ANNEX 6

**REPORT OF THE WORKSHOP ON**
**MARINE PROTECTED AREAS**
(Brest, France, 29 August to 2 September 2011)

## CONTENTS

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## INTRODUCTION

### Opening of the meeting

1.1 The Workshop on Marine Protected Areas (WS-MPA) was held at the Institut Paul Emile Victor (IPEV), Brest, France, from 29 August to 2 September 2011. The Workshop was co-convened by Dr P. Penhale (USA) and Prof. P. Koubbi (France) and was hosted by IPEV and the Agence des Aires Marines Protegées (AAMP).

1.2 The Co-conveners welcomed all participants (Appendix A) and, in particular, the invited experts: Dr M. Lombard (Nelson Mandela Metropolitan University and University of Pretoria, South Africa), Prof. A. Rogers (University of Oxford, UK) and Dr B. Smith (University of Kent, UK).

1.3 Dr Y. Frenot (Director of IPEV and Chair of CEP) welcomed participants to IPEV and introduced the infrastructure and resources of the French Antarctic Program. In his role as Chair of the CEP, he emphasised the strong links between the CEP and SC-CAMLR with respect to MPAs and noted that the CEP has included consideration of the outcomes of this Workshop at its next meeting.

1.4 Dr F. Gauthiez (AAMP) noted that welcoming participants to a meeting on MPAs in Brest was particularly appropriate as it is adjacent to the Mer d'Iroise MPA; the largest MPA in France.

1.5 Mr J. Ringelstein (Terres Australes et Antarctiques Françaises (TAAF)) provided a review of the development of the 22 700 $km^2$ marine reserve in the French EEZs around Crozet and Kerguelen Islands.

### Adoption of the agenda and organisation of the meeting

1.6 The Workshop agenda was prepared based on the terms of reference as agreed by the Scientific Committee (SC-CAMLR-XXIX, paragraph 5.22). The adopted agenda is in Appendix B.

1.7 Documents submitted to the Workshop are listed in Appendix C.

1.8 In providing an introduction to the Workshop, Dr Penhale reviewed the development of discussions in CCAMLR on MPAs, in particular, the 2005 MPA Workshop and the 2007 Bioregionalisation Workshop. She also recalled the discussion at the Scientific Committee in 2010, including the agreed recommended outcomes for the Workshop (SC-CAMLR-XXIX, paragraph 5.23).

1.9 The report of the meeting was prepared by Drs J. Arata (Chile), A. Constable (Australia), Ms A. Dahood (USA), Ms K. Delord (France), Drs S. Grant (UK), M. Kiyota (Japan), E. Marschoff (Argentina), K. Reid (Science Officer), B. Sharp (New Zealand), P. Trathan (UK) and G. Watters (USA).

1.10 In this report, paragraphs that provide advice to the Scientific Committee, its working groups and the Commission have been highlighted. A list of these paragraphs is provided in Item 8.

## BIOREGIONALISATION AND SYSTEMATIC CONSERVATION PLANNING

2.1 The Workshop recalled the advice of the Scientific Committee that a number of methods could be used for designing a representative system of MPAs, including, inter alia, bioregionalisation and/or systematic conservation planning (SCP) (SC-CAMLR-XXVII, paragraph 3.55).

### Existing spatial protection and management

2.2 Dr Grant introduced two papers summarising existing marine spatial protection and management in the Southern Ocean. WS-MPA-11/19 provided updated information on the status of protected areas currently designated in the Southern Ocean, including MPAs designated by CCAMLR, ASPAs and ASMAs designated by the ATCM, and additional MPAs not designated under the Antarctic Treaty System. The total marine area under these types of protection within the Convention Area is currently 179 889 $km^2$ (equivalent to around 0.5% of the total Convention Area). This compares to 66 671 $km^2$ (0.19% of the total Convention Area) in 2005. Although some progress has been made since 2005, the geographic coverage, habitat representation and range of values being protected by the existing range of MPAs, remain poor.

2.3 WS-MPA-11/20 described a GIS and accompanying database which has been developed by the UK to store and deliver data on CCAMLR's management units and spatially resolved conservation measures. The GIS can help to inform the development of MPAs as part of an SCP process, by providing information on the location and extent of existing spatial management, and allowing analysis of management measures in relation to the distribution of bioregions and other environmental characteristics or biological distributions. It also provides a central repository for data on the location and status of designated MPAs.

2.4 The Workshop welcomed the development of the GIS, which allows Members to access standardised information and provides a common foundation for spatial analyses. Summary statistics generated by the database, such as those illustrated in WS-MPA-11/20, may help to inform development of the representative system of MPAs, although it was noted that some spatial management measures, such as catch limits, are not resolved at a fine spatial scale, for example, in relation to features such as fishable depth ranges, and caution is therefore necessary when generalising such information across different spatial scales.

2.5 The Workshop endorsed the further development of this GIS tool and encouraged the UK to work with the CCAMLR Secretariat to further develop and maintain this GIS tool for the use of all Members, including incorporation of the results of bioregionalisation work that has been endorsed by the Scientific Committee and its working groups. The Workshop also recommended that a standard protocol should be developed for the submission of data to the GIS database.

Regionalisation analyses

2.6 WS-MPA-11/6 described an updated circumpolar pelagic regionalisation of the Southern Ocean, based on sea-surface temperature, depth and sea-ice information. The results show a series of latitudinal bands in open areas, consistent with the meridional zonation of the ACC. Around islands and continents, the spatial scale of the patterns is finer, and is driven by variations in depth and sea-ice. The Workshop welcomed this updated analysis, which is broadly consistent with the earlier circumpolar pelagic regionalisation (Grant et al., 2006), as well as finer-scale regional results from the Ross Sea region (Sharp et al., 2010).

2.7 The updated pelagic regionalisation can be used to demonstrate representativeness at a circumpolar scale, and can be used to identify gaps in the representation of pelagic habitats, for example, outside the current priority areas. It can also be used to identify areas of particular importance, such as polynyas, in the absence of more detailed regional analyses.

2.8 The Workshop agreed that the synoptic satellite-derived datasets on sea-surface temperature and sea-ice can summarise broad-scale changes in the pelagic environment, and recommended that periodic updates to the regionalisation analysis should be undertaken to monitor such change. It was further recommended that such updated regionalisation results could be made available as part of the GIS database developed by the UK (paragraph 2.5).

2.9 Prof. Koubbi introduced WS-MPA-11/15 on the CAML/SCAR-MarBIN 'Biogeographic Atlas of the Southern Ocean' which is currently in preparation. This will constitute a major scientific output of CAML and SCAR-MarBIN, and will include a collection of maps and synthetic texts presenting key biogeographic patterns and processes of Antarctic marine biodiversity (benthos, plankton, nekton, birds and seals) south of 40°S.

2.10 It was noted that information useful for incorporation into bioregionalisation analyses would also be the uncertainty associated with the projected species distributions, and on where ecological barriers to connectivity may disrupt the distribution of populations across the estimated habitat space.

2.11 It was further noted that species distribution data are not only relevant to the particular species being modelled, but that such information, if appropriately selected, can be useful for indicating variation in other species, as well as capturing complex variation in the pelagic environment which may not be achieved so well using only physical information.

2.12 Prof. Rogers introduced WS-MPA-11/23 and 11/16 on behalf of the authors. These papers update circumpolar analyses previously presented to WG-EMM, incorporating advice received from the Working Group.

2.13 A hierarchical classification of benthic biodiversity in the Southern Ocean (WS-MPA-11/23) identified benthic ecoregions, bathomes and geomorphic seabed features, and used these to define 846 unique environmental types. Spatial protection of these environmental types were assessed against current protected areas in the CCAMLR area. The full range of environmental types were not represented within MPAs in any ecoregions, and 12 ecoregions contained no protected areas. The authors further recommended that 119 locations with spatially restricted or rare environmental types should be considered for inclusion in future MPAs.

2.14 WS-MPA-11/16 described a revised SCP process using a variety of physical datasets, updated pelagic regionalisation (WS-MPA-11/6), the benthic classification produced in WS-MPA-11/23, and species distributions modelled from Aquamaps (www.aquamaps.org), to identify potential areas in offshore areas of the Southern Ocean that would contribute to a representative system of MPAs. The preliminary results identified 22 potential areas to capture conservation features including benthic ecoregions and environmental types, pelagic regions, rare features, VMEs and biological features around the entire CCAMLR area.

2.15 Overall, the Workshop welcomed the concept of addressing representativeness at a circumpolar scale. It was suggested that further development of the methodology would be valuable, in particular incorporating refinements to the benthic classification (as described in paragraphs 2.13 and 2.14). Dr M. Eléaume (France) asked how, given the circumpolar distribution of many species, could the source and sink populations be taken into account.

2.16 The Workshop welcomed the updated analysis, but noted that some concerns remained (reiterating the advice of WG-EMM-10 (SC-CAMLR-XXIX, Annex 6, paragraph 3.66)), regarding the use of modelled biological distributions without expert validation, and the need to limit the number of correlated input variables. It was also noted that a smaller number of output classes would have more utility for incorporation into SCP processes. Benthic terrain analysis may also improve the geomorphological classification used in the study.

2.17 The Workshop recommended that the authors could further refine the benthic analysis, and, as a second stage, could collaborate with other approaches to incorporate biological data into a synthesised product.

2.18 More generally, the Workshop noted that in undertaking regionalisation analyses, it is important to consider the extent to which it is expected that the environment be subdivided, and also to consider how ecoregions might be defined differently in shelf and sub-Antarctic areas.

2.19 Despite the need for further work to develop the methods and results presented in WS-MPA-11/16, the Workshop noted that the preliminary results provided in the paper indicate important gaps in the coverage provided by the ‘priority areas’ previously identified by WG-EMM to further work on the development of MPAs in the Convention Area (SC-CAMLR-XXVII, Annex 4, Figure 12). In particular, WS-MPA-11/16 indicated potential heterogeneity in the spatial distribution of bioregions occurring in the Bellingshausen and Amundsen Seas, and this heterogeneity was not apparent at the time WG-EMM identified the priority areas.

Data for systematic conservation planning in the southern Indian Ocean

2.20 Prof. Koubbi and members of the French Delegation introduced three papers on the estimation of biodiversity of the sub-Antarctic Indian Ocean for ecoregionalisation (WS-MPA-11/8 to 11/10), noting that this work was initiated following a working group held in May 2011. Three additional background papers on databases, benthic biodiversity and the status of fish stocks around Kerguelen Islands (WS-MPA-11/P2 to 11/P4) were also presented. The Workshop agreed that this work provided a sound basis for the further development of an SCP process for MPAs in this region.

2.21 WS-MPA-11/10 demonstrated how existing information on marine pelagic species (plankton and fish) can be used to achieve a pelagic ecoregionalisation of the Crozet Basin and northern Kerguelen Plateau region. Three types of methodology were used: (i) a taxonomic approach based on communities only; (ii) a physiognomic approach for bioregionalisation based on abiotic factors; and (iii) a mixed approach termed 'ecoregionalisation' which incorporates taxonomic, ecological and physiognomic data.

2.22 The ecoregionalisation approach models potential preferred habitats of species and communities based on relationships between the presence/absence of species and environmental factors. It allows for the prediction of species or community presence/absence in areas where sampling has not been undertaken, but where environmental information is available from remote sensing or model data. The approach was tested only for mesopelagic fish at this stage. It was concluded that this methodology represents an objective and repeatable approach, which can be improved using expert knowledge and new data.

2.23 Dr Constable noted that mapping the distribution of relative abundances arising from this estimation procedure may be more appropriate for modelling patterns of species' spatial distributions to inform MPA planning rather than predicting absolute abundances in a time-varying seascape.

2.24 WS-MPA-11/8 described a preliminary analysis of tracking data for 19 species of seabirds and seals breeding in Crozet, Kerguelen and Amsterdam Islands, to identify areas of ecological significance in the Southern Ocean. These higher predators were found to be widely distributed across the southern Indian Ocean, and to overlap extensively with other EEZs and areas managed by other international organisations.

2.25 The results highlighted the need to consider different scales of ecological processes, particularly with regard to higher predators. Certain life-history stages (e.g. breeding stages) may be focused on small areas, whereas other stages (especially non-breeding, but also breeding winter migration) occur across very large areas according to the species, and analyses therefore need to be scaled appropriately.

2.26 The Workshop agreed on the importance of collaboration with other international organisations on the conservation of higher predators, and noted that further discussion is required on how to measure the success of MPAs for such predators when they are also foraging outside the CCAMLR area.

2.27 WS-MPA-11/9 described the use of information on the biodiversity and distribution of benthos and demersal fish for ecoregionalisation in the northern part of the Kerguelen Islands slope, shelf and shelf-break. This study provided a first overview of optimal habitats for

indicator species (including one VME target species) and the benthic assemblages of the Kerguelen Plateau. Further work will determine essential fish habitat for dominant species. Biodiversity data available in the Système d'Information des Milieux et Peuplements Aquatiques (SIMPA) and Pêcherie de Kerguelen (Pecheker) databases (WS-MPA-11/P2), long-term data on fisheries in the Kerguelen region (WS-MPA-11/P4), and information on benthic biodiversity off Kerguelen Islands (WS-MPA-11/P3) will also provide important input to the project.

2.28 The Workshop endorsed the ecoregionalisation approach employed in these studies, as a valuable and informative way to combine taxonomic and environmental data in delineating ecoregions. It encouraged the use of similar approaches in other regions, where appropriate.

2.29 Prof. Koubbi noted that the next step will be to define a strategy for the translation of this ecological information into candidate MPAs in the Southern Indian Ocean region, and that this will require consideration of appropriate methodologies, as well as the different conservation tools available for protection.

Systematic conservation planning – experiences
from outside the CCAMLR area

2.30 Dr Lombard gave an overview of the SCP process, and introduced WS-MPA-11/11 and 11/12 which described practical experiences of SCP in South Africa.

2.31 WS-MPA-11/11 described systematic biodiversity planning to identify a potential offshore MPA network for South Africa. The objectives of the process were designed to meet the needs of biodiversity as well as fishery and non-fishery interests. Targets were defined to evaluate achievement of objectives. Marxan (a software tool designed to aid SCP) was used to generate a range of different MPA scenarios, each with specific objectives. The transparency of this process also allowed measurement of the impacts of different conservation scenarios on the achievement of the targets desired by different stakeholders.

2.32 The Workshop discussed issues surrounding the inclusion of cost layers in SCP processes. It was noted that:

(i) cost can be defined by a simple measure of area size, although additional information on human activities may be useful in considering impacts on rational use, for example, fishing effort data or modelled fish distributions (as noted by the Scientific Committee; SC-CAMLR-XXIX, paragraph 5.34)

(ii) data on costs may need to be normalised for incorporation into the SCP process

(iii) instead of choosing between different cost metrics, it may be beneficial to use all available metrics in the first instance, to clarify how specific costs affect the achievement of different targets. Individual cost layers can be combined into an integrated analysis at a later stage.

2.33 Dr Lombard next presented the results of multi-resolution conservation planning to design MPA networks linking inshore and offshore ecosystems in South Africa (WS-MPA-11/12). To address this challenge, a spatially nested system of planning units was designed to

select priority areas for conservation using Marxan software, reflecting the multi-scalar nature of marine ecosystem patterns and processes, contributing to better connectivity between inshore and offshore systems, and towards more resilient and efficient MPA networks. Lessons from this work which may be of use to CCAMLR include (i) the importance of setting appropriate scales of analysis for different contexts, (ii) the importance of setting clear protection objectives and targets for performance metrics by which achievement of those targets will be assessed, (iii) the importance of a scientific basis for setting targets, and (iv) the need to provide clear and simple guidance on zonation within MPAs.

2.34 The Workshop noted that the question of multiple resolutions and scales is relevant to the division of interests between CCAMLR and the ATCM, and the scales at which different human activities operate in the Southern Ocean, particularly between offshore and coastal areas.

2.35 Dr Lombard also drew the Workshop's attention to the del Cano Collaboration initiative being pursued by WWF-South Africa and the Department of Environment Affairs, South Africa. The initiative was begun by WWF in 2008, and the intention is to work toward a jointly-managed MPA on the del Cano plateau, between South Africa's Prince Edward Islands and France's Crozet Islands. The first step is promulgation of the Prince Edward Islands MPA which is currently under review by the Department of Environment Affairs, South Africa. Dr C. Bost (France) indicated that this collaborative project has been extremely productive with respect to science.

2.36 Dr Smith presented WS-MPA-11/22 on designing MPA networks using SCP as part of the Channel Habitat Atlas for Marine Resource Management (CHARM3) Project in the English Channel. Setting targets is a key aspect of SCP. Targets must always be context-specific, fitting into the objectives of a particular region. Habitat targets should reflect patterns of species richness and species turnover, as well as other relevant conservation factors. Species area curves may be useful in setting marine habitat targets, and there is a need to develop approaches that account for differences in sample effort to ensure that targets are objective and scientifically defensible. Once targets have been set, software such as Marxan can be used to identify networks of MPAs that meet targets, minimise impacts on fishing, and meet spatial constraints on minimum MPA size and spacing. The CHARM3 Project has investigated the use of MinPatch software in conjunction with Marxan, and initial results show that including additional constraints on MPA size produces a much less fragmented MPA network.

2.37 Dr Constable noted that estimations of species–area relationships were poorly known for the Southern Ocean, and that alternative methods for setting objectives may therefore be required. Dr Watters noted that simplifying the boundaries of MPA proposals generated by the use of MinPatch might increase the practicality of MPAs (e.g. by providing boundaries that are easy to communicate and enforce).

2.38 The Workshop agreed that insights from the South African and English Channel experiences could assist in the development of SCP processes in the Southern Ocean. It was noted that the Antarctic situation has significant differences to most other parts of the world, in terms of the absence of complex human activities and interactions, and (in many regions) a lack of data. It may not always be appropriate to use mathematical software for Antarctic SCP processes, or to incorporate the same type of cost metrics that have been employed

elsewhere. However, taking account of best-practice on matters such as defining appropriate scales, setting clear and scientific objectives, and maintaining transparency, will help to ensure that MPA planning for the Southern Ocean is systematic and effective.

2.39 Dr A. van de Putte (Belgium) presented some background information on connectivity and genetics for consideration as part of MPA planning processes (Volckaert et al., submitted). It was noted that large areas would be required to incorporate genetic diversity and to maintain viability. However, it may also be advantageous to design many smaller and well-connected areas in order to accommodate different life-history stages. The design of MPA systems will therefore require areas to be designated with a diversity of sizes and spacing.

2.40 Prof. Rogers noted that it is important to consider the unique evolutionary history of the Antarctic region, especially in the context of climate change. Evolutionary history may constrain the ability of species to adapt, and MPA systems will therefore need to consider refugia areas. Dr Eléaume also noted that important differences exist between broadcaster and brooder life styles and that MPAs should be designed so as to consider these differences.

Systematic conservation planning methodology
for the Ross Sea region used by New Zealand

2.41 Dr Sharp presented the methods used by New Zealand in WS-MPA-11/25 describing the SCP process used by New Zealand in developing MPA scenarios for the Ross Sea (the remainder of WS-MPA-11/25 was considered under Item 3; see paragraphs 3.26 to 3.51). New Zealand maintained a procedural separation between the science process (Phase 1, summarised in Sharp et al., 2010) and the planning process (Phase 2). The planning process used had the following steps:

(i) define protection objectives that will contribute towards the achievement of the overall management aims

(ii) for each protection objective, identify target areas, the protection of which will contribute to the achievement of the objective

(iii) for each target area, assign a numerical protection target reflecting the desired level of protection for that area

(iv) define spatially explicit representation of the cost of MPA designation to competing objectives such as rational use

(v) define additional constraints (if any) on MPA scenario design

(vi) develop and evaluate MPA scenarios that meet protection targets for each identified target area to the extent possible while minimising cost and being mindful of other constraints

(vii) develop an associated management plan, research and monitoring plan, and legal framework for a proposal to implement the MPA scenario designed in Phase 2 (this is a subsequent phase of work not described in WS-MPA-11/25).

2.42 Dr Sharp further explained that, following this process, different MPA scenarios were iteratively developed, evaluated and adjusted based on scientific review and consultations with domestic stakeholders, and discussions with the USA. This process was aided by the use of a custom-designed MPA planning tool in ArcGIS, allowing rapid evaluation of user-defined MPA boundary scenarios against standard performance metrics. Unlike Marxan, this tool does not use an optimisation function, however, it allows the user to perform a basic manual optimisation, by altering proposed MPA boundaries based on the extent to which protection targets are being achieved at each iteration.

2.43 Dr Sharp indicated that the resulting MPA scenario was retrospectively validated by comparison with a Marxan analysis that used the actual protection levels achieved in the New Zealand scenario as targets; differences between the two scenarios were observed to be minimal. It was therefore concluded in the New Zealand process that the iterative user-driven MPA planning tool and methodology was successful at identifying an optimal spatial design to achieve the desired level of protection while minimising cost to rational use.

2.44 The Workshop supported the use of the MPA planning tool in helping transparent and efficient consultation with stakeholders, and some Members expressed an interest in trialling the tool for other regions. Dr Sharp noted that the MPA planning tool could be made available to Members on request.

## REVIEW OF DRAFT PROPOSALS FOR MPAs OR A REPRESENTATIVE SYSTEM OF MPAs IN THE CAMLR CONVENTION AREA

3.1 The Workshop considered a number of papers in order to review progress on draft proposals for the development of MPAs, or representative systems of MPAs, in the Convention Area.

### Circumpolar analyses

3.2 Prof. Rogers introduced WS-MPA-11/16 which provided a circumpolar analysis designed to help identify areas within the high seas of the Southern Ocean that would contribute to a representative system of MPAs (paragraphs 2.12 to 2.19).

3.3 The Workshop noted that it would be valuable if the authors were able to convene a workshop to address a number of issues with the analysis, including the fact that some environmental information used in the analysis was potentially correlated across different datasets and that this was likely to result in over-fitting of information (SC-CAMLR-XXIX, Annex 6, paragraph 3.66). It also expressed an opinion that it would be useful to see some of the Marxan outputs from the analysis and also how various datasets (e.g. the data from Aquamaps and the predator tracking data) were used in the synthesis. The application of benthic terrain modelling may also improve the geomorphological classification used in the study. The Workshop noted that the inclusion of cost layers would enhance the SCP process but recognised that there may be particular issues in accessing such data.

3.4 The Workshop encouraged the authors to continue their work in consultation with other scientists, particularly the biogeographers associated with the ‘Biogeographic Atlas of

the Southern Ocean' and scientists with appropriate technical expertise and prior experience in the CCAMLR bioregionalisation process, and to submit revisions to WG-EMM in the future.

Regional sea-ice and ice shelf features

3.5 WS-MPA-11/17 considered the issues of habitats under ice shelves and how they may be subjected to special conservation requirements as they recede due to climate change. Ice-shelf collapse is now known to lead to new marine habitats and to subsequent biological colonisation. Colonists may be local or may come from distant areas as water temperatures and currents change. Importantly, altered ecosystem dynamics may also allow new alien species to invade as ocean warming potentially removes physiological barriers that have previously led to the isolation of the Antarctic benthos. Given the complexity of the possible interactions and the need to study these in the absence of other human-induced perturbations in order to understand management requirements, WS-MPA-11/17 recommended that areas under existing ice shelves should be protected as reference areas for scientific study. This would be consistent with the types of objectives for protection identified at the 2005 Workshop (paragraph 5.1). The paper further argued that there would be negligible impacts on rational use as these areas are not accessible or utilised by fisheries.

3.6 The Workshop agreed that newly exposed benthic habitats created by ice-shelf collapse warrant special consideration, particularly in relation to the need to understand the processes that govern change and recovery in benthic habitats and for protection from invasion by alien species. It encouraged the authors to develop proposals for consideration by the Scientific Committee, noting the need to develop boundaries that are practical in designating and managing MPAs.

3.7 The Workshop also agreed that the protection of invasion from alien species would require consideration of controls for all vessels in these areas, including those for science, tourism and fisheries. It noted that how to manage vessel activities for this purpose is a matter for the Commission to consider.

Climate change effects

3.8 WS-MPA-11/18 and 11/24 presented initial thoughts on issues related to achieving conservation of marine biodiversity in the sea-ice zone under climate change. The implications of climate change for sea-ice communities remain poorly understood, with a growing recognition that multiple stressors from climate change could result in compounding effects in the region. Understanding these effects will require areas that are not impacted by human activities.

3.9 WS-MPA-11/18 developed an approach for achieving this and recommended that the krill fishery should not be allowed to move into areas currently covered by sea-ice should sea-ice extent reduce in the future. These areas should be protected as reference areas for scientific study and to increase ecosystem resilience. The paper recommended that the Weddell Sea be given special attention as this is one of the least known areas in the Southern Ocean, there has been no historical exploitation, except along the northern margin. It is,

however, thought to be extremely important in the life cycle of krill. In the context of climate change, it will be important to protect the sources of krill, not only for dependent species, but also for the fishery.

3.10 The Workshop encouraged Members to continue to consider options for spatial protection in the Weddell Sea. It agreed that approaches similar to the analysis undertaken for East Antarctica might be useful. One possible approach may be to consider protection of the southern Weddell Sea as a means for monitoring change in these ecosystems, as well as for providing climate change refugia.

3.11 The Workshop noted the importance of monitoring for the effects of climate change, utilising data from a variety of sources. For example, fishing vessels may provide a platform for gathering data for monitoring.

3.12 WS-MPA-11/24 provided some clear signals of climate-change impacts on pack-ice seals in the region, some of which are krill-dependent. It reported, with reasonable certainty, that the Western Antarctic Peninsula is a region of high importance for several species of seal. It shows that these seals have a habitat preference for pack-ice and that regional directional changes in climate are reducing this habitat which will potentially result in stress on these seal populations. Pack-ice seals, particularly crabeater seals, have a high proportion of krill in their diet, and increasing fishing in the region is likely to further stress the predator–prey dynamics in the region.

3.13 The Workshop noted that there may need to be some safeguards other than just relying on the feedback management procedure and that spatial measures will be very important to reduce the overlap of predator foraging and the fishery for stressed populations. It may be that management could be achieved through the use of SSMUs. It encouraged Members to consider how MPAs might be used to help reduce stress on pack-ice seals and other components of the pack-ice dependent community, perhaps through the use of different zones and in the light of the work currently undertaken by WG-EMM.

East Antarctica

3.14 Dr Constable introduced WS-MPA-11/5, the object of which was to identify areas in data-poor regions of East Antarctica that would conserve biodiversity, and act as reference areas for measuring ecosystem change and for estimating the effects of fishing in neighbouring areas. The Workshop welcomed the study, recognising that it built on earlier related work described in WG-EMM-10/26, SC-CAMLR-XXIX/11 and BG/9, which used the CAR (comprehensiveness, adequacy, representativeness) principles for developing a representative system of MPAs. Supplemental material provided to complement this body of work provides summary data and consideration of potential rational use in the region and consideration of how the candidate MPAs would be unlikely to impact on rational use.

3.15 During discussion of the paper, Dr Constable clarified a number of issues. He emphasised that the spatial extent of the planning area for East Antarctica had been limited so as to remove any potential overlap with any other SCP initiatives undertaken elsewhere in the Antarctic by other Members, particularly the initiatives being undertaken in adjacent areas.

He also noted that the East Antarctic region was data-poor, which meant that data-intensive software, such as Marxan, would be inappropriate to use. He also noted that a particular difficulty with Marxan was that it is very difficult to account for ecological connectivity.

3.16 The Workshop noted that despite the paucity of data available in East Antarctica, the design was a credible one, and the subdivision of the region into provinces was supported by subsequent regionalisation and biogeographic analyses indicated in WS-MPA-11/23.

3.17 Dr Constable emphasised that all of the candidate protected areas (Figure 1) had been selected for their benthic values; however, some had also been selected for the important combination of benthic values and pelagic values, including information on top predators. He noted that the combined benthic–pelagic areas were the most important reference areas for measuring long-term ecosystem change and for monitoring the effects of krill fishing.

3.18 The Workshop noted that the areas identified in WS-MPA-11/5 solely for protection of benthic habitat may need to be considered for their pelagic values as well, because of the increasing evidence of benthic–pelagic coupling over shelf areas.

3.19 Dr Constable noted that selections of the Gunnerus and Enderby areas in the west were based only on their benthic values, but that the definition of pelagic values for these candidate areas may be necessary in the future, when more data were available, as the adjacent region to the west in the Weddell Gyre, was a region where pelagic values may be extremely important, especially for Antarctic krill (*Euphausia superba*). He also noted that the candidate Mertz protected area in the east had specific conservation values, including the fact that it is an important site of bottom-water formation, benthic–pelagic coupling and as a reference area for monitoring long-term ecosystem change. Consequently, he considered that it was unlikely that the values of the Mertz area (see paragraph 3.21) would be found in areas further to the east, which were being considered as part of the Ross Sea region conservation planning process (WS-MPA-11/25).

3.20 Prof. Koubbi introduced WS-MPA-11/7 and 11/P1, which presented results from surveys undertaken by France, Australia and Japan during the Collaborative East Antarctic Marine Census. These surveys provide results for the shelf and offshore waters coincident with the Mertz candidate MPA proposed by Australia for East Antarctica (WS-MPA-11/5). A regional synthesis with pelagic and benthic ecoregions was proposed utilising information from a biodiversity census of fish, benthos, plankton and top predators. The synthesis highlighted the importance of spawning grounds of Antarctic silverfish (*Pleurgramma antarcticum*) which occurred in coastal canyons and areas of ecological significance for Adélie penguins (*Pygoscelis adeliae*), emperor penguins (*Aptenodytes forsteri*) and Weddell seals (*Leptonychotes weddellii*).

3.21 The Workshop welcomed the reports and recognised that one important result from this project, which assembled available biological data for the area, was that analyses supported the characterisation of the Mertz candidate MPA identified in WG-EMM-10/16 and 11/5. This result therefore provided direct support for the planning process undertaken more broadly for East Antarctica. An additional important result described in WS-MPA-11/7 was a proposed change in the boundaries of the Mertz candidate MPA based on topographic, oceanographic and biodiversity patterns, moving the western boundary from 140°E to 136°E and the eastern boundary from 150°E to 148°E; the northern limit remained at 60°S. Two VMEs have been declared in this area and this work further identified the importance of this

region. The Workshop noted that there was a probability that other VME-type habitats existed in the area and that they would be detected along the continental shelf, should demersal fishing activities continue.

3.22 Dr Constable presented SC-CAMLR-XXIX/BG/9 which provided a compilation of materials for considering rational use in the context of designing CCAMLR's representative system of MPAs in East Antarctica.

3.23 The Workshop noted that krill fishing in East Antarctica had not taken place for many years and that information on krill fishing effort and catch were out of date, especially in the context of environmental change which had been recorded in the region. In that respect, the use of the results of the BROKE East and BROKE West krill surveys provided the most current indication of the densities of krill in the region.

3.24 Dr Constable noted that juvenile toothfish reported from the candidate Gunnerus area are most probably related to populations living to the west, but that considerable uncertainty remained over the spatial geographic separation of stocks, including ontogenetic separation. He also noted that the toothfish population found to the east of Enderby Land to the Mertz area was probably a separate stock which is likely to be related to the BANZARE Bank stock. Dr Constable indicated that toothfish moved over considerable distances during different parts of their life cycle/seasonal cycle and therefore the populations would be accessible to fisheries operating in the candidate open areas outside the candidate closed areas. He indicated that long-term remotely sensed data on sea-ice distribution indicated that the physical environment was unlikely to restrict access in those areas.

3.25 The Workshop noted that WS-MPA-11/5 provided different levels of scientific explanation and justification for the individual candidate MPAs in East Antarctica and considered that it would be valuable to expand the explanations detailing the ecological values and conservation objectives for each MPA. Similarly, it suggested that it would be useful to provide further details of the stakeholder consultation process. The Workshop also noted that it would be useful to consider the ecological connections that linked East Antarctica with the adjacent areas to the north, particularly for species such as higher-trophic level predators that may forage or commute over large distances, or fish with ontogenetic life-cycle stages in different areas.

The Ross Sea region

3.26 Dr Watters introduced WS-MPA-11/25, particularly focusing on the scenario developed by the USA. The Workshop welcomed the study, recognising that it built on earlier related work described in WG-EMM-10/11, 10/12 and 10/30.

3.27 Dr Watters identified three overarching protection objectives by which the US scenario was designed; achievement of these objectives was assessed with reference to biological distributions defined in this paper and to the modelling outputs of WG-EMM-10/12, and a benthic and pelagic bioregionalisation. Dr Watters noted that planning objectives included: (i) providing a high level of protection to the Ross Sea shelf ecosystem at all levels, including top predators and benthic invertebrates; (ii) the existence of ecologically

comparable areas of the Ross Sea slope both inside and outside the candidate MPA, as a reference area to distinguish between the effects of fishing and of climate change; and (iii) the value of the MPA for science and monitoring activities.

3.28 The Workshop noted that a number of stakeholders had been consulted during the development of the analysis and that the project outcomes were intended to balance the interests of a variety of interest groups. The Workshop recognised that scientists may have a dual role in the development of spatial planning. Firstly, they provide scientific evidence for decision makers; however, some scientists may represent the interests of the wider scientific community, particularly their involvement in the future of science in a particular area.

3.29 The Workshop also noted that stakeholders included individuals and groups interested in rational use. Such interests might relate to the sustainable harvest of living resources, but may include other activities.

3.30 The Workshop recognised that benthic communities in the Antarctic were generally dependent on depth and that information about deeper benthic communities would potentially provide additional valuable information for the development of the candidate Ross Sea region MPA. The Workshop also noted that the seamounts along the Pacific–Antarctic Ridge may have unique or important ecological value, as well as being important spawning areas for Antarctic toothfish (*Dissostichus mawsoni*). The Workshop therefore suggested that the authors of WS-MPA-11/25 consider the ecological values associated with these features.

3.31 Dr Sharp introduced WS-MPA-11/25, particularly focusing on the scenario developed by New Zealand. The Workshop welcomed the study, recognising that it built on earlier related work described in WG-EMM-10/11 and 10/30. The SCP method by which the scenario was developed is described above in paragraphs 2.41 to 2.44.

3.32 Dr Sharp described eight ecosystem protection objectives for which the New Zealand scenario was designed, and summarised achievement of these objectives with reference to quantitative performance metrics for each of the 27 identified target areas of particular ecosystem importance; and a benthic and pelagic bioregionalisation. He identified the following key protection outcomes achieved by both the New Zealand and US scenarios: (i) full protection for polynyas and identified rare or vulnerable benthic habitats; (ii) very high protection for *P. antarcticum*; (iii) full protection for toothfish key life cycle areas utilised by sub-adult and pre-recruit toothfish; and (iv) very high protection for the summer foraging areas of top predators that may experience direct trophic competition with fisheries.

3.33 Dr Sharp noted that the New Zealand scenario would involve displacement of 21% of historical fishing effort in the Ross Sea region fishery. The New Zealand scenario was designed to minimise effort displacement while achieving protection targets, and bearing in mind the need to ensure viable fishery access as affected by ice cover, and the continuity of data from tag returns to inform the toothfish stock assessment.

3.34 Dr Sharp reported that the northeastern part of the New Zealand scenario was included to protect a portion of the presumed eastern toothfish spawning area. He noted that tag returns from the exploratory toothfish fishery in the Ross Sea region were inadequate to provide a fully resolved life cycle, but that the best evidence available (Hanchet et al., 2008) suggests that only spawning areas east of the Ross Gyre divergence will supply recruits to the Ross Sea shelf.

3.35 The Workshop noted that there were potentially important ecological connections between the seamounts of the Pacific–Antarctic Ridge and the Ross Sea shelf, principally through *D. mawsoni* life-history connections.

3.36 Prof. Rogers reported that it was probably not possible to separate stock identity in this region using genetic techniques, as even the movement of a few individuals between populations was sufficient to maintain genetic homogeneity between populations. Given the proximity of toothfish from the two areas, at least a low level of migration was likely.

3.37 The Workshop noted that an alternative approach to the designation of an MPA over the putative spawning grounds along the Pacific–Antarctic Ridge would be to have seasonal closures of the areas during spawning. It recognised that this may already occur in a de facto manner as spawning may occur under sea-ice in winter. The Workshop recognised that scientific surveys to determine spawning grounds and the location of pre-recruits would be valuable, but potentially difficult. Such surveys would be important for verifying the locations of life-history stages.

3.38 The Workshop noted that the eastern part of the candidate MPA (New Zealand version), south of the presumed spawning areas, was included as it contributed to the achievement of representativeness targets. It noted that the area included for its representative contribution could be allocated in a number of different locations, but that the current position achieved a single spatially contiguous candidate MPA. The Workshop recognised that deciding on the appropriate level of representativeness to be included in MPAs was an issue where advice from the Scientific Committee and Commission would be necessary.

3.39 Dr Sharp reported that there would be considerable ecological benefits if fishing (for *D. mawsoni*) was eliminated from the candidate Ross Sea MPA. This would eliminate potential resource competition for *P. antarcticum* and risks to the shelf community dependent on silverfish. Off the shelf there is little evidence of direct trophic coupling between toothfish and the silverfish-dominated Ross Sea shelf ecosystem. He also highlighted that removing the *D. mawsoni* fishery from the shelf would mitigate the potential for direct trophic competition with toothfish predators (*L. weddellii* and Type 'C' killer whales (*Orcinus orca*) and eliminate the risk that Type 'C' *O. orca* would learn to depredate longlines catching toothfish; given the high number of Type 'C' *O. orca* over the Ross Sea shelf, learned depredation behaviour could have significant impacts on harvesting rates and the economic viability of the fishery. Dr Sharp also suggested that protecting pre-recruit toothfish on the shelf would safeguard future fishery viability and allow scientists to monitor toothfish recruitment (e.g. WG-SAM-11/16) unconfounded by fishery impacts. He concluded that there would be strong ecosystem and scientific benefits from excluding the fishery from this area, and benefits to the fishery itself.

3.40 The Workshop agreed that there was a strong rationale for achieving high levels of protection for *P. antarcticum* and dependent communities; for eliminating spatial overlap between the area occupied by the toothfish fishery and the preferred foraging areas of toothfish predators; for protecting pre-recruit settlement areas and spawning areas for toothfish; and for protecting VMEs.

3.41 The Workshop recognised that Table 1 in WS-MPA-11/25 provided valuable information about protection objectives, target areas, and protection targets as used by New Zealand in its Ross Sea MPA planning process, and that the comparison table on page 31 of

that paper clearly demonstrated the levels of protection achieved for those targets, and associated costs. The Workshop noted that this was useful for summarising results for review of proposals, and that it would benefit from the addition of an analysis of how different activities may potentially compromise the values of the conservation objectives within each target area identified in Table 1 of WS-MPA-11/25.

3.42 Dr Sharp noted that IUU vessels attempting to gain access to the protected slope and shelf areas within the candidate Ross Sea region MPA would need to pass through areas occupied by the legal toothfish fishery, and therefore the probability of detection of IUU vessels in this area was high. In the northern seamount areas the potential attraction of IUU vessels to closed areas remains a cause for concern, warranting careful consideration.

Joint considerations from the US and New Zealand Ross Sea region analyses

3.43 Dr Sharp and Dr Watters both emphasised the value of the collaboration between the USA and New Zealand in the development of their respective planning scenarios for a candidate no-take MPA (Figure 2), and the commitment of both countries to continue to work together and with other Members to achieve a system of MPAs in the Ross Sea region.

3.44 The Workshop noted that the western boundary of the Ross Sea region candidate MPA may benefit from further consideration in the context of the outcomes of the conservation planning initiative for East Antarctica (see WS-MPA-11/5).

3.45 The Workshop noted that the planning objectives of the US Ross Sea region planning process and the New Zealand planning process were different, and that these were the basis for some of the different scenario outcomes. The Workshop noted that the two planning processes reflected a similar scientific understanding of the Ross Sea region ecosystem and similar conservation protection priorities, including the intact trophic functioning of the Ross Sea shelf, the protection of top predator foraging areas and the utility of the MPA scenarios for science. The differences in the scenario outcomes arose from different levels of accommodation of fishery outcomes.

3.46 The Workshop identified that there were many similarities between the candidate Ross Sea MPA (US scenario) and the candidate Ross Sea MPA (New Zealand scenario), with a major difference being the eastern and northeastern part of the MPA (New Zealand version). The Workshop considered that it would be extremely valuable if a single proposal could be developed which also included elements from the Italian Terra Nova Bay candidate MPA (WS-MPA-11/14). The Workshop suggested that one plausible way forward would be to consider the area of overlap as a primary candidate MPA, and that other areas outside this could be considered as secondary candidate MPAs, noting that only the latter areas would include presumed spawning areas supplying recruits to the Ross Sea stock. Progress with the primary candidate MPA could then be made whilst further work was undertaken in support of the secondary MPAs. The Workshop recognised that this approach was similar to the Conservation Zone approach used in Australia in systematic MPA planning (see WS-MPA-05/6).

3.47 The Workshop noted that the USA and New Zealand had tried to develop a joint proposal and would continue working to achieve this, but that the absence of a single agreed scenario was attributable to differences in policy aims that may benefit from discussion at the Commission level.

Terra Nova Bay

3.48 Dr M. Vacchi (Italy) introduced WS-MPA-11/14, summarising the significant research effort at Terra Nova Bay encompassing the collection of both physical and biological data. A significant finding of the study was the description of the first known spawning ground for *P. antarcticum*, which has been highlighted as a key species in the sea-ice community over the Ross Sea shelf (see also WS-MPA-11/25).

3.49 The Workshop encouraged continuation of the research on the spawning habitat of *P. antarcticum* which may also aid in helping determine other potential spawning areas. The Workshop noted that the study also described benthic communities in Terra Nova Bay which appear to be different to other communities described in East Antarctica (see WS-MPA-11/7).

3.50 Dr Vacchi noted that, should future fishing activity occur in the area, targeting either *D. mawsoni* or *P. antarcticum*, it was likely that important trophic cascade effects would occur (due to the high density of top predators in the area foraging on these fish species).

3.51 The Workshop recognised the value of the Terra Nova Bay studies, documenting important levels of biodiversity, which also provided additional and important support for the Ross Sea candidate MPA suggested by New Zealand and the USA (WS-MPA-11/25). Given the spatial scale of Terra Nova Bay and its apparent unique ecological values, the Workshop also suggested that the authors of WS-MPA-11/14 should consider whether it would be appropriate to develop a proposal for an ASMA for the area, as such an ASMA could allow coordination of activities and could protect the special ecological values of the area, but nested within the larger Ross Sea region MPA.

Reference areas, research and monitoring

3.52 The Workshop recognised that the Southern Ocean offered important opportunities to study a wide range of ecosystem processes, including the effects of climate change and the effects of harvesting on ecosystem components. Consequently, one use of protected areas was as reference areas to study such ecosystem effects. Where the impacts of fisheries are to be considered, careful selection of reference and fished areas will be important and selected areas must take regard of historical harvesting impacts.

3.53 The Workshop noted that, where candidate protected areas were to be used as reference areas to help understand climate change or the ecosystem effects of fishing, only research fishing consistent with the objectives of the MPA and approved by the Scientific Committee should occur in the MPA.

3.54 The Workshop recognised that the values of MPAs as reference areas could be compromised should there be IUU fishing activity in that area.

3.55 The Workshop noted that further consideration of research and monitoring plans was needed for MPA proposals, potentially including any contributions from research fishing activities. The Workshop requested that the Scientific Committee consider how best to monitor individual MPAs.

Fishing capacity in relation to systematic conservation planning

3.56 The Workshop noted that one of the important planning issues that had been considered in the preparation of the Ross Sea candidate MPA had been the displacement of fishing effort which may cause vessel crowding (WS-MPA-11/25). The Workshop recognised that such considerations were important for both economic and safety reasons, especially in the Olympic-style fishery that operated in the Ross Sea region. It also recognised that vessel crowding was a different issue to being able to access catch limits. The Workshop considered that increased flexibility in MPA planning would be possible if fisheries were managed in ways that limited fleet capacity to levels commensurate with the fishable area or the catch limit. It therefore requested that the Scientific Committee and Commission consider alternative management approaches that may facilitate the MPA planning process, whilst maintaining economic and safety considerations.

PROGRESS WITHIN PREVIOUSLY IDENTIFIED PRIORITY AREAS

4.1 The Workshop reviewed progress toward the development of a system of MPAs within the 11 priority regions identified in 2008 (see Table 1) (SC-CAMLR-XXVII, Annex 4, Figure 12). The following papers presented to the Workshop describe work with particular relevance to MPA planning in these areas:

- priority area 1 – WS-MPA-11/24
- priority areas 2 to 6 – no papers
- priority area 7 – WS-MPA-11/5
- priority areas 8 and 9 – WS-MPA-11/8 to 11/10
- priority area 10 – WS-MPA-11/5, 11/7, 11/25
- priority area 11 – WS-MPA-11/14, 11/25.

4.2 The Workshop also discussed work in progress that was not presented in the tabled papers, but is nonetheless relevant to the development of MPAs both inside and outside the identified priority areas. The following ongoing research and/or MPA planning efforts were noted, with reference to the corresponding priority area, where applicable.

(i) Plans by Argentina to develop a proposal for an MPA, or system of MPAs, in the Weddell Sea and similar interest by the UK in seeing progress in this area. Noting that German researchers worked in this area for a long time, it was noted that any kind of cooperation would be helpful. The Workshop encouraged Members to work together to coordinate MPA planning in this area.

(ii) While a single MPA had been designated at the South Orkney Islands (priority area 2), additional work is required to achieve a representative system of MPAs in this region. Many of the environmental features and biological distributions

of particular importance to planning (e.g. fronts or preferred foraging areas for wide-ranging top predators, e.g. marine important bird areas) occur at a larger scale than was considered in the planning exercise by which the South Orkneys MPA was designed (SC-CAMLR-XXVIII/14). Such features are not represented in the existing MPA and this area would therefore benefit from inclusion in a broader-scale planning process. The Workshop noted that work was under way in the UK to progress MPA planning around South Georgia and the South Sandwich Islands (priority areas 3 and 4 respectively).

(iii) Considerable amounts of biological distribution data from radio-tracked animals, as well as environmental data collected from sensors attached to the tracked animals, were being collected in the area of Bouvet Island (priority area 5) and could be useful for MPA planning.

(iv) Work is under way by scientists in the USA that can progress MPA planning in the Antarctic Peninsula, including strong interest in doing 'ecoregionalisation', i.e. the use of biological data and modelled biological distributions to directly characterise environmental patterns (as in WS-MPA-11/7 to 11/10), as well as to define areas of particular priority for inclusion within MPAs. These approaches are particularly useful in the Antarctic Peninsula due to the availability of large amounts of high-quality biological distribution data, for example, in the US AMLR study area. The Workshop noted that these efforts would benefit from collaboration from different Members and encouraged Members with data or particular interests in the region to participate in the fine-scale analyses and MPA planning process. Dr G. Milinevsky (Ukraine) noted that Ukraine had data to contribute to this process in the vicinity of Vernadsky Station, and would participate in MPA planning in this area.

4.3 The Workshop noted that it may be useful to undertake larger-scale MPA planning in a unified way across all of Area 48 (from 70°W to 30°E, including priority areas 1 to 6), to ensure representative protection of larger-scale features in this region, and in parallel to address smaller patterns and processes particular to each individual priority area using finer-scale analyses embedded within the larger planning domain.

4.4 The Workshop further noted that a harmonised approach in the Antarctic Treaty System to spatial protection may result in having ASPAs and ASMAs designated by the ATCM within CCAMLR MPAs (paragraph 3.51).

Updated priority areas for MPA development

4.5 The Workshop noted that the priority regions agreed in 2008 (SC-CAMLR-XXVII, Annex 4, Figure 12) were developed with the aim of encouraging the initiation of MPA planning projects, and focusing limited resources on regions that were likely to be of ecological interest and where appropriate data were considered to be available. While these original priority areas had been useful in encouraging fine-scale analyses to progress MPA planning, the Workshop agreed that an updated mechanism was now required to facilitate planning and reporting on the development of a representative system of MPAs throughout the Convention Area. Such a revision would also incorporate new information and to

acknowledge finer-scale MPA planning efforts that are already under way in different regions, including those presented at the Workshop. The Workshop therefore identified possible gaps in the definition of priority areas and recommended that additional areas be defined consistent with current knowledge and under-way efforts. In particular, the Workshop noted the following omissions for which new priority areas should be defined:

(i) Prince Edward Island, del Cano and Crozet Island – An SCP approach to designate MPAs in the Prince Edward Island area is described in Lombard et al. (2007). Efforts to implement a system of MPAs based on this work are ongoing, and new work has been initiated by France in the Crozet Island area (see WS-MPA-11/7 to 11/10, 11/P1 and 11/P2). Collaborative efforts are planned between South Africa and France to coordinate planning for a system of MPAs between these areas.

(ii) The Amundsen Sea and Bellingshausen Seas – The Workshop noted the existence of a large gap in the designation of priority areas and the lack of work currently under way to develop MPAs in Subareas 88.2 and 88.3 east of the Ross Sea region, reflecting very low data availability in this area. The Workshop noted that the planned annual passage of the Korean research vessel *Araon* was a valuable opportunity to collect otherwise unobtainable oceanographic and biological data in this region. In particular, the routine deployment of a CPR and use of acoustic echosounders would be valuable to fill gaps in existing circumpolar datasets. The Workshop encouraged the Republic of Korea to collaborate with other interested Members to develop research programs to utilise the vessel in this way. Information on these areas might also be collected from remote sensing or sampling platforms (e.g. satellites and gliders) and from platforms deployed on animals like southern elephant seals (*Mirounga leonina*). The Workshop also noted the availability of data from benthic sampling by BAS in the UK, to inform MPA design in this area.

4.6 The Workshop recommended that research vessels that navigate CAMLR Convention waters should cooperate in data collection or research activities, including collection of biological, ecological and oceanographic information as required to meet the needs of CCAMLR, as determined by the Scientific Committee.

4.7 The Workshop agreed that it would be useful to define a planning schedule to progress MPAs in these areas (see paragraphs 6.19 to 6.23).

4.8 The Workshop encouraged development of a staged and nested approach, under which environmental data (i.e. bioregionalisation) are used primarily to define a representative system of MPAs in large planning domains, within which finer-scale planning processes are nested that rely more strongly on biological data and the identification of target areas of particular importance for inclusion within MPAs. This nested approach is consistent with the advice of the Scientific Committee that bioregionalisation occur separately within oceanographic provinces corresponding to statistical area boundaries, but that biological data be used at smaller scales where there is sufficient finer-scale data available and sufficient understanding of ecological processes (SC-CAMLR-XXIX, paragraph 5.16 and Annex 6, paragraph 3.124). The Workshop further noted that in the latter instance the use of target areas and protection targets within an SCP framework can reflect variable levels of data availability in different portions of the planning domain. This may be achieved because the

use of targets tightly constrains MPA scenario solutions in areas of high data availability and high priority for protection, but relies on bioregionalisation to achieve representativeness in data-poor areas where there are no identified target areas of particular priority for protection.

4.9 The Workshop agreed that the circumpolar pelagic bioregionalisation in WS-MPA-11/6 could be useful for analyses across larger planning domains, and noted that a comparable benthic bioregionalisation at a similar scale and resolution could be developed using currently available data layers.

## IDENTIFICATION OF CONSERVATION OBJECTIVES IN PRIORITY REGIONS

### Conservation objectives for MPAs

5.1 The Workshop recalled the outcomes of the 2005 MPA Workshop which considered the use of MPAs to further the objectives of CCAMLR (SC-CAMLR-XXIV, Annex 7, paragraphs 27 to 70) and that the following paragraphs from SC-CAMLR-XXIV were pertinent to this discussion:

> ‘3.53 The Scientific Committee noted that:
>
> (i) Article II establishes the basic objective of CCAMLR as the conservation of Antarctic marine living resources (where conservation includes rational use) and sets out the principles by which harvesting and associated activities shall be carried out (Annex 7, paragraph 28).
>
> (ii) Article IX further specifies the ways to give effect to the objective and principles of Article II. This article relates particularly to the development and use of conservation measures, specifically including the opening and closing of areas, regions or sub-regions for purposes of scientific study or conservation, including special areas for protection and scientific study (Annex 7, paragraph 29).
>
> 3.54 The Scientific Committee endorsed advice that:
>
> (i) MPAs had considerable potential for furthering CCAMLR’s objectives in applications ranging from protection of ecosystem processes, habitats and biodiversity, and protection of species (including population and life-history stages) (Annex 7, paragraph 126).
>
> (ii) Overall, when viewed in relation to the IUCN categories of protected areas, that the Convention Area as a whole would qualify as Category IV (Habitat/Species Management Area: protected area managed mainly for conservation through management intervention). This is defined as an area of land and/or sea, subject to active intervention for management purposes so as to ensure the maintenance of habitats and/or to meet the requirements of specific species (Annex 7, paragraph 127).

(iii) Conservation outcomes appropriate for achieving the objectives of Article II would include the maintenance of biological diversity as well as the maintenance of ecosystem processes (Annex 7, paragraph 129).

(iv) Attention may need to be given to the need for, inter alia, protection of:

(a) representative areas – a system of representative areas would aim to provide a comprehensive, adequate and representative system of MPAs to contribute to the long-term ecological viability of marine systems, to maintain ecological processes and systems, and to protect the Antarctic marine biological diversity at all levels

(b) scientific areas to assist with distinguishing between the effects of harvesting and other activities from natural ecosystem changes as well as providing opportunities for understanding the Antarctic marine ecosystem without interference

(c) areas potentially vulnerable to impacts by human activities, to mitigate those impacts and/or ensure the sustainability of the rational use of marine living resources (Annex 7, paragraph 130).

(v) The process for establishing a system of protected areas will need to have regard for the objective of the Commission to achieve satisfactory fishery outcomes in terms of sustainable rational use (Annex 7, paragraph 132).

3.55 The Scientific Committee noted workshop views on the potential importance of making provision in protected area systems for the protection of spatially predictable features (such as upwellings and fronts) that are critical to the function of local ecosystems (Annex 7, paragraph 131).'

5.2 Three invited independent experts to the MPA workshop, Prof. Rogers, Dr Smith and Dr Lombard, provided a statement addressing the following sub-points of Item 5. This statement is provided in Appendix D:

(i) identifying conservation objectives appropriate to different regions with reference to particular data layers and metrics against which achievement of objectives might be assessed

(ii) identification of the value of particular areas for rational use

(iii) methods for identifying and prioritising candidate sites for protection, including the means by which conservation and rational use objectives might be addressed.

5.3 The Workshop thanked the experts for their substantial contributions to the work of the Workshop.

5.4 The Workshop noted the invited experts' statement and that it reflects many views expressed throughout the meeting. The Workshop noted the importance of (i) defining clear objectives for MPAs, (ii) having clear approaches and methods to determine how the

objectives will be achieved by designating MPAs, (iii) providing explicit consideration of rational use, and (iv) devising a method for showing the trade-offs, if any, between possible MPAs and rational use.

5.5 Mr L. Yang (People's Republic of China) indicated that:

(i) MPAs should be based on scientific evidence available that clearly demonstrates the necessity for establishment of MPAs. The establishment of MPAs should not be based on a presumed basis

(ii) scientific activities and the passage of ships should be able to occur without being limited within the MPAs

(iii) the stakeholders should be fully consulted, and the cost to stakeholders (e.g. fishing), should be fully considered all the way through the MPA development.

Rational use

5.6 In order to achieve a representative system of MPAs, the Workshop noted that:

(i) the interests of rational use need to be accounted for in the process of establishing a network of MPAs

(ii) the objectives of each MPA need to be stated explicitly and the system of MPAs needs to take account of achieving the objectives over the region, noting that individual MPAs may have differing specific objectives to other MPAs, such as protection of vulnerable communities from fishing, reference areas for managing fisheries or for understanding impacts of climate change, or for providing protection to predators from direct competition with fishing

(iii) when an MPA is designed to include protection of spawning areas as part of stock management, then it would be beneficial for the Scientific Committee and, as appropriate, the working groups to review the implications for the stocks

(iv) individual MPAs may have zones within them to regulate different activities in different locations

(v) MPAs can be established using the precautionary approach and the performance of any of the MPAs with respect to their values need to be reviewed, based on monitoring or other data, to determine if the values of the MPAs are likely to have remained in the MPAs, particularly in light of the effects of climate change, and whether the MPA is still required and/or whether its boundaries should be revised or moved

(vi) the approach put forward by the experts has merit but that a variety of approaches can be used to develop a sound rationale and scientific support for establishing MPAs

(vii) in presenting a proposal for an MPA, an analysis, which may include an optimisation analysis, needs to be presented on the degree to which the objectives for an MPA have been met along with the degree to which rational use may be affected

(viii) stakeholder consultation is expected through the processes of the Scientific Committee and Commission.

5.7 The Workshop recognised that potential impacts of fishing included, inter alia:

(i) resource competition between fisheries and species dependent on the targeted species, possibly leading to impacts on other trophic levels – so-called trophic cascades

(ii) by-catch of non-targeted species and other habitat impacts

(iii) disturbance caused by shipping activity.

It recalled that such effects should be managed in a precautionary manner taking into account the state of available knowledge of the direct and indirect impact of harvesting.

5.8 The Workshop noted that where the impacts of fishing described in paragraph 5.7 may prevent the achievement of objectives for which the MPA is to be established, the prevention of those impacts provides a strong rationale for that MPA designation.

5.9 The Workshop noted that, in CCAMLR, the term 'conservation' includes rational use and that the term 'rational use' has never been defined, although it has received discussion in the Commission from time to time, including in 2010 (CCAMLR-XXIX, paragraphs 7.2 and 7.3). Nevertheless, it considered a number of issues related to rational use and the designation of MPAs.

5.10 Mr T. Kawashima (Japan) suggested that, during the development process for an MPA, it would be necessary to conduct an analysis on the effects of fishing activity in relation to the specified objectives and values of the MPA, in order to determine whether the effects from fishing activity would prevent the achievement of objectives and values of the MPA. He noted that fishing activity should not necessarily be stopped in an MPA, depending on the magnitude of the effect of fishing activity. He suggested that when the effects of fishing activity are limited, other types of regulatory tools, such as a reduction in the catch limit and/or seasonal closure, would be useful while continuing fishing activity in the MPA. He considered that the process by which regulation of fishing in an MPA should be determined should be based on the analysis of the effects of fishing activity.

5.11 The Workshop noted that conservation values in a particular protected area might not be seriously eroded if a small amount of fishing was allowed to take place inside that area. It would be useful to determine thresholds for activities that would not be expected to erode the values of the MPAs. It recognised that as effects from individual boats would almost certainly be cumulative, it may be difficult to determine in practice when the effects of an activity would have accumulated to the point that the values were about to be impacted. A possible approach is to assess thresholds of activity that do not require further studies for their determination. If activities were to be greater, then a two-part approach could be applied:

(i) studies on possible effects to increase the threshold; and/or (ii) monitoring during the activities to better assess whether cumulative effects may result in impacts on the values. Advice on these strategies would be useful.

5.12 The Workshop noted that the analysis required to determine whether the effects from fishing activity would prevent the achievement of objectives and values of the MPA also needs to assess the degree to which rational use will be enhanced by fishing in the MPA.

5.13 The Workshop recognised that candidate protected areas were intended to provide long-term protection and/or to act as long-term reference areas. Consequently, only activities consistent with the values of each MPA would be acceptable.

5.14 The Workshop noted that bentho-pelagic coupling would mean that multi-use candidate protected areas, such as Gunnerus in East Antarctica, would need careful consideration about where fishing activities were allowed. For example, the importance of benthic and/or deep habitat use by *E. superba* was becoming more apparent. Consequently, if krill are consumed by bottom-dwelling fish, then understanding food-web connections and bentho-pelagic coupling would be particularly important (see Belchier and Collins, 2008).

5.15 Prof. Rogers reminded the Workshop that the objective of CCAMLR was conservation, which also included rational use. He noted that MPAs should be considered as an integral part of the rational use of Antarctic marine ecosystems, as they were a tool that could be used to prevent changes, or minimise the risk of changes, to the marine ecosystem brought about by direct or indirect impacts of harvesting. He suggested that they could also help reduce effects associated with the introduction of alien species, protect genetic diversity and provide ecosystem resilience and buffering to environmental change. He noted that we are currently in a period of considerable environmental uncertainty and therefore MPAs are critical management tools.

5.16 In reflecting on the concept of rational use, Prof. Rogers suggested a definition for rational use might be

> 'The use of the resources of an ecosystem in such a way that the goods and services provided by that ecosystem are maintained in perpetuity along with the biological diversity and ecosystem structure on which they depend.'

## DEVELOPMENT OF WORKPLANS FOR PRIORITY REGIONS

### Papers and background documents

6.1 WS-MPA-11/21 drew the Workshop's attention to the recent publication of 'A Toolbox of Marine Protected Area Management Techniques for the Area Covered by the Antarctic Treaty and by CCAMLR'. This toolbox will be updated regularly and may be of use to individuals considering spatial management and protection issues throughout the Antarctic Treaty System.

6.2 Dr Milinevsky summarised WS-MPA-11/13 and drew the Workshop's attention to three main points from the paper. First, the paper suggested that it is very important to develop a procedure for submitting proposals and this procedure should define what must be

included in a proposal. The proposals should also state how long the MPA will remain in force and describe a review and revision process. Secondly, the paper suggested that the lack of a clear procedure for MPA designation means that there is a lack of management. Thirdly, the paper asserted that all proposals should include a management plan which states management objectives and how activities will be regulated. The paper also noted that MPAs can serve as valuable reference areas to study the impacts of fishing. Finally, the authors of WS-MPA-11/13 expressed their interest in seeing further development of a Ross Sea MPA proposal and further developments in management for the South Orkneys MPA.

6.3 The Workshop noted the paper's point that it would be useful if MPA proposals clearly indicate the activities for which management actions might be required. Some topics related to this issue were addressed in WS-MPA-11/13, but several of the suggestions presented in that paper were considered to be beyond the scope of the Workshop. It was also noted that the discussions occurring in the Commission include consideration of the types of activities that might be managed within MPAs. It was agreed that many of the suggestions made in the paper would be better addressed by the Scientific Committee and/or Commission.

6.4 The Workshop advised the Scientific Committee that WS-MPA-11/21 may provide useful information relevant to the conduct of future work. Discussion of issues raised in WS-MPA-11/13 might also be useful in the future.

6.5 The Workshop discussed the continued utility of the 11 priority areas designated in 2008. These priority areas were originally identified as areas where work could be focused and progress achieved in the short term, but work relevant to the areas outside the priority areas was also encouraged. Work conducted since 2008 has improved general understanding of the circumpolar distribution of bioregions and suggests that the 11 priority areas are not sufficient for ensuring comprehensive spatial planning throughout the Convention Area. Further, much of the work that has progressed to date does not fit neatly into the priority areas.

6.6 The Workshop agreed that an updated mechanism by which to plan and report on the development of MPAs was now required. As a result, it defined nine large-scale planning domains that cover the entire Convention Area (Table 2 and Figure 3). These planning domains also cover all 11 priority areas, and work to develop MPAs within the priority areas was still encouraged. The planning domains better reflect the scale and location of current and planned research efforts and, therefore, can be helpful as reporting and auditing units. Additionally, the planning domains provide comprehensive coverage of bioregions in the Southern Ocean and allow for effectively nesting fine-scale analyses of biological data within larger-scale analyses to help ensure that the system of MPAs developed for the Convention Area is representative as well as comprehensive.

6.7 The boundaries of the planning domains are not intended to confine or restrict research or other work to develop MPAs. The objectives and values for MPAs sited within each planning domain would still be determined on a case-specific basis, but comparison of such objectives and values across all MPAs within any single planning domain can provide a method for assessing the degree to which the MPAs are representative and comprehensive.

6.8 The Workshop recommended that the Scientific Committee consider the use of the nine planning domains as reporting and auditing units for work related to the development of MPAs and as a means to organise future activities related to this effort.

6.9 Workshop participants noted that some planning domains, particularly Planning Domain 9 which covers the Amundsen and Bellingshausen Seas, are data-poor. Supply vessels and other vessels may transit through these areas and may thus serve as platforms of opportunity to collect several types of data (e.g. CPR data, XBT data and hydroacoustics data).

6.10 The Workshop encouraged Members to investigate possibilities for collecting data from ships of opportunity and other platforms developed through SOOS. Meetings such as the SCAR Open Science Conference may provide particularly good opportunities for such interactions.

6.11 The Workshop encouraged Ms H. Kwon (Republic of Korea) to consult with her colleagues about collecting such data during transits that the new Korean icebreaker, *Araon*, may make between stations in the South Shetland Islands and the Ross Sea.

6.12 The Workshop recognised the value of creating a central repository for data, particularly GIS data layers, related to SCP and other work supporting the development of MPAs. The Workshop recalled its discussion of WS-MPA-11/20 (paragraphs 2.3 to 2.5) and noted that the GIS and accompanying database under development by the UK might provide an appropriate repository. The Workshop recommended that Members or organisations submitting papers to inform MPA planning also submit relevant data layers in GIS format, including outputs (e.g. candidate MPA boundaries), as well as inputs used in the planning process (e.g. bioregionalisations or identified target areas), for access by other Members and for possible inclusion in a CCAMLR GIS. Access to this data would facilitate transparent evaluation of candidate MPAs and of MPA planning methods. The Working Group noted that it would be necessary to establish a standard format for all submitted data and dealing with confidential information would be challenging and require careful consideration.

6.13 The Workshop also recognised that SCAR-MarBIN might provide a useful data repository for information supporting the development of MPAs in the Convention Area. Scientists can consult SCAR-MarBIN on data standards for biodiversity information and are encouraged to publish metadata and occurrence data to SCAR-MarBIN. Occurrence data can contribute to the development of biogeographical atlases for the Southern Ocean. SCAR-MarBIN contributors can control the release of data when requested. Metadata[1] will be openly available through SCAR-MarBIN to facilitate collaboration.

6.14 It was acknowledged that data used to underpin MPA proposals must be included in official CCAMLR documents and be available to Members according to the Rules for Access and Use of CCAMLR Data. This may require that key elements of a data repository are archived by the Secretariat.

6.15 The Workshop recommended that the CCAMLR Secretariat develop a set of options for establishing a data repository to support the establishment of MPAs in the Convention Area. In developing these options, the Secretariat should consider standardised formatting and links to other data-management efforts (e.g. the GIS being developed by the UK and SCAR-MarBIN). The options should subsequently be reviewed by the Scientific Committee, and, if a preferred option is ultimately identified, the MPA Special Fund should be considered as a source of funds to support the development of the data repository.

[1] Metadata is defined as a description of how, when and by whom a particular set of data was collected.

6.16 The Workshop noted that the potential development of MPAs under ice shelves might be of interest to the CEP. Following the collapse of ice shelves, benthic communities would be particularly vulnerable to invasion by non-native species. Understanding and addressing potential threats to biodiversity from tourism and other activities in these areas might require cooperation between the CEP and SC-CAMLR.

6.17 The Workshop noted that in the Ross Sea region and the Western Antarctic Peninsula, it would be worthwhile to consider ASMAs and ASPAs within any proposed MPA. This would provide a multi-level approach to area management, harmonise decisions made at the ATCM and CCAMLR, and allow for detailed consideration of activities not normally considered by CCAMLR; thus more comprehensive protection might be provided for such areas. The objectives for, and activities within, ASMAs and ASPAs inside MPAs would need to be compatible with the objectives of the overlying MPAs.

6.18 The Workshop recommended that the Scientific Committee consider how to address the protection of habitats underlying ice shelves and the options of having special protection areas within MPAs. It suggested that the CEP may wish to consider the concepts of ASMAs and ASPAs within MPAs.

6.19 The Workshop summarised the planning activities that have been reported to CCAMLR in the MPA planning domains in Table 2, including the status of future planning for developing proposals for MPAs in each domain in the future.

6.20 While evaluating progress made towards the development of a representative system of MPAs across the 11 priority areas and the new planning domains, the Workshop noted the WSSD deadline of 2012 and acknowledged that a large amount of work remains to be completed in a short amount of time. Although timelines for future work relative to several planning domains were not available to the Workshop (Table 2), it is unlikely that MPAs can be proposed for all planning domains by 2012. Fortunately, the work presented to this Workshop has demonstrated that work to develop MPAs can be progressed relatively quickly if there is a dedicated effort to do so.

6.21 The Workshop agreed that future work focused on the Western Antarctic Peninsula–South Scotia Arc domain, the del Cano–Crozet domain, and an SCP effort for all domains simultaneously would be particularly useful for progressing towards the 2012 deadline. The focus and intensity needed to advance this work in a short amount of time could be provided by holding new workshops to advance each of these efforts (Table 2).

6.22 The Workshop recommended that the Scientific Committee consider supporting three new workshops to focus work on the Western Antarctic Peninsula–South Scotia Arc domain, the del Cano–Crozet domain, and an SCP effort for all domains simultaneously. Such workshops may not need to be official CCAMLR workshops (thus eliminating requirements for Secretariat support and translation), but they would likely benefit from financial support (e.g. for experts and/or infrastructure support) provided through the CCAMLR MPA Special Fund. The new workshops could synthesize their work to provide background papers for discussion and review by WG-EMM.

6.23 The Workshop acknowledged that the Scientific Committee and WG-EMM have several other work priorities (e.g. the development of a feedback management strategy for the krill fishery), and advised that new workshops to progress the development of MPAs should

be considered within a larger prioritisation of the future work for these two groups. The Workshop requested that the Scientific Committee identify one or more coordinators for any workshop that it endorses.

## APPROACHES TO THE DEVELOPMENT OF MPA MANAGEMENT PLANS

7.1 There were no papers tabled under this agenda item and there was no general discussion of the subject. Specific issues relating to the monitoring and management requirements of the specific proposals for MPAs are reported in Item 3 (paragraphs 3.52 to 3.55).

## ADVICE TO THE SCIENTIFIC COMMITTEE, ITS WORKING GROUPS AND THE COMMISSION

8.1 Advice to the Scientific Committee is included in the following paragraphs:

(i) Bioregionalisation and SCP –

(a) development of a GIS tool, including a standard protocol for the submission of data to the GIS database and the need for periodic updates of bioregionalisation layers (paragraphs 2.5 and 2.8)

(b) the need for collaboration with other international organisations to measure the success of MPAs for predators when they are also foraging outside the CCAMLR area (paragraph 2.26)

(c) endorsement of ecoregionalisation to combine taxonomic and environmental data in delineating ecoregions (paragraph 2.28).

(ii) Review of draft proposals for MPAs or a representative system of MPAs in the CAMLR Convention Area –

(a) Regional sea-ice and ice-shelf features:

- the need for proposals to protect newly exposed benthic habitats created by ice-shelf collapse (paragraphs 3.6 and 3.7)

- consideration of the spatial protection in the Weddell Sea, including protection of the southern Weddell Sea as a means for monitoring change in these ecosystems as well as for providing climate change refugia (paragraph 3.10).

(b) East Antarctica:

- the proposed design for a representative system of MPAs in East Antarctica was supported by regionalisation and biogeographic analyses (paragraph 3.16)

- analysis of detailed studies in the Mertz region, including likely presence of VMEs (paragraph 3.21)

- request to expand the explanations detailing the ecological values and conservation objectives for each candidate MPA (paragraph 3.25).

(c) Ross Sea region:

- alternative approaches to the designation of an MPA over the Pacific–Antarctic Ridge and value of scientific surveys to determine spawning grounds of toothfish (paragraph 3.37)

- advice from the Scientific Committee and Commission necessary on appropriate level of representativeness to be included in MPAs (paragraph 3.38)

- identification of a strong rationale for achieving high levels of protection of particular ecosystem processes in the Ross Sea region (paragraph 3.40)

- protection objectives, target areas, and protection targets as used by New Zealand in its Ross Sea region MPA planning process (paragraph 3.41)

- consideration of the western boundary of the Ross Sea candidate MPA and planning initiative for East Antarctica (paragraph 3.44)

- different objectives of the US and New Zealand planning process in the Ross Sea region arising from different levels of accommodation of fishery outcomes (paragraph 3.45)

- potential development of a primary candidate MPA in areas of overlap in proposals, noting that the absence of a single agreed scenario was attributable to differences in policy aims that may benefit from discussion at the Commission level (paragraphs 3.46 and 3.47).

(d) Terra Nova Bay:

- recognition of importance of Terra Nova Bay potential to develop a proposal for an ASMA within a larger Ross Sea region MPA (paragraphs 3.49 and 3.51).

(e) Reference areas, research and monitoring:

- research and monitoring plans needed for MPAs (paragraph 3.55).

(f) Fishing capacity and SCP:

- alternative management approaches for fleet capacity levels (paragraph 3.56).

(iii) Progress within previously identified priority areas –

(a) a harmonised approach in the Antarctic Treaty System to spatial protection may result in having ASPAs and ASMAs designated by the ATCM within CCAMLR MPAs (paragraph 4.4)

(b) cooperation in data collection or research activities in the CAMLR Convention Area to meet the needs of CCAMLR, as determined by the Scientific Committee (paragraph 4.6)

(c) use of a nested design consistent with availability of data and ecological understanding (paragraph 4.8)

(d) utility of the revised circumpolar pelagic bioregionalisation and potential development of comparable benthic bioregionalisation (paragraph 4.9).

(iv) Identification of conservation objectives in priority regions –

(a) Rational use:

- request for advice on approaches to determine threshold levels for activities that might erode values of an MPA and the degree to which rational use will be enhanced by fishing in the MPA noting that only activities consistent with the values of each MPA would be acceptable (paragraphs 5.11 to 5.13)

- proposal for fishing activities in multi-use candidate protected areas to consider issues such as bentho-pelagic coupling and deep habitat use by *E. superba* (paragraph 5.14).

(v) Development of work plans for priority regions –

(a) information relevant to the conduct of future work by the Scientific Committee (paragraph 6.4)

(b) recommendation to use nine planning domains as reporting and auditing units for work related to the development of MPAs (paragraph 6.8)

(c) CCAMLR Secretariat to develop a set of options for establishing a data repository to support the establishment of MPAs in the Convention Area (paragraph 6.15)

(d) consideration of how to address the protection of habitats underlying ice shelves and the options of having special protection areas within MPAs (paragraph 6.18)

(e) request to include workshops to focus work on the Western Antarctic Peninsula–South Scotia Arc domain, the del Cano–Crozet domain, and an SCP effort for all domains simultaneously in the priorities for the Scientific Committee (paragraphs 6.22 and 6.23).

## CLOSE OF THE WORKSHOP

9.1 The report of the workshop was adopted.

9.2 Dr Penhale and Prof. Koubbi congratulated all participants on the successful conclusion of the workshop and thanked them for their contributions. They especially thanked the rapporteurs for producing the Workshop report.

9.3 The participants joined Dr Constable in thanking Dr Penhale and Prof. Koubbi for their work in preparation for, and during, the workshop and in thanking IPEV for the excellent facilities provided to support the Workshop.

9.4 The Workshop was closed.

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Table 1: Summary of progress towards the development of a system of MPAs within the 11 priority areas identified in 2008 (SC-CAMLR-XXVII, Annex 4, Figure 12). For each priority area, progress is described in terms of the achievement of work on the collation of data, fine-scale analyses, systematic conservation planning and the development of proposals. (Work in progress is denoted by 'P' and work completed is denoted by 'Y'.) The requirements for completion of individual steps is dependent on MPA planning processes defined on a case-specific basis, and the same set of steps may not necessarily be required for all planning processes.

| Subarea/division | Priority area | Environment data | Biological data | Biogeographic provinces | Rational use data | Objectives | Fine-scale analysis | SCP process | MPA scenario designs | Proposal | Values |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 48.1, 88.3 | 1 | P | P | P | P | | | | | | |
| 48.1, 48.2 | 2 | Y | Y | | Y | Y | Y | Y | Y | Y | Y |
| 48.2, 48.3, 48.4 | 3 | Y | Y | | P | P | | P | P | | P |
| 48.3 | 4 | Y | Y | | P | P | | P | P | | P |
| 48.6 | 5 | P | P | | | | | | | | |
| 48.6 | 6 | P | P | | | | | | | | |
| 58.4.1, 58.4.3a, 58.4.3b | 8 | Y | P | Y | Y | | | | | | |
| 58.5.1, 58.5.2 | 9 | Y | Y | Y | Y | Y | Y | P | | | |
| 58.4.1, 58.4.2 | 7 | Y | Y | Y | Y | Y | Y | Y | Y | N | Y |
| 58.4.1, 88.1, 88.2 | 10 | Y | Y | Y | Y | Y | Y | Y | Y | | Y |
| 88.1, 88.2 | 11 | Y | Y | Y | Y | Y | Y | Y | Y | | Y |

Table 2: Summary of MPA planning domains and the planning activities that have been reported to CCAMLR and the status of future planning for developing proposals for MPAs in each domain in the future. At the time of adoption it was acknowledged that additional information would be added to this table.

| Domain | Subarea/division (whole or part) | Name | Submitted papers and relevant report paragraphs (to be filled in for the Scientific Committee) | Activities |
|---|---|---|---|---|
| 1 | 48.1, 48.2, 88.3 | Western Antarctic Peninsula–South Scotia Arc | South Orkney Islands southern shelf:<br>WG-EMM-08/49<br>WG-EMM-08 report (SC-CAMLR-XXVII, Annex 4), paragraphs 3.49 to 3.59<br>WG-EMM-09/22<br>WG-EMM-09 report (SC-CAMLR-XXVIII, Annex 4), paragraphs 5.17 and 5.20 to 5.24<br>SC-CAMLR-XXVIII/14<br>SC-CAMLR-XXVIII, paragraphs 3.16 to 3.23 and 3.26<br>CCAMLR-XXVIII, paragraphs 7.1 to 7.8 and 7.14 to 7.17<br>WG-EMM-10 report (SC-CAMLR-XXIX, Annex 6), paragraphs 3.111 and 3.113<br>CCAMLR-XXIX, paragraph 7.7 | Workshop proposed for 2011/12 to develop and progress MPA proposals for this domain (likely conclusion of process post-2012). |
| 2 | 48.3, 48.4 | North Scotia Arc | | Active process to develop MPA proposals (timeline not available at Workshop). |
| 3 | 48.5 | Weddell Sea | | Progress encouraged for this region based on science by Argentina, Germany, UK. |
| 4 | 48.6 | Bouvet–Maud | Relevant paper:<br>Nost et al. (in press) | Unknown at the Workshop, although circumpolar analyses could contribute to the progression of representative MPAs in this domain.<br>CEMP monitoring data is available. |
| 5 | 58.6, 58.7, 58.4.4 | del Cano–Crozet | WS-MPA-11/8, 11/10<br>WS-BSO-07/P1 | Active process to develop MPA proposals (timeline not available at Worskhop). |
| 6 | 58.5, 58.4.3 | Kerguelen Plateau | WS-MPA-11/8 to 11/10 | Active process to develop MPA proposals (timeline not available at Workshop). |
| 7 | 58.4.1, 58.4.2 | East Antarctica | WS-MPA-11/5, 11/7<br>WG-EMM-10/26, SC-CAMLR-XXIX/11and BG/9 | Proposals can be developed based on work to date and comments at Workshop. |
| 8 | 88.1, 88.2 | Ross Sea Region | WS-MPA-11/14, 11/25<br>WG-EMM-10/11, 10/12, 10/30 | Proposals can be developed based on work to date and comments at Workshop. |
| 9 | 88.2, 88.3 | Amundsen–Bellingshausen | | Unknown at the Workshop, although circumpolar analyses could contribute to the progression of representative MPAs in this domain. |
| All domains | | | WS-MPA-11/6, 11/16 to 11/18, 11/23 | |

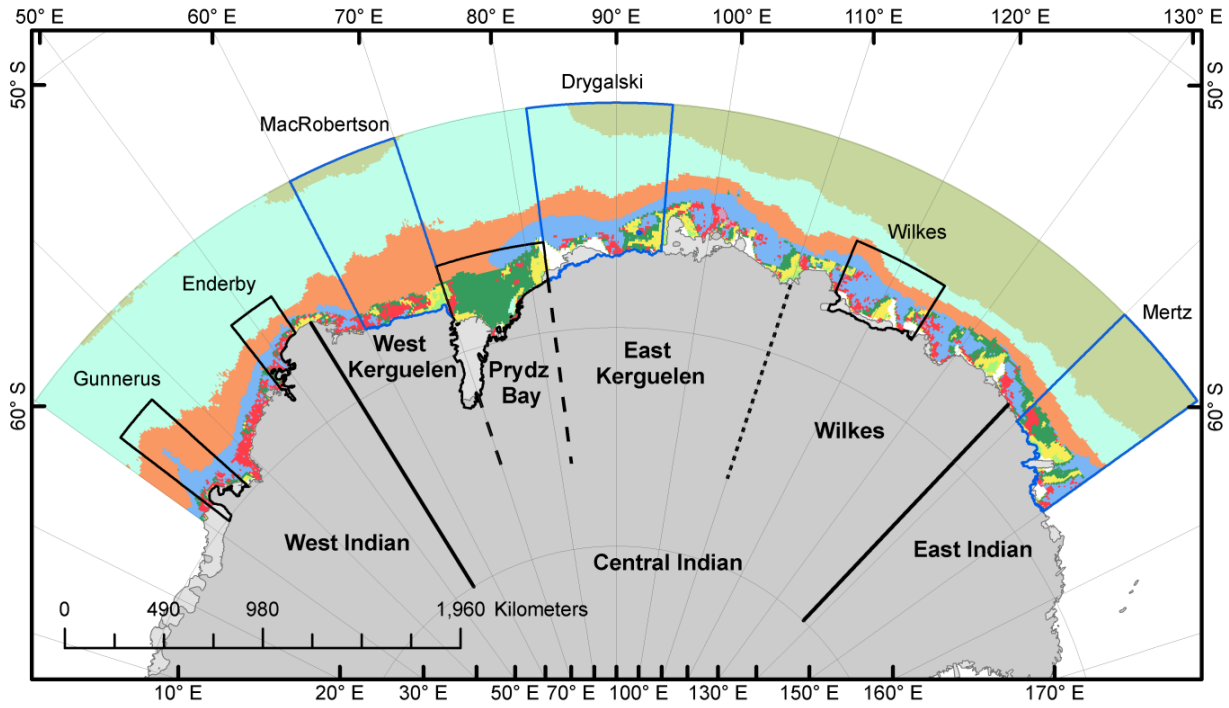


Figure 1[1]: Location of proposed MPAs in East Antartica (for details see Figure 7 in WS-MPA-11/23).

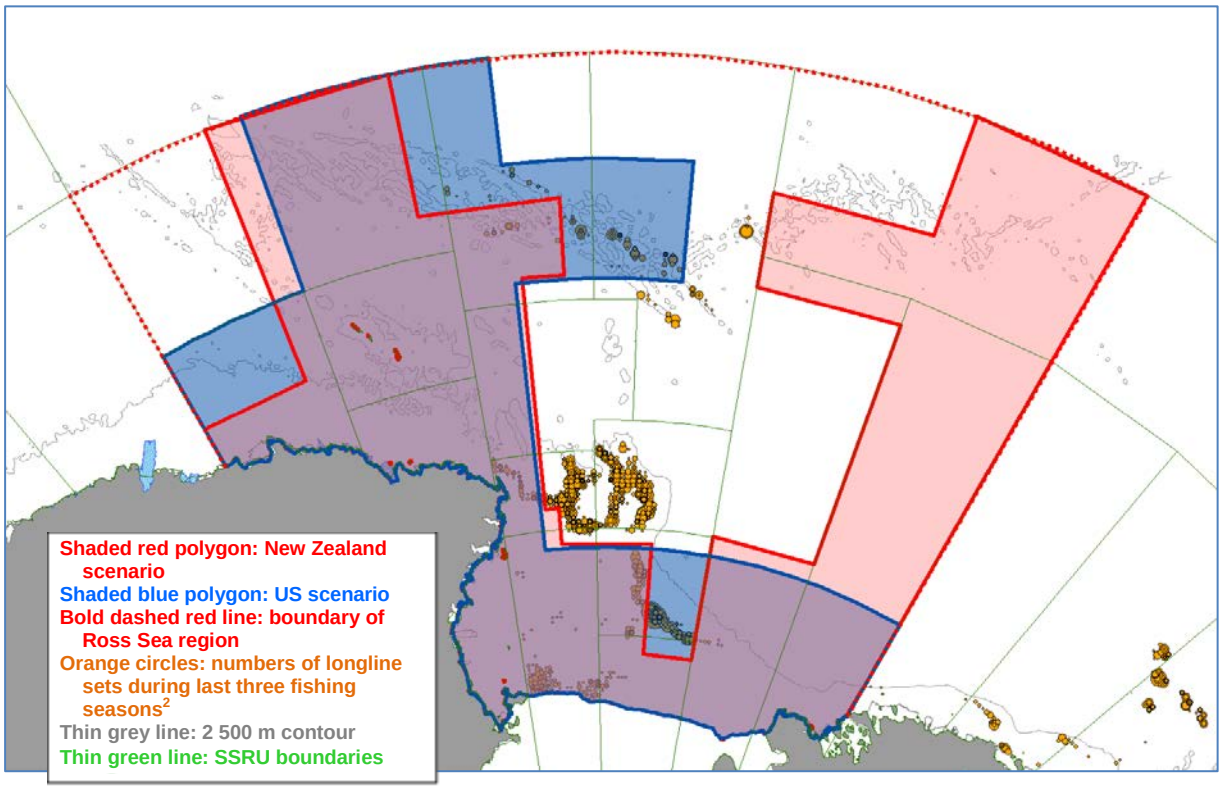


Figure 2[1]: A comparison of the MPA scenarios developed by New Zealand and the USA. [2]Data for the 2010/11 season are preliminary.

[1] These figures are available in colour on the CCAMLR website

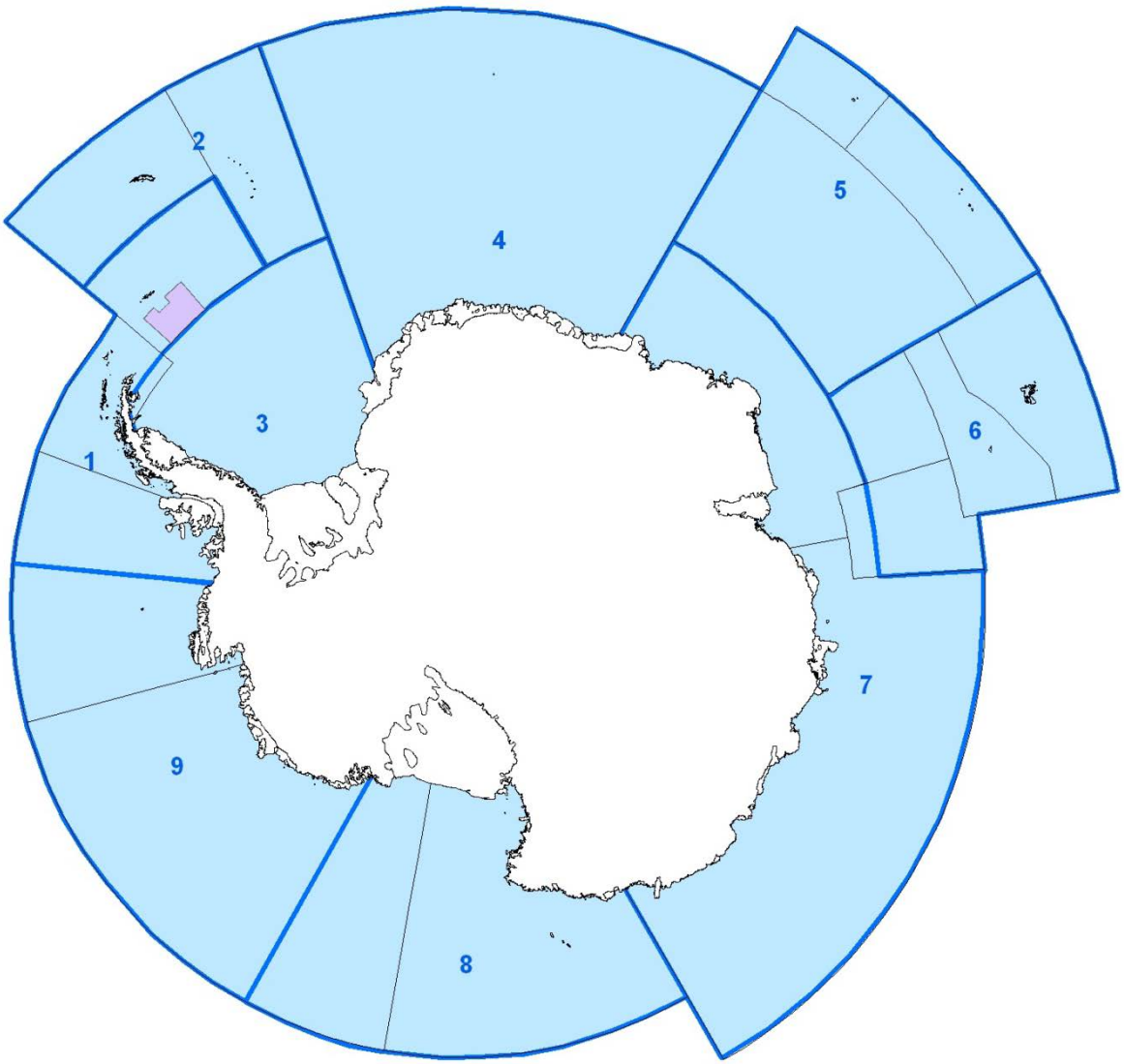


Figure 3: Planning domains defined by the Workshop to provide an updated mechanism by which to plan and report on the development of MPAs across the Convention Area. (1: Western Antarctic Peninsula–South Scotia Arc; 2: North Scotia Arc; 3: Weddell Sea; 4: Bouvet–Maud; 5: del Cano–Crozet; 6: Kerguelen Plateau; 7: East Antarctica; 8: Ross Sea region; 9: Amundsen–Bellingshausen.) Planning domain boundaries (thick lines) follow subarea boundaries (thin lines) where possible. The existing South Orkney Islands southern shelf MPA (shaded) is also shown.

APPENDIX A

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(Brest, France, 29 August to 2 September 2011)


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APPENDIX B

# AGENDA

Workshop on Marine Protected Areas
(Brest, France, 29 August to 2 September 2011)

1. Introduction and opening of the meeting

2. Bioregionalisation and systematic conservation planning

3. Review of draft proposals for MPAs or a representative system of MPAs in the CAMLR Convention Area

4. Progress in developing MPAs in priority regions

5. Identification of conservation objectives in priority regions

6. Development of workplan for priority regions

7. Approaches to the development of MPA management plans

8. Advice to the Scientific Committee, its working groups and the Commission

9. Preparation and adoption of the report.

APPENDIX C

## LIST OF DOCUMENTS

Workshop on Marine Protected Areas
(Brest, France, 29 August to 2 September 2011)

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| WS-MPA-11/1 | Draft Agenda for the 2011 Meeting of the Workshop on Marine Protected Areas (WS-MPA) |
| WS-MPA-11/2 | List of participants |
| WS-MPA-11/3 | List of documents |
| WS-MPA-11/4 | Summary of the work of the CEP on Marine Protected Areas<br>Antarctic Treaty Secretariat, c/o Dr P. Penhale, CEP Representative to the CCAMLR MPA Workshop |
| WS-MPA-11/5 | Identifying marine protected areas (MPAs) in data-poor regions to conserve biodiversity and to monitor ecosystem change: an Antarctic case study<br>A.J. Constable, B. Raymond, S. Doust, D. Welsford (Australia), P. Koubbi (France) and A.L. Post (Australia) |
| WS-MPA-11/6 | A circumpolar pelagic regionalisation of the Southern Ocean<br>B. Raymond (Australia) |
| WS-MPA-11/7 | Estimating the biodiversity of the shelf and oceanic zone of the d'Urville Sea (East Antarctica) for ecoregionalisation using the CEAMARC (Collaborative East Antarctic Marine Census) CAML surveys<br>P. Koubbi (France), G. Hosie, A. Constable, B. Raymond (Australia), M. Moteki (Japan), N. Améziane, R. Causse (France), V. Fuentes (Spain), K. Heerah, F. Penot, D. Vincent, A. Ancel, C.A. Bost, M. Eléaume (France), D. Lindsay (Japan), M. Lindsay (Australia), M. Cottin, J.B. Charrassin, Y. Ropert-Coudert (France), R. Toda, M. Grossmann (Japan), R. Hopcroft (USA), C. Ozouf-Costaz (France), I. Zimmer (Germany) and CEAMARC experts |
| WS-MPA-11/8 | Estimating the biodiversity of the sub-Antarctic Indian part for the ecoregionalisation of CCAMLR areas 58.5.1 and 58.6: Part II. Foraging habitats of top predators from French Antarctic Territories – areas of ecological significance in the Southern Ocean<br>K. Delord, C. Bost, C. Guinet and H. Weimerskirch (France) |

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| WS-MPA-11/9 | Estimating the biodiversity and distribution of the northern part of the Kerguelen Islands slope, shelf and shelf-break for ecoregionalisation: benthos and demersal fish<br>N. Améziane, M. Eléaume, P. Pruvost, G. Duhamel and Kerguelen group (France) |
| WS-MPA-11/10 | Estimating the biodiversity of the sub-Antarctic Indian part for ecoregionalisation: Part I. Pelagic realm of CCAMLR areas 58.5.1 and 58.6<br>P. Koubbi (France), P.A. Hulley (South Africa), B. Raymond (Australia), F. Penot, S. Gasparini, J.P. Labat, P. Pruvost (France), S. Mormède (New Zealand), J.O. Irisson, G. Duhamel and P. Mayzaud (France) |
| WS-MPA-11/11 | Systematic Biodiversity Planning to identify a potential offshore Marine Protected Area network for South Africa<br>K. Sink, M. Lombard (South Africa), H. Grantham (Australia), C. Attwood, R. Leslie, T. Samaai, S. Kerwath, T. Fairweather, C. van der Lingen, L. Atkinson, T. Wolf and P. Majiedt (South Africa) |
| WS-MPA-11/12 | Focal areas for marine biodiversity protection in KwaZulu-Natal, South Africa. Marine Systematic Conservation Plan Analyses (SeaPLAN): Summary of Results 2011<br>T. Livingstone, J. Harris, M. Lombard and E. Lagabrielle (South Africa) |
| WS-MPA-11/13 | On marine protected areas in the Southern Ocean<br>G.P. Milinevsky and S.B. Kovalonok (Ukraine) |
| WS-MPA-11/14 | Terra Nova Bay: hot spot in marine and terrestrial biodiversity, knowledge and functioning of the ecosystem<br>S. Torcini, M. Vacchi, S. Aliani, G. Bavestrello, A. Bergamasco, G. Budillon, B. Calcinai, G. Catalano, R. Cattaneo-Vietti, C. Cerrano, M. Chiantore, S. Corsolini, R. Bargagli, A. Dell'Anno, G. di Prisco, G. Fusco, S. Focardi, L. Gugliemo, G. Lauriano, P. Luporini, O. Mangoni, S. Olmastroni, F. Pezzo, E. Pisano, L. Ghigliotti, P. Povero, S. Puce, A. Pusceddu, E. Rusciano, M. Saggiomo, V. Saggiomo, M.C. Gambi, S. Schiaparelli, G. Spezie, C. Verde, P. Del Negro (Italy) |
| WS-MPA-11/15 | The 'CAML/SCAR-MarBIN Biogeographic Atlas of the Southern Ocean'<br>C. De Broyer (Belgium) and P. Koubbi (France) |
| WS-MPA-11/16 | An identification of areas within the high seas of the Southern Ocean that would contribute to a representative system of marine protected areas<br>L.L. Douglass, D. Beaver, J. Turner and R. Nicoll (WWF–ASOC) |

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| WS-MPA-11/17 | Climate change and precautionary spatial protection: ice shelves<br>P.N. Trathan and S.M. Grant (UK) |
| WS-MPA-11/18 | Climate change and precautionary spatial protection: seasonal sea ice<br>P.N. Trathan and S.M. Grant (UK) |
| WS-MPA-11/19 | Marine Protected Areas in the Southern Ocean: update on current status of designated areas<br>S.M. Grant and P.N. Trathan (UK) |
| WS-MPA-11/20 | CCAMLR spatial management GIS: potential applications for informing the development of a representative system of MPAs<br>S.M. Grant, S.L. Hill and P.T. Fretwell (UK) |
| WS-MPA-11/21 | A toolbox of Marine Protected Area management techniques for the area covered by the Antarctic Treaty and by CCAMLR<br>WWF and UK Foreign and Commonwealth Office |
| WS-MPA-11/22 | Designing Marine Protected Area networks: insights from the CHARM3 project<br>R.J. Smith and K. Metcalfe (UK) |
| WS-MPA-11/23 | A hierarchical classification of benthic biodiversity and assessment of protected areas in the Southern Ocean<br>L.L. Douglass, J. Turner, H.S. Grantham, S. Kaiser, R. Nicoll, A. Post, A. Brandt and D. Beaver (WWF–ASOC) |
| WS-MPA-11/24 | Conservation of Antarctic pack-ice seals with increasing krill fishing and environmental change<br>J. Forcada, P.N. Trathan (UK), P.L. Boveng (USA), I.L. Boyd (UK), D.P. Costa (USA), M. Fedak (UK), T.L. Rogers and C.J. Southwell (Australia) |
| WS-MPA-11/25 | Marine Protected Area planning by New Zealand and the United States in the Ross Sea region<br>B.R. Sharp (New Zealand) and G.M. Watters (USA) |
| Other documents | |
| WS-MPA-11/P1 | CEAMARC, the Collaborative East Antarctic Marine Census for the Census of Antarctic Marine Life (IPY # 53): An overview<br>G. Hosie, P. Koubbi, M. Riddle, C. Ozouf-Costaz, M. Moteki, M. Fukuchi, N. Ameziane, T. Ishimaru, A. Goffart<br>(*Polar Science*, 5 (2011): 75–87) |

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| WS-MPA-11/P2 | PECHEKER-SIMPA – A tool for fisheries management and ecosystem modeling<br>P. Pruvost, A. Martin, G. Denys and R. Causse<br>(In: *The Kerguelen Plateau Marine Ecosystem and Fisheries*. Duhamel, G. and D. Welsford (Eds), Société Française d'ichtyologie publ. (2011): 259–266) |
| WS-MPA-11/P3 | Biodiversity of the benthos off Kerguelen Islands: overview and perspectives<br>N. Améziane, M. Eléaume, L.G. Hemery, F. Monniot, A. Hemery, M. Hautecoeur and A. Dettaï<br>(In: *The Kerguelen Plateau Marine Ecosystem and Fisheries*. Duhamel, G. and D. Welsford (Eds), Société Française d'ichtyologie publ. (2011): 1–11) |
| WS-MPA-11/P4 | Major fishery events in Kerguelen Islands: *Notothenia rossii*, *Champsocephalus gunnari*, *Dissostichus eleginoides* – current distribution and status of stocks<br>G. Duhamel, P, Pruvost, M. Bertignac, N. Gasco and M. Hautecoeur<br>(In: *The Kerguelen Plateau Marine Ecosystem and Fisheries*. Duhamel, G. and D. Welsford (Eds), Société Française d'ichtyologie publ. (2011): 1–11) |

APPENDIX D

# EXPERT COMMENTARY ON OBJECTIVES, RATIONAL USE AND METHODS FOR IDENTIFYING MPAs

by Invited Experts to the Workshop:
Prof. A. Rogers, University of Oxford, UK
Dr B. Smith, DICE, University of Kent, UK
Dr M. Lombard, Nelson Mandela Metropolitan University
and University of Pretoria, South Africa

## 5.1 Identify conservation objectives appropriate to different regions with reference to particular data layers and metrics against which achievement of objectives might be assessed

Conservation objectives for any planning domain need to be translated into a list of conservation features such as important species, important habitats, biogeographic regions, areas with important ecological processes, etc. These features then need to be mapped and in some cases extra data might need to be collected to address data gaps. In addition, spatial and intensity data of rational use within the region need to be compiled (for example, the area and intensity of a particular fishing activity).

Comprehensiveness and representation can be assessed by setting quantitative targets for each conservation feature and compare current protection levels with these targets, as this provides transparency and scientific defensibility. In some cases there may be disagreement over target values for particular features, and in such situations we recommend undertaking sensitivity analyses (i.e. using a range of targets for different features) to investigate the impacts of different targets on conservation scenarios (e.g. a scenario for a 20%, or 40% protection of all benthic habitats). The systematic conservation planning approach attempts to meet all conservation targets, while minimising the impact on patterns of rational use. It is also possible to set targets for rational use, for example, a conservation scenario may wish to meet all biodiversity targets while NOT impacting by more than 10% on a particular form of rational use.

Measures of MPA design (size, shape, spacing) are an important metric of network adequacy. Where data exist on species-specific habitat requirements (e.g. penguin foraging areas), or on the spatial and temporal occurrence of nutrient-rich fronts or eddies, these data can also inform MPA design principles.

## 5.2 Identify the value of particular areas for rational use

The SCP process should begin with an assessment of how each conservation feature is affected by each form of rational use. Once particular areas have been identified for protection, then this general information should be supplemented with site-specific assessments, based on expert knowledge and literature reviews, of how each feature that it contains is affected by known patterns of rational use at that site.

5.3 Discuss methods for identifying and prioritising candidate sites for protection, including the means by which conservation and rational use objectives might be addressed

The systematic conservation planning approach is an adaptive process that is most successful when applied within an appropriate management framework. This framework should operate in a way that allows it to respond in a timely fashion to changes in availability of new information, patterns of rational use, policy frameworks, and other anthropogenic and natural environmental changes, as well as opportunities for collaborative management.

Currently the most common practice is to develop MPA networks informed by optimisation software outputs which can help to minimise impacts on rational use, although other GIS-based methods that account for targets and costs can also be used, particularly if they capture important implementation considerations (e.g. compliance issues). These approaches can be limited by a general lack of data or differences in the quantity and quality of data across different parts of a planning domain.

Prioritisation of spatial management measures within a network of proposed MPAs should be based on ease of implementation, vulnerability to current and future threats, and the contribution of the area to meeting targets. Zonation scenarios should be clearly defined with respect to which zone contributes to which target (i.e. which rational use activities are appropriate within each zone).