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Marine Protected Areas in the Southern Ocean

An iceberg in the Ross Sea, seen from the Hercules during the flight to Antarctica. Photo courtesy of Rickard Kennedy.

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Abstract

We have reached a critical turning point for Marine Protected Areas (MPAs) in the Southern Ocean. The Southern Ocean contains features of exceptional ecological value and scientific importance. It is one of the last great wildernesses of the world which has not yet been heavily impacted by human activity. There is growing international pressure for the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR) to provide more protection for Southern Ocean ecosystems than the current Regional Fisheries Management Organisation (RFMO) framework provides.

This report explores the use of MPAs as a management tool in the Southern Ocean. MPAs are effective management tools as they promote conservation and recovery of fish stocks at the ecosystem level. The success of MPAs in both near shore and high seas contexts were explored. Near shore MPAs have ample scientific evidence of their success but it was concluded that high seas have not been established for long enough to provide conclusive evidence of success. For MPAs on the high seas to succeed they must be well planned, include adequate resources to combat Illegal, Unreported and Unregulated (IUU) fishing and provide flexibility through adaptive management. While CCAMLR is governed by consensus decision making, the key challenge in the establishment of MPAs will be to balance the different agendas of conservation and exploitation of the 25 CCAMLR Members. The solution most likely to gain consensus is a create a network of MPAs in the Southern Ocean that incorporate a mixture of managed harvest and no-take areas. We expect that by the end of 2013 if CCCAMLR Members will reach consensus on the Ross Sea MPA Proposal, the Southern Ocean will then have its first large-scale, high seas MPA. This is an important step in creating a network of MPAs that will protect and conserve the Antarctic marine resources for us, and for future generations, to enjoy.

Contents

Introduction

1. The Southern Ocean

The Southern Ocean is an extraordinary ecosystem. Little is known about the Southern Ocean ecosystem even though it accounts for approximately 10% of the world's oceans (Grant, 2005). This region is home to a diverse range of organisms, some of which are not found anywhere else on earth. The majority of the species are pelagic and highly mobile, and may have habitat ranges of thousands of kilometres (Game *et al*, 2009).These organisms and the ecosystems they are a part of, make up one of the most productive marine areas in the world. The Southern Ocean provides humans with a number of resources and services which we are increasingly reliant on, but which are increasingly at risk from the actions of humans. Given the size of the Southern Ocean and the fact that marine life has remained relatively unaffected by human impacts, the marine resources of the Antarctic region are of global significance.

2. Focus of the Report

In writing this report we analyse the particular conservation challenges in protecting the wider Southern Ocean ecosystem through a system of Marine Protected Areas (MPAs). We outline the context of Regional Fisheries Management Organisations (RFMOs) and the role of the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR). We then examine MPAs and the rationale behind them, the evidence of MPA successes and the challenges of implementing a successful MPA. Finally, we look towards the future and explore the current MPA proposals in the Southern Ocean. Within the report we aim to answer three key questions:

1. Can MPAs on the high seas be shown scientifically to protect marine biodiversity and/or conserve fish stocks?
2. Is it reasonable to expect that a regional fisheries management organisation (RFMO) would be able to adequately reconcile the very different agendas of conservation and exploitation and attain consensus on developing a marine protected area network in the Convention Area?
3. Will a ban on fishing in parts of the CCAMLR Area serve as an MPA proxy in terms of protecting marine diversity and/or fish stocks, and if not, why not?

3. Regional Fisheries Management Organisations (RFMOs)

The Antarctic Treaty applies to the area south of 60˚S. Given that Article IV of the Antarctic Treaty essentially 'freezes' territorial sovereignty on the Antarctic continental landmass, there is an effective absence of national sovereignty over such areas (Antarctic Treaty 1959). This means that marine areas within the Treaty Area fall within the definition of 'high seas' provided by Part VII of the 1982 United Nations Convention on the Law of the Sea (UNCLOS) It follows that the preservation and conservation of living resources under Article IX(1)(f) of the Antarctic Treaty is not applicable to marine living resources, a matter later addressed by the 1980 Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR Convention). Under UNCLOS all countries have the freedom of access to the high seas and there are no restrictions of activities. Conservation objectives for the high seas are achieved on a voluntary basis.

Regional Fisheries Management Organisations (RFMOs) are inter-governmental organisations which are dedicated to the sustainable management of fisheries within international waters or of a migratory species (see Figure 1). RFMOs are increasingly seen as being viewed as "vehicles of good governance" and are created to secure the sustainable development of international fisheries (Sydnes, 2001). RFMOs vary in scope and in decision making and authority but the majority of RFMOs have management powers to set limits to both catch and fishing efforts. In an analysis of the institutional arrangements of regional fishery organisations, Sydnes (2001) concluded that UNCLOS explains variations in the scope of RFMOs, while organisational roles explain differences in decision making and authority. RFMO agreements generally contain a clause to the effect that nothing in the agreements should be construed to affect a Party's rights under UNCLOS (Schwarte & Siegele, 2008).

Illegal, unreported and unregulated (IUU) fishing is an issue in many of the world's oceans. Agnew, *et al.,* (2009) undertook the first, world-wide analysis of IUU fishing, providing a baseline which efforts to curb illegal fishing can be judged. The levels of IUU fishing were found to seriously hamper the sustainable management of marine ecosystems (Agnew *et al*., 2009). IUU fishing needs to be incorporated into RFMO management plans in order to address this issue. This is because information about IUU fishing, including the environment impacts needs to be included into fishing quotas and plans which aim to reduce the amount of IUU fishing occurring within the RFMO. CCAMLR is the RFMO charged with the management of marine life south of the Polar Front.

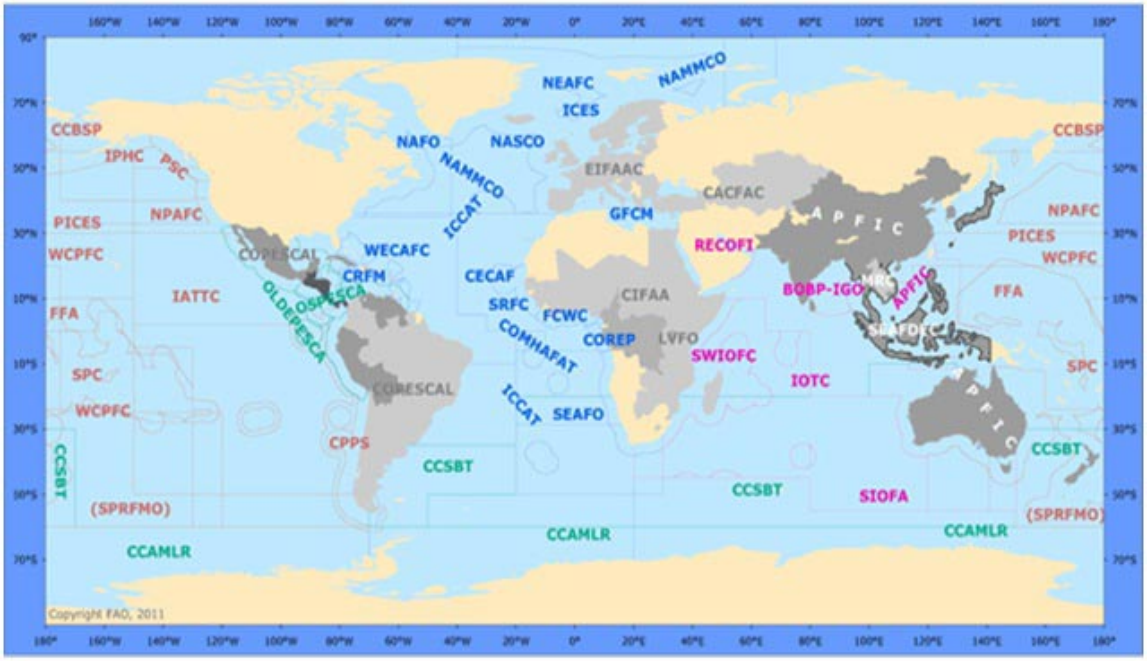

Figure 1: Map showing the location of RFMOs worldwide. Retrieved from (Food and Aquaculture Organization of the United Nations, 2013).

3.1. Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR)

During the 1970s commercial fishing of finfish began to take place on a large scale in the southern ocean. At this time there was also a growing investment in krill fisheries as countries, especially the former Soviet Union, explored ways to make use of this abundant resource (CCAMLR, 2012a). Parties to the Antarctic Treaty System recognised these activities as a threat to the stability of the Southern Ocean marine ecosystem. This highlighted the need for a management regime that would ensure the sustainable use of Antarctic marine resources (Grant, 2005). The Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR) was signed in May 1980 and entered into force in April 1982 (CCAMLR, 2012a).

While the Antarctic Treaty System (ATS) governs the area south of 60˚S, CCAMLR is responsible for a wider, specifically marine, region. CCAMLR governs the Antarctic marine environment up to an approximation of the Antarctic Convergence; the dynamic oceanographic and ecological boundary of the Southern Ocean (Grant, 2005). Figure 2 shows the CCAMLR boundary and its sub-regions in relation to Antarctica and the approximate location of the Antarctic Convergence.

CCAMLR has 25 Members (including the European Union) and a further 10 Acceding Nations. CCAMLR members have the power to make decisions at the annual meetings; however consensus

must be reached by all members before any measures can be passed. Of the 25 CCAMLR Members, 13 are nations with fishing vessels licensed under CCAMLR for the 2012/13 summer fishing season (CCAMLR, 2012a). The mixture of fishing and non-fishing nations underlies the presence of dual agendas in CCAMLR; that of conservation and exploitation. These differing agendas are the source of much debate in CCAMLR meetings and are a significant obstacle in reaching consensus.

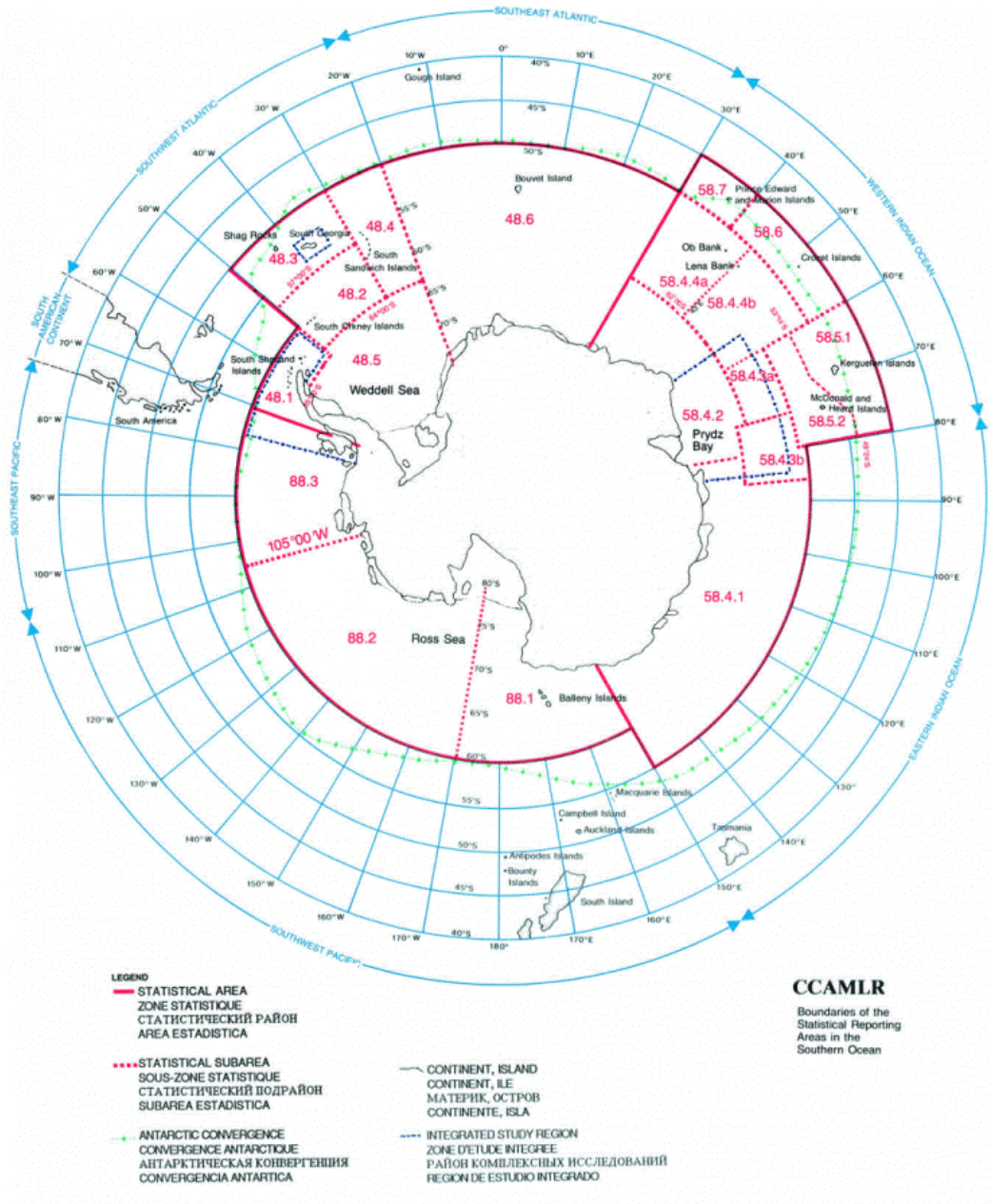

Figure 2: Map showing the boundary of CCAMLR and its sub-areas (CCAMLR, 2012a).

CCAMLR is primarily a fisheries management organisation but differs from other RFMOs as it has "a wider conservation mandate than any other RFMO" (Grant, 2005, p. 44). CCAMLR's aim is to preserve marine life of the Southern Ocean. To reach this goal the CCAMLR Commission, the decision making body established by the Convention, sets conservation principles that guide the implementation of conservation measures (the tools used to manage marine living resources in the CCAMLR area).

The principle conservation objectives of CCAMLR are detailed in Article II of the convention. Part 3 of Article II states that CCAMLR will:

a) Prevent populations from declining to a level that threatens stable recruitment of harvested species.
b) Maintain the ecological relationships between harvested, dependent and related populations.
c) Minimize the threat of changes to the marine ecosystem that cannot be reversed within 2-3 decades.

Part 2 of Article IX outlines the measures that CCAMLR can implement to manage resources. This article gives CCAMLR power to: set fishing quotas for species and areas, regulate harvesting methods, and designate areas as open or closed to fishing for purposes of scientific research or conservation (CCAMLR, 1980).

These conservation principles and measures were bold for their time as they pioneered the ecosystem approach to conservation. The ecosystem approach is defined by the International Union for Conservation of Nature (IUCN) as "the management of an ecosystem, based on the multiple functions that ecosystems perform and the multiple uses that are made of these functions" (Hammerlynck, 2011). Within CCAMLR this was interpreted to allow the rational use of resources, but only where it did not cause negative and long lasting effects on the wider ecosystem and its processes. These measures also incorporate the precautionary principle. This is where "scientific certainty of environmental harm is not required as a prerequisite for taking action to avert it" (Cooney, 2004, p.6). Under CCAMLR the precautionary principle is an important concept for encouraging conservation where large gaps exist in our knowledge of species and processes in the Southern Ocean.

CCAMLR's pioneering application of precautionary and ecosystem approaches in the management of harvesting has met with some success. Notably in applying conservative yield models for Patagonian Toothfish and Antarctic Krill stocks and in establishing strict rules for undertaking new and exploratory fisheries (Croxhall & Nicol, 2004). However, fisheries management is compromised by IUU fishing, especially of the Patagonian Toothfish (*Dissostichus eleginoides),* which is driven by forces beyond the Southern Ocean (Croxhall & Nicol, 2004). Southern Ocean harvestable resources are also subject to other global forces such as environmental changes, climate change (including ocean acidification) which are increasingly affecting the delicate balance of Southern Ocean ecosystems (Cameron *et al*, 2012). The success of CCAMLR as an RFMO also remains vulnerable to rapid shifts in worldwide fishery economics and to inadequate management in adjacent areas, particularly the high seas. CCAMLR needs to develop flexible and effective management tools in order to respond adequately to changes in these global forces. The complementary task, however, is to raise the management standard of other RFMOs to those of CCAMLR if global high seas marine resources are to be sustainable for the rest of this century (Croxhall & Nicol, 2004).

4. Marine Protected Areas (MPAs)

The IUCN defines MPAs as "any area of inter-tidal or sub-tidal terrain, together with its overlying water and associated flora, fauna, historical or cultural features, which have been reserved by law or other effective means to protect part or all of the enclosed environment" (IUCN, 2012). According to this definition any coastal or marine island ecosystem can be protected by an MPA. This definition does not automatically cover the high seas and the majority of MPAs have, to date, been established in inter-tidal and sub-tidal areas.

IUCN's MPA definition changed slightly following the 2004 Convention for Biodiversity (CBD) Conference (Hai-Dang, 2011). The CBD defines MPAs as "coastal or oceanic management area designed to conserve ecosystems together with their functions and resources" (de Fontaubert *et al*., 1996). This definition is better suited for the establishment of MPAs in the high seas.

4.1. The Purpose of MPAs

As a result of the range of MPA definitions there have been a number of different types of MPAs established. Examples include marine parks, fisheries resources and marine sanctuaries (Argardy *et al.,* 2003). MPAs differ in regard to the limits placed on particular activities, ranging from

protection of certain species, to a ban on all human activity (Schwarte & Siegele, 2008). While the application of MPAs differs according to the area or feature that is to be protected, MPAs can be seen to perform just a few key functions. The first is the conservation of marine ecosystems through the protection of critical habitats, species and processes from human impacts. The second function is the sustainable management of fish stocks. Other minor functions include providing the framework for scientific research, enhancing tourism, and preserving cultural, historical, spiritual and aesthetic values (Hai-Dang, 2011).

4.2. Historical Marine Protection in Antarctica and the High Seas

In 1985 the first MPAs were proclaimed over small, mostly coastal, areas (Argardy *et al.,* 2003). By 1995 there were over 1300 MPAs worldwide (Argardy *et al.* 2003). MPAs are found in virtually all coastal countries including Antarctica. Before CCAMLR was established a very small area (0.012%) of Antarctica's marine ecosystem was protected by Antarctic Specially Protected Areas (ASPAs) (Grant, 2005). ASPAs are designated under Annex V of the Protocol on Environmental Protection (CEP) within the ATS. They aim to protect areas (whether terrestrial or marine) of "outstanding environmental, scientific, historic, aesthetic or wilderness values…or scientific research" (United Kingdom Consultative Party, 2006). ASPAs with a marine component, which are still valid today, are limited in the level of protection they afford. This is because they only provide protection for the foraging grounds and coastal habitats of seabirds (especially along the coastal areas of the Antarctic Peninsula) (Grant, 2005).

Older ASPAs with a marine component were established before the IUCN first proposed the concept of MPAs and, as a consequence, ASPAs and MPAs have some significant differences. ASPAs are based on pure conservation and focus on protecting the species and habitats. MPAs often allow for the rational use of resources as a part of wider conservation objectives. An example of this is the proposed CCAMLR MPAs. CCAMLR's definition of conservation allows for rational use of resources and proposed MPAs in the area are likely to include a combination of controlled harvest and no-take areas (CCAMLR, 2005).

Before CCAMLR was established there was little protection of the Southern Ocean marine ecosystem. In the past remote, deep water areas were "natural refuges" as they were not accessible to fishermen (Argardy *et al.,* 2003). Improving technologies and an increase in fishing effort mean that the high seas are no longer places of refuge (Argardy *et al.,* 2003). Worldwide,

the vast majority of MPAs are located along coastlines, whilst the more distant offshore areas remain relatively unprotected in comparison. These offshore areas are dominated by pelagic communities which Game *et al*., (2009) concludes, directly or indirectly support most marine life. The areas are under threat of overfishing, pollution, climate change, eutrophication, and introduced species, all of which can alter the pelagic community (Game *et al*., 2009). Some progress has been made in the conservation of the high seas ecosystems with the establishment of RFMOs worldwide. However, most RFMOs that incorporate regulations for pelagic ecosystems are based around fisheries management, not about the conservation of the ecosystem as a whole (Grant, 2005).

4.3. Criteria and Process for Selecting MPAs

According to the CBD there are some key criteria that must be considered for an area considered for an MPA (United Nations Environment Programme, n.d.). An MPA should include some, or all, of the following:

- Unique, rare or endemic species, habitats, or oceanic features.
- Special importance for the life-history stages of certain endangered or threatened species.
- Habitats which are essential for the survival of target species.
- High diversity, whether the diversity is within the ecosystems, habitats, communities, species or genetic diversity.
- High degree of naturalness (a low level of human induced disturbance).

Countries wanting to incorporate MPAs into their management are able to do so if the area selected is within their Exclusive Economic Zone. For example; the Macquarie Island MPA is within the Australian EEZ and was established by the Australian Government. Many of the sub-Antarctic islands are territories of states and are not within the Antarctic Treaty Area. Therefore these states are within their rights to also claim an EEZ in around those islands though the islands may be within the CCAMLR area. These countries are also free to establish MPAs within the EEZ of these islands. However, there is pressure for CCAMLR Members creating MPAs within the Convention Area to uphold the values of CCAMLR in the management plans for the MPAs.

Difficulty arises when a MPA is proposed in the wider CCAMLR area. As explained in the introduction Antarctic waters are regarded as the high seas. In the high seas no state has

jurisdiction, therefore no state can dictate an MPA in these waters. It is therefore up to the RFMOs (in this case CCAMLR) to propose MPAs. The establishment of an MPA in Antarctica is made more difficult due to CCAMLRs consensus requirement. If consensus cannot be reached, the MPA will not be established.

Conservation and science are important parts of MPAs. An important step in establishing successful MPAs is to ensure the conservation and science underlying the proposal is understood (Argardy *et al.,* 2003). If this is ignored then both resource managers and policymakers may "make ill-informed decisions regarding MPAs, resulting in poor MPA design and performance" (Argardy *et al.,* 2003). As Antarctic high seas MPAs can be considered to be leading the field, the more that this can be avoided the better.

4.4. MPA Rationale

CCAMLR has recognised that its current management tools available under CCAMLR provisions (notably fishing bans) could be used to protect marine areas in the Southern Ocean that meet MPA criteria (explained in the above section 3.1). However there are a number of shortcomings with fishing bans that would make it difficult to imitate the estimated results of a representative network of MPAs in the Southern Ocean (United Kingdom Consultative Party, 2006).

MPAs are increasingly being used worldwide as an effective management tool, achieving a broad range of conservation and resource management objectives. At the World Summit for Sustainable Development (WSSD), held in 2002, Governments committed to the establishment of a worldwide network of MPAs by 2012 (United Kingdom Consultative Party, 2006). This agreement was supported by the development of a programme of work relating to MPAs by the governing body of the Convention on Biological Diversity (CBD) in 2004 (Hai-Dang, 2011).

As an organisation responsible to the management of high seas resources CCAMLR has an obligation to participate in the international initiative for the establishment of MPAs. Furthermore many of CCAMLR's member nations have made individual commitments to creating MPAs in their own territories (CCAMLR, 2005). This international pressure has provided a strong incentive for CCAMLR to explore MPAs as an additional conservation and management tool.

In 2005 CCAMLR held a workshop on MPAs. The workshop recognised that a network of MPAs in the Southern Ocean would further the objectives of the Convention. Under the provisions of

Article IX, CCAMLR has closed a number of areas to fishing. The motivation behind these measures has primarily been management of specific fisheries rather than ecosystem conservation (CCAMLR, 2005). Paragraph (i) of Article IX directs "the taking of such other conservation measures as … necessary for the fulfilment of the objective of this Convention, including measures concerning the effects of harvesting and associated activities on components of the marine ecosystem other than the harvested populations" (CCAMLR, 1980). MPAs could help CCAMLR to realise conservation on a wider ecosystem scale; where management had previously emphasized protection of selected fisheries.

MPAs encourage conservation on the ecosystem scale because they have broader objectives than CCAMLR fishing bans. Fishing bans under CCAMLR are generally prescribed to maintain and rebuild fish stocks of a certain species, in a specific area, or both. MPAs do not only provide for the conservation of fish stocks but encourage the recovery and maintenance of the ecosystem as a whole. MPAs also preserve areas from human impacts for special uses. Examples of these uses are: the protection of "rare, fragile and critical habitats of the marine environment"; reference areas for research on environmental change; and as a safeguard against the failure of fisheries management elsewhere (Hai-Dang, 2011, p.11, Grant, 2005).

Using MPAs for different objectives as a part of a wider network further strengthens conservation, as a more representative set of ecosystem features receive some form of protection. This is in comparison to the application of fishing bans and ASPAs which have been established in an ad hoc fashion in the past (United Kingdom Consultative Party, 2006).

Broad conservation objectives lend MPAs flexibility in management. Different levels of protection can be established for each area according to their ecosystem features. This flexibility allows for the 'rational use' of resources which is written into Article II of CCAMLR (CCAMLR, 1980). Rational use of resources is an important factor in any decision relating to CCAMLR as many members have fisheries investments in the Southern Ocean. These countries continue to argue in support of rational use of Southern Ocean resources as the fisheries are a source of income for countries and individuals. If fishing bans were used as a proxy for MPAs the livelihood of many people would be threatened (Hai-Dang, 2011).

Another argument can be made for rational use where it provides a source of funding for research. Vessels licensed under CCAMLR are required to have on board an independent scientific observer who reports to CCAMLR. Vessels also have strict requirements to report their catch

statistics to CCAMLR on a regular basis (CCAMLR, 2012a). These measures directly fund research in the CCAMLR area. Fishing companies also indirectly fund research through taxes paid to their respective governments. If CCAMLR management tools were confined to fishing bans an important avenue for research would be lost.

The longevity of MPAs is another advantage over fishing bans. MPAs provide for the long term conservation of an area. Fishing bans under CCAMLR regulations are reviewed annually and can be reversed upon the advice of the Commission's Scientific Committee (CCAMLR, 2012a). CCAMLR has recognised that if it were to use fishing bans as a proxy for MPAs it would need to ensure fishing bands were "indefinite or sufficiently long term to satisfy their objectives" (United Kingdom Consultative Party, 2006).

While fishing bans are a useful tool in CCAMLR fisheries management but they will not serve as an adequate alternative to the establishment of MPAs. Instead, they will be best used in combination with other management tools across a network of MPAs in the Southern Ocean.

4.5. Success of MPAs

There is a growing amount of scientific research in support of MPAs. A number of MPAs, not only of the high seas, have shown success in the recovery of population sizes of different species and stabilization of fish stocks. There are many potential benefits of MPAs including increases in species density and biomass, as well as individual size increases of target and non-target species (Bloomfield *et al.*, 2012). There are also many benefits to areas adjacent to the MPA, especially for fisheries, as there is an export of larvae, juveniles and adults from the protected areas into the surrounding oceans, replenishing the fish stock. This over flow effect will depend on the targeted fishery and its life history, levels of previous exploitation and habitat range (Bloomfield *et al.*, 2012). Three examples of successful MPAs with different management and governance structure are explored below.

4.5.1. Poor Knights Islands Marine Reserve

The Poor Knights Islands Marine Reserve is one of many marine reserves found within New Zealand's EEZ and has had a substantial amount of scientific research conducted within it over many decades (see Figure 3). Marine Reserves are a sub-set of MPAs. Marine Reserves allow no fishing (not even recreational), no construction, dumping of waste or disturbance within its

boundaries. However recreational activities are allowed, for example swimming and scenic diving or snorkelling. The waters around New Zealand are rich in seafood and the snapper industry caught huge amounts of fish of the North Island coast in the 1960s to 1970s. In the 1980s the industry crashed through over overexploitation and to help recover the snapper population the Poor Knights Island Marine Reserve was established. Snapper biomass has increased by 818% since the marine reserve was opened in 1981 and the number of large snapper has increased 7.4 times (Denny *et al*, 2004). These statistics are not found outside of the reserve, suggesting continued over-exploitation beyond the reserve boundaries. Kelp forests in the park have also increased by 100% since being decimated by a storm in 1993, suggesting a healthy ecosystem within the reserve.

Figure 3: Map showing the location of the Poor Knights Islands Marine Reserve. Retrieved from (Kilroy Travels, n.d.)

4.5.2. Macquarie Island MPA

The Macquarie Island Marine Park is located in the Southern Ocean between Tasmania and Antarctica (see Figure 4). Macquarie Island is an Australian territory which is outside of the Antarctic Treaty and CCAMLR boundaries. This MPA therefore sits within the EEZ of Australia and is not considered a high seas MPA. Trebilco *et al.,* (2008) carried out a study on the Southern and Northern Giant Petrel foraging areas. Through satellite tracking, the movements of 19 birds were tracked. It was found that the birds spent a significant time in the MPA zone, especially when rearing chicks. A possible explanation for this is that the recovering fish stocks in this area provide abundant food for the birds and their young. Similar patterns have been found with king penguins of Macquarie Island. Weinecke & Robertson (2002) found that the king penguins spend the majority of their foraging time within the boundaries of the MPA. Black-browed albatross and grey-headed albatross were found to spend 90% and 35% of their foraging time, respectively within the MPA during egg incubation (Terauds *et al.*, 2006).

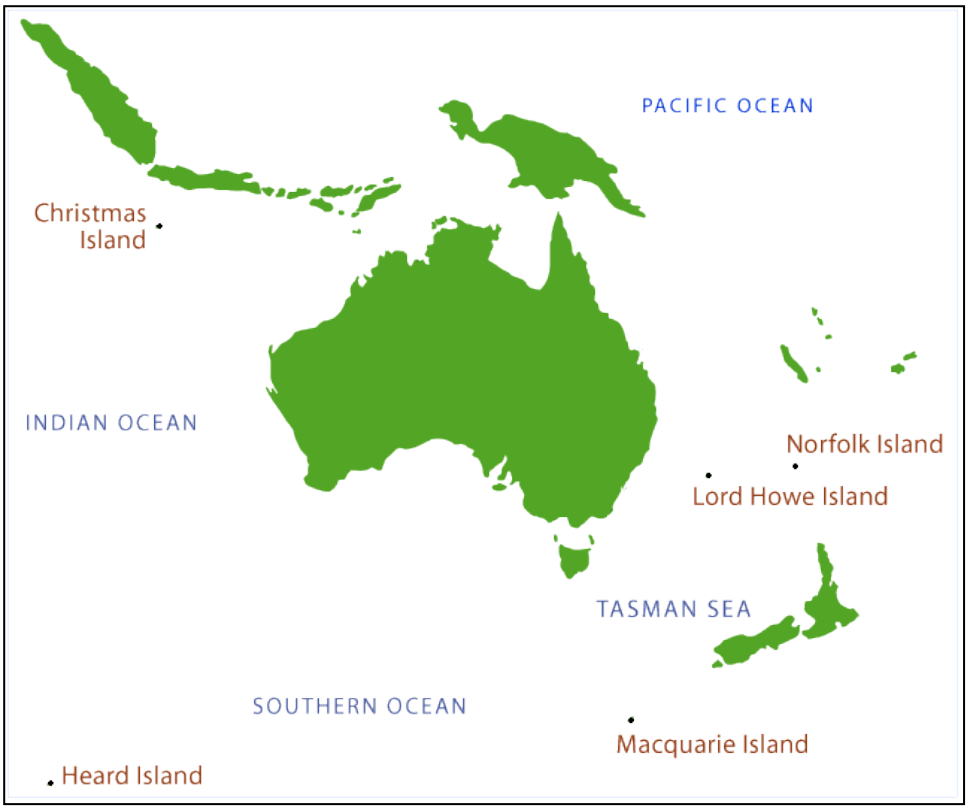

Figure 4: Map showing the location of Macquarie Island. Retrieved from (Australian Biological Resources, 2012).

It is interesting to note Trebilco *et al.,* (2008) found that after fledging, the Giant Petrel moved further afield and spent a significant amount of time on longer trips into the CCAMLR subareas 88.1 (the Ross Sea) and 58.4.1. These areas currently have low standards of observer coverage and by catch mitigation, so fisheries related mortality is likely to pose a significant

risk (Trebilco *et al*., 2008). This example suggests that MPAs will be more successful where there is integration of management within and around MPAs.

4.5.3. South Orkney Island MPA

The first high seas MPA, the South Orkney Islands Continental Shelf MPA, was established in 2009 (see Figure 5). It is located within CCAMLR jurisdiction and was established by CCAMLR partly as a trial for high seas MPAs. The last 4 years have not been adequate to gain conclusive data on the South Orkney Island MPA that shows positive changes to biodiversity, population, or fish stock numbers. Many of the pelagic species that are found within this MPA are long-lived and 4 years is not enough time to see any real changes. Since the construction of the South Orkney Islands MPA, there have been five other high seas MPAs added around mid-ocean ridges and seamounts in the northeast Atlantic (WWF, n.d.). All these MPA's are in their first few years of protection. Many species take years to recover after exploitation so scientific evidence to support MPA's on the high seas is lacking at this point in time.

The South Orkney Islands MPA is considered a highly productive area that is a key habitat for krill, a main food source in the Southern Ocean ecosystem (Ammann, 2009). It consists of submarine shelves and sea mounts that include pelagic communities as well as the benthic communities. In the preliminary analysis of the area, over 1200 species were found including marine and land animals, of this half were not previously thought to be living in that region and of that, five of them were new undefined species (Ammann, 2009).

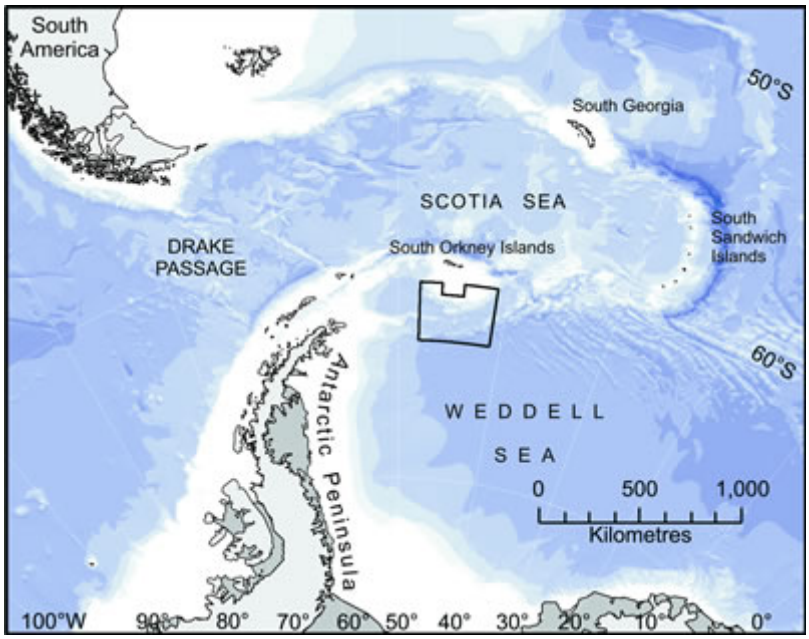

Figure 5: Map showing the location and extent of the South Orkney Islands MPA. Retrieved from (Whale and Dolphin Conservation Society, n.d.)

In the current rush to establish MPAs, there have been a small number that have failed to reach their objectives. This is caused by a lack of scientific evidence to support the establishment of a sound MPA management framework, and a lack of funds for the continuation of enforcement and research in the MPA. These MPAs are considered 'paper only' MPAs due to their ineffectiveness (Scripps Institution of Oceanography, 2012). In some instances MPAs have not seen any real improvements following the establishment of protective measures. For example, in 2003 an area of the Labrador Sea near Canada was closed to trawling due to the decline of Snow Crab fisheries. So far there has been little evidence of any recovery in populations of the Snow Crabs. This may be due to the MPA not covering enough of the crabs range or habitat. There may also be other influences affecting the Snow Crabs which were not taken into consideration when the MPA was established (Mullowney *et al.*, 2012). These examples of MPA failures highlight the importance of adequate planning and implementation of MPAs.

While we cannot conclusively show that MPAs on the high seas will be successful, initial indications suggest we may see improvements in the next few years. There is however plenty of evidence showing the success of more traditional in-shore MPAs and if high seas MPAs are planned and implemented to the same high standard then there is reason to expect that high seas MPAs will see similar successes.

4.6. Challenges of MPAs

4.6.1. Governance and Enforcement on the High Seas

The nature of international law regarding the high seas makes governance challenging. Article 87 of UNCLOS states have the right to fish in the high seas as these regions are global commons (UNCLOS, 1982). This right also comes with responsibilities. Under UNCLOS states have a duty to ensure the conservation of living resources which is to be based on the "best available scientific evidence" (UNCLOS, 1982). There needs to be integration between international agreements to ensure that that conservation measures based on good science is included in treaty obligations such as the CAMLR Convention along with recognition of the right to fish. Finding the balance between states' rights and responsibilities is challenging as reaching consensus on what 'conservation' entails is never easy. Countries have differing conservation agendas as a result of their individual government, culture and history. When a

number of countries come together, as in the case of CCAMLR, it can take a long time to reach an agreement that is suitable and achievable for all parties.

Successful MPA management plans need to ensure that regulations are practical for all parties and will be adhered to. However as mentioned in Part 3 of this report, MPAs will have to be aware of, and prepare for, the problem of IUU fishing. By allocating resources for enforcement of regulations MPAs will be able to better conserve the resources of the Southern Ocean. It is possible that MPAs will encourage IUU fishing as the number of fishing restrictions increases. CCAMLR will have to trade off these negative effects against the potential benefit gained from the protected areas.

Some CCAMLR enforcement methods are the mandatory use of Vessel Monitoring Systems, the inspection and observer schemes, and the Catch Documentation Scheme (CCAMLR, 2013). Countries, including Australia (Delegation of Australia, 2010), New Zealand (Ministry for Primary Industries, 2010) and the United States provide surveillance patrols (both aerial and on the water) within the Convention area to help with the identification of IUU fishers as enforcing penalties (United States Department of State, n.d.). In addition to this the industry, including the Coalition of Legal Toothfish Operators (COLTO) are also working towards reducing IUU fishing (COLTO, 2013).

There are some improvements that CCAMLR could consider making in regards to IUU fishing. These include encouraging the amount of information shared about known and suspected IUU fishers. CCAMLR could also support the development of satellite technologies used to improve the monitoring and identification of IUU fishers. Work could also be done to make it more difficult for IUU fishers to bring their catch to market, for example by introducing a system, like the United States has done, where shipments need prior approval before entering a country's markets, (Australian Fisheries Management Authority (AFMA), 2012). If IUU fishing becomes a significant issue than increase in the number of surveillance patrols might be required, at a further economic cost to CCAMLR.

Funding is another issue to consider when MPAs are being planned. As part of the current CCAMLR system Members pay an annual contributions which is based on how much vessels flagged to that Member catch (AFMA, 2012). These fees pay for the activities of the CCAMLR

Secretariat. If Members (and industry groups such as COLTO) also provide funds to support various CCAMLR initiatives, including improving the quality of scientific advice of the Scientific Committee, advice on the CCAMLR fisheries conduct will be improved (CCAMLR, 2012c). Other types of research and patrols are paid for by the Members who initiate these activities. Due to high costs of patrols, funding of effective patrols may become financially unsustainable over time if there is a need for extra patrolling due to an increase in IUU fishing. If enforcement cannot be maintained, the future success of MPAs in areas suffering from IUU fishing may be compromised.

4.6.2. MPA Boundaries

The size and location of the MPA needs to incorporate a number of factors; including the range of species being protected, the amount of habitat needing protection and fisheries activities in the area. It has been suggested that single, large MPAs are more effective (from an ecosystem perspective) in protecting species which are relatively mobile than many small MPAs (Walter , 2000). Models have suggested that MPAs need to be "extremely large" to deal with uncertainties resulting from overexploitation, possibly needing to cover 50-90% of the total area of a species' range (Boersma & Parrish, 1999, pg. 292). Deciding on which parts of the ecosystem (to ensure representativeness) and which habitats and species should have priority for protected is extremely difficult. The best solution to this issue is sound, unbiased science. However, in CCAMLR meetings, the minimum size of future MPAs will result from a combination of these factors and the precautionary principle, balanced against what can be agreed upon during consensus decision making.

4.6.3. Preconceived Perceptions

There are a number of preconceived perceptions associated with MPAs that can hinder the decision making process. Firstly, the view that all MPAs are no-take areas; in some cases a MPA may be a no-take area (such as the South Orkney Islands MPA). Yet an increasing number of MPAs (including the Great Barrier Reef Marine Park and the proposed Ross Sea MPA, which will be discussed later) allow for multiple uses to occur within the MPA (Agardy *et al,.* 2003).

Second, that MPAs are a "one size fits all" solution (Agardy *et al*., 2003; Pomeroy *et al*., 2005). This is another incorrect perception, although it is often believed that they can automatically

solve fisheries issues and that all MPAs are the one and the same. On the contrary, evidence has shown that the most successful MPAs are tailored to meet a specific need and must to be used in conjunction with effective fisheries management (Kaiser, 2005). There is no single sized, standard MPA design that can be applied to an area and result in a successful outcome.

Another common misconception is that MPAs only serve conservation agendas. While conservation agendas drive the creation of MPAs, fisheries also benefit from their creation. MPAs safeguard stocks against fisheries management failures including quotas that have been set too high, preventing stock collapse (Roberts *et al*., 2005). They also allow for spill-over effects in regions adjacent to MPAs which increase catch rates and extend the life fisheries (McClanahan & Mangi, 2000; Roberts *et al.,* 2002).

Lastly, some groups are unaware of the scientific evidence showing the success of MPAs. As already mentioned above in Part 5, there is evidence showing that when managed well, MPAs are successful. However, some scientific uncertainty still exists in regards to MPAs. This should not be denied as it raises the expectations of stakeholders and makes MPAs cynics wary (Agardy *et al*., 2003). In turn, this puts MPA managers under unnecessary pressure and jeopardises the future of MPAs (Agardy *et al*., 2003). Therefore statements about MPAs need to be honest, even if this means that the MPAs are not being portrayed as favourably as the proposer would like.

These perceptions are all important factors to take into account when planning an MPA. This is because they can present considerable obstacles. Understanding what the common misconceptions are, which groups hold these views and why, is important to understand how to make the best pitch for an MPA proposal. This will help ensure that the first impressions on the stakeholders of the proposal are as positive as possible, increasing the likelihood of consensus.

4.6.4. Achieving Consensus

Reconciling the dual agendas of conservation, (such as a protecting fish and krill stocks) and exploitation (including sustainable fishing) present within CCAMLR is a considerable challenge. This is because both agendas seem to have opposite goals. However, since conservation under CCAMLR includes rational use, a balance between the two agendas needs to be found in order to reach consensus.

The key to reaching consensus is the recognition and acceptance by parties with opposing agendas that both agendas are valid uses of the marine environment. MPAs need to be flexible to not only obtain consensus, but to be successful in the long term. MPAs that have standards and targets which are absolute, inflexible and use a single approach (Agardy *et al.,* 2003) are not the best way to implement and manage MPAs. This is because it "pushes marine conservation into unnecessary and costly battles that cannot be afforded" (Agardy *et al.,* 2003). Also, consensus will not be reached. Therefore flexibility is needed.

Flexibility can be achieved through adaptive management and the creation of multiple use MPAs (MUMPAs). MUMPAs use a range of conservation tools and often include a mix of managed harvest and no take zones. Whether or not a MPA is successful also relies somewhat on the attitude and behaviour of fishermen (Pita *et al*., 2011). It has been found that when MPAs are implemented to manage fisheries, they are usually accepted by fishers as "effective and beneficial management tools" (Pita *et al*., 2011).

Exploitation and conservation can also be integrated through adaptive management. Adaptive management is defined by the United States Geological Survey as "learning by doing, and adapting based on what's learned" (USGS, 2013). It is effective in managing resources when there are high levels of uncertainty. It also serves as a science and management feedback loop and allows modifications to the system to occur in response to changes, both environmental and social (Agardy, 1994). For MPAs, this means that once a system of management is in place it needs to be open to revision if and when circumstances (such as the availability of new information) change. Also, decisions should be made based on past and current experiences, and data collected from the MPA (or potential MPA) in question as well as other MPAs around the world.

MUMPAs are adaptive management excellent tools if integrated. They each provide a middle ground between the two agendas and are considered to be the best ways to balance the two agendas (Argardy *et al.,* 2003). This is because they recognise that different sets of values exist in the area or areas being protected. To integrate MUMPAs and adaptive management, an MPA is divided into zones which allow for different activities to take place within them. For example, in the Macquarie Island MPA there are three different zones each with different levels of protection; Australian fishing Zone, Aurora Trough Marine Park Habitat/Species Management Zone (in two parts) and Marine Park Highly Protected Zone (Australian Fisheries Management Authority AFMA, n.d.).

MUMPAs can be used to great effect where no take areas are strategically linked to create a larger area, managed as a part of the wider environment. Further success will be achieved where these areas are adaptively managed, with the location and size of the zones being changed as if needed (Argardy *et al.,* 2003).

4.7. Future of MPAs in the Southern Ocean

The designation of MPAs within the Southern Ocean can be problematic. However, following the South Orkney Islands MPA there has been a push for wider protection of the Southern Ocean (Gray, 2010). Negotiators at the 2012 meeting of CCAMLR considered four different MPA proposals; the United States' and New Zealand's competing proposals for the Ross Sea, United Kingdom's proposal for the protection of areas exposed on the Antarctic peninsula by collapsing ice shelves and also Australia's proposed network of reserves along the coast of Eastern Antarctica (see Figure 6)(Cressey, 2012) .

Figure 6: Diagrammatic representation of proposed MPAs heading into the CCAMLR 2012 meeting. Reprinted from Cressey (2012).

4.7.1. Ross Sea MPA proposal

The Ross Sea is seen as an important environment to protect as it contains features of exceptional ecological value and scientific importance (Ballard *et al.*, 2012). The Ross Sea Ice shelf is one of the most productive areas of the Southern Ocean and is one of the very few places in the world that still has a full community of top-level predators; its whale, seal and fish populations have yet to be extensively exploited and their numbers remain high. The Antarctic and Southern Ocean Coalition (ASOC) state that the entire Ross Sea should be protected to prevent disruption to this last refuge for open-ocean marine life and scientific research (Cameron *et al.*, 2012).

The proposal put forward by the United States (US) to protect the Ross Sea, would have covered 1.8 million km^2 of which 800,000 km^2 would be completely closed to fishing and utilized only for studies into the effect of climate change. The New Zealand (NZ) proposal would have covered 2.5 million km^2 and a key difference between the plans was that fishing would be

allowed in some areas (Cressey, 2012). Officials from the US and NZ governments spent two years prior to the CCAMLR 2012 meeting developing a joint proposal for a large MPA in the Ross Sea. However, in September 2012, only a month before the CCAMLR meeting, the New Zealand government backed away from the joint plan and instead introduced its own proposal (Perry, 2012). It has been speculated that the reason for this was that the US's proposal had no-take areas around some of the main toothfish fishing areas to protect key habitats, which would have prevented harvesting; NZ has an active toothfish fishing fleet in the southern ocean while the US does not (Cressey, 2012).

During the CCAMLR meeting a number of countries stated they did not want to vote between the two countries proposals, eventually in the closing days of the CCAMLR meeting NZ and the US came to an agreement for a joint proposal (CCAMLR, 2012b). The joint proposal is an example of a MUMPA and covers 2.25 million km^2, which although less than the initial New Zealand proposal would still be the world's largest MPA if signed into force (Ministry of Foreign Affairs and Trade (MFAT), 2012). The proposal also demonstrates flexibility designating three different areas as shown in Figure 7.

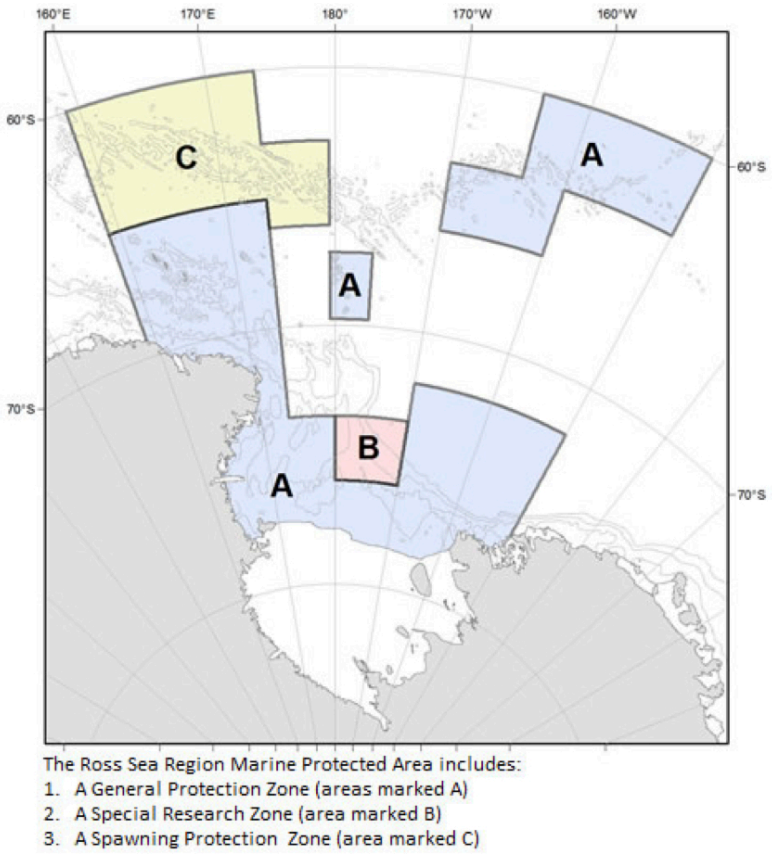

Figure 7: **The current Ross Sea proposal which was jointly put forward by New Zealand and the United States. The areas marked with A are complete no take areas, the area marked with B designates a special research area where fisheries will have to tag three Antarctic Toothfish per green weight tonne, The final area C is closed to fisheries at certain times of the year in order to protect spawning and reproduction of the Toothfish. Reprinted from MFAT (2012).**

The joint proposal is seen as a positive move forward due to the creation of an MPA and designating areas as 'special' allows improvement in the future (Geoff Keey, personal communication, January 22, 2013). According to MFAT "The proposal is a balanced approach to ecosystem protection, scientific research and fishing" (MFAT, 2012). The Ross Sea MPA is an example of CCAMLR demonstrating leadership in the development of a wider network of Antarctic MPAs (Grant, 2005).

4.7.2. CCAMLR Intersessional Meeting

At the last CCAMLR meeting the Antarctic Peninsula proposal also failed with an objection from Norway, due to a conflict of interest with the Arctic (Geoff Keey, pers. comm. 2013). Because of the complexity of creating MPAs, the large requirement for research and international diplomacy, it was decided to hold a special intersessional meeting of the Commission in July 2013 to discuss the MPA proposals (CCAMLR 2012b). New Zealand put forward this proposal and this is only the second ever intersessional meeting, highlighting the importance the international community places upon the meeting outcome (Geoff Keey, pers. comm. 2013). It is currently not thought that the Ross sea MPA proposal will be signed at the July 2013 meeting, rather the aim is to resolve issues surrounding the MPA, which would then be discussed within countries' governments before being signed at the next annual meeting in October 2012 (Geoff Keey, pers. comm. 2013).

Conclusions

The Southern Ocean contains features of exceptional ecological value and scientific importance. It is special not only because of its biodiversity and ecosystem structure but because it is one of the least impacted environments in the world. There is growing international pressure for CCAMLR to provide more protection for Southern Ocean ecosystems than the current RFMO framework offers.

MPAs are a relatively new management concept used to promote conservation and recovery at the ecosystem level. There is ample scientific evidence to suggest near-shore MPAs are successful however because high seas MPAs are all still less than five years old we cannot yet conclusively show that they are a successful management tool. For MPAs on the high seas to succeed they must be well planned, include adequate resources to combat IUU fishing and provide flexibility through adaptive management. The key challenge in the establishment is to balance the different agendas of conservation and exploitation that the 25 CCAMLR Members bring to the table. Conservation and exploitation are both valid uses of the Southern Ocean marine living resources and there is room for compromise between both of these agendas. The most suitable solution (to gain consensus) is to create a network of MPAs in the Southern Ocean that incorporate a mixture of managed harvest and no-take areas.

By the end of 2013 we may have reached a critical turning point for MPAs in the Southern Ocean. If the CCAMLR members can agree on the Ross Sea Proposal the Southern Ocean will have its first large-scale, high seas MPA. This is an important step in creating a network of MPAs that will protect and conserve the Antarctic marine resources for the future

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