the krill fishery has become more concentrated in discrete regions off the Antarctic Peninsula and there are concerns over the timing, level and distribution of fishing activity in relation to penguin and seal breeding. Different penguin species have different foraging ranges and phenologies, and are showing different patterns of population changes. Chinstrap penguins have high overlap with the krill fisheries in the Peninsula region and are showing population declines and this could be linked. Aggregation of krill vessels may lead to local depletion. There has been some small scale redistribution of colonies, and more data is needed on how long penguins are present and what movement there is between colonies.

Discussion

There is currently little data to assess whether the current temporal closure at the SSI would protect the predator populations present if krill fishing were to take place. However, with such large colonies a small impact, especially on the shoulders of the season, could still be important. The NTZ is effectively 200nm (the whole MPA) during the breeding season (1 Nov – 31 Mar) so extending the temporal closure may be important. Defining the chronology at SSI is key.

Two new papers have just been published relating to penguin foraging patterns at the Antarctic Peninsula (Trathan et al, 2018: https://doi.org/10.1002/ecs2.2392) and the South Orkney Islands (Warwick-Evans et al, 2018: https://doi.org/10.1002/ecs2.2392).

The comparative lack of information from SSI should be highlighted and incorporated in the Research & Monitoring Plan (RMP). It was noted that:

- Zavodovski Island penguin colonies will hopefully be counted next season (2018/19).
- The IWC holds data which covers 50 years of whaling around the SSI.
- Longer term research and monitoring is ongoing with time-lapse cameras for phenology and survivorship on Saunders Island. Fine scale, precise measures are needed to detect local and transient effects, which are difficult to collect, therefore we need to be precautionary.

Oceanography and flux means there is a strong interconnectivity of krill across the Scotia Sea. If you change management of the fishery in one area, it may effect krill elsewhere. Dr Hart noted that spatial patterns of krill fishing overlap with decline/movement of penguin colonies, he noted that the association is present but correlation is difficult to prove. There is evidence that penguin populations at the Antarctic Peninsula are in flux, in association with fishing, but proving causality between nest abandonment and survivorship vs krill fishing is challenging.

CCAMLR has advised that krill fishing fleet behaviour should be taken into account when undertaking capacity analysis for the Antarctic Peninsula region as it is not a static picture. Vessels are not taking a
high percentage of the biomass, but local depletion is a concern and should be considered in terms of spatial boundaries and management.

Different penguin foraging ranges are acknowledged, but associated data on feeding density is sparse. A hard spatial buffer boundary at the maximum foraging range is highly precautionary, but less scientifically robust than the use of feeding density distribution data. It is difficult to collect data at the SSI, diet data and consumption estimates could be used, which means diet data would be a RMP priority as it is a data gap at SG and SSI. Chinstraps and Adélie are very krill dependent, Macaronis are largely krill dependent, and Gentoos are generalist predators. The spatial and temporal variability in sampling will require a degree of spatial extrapolation and interpolation.

Dr Simeon Hill – Antarctic Krill: Past and future

Dr Hill’s presentation summarised recent research and advances in the development of Krillbase, krill management and climate change impacts on krill populations in the Scotia Sea region. The presentation drew on information provide in several new or recent scientific papers. Key points were:

- Krillbase shows locations of scientific net samples for krill and highlights that SG is well studied whereas data from SSI is sparse. A krill distribution, aggregate heatmap shows SG as an historic hotspot, but that higher densities of krill were also identified further east at SSI.

- Reconstructing the population trajectory shows a decline in krill density in the 1970s/80s with no evidence of subsequent declines. On shelf vs >1000m samples show consistent change with lower krill abundance in subsequent decades (despite high scatter). Past dynamics show that significant changes can occur on decadal timescales.

- Acoustic survey data from the Western Core Box is extrapolated to all of Subarea 48.3. Krill catch limits and realised catches remain low relative to conservative estimates of krill stock size.

- Climate change predictions of future ocean warming using 13 models show warming at SG under all scenarios. At SSI it is dependent on best or worst case scenarios (especially at the north of the chain). The indicator is the quality of the habitat to support krill. SG is likely to be the hardest hit area in the South West Atlantic, and spatially constrained foragers (near SG) may be the hardest hit, whereas wide-ranging foragers have a better ability to overcome.

- Models looked at the relationship between krill, predators and the fishery, resolved to CCAMLR SSMUs. There has been no research on what might happen at SSI. Likely there will be a significant impact on penguins, some impact but less so on seals.

- Reducing krill catch limits at the regional scale will not offset the potential effects of climate change (RCP 8.5). Targeted measures to protect vulnerable populations might help. Evaluation of proposed measures is feasible. However, all modelling to date has assumed fishing to the level of the catch limit, which has never been reached. Future modelling should be based on actual catch data.

- Models suggest stopping fishing would have no beneficial effect for higher predators in the west of SG, but potentially significant benefit in the east of SG. In the worst case scenario for climate change, SG will take the hardest hit. For animals at the northern edge of their range, a small change in temperature may have a big impact.
The broad conclusion is that the research suggests that the effects of climate change will be far greater than the effects of fishing. There may be differences in predator populations spatially and effects could be alleviated by moving catch, but the model doesn’t suggest how it should be redistributed.

Discussion

This work identified a number of data gaps that could be addressed through the research and monitoring plan. In particular, the ability to detect effects of climate change on krill and predator populations will be of great importance and consideration should be given to the level of observation and monitoring required to disentangle effects from non-climate related changes.

Prof Alex Rogers – South Georgia & South Sandwich Islands: Climate Change and Spatial Conservation Measures

Prof Rogers presented a broad overview of biodiversity, climate change and spatial management at SGSSI drawing on information contained in a range of scientific papers, the majority of which are included within the background paper4. The key points of the presentation were:

- South Georgia and the South Sandwich Islands host an abundance of marine predators, endemic species and unique ecosystems: high conservation value
- Evidence that environmental change may be driving changes in populations of krill and salps in the region. Potentially serious impacts on krill-dependent predators.
- The SSI has the only trench system and vents in the Antarctic and these are therefore globally unique, although some are found in the Pacific sector. They are geologically and biologically unique features.
- Modelling changes in ecosystems in relation to climate change, Cheung et al (2009) looked at extinction and invasion intensity and indicated that high latitudes were/would be strongly affected.
- Endemic low-range species in coastal zone and shelf particularly vulnerable to climate change impacts.
- The CCAMLR bio-regionalisation approach identifies a network of representative MPAs, with 11 priority areas and 9 planning domains, however it is a slow process to achieve consensus. The Antarctic Ocean Alliance also has a vision for a circumpolar network of MPAs.
- A large scale no-take MPA offers significant insurance against the future impacts of climate change in improving the resilience of SSI ecosystems (removal of future pressure on krill or new resources; increased predator resilience; room for species to more south)

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4 The background paper will be made available on the GSGSSI website on completion of the MPA review process. The draft of this record will be updated with a link to the document at that time.
• Value of SSI as a barometer of effects of climate change in the region (contact zone) The Northern Scotia Sea is an area of high risk from climate change, mainly at SG but the contact zone at SSI could be particularly sensitive.

• In September a climate change workshop was held in Oxford, and much of the information relating to the SSI was discussed during that meeting. The biodiversity impacts of climate change were assessed and the probability of change and consequences of actions were scored with a traffic light system. The take home message is that the high endemism of species at SGSSI makes them highly vulnerable to some climate change effects, and a follow-up study is required to make the assessments more robust.

Discussion

In relation to CCAMLR, taking ten years to reach an agreement on an MPA was considered fast in comparison to how long some international agreements can take. Other RFMO’s may have been faster to adopt spatial closures and NTZs, e.g. NAFO, but CCAMLR have had such closed areas as management measures in place since 1990s.

There are arguments for large MPAs, but the use of dynamic boundaries in relation to environmental variables should be considered. It is hard to implement practically, but dynamic rather than static boundaries follow movements (temporal and spatial etc.). The Southern Ocean is responding to change at multiple scales and there is a need to distinguish cause and effect. The sub-Antarctic can expect greater, more visible changes.

SSI populations are all part of bigger populations, e.g. krill, Patagonian toothfish, Antarctic toothfish etc.– the RMP for SSI needs to be linked to a wider context. There are external threats to SSI, some of which can’t be dealt with by GSGSSI, therefore impacts of things outside the MZ can’t be solely mitigated by GSGSSI. For example, South Georgia’s albatross are suffering from the effects of fisheries outside the MZ, hard to quantify and even harder to mitigate against.

Marine mammal recovery has the potential to be a driver of krill biomass, there is a need to understand the recovery process to separate it from climate change impacts, and for that we need more data. Hydrophones could be an option for marine mammal and fisheries monitoring (acoustic devices to monitor vessel presence/activity).

At the South Orkneys, penguins on the southern coast of the islands forage further than those on the northern coast of the islands – most likely shelf edge processes driving foraging ranges. Foraging ranges are variable and unknown at the SSI, however Chinstrap penguin have been seen foraging around a ship 60km+ from SSI. R&M is required but there is a need to be precautionary in the interim.

We need to react to the potential impacts of climate change now, rather than in 10-20 years when it is too late. SOOS and ICED are working with CCAMLR, making vital inputs.

A healthy ecosystem has more resilience to change, and a large MPA will not suffer the impacts of other human activities that increase stress on the system.

Regarding toothfish, there is little evidence or information on the impact of removing a top predator.

At SSI, TOP/TOA are at their range edge, even low level removals (and climate change impacts) are likely to affect the contact zone biology. Broader ecosystem effects are largely unknown. Much may depend on geospatial linkages, for example tags show TOP movement from SSI to SG, but toothfish
are not breeding at SSI therefore ‘invading’ and then returning. Currently the stocks are treated separately, which is the most precautionary assumption. TOA are considered to be the northern extent of a southern stock that extends to the Antarctic Continent, although the region is unknown. The contact zone may be sensitive and vulnerable to wider cumulative effects.

Professor Rogers cross-referenced the letter sent to GSGSSI by 5 UK members of the IUCN’s World Commission on Protected Areas (WCPA), as mentioned in the welcome and introduction to the workshop, relating to the classification of the MPA. Prof Rogers supported the assertion that the SGSSI MPA does not class as an IUCN category VI MPA due to industrial fishing activity being allowed, and whilst it is complex to define ‘industrial’, recognised definitions include commercial (fishing for profit), using large technologically advanced vessels, and fishing for non-food products. These comments led to a discussion:

‘Industrial’ should relate to the impact rather than the scale of the fishery and the consequences of fishing activity e.g. a recent Chilean scientific paper (https://doi.org/10.1016/j.fishres.2018.04.013) showed that the impact of bycatch from some artisanal fisheries can be more damaging than that of a well-managed commercial fishery, the size of the vessel is not the key factor, and the outcome is more important that the terminology.

It is very complex to define ‘industrial’, and if it includes far-seas fleets then by their very nature all Antarctic fleets would be classed as industrial.

The MSC uses terms ‘large scale’ and ‘small scale’ fisheries to avoid issues of terminology relating to industrial fishing. The definitions given in the presentation were the best available. Multiple definitions are broadly consistent, but shifting over time to expand and broaden range e.g. non-food to more detailed descriptions.

IUCN processes for assessing and defining MPAs are currently unclear. There is a need to understand the global definitions if categories are to be modified. IUCN have attempted to clarify their guidelines, not modify or introduce new ones. The IUCN have not considered the range of impacts associated with a change of the definition. IUCN allows fishing in Category VI MPAs, use of the term industrial confuses the issue.

There was a legitimate claim of the SGSSI MPA being a Category VI when established in 2012.

The chair drew this debate to a close stating that the IUCN issues have been raised and noted, and GSGSSI will consider them in wider discussions. The issue is relevant to the review, but not under the TOR for this group, but the need for clarity and further discussion is noted.

Dr Chris Darby – South Georgia Deep-Water Camera Survey 2018

Dr Darby presented an overview and preliminary results of the Blue Belt programme funded deep-water camera survey around South Georgia in April 2018. The key points of the presentation were:

- The camera was deployed from the Fisheries Patrol Vessel Pharos SG in a number of locations and depths, but with particular focus on the West Gully and NESG BCAs.
- The West Gully camera drops focussed on historic fishing areas, and then along a depth profile to 1200m. Transects were carried out where the BCA research lines had been set in previous seasons as this is a known area of concentrated longline fishing activity.
• In areas with high sediment there was lower biodiversity and numbers, and drop stones were the key to biodiversity in many areas. The images recorded were similar to those seen in footage from the Ross Sea, the same structure was visible if not the same species.

• In the BCA which was created, in part, to minimise skate bycatch, many skate egg cases were observed indicating the BCA has been positioned in the correct location for that objective to be met.

• In areas considered to be ‘impacted’ there was no visible scour although an old, benthos encrusted ‘Spanish system’ line was snagged, but fine scale analysis is underway with many variables to be taken into account.

**Further discussion by the workshop participants highlighted the following:**

Oliver Hogg’s PhD (BAS-Southampton student –recently finished) used modelling to develop habitat classification maps, the camera work could be a useful opportunity to validate the models he created.

Cameras are also being deployed on longlines this season and 60-70% of lines set will have cameras attached (cameras rated to 2000m). This should provide information on the movement and impact of lines in addition to data on benthos.

**Dr Chris Darby – Antarctic toothfish connectivity**

Dr Darby reported on a three day CCAMLR workshop on the Development of an Antarctic toothfish (*Dissostichus mawsoni*) Population Hypothesis for Area 48 was held in Berlin in February 2018. Key considerations for the workshop were:

*D. mawsoni* at the SSI likely represent a small fraction of the regional *D. mawsoni* population extending south to the Antarctic continent, most likely part of the Weddell Sea populations. Juveniles have not been found in the SSI region. A range of stock hypotheses were developed at the Berlin workshop using data on oceanography, fishery and fishery independent survey data. Data derived from the SSI research fishery was a key component to testing and refining the hypotheses. Further Antarctic toothfish tagging studies in the SSI will complement a population genetics study of all Antarctic toothfish stocks being carried out by scientists at the Australian Antarctic Division.

**Dr Phil Trathan – multiple progress reports**

Dr Trathan updated the workshop on progression an RSPB/PEW/Birdlife funded project identifying at-sea marine Important Bird and Biodiversity Areas (marine IBAs) and Key Biodiversity Areas (KBAs) for seabirds and seals which breed at South Georgia and the South Sandwich Islands (SGSSI). In addition, he provided information on an upcoming SG penguin tracking study and developments in CCAMLR’s risk assessment analysis for the krill fishery:

**Identifying and confirming marine Important Bird & Biodiversity Areas (mIBAs) and Key Biodiversity Areas (KBAs) around SGSSI, to inform the SGSSI MPA review**

• The mIBA analysis considered 22 species/sites/demographic class combinations and the KBA looked at 11 seabird and 2 seal species. Tracking data (from limited sites) and estimated
distributions were used to identify key areas. The intention is for a peer reviewed output to be available next year. No data (other than estimated distributions) were available for SSI.

- Preliminary findings indicate that the MPA is effective, although this is somewhat circular as the data analysed in this project was largely the same information that was available when designing the MPA. More sites are required, especially from the SSI. The RMP should prioritise sampling based on locations and processes, then gaps can be interpolated rather than extrapolated. Priority should also be given to ACAP species.

- The effect of the krill fishery during the spring ‘shoulder’ period is currently unknown, especially with naïve juvenile birds. Anthropogenic effects need consideration, particularly in the context of domestic vs international effects. Corridors between SG and Shag Rocks could be viewed in terms of process management (e.g. mitigation measures) as well as spatial/temporal protection.

**Gentoo tracking**

A Pew funded project carried out by BAS scientists is due to start deploying tags on Gentoo penguins from two sites at SG in mid-June. The intention is to look at foraging locations before the krill fishing season begins, and then continue tracking during the fishing season. It is hoped that the project can be extended to multiple seasons.

Previous data from 2004 showed that winter foraging took place within 12nm from shore, this project will provide modern data to augment older data and help determine if this is the case or whether gentoos forage further afield.

**Kril Risk Assessment**

CCAMLR have endorsed the use of a risk assessment framework including spatial data on krill stocks, predator foraging and fisheries to highlight spatial and temporal risks associated with subdividing regional catch limits. Recent proposals have indicated that this could be revised to include areas identified by ecological boundaries, rather than existing management boundaries.

It was agreed that risk assessments at ecological scales and different temporal resolution, not just spring/winter but pre-laying, hatching, creching etc., and finer spatial resolution would be useful.

Climate change impacts on krill fishery dynamics could be incorporated into the risk assessment framework. The krill fishery operates across the Scotia Sea, therefore sea ice positions are critical. At SSI the sea ice is an important restriction as to how/why the krill fishery doesn’t operate there.

Previous agreement on catch levels have been arbitrary, but the Risk Assessment is now a defensible strategy based on relative risk.

14:15-14:30  **NGO Position Statements**

The representatives from GBO and WWF requested the opportunity to make statements regarding their position on the South Sandwich Islands.
**Simon Reddy – GBO**

GBO supports the full protection of the SSI and believes there is a clear science rationale for doing so, with evidence of climate change, the declining health of the oceans and the benefits of large scale MPAs. GBO understand that the UK has contributed greatly towards the 10% global target of MPA’s, but that this isn’t a reason not to fully protect the SSI.

GBO is not anti-fishing and recognises the high standards of fisheries at SGSSI. The article published in The Times did not call for total closure, it questioned the fact that 98% of the area is open and whether nature conservation is the primary aim of the MPA. The IUCN feels that the MPA falls short of its criteria for a Category VI MPA with only 2% of the area being fully protected and industrial fishing being allowed within the MPA area. In the opinion of GBO, a total closure of the SSI would rebalance that fact.

GBO are not oblivious to the CCAMLR landscape. They recognise the role that it plays and acknowledge the reallocation of catch agenda, but they are calibrating risk and not just looking to the 2021 discussions. There will be significant political manoeuvrings in 2021 and the arguments for reallocation has already been made and will continue to be made irrespective of the decision to fully protect SSI.

GBO/Pew have committed £250k for research feeding into the SGSSI MPA review. GBO would like to put their frustrations on record regarding the MPA review process. GBO have questioned the scope of representation present on the review panel and have asked to see the process and criteria by which panel members were chosen. We are unhappy that IUCN representatives and scientists with alternative viewpoints, such as Alex Rogers, were not invited to participate fully on the review panel. Furthermore throughout the whole process there has been a lack of clarity between scientific advice and policy recommendations.

The chair requested that a written version of the statement be provided to the review group. It was highlighted that members of GBO would need to agree/approve the written statement, which would also include comments relating to IUCN which had been made by the GBO representative earlier on day one.

**Sarah Davie – WWF**

WWF have evolved their position on the South Sandwich Islands, based on science, and are now aligning with GBO to support the closure of the SSI. WWF still want to keep working closely with Cefas, BAS and GSGSSI, and reiterate their desire to see a total ban on HFO at SGSSI.

A written position statement from WWF is available in Annex 2.

**Discussion**

The financial contribution of GBO/Pew in terms of funding research was recognised and appreciated.

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5 The full written statement was received following consultation amongst GBO members, and is available as Annex 1 of this record. There was further discussion on the GBO statement during day two of the workshop, see page 28 of this record.
The fishing industry representatives highlighted that they too make major contributions through funding and providing platforms for science but thought that this was not widely recognised.

GBO were thanked for clarifying their position in relation to a recent article in The Times and were asked if the briefing document they released on 29 January 2018 still reflected their current thinking, particularly relating to the krill and toothfish fisheries operating at the SSI. The GBO representative said they believe scientific research is not incompatible with full protection, and that an IUCN Category VI MPA makes provision for scientific research. GBO feel that the biogeographic divide highlighted in the morning presentations should be a focus for research, and that their concern was with the krill fishery, not toothfish research fishing.

14:30 – 16:00  TOR 1 review – consideration of how scientific understanding of the South Georgia Maritime Zone has developed since 2013 in light of new evidence

This session began with a recap on TOR 1, the development of scientific understanding in the SGMZ since 2013, which was covered in detail in the first workshop. The advisory group was then asked to reconsider this TOR, under the same headings as previously, in the light of the further evidence presented in the morning session.

1. Fisheries

Toothfish

The Antarctic toothfish workshop (https://www.ccamlr.org/en/news/2018/antarctic-toothfish-workshop-held-germany) had provided a better understanding of how the SSI stock structure links to the wider region. The information had been previously available, but had not been synthesised or conceptualised prior to the meeting.

Research in the northern Ross Sea during winter had identified the positive buoyancy of toothfish eggs, and links between sea ice cover and spawning condition of fish. The research had linked the importance of sea ice cover with spawning and larval survival, and whilst it was still a speculative hypothesis there was potential to link this work with the SGSSI Research & Monitoring Plan (RMP). With research conducted during the fishing season, i.e. southern hemisphere winters, there are many technical challenges associated with carrying out fieldwork in dark and icy conditions.

It was highlighted that the transition zone at Saunders Island in the SSI, between TOP in the north and TOA in the south, may be driven by bathymetry. The range edge species differentiation might be physically driven by a bathymetric feature rather than it being a temperature effect.

The Scotia Sea oceanographic model for South Georgia includes toothfish presence, krill and toothfish egg dispersal, but additional funding would be required to extend the model to cover the SSI. A paper from Katie Brigden’s PhD on toothfish recruitment is in progress and results should be refined within the next six months.

6 The GBO briefing document and associated Cefas/BAS background documents on the toothfish and krill fisheries at the SSI are available in Annex’s 3, 4 and 5 respectively.
Krill

The Norwegian led synoptic survey scheduled for 2019 will feed into CCAMLR, and in terms of management there should be an awareness of this survey when developing the RMP\(^7\). Blue Belt may sponsor the survey with BAS conducting the research, however there will be a 2/3-year timeline from data collection to digestion and analysis.

2. Stock/species recovery

Bird strikes – despite the introduction of the Early Season Closed Area to the north east of SG, there has still been incidental mortality in the 2018 toothfish season. The need to be precautionary limits the opportunity for testing alternative measures. Following the rat eradication, it is likely that bird numbers are increasing at South Georgia but there has been no systematic bird survey to provide evidence of this.

3. Climate change

Two of the presentations by the invited speakers gave information relating to climate change impacts. The level of uncertainty over climate impacts is high for the Southern Ocean when compared to other regions and monitoring will be key to finding out what is happening, for example validating sea ice cycle predictions with empirical data. There is a lack of information to feed into models, especially in the Scotia Sea, and the seasonal and regional scale is hard to resolve. Behavioural responses are not captured in models, for example with behaviours from species that have been through the cycle before but aren’t seen now, for example emperor penguins using pack ice.

In terms of resilience at the population/ecosystem level in both the terrestrial and marine environment, the precautionary principle aids populations in their ability to survive.

Change could occur over a gradual trajectory or there could be a knife edge response. It is difficult to know how far into the future predictions can be made. Comparative studies with similar sub-Antarctic regions may be informative. At Kerguelen there are similar species to SG but with different diets, how will this affect their ability to adapt?

The need to monitor climate change and its impacts highlights the importance of long term monitoring projects and the lack of long term monitoring (LTMS) at SSI. At SG certain bird species and higher predators are monitored, but there are large numbers of other species that have no monitoring. The ability to utilise new technology and monitor remotely should be considered within the RMP.

4. By-catch

Benthic Closed Areas were primarily developed to protect corals. Blue Belt camera will integrate with presence/absence data to develop quantitative results. All Longline vessels are deploying cameras this

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\(^7\) Details of two research cruises have been finalised since the MPA workshop concluded. BAS scientists will lead the D98 cruise which will survey around the South Sandwich Islands, to coincide with a multinational repeat of the CCAMLR 2000 large scale survey, as well as providing additional information on Antarctic krill distribution around the South Sandwich Islands. The research at SSI will be in addition to the annual monitoring programme in the Western Core Box at SG (https://www.bas.ac.uk/project/poets-wcb/). This will make a UK contribution to the CCAMLR 2019 large scale survey. The D99 cruise to the SSI to conduct benthic research will be led by Cefas, including use of the deep-water camera system which was used at SG in April 2018.
season and could form the basis of a LTMS programme to take forward beyond the Blue belt programme.

Fishery observers provide data in addition to that required by CCAMLR under SISO, including where and when birds are attracted to vessels, whale observations etc. This is all useful LTMS and the role of the observer could be developed to maximise this data collection. Fishing industry representatives highlighted that all toothfish vessels are required to have Electronic Monitoring CCTV as part of the GSGSSI licence conditions and data is being gathered even if it isn’t yet being analysed. There is potential to monitor bird strikes during setting, and to identify by-catch fish to species level on hauling, including using machine learning for computers to identify fish. These options should be raised when developing the RMP.

Given bird strikes can occur on all vessels, not just fishing boats, the use of observers on other types of vessels and use of a standardised reporting format should be considered in relation to the RMP. IAATO could provide a link to cruise ships and on-board citizen science. WWF UK and Dr Hart both already use citizen science to count penguin colonies, and drone imagery could be useful at SG.

5. Non-native species - introductions and eradications

At least 31 new expedition vessels/cruise ships are being built under the Polar Code which has the potential to double the number of tourists visiting SG, thus leading to an increased risk of invasive species introduction.

Under climate change scenarios, warming waters could increase the potential for ‘natural’ species changes rather than introductions. If it is a ‘natural invasion’ and not by human transfer, should we worry, and is there anything we could actually do? The potential movement of the Polar Front could have many impacts under different climate change scenarios, for example SG could become a hotspot for king penguins. A paper by Huw Griffiths (https://doi.org/10.1038/nclimate3377) discusses changes in benthos relating to climate change, and SAERI are bidding for a Darwin+ grant with Aberdeen University for research into marine bio-invasive species in both the Falklands Islands and at SG.

Comparisons of Continuous Plankton Recorder records from the Discovery Expedition (1930s) to current day have shown no change in the zooplankton species found in the Scotia Sea (https://doi.org/10.1007/s00300-018-2369-3). Funding for the Pharos to continue towing the CPR is under consideration, with discussions taking place on the potential for IAATO to raise funds for the project. Starting this season, a New Zealand (NZ) toothfish longliner which fishes at both SG and SSI is towing a CPR between NZ and SG at the start and end of the season, and also on the transits between SG and SSI, with the intention of this becoming a multi-year monitoring effort.

6. Mining and mineral extraction

A 2018 paper described the location of potential mineral extraction sites and SSI vents were identified as a possible source. Impacts of extraction were discussed.

Mining activities taking place outside the Maritime Zone still have the potential to create impacts within the MZ, for example sediment plumes and changes to currents. Given the proximity to SG, could the hydrocarbon industry in the Falkland Islands be a source of concern?
7. Plastics

At the Marine Ecosystem Assessment for the Southern Ocean (MEASO) conference in April 2018, a presentation described how kelp found on the Antarctic Peninsula was genetically identified as coming from SG. The kelp had taken 2 years to circumnavigate around the continent, and this transport could be used as a proxy for plastics. Airborne plastics have been identified in Antarctica, and from CPRs towed between NZ and the Ross Sea there is evidence of a relatively high frequency of microplastics (based on presence/absence, not quantified).

Following an industry led initiative, all toothfish longliners at SG now have microplastic filters on their washing machines. There is a commitment for these filters to be installed on the FPV Pharos and at the King Edward Point research station, and RRS Discovery has also agreed to install them.

As highlighted in Dr Hart’s presentation, the abandoned base at Thule is a pollution source. HMS Protector had been tasked to review the current situation, however engine trouble meant the plan had to be aborted.

8. HFO

A consultation on HFO and bunkering activity at SG is in development, and a consultancy firm has been contracted to carry out the process.

Regional Oceans Modelling System (ROMS) hindcast models have been developed. When an environmental event occurs (e.g. an oil spill) it is possible to model what has happened and predicts rates of dispersion etc. These data can be used to design shipping corridors or help react to spills.

9. Volcanic activity

Dr Hart’s presentation highlighted that volcanic activity is the biggest threat to species at the SSI. Sentinel 1 satellite imagery can be used to identify activity, although the resolution is insufficient to see impacts. A SAERI coastal habitat mapping project is currently focussing on SG and FI, but with additional funding future work could be used to look at SSI.

10. Other changes and threats

Whilst not a response to a direct change or threat, GSGSSI should look to showcasing their work through greater outreach. Looking at GSGSSI in the global context, there should be broad opportunities to talk about marine management and the gold standards for fishing and protection beyond GSGSSI. Research should be viewed in the global context where science contributes to conservation leadership. Grouping of key messages to develop and share, translating GSGSSI into a wider context, should be added into the RMP discussion. There is worldwide scientific interest in GSGSSI e.g. German research cruises, the Orchestra project, Discovery 100, and opportunities to build broader global collaborations. As a unique environment and landscape, SG is a reference area to compare with other regions, therefore is totally closing an area the best way to proceed given thoughts on wider collaborations? Given that GBO are still actively participating in the MPA Review process despite having different views, the possibility of a joint paper based on science was raised.

Highlighting GSGSSI as a reference area, and publicising successes such as bird mitigation measures etc. could lead to cooperative projects.
There is a link between scientific understanding to manage an area and social science value judgements on public viewpoints. At a recent WWF workshop on management of the krill fishery the aims and objectives were to find agreements rather than differences in points of view (http://www.iced.ac.uk/documents/Krill%20divide%20report_FINAL.pdf).

16:00 – 16:30  TOR 2 review – evidence-based assessment of effectiveness of current management measures

The advisory group was asked to reconsider TOR 2, under the same headings as previously, in the light of the further evidence presented in the morning session.

1. Seasonal closure of the krill fishery

Results from Dr Hart’s presentation indicate the breeding phenology for species at SSI may be different to at SG. The current temporal closure doesn’t encapsulate the entire seabird breeding/fledging period at SG, and there is now better information available of breeding phenology, for example for white-chinned petrels.

GBO and WWF felt their proposal to close the krill fishery at SSI in its entirety would mitigate this issue.

2. South Georgia and Clerke Rocks No-Take Zones

A recent research trip conducted as part of an ongoing research project on Southern right whale populations by Dr Jennifer Jackson at BAS found individuals in nearshore waters. Data collected by fisheries observers also identified Southern right whales further offshore (>12nm).

3. South Sandwich Islands No-Take Zones and Pelagic Closed Areas

Dr Hart’s presentation indicated that some penguin foraging grounds extend further than 12nm at SSI. During the breeding season the temporal closure means there is effectively a 200nm NTZ, however more information on where birds forage in winter is required. During the ‘shoulder’ periods of the closed time, increased temporal closure/management may be required as TOR 2.1 and 2.3 are intrinsically linked.

The KBA/mIBA are precautionary due to a lack of data, more information is required.

4. Shag Rocks No-Take Zone

Whilst not an existing objective, comments on the KBA paper raised the idea of a Shag Rocks – SG corridor as a seasonal and/or spatial extension of the Shag Rocks NTZ.

5. Benthic Closed Areas (BCA)

Qualitative results from the Blue Belt deep water camera survey found that corals are protected by the BCAs, and corals were present in areas where longlines had previously fished. The camera survey found a noticeable drop off in biodiversity with depth which was not factored in to the original MPA planning in 2012, and the West Gully BCA showed corals and skate eggs which supports the fact that the West Gully BCA objective to protect both benthos and skate is being met.
Toothfish longliners are deploying cameras on their lines this season in association with motion sensors and collection of bathymetric data. Once bottom hardness rocky, sediment etc. is identified, the benthos can be related to the substrate and predictive models developed. Oliver Hogg’s PhD also modelled benthic communities around SG and camera data could be used to verify his models and identify potentially sensitive areas.

The NESG BCA was established as toothfish refugia and to protect benthos/VME, however a potentially important seamount lies just outside the designated area. New bathymetric data is required to ensure that the BCAs are located in the correct place and are protecting vulnerable areas.

6. Additional Measures

A request was made that the report/slides were corrected to state that bottom fishing, rather than the previously stated bottom trawling, is not allowed at depths >2,250m.

It was highlighted that the winter-only toothfish fishery encapsulated the new additional measure of the Early Season Closed Area to minimise the potential for bird by-catch events.

16:30 – 17:30  TOR 3 review – review and assess the effectiveness of existing monitoring measures

The group was asked to reconsider TOR 3, under the same headings as during the first MPA review meeting, in the light of the further evidence presented in the morning session.

1. Conserve marine biodiversity, habitats and critical ecosystem functions

It was felt that SG meets this objective, however SSI potentially does not. The concept of separating this management objective into two distinct regional objectives could be helpful.

2. Ensure that fisheries are managed sustainably, with minimal impact on associated and dependent ecosystems

The group was broadly happy that the key issues are captured, however this objective highlights the importance of LTMS and maintaining research effort.

3. Manage other human activities including shipping and scientific research, to minimise environmental impacts on the marine environment

Areas of concern raised during this workshop included marine noise and the abandoned base on Thule as sources of pollution.

Standardisation of bird bycatch (vessel strike) data collection across all vessel types was identified as an area needing consideration.

SGSSI related data comes from a range of sources, consideration needs to be given regarding data collection and archiving and how to bring it all together. Data archiving and accessibility is an area of concern.
4. Protect the benthic marine organisms from the destructive efforts of bottom trawling

Benthic camera research gives more information on what is being protected and recovery rates from previous trawling activity.

Cameras on the groundfish survey provide data on the impacts of trawl gear under an exemption for scientific trawling. Known areas of methane seeps around SG would be avoided during the survey. Discussion was had on standardising the EIA protocols for all science and assessing the impact vs value of the data collected.

5. Facilitate the recovery of previously over-exploited marine species

Dr Jackson’s southern right whale project is providing new data on the process of recovery and distribution of that species.

Growth of higher predator populations (fur seal, whales etc.) and the impact they are having on the recovery of other species needs consideration.

Fisheries observers started LTMS of seabirds and pelagic marine predators 2 years ago and will continue to provide these data.

With the potential for invasive species to impact on SG, monitoring the area between FI and SG could provide a barometer for potential change and monitoring shifts in the polar front. Use of baited cameras and WCB style systematic monitoring could be an option. There is fishing activity in this region and potentially an opportunity to engage with high seas vessels for data collection, camera deployment etc. A request from the Ukraine to join the Coalition of Legal Toothfish Operators (COLTO) is currently under review, this could give a potential opportunity to engage with their vessels.

6. Increase the resilience of the marine environment to the effects of climate change

Modelling is key to monitoring the effects of climate change, but it is dependent on the data used (e.g. fishing effort) and the SSI aren’t covered. There is a need to integrate this work with CCAMLR and the wider context for broader monitoring. There could be potential for overlap with Ross Sea work.

The SSI system is more akin to the South Orkneys/Peninsula rather than SG due to sea ice patterns etc. Need to consider the context and differences between SG and SSI.

7. Prevent the introduction of non-native marine species

The DEFRA non-native species secretariat is undertaking a review of biosecurity and will produce recommendations on GSGSSI procedures.

The discussions on the TOR were captured on whiteboards throughout the session and these are available in Annex 6.

Of the seven objectives of the MPA reviewed by the group in this session, it was noted that only two of them relate to fisheries management. Given that the stated aims indicate that the primary objective of the MPA is conservation of marine biodiversity, the validity of claiming that the MPA is purely a fisheries management endeavour was questioned.
17:30 - 17:45  Day one synthesis

The chair provided a short round up of day one. The morning session focussed on the presentations of new/relevant information by the invited speakers and subsequent discussions, whilst the afternoon session allowed GBO and WWF to clarify their positions, followed by a review of the Terms of Reference in the context of new information that had become available since the first workshop in November 2017. The chair thanked the group for a productive day, and noted that despite the differences in viewpoints there were many common areas of agreement. Building on this work, day two would provide the opportunity to take discussions forward and develop the report and RMP.
Day 2 – Tuesday 12th June 2018

09:00 - 09:15 Welcome and recap of conclusions and key issues from day one

The chair provided a brief recap, highlighting that TOR’s 1, 2 and 3 had been covered during day one, and that today would be an opportunity to discuss TOR 4 and to shape the RMP based on discussions and input thus far. The group would then look at how the work is taken forward in terms of the review group report and recommendations for GSGSSI.

09:15 – 09:45 TOR 4 review – priorities for future scientific research and monitoring

The secretariat presented a summary of the report of the first MPA review workshop in November 2017, highlighting the data gaps that were identified at that workshop, updated with additional gaps identified during discussions during day one of this (June 2018) workshop (see Annex 7).

Following discussions on TOR 3 the previous day, the group established a list of priorities and areas of work that had been identified during day one of the workshop (not listed in any order of priority):

- Split management objectives between SG and SSI
- Southern Thule clean up
- LTMS monitoring
- Marine noise pollution
- Standardising data collection
- Continuing use of cameras for higher predator monitoring and deployment on longlines
- Recovery rates in closed areas
- EIAs for scientific trawling/research
- Whales (especially Southern Right Whales)
- Observers
- Monitoring outside the MPA
- Role of modelling
- Mesh more and better with CCAMLR
- Reference areas
- Biosecurity and invasive pathways

The chair clarified that there were three streams of information to be considered:
- data gaps identified in the background paper;
- data gaps identified during the November 2017 meeting;
- further data gaps identified as a result of new information presented since the November 2017 workshop, including from the presentations given during day one.

The intention is for these data gaps to be addressed through the development of a research and monitoring plan for the MPA, to guide future research.

It was suggested that climate impacts, with “resilience” and “migration” as sub-headings, might be an appropriate way to approach that topic, as there are a range of issues relating to climate change that need consideration.

09:45 – 10:45 Development of a Research and Monitoring Plan

Dr Susie Grant gave a presentation (Annex 8) explaining the background and intentions for the structure and development of the Research and Monitoring Plan (RMP), especially in the context of
CCAMLR. A high level of detail had already been captured under reviews of the TOR, alongside research questions and data gaps identified in the background paper. The intention was for the review group to discuss the structure of the RMP, including the mechanism for updating the document when necessary and how it would be used in the future.

To enable future reviews, the RMP should guide activities and provide information. Plans need to be achievable (it’s good to know what we want, but we should be realistic, and it shouldn’t include everything under the sun) and flexible to enable integration of new information as it becomes available.

It may be difficult to attribute causality to effects observed, but the RMP should identify the baseline data on key indicators required to evaluate changes. There is already a large amount of available data, e.g. LTMS, which is highlighted in the background paper. The RMP can be used to identify gaps and new projects, but should also highlight ongoing relevant LTMS/data collection which is important to the MPA.

Where possible the RMP should integrate with CCAMLR, although the Conservation Measure on RMP is rather vague – ‘other research’ could cover anything. Work carried out under the CCAMLR Ecosystem Monitoring Programme (CEMP) is useful to distinguish changes.

Organisation/structure of the RMP:

- MPA objectives
- Geographic areas, i.e. SG vs SSI
- Management measures, i.e. BCAs, NTZs, other measures

Possible thematic sections:

- Representation – what and where?
- Threats – to what extent is protection required?
- Understanding change

The development of the RMP should be inclusive and transparent. There are many scientists working on and around SGSSI who should be able to feed in to the process. There should be separate, independent review processes for the RMP and the Management Plan.

One way to develop the RMP could be to devise a table based on the specific objectives taken from the MPA Management Plan, including relevant features, parameters, locations, projects etc. Different levels can be used to specify the current level of knowledge and what is required – general understanding or more detailed.

The Darwin+ project is funded for two years, with one year remaining. The intention is to create a data system which is linked to the existing South Georgia GIS, and work to date has included the identification of data sources that could be included in the GIS in future, however there is the capacity to take it further and use resources to produce a draft RMP. A workshop can then put detail into the draft plan for GSGSSI to take forward in due course. This work would be outside the MPA review process and would therefore not need to be completed before the review process is finalised.

The chair suggested formalising the relationship between the advisory group and the Darwin+ project, including increased stakeholder input through a RMP workshop. The group could then support and sign off the draft, or modify as they see fit. Concerns were raised about whether the plan should be to develop a wish-list RMP regardless of the funding requirements for such work, whether activities
should be prioritised, and what support should be given to how work is funded going forward. Should the details be handed over to the Darwin+ project to figure out?

It would be helpful to get an idea of the scale of resources available for research at SGSSI, for example the number of research cruises that have taken place in the past 5 years could give an indication of future resources. If we can predict the scale of future opportunities at SGSSI then we can stay close to the envelope when developing the RMP.

Given the biogeographical divide, more reference should be made to how much work is done at SG vs SSI and what research opportunities are available to monitor change. The GBO representative confirmed that Pew were interested in that area of work with potential funding opportunities.

Fishing industry representatives highlighted that as a result of the recent licensing round, vessels had committed to contribute to science over the next four years. With six assets on the water, each with a commitment to conduct research, it was an ideal time to look at linkages and tailor projects to fit the MPA review process. Krill operators were also undertaking scientific research, therefore highlighting the requirement for better integration. With assets on the water it should be straightforward to put scientists on board, linking with the FPV for transport support.

Advisory group members highlighted that there is a deficiency in communicating the capability of fishing vessels to undertake scientific research; whilst the fishing companies and GSGSSI are aware of this, the wider scientific community don’t know what each vessel is capable of and what facilities are available. There are also other undervalued platforms of opportunity, including cruise ships, MV Hans Hansson and other smaller yachts; plans to conduct science shouldn’t be restricted to research vessels. In addition, thinking shouldn’t be restricted to UK vessels; German research vessels regularly undertake work around the Scotia Sea with the RV Meteor and RV Polarstern. Links with other nations should also be fostered.

It was noted that State Research Vessels are required to notify the FCO, who consult with GSGSSI, prior to entering the SG Maritime Zone. A cruise report should also be submitted following the survey, although these are not detailed reports, but rather a summary of activities. The GSGSSI permitting process requires thorough application forms to be completed, so the detail on research is available, but data privacy issues mean sharing such information is complicated. The suggestion was made that metadata be collated on what cruises have happened (where, when and who carried them out) and then individuals can follow up with the lead scientist/organisation for further details. A full list of research projects carried out and planned within the Scotia Sea would be beneficial.

The Darwin+ project could address this issue and provide a central repository of past and planned research, with multi-level access e.g. general metadata freely available but detail being password protected. The ease of access to the basic metadata was felt to be critical.

CCAMLR had been considering a similar portal to enable coordination and archiving of data in support of the Ross Sea research and monitoring plan, however it requires resources to set up and maintain.

Publicising upcoming research would be beneficial in terms of outreach and also advertising projects to other scientists who may be interested. This could be through simply saying “we are doing x” or asking the question “you’re coming in our waters, does your work link with x, y or z (our priorities)”.

It is important to also take into account desktop research and scenario testing, modelling etc. and the RMP should include thematic areas of hypothesis testing, not just direct field research.
The chair asked the group if they were content to support the Darwin+ project to develop the detail of the data repository and the group agreed that this was an appropriate way forward.

The question was asked how the group would deliver TOR 4. There are multiple ways of organising the framework/structure of the RMP, either adapting other plans, e.g. Ross Sea or developing new methodologies, is the group going to devolve the decision to the Darwin+ project or put forward ideas.

The Darwin Initiative is a UK government funding initiative for environmental research in OTs, and anyone can apply. Given the MPA review group is administered by GSGSSI and Darwin is administered by the UK Government, is there a potential for conflict? There needs to be an awareness of decision making and responsibility lines with different constituents. Darwin+ project applications need a letter of support from the relevant OT so there is some linkage between the project and GSGSSI. A Darwin+ project RMP workshop would have greater involvement from wider stakeholders and GBO are keen to see increased opportunities for stakeholder contributions.

When talking about SGSSI most people are usually referring purely to SG, not SSI, and lines can get blurred. Should SG and SSI be viewed as two separate research and monitoring streams? Whilst there are differences in the level of knowledge, the two regions are linked and there may be concerns if diverging analysis meant SG and SSI were treated as separate units. Whilst complete separation is concerning, could there be consideration of a ‘special area’ rather than totally split, e.g. with toothfish linkages?

Assumptions on SSI based on knowledge from SG, can when sensible be useful, as it saves effort, but if not then a clear gap could be helpful.

A Venn diagram approach could be a useful tool to conceptualise differing regional requirements:

![Venn Diagram](image)

Different areas/topics would have different sized overlap, for example the benthic overlap between SG and SSI may be low, but the pelagic zones may have very similar features and a broad overlap. The Darwin+ project workshop could look to encapsulate this. In addition, there are differences between Shag Rocks and SG as well as SG and SSI. There needs to be a framework to look at all regional differences within the territory.

In terms of the report it may be useful to split SG and SSI and look at the available evidence for each region, which would allow region-specific data gaps to be identified and provide a focus for research. If there is a heterogeneous area this needs highlighting early in final report in terms of evidence.

There will be commonalities across the region for some habitats but not for others, so having an overarching area with subdivisions could be an option. The MPA management plan and its objectives should be at the core of the RMP.
Whilst there are similarities with the Ross Sea MPA, there are other sub-Antarctic islands in the same biogeographic region with MPAs and associated RMPs (Bouvet has had a 12nm MPA since the 1970s). A “low key” review of their procedures and processes in the Southern Ocean could help shape thoughts at SGSSI. Representatives from these other sub-Antarctic MPA regions (e.g. Philippe Koubbi has expertise for Kerguelen and Crozet) could be invited to the Darwin+ project workshop to help with the process.

It is ok to outsource the RMP but the MPA group needs to retain control of it, it should not end up being unachievable or formed of pet projects which are justified by theme but are not actually useful for future management of the MPA. What happens after the Darwin+ project provides the detail?

What happens to the MPA review group after this June workshop, what are the next steps? Will the advisory group continue to exist with more work to do, and will the group review the RMP?

There will be another MPA review in 5 years. There is a need to monitor the RMP and if it drifts then how is it brought back on track? The annual stakeholder meeting could host an extra session/meeting with an MPA update as part of the longer term process. There could be a more regular review of science and research than is necessary for the Management Plan review.

The Darwin+ project has its own deliverables; they are separate entities but complementary. The Darwin+ project group can produce the RMP but others can take it forward.

There are already presentations of research at the stakeholder meeting, the format of which could be restructured. If research is not in the RMP it can still be carried out.

There is a need to separate the RMP update from the MPA review. The Darwin+ project workshop can be followed by an annual RMP update, but the MPA Review is this advisory group, once it’s done and advice is given, the group dissolves and a new advisory group is established in 5 years’ time. Who then takes ownership of the RMP?

The MPA review group has specific TOR, but more work is needed on TOR 4 with a broader group through the mechanism of the Darwin+ project, and then the plan can be given to GSGSSI and they will decide what to do with it. The 5 year MPA review will have TOR set by GSGSSI, the RMP review will be more a sharing of science updates in a show and tell format which form a body of evidence which can then be inserted into a collation of information to inform the next review (annual summary to update the background paper).

The MPA review process requires an independent review group to assemble every 5 years, it would have helped to have a RMP this time to review. Should the MPA group develop TOR for the RMP? The RMP will allow coordination, but won’t see reports following the research of who did what, where and when, so how do people access that information? Should it be a requirement of the RMP to provide a report of the work being done?

The Ross Sea MPA has a project list, effectively a register of work that can link with other researchers to do standardised work and collaborate etc. An abstract of the work that has been done is on record and collated. In the CCAMLR context, they won’t consider projects as part of the review if not registered research – shows transparency.

Can an online sign-up list be created which notifies a mailing list of recipients when any information is added or updated? Could this be linked to the Regulated Activity Permit (RAP) process and you have to register online as part of the permitting process?
Where is the line drawn on relevant research? In an ecosystem context the linkages and scope could be wider than anticipated, e.g. South African penguin research – is it related to SG penguins etc.?

For notification systems, how should GSGSSI assess applications to do research – quality of proposal, relevance to RMP? How do you prioritise when there are limited resources/time? GSGSSI does undertake external review of certain applications, e.g. any animal handling projects require ethics approval.

Based on RMP priorities, scientists should notify GSGSSI when doing research that helps to fill a data gap, not necessarily registering but just to inform – “given the RMP and data gaps, is this likely to contribute to our knowledge?” Subject matter experts could assist in reviewing applications.

GSGSSI does not want to make the RAP application an onerous process. If the research isn’t in the RMP, is it still worth doing? What happens if an application isn’t meeting the objectives, do GSGSSI say no to the research? Should it depend on the impact? Impact vs contribution - needs to link to the RMP if there is potentially a high impact? Could it be a criterion on the RAP to state if/how it contributes to the RMP objectives?

Don’t want to inhibit blue sky research, need to take into account implications of projects such as bioprospecting (to find compounds that are then synthetically replicated rather than harvested). The permit system assesses risk but GSGSSI can’t review the detail of every application. In some cases, the proposal will already have been through scientific review to get funding. For example, the Australian Antarctic Division require a peer review before a project can progresses. Prior peer review puts the onus on the applicant.

Does the RAP process assess value? Most research at SGSSI is on research vessels and will have undergone prior review, GSGSSI criterion are only applied if it’s a high impact project. Previously GSGSSI have offered small research grants (the scheme is not running at the moment) but contributing to the MPA could be a criterion to bid for funding. If you want your research to contribute to the MPA review then you need to meet X, Y and Z before submitting application.

What are the provisions for competing research? There is value in coordination – a historical example relating to glacial lake research was given; two similar projects from different institutes working independently that could have collaborated to provide added value or reduced impact. Also need to coordinate different types of research to avoid overlap in time and space (e.g. acoustic whale work vs seismic survey).

**11:15 – 11:40 Continuing Discussions on Development of a Research and Monitoring Plan**

What is the timescale for the Darwin+ project, and is the RMP a specified deliverable? The Darwin+ project deliverable was to provide advice, not necessarily a draft, but the project can do either. If the group want a draft, then a possible timescale is to hold a Darwin+ project workshop in Autumn 2018 with a view to providing a draft by the end of the year. The Darwin+ project is due to finish in May 2019.

Timing becomes a factor, GSGSSI will take the review group advice and consult on any Management Plan changes, where do the processes intersect? Separation of the Management Plan review and the

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8 The Darwin+ project timetable changed following the MPA review meeting, and the workshop which was planned for autumn is now likely to take place in late 2018.
RMP: although the RMP is an output, the actual document isn’t required before the end of the MPA review, and they aren’t dependent on each other.

The chair asked the group if they were happy with the process or does the RMP need to come back to the group, bearing in mind that the members of the group were likely to be at the RMP workshop?

The RMP should not become a wish list endorsed by the group as GSGSSI will have to deliver or risk accusations of “not following the advice of the group”.

Under the current TOR there is no reason to reassemble the MPA review group after this June workshop, however if an interim need was identified then the RMP can be included in the agenda of any future review meeting. GSGSSI have limited scope to deliver the RMP, instead it is providing a framework to deliver/advise science, should the resources be available (in the same vein as the Heritage Framework).

R&M requirements from Darwin+ project, then in terms of things we can deliver the MPA group prioritises these things. GSGSSI take ownership of the plan – “we can deliver x, y and z, we need to seek assistance on further goals”. If a list of requirements is produced, GSGSSI need to take responsibility for some of them to deliver against, although it would not be obligated to do so.

The question was asked whether GSGSSI would attend the Darwin+ project RMP workshop. The group agreed that that it would be valuable if they attended.

Notwithstanding funding, it was felt that a list of R&M priorities should be produced and publicised, and that funding shouldn’t constrain what we think is important. Aspirations shouldn’t be limited by funding.

In may be tricky when the review process looks at research against the RMP in terms of the objectives. Need to evaluate including the nuances of any work so when you take advice it’s integrated in terms of a 5-year review.

A number of issues have been parked through the course of the review as it was felt they were beyond the remit of the TORs, but they may need to be addressed in strategic delivery. Thus far, all issues have been considered in dialogue to continue rather than impose.

11:40 – 12:30 Development of the review group report and advice to government

The intention is for the secretariat and chair to produce and agree a record of the current workshop under the same process as the November 2017 workshop, with an opportunity for participants to comment/edit, then sign off the document as a record of discussions within the context of the final report. The independent chair will then produce an executive summary of the MPA review, with support from the secretariat, which will include the recommendations agreed on by the advisory group.

Management objectives have been fully met in some cases, and partially in others. The group needs to decide how to take this information forward:

1) How will the report look? Records of the two workshops as the basis of an executive summary with recommendations, or a completely separate report?
2) Regardless of the format of the report, recommendations are required under the TORs, with differences of opinion being recorded.

There needs to be an agreed structure of the report and what the advice will look like. The record of the meeting is necessary, but the outcome should be integrated into a single report with a concise summary. The background paper can be an appendix with the recommendations forming the body of the report, the record is good for the group but policymakers only need a short summary.

The timeline for producing the report and recommendations needs to be considered, particularly in light of CCAMLR commitments. It should be relatively straightforward to go through the records of the November 2017 workshop, background papers and whiteboards, and then extract the key recommendations and grade them.

The background paper was originally created as a draft with the intention of being updated. This essentially provides the evidence for TOR 1, although the presentations at this second workshop have provided extra information therefore the background paper could be viewed as a starting point with additional data from the invited speakers used to complete it. As part of the update any commercially sensitive or confidential information can be removed making it suitable for the public. The presentations can be uploaded onto the GSGSSI website, then in due course a peer reviewed paper could be published.

In its current form, the background paper is not ready to go on the website as there are sections that need to be removed and extra information to be inserted, however that shouldn’t take long. It will be more appropriate to have all the information in one place.

There were two possible ways to proceed, adding the presentation data to the paper, or publishing the presentations alongside the paper on the website.

It was felt it would be best to drop the term ‘peer review’ and have the summary report as a standalone document not for journal publication, but that it could be made publicly available in a relatively short time.

Aim is to have the background paper updated and online by the Autumn Darwin+ project workshop. The report of the workshop can be submitted to GSGSSI in July but the background paper won’t be ready until September.

There are different stages to the process, with peer review, report, and statements to come in, so some general tidying up of the documentation will be required. Stages will evolve, not everything will be ready at the same time.

An agreement was made that a record of this meeting will be prepared including presentations from the invited speakers and statements from GBO and WWF, timeline TBC by GSGSSI and the chair. The report should comprise four elements – synthesis of the records of meetings by TOR (short) supported by the two complete workshop records plus scientific evidence to meet TOR 1 [web based background

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9 The question was asked on how members of the panel may address any issues in the written statement that they may have concerns about, given there could be differences to the verbal statement given on day one of the workshop. The chair explained that he had originally believed the verbal statement had been agreed by GBO and provision of a written copy would not require additional discussion with GBO members. The chair advised that the statement should be circulated and responses could be made as necessary. One response to the written statement was received (from Peter Thompson, Argos Froyanes Ltd) and this is available in Annex 9.
paper and presentations plus narrative on how it is being synthesised into one document, redacted for common sense and potentially the basis for a peer reviewed paper].

Recommendations to GSGSSI based on TOR:

- TOR 1 narrative as above
- Moving onto TOR 2 based on record of November meeting, include new evidence from Monday and any differences of opinion
- TOR 3 to be looked at in terms of the RMP

In terms of the background paper, clarification was requested in terms of the editing process and whether the group needs to comment on the draft. Use of common sense when editing information (such as locations, anything that identifies a vessel or individual etc.) was advised. The group suggested that it might not be necessary to include unpublished work and reports that aren’t publicly available in the revised background paper. Once a final draft of the background paper has been prepared then rather than have a full review by members of the group, the group agreed that it could be circulated with a short time frame to respond under the proviso “if I don’t hear back from you I’ll assume it’s ok”. Releasing a draft with a watermark and disclaimer that it is unpublished is an option. An estimated delivery date of the end of August was proposed, with no need for an interim version given the amount of time it will take to get the workshop record prepared. With regard to the presentations it was agreed that they could be posted on the website in the same section as the list of references from the first workshop.

With regard to the correspondence that had been received by GSGSSI during the review period, it was felt that they should remain confidential at this time and a note that they had been received and reviewed was all that was necessary at this time. If the letters were made public, then the group would need to respond to each of them individually.

13:45 – 15:30 Development of the Review Group report and advice by TOR

This session provided an opportunity to review the comments from the November 2017 workshop record to see whether, in the light of new evidence, they were still valid and could go into the final recommendations, or whether they required modification. The language that should be used in the report around each TOR was also discussed. The secretariat made edits to the November report text (track changes) which were agreed by the group at the end of the discussion for each point.

TOR 2: Provide any initial evidence based assessment of the effectiveness of current management measures and advice on the degree to which evidence might support any revisions to management measures

1. Seasonal closure of the krill fishery

Does the need for a broader understanding relate to krill, predators or both? Are we talking about breeding phenology, krill movement, how SGSSI fits in with 48.1? There is a need to review in light of further evidence, e.g. climate change impacts – ‘noting growing evidence of climate impacts in the region, we will need monitoring and review’.

Clarification should be made that this is monitoring to see if it’s affording protection/if the protection is sufficient given climate change. The management measure may need assessing due to the level of uncertainty.
Two questions – is management measure meeting the objective, and is the management measure a good one (specific to climate change) or does it need modifying?

For anyone not well-versed, there is a need to be more specific/explicit i.e. it’s not delivering what we want in terms of the measure in relation to climate change. Subtleties can be hard to express but the intent needs to be easily understood by non-experts.

Is there a way to encapsulate the breeding phenology at SSI? There was some debate over whether there was actually a seasonal closure at SSI, however it is in place even though the fishery isn’t operating there, the measure would still apply if anyone did want to fish there. A possible extension of the shoulder of the closed season to encapsulate species not fully covered by the seasonal closure should be included, it can be kept high level as ‘species’ in the report, but the detail of which species can be considered by the RMP. There is already phenology information available, maybe not new monitoring but we can work on what we’ve got.

The recommendation on extension for example may be along the lines of ‘GSGSSI may want to consider, in the light of phenology, and extension...’ in this section.

The group could add this to a list of recommendation of items for inclusion in the RMP which will feed into the Darwin+ project workshop in Autumn 2018.

It would be preferable to merge multiple points into one document rather than taking points individually, therefore points from November should be taken as read, then add in the new information rather than totally revisit each one.

Under TOR 2, the management measures are effective, but for some species the objective of foraging ground protection is not quite being met (based on phenology), therefore the closed season may need to be extended.

The eradication of rats and reindeer is likely to have had an impact on bird numbers, and there has always been an issue with the shoulders of the closed season, so should the term ‘additional evidence’ be used? If you use the term ‘adequate’, how do you define it? Is it best to talk in terms of risk? ‘Some risk to some species’ in terms of breeding phenology removes quantifying/qualifying language.

GBO asked that their position be recorded, that in light of climate change evidence/impacts, they believe consideration should be given to whether the management measure needs extending from a seasonal closure to a total closure of the krill fishery at the SSI.

Given the time period for review, advice should be an action/decision rather than a review which would need a new group, additional input etc. Evidence presented that climate change is happening with impacts, needs more than a general review, needs targeted work on that measure.

There are many potential impacts of climate change. It was suggested that a non-exhaustive list of potential impacts, with the caveat ‘including but not limited to...’, could be created and referenced when the group provides advice, rather than repeatedly stating all the impacts under each management measure being reviewed. Such a list could be useful to non-experts, and there may be a need to clarify between effect vs impact.

There may be short term and long term objectives – the MPA might be meeting it now but maybe not in years to come.
It was emphasised that one presentation presenting additional evidence doesn’t negate all the other evidence from the first review meeting in November 2017 etc.

Is evidence being appended, and what is new since November 2017? Not all evidence is new, in some cases it is the same data with a different interpretation. Dr Hart has introduced some new evidence from SSI with some reassessment of old evidence – need to qualify ‘new evidence from SSI’. Adélie and chinstraps not considered in original document, therefore new evidence.

2. South Georgia and Clerke Rocks No-Take Zone

The RMP should be used to extend knowledge. Dr Trathan’s KBA/mIBA presentation showed that if you input the same data you will get the same results, there is a need to identify new data to challenge assumptions.

Only partially meeting objectives, what do we need to make it fully met? More data – TOR 3, RMP priorities.

3. South Sandwich Islands No-Take Zone and Pelagic Closed Areas

As described under point 1 (seasonal closure of the krill fishery), an overall statement about climate change would be beneficial rather than relating/repeating with each point. It would be a large paragraph discussing confidence in projections and whether impacts are trending or a knife edge response. Some trends are visible, highlighting the overall picture. Need a robust statement on potential perceived impacts being acknowledged – important for GBO and the UK in general.

Consideration was given as to whether a generic statement on climate change should be drafted by members of the review group which could be included at the start of the report.

Confounding statement in this TOR, two different things being addressed – should comment on whether the objective is being met, with the proviso that GBO/WWF feel that the objective/measure needs to be extended.

GBO stated that their position is not just a policy statement, it has valid scientific reasons. This was challenged on the basis that some group members felt that evidence has not been presented and the information provided in letters sent during the review period was generic rather than specific.

Prof Rogers stated in the morning session that he wanted a full closure at SSI, debate on whether he was presenting policy with no additional science.

With either limited or no data for the SSI, but considering the risk to the area by climate change (as presented by Alex Rogers and Simeon Hill), there is an argument that a more precautionary approach to protecting this area should be taken.

Some felt that closure of the SSI as advocated by GBO could lead to krill fishing displacement. Potentially the 15% allocated to the SSI could be taken in a far smaller area, condensing fishing is not precautionary in terms of the broader ecosystem. Modelling total closure to assess the impacts in even more data poor areas (e.g. inside 48.4 but outside the SGSSI MZ). GBO made two comments to address this concern: 1) No fishing takes place around SSI as the krill does not aggregate – so closure of SSI waters would not displace actual vessels. It is a fact that 48.4 has only been fished in four of the past 44 years and not since 1992 and not for 25 years; 2) Irrespective - GBO is not insisting that the
15% 48.4 quota is annulled. GBO has proposed that the option to catch the 93,000 tonnes (not caught since 1992) be retained across the 53% of 48.4 which sits beyond the SSI marine zone.

Despite this some felt that with the law of unexpected consequences, it would be wrong to take a position that could potentially disadvantage areas outside the SGSSI MZ. By mitigating a minimal risk in 48.4, the fishery could then operate just outside the MZ including during the summer when there is more limited data on predator demands.

If the group is unable to reach a consensus on closure of the SSI, then it may be necessary to list opposing views with no weighting given to any viewpoint.

Some felt there is a need to look at alternative scenarios, and a risk assessment looking at relative vs absolute risk would be a useful tool, moving towards objectives for 48.3, 48.4 and all of CCAMLR.

Any displacement from 48.4 would not be immediate, and could be blocked until the 2021 CCAMLR review of the distribution of Krill catch quota

There is an apparent need to agree to disagree on this issue, to put forward differing views and give equal weight to each. This topic may require its own section in the report which can be cross referenced to SSI NTZ and Pelagic Closed Area section.

A much broader CCAMLR related discussion needs to be had – Dr Hart’s presentation highlighted the potential risks of displacement to 48.1 and elsewhere, need to consider how changes to the SG MPA could have a knock-on effect for krill, toothfish etc. in a wider context. It was pointed out that the argument to move the unused quota from 48.4 to areas with higher densities of Krill has been made before and will continue to be made irrespective of whether or not SSI EEZ is fully protected.

Comments can be made on the substance of discussions in an extra section. Interpreting the science into policy may find more areas for agreement.

Is there additional risk from displacement and if so, how do you manage it? Focus on scientific aspects, not interpretation could help provide consensus. How should the group review any predicted impacts and outcomes as that isn’t within the TORs?

Narrative could lead to looking if 12nm is sufficient, extrapolate to extending. This could be a catalyst to further action, and would be GSGSSI leading by example.

Need to take a scientific view, to what end does science support the policy? Risks and trade-offs need to be phrased as scientific questions without weighting, then with the best available scientific evidence it is then up to GSGSSI to deal with any other factors and policy implications.

At this point, Alistair Dunn mediated a discussion to reach a compromise statement that could be incorporated into the final report which would reflect the views of all concerned regarding the potential for displacement of fishing at SSI. After considerable discussion a compromise could not be agreed on the language

4. Shag Rocks No-Take Zone

10 Following the workshop there was a further attempt to reach consensus on the language for a compromise statement, however no agreement was reached and the decision was taken that the advisory group members would agree to disagree on this point.
At what point in the review should the Shag Rocks corridor be considered? Is it just for krill? Whales and juvenile TOP were both mentioned previously in relation to this region. Juvenile toothfish are protected from bottom trawling but potentially vulnerable to pelagic fishing east of the NTZ (although unlikely - there is a potential threat but no evidence to suggest that it is an issue). Monitoring should identify if this becomes an issue, highlight in RMP.

5. Benthic Closed Areas

Two questions are being asked, need to split the paragraph – are the BCAs in the right place, and are the objectives being met. Data gaps have been identified.

Issues with grammar in sentence about VME – clarify that data poor areas are not linked to VMEs. Need to update based on bathymetry where boxes don’t encapsulate features e.g. the seamount just outside the NESG box. Is the NESG seamount still a priority? A priority, not the priority.

Do the hydrothermal vents need additional protection? When a site is found, a management tool to then close areas would be helpful. Should this only be applicable to FV’s, or more broadly? Should the closed area apply to science activities if it’s outside of fishable depths? It could be included as a recommendation from the group.

6. Additional Measures

What was the purpose of the review of additional measures? Not part of the MPA Management Plan, they are fisheries regulations that were considered to be relevant to the MPA review.

Would removing the additional measures impact on MPA management? Recommend that for clarity, each measure is linked to specific MPA objectives – what do they support rather than being a list of nice things.

Revisions to additional measures should be assessed in relation to MPA impacts if intrinsically linked – fisheries are part of the MPA so it would be considered anyway.

Where does the Early Season Closed Area for bird bycatch mitigation fit within the MPA? GSGSSI haven’t had any data back yet, can we review it? Would fall under the RMP. Debate was held over whether it should fall under the review of the shoulder season, unless that is just for krill? Yes, 2 separate issues, krill and TOP timings are different issues.

TOR 3: Review, and assess the effectiveness of, existing monitoring measures for evaluating the extent to which the objectives of the sustainable use MPA are met

It was agreed that it was possible to incorporate notes from the earlier discussions on the review of TOR 3. The secretariat summarised the points raised from his notes and made a list that could be detailed in the record of the workshop, with the report to advise the Darwin+ project workshop in the autumn.

TOR 4: Contribute to priorities for future scientific research, including any new research and monitoring that may be necessary
Feeds into the RMP, and with the strong linkage to TOR 3 it was agreed that TORs 3 and 4 could be viewed together. The question was raised as to whether GSGSSI should be prioritising its own RMP? An analogy was drawn with the Heritage Advisory Panel, where recommendations are made, but it is up to GSGSSI how they chose to act on such advice.

16:45 – 17:00 Conclusion

It was agreed that enough evidence had been inputted and assessed to produce a record and report of the meeting. The chair thanked all participants for their wide-ranging contributions and outlined an approximate timetable for taking the review process forwards from this point:

- get a record of the meeting out in next 6 weeks (by end of July)
- give group members 2/3 weeks to review (mid-August)
- Ready to issue record by end of August? Link to the Darwin+ workshop (2 days, w/c 17 Sept) before the stakeholder meeting (mid/late Sept)
### List of Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>ACAP</td>
<td>Agreement on the Conservation of Albatross and Petrels</td>
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<td>AIS</td>
<td>Automatic Identification System</td>
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<tr>
<td>BAS</td>
<td>British Antarctic Survey</td>
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<td>BCA</td>
<td>Benthic Closed Area</td>
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<td>CCAMLR</td>
<td>Commission for the Conservation of Antarctic Marine Living Resources</td>
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<td>CEFAS</td>
<td>Centre for Environment, Fisheries and Aquaculture Science</td>
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<tr>
<td>CEMP</td>
<td>CCAMLR Ecosystem Monitoring Programme</td>
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<td>COLTO</td>
<td>Coalition of Legal Toothfish Operators</td>
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<td>CPR</td>
<td>Continuous Plankton Recorder</td>
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<td>EEZ</td>
<td>Exclusive Economic Zone</td>
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<td>EIA</td>
<td>Environmental Impact Assessment</td>
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<td>FCO</td>
<td>Foreign &amp; Commonwealth Office</td>
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<td>FI</td>
<td>Falkland Islands</td>
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<td>FPV</td>
<td>Fisheries Patrol Vessel</td>
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<td>FV</td>
<td>Fishing Vessel</td>
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<td>GBO</td>
<td>Great British Oceans</td>
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<td>GFW</td>
<td>Global Fishing Watch</td>
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<td>GIS</td>
<td>Geographic Information System</td>
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<td>GSGSSI</td>
<td>Government of South Georgia &amp; South Sandwich Islands</td>
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<td>HFO</td>
<td>Heavy Fuel Oil</td>
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<tr>
<td>IAATO</td>
<td>International Association of Antarctic Tour Operators</td>
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<td>IBA</td>
<td>Important Bird Area</td>
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<td>ICED</td>
<td>Integrating Climate and Ecosystems</td>
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<td>IUCN</td>
<td>International Union for Conservation of Nature</td>
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<td>IUU</td>
<td>Illegal, Unreported and Unregulated</td>
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<td>IWC</td>
<td>International Whaling Commission</td>
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<td>KBA</td>
<td>Key Biodiversity Areas</td>
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<td>LTMS</td>
<td>Long Term Monitoring and Survey</td>
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<td>MEASO</td>
<td>Marine Ecosystem Assessment for the Southern Ocean</td>
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<td>mIBA</td>
<td>Marine Important Bird Area</td>
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<td>MODIS</td>
<td>Moderate Resolution Imaging Spectrometer</td>
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<td>Marine Protected Area</td>
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<td>MSC</td>
<td>Marine Stewardship Council</td>
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<td>MZ</td>
<td>Maritime Zone</td>
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<td>Abbreviation</td>
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<td>NAFO</td>
<td>Northwest Atlantic Fisheries Organisation</td>
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<td>NASA</td>
<td>National Aeronautics and Space Administration</td>
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<td>North East South Georgia</td>
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<td>No Take Zone</td>
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<td>Research &amp; Monitoring Plan</td>
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<td>ROMS</td>
<td>Regional Oceans Modelling System</td>
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<td>Royal Research Ship</td>
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<td>RV</td>
<td>Research Vessel</td>
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<td>SAERI</td>
<td>South Atlantic Environmental Research Institute</td>
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<td>SAR</td>
<td>Synthetic Aperture Radar</td>
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<td>SG</td>
<td>South Georgia</td>
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<td>SGSSI</td>
<td>South Georgia &amp; the South Sandwich Islands</td>
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<td>SISO</td>
<td>Scheme of International Scientific Observers</td>
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<td>SOOS</td>
<td>Southern Ocean Observing System</td>
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<td>SSI</td>
<td>South Sandwich Islands</td>
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<td>SSMU</td>
<td>Small Scale Management Unit</td>
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<td>TOA</td>
<td>Antarctic toothfish (<em>Dissostichus mawsoni</em>)</td>
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<td>TOP</td>
<td>Patagonian toothfish (<em>Dissostichus eleginoides</em>)</td>
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<td>TOR</td>
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<td>Visible Infrared Imaging Radiometer Suite</td>
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<td>VME</td>
<td>Vulnerable Marine Ecosystem</td>
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<td>Vessel Monitoring System</td>
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<td>World Commission on Protected Areas</td>
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<td>WWF</td>
<td>World Wide Fund for Nature</td>
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### Day 1 – Monday 11th June

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<tr>
<th>Time</th>
<th>Activity</th>
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<tr>
<td>0900 – 0930</td>
<td><strong>Arrive, tea &amp; coffee available</strong></td>
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| 0930 – 0945 | Welcome  
- November 2017 MPA workshop report  
- Second workshop objectives - recap on Terms of Reference and expected outputs |
| 0945 – 1300 | Call for evidence: presentations by invited experts (20 minute presentations; 10 minutes for Q&A/discussion):  
  0945-1015: Remote sensing – Dr Andrew Fleming, BAS  
  1015-1045: South Sandwich Islands biodiversity – Dr Tom Hart, University of Oxford  
  1045-1115: Krill population dynamics and climate change – Dr Simeon Hill, BAS  
  1115-1145: Climate change and marine ecosystems – Prof Alex Rogers, University of Oxford  
  1145-1155: Update on South Georgia benthic camera survey – Dr Chris Darby, Cefas  
  1155-1205: Update on Key Biodiversity Area & Important Bird Area analysis, Gentoo tracking study, and Krill Risk Assessment Project – Dr Phil Trathan, BAS  
  1205-1215: Update from Berlin workshop on Antarctic toothfish connectivity – Dr Mark Belchier, BAS  
  Discussion |
| 1315 – 1400 | **Buffet lunch in Innovation Centre**                                   |
| 1400 – 1430 | TOR 1 review - consideration of how scientific understanding of the South Georgia Maritime Zone has developed since 2013 in light of evidence presented in morning session |
| 1430 – 1530 | TOR 2 review - evidence-based assessment of effectiveness of current management measures in light of evidence presented in morning session |
| 1530 – 1545 | **Tea & coffee break**                                                   |
| 1545 – 1645 | TOR 3 review - assess effectiveness of existing monitoring measures in light of evidence presented in morning session |
| 1645 – 1700 | Summary of conclusions from Day 1                                       |
| 1700 | Close                                                                 |
| 1900 | **Workshop dinner at The Punter, 3 Pound Hill, Cambridge, CB3 0AE**      |
# Day 2 – Tuesday 12th June

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
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<tr>
<td>0830 – 0900</td>
<td><strong>Arrive, tea &amp; coffee available</strong></td>
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<tr>
<td>0900 – 0915</td>
<td>Recap of conclusions and key issues from Day 1</td>
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<td>0915 – 0945</td>
<td>TOR 4 review - priorities for future scientific research and monitoring in light of evidence presented on Day 1</td>
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<tr>
<td>0945 – 1045</td>
<td>Development of Research and Monitoring Plan, including structure, priorities and focus, and consideration of SGSSI position within the broader Southern Ocean context</td>
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<td>1045 – 1115</td>
<td><strong>Tea &amp; coffee break</strong></td>
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<tr>
<td>1115 – 1230</td>
<td>Discussion on priorities and focus for Research and Monitoring Plan contd.</td>
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<tr>
<td>1230 – 1330</td>
<td><strong>Lunch in the Icebreaker</strong></td>
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<tr>
<td>1330 – 1500</td>
<td>Development of the Review Group report and advice by TOR</td>
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<tr>
<td>1500 – 1530</td>
<td><strong>Tea &amp; coffee break</strong></td>
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<tr>
<td>1645 - 1700</td>
<td>Workshop wrap up</td>
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<td></td>
<td>- Key conclusions</td>
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<td>- Next steps for Review Group and GSGSSI</td>
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<td>1700</td>
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## Terms of Reference:

**TOR 1** Consider how scientific understanding of the South Georgia Maritime Zone has developed since 2013

**TOR 2** Provide any initial evidence based assessment of the effectiveness of current management measures and advice on the degree to which evidence might support any revisions to management measures

**TOR 3** Review, and assess the effectiveness of, existing monitoring measures for evaluating the extent to which the objectives of the sustainable use MPA are met

**TOR 4** Contribute to priorities for future scientific research, including any new research and monitoring that may be necessary
Annex 1 – GBO Position Statement

Great British Oceans remarks to GSGSSI MPA Review Panel – 11.06.18

- Great British Oceans (GBO) continues to support full protection of the South Sandwich Islands. The scientific rationale for this is clear. Primarily SSI is a global biodiversity hotspot worthy of protection. In addition, overwhelming scientific evidence exists detailing both the declining health of the world’s oceans and the efficacy of large scale marine reserves in both arresting this decline and future proofing near-pristine areas. It should be recognized that the UK has already contributed a great deal toward the 10% global target of 2020, but that should not impede continued ambition. The UK is in a privileged position to make a globally significant contribution.

- GBO is not anti-fishing. GBO has publicly recognized the high standards to which the South Georgia fisheries operate relative to some other Southern Ocean operations. Many of GBOs’ member organizations also work within an extensive range of other marine fora concerned with sustainable management of fisheries – not solely MPAs.

- The South Georgia and South Sandwich Islands Government has claimed ever since the MPA was designated in 2012 that it is a Category VI Marine Protected Area, as defined by IUCN (with small closed areas classified as Category Ia). Independent experts have reviewed that claim and concluded that 98 per cent of SGSSI waters “do not qualify” as an MPA, for two reasons: 1) the objective of the management plan is not conservation, and 2) the MPA includes industrial fishing in all but 2% of its waters. GBO have asked the same IUCN experts what would make the MPA compliant with the guidelines. These IUCN experts have said that large areas of full protection, for example around the South Sandwich Islands, would compensate for industrial fishing in the South Georgia part. Full protection of SSI would be a clear means of achieving that aim – and winning international recognition. This expert opinion is shared by GBO.

- GBO has publicly recognized the leading role that the UK delegation – including foreign office officials and BAS scientists – play in CCAMLR. SSI waters sit predominantly within CCAMLR management area 48.4. This area is allocated 15% of the CCAMLR krill quota (which totals 130% of TAC). However, nobody has fished for krill in SSI waters or the remaining part of area 48.4 for over 25 years.

- Krill catch distributions will be re-negotiated within CCAMLR in 2021. Closure of SSI prior to 2021 would not automatically lead to re-negotiation of krill catch. Regardless of any decision taken to fully protect SSI waters within domestic legislation in 2018, we understand that it is likely that some CCAMLR members with fishing interests will advocate to increase krill quotas in some regions of the Southern Ocean during the 2021 negotiation. This happened previously in 2016, but was discounted by the CCAMLR Scientific Committee on grounds of sustainability. There therefore appears no immediate procedural means, or scientific rationale, for the closure of SSI to be used as justification to increase fishing effort in other areas.
• Many GBO organizations are already working within CCAMLR toward the same end as the UK Government’s stated aim – a more sustainable distribution of krill quota in 2021. We want the same things, but UK decision makers should not miss the opportunity to protect 500,000km² of near pristine Antarctic environment around SSI today on account of technical dialogues on krill management in 2021.

• GBO would finally express its frustration with the means by which this Review has been conducted. GBO entered into the Review in good faith, including many organizations contributing significant amounts of research to the Review process. GBO has not questioned the integrity of the scientific opinions offered by all review panel members. We have however raised concerns as to the representivity of the scientific opinions formally appointed to the Review Panel – in particular, the heavy emphasis on sustainable fisheries science. We have also raised concerns regarding the blurriness of the lines between providing scientific advice, and policy recommendations.
Annex 2 – WWF Position Statement

On Monday 11th June, Dr Sarah Davie provided the following position statement from WWF:

“WWF-UK would like to update the review panel that our position regarding the South Sandwich Islands has evolved.

In summary, we are more closely aligning ourselves with our fellow environmental NGOs on this issue, in the context of wider global biodiversity conservation. With this in mind we are supporting the GBO ask for a marine reserve for the South Sandwich Islands to futureproof the area from potential developments which could undermine the long-term conservation of its great biodiversity. WWF-UK also want to continue working constructively with our CEFAS, BAS, and government colleagues in order to ensure the highest standards of conservation and fisheries management across Area 48 and the entire Southern Ocean”.
Annex 3: GBO Briefing on South Sandwich Islands

Great British Oceans Briefing - South Sandwich Islands
Foreign and Commonwealth Office - 29th January 2018

The South Sandwich Islands proposal represents an opportunity to create a 500,000 km² reserve in a globally significant biodiversity hotspot. It can be fully protected by the UK without having any tangible impact on any CCAMLR member and within the existing UK budget allocated for delivery of the Blue Belt policy.

Protecting the world’s ocean is a global challenge which requires global leadership. The UK has committed to conserve the ocean through international agreements. Political and public appetite for ambitions action has never been stronger. By protecting the South Sandwich Islands the UK and SGSSI Governments can meet their goals to deliver the “global gold standard on environmental protection” and in doing so can drive the regional and global agenda.

SGSSI could represent a template for wider global management of the ocean fully protecting outstanding environments (e.g. the South Sandwich Islands), in parallel to driving the highest possible standards in sustainable fisheries management (e.g. around South Georgia).

Great British Oceans’ (GBO) proposal

The United Kingdom and South Georgia and South Sandwich Islands (SGSSI) Governments create a fully protected marine reserve around the South Sandwich Islands (SSI), banning all commercial exploitation in an area of over 500,000 km² - twice the size of the UK.

GBO is open to exploring the retention of a scientifically credible stock assessment of toothfish (currently limited to two boats operating one month a year in 2% of the SSI EEZ). It is our view that, if feasible, the UK should promote non-lethal means of assessing the toothfish population inside the protected area.

Why protect the South Sandwich Islands?

This is a globally significant, near pristine environment which hosts nearly half of the world’s chinstrap penguin population (1.3 million breeding pairs), as well as globally significant populations of seals and whales. The SSI maritime zone contains unique deep-sea hydrothermal vent ecosystems, the 8km deep SSI trench, as well as seamounts not yet fully explored. The nine islands also span the range for Antarctic sea ice, uniquely positioning SSI across a bio-geographic boundary which could provide crucial science on the impacts of climate change.

The SSI are not commercially fished - 97% of SGSSI Government fisheries revenues are derived from South Georgia waters. No krill fishing has taken place in SSI waters for over 25 years, largely due to the fact that krill do not aggregate. A small research fishing effort is undertaken for toothfish for approximately one month per year.

The UK is in the position to fully protect the SSI marine zone. Although the waters fall within the CCAMLR management area, the UK designated a sustainable management Marine Protected Area (MPA) within SGSSI waters through domestic regulation in 2012 and could fully protect SSI through the same approach today.

Why now?

The Government of SGSSI scheduled a review of its MPA in 2018 to assess the efficacy of existing management measures. A highly protected MPA would formalise protection for the wildlife of these islands in an enduring contribution, re-affirming the UK’s standing as a global leader in ocean conservation.
Concerns expressed

Displacement of krill fishing effort

SSI waters sit predominantly within CCAMLR management area 48.4. This area is allocated 15% of the CCAMLR krill quota (which totals 130% of TAC). The suggestion has been raised that the SSI designation will lead to this 15% quota being shifted to other areas – such as the Antarctic Peninsula. In response:

- Nobody has fished for krill in CCAMLR region 48.4 for over 25 years.

Regardless, GBO is not asking for the annulment of the 15% CCAMLR quota allocated to 48.4. GBO is calling for the UK to protect SSI’s waters under domestic management measures (the same method used to originally designate the MPA in 2012), but to allow for the option to catch the 15% to remain in the 533,000 km² (56%) of 48.4 outside SSI.

- The wider krill catch allocations will be re-negotiated in CCAMLR in 2021. Closure of SSI prior to 2021 would not automatically lead to re-negotiation of krill catch – all CCAMLR members would need to agree to open this up to debate. In 2016, certain CCAMLR members pursued such a move, which was discounted by the CCAMLR Environmental Committee on grounds of sustainability. The same logic remains.

- It is understood that, regardless of any decision taken around SSI, some CCAMLR members will advocate to increase krill quotas in some regions during the 2021 negotiation.

- There therefore appears no immediate procedural means, or scientific rationale, for the closure of SSI to be used as justification to displace fishing effort.

UK decision makers need not miss the opportunity to protect 500,000km² of near pristine Antarctic environment today on account of technical dialogues on krill management in 2021.
UK influence over ongoing CCAMLR negotiations

It has been suggested that closure of SSI would undermine the UK’s influence in CCAMLR on future decisions (e.g. related to new MPAs and the 2021 negotiation on wider krill management). Having consulted with a number of CCAMLR delegates, GBO has been advised that the UK’s influence in CCAMLR derives predominantly from two factors:

1. Issuance of fishing licenses in South Georgia waters. This is economically significant to the Government of SGSSI, which in turn provides political latitude in CCAMLR negotiations and also allows the UK to demonstrate it is conservation minded when applying best practice fisheries management.

2. Respected science. The UK (BAS & CEFAs) is considered a leading voice, providing much of the research for active proposals, including the proposed CCAMLR MPA around the Antarctic Peninsula.

The GBO proposal would see all South Georgia fisheries licenses retained (97% of SGSSI fisheries revenues), having no tangible effect on any CCAMLR fishing interests, but continuing to signal the UK’s intent to champion protections in the Southern Ocean. The basis of the UK’s influence – providing science, and championing both high levels of protection and good fisheries management – would be unaffected.

There is precedent. In 2012, when first designating the SGSSI MPA, the UK closed actively fished toothfish grounds, changed the timeframes in which krill could be caught and demanded far higher technical standards/conservation measures of vessels operating within SGSSI waters. As such, the UK changed the domestic management requirements of fisheries within SGSSI waters within more than one million km² of CCAMLR waters. After this designation the UK’s standing within CCAMLR remained strong. For example, the UK team was acknowledged as a key figure in the Ross Sea MPA designation in 2016. What is being proposed here is far less impactful – protection of an area not fished for 25 years.

What is the point?

The UK has committed to protect the ocean through international agreements such as the Convention on Biological Diversity and the Sustainable Development Goals. The Government is also in the process of executing its ambitious Blue Belt policy, through which the UK and its Overseas Territories have already taken significant steps to protect their waters and should be applauded as such. However, as custodian to the fifth largest marine estate in the world, the UK is in the privileged position to take a global leadership position in marine conservation.

Full protection of the South Sandwich Islands would safeguard a globally significant biodiversity hotspot, with no tangible impact on any CCAMLR member. The scientific justification for protecting SSI is grounded in the overwhelming evidence of the declining health, productivity and diversity of our ocean globally, and the critical role that fully protected areas can play in fostering recovery and safeguarding near pristine habitats.

In addition, SGSSI could be held up by the UK as a template for wider global management of the ocean: fully protecting outstanding environments with the greatest biodiversity (e.g. the South Sandwich Islands), in parallel to driving the highest possible standards in sustainable fisheries management (e.g. around South Georgia).

SSI provides an opportunity for the UK to be a catalyst for change and to set the agenda within CCAMLR and internationally on marine conservation. GBO encourages the UK to seize this opportunity.
Toothfish fishing at the South Sandwich Islands (CCAMLR Subarea 48.4)

Context

A complete closure to fishing for Patagonian and Antarctic toothfish (*Dissostichus eleginoides* and *Dissostichus mawsoni*) within the South Sandwich Islands (SSI) section of the Government of South Georgia & South Sandwich Islands (GSGSSI) Marine Protected Area (MPA) has been advocated by the Great British Oceans initiative.

This note and background supporting information reviews the current understanding of the South Sandwich Islands toothfish, the rationale underpinning current management advice, and the design of the UK research programme which uses commercial vessels to collect information.

The science, management and policy implications of a closure on the UK research programme in the South Atlantic Antarctic region are discussed.

Synopsis

*Stock identity*

The South Sandwich Islands toothfish comprise two species, Patagonian toothfish (*Dissostichus eleginoides*) in the north and Antarctic toothfish (*Dissostichus mawsoni*) in the south. At the SSI both species are managed as independent stock units, which is the optimum initial precautionary assumption. However, based on the research carried out by the UK around the SSI it is becoming evident that the SSI Patagonian toothfish are, most likely, part of the South Georgia population and the Antarctic toothfish part of a larger population distributed to the south, including throughout the British Antarctic Territory.

The wider biological links do not preclude separate monitoring and management of the SSI stock units, but means that a closure of the SSI toothfish fishery will not in itself isolate a self-contained breeding population that would be protected from external exploitation and impacts. A closure to the current research fishery will have a negligible, if any, local conservation benefit for the toothfish at SSI, but will have a tangible negative impact on UK research in its Antarctic territories.

*The fishery*

The South Sandwich Islands toothfish fishery is not a commercial operation, it is only presented as such to CCAMLR, to avoid political sensitivities. GSGSSI sets out when and where the licensed vessels should set fishing longlines, as part of a scientifically directed data collection, research and monitoring programme.

The allocation of research fishing locations reduces vessel efficiency and is therefore considered part of the vessels contribution to the monitoring and scientific understanding of the region. Experience has shown that without such strict direction, the vessels would fish in a single high density area to maximise their catches.
The GSGSSI & UK CCAMLR science programme

The UK CCAMLR science team advice is that the current SSI monitoring fishery is sustainable, independently monitored, uses a gear type with minimal impact to the environment, and is not a threat to the wider ecosystem.

The UK science team have developed, presented and endorsed the scientific basis of the current management of the SSI toothfish units within CCAMLR. It would be almost impossible for them to argue against their previous advice and maintain credibility at CCAMLR. A closure would have to be presented as a policy decision.

The UK CCAMLR science team advice is that terminating the current scientific research programme will create a black hole in data, data which is needed for management advice for the SSI and the wider regional stocks. It will weaken the UK science position in CCAMLR and impact a long-standing and well-developed wider UK science, policy, and influence strategy in the South Atlantic, including the UK British Antarctic Territory. Closure will have a negative conservation impact for the region.

CCAMLR

The SSI Patagonian fishery is regarded in CCAMLR as the exemplar of how to gather scientific data in a precautionary and systematic way to ensure the development of a long-term sustainable stock assessment process within CCAMLR. The clear timeline of development based on sound research is often cited as the model and standard by which data poor regions in the Southern Ocean should be developing.

If a closure was unilaterally declared and widely advertised, and thus if CCAMLR were aware of the closure, there would be no agreement on the management of the SSI at CCAMLR due to sovereignty issues as CCAMLR operates by complete consensus. The current ‘established’ fishery status would immediately lapse, thus opening the fishery to fishing proposals from all CCAMLR Member States and relinquishing any control over the fishery in SSI by the UK. There could also be a knock-on impact on the management agreement for South Georgia, particularly area A which is closed to fishing.

If the closure is not advertised at CCAMLR, the most likely outcome of not fishing the catch limit would be that CCAMLR would consider the management area as a data poor zero-catch limit Subarea (no data and or assessment advice). Such a categorisation would allow any CCAMLR Member to submit a research proposal to fish for toothfish in the Subarea to fill the data gap created, restrictions such as the winter fishery would lapse.

A science basis for the closure would not be supported at CCAMLR due to lack of scientific evidence justifying a closure. Therefore, to maintain the closure, the UK would need to block CCAMLR science proposals in the SSI at Commission, raising sovereignty issues and damaging the GSGSSI and UK reputation for science based management and advice, as well as damaging the good standing of the UK diplomatic input to the international developments in Antarctica.

UK CCAMLR science team advice

The current toothfish fishing conducted at the SSI is not a commercial fishery. The fishery is a well-managed, sustainable, independently monitored fishery with low ecological risk, providing the framework for a long-standing research data gathering programme conducted for GSGSSI by commercial vessels.

Closing the area would have no beneficial conservation impact but will create a data black hole that will negatively impact wider regional Antarctic toothfish sustainable management.
The creation of a data black hole and the loss of influence in the SSI research links with the BAT and the Weddell Sea regions will reduce, not enhance, UK influence and delivery of its conservation objectives in the South Atlantic Antarctic region.

Dr Chris Darby (UK Chief Scientist to the Commission for the Conservation of Antarctic Marine Living Resources, Cefas),

Dr Marta Soeffker (Fisheries Ecologist, delegation member to the Commission for the Conservation of Antarctic Marine Living Resources, Cefas)

Dr Mark Belchier (CCAMLR Scientific Committee Chair, Science Manager, South Georgia, British Antarctic Survey)

Dr Phil Trathan (Head of Conservation Biology, British Antarctic Survey)

Dr Tim Earl (Fisheries and Ecosystems modeller, Cefas)

Toothfish fishing at the South Sandwich Islands – Supporting information

Background

The South Georgia & South Sandwich Islands (SSI) Maritime Zone falls within the area of the Southern Ocean under the jurisdiction of the Convention for the Conservation of Antarctic Living Resources (CCAMLR), to which the UK is a signatory. Management of the waters around South Georgia and the South Sandwich Islands therefore comprise management procedures set both by CCAMLR and by the Government of South Georgia & South Sandwich Islands (GSGSSI). GSGSSI enforces and adds to CCAMLR management measures, for instance, catch limits are generally set below those agreed by CCAMLR and the fishery is confined to the winter months when seabirds are not breeding.

Toothfish

Stock identity

Two species of toothfish occur in Antarctic waters (Figure 1).

The Patagonian toothfish (*Dissostichus eleginoides*) stock distributions occur, predominantly, around the sub-Antarctic Islands but also extend north along the South American continental shelf.

Tagging studies have established that there is negligible movement between the main Patagonian toothfish populations illustrated in the Figure 1. Between adjacent seamounts, or shelf areas, dispersion and or spawning migration associated movement, has been regularly recorded. Vertical migration occurs as part of the Patagonian toothfish life cycle, related to growth - migration from shallow to deep water as size increases, and annual spawning - which occurs in shallower waters.

Antarctic toothfish (*Dissostichus mawsoni*) is confined to Antarctic waters, ranging from the continental shelf, northwards, to the southernmost sub-Antarctic Islands.

Juveniles are associated with the shallower waters around the continental shelf. Adults feed in the deeper waters of the continental shelf. Tagging and biometric studies indicate migration offshore to the sub-Antarctic seamounts to spawn before returning south. Although currently managed within the separate management units illustrated in Figure 1 (e.g. the Ross Sea), Antarctic toothfish may form a continuous distribution around the Antarctic continent.
**South Georgia & South Sandwich Islands management units**

The two species of South Georgia & South Sandwich Islands toothfish are currently managed and assessed as three distinct stock units by CCAMLR; the optimum initial, precautionary assumption.

However, it is becoming evident that the distribution of the SSI Patagonian toothfish is linked to the South Georgia population (Figure 2 & 3) and the Antarctic toothfish part of a larger stock distributed to the south and west (Figure 4), within the CCAMLR management regions around the South Orkneys (Area 48.2) and Weddell Sea (Area 48.5 & 6).

The wider biological links do not preclude separate monitoring and management of the SSI stock units, but signifies that the SSI stock units are not isolated self-contained breeding populations that if fully protected from exploitation would be independent from external impacts; their monitoring and management needs to be linked to the wider external policies.

**CCAMLR stock assessment and management**

CCAMLR currently assumes that the three stocks, are separate entities, distinct from the larger units with which they have been linked, which is recognised as the most precautionary stock assessment and management approach; until the necessary assessment information (e.g. migration rates between areas) are available.

Assessment of all three South Georgia & SSI stock units is based on the release and recapture of tagged fish following CCAMLRs agreed, and internationally accepted, protocols and analytical approaches.

The South Georgia & SSI Patagonian toothfish assessments are both CASAL fully integrated statistical models. The Antarctic toothfish, due to the shorter period over which tagging has been conducted, uses a simpler tag based approach.

Both SSI stock units are considered by CCAMLR to have relatively robust assessments and as being sustainably exploited, at target rates averaging 4% per annum. This compares to the optimum exploitation target for cod stocks of around 15%.

For the SSI the relatively low catch limits, combined with the requirement to distribute the monitoring fishery across a wide geographic area, have resulted in low and noisy tag return rates. To ensure robust sustainable management the uncertainty is incorporated within the assessment and management process for both stock units.

The SSI Patagonian fishery is regarded in CCAMLR as the ‘exemplar’ of how to gather scientific data in a precautionary and systematic way to ensure the development of a long-term sustainable stock assessment process within CCAMLR. The clear timeline of development based on sound research is often cited as the model by which the other data poor regions in the Southern Ocean should be developing.

**GSGSSI management measures**

In addition to the CCAMLR management measures and catch limits, GSGSSI applies additional vessel and fishery restrictions.

- Fishing is restricted to the winter months when seabirds and marine mammals are not breeding.
- Longlining is only permitted deeper than 700m (550m CCAMLR) and shallower than 2250m
- Benthic closed areas restrict fishing in vulnerable benthic habitats, juvenile and high by catch areas
- Vessels are required to use hook markings that identify the vessel using them
The South Sandwich Islands toothfish fisheries

Fishing around the SSI is categorised as an established “international” fishery within CCAMLR but is tacitly accepted as a UK managed restricted access fishery. Vessels carry independent, international, scientific observers to monitor the vessel fishing process and data reporting, collect biological samples from the catch and by-catch and monitor predator and seabird interactions. The catches from the area are presented in Table 1.

Longlining is only permitted deeper than 700 m (500 m CCAMLR) and shallower than 2000 m (CCAMLR no limit). As a result of the narrow shelf topography of the SSI this means that 98% of the SSI waters are closed to toothfish fishing.

On the basis of scientific advice, the SSI commercial fishery has been gradually phased out and the GSGSSI licensed vessels are no longer permitted to fish in their preferred, commercially viable sites, until they have undertaken a research fishery which allocates the majority of the allocated catch limit.

The vessels are required to conduct research and monitoring for GSGSSI by setting lines in pre-specified locations. Initially, during the transition from the commercial fishery to the monitoring programme, vessels were free to set lines within research blocks set out along the island chain. In recent years the restrictions have been tightened and vessels are allocated pre-specified fishing locations at which to set lines (or, after consultation, as close as possible, Figure 5). The research and monitoring design ensures that effort and tags are distributed evenly throughout the population, to reduce the bias and noise in the stock assessment process and monitor movements and migration, and to allow scientific samples to be collected from across the whole SSI region.

The allocation of research fishing locations has reduced vessel efficiency, increasing costs and therefore is considered part of the vessels contribution to the monitoring and scientific understanding of the region. Left to their own decisions, the vessels would fish in a single, favoured high density, area which would restrict the information available for scientific analysis.

Additional scientific research in the SSI management area

Under the CCAMLR research protocol, the UK is currently conducting a three year research survey within the southern portion of the GSGSSI MPA extending into CCAMLR Subarea 48.2 (Figure 6).

The information is needed to determine the wider geographical extent of the Antarctic toothfish in the southern SSI, particularly in the context of the links to the research being conducted near the south Orkneys by Ukraine and Chile, and current and historic research in the Weddell Sea and Subarea 48.6.

Closure of the South Sandwich Island toothfish fishery

Current management

CCAMLR considers the toothfish within the SSI, Subarea 48.4, to be sustainably fished, at rates that are in line with if not more precautionary than, internationally agreed standards. The fishery is fully monitored and is not a threat to the target species, predators, by-catch or the wider ecosystem.

There is negligible habitat for toothfish outside of the SSI maritime zone and within CCAMLR Subarea 48.4, that is suited to a toothfish fishery and from which representative data could be collected.

If the closure were not advertised and CCAMLR aware:

- No catch would mean that no data on the toothfish population dynamics in the SSI area would be presented at CCAMLR.
• After one or two years, there would be no assessment advice for the stock units.
• After two years with no data and assessment the subarea would lose its status as an established fishery.
• CCAMLR would consider the Subarea had reverted to a zero-catch limit fishery (no data and or assessment advice).
• A zero-catch limit would allow any member to submit a research application to fish for toothfish in the Subarea.
• Other members would not be restricted to the GSGSSI conservation protocols e.g. winter fishery, hook marking.
• In order to maintain the closure, the UK would need to block the proposals in Commission.

If the closure was advertised and CCAMLR aware:
• Due to sovereignty issues and no science basis, there would be no agreement on the management of the SSI at CCAMLR
• The current ‘established’ fishery status would immediately lapse.
• There could also be an impact on CCAMLR agreement for South Georgia.

Science issues
The UK CCAMLR science team have presented and endorsed the scientific basis of the current management of the SSI toothfish units within CCAMLR. It would be almost impossible for them to argue against their previous advice and maintain credibility. Consequently, a closure would need to be presented as a policy decision or based on science other than that applicable to fisheries management.

Closure of the South Sandwich Islands would create a data black hole in a key area of the Sub-Antarctic.

• Antarctic toothfish - given the established links with adjacent areas (48.2 and the Weddell Sea), the closure would reduce the ability of the UK science team to engage in the development of the research conducted by Chile and the Ukraine in the British Antarctic Territory (BAT) region and to maintain a, data linked, position in the development of the Weddell Sea MPA, particularly after BREXIT.
• For the northern Patagonian toothfish, not monitoring the dynamics of a significant part of the regional toothfish distribution would be considered non-precautionary.
• For both species there would be scientific pressure from CCAMLR to resume data collection.
• Under CCAMLR regulations, if the UK did not resume the programme, it could be filled by other Members putting forward research programmes; which the UK would need to block to maintain the closure or lose control of the data collection in its waters.

Research vessels
The data required from the fishery could not be collected by research vessels:

• Research vessels are not equipped to the same extent as fishing vessels,
• The cost is substantially greater than using some catch to cover those of a fishing vessel
• The practicalities of deploying the amount of gear and the volume of catches required to recapture sufficient tags and collect the biological information required, would make the use of a research vessel irrational.
• The noise introduced by reducing the current level of information collected would reduce the quality of the science advice and its utility.
Policy issues

The current toothfish fishery at the South Sandwich Islands is not a commercial fishery, it is a science-led research data gathering programme conducted by fishing vessels.

A total closure to the current research fishing would have no beneficial conservation impact but will create a data black hole that will negatively impact the ability to manage the toothfish in the wider region according to agreed sustainable practices.

The UK reputation for science-based advice and management within the CCAMLR area would be damaged.

The UK CCAMLR science team have a strong reputation for the quality of its research, monitoring, assessment and advice programmes. The research has allowed the development of links to equivalent and adjacent research being conducted by Chile and Ukraine in Subarea 48.2, near to the South Orkneys, with Japan and South Africa fishing and conducting research in Subarea 48.6, and with the German team developing the MPA proposal for the Weddell Sea.

The creation of a data black hole and the loss of influence in the SSI research links with the BAT and the Weddell Sea regions will reduce, not enhance, UK influence and deliver of its conservation objectives in the South Atlantic-Antarctic region.

At the same time the loss of data from an area that is being directly linked to the South Georgia stock will reduce the quality of the information available for the management of that stock. Its current reputation for research and monitoring will be diminished and its MSC status will be directly impacted and reduced.

Conclusion

Stock identity

Toothfish in the South Sandwich Islands comprise two species; Patagonian toothfish (Dissostichus eleginoides) in the north and Antarctic toothfish (Dissostichus mawsoni) in the south. The distribution of the SSI Patagonian toothfish is linked to the South Georgia population and the Antarctic toothfish part of a larger stock distributed to the South Orkneys (Area 48.2) and Weddell Sea (Area 48.5 & 6).

The wider biological links do not preclude separate monitoring and management of the SSI stock units, but signifies that the SSI stock units are not isolated self-contained breeding populations, which if fully protected from exploitation would be independent from external impacts; their monitoring and management needs to be linked to the wider regional strategies.

Current management

To date both species have been managed as separate units, in line with and exceeding international standards.

The UK science team and CCAMLR advice is that current exploitation rate is sustainable, the research fishery independently monitored, uses a gear type that does not cause environmental damage and is not considered a threat to the wider ecosystem.

The fishery

The current toothfish fishery at the South Sandwich Islands is not a commercial fishery, it has been conducted by commercial vessels supporting a science-led research and monitoring programme.
The data required to support the MPA monitoring and regional assessments are long term time series. They could not be collected sporadically by research vessels, which are not equipped to the same extent as fishing vessels, the cost is substantially greater than using some catch to cover those of a fishing vessel and the practicalities of deploying the amount of gear required would make the use of a research vessel irrational.

**CCAMLR**

Closure would most likely a negative conservation impact. It would create a data black hole that would result in pressures from CCAMLR, and likely the MSC (by setting conditions on the South Georgia status), to resume data collection.

Terminating the current scientific research programme will prevent the collection of information that is needed for management advice for the wider regional stocks, weakening the UK science position in CCAMLR and impacting a wider UK science strategy in the South Atlantic including the UK British Antarctic Territory.

In order to prevent other CCAMLR Members from applying for research permits in the area to fill the data gap, the UK would have to resume monitoring or, as a policy decision, go against CCAMLR science advice. Closure of the research fishery would therefore be policy decision made with no clearly defined science basis. The UK reputation for science based advice and management within the CCAMLR area would be damaged.

Closing the South Sandwich Islands would have major unintended consequences, as a fisheries management policy it would be seen as creating a paper park, with potential local and regional negative conservation impact.

Closing the South Sandwich Islands would not represent UK science and CCAMLR engagement at its best.

**Dr Chris Darby (UK Chief Scientist to the Commission for the Conservation of Antarctic Marine Living Resources, Cefas)**

![Figure 1](https://www.niwa.co.nz/fisheries/research-projects/the-ross-sea-trophic-model/toothfish-fishery)

**Figure 1** - Approximate distributions of Antarctic and Patagonian toothfish in the Southern Ocean, also showing the CCAMLR management areas and the location of the Polar Front (dashed line). [https://www.niwa.co.nz/fisheries/research-projects/the-ross-sea-trophic-model/toothfish-fishery](https://www.niwa.co.nz/fisheries/research-projects/the-ross-sea-trophic-model/toothfish-fishery)
Figure 2 – Patagonian toothfish moving between the South Sandwich Islands and South Georgia; blue are releases at the South Sandwich Islands, red releases at and South Georgia. Labels show the sex of the recaptured toothfish at recapture site: M – male, F – female, NA – unknown. From Soeffker et al. (2015) WG-SAM-15/30.

Figure 3 – Patagonian toothfish (*Dissostichus eleginoides*). movement hypothesis between South Georgia and the South Sandwich Islands based on tagging returns. From Soeffker et al. (2015) WG-SAM-15/30.
Figure 4 - Linked release (red square) and recapture (blue triangle) events for long-distance movements of *Dissostichus mawsoni* in the CCAMLR area.

Figure 5 – Spatially balanced points assigned based on the fishing probability raster. These points form 60 sampling stations from which each research fishing season is randomly assigned 30 stations. The 700m depth contour is shown in red, the 1000 and 2000 m depth contours in grey.
Figure 6 – Proposed approximate survey station locations within and adjacent to the UK South Georgia and the South Sandwich Islands MPA, for the three survey proposals by Chile (orange), United Kingdom (green) and Ukraine (blue). The area in grey indicates the extent of the established toothfish fishery in Subarea 48.4.

Table 1 - Catch history for Dissostichus spp. in Subarea 48.4 since 2004. Prior to 2014, when a species-specific catch limit was introduced, there was a combined catch limit for the subarea. (Source: STATLANT data for past seasons, catch and effort reports for the current season.)

<table>
<thead>
<tr>
<th>Season</th>
<th>Catch limit (tonnes)</th>
<th>Reported catch (tonnes)</th>
<th>D. eleginoides</th>
<th>D. mawsoni</th>
<th>Total</th>
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<tr>
<td>2004</td>
<td>28</td>
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<td>0</td>
<td>0</td>
<td>0</td>
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<td>2017</td>
<td>47, 38*</td>
<td>36</td>
<td>28</td>
<td>70</td>
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</tbody>
</table>

* Catch limits for D. eleginoides and D. mawsoni respectively.
Annex 5 – Cefas/BAS Briefing on Krill Fishing at the South Sandwich Islands

Krill fishing at the South Sandwich Islands (CCAMLR Subarea 48.4)

Context
A complete closure to fishing for Antarctic krill (*Euphausia superba* Dana) within the South Sandwich Islands section of the Government of South Georgia & South Sandwich Islands (GSGSSI) Marine Protected Area (MPA), has been advocated by the Great British Oceans coalition in order to establish a marine reserve for krill dependent species.

Summary
This note, which has been prepared by UK scientists who represent both the UK and the GSGSSI at CCAMLR, reviews the ecological consequences of such a closure, including an evaluation of probable management scenarios and their consequences. The risks to the South Georgia & South Sandwich Islands as well as those to the wider regional Antarctic krill-dependent ecosystem are also discussed.

*Scientific basis and consequences for the regional ecosystem*

- No decrease in wildlife attributable to krill fishing within the GSGSSI MPA has ever been recorded. Closing the GSGSSI MPA to krill fishing is highly unlikely to have any net benefit in terms of increasing biodiversity.
- Krill at South Georgia and the South Sandwich Islands are not a self-sustaining population. They arrive in the flow of the Antarctic Circumpolar Current from the Antarctic Peninsula and from the Weddell Sea further south. It is therefore vital to protect and reduce the risks to the sources of these krill flows, upstream of the GSGSSI MPA.
- The South Sandwich Islands are currently allocated 15% of the regional krill catch limits for the southwest Atlantic.
- This allocation is currently not fished, as the fishery prefers other areas, and the South Sandwich Islands are therefore already a *de facto* no take zone.
- A formal closure of the South Sandwich Islands will result in the catch being taken elsewhere, and most likely it will be reallocated upstream to either the Antarctic Peninsula, the South Shetland Islands or the South Orkney Islands.
- These areas are particularly vulnerable to pressure from the krill fishery, as the fishery operates at these locations during the summer. These locations support millions of krill dependent predators throughout the summer breeding season, including penguins and seals; these areas are also important for recovering populations of whales.
- Reallocating catch to these upstream areas will not only increase the environmental risk to them, but also to South Georgia and the South Sandwich Islands, which are reliant on the streams of krill flowing from the Antarctic Peninsula and the Weddell Sea.
- The remoteness of the South Sandwich Islands means that they are relatively little understood scientifically. This is a risk identified during the science development of the GSGSSI MPA and during the ongoing MPA review. The MPA review forms part of the 5-year fishery science plan working towards an impact assessment of management measures in the MPA and wider region.
Policy advice and management scenarios

- The krill fishery is closed in summer during the predator breeding season throughout the entire SGSSI MPA, with additional pelagic no-take zones (year-round closures) extending 12 nm around each of the South Sandwich Islands.
- Extending these existing closures to the whole of the South Sandwich Islands (Subarea 48.4) will have no net ecological benefit within the SGSSI MPA. However, the risk to the SGSSI ecosystem will be increased facilitating more krill, to be taken from areas that are upstream of the islands.
- Reallocation of the catch to other areas will also allow the fishery to take increased amounts of krill at times of years when the krill ecosystem is more vulnerable.
- The UK reputation for providing precautionary, impartial scientific advice for CCAMLR could be severely damaged. The UK has been instrumental in many world-leading management initiatives within CCAMLR, exactly because the Delegation advocates using the best available science for making management and policy decisions in the natural environment.
- The UK is currently a strong voice in CCAMLR initiatives to develop MPAs in the Weddell Sea and the Antarctic Peninsula and any unilateral closure would lead to mistrust of the UK, damaging a much wider strategy.

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15/12/17

Krill fishing at the South Sandwich Islands – Supporting information

Background

The Antarctic krill fishery is managed by the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR). CCAMLR is an international convention with 25 Member States, including the UK, forming the Commission. The Convention follows an ecosystem-based approach to management, and the Convention Area includes the waters within the SGSSI MPA. Management of the waters around South Georgia and the South Sandwich Islands therefore comprise management procedures set both by CCAMLR and by GSGSSI.

Krill life history

Antarctic krill (Euphausia superba) is a key species in the Southern Ocean ecosystem, linking primary production to abundant, charismatic, vertebrate predators such as whales and penguins in short and
highly efficient food chains. Antarctic krill has a circumpolar distribution; it is a species that is believed to have a high reproductive dependence on the seasonal sea ice surrounding the Antarctic continent.

The South Georgia and the South Sandwich Islands are at the northern limit of the krill distribution. Krill at South Georgia and the South Sandwich Islands do not form a self-sustaining population. Rather, the biomass of krill at South Georgia and the South Sandwich Islands is entirely dependent on advection of krill produced in the seas adjacent to the Antarctic Peninsula and the Weddell Sea.

**Current catch limit and its allocation**

CCAMLR has agreed that until robust assessment and management procedures are available, an interim annual catch limit for the southwest Atlantic will be set at 620,000 tonnes. The interim catch limit is known within CCAMLR as the ‘trigger’ level.

The trigger level is spatially subdivided across four CCAMLR management regions, established in 2009 and based on advice from the CCAMLR Scientific Committee. A total of 25% of the total krill catch can be taken around the Antarctic Peninsula (CCAMLR Subarea 48.1), 45% around the South Orkneys (CCAMLR Subarea 48.2), 45% around South Georgia (CCAMLR Subarea 48.3) and 15% around the South Sandwich Islands (CCAMLR Subarea 48.4). The regional proportions of the trigger level allocation sum to more than 100%, to allow flexibility for the fishery, but the overall catch is still capped at 620,000 tonnes; around 1% of the estimated regional biomass.

Under GSGSSI legislation, the krill fishery can only operate within the SGSSI MPA during winter. At the South Sandwich Islands the quota is currently not fished, as the fishery prefers South Georgia. The islands are therefore already a de facto no take zone.

If the UK notified CCAMLR that the South Sandwich Islands was formally a closed area, but also argued that the spatial allocation of the interim catch limit be maintained at 15%, this would probably be perceived by other CCAMLR Members as the UK allocating 15% of the krill catch to itself. As CCAMLR does not use catch allocations to Members, this would be viewed as operating against the spirit of the CAMLR Convention.

During the 2016 discussions concerning the spatial allocation of catches, several fishing nations argued that the proportional catch allocated to the South Sandwich Islands should be reallocated to the Antarctic Peninsula. No scientific basis for the reallocation was provided by the fishing nations, the rationale they presented was purely economic. The motives for this proposal are probably because some fishing nations wished to increase the catch allocation for the Antarctic Peninsula, as it has been fully taken in recent years (Figure 3). The CAMLR Commission eventually agreed to maintain the status quo and not to reallocate the catch allocation from the South Sandwich Islands; noting that any expansion of the total catch or changes to the regional allocation of the krill fishery should not happen unless advice from the CCAMLR Scientific Committee indicates that it will continue to be sustainable. This discussion illustrates the fact that any reallocation (either through national GSGSSI legislation, or through CCAMLR) must be on the basis of robust scientific evidence, to do otherwise will be extremely difficult to justify in CCAMLR.

**The krill fishery**

Fishing for krill follows a seasonal pattern over the course of the CCAMLR fishing season (December – November). The fishery usually begins during the Austral summer in December at the Antarctic Peninsula, progresses to the South Orkneys in the period April to July, usually as a result of Autumn seasonal sea ice formation. Subsequently, as the seasonal sea ice expands during late Autumn, the fishery moves from the South Orkneys to South Georgia where it operates as a winter fishery. In recent
years, the local allocation of catch at the Peninsula has been reached in May and the fishery has moved early to the South Orkneys. Only the Peninsula region, Subarea 48.1, has been closed in recent years due to the catch limit being reached.

Within the SGSSI MPA, krill fishing has occurred predominantly at South Georgia, though historically a very small amount of harvesting also occurred at the South Sandwich Islands (Figure 1).

**Changing seasonal ecological interactions within the krill fishery**

The krill fishery has a differing spatial overlap with krill predators at different times of year. When the fishery operates at the Peninsula it occurs during the breeding season of penguins and seals. This is a particularly important period as penguins and seals are constrained to feed close to their colonies, so that they can return to land to provision their offspring. As the fishery moves to the South Orkneys, the temporal overlap with these same predators is mostly during moult and juvenile dispersion. The winter fishery at South Georgia and, potentially, at the South Sandwich Islands, occurs when the predators are widely dispersed across the wider Scotia Sea region; however, less is known about the spatial distribution of predators at this time of year, and it remains an active topic of research. Krill fishing during the summer predator breeding season is generally considered to be of higher risk. This was part of the scientific advice presented to GSGSSI during planning for the SGSSI MPA in 2012 and 2013. Now, as part of the SGSSI MPA, krill harvesting is restricted to the winter months preventing conflict with predators during their summer breeding seasons.

**Provisions for protection within the SGSSI MPA**

The MPA, introduced in 2012, has a set of overarching objectives for the whole protected area, as well as specific objectives and conservation targets in relation to protecting specific species or ecosystem processes. The SGSSI MPA management identified the dependence of land-based predators on krill flow from the Antarctic Peninsula as a risk, and acknowledged the effect a closure of the South Sandwich Islands to the krill fishery would have on krill and predator populations around the Antarctic Peninsula. Within the MPA therefore, GSGSSI introduced specific measures aimed to reduce risks from fishing pressure, as well as to protect land-based predators during their most constrained and vulnerable period of breeding. Specifically, for the protection of land-based krill predators and to reduce the risk of land-based predators interacting with the fishery, the MPA provides the following:

- The krill fishery is closed in summer during their breeding season throughout the SGSSI MPA
- Penguin colonies at the South Sandwich Islands are protected by pelagic no-take zones of 12 nm around each island during (summer and) winter
- Land-based predators at South Georgia are also protected by pelagic no-take zones of 12nm during (summer and) winter.

These spatial and temporal measures protect krill-eating land-based predators, including some of their important foraging areas within the SGSSI MPA, without increasing pressure on the krill-dependent ecosystem upstream at the Antarctic Peninsula or South Orkney Islands.

**Closing of the South Sandwich Island krill fishery**

As CCAMLR does not use catch allocations to Members, a scenario whereby the catch allocation remains at the South Sandwich Islands would be viewed as the UK setting out its own quota and going against the spirit of the CAMLR Convention, consequently that option is not considered further in this note.
Two other plausible scenarios are considered, whereby the interim catch allocated to the South Sandwich Islands, either:

1) remains available to CCAMLR Members, within Subarea 48.4, but outside of the SGSSI MPA; or,
2) is reallocated across other CCAMLR Subareas - the Antarctic Peninsula, the South Orkneys or South Georgia.

Scenario 1: The catch remains available to CCAMLR Members, within Subarea 48.4, but outside of the SGSSI MPA

Scenario 1 would retain the catch allocation within Subarea 48.4, but would restrict fishing to outside of the SGSSI MPA. Figure 2 shows results from the last large scale survey for krill which was undertaken in 2000. The figure shows the distribution of krill biomass across the Scotia Sea. The results show that where information is available there are only low densities of krill, within Subarea 48.4 and outside of the UK EEZ. In general, the fishery operates elsewhere over the continental shelf, or at the shelf edge. In subarea 48.4, there are no major continental shelves, so the fishery cannot find predictable krill fishing locations.

In order to present a scientific argument that fishing in Subarea 48.4 outside the SGSSI MPA is feasible, the UK would need to provide evidence that there were sufficient krill outside of its waters for a fishery to occur. If this was not possible, the UK may be perceived to be setting up artificial barriers to fishing.

Scenario 2: The catch is reallocated across other CCAMLR Subareas - the Antarctic Peninsula, the South Orkneys or South Georgia

Scenario 2 would redistribute the catch allocation across other CCAMLR Subareas. CCAMLR Members are highly likely to argue that the catch allocation for the South Sandwich Islands should be allocated to Subareas 48.1 (Antarctic Peninsula) and/or Subarea 48.2 (South Orkney Islands), particularly as the interim catch limit for Subarea 48.1 has been reached every year in recent years.

This scenario would probably result in additional krill catch being taken upstream of the South Sandwich Islands during the summer (Figure 2), consequently increasing the risk to the whole Antarctic krill based ecosystem. Not only would the fishery increase the risk to the Peninsula and South Orkney regions but it would catch the krill destined to reach the South Sandwich Islands before they reach the islands. This therefore nullifies the perceived benefit of a closure at the South Sandwich Islands.

To date, the approach adopted by CCAMLR, as advocated by the UK, has been to spread catches in space and time, in order to avoid conflicts with natural krill eating predators; the closure of the South Sandwich Islands would have exactly the reverse effect.

Conclusion

The South Georgia and South Sandwich Islands krill are not a unit stock, but originate from the Weddell Sea and the Antarctic Peninsula.

Currently, there is no krill fishing at the South Sandwich Islands. If it were to occur under the GSGSSI management and monitoring regulations, the fishery would:

1) be subject to higher quality monitoring and regulation than occurs within CCAMLR,
2) would be restricted to winter when the impact on and risk to predators is at its lowest.
Forcing the fishery outside of the SGSSI MPA, such that catches are taken upstream of the islands would:

1) increase the catch in areas that are the source of krill that would otherwise eventually arrive at South Georgia and the South Sandwich Islands,
2) increase the catch in the summer breeding season thereby increasing the risk to the wider Antarctic krill based ecosystem.

Within the SGSSI MPA, the reallocation of catches would increase the risk to the ecosystems at South Georgia, the South Sandwich Islands, not reduce it.

Increasing the ecological risks across the whole of the Antarctic krill dependent ecosystem, would be almost impossible to defend at CCAMLR. The UK reputation for impartial, unbiased and independent science would be damaged at a critical time when major decisions on management of the Scotia Sea ecosystem are required, particularly the design and agreement of MPAs near the Antarctic Peninsula and the Weddell Sea.

Closing the South Sandwich Islands would have major unintended consequences, it would be seen as creating a paper park, and it would potentially have negative impacts on the Antarctic ecosystem. Closing the South Sandwich Islands would not represent UK science at its best.

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Figure 1 - Total krill catch (tonnes) summed for consecutive 5 year intervals (final box shows 3 year sums) for the period 1980 to 2015. Catch data are C1 catch and effort reporting data. Final panel shows 2015 data only.
**Figure 2** - The CCAMLR 2000 synoptic survey krill density distributions (taken from Hewitt et al 2004) with the current MPA protections and CCAMLR management areas plotted.

**Figure 3** Total krill catch (tonnes) in Subareas 48.1, 48.2, 48.3 for the period 1980 to 2015. Horizontal grey line shows the catch limit for each Subarea. Source: CCAMLR data. Fishing in 48.4 has been negligible since the 1990's.
Annex 6 – Whiteboards from TOR 2 review: evidence-based assessment of effectiveness of current management measures

48.4 Stock linkage

1. Sea ice impacts of larval distribution (TBA)
   - Kiln - most approach based on absolute risk
     - Adapt & synoptic survey plans (2-3yr timeline)

2. Bird strike - same catches - more analysis

3. CC levels of uncertainty high.
   - Resilience - role in CC mitigation (REM)
   - Importance of long-term time series

4. Role of observers to collect data
   - Benthic camera data collection for each line
   - IAATO discussions re data collection / Citizen science

5. 30+ new hulls being laid (tuna)
   - Migration of app due to CC - REM
   - Research on phenological shift of polar front
   - Start at box - local invasion (electronics)
6. paper on mineral resources around SSIs + ...
   potential impacts of mining activity outside zone

7. help date proxy for plumes - dust by currents
   paper on airborne plastics, & in CPR receivers
   toothfish fleet using microplastic filters

8. CSGSSI shrimp consultation plans
   Model developed which could be applied = impact response (Rome)

9. Harry Conway - volcanoes high impact threat to biodiversity
   Sample set. picture for SSIs

10. Outreach potential - global state (fish 2 protection)
    - fit with broader picture
    - eg role of imp area 
    - eg contact zone (SSIs)
    - how do we deal at CCMR?

  Marine Noise

  Social science study - value judgments & trade-offs
1. Breeding phenology at SSI's
   Closure doesn't encapsulate season for certain spp - Akr/Gpy (SG/SSI)
   SSI closure to knit fishing

2. Collecting more info on whale dist
   (ongoing study) - sampling near shore
   + fishery observer data @ shore

3. Foraging grounds may be > 12nm
   - temporal measures adequate?

4. Shag rocks - SG Corridor NT2
   (not existing objective)
   value slope

5. Work underway demonstrates protection - move in both may be more areas that need protection in fishing
   NESQ BCA is north of Seymour
TOR 3

1. Less data on 700-2250m zone annual SS&H split
   monitoring objectives be SG/SS1s
2. Maintaining long term time series
3. Vessel noise
   Southern Thule - monitor
   Standardisation of data collection for
   Cruise ships
data archival ability
4. Camera tell us more about what we're
   protecting
   1D recovery routes from fishing in closed areas
   Consider backup areas! Risk approach to scientific
   fishing
5. SRW research to establish more whole data
   Fishery observer research should be continued
   - Seabirds
   - Pelagic marine predators
   - Monitoring outside MPAs eg long time series/rock
   - Can it bring in existing fishing
6. Role of modelling (at Simon) in predicting fish
   change
   Integrate with more validation by Coastal
   how do we deal w/ Reference areas
   & SG/SS1 difference
7. FGSSS1 biosecurity report
Annex 7 – 5-year review of SGSSI sustainable use Marine Protected Area
Presentation by James Jansen

5-year review of SGSSI sustainable-use Marine Protected Area
Government of South Georgia & the South Sandwich Islands

TOR 1 Review: Development of scientific understanding of the SGMZ since 2013
1. Fisheries
2. Stock/species recovery
3. Climate change
4. By-catch
5. Non-native spp (introductions and eradications)
6. Mining and mineral extraction
7. Plastics
8. HFO
9. Volcanic activity
10. Other changes and threats (e.g. bird strike, iceberg scour).

TOR 2: Evidence-based assessment of effectiveness of current management measures
1. Seasonal closure of the krill fishery

Management objective: to reduce the risk of competition between the krill fishery and krill-dependent predators during their breeding season

Is objective of seasonal closure being met?
TOR 2: Evidence-based assessment of effectiveness of current management measures

2. South Georgia and Clerke Rocks No-Take Zones

Management objectives:
- Protect the shallow inshore environment around South Georgia and Clerke Rocks from any form of fishing activity
- Protect spawning aggregations of mackerel icefish and other species of benthic spawning fish
- Protect the foraging grounds of land-based predators that forage within 12nm of South Georgia, notably Gentoo penguins and imperial shags
- Facilitate recovery of the marbled rock-cod (Notothenia rossii) population, whose juveniles inhabit inshore areas
- Protect the serpulid reef on the shelf in the area of Clerke Rocks

Are the objectives of the No-Take Zones being met?

TOR 2: Evidence-based assessment of effectiveness of current management measures

3. South Sandwich Islands No-Take Zones and Pelagic Closed Areas

Management objectives:
- Protection of the shallow inshore environment around the SSI from any form of fishing activity
- Protect spawning aggregations of benthic fish
- Protection of benthic fauna from any form of fishing activity in the NTZ
- Protect the foraging grounds of land-based predators that forage within 12nm of the SSI

Are the management objectives being met?

TOR 2: Evidence-based assessment of effectiveness of current management measures

4. Shag Rocks No-Take Zone

Management objectives:
- Protection of the shallow inshore environment around Shag Rocks from any form of fishing activity
- Protection of juvenile toothfish
- Protection of spawning aggregations of benthic-spawning fish
- Protection of the benthic fauna from any form of commercial fishing activity
- Protection of foraging areas of marine predators

Are the management objectives being met?
TOR 2: Evidence-based assessment of effectiveness of current management measures

5. (Nine) Benthic Closed Areas

Management objectives:
• Protection of sensitive benthic fauna
• Provide refugia for adult toothfish

Are the management objectives being met?

TOR 2: Evidence-based assessment of effectiveness of current management measures

6. Additional Measures

• No bottom trawling
• No bottom fishing <700m
• No bottom trawling >2,250m
• Winter only toothfish fishery
• No daytime setting
• Move-on rules
• Additional limits on some by-catch species
• CMs applied to MPA

TOR 3: Effectiveness of existing monitoring measures

MPA Objective 1
Conserving marine biodiversity, habitats and critical ecosystem function

Questions: e.g. are these being mapped? Do we understand them? What are we conserving them from?

Overall:
• the region between 700m – 2250m is relatively well understood however other areas are lacking in data;
• more knowledge on assemblages than biodiversity and potential need to develop indices/proxies for biodiversity;
• focus on areas most likely to change.
TOR 3: Effectiveness of existing monitoring measures

MPA Objective 2:
Ensure that fisheries are managed sustainably, with minimal impact on associated and dependent ecosystems

Questions: e.g. how can we manage spatial distribution in the krill fishery?; what is the overlap between fisheries and predator foraging?

Overall:
• data gap on certain by-catch species, plus more data on skate and grenadier;
• more data on foraging predators, and gear impacts on benthos;
• current activities should continue.

TOR 3: Effectiveness of existing monitoring measures

MPA Objective 3:
Manage other human activities including shipping and scientific research, to minimise environmental impacts on the marine environment.

Questions: how can we best use vessels for citizen science? How can we maximise use of visit locations and existing data?

Overall:
• visitor impact not clear – better use of existing data and new data collection;
• are there ship traffic corridors which are high risk areas for e.g. pollution (HFO, plastics...) / biosecurity?
• additional research and monitoring required.

TOR 3: Effectiveness of existing monitoring measures

MPA Objective 4:
Protect the benthic marine organisms from the destructive efforts of bottom trawling

Overall:
• ban on bottom trawling ensures this objective is met.
• more knowledge on biodiversity assemblages being outlined under other objectives;
TOR 3: Effectiveness of existing monitoring measures

MPA Objective 5:  
Facilitate recovery of previously over-exploited marine species

Questions: e.g. how do we calculate pre-exploitation numbers? What is best possible, achievable outcome, noting impacts of e.g. climate change.

Overall:
• develop an agreed list of exploited species with an assessment of what, if any, monitoring measures are in place or need establishing;
• consider process of recovery rather than actual total recovery.

TOR 3: Effectiveness of existing monitoring measures

Management Objective 6:  
Increase the resilience of the marine environment to the effects of climate change

Questions: e.g. how will climate change affect the marine environment? How can we determine the difference between climate change and e.g. natural spp recovery?

Overall:
• management responses need to be adaptive under changing circumstances;
• could different scenarios be tested e.g. ocean acidification impacts or changes in fishing?

TOR 3: Effectiveness of existing monitoring measures

MPA Objective 7:  
Prevent the introduction of non-native marine species

Questions: e.g. how would we know if a non-native spp appeared? How do we differentiate from natural range shifts? What are the vectors?

Overall:
• a need to identify key risk areas and potential pathways of introduction.
TOR 4: Priorities for future scientific research and monitoring

South Georgia and Clerke Rocks NTZ
• Protect foraging grounds of land-based predators (which spp do we need additional data for?)

South Sandwich Islands NTZ
• Protect spawning aggregations of benthic spawning fish (more information required on benthic fauna and location of spawning)
• Protect the foraging grounds of land-based predators (more data on foraging ranges and population sizes)

TOR 4: Priorities for future scientific research and monitoring

Pelagic closed areas
• Foraging data from summer is adequate but insufficient data in winter

Benthic closed areas
• Other sensitive benthic fauna, new and emerging vent areas, toothfish refugia?

TOR 4: Priorities for future scientific research and monitoring

Areas identified yesterday from the development of our scientific understanding:

• Ecosystem resilience (e.g. to climate change)
• Migration of species due to climate change
• Oil spill response modelling
• Research outreach and collaboration
MPA Research & Monitoring Plan

• Review and ongoing management of the SGSSI MPA requires comprehensive and accessible data on the status and trends of marine biodiversity, ecosystem features and human activities.

• A Research and Monitoring Plan (RMP) aims to guide scientific activities that will:
  - contribute to an increased understanding of the marine ecosystem
  - provide information to evaluate the effectiveness of the MPA
  - assess the nature and extent of change
  - inform the development of enhanced management as required

• Also needs to be:
  - Achievable
  - Flexible/updatable

MPA Research & Monitoring Plan

• Understanding future change, particularly relating to the potential effects of human activities, requires accessible data and an ability to integrate data from different sources to undertake analyses across the whole ecosystem.

• Assessment of the effects of climate change, fishing and other human activities, and environmental variability on species, habitats and ecosystems within the MPA.

• Baseline information on key indicators can be used to ‘benchmark’ the current state of the SGSSI marine ecosystem, and used to evaluate future change. Many of these data are already being collected, e.g. predator populations and indices of breeding success.
MPA Research & Monitoring Plan

CCAMLR RMPs to include:

- Scientific research pursuant to the specific objectives of the MPA;
- Monitoring of the degree to which the specific objectives of the MPA are being met;
- Other research consistent with the specific objectives of the MPA (including outside the designated area).

Aims of the CCAMLR Ecosystem Monitoring Programme (CEMP):

- To detect and record significant changes in critical components of the ecosystem, to serve as a basis for the Conservation of Antarctic Marine Living Resources;
- To distinguish between changes due to the harvesting of commercial species and changes due to environmental variability, both physical and biological.

MPA Research & Monitoring Plan

Review group has identified:

- Priorities for research and monitoring (TOR 4)
- Data gaps (Background Document)
- Existing research / time-series

Organisation / structure:

- MPA objectives (general and specific)
- Geographic areas or management measures
- Themes (e.g. representativeness, threat mitigation, understanding change)

Practical implementation:

- Inclusive and transparent process to develop the plan
- Storage and access to data
- Process for update and review of the plan (separate to management review)
### MPA Research & Monitoring Plan

<table>
<thead>
<tr>
<th>Specific MPA objective</th>
<th>Relevant features / attributes</th>
<th>Parameters / indicators to be measured</th>
<th>Location within (or outside) MPA</th>
<th>Research activities and projects</th>
</tr>
</thead>
</table>
| Reduce risk of competition between the krill fishery and krill-dependent predators during their breeding season | Populations of krill-dependent predators | - Spatial and functional overlap between krill-dependent predators and the krill fishery | All areas within predator foraging ranges | - Tracking and diet studies of krill-dependent predators  
- Characterise predator requirements for krill resources  
- Effects of competition among predators |
| Protect sensitive benthic fauna | Benthic species and habitats | - Spatial patterns of diversity;  
- Evidence of physical impact | Benthic Closed Areas | - Camera studies to assess impact within and outside BCAs |

### MPA Research & Monitoring Plan

- Darwin Plus funded project (2017-2019) to develop a web GIS and data portal, to allow for information to be collected, stored, accessed and used for management purposes into the future.

- Data Prioritisation workshop (May 2017) identified key datasets relevant to understanding and management of the MPA, and gaps in available data.

- Research questions and data gaps identified in Background Document prepared for first review meeting (November 2017)

- Proposed RMP workshop (September 2018) to identify research and monitoring priorities relevant to MPA conservation and management objectives, and to develop a draft RMP in collaboration with a broad range of scientific and other stakeholders.
The Director of Fisheries  
Government of South Georgia & the South Sandwich Islands  
Government House  
Stanley  
Falklands Islands  
13th of July 2018

Dear Sue/Mark,

Great British Oceans remarks to GSGSSI MPA Review Panel – 11.06.18

You have invited us to comment upon the written statement presented by Great British Oceans after the recent second workshop on the SGSSI MPA review.

We will leave others more qualified to comment on CCAMLR and GSGSSI Management of Krill populations, but we do wish to comment on GBO’s assertions surrounding the status of the SGSSI MPA.

We do not accept GBO/some IUCN Members assertion that SGSSI does not qualify as a Category VI sustainable use MPA.

It is claimed that the objective of the MPA’s Management Plan is not Conservation and that this automatically excludes the SGSSI MPA from categorisation. The Management Plan is the tool used to communicate and implement the Marine Protected Areas Order 2013 and management Plans are described in the Wildlife and Protected Areas Ordinance 2011 as being schemes for conserving, protecting or preserving:

(a) marine flora or fauna;  
(b) any species dependent on the marine environment;  
(c) marine habitats or types of marine habitat;  
(d) features of scientific interest, including those of geological, geomorphological or oceanographic interest.

The Marine Protected Areas Order 2013 goes further and sets out the objective of the SGSSI MPA set up under the WPA Ordinance 2011:

4 (4) The purpose of designating the SGSSI MPA is for the conservation of —  
(a) the seabed and its overlying waters; and  
(b) their associated organisms.

(5) The principal conservation objectives for the SGSSI MPA are to —  
(a) conserve marine biodiversity, habitats and critical ecosystem function;
(b) ensure that fisheries are managed sustainably, with minimal impact on associated and dependent ecosystems;
(c) manage other human activities including shipping and scientific research, to minimise environmental impacts on the marine environment;
(d) protect the benthic marine organisms from the destructive effects of bottom trawling;
(e) facilitate recovery of previously over-exploited marine species;
(f) increase the resilience of the marine environment to the effects of climate change; and
(g) prevent the introduction of non-native marine species.

We believe that the SGSSI Legislation is quite clear in setting Conservation as the primary objective for the establishment and management of the MPA.

We have reviewed the World Commission on Protected Areas 'Statements of Compliance' for the SGSSI MPA against the Legislation in force mentioned above. We do not agree with WCPA’s points 2,3,5 & 6 and we believe that the network of spatial and temporal closures provide clear intention to maintain or increase the naturalness of the protected ecosystem.

We believe that the current review process and study of the reduced impact and closed areas provide an excellent mechanism to quantify the effectiveness of the MPA against its conservation goals. We would regard the SGSSI MPA as an exemplar Category VI MPA

Regards

[Signature]

Peter Thomson