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Competing values on the Antarctic high seas: CCAMLR and the challenge of marine-protected areas

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The Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) has been lauded as a leader in high seas conservation. Highlighting its leadership, CCAMLR joined the international movement to designate a representative network of marine-protected areas (MPAs) throughout the world’s oceans by 2012. Over the last decade, CCAMLR has been working towards this goal convening a series of workshops and celebrating their first Southern Ocean MPA in 2009. In 2011, plans for large MPAs in the Ross Sea and East Antarctic came up for discussion but their adoption has stalled due to Member States’ objections, with the primary concern being interference with fishing. In July 2013, CCAMLR’s Scientific Committee and Commission convened a special intersessional meeting dedicated to making progress on the Ross Sea and East Antarctic MPAs. Progress was again stalled due to Member’s objections and the Russian delegation’s concerns over the legal capacity of CCAMLR to adopt Southern Ocean MPAs. To address potential barriers to MPA adoption, including fishing interests, I provide a synthesis of the CCAMLR MPA process to date and then analyse CCAMLR fishing trends from 1982 to 2012. The results show that since 1982, the number of fishing States has increased four-fold, correlating with the rise of toothfish fisheries (sold on the market as “Chilean sea bass”). While historically, and in the present, krill (Euphasia superba) comprise the largest catch, toothfish (Dissostichus spp.) bring in 20 times more profit. While the MPA proposals under consideration in 2012/2013 were designed specifically to balance conservation and fishing interests, they would displace some toothfish fishing and would limit potential future access to Southern Ocean resources. The shift in balance among fishing States along with the increasing pressure to find more toothfish fisheries may be interfering with CCAMLR’s ability to effectively implement MPAs in the Convention Area.

Keywords: Toothfish; Southern Ocean; CCAMLR; Antarctic; Marine-protected areas

Introduction

The Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), tasked with overseeing ~10% of the global oceans, agreed to join the international movement to develop a global network of marine-protected areas (MPAs) by 2012. Leading up to 2012, several countries proposed what would have become the world’s largest MPAs to protect marine ecosystems in the Southern

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1CCAMLR, XXVIII, para 7.19.
Ocean. When the Commission failed to reach consensus on the MPAs during their 2012 annual meeting, they agreed to hold a special intersessional meeting focused entirely on making progress towards the designation of these MPAs. Yet, the Commission, held as a leader in high seas marine resource management and founded on values of conservation and science as an ocean counterpart to the Antarctic Treaty, could not achieve consensus during the July 2013 meeting. This outcome has left many people within and outside of the Commission wondering whether national economic incentives in the Southern Ocean are now overwhelming science and conservation values. Here, I examine CCAMLR’s progress over the last 10 years towards a network of MPAs and consider barriers to adoption, including fishing interests.

A history of peace, science and exploitation

The Antarctic has long been celebrated for its riveting history of exploration and international scientific value. The windiest, driest, coldest continent on Earth humbled the world’s best explorers, while captivating scientists worldwide. Since its discovery, the Antarctic has fostered tremendous advances in atmospheric, geological, glaciological and climate science, as well as oceanography, biology, marine ecology and evolution. Nations were already starting to claim regions of Antarctica at the height of the cold war in 1959, but instead of dividing up the continent they conceived and signed the Antarctic Treaty, setting aside the entire continent in the name of international peace and science. Through the Treaty and later Protocols and Conventions, military operations, mining and resource extraction were prohibited. The provisions of the Treaty apply to the area south of 60°S without prejudice to the high seas rights of States under international law.

Despite its remoteness and extreme conditions, humans have exploited the Southern Ocean at least since Captain James Cook reported an abundance of Fur Seals on South Georgia Island in the late eighteenth century. Within decades, populations of Fur Seals (Arctocephalus spp) were hunted to the brink of extinction throughout the Antarctic and subantarctic islands, followed by Southern Elephant Seals (Mirounga leoninea). In the early 1900s, as whale populations became depleted in temperate oceans, whalers moved into the Southern Ocean, severely depleting every whale population in the Antarctic, with the exception of the smaller Antarctic Minke Whales (Balaenoptera bonaerensis). Commercial finfish exploitation ensued in the early 1970s, quickly depleting several finfish populations,

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2CCAMLR, XXXI, para 7.105.
4The Convention for Conservation of Antarctic Marine Living Resources.
5Brooks, “CCAMLR 2nd Intercessional Meeting.”
6CCAMLR, XXXI, para 7.90–7.91; McGrath “Deep Concern.”
7Fogg, A History of Antarctic Science; Berkman, Science into Policy.
9Stonehouse, Encyclopedia of Antarctica.
10Ibid.
11Ibid.; FAO, Review of the State of World Marine Fishery Resources.
including some stocks of Marbled Rockcod (*Notothenia rossii*) that remain at only a fraction of their original biomass.\(^\text{12}\)

Given the previous history of unregulated and uncontrolled fishing in the Southern Ocean, a developing Antarctic krill (*Euphausia superba*; hereafter referred to as “krill”) fishery in the 1960s and 1970s caused concern among scientists from Antarctic Treaty Consultative Parties about the ecological impacts of the fishery, particularly on depleted mammal populations that depend heavily on krill. In

response, the Treaty Parties negotiated the Convention on the Conservation of Antarctic Marine Living Resources (CAMLR Convention), which entered into force in 1982. The Convention applies to all marine organisms south of the Antarctic Polar Front (Figure 1), but recognizes the authority of the International Whaling Commission and the Convention for the Conservation of Antarctic Seals to regulate the exploitation of whales and seals, respectively. The new CAMLR Convention established a regulatory commission (CCAMLR) and a scientific advisory body (the Scientific Committee for the Conservation of Antarctic Marine Living Resources, or SC-CAMLR). Following the operational procedure of the Antarctic Treaty, decisions by the Commission require consensus of all Members.

**Foundations of conservation and rational use**

Over time CCAMLR has been celebrated as a progressive leader in high seas management for its principles and achievements in employing precautionary and ecosystem-based management. Unlike other marine resource management bodies, in which the primary objective is managing fisheries, the explicit objective of the Convention is to conserve Antarctic marine living resources. Upon coming into force, the Commission immediately closed overexploited fisheries in the Scotia Sea and north-western coast of the Antarctic Peninsula. Shortly thereafter, it initiated the CCAMLR Ecosystem Monitoring Programme to monitor the effects of krill fishing on land-based predators, such as seabirds and seals.

The CAMLR Convention (Article II.2) defines conservation to include “rational use.” Foundational documents that informed the ideas in the CAMLR Convention describe rational use as “wise use”, “keeping for future use” or management that will “result in a equitable distribution of benefits between present and future users of the resource.” Within the CAMLR Convention, rational use allows for scientific and commercial harvesting of living resources as long as activities do not cause changes in the exploited and dependent populations or significant adverse effects on the ecosystems of which they are part, that are not reversible in 20–30 years. CCAMLR’s management toolbox includes explicit means for conservation, including establishment of closed areas for the purposes of scientific study or conservation.

**A network of MPAs by 2012**

MPAs, areas where human activities are limited or prohibited, have become an increasingly valuable conservation instrument for scientists and fishers in managing...
often conflicting activities and objectives to ensure the long-term health and sustainable use of our oceans.\textsuperscript{21} For the last 10 years, CCAMLR Members have been working to establish a network of Southern Ocean MPAs by 2012, to fulfil an international commitment voiced by States attending the 2002 World Summit on Sustainable Development (WSSD).\textsuperscript{22} While general discussions of CCAMLR MPAs began in 1999,\textsuperscript{23} CCAMLR recognized the WSSD commitment during their 2002 annual meeting and established a separate agenda item for discussing management of protected areas at future meetings.\textsuperscript{24}

The first CCAMLR MPA workshop convened in 2005 to develop advice on the designation of MPAs and discuss how MPAs could contribute to achieving the objectives of the Convention (particularly in relation to Articles II and IX).\textsuperscript{25} The workshop recognized the importance of MPAs both for the conservation of biodiversity and as a management tool for harvested species in the Southern Ocean. Further, it acknowledged CCAMLR’s responsibility to employ them.\textsuperscript{26} Based on the 2005 workshop’s call for broad-scale bioregionalization of the Southern Ocean, CCAMLR convened a second workshop to meet this end in 2007 (Table 1).

In 2009, CCAMLR designated its first MPA south of the South Orkney Islands\textsuperscript{27} and further committed to work towards a representative system of MPAs in the Convention Area by 2012.\textsuperscript{28} A third MPA workshop convened in 2011, followed by a 2012 technical workshop to analyse the gaps in CCAMLR’s MPA planning so far. The 2011 Commission meeting also resulted in the adoption of a conservation measure (CM 91-04) that established an explicit framework for establishing CCAMLR MPAs. Key guidelines laid out in CM 91-04 include:

- To remain in accordance with international law, including the Law of the Sea Convention, in full consideration of Article II, and based on the best available science.

\begin{table}
\centering
\begin{tabular}{|l|l|}
\hline
Year & Milestone \\
\hline
2002 & Recognition of WSSD commitment, added agenda item for MPAs \\
2005 & First CCAMLR MPA workshop \\
2007 & CCAMLR Southern Ocean Bioregionalisation Workshop \\
2009 & Adoption of South Orkney Islands Southern Shelf MPA \\
2009 & Commitment to a network of Southern Ocean MPAs \\
2011 & Second CCAMLR MPA workshop \\
2011 & Adoption of CM 91-04, a framework for establishing CCAMLR MPAs \\
2012 & CCAMLR circumpolar GAP analysis MPA technical workshop \\
2013 & Special CCAMLR and SC-CAMLR intersessional meeting \\
\hline
\end{tabular}
\caption{CCAMLR MPA milestones (since 2002) with year of designation (Compiled from CCAMLR annual meeting reports 2002–2013).}
\end{table}

\textsuperscript{21} Lester et al., “Biological effects;” Roberts, Hawkins and Gell, “The role of marine reserves;” Lubchenco et al., “Plugging a hole.”
\textsuperscript{22} WSSD, \textit{Plan of Implementation}, para 32(c); CCAMLR, \textit{XXI}, para 4.19.
\textsuperscript{23} E.g. CCAMLR \textit{XVIII}, para 4.9.
\textsuperscript{24} CCAMLR, \textit{XXI}, para 4.20.
\textsuperscript{25} CCAMLR, \textit{XXIV}, Annex 7, paras 6–7.
\textsuperscript{26} CCAMLR, \textit{XXIV}, Annex 7, para 36 & 33.
\textsuperscript{27} CCAMLR, CM 91-03.
\textsuperscript{28} CCAMLR, \textit{XXVIII}, para 7.19.
• To protect representative marine ecosystems, biodiversity and habitats, 
  including key ecosystem processes and species as well as vulnerable, unique 
  or rare habitats and features.
• To establish scientific reference areas for monitoring natural or human-induced 
  changes.
• To establish specific objectives, restrictions, spatial boundaries, and a 
  determined period of designation.
• To develop a management plan and a research and monitoring plan.
• A review every 10 years or as agreed by the Commission.29

Thus far, CCAMLR has identified nine designated planning domains within the 
Convention Area and various States have taken the lead on developing MPA 
proposals based on their historical involvement in these areas. Since 2011, three 
more MPA proposals – in the Ross Sea, East Antarctic and for the areas under ice 
shelves – have been developed but have not yet been adopted.

First high seas MPA: South Orkney Islands southern shelf

In 2009, the UK proposed a South Orkney Islands Southern Shelf MPA to 
CCAMLR. The proposal went through with little resistance from CCAMLR 
Members, with the exception of a confrontation over an area in the northern part 
of the proposed MPA, eventually left open for an exploratory crab fishery (Figure 2(C)). As such, the MPA was adopted, protecting ~94,000 km² of the 
Southern Ocean. It is celebrated as the world’s first wholly high seas MPA and 
reaffirmed CCAMLR’s position as a leader in international marine resource 
management. The MPA’s designation as no-take meant it was explicitly closed to 
fishing, affording the South Orkney Islands Southern Shelf the highest level of 
protection possible.

However, while the MPA does protect a large continental shelf area, it leaves 
out the regions adjacent to the South Orkney Islands, which achieved the highest 
value for conservation objectives (according to Marxan models; Figure 2(A) and 
(B)).30 These regions are the most biologically rich: thick with krill and heavily 
used by foraging penguins and other seabirds. Yet, these regions were also prime 
krill fishing grounds. The MPA was designed explicitly to not interfere with the 
krill fishery, particularly with the development of fisheries management plans, 
which included efforts to subdivide the region immediately adjacent to the South 
Orkney Islands into Small Scale Management Units (Figure 2(A) and (B)).31 As 
for the northern region omitted from the final MPA boundaries, exploratory crab 
fisheries proved fruitless: after almost 80,000 pot hours and 17 sets, only three 
crabs were caught.32

29CCAMLR, CM 91-04.
30SC-CAMLR XXVIII/14; The Marxan conservation weighting included protection of 
ecosystem processes, scientific areas and critical life history stages for penguins and flying 
seabirds as well as the conservation of biodiversity and the enhancement of resilience to cli-
mate change.
31Ibid.
32FAO, Review of the State of World Marine Fishery Resources
Figure 2. South Orkney Islands Southern Shelf MPA planning proposal showing areas important for conservation (A; lighter, more yellow colours indicate greater conservation value), tracks of Chinstrap and Adélie Penguins (B) – note the thin line around the South Orkney Islands identifies the Small Scale Management Units (SSMUs; SC-CAMLR XXVIII/14) and final boundaries for the South Orkney Islands MPA (C; CM 91-03).
Figure 3. MPA scenarios developed by the United States and New Zealand for the Ross Sea and presented to the Scientific Committee in 2011 (A; based on Delegation of New Zealand 2011 and Delegation of the United States 2011) and the joint proposal presented to CCAMLR in July 2013 (B; NOAA 2013).
Towards a network of MPAs: The Ross Sea and the East Antarctic

In 2011, scenarios for MPAs in the Ross Sea region (Subarea 88.1 and 88.2; Figure 3(A); developed by New Zealand and the USA) and the East Antarctic (Subarea 58.4; developed by Australia and France) were presented to the Scientific Committee. An additional MPA was also discussed in 2011: to provide protection for ice shelves vulnerable to collapse around the Antarctic Peninsula (Subarea 48.1, 48.5 and 88.3; developed by the United Kingdom and European Union). These MPA scenarios were deemed as being based on the best available science, and were drafted according to CM 91-04 and formally presented to the Commission in 2012.

Extensive research was incorporated into the proposals, particularly for the Ross Sea, a region deemed by many scientists to be the only large intact marine ecosystem remaining on the planet. As the most productive stretch of the Southern Ocean, the Ross Sea supports disproportionately large populations of mammals and birds, including more than one-third of all Adélie Penguins and one-quarter of all Emperor Penguins. It is also the most-studied ecosystem in Antarctica. Given its tremendous scientific and ecological value, more than 500 scientists have signed a petition in favour of protecting the Ross Sea from fishing or other extractive uses.

Since MPA planning commenced in 2002, CCAMLR has identified the Ross Sea as a key region in a representative network of Southern Ocean MPAs due to its unique scientific and biological value. New Zealand and the USA led the development of the Ross Sea MPA and both brought independent proposals to the Commission in 2012. Both of the proposals had similar overarching conservation objectives: to protect the ecological structure and function of the ecosystem. The proposals included areas important for the life history of birds, mammals and fish and reference areas aimed at improving current understanding of the potential impacts from fishing and climate change. Yet, the two States struggled to reach a compromise and agree on a common proposal (Figure 3(A)). The USA, which does not engage in toothfish fishing, proposed an MPA that displaced more of the commercial fishery than that proposed by New Zealand. The Ross Sea fishery, which New Zealand initiated and has historically dominated, is now largely managed using tag and recapture data, predominantly provided by New Zealand. The major point of contention between the USA and New Zealand proposals was the “Special Research Zone” (Figure 3(B)). The USA wanted to close much of this highly productive area to provide a reference area for measuring the ecosystem impacts of the Ross Sea fishery by comparing this area with the heavy fished areas located just outside the proposed MPA. However, this area is also a prime toothfish fishing ground and New Zealand emphasized this region was essential to maintaining the continuity and integrity of their tagging programme. It took intense after hours work during the 2012 CCAMLR meeting and much urging from the other

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33SC-CAMLR, XXX, para 5.45 & 5.63.
35Arrigo et al., “Primary Production.”
36Ainley, Ballard and Weller, “Ross Sea Bioregionalization Part I.”
37Ibid.
38ASOC, “Scientists’ Consensus Statement.”
39E.g. SC-CAMLR, XXVII, Figure 12.
40CCAMLR, XXX, paras 7.61 & 7.64.
Commission Members, but the two countries did forge a compromise (Figure 3(B)).

In contrast to the long-studied Ross Sea region, much of the East Antarctic is considered a “data-poor” region. This challenged the proponents of the East Antarctic MPA to develop suitable methods for designing MPAs given the inherently large ecological uncertainties prevailing in the region. A precautionary-based approach thus guided the proposal’s design. Australia and France, later joined by the European Union, took the lead and developed spatial models, compiling known biological, benthic, hydrographic and geophysical data. Using biogeography as a proxy for species richness and community composition, they generated a representative system of seven MPAs that would capture key ecosystem processes and provide reference areas to measure the ecological impacts of climate change and fisheries across the East Antarctic. Taking account of the major uncertainties and data gaps, the East Antarctic MPA proposal sets aside large enough areas, including replicate habitats, to ensure protection of important physical and biological processes.

The Ice Shelves MPA presented to the Scientific Committee in 2011 and to the Commission in 2012 was specifically directed at facilitating the study of ecosystem processes under climatic change, given that ~87% of glaciers around the Antarctic Peninsula have retreated in recent decades. The proposal aimed to provide precautionary protection of newly exposed habitats and the ensuing new ecological colonization in the event of an ice shelf collapse. As it focused on areas under ice shelves, which have yet to be studied, the proposal necessarily lacked extensive data but was considered by the Scientific Committee to be of major scientific and conservation value. Extensive discussions during the 2012 Commission meeting ensued, with many delegations questioning the necessity of establishing an MPA for the purpose of carrying out research on newly exposed shelf ecosystems. To accommodate these concerns, the European Union transformed the proposal from an MPA to a CCAMLR Special Area for Scientific Research.

Yet, even with an unified Ross Sea proposal, extensive discussions over the East Antarctic proposal, and significant accommodations to the Ice Shelves proposal, the Commission did not reach consensus on any MPAs in 2012. However, the Commission did call for an intersessional meeting in July 2013, dedicated to making progress on the Ross Sea and East Antarctic MPAs.

The joint Ross Sea proposal brought to the Commission during the July 2013 special meeting comprised 2.27 million km² (with ~1.6 million km² no-take) and included much of the Ross Sea shelf and slope, the Balleny Islands, Scott Seamount and much of the Pacific Antarctic Ridge system to the north (Figure 3(B)). The proposal encompassed key foraging areas for top predators, ecological hotspots and the suspected spawning grounds for Antarctic toothfish. The MPA proposal was further divided into three protection categories (Figure 3(B)): a General Protection Zone (A), a Special Research Zone (B) and a Spawning Protection Zone (C). The

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41CCAMLR, XXXI, paras 7.68–7.75.
43Cook et al., “Retreating Glacier Fronts.”
44SC-CAMLR, XXX, para 5.67; CCAMLR, XXXI, para 7.62.
45SC-CAMLR, XXX, paras 5.76–5.77.
46CCAMLR, XXXI, paras 7–86-7.88.
47CCAMLR, XXXI, paras 7.82, 7.88 & 7.105.
General Protection Zone was proposed as a no-take zone where commercial fishing is prohibited, while the contentious Special Research Zone aimed to reduce commercial fishing with increased tagging rates. The most productive toothfish fishing grounds, including Iselin Bank, were excluded completely from the joint MPA proposal. The Spawning Protection Zone was permitted to be open during the summer fishery, but closed during winter months when Ross Sea toothfish purportedly spawn.48

The East Antarctic proposal brought to the July 2013 meeting, encompassed ~1.6 million km². Four of the seven proposed MPAs spanned benthic and pelagic realms, including the well-studied D’Urville Sea, the Prydz Bay shelf area and large regions to the east and west of Prydz Bay. These areas were designed to encompass the foraging areas of top predators as well as suspected nursery grounds for Antarctic krill and toothfish. Three other MPAs aimed to protect unique benthic regions adjacent to Wilkes and Enderby Lands, as well as the Gunnerus Ridge. This system of MPAs was also designed not to interfere with the already limited toothfish fishery in the East Antarctic.49

Consensus was not achieved in adopting a Ross Sea or East Antarctic system of MPAs during the intersessional CCAMLR meeting. However, proponent States have continued to expend significant effort on the proposals since the July meeting, and a new MPA plan for the Ross Sea has already emerged, based on the advice and concerns put forward by the Scientific Committee. This proposal has been reduced to 1.34 million km² (of which 1.25 million km² is no-take) and still includes the Balleny Islands and the shelf and slope encompassed in the General Protection Zone. The northern area has been significantly reduced, likely due to concerns among many delegations about the paucity of data supporting this area as a toothfish spawning ground. Instead of a seasonal no-take area, the northern area included in the current Ross Sea MPA plan would be fully no-take. A much reduced no-take area is also proposed to encompass Scott Seamount.50 This proposal, along with a new East Antarctic proposal, will likely be tabled at the October 2013 CCAMLR annual meeting.

**Barriers to MPA adoption**

The July 2013 meeting was only the second intersessional Commission meeting in the history of CCAMLR and the first of the Scientific Committee. The historic nature of the meeting brought heightened expectations. Given the significant resources invested, and the precedent attached to this special meeting, many attendees seemed confident that progress on resolving the fate of the two proposed MPAs would be made.51 Yet, after grueling discussion during this Scientific Committee meeting, consensus was not reached. In the final hour of the meeting, the Russian delegation lodged a reservation to adopting the Scientific Committee’s

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Table 2. CCAMLR Members that voiced concern or support for the Ross Sea and East Antarctic MPAs proposed during the July 2013 CCAMLR intersessional meeting (based on detailed meeting observations and CCAMLR, _SM-II_, paras 3.15–3.39 & 3.46–3.69; India was the only Member not present at the meeting). Table also shows the species (toothfish; _Dissostichus eleginoides_ and _D. mawsoni_, icefish: _Champsocephalus gunnari_ and krill: _Euphausia superba_) and CCAMLR Subareas and Divisions fished by Members during the last five years (2008–2012; based on CCAMLR, _Statistical Bulletin 25_). Fisheries include all Established, Exploratory and Research fisheries within the Convention Area (including EEZs). See Figure 1 for Subarea boundaries. The July 2013 proposed Ross Sea MPA falls within Subareas 88.1 and 88.2, whereas the East Antarctic MPA falls primarily within Divisions 58.4.1 and 58.4.2 with a small portion in 58.4.3b.

<table>
<thead>
<tr>
<th>Member</th>
<th>2013 MPAs</th>
<th>Species fished</th>
<th>Subareas/Divisions fished (2008–2012)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>Concern</td>
<td>Toothfish</td>
<td>88.1, 88.2</td>
</tr>
<tr>
<td>Australia</td>
<td>Support</td>
<td>Toothfish, icefish</td>
<td>58.5.2 (Australian EEZ)</td>
</tr>
<tr>
<td>Belgium</td>
<td>Support</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Brazil</td>
<td>Concern</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Chile</td>
<td>Concern</td>
<td>Toothfish, icefish, krill</td>
<td>48.3 (toothfish, icefish, krill); 88.1, 88.2 (toothfish)</td>
</tr>
<tr>
<td>China</td>
<td>Concern</td>
<td>Krill</td>
<td>48.1, 48.2</td>
</tr>
<tr>
<td>European Union</td>
<td>Support</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>Support</td>
<td>Toothfish</td>
<td>58.5.1, 58.6 (France EEZ)</td>
</tr>
<tr>
<td>Germany</td>
<td>Support</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>India</td>
<td>N/A</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td>Support</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>Concern</td>
<td>Toothfish, krill</td>
<td>48.1, 48.2, 48.3 (krill); 48.6, 58.4.1, 58.4.2, 58.4.3a, 58.4.3b (toothfish)</td>
</tr>
<tr>
<td>Korea</td>
<td>Concern</td>
<td>Toothfish, icefish, krill</td>
<td>48.3 (icefish); 48.1, 48.2, 48.3 (krill); 48.3, 48.6, 58.4.1, 58.4.2, 88.1, 88.2 (toothfish)</td>
</tr>
<tr>
<td>Namibia</td>
<td>Concern</td>
<td>Toothfish</td>
<td>58.4.1, 58.4.2, 58.4.3b</td>
</tr>
<tr>
<td>New Zealand</td>
<td>Support</td>
<td>Toothfish</td>
<td>48.3, 48.4, 88.1, 88.2</td>
</tr>
<tr>
<td>Norway</td>
<td>Concern</td>
<td>Toothfish, krill</td>
<td>48.1, 48.2, 48.3 (krill); 88.1 (toothfish)</td>
</tr>
<tr>
<td>Poland</td>
<td>Support</td>
<td>Krill</td>
<td>48.1, 48.2, 48.3</td>
</tr>
<tr>
<td>Russia</td>
<td>Concern</td>
<td>Toothfish, krill</td>
<td>48.2, 48.3 (krill); 88.1, 88.2 (toothfish)</td>
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<tr>
<td>South Africa</td>
<td>Concern</td>
<td>Toothfish</td>
<td>58.6 &amp; 58.7 (South Africa EEZ), 48.3, 88.1, 88.2</td>
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<tr>
<td>Spain</td>
<td>Support</td>
<td>Toothfish</td>
<td>48.3, 58.4.1, 88.1, 88.2</td>
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<tr>
<td>Sweden</td>
<td>Support</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Ukraine</td>
<td>Concern</td>
<td>Krill</td>
<td>48.1, 48.2</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>Support</td>
<td>Toothfish, icefish</td>
<td>48.3 (icefish); 48.3, 48.4, 88.1, 88.2 (toothfish)</td>
</tr>
<tr>
<td>USA</td>
<td>Support</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Uruguay</td>
<td>Concern</td>
<td>Toothfish</td>
<td>48.3, 58.4.1, 58.4.3b, 88.1, 88.2</td>
</tr>
</tbody>
</table>

report, based on their disagreement about the aims and boundaries of the Ross Sea MPA.\(^{52}\) This move, as with the intersessional meeting itself, was also unprecedented in the history of CCAMLR.

\(^{52}\)Brooks, “CCAMLR 2nd Intersessional Meeting;” SC-CAMLR, _IM-I_, para 4.3.
During the two-day Commission meeting, which followed the Scientific Committee meeting, 11 of the 24 Member States plus the European Union were in full support of the MPAs as they were presented, while another 12 voiced concerns during the 2013 plenary sessions (Table 2). Ranked in order of importance according to how many countries voiced the concern and how many times the concern was raised, the primary concerns were:

1. Interference with fishing, both now and in the future, including concerns over the MPA boundaries and large size.
2. Duration of the MPA designation, including requests for a sunset clause (e.g. fixed period of designation) and short review periods.
3. Sufficiency of research and monitoring plans.
4. Sufficiency of science with regards to threats and conservation objectives.

Beyond these concerns, the Russian and Ukrainian delegations, with some support from the Chinese delegation, also questioned whether CCAMLR even had the legal capacity to establish high seas MPAs, further stressing that CCAMLR had never formulated an approved definition of what constitutes an MPA. Without these two issues resolved, Russia refused to negotiate further. Given that CCAMLR operates on consensus, Russia’s objections, supported by the Ukrainian delegation, effectively halted any meaningful progress on MPAs. The meeting ended without a clear path to progress further.

Some of the concerns listed above were also raised in 2009 during the adoption of the CCAMLR South Orkneys MPA. However, consensus was achieved rather quickly (over the course of the 2009 annual meeting) by excising the northern area that would have interfered with the potential for a crab fishery. The road to consensus for the Ross Sea and East Antarctic MPAs has already taken much longer, with many versions of the plans re-drafted according to feedback from the Scientific Committee and Commission. Currently, the Ross Sea and the East Antarctic MPA proposals already contain notable compromises. As mentioned, the main fishing grounds on and around Iselin Bank have been excised from the Ross Sea proposal despite the critical ecological importance of the area. For example, toothfish pass through this region to access their purported spawning grounds as do Minke Whales, Ross Sea Killer Whales, Crabeater and Weddell Seals, Emperor and Adélie Penguins, and multiple flying seabird species. According to Ballard et al., Iselin Bank is one of the areas of highest species richness and conservation importance in the Ross Sea.

The East Antarctic proposal also faced the challenge of protecting key biological areas while not interfering with fishing. Small toothfish fisheries are scattered throughout the East Antarctic with a 280 metric tonne (t) collective catch limit.

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53 Based on CCAMLR, SM-II, paras 3.15–3.39 & 3.46–3.69, along with detailed meeting observations during CCAMLR SM-II. Note that these were the same concerns raised during CCAMLR, XXXI.
54 CCAMLR, SM-II, paras 3.18, 3.26, 3.34; Brooks, “CCAMLR 2nd Intersessional Meeting.”
55 Ashford et al., “Does large-scale circulation.”
56 Ballard, Jongsomjit and Ainley, “Ross Sea Bioregionalization Part II.”
57 Ibid.
The East Antarctic proposal displaced little fishing, even excluding most of Prydz Bay, an area that supports the most economically viable toothfish fishery in the region, but which is also the region’s most biologically productive area and believed to be a nursery ground for krill and toothfish.  

Though the Ross Sea and East Antarctic MPAs were designed with the most valuable fishing areas excised from the proposals, the concern most voiced by delegations was interference with fishing. As they currently stand and despite the compromises for fishing interests, these Antarctic MPA proposals would displace some existing fishing, especially the Ross Sea proposal. Beyond the currently proposed displacements, the sheer size and potential long durations of the MPAs could limit future exploitation in areas that have not yet been assessed for viable fisheries. Whether or not consensus can be achieved under these conditions remains to be seen.

At the close of both CCAMLR’s 2012 annual meeting and the 2013 intersessional, some delegations expressed concern over CCAMLR’s inability to meet their 2012 deadline in creating a network of Southern Ocean MPAs and the potential damage to CCAMLR’s reputation as a science-based management body. For example, upon discussing CCAMLR’s failure to reach consensus on any of the MPA proposals presented in 2012, the European Union stated that: “This is a failure not only to the high expectations raised outside this room by our citizens, civil society, NGOs and the media, but to our own commitment versus an establishment of a representative network of MPAs by 2012. This failure is sending the wrong signal that individual economic interests are overriding the common good which we believe is not in the spirit of the Antarctic Treaty System.”

Economic interests: white gold

Krill support the largest fishery in the Southern Ocean by far, with between 161,000–211,000t caught per year in the last few seasons. Yet, the 1990s saw an increase in the catch for toothfishes (Dissostichus eleginoides and D. mawsoni) spurred by the growing demand for “Chilean sea bass” in up-scale restaurants around the world, especially in the United States and throughout Asia. Toothfish are the top fish predator in the Southern Ocean, growing in excess of two metres and 150 kg. These fisheries became so lucrative that the fish was commonly referred to as “White Gold” and pirate vessels (referred to as illegal, unregulated and unreported or IUU) ravaged the Southern Ocean toothfish populations.

Most of the largest toothfish commercial fisheries lie within countries’ Exclusive Economic Zones (EEZs). This includes stocks around Chile and Argentina, with total allowable catches (TAC) of about 10,000t year⁻¹. Combined toothfish catches

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59SC-CAMLR, IM, para 2.40 (iv).
60CCAMLR, XXXI, paras 7.83–7.103; CCAMLR, SM-II, paras 3.72–3.77.
61CCAMLR XXXI, para 7.91.
62CCAMLR, Statistical Bulletin 25, Table 8.
63CCAMLR, Statistical Bulletin 15 & 25, Table 8.
64CCAMLR, Statistical Bulletin, 25, Table 16.
65Collins et al., “The Patagonian Toothfish.”
66Lack and Sant, “Patagonian Toothfish.”
67COLTO, “Toothfish fact sheet.”
in the CCAMLR Area are ~15,000t year^{-1} (Figure 4), with about two-thirds of that catch coming from subantarctic island’s EEZs (which fall within CCAMLR’s jurisdiction). The majority of CCAMLR’s non-EEZ (or high seas) catches come
from the Ross Sea with a TAC of about 3,000t year$^{-1}$. The remaining high seas toothfisheries scattered throughout the Convention Area only allow for a few hundred tonnes of catch within each different statistical subarea (Figure 1 shows Subarea boundaries).  

Despite changes in and between targeted toothfish stocks (e.g. closures on collapsed stocks balanced by the discovery of new stocks), the CAMLR Convention Area toothfish catches have remained relatively stable over the last 15 years (Figure 4).  

Despite these seemingly small catches, toothfish is by far the most financially valuable fishery in the Southern Ocean. Toothfish, with more than 10,000t landed in 2012, accounted for more than $USD 200 million (based on “ex-vessel,” or landed value; Table 3). Krill, at more than 160,000t in 2012, was worth $USD 160 million while icefish, with just over 1,000t landed in 2012, was valued at less than $USD 2 million (Table 3).  

Currently, krill is worth only 1/20th of a tonne of toothfish due in part to the swiftness with which its flesh degrades, leaving it most suitable for fishmeal production. However, due to advances in krill fishing technology and increasing markets for krill products (e.g. fish oil supplements), krill value and catches have been increasing in recent years (Figure 4). Each country that intends to fish for krill must notify CCAMLR of the tonnage it expects to take during the season. In 2012, countries catch notifications exceeded the allowable catch in CCAMLR Subareas, highlighting potential issues of capacity and compliance.

In the early years of the Convention (from 1982–1992), the USSR dominated both the catch and the financial gain through large and subsidized krill fisheries

### Table 3
Ex-vessel values per landed metric tonne (t) for commercial Southern Ocean fisheries. Krill values are reported as fishmeal rather than oil (fish oil fetches a much higher price than meal, but currently comprises only a small fraction of the total krill catch). Table values compiled from Sumaila et al. 2007, Swartz et al. 2012 and the Sea Around Us Project 2013 and verified with Greg Johansson Sanford Ltd pers. comm. (toothfish), Martin Exel Austral fisheries pers. comm. (icefish) and Tharos Ltd. 2012 (krill). Table also includes landed tonnes (reported from CCAMLR Statistical Bulletin 25) and value in 2012.

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<td>Mackerel Icefish</td>
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<td>Antarctic Krill</td>
<td>$1000</td>
<td>161,085</td>
<td>$159,050,416</td>
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69CCAMLR, Statistical Bulletin 15 & 25, Table 8.
70Catches refer to “green weight” or whole fish, whereas landings refer to processed catch, which for toothfish usually means headed, gutted and tailed.
71Antarctic Krill (*Euphausia superba*), Patagonian and Antarctic Toothfishes (*Dissostichus eleginoides* and *D. mawsoni*) and Mackerel Icefish (*Champscephalus gunnari*) support the only active commercial fisheries in the Convention Area. Although exploratory fisheries for other species (e.g. *Lithodidae* crabs) are have been conducted. Landings data from CCAMLR, Statistical Bulletin, 25. Ex-vessel values from Table 3.
72CCAMLR, Statistical Bulletin 25, Table 8; Nicol, Foster, and Kawaguchi, “The fishery for Antarctic krill.”
73CCAMLR, XXV, para 5.3.
Figure 5. Total commercial catch of krill, icefish and toothfish (combined) per country in the Convention Area since CCAMLR came into force (1982–2012; A). Proportion of catch per country during last five years (2008–2012; B). Proportion of the financial value gained per country harvesting toothfish, krill and icefish (combined) during the last five years (2008–2012; C). Financial value in millions of dollars gained per country harvesting toothfish, krill and icefish in the CAMLR Convention Area (including in countries EEZs around subantarctic islands) since CCAMLR came into force (1982–2012; D). Russia includes the current-day Russia and the former USSR. Colours represent the catch per country. Member States with less than 1% (for B-C) and less than 2% (for A & D) of catch for the time period are not labelled. Data source: CCAMLR Statistical Reports (Volumes 2, 12, 15, 25). Each year refers to a CCAMLR designated fishing year. Toothfish catches were converted to landings using the CCAMLR conversation ratio with financial values calculated based on ex-vessel values (Table 3) and adjusted for inflation using the US Consumer Price Index.
During the next 15 years (1993–2007), the countries catching the most tonnage were Japan, Ukraine and Poland, again largely through krill fisheries (Figure 5(A)). But Japan, France and Australia were gaining the most economic value (Figure 5(D)). The latter seems surprising since during this time France’s catch was just over 4% of total catch and Australia had just over 2%. Yet these countries primarily fish for toothfish, reaping large financial gain for relatively small tonnage. Through France’s EEZ around Kerguelen Island, fishing vessels currently catch roughly 5,000t year\(^{-1}\), while Australia’s EEZ around the Heard and McDonald Islands accounts for more than 2,500t year\(^{-1}\).

During the last five years of the CCAMLR Convention (2008–2012), Norway, Korea and Japan have dominated the catch, accounting collectively for more than 80% of the landings (Figure 5(B)). Norway has derived the greatest financial benefit (24%), followed by France (20%), Korea (14%) and Australia (9%; Figure 5(C)). Norway harvests both krill and toothfish, while Korea harvests krill, toothfish and icefish. France and Australia harvest almost exclusively toothfish, which is why they amassed significant landed value while only accounting for 4 and 2%, respectively, of the catch in tonnage (Figure 5(B)). Japan harvests both krill and toothfish (14% total catch in the last five years) with an 8% share of the total landed value (Figure 5(C)).

Countries with the largest or most financially valuable fisheries are not the only Member States with concerns over the MPA proposals. However, fishing interests do seem to correlate with concerns. Of the 12 States that have concerns, 11 have active fisheries and nine have fisheries within the Subareas where the MPAs have been proposed (Table 2). Of the 11 States supporting the MPAs in full, five have not engaged in fisheries for at least the last five years. Three (Australia, France and the UK) have subantarctic EEZs where they obtain the bulk of their CCAMLR Area catch and they are also among the States with greatest financial gain from Southern Ocean resources in recent years (Table 2; Figure 5(C)). Three fishing States (New Zealand, Poland and Spain) support the MPAs. Brazil is the only non-fishing State that has concerns over the MPAs (Table 2).

The rise of fishing states
CCAMLR’s foundations are unusual and remarkable: the Convention remains the only high seas fisheries management organization that includes nations that do not fish. Even the original International Whaling Commission participants were all engaged in whaling. The original 12 signatories to the Antarctic Treaty were also among the original 15 CCAMLR States, suggesting a continued commitment to

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74CCAMLR, Statistical Bulletin 2 & 12, Table 3 & 8.
75CCAMLR, Statistical Bulletin 15 & 25, Table 8.
76Based on applying ex-vessel values (Table 3) to landings data. Krill and icefish are customarily landed whole while toothfish catches, customarily landed as headed, gutted and tailed, were converted to landings using CCAMLR conversion factors (CCAMLR, Statistical Bulletin 25, Table 1.6).
77CCAMLR, Statistical Bulletin 25, Table 9.
78CCAMLR, Statistical Bulletin 25, Table 8; Based on converting catch to landings and applying ex-vessel values (Table 3).
79See Table 2, based on CCAMLR, SM-II, paras 3.15–3.39 & 3.46–3.69 and detailed meeting observations; CCAMLR, Statistical Bulletin 25, Table 9.
80Edwards and Heap, “CCAMLR: a commentary.”
peace and science in the Antarctic. At the time, fewer than half the States involved in negotiating the Convention had fishing interests (Appendix A). Yet, according to Edwards and Heap who were present for the negotiations: “The harvesters naturally saw their own willingness to participate in a negotiation where they were outnumbered, two to one by conservers, as a considerable concession and were keen thereafter that they should not, if it could be avoided, be further outnumbered.”

Fishing States have achieved their desired outcome. Any State can become a CCAMLR Member, so long as it is engaged in research or harvesting in the CCAMLR Area. Over the history of the CAMLR Convention, the number of non-fishing States has remained relatively stable, while the number of fishing States has increased. In 1982, CCAMLR comprised a 1:2 ratio of fishing to non-fishing States. Over the last 10 years, fishing States now outnumber non-fishing States by 5:3 (Appendix A). The shift to a majority of fishing States occurred during the mid-1990s, correlating with the rise in the economically lucrative toothfish fisheries. During this time, States that had previously not fished (e.g. New Zealand and Australia) began fishing for toothfish. Further, new States joined, including China, Namibia and Uruguay, and soon began fishing operations, some focused explicitly on toothfish (Appendix A).

Because CCAMLR’s decision-making operates on consensus, all Members must be in agreement (or at least not raise a formal objection) for conservation measures to pass. While this approach is based on the decision-making structure of the Antarctic Treaty Consultative Meetings, Treaty parties do not customarily address resource issues. In contrast to the Treaty, CCAMLR expressly faces the challenge of balancing mutual State aspirations (e.g. conservation of marine living resources) with individual State interests (i.e. harvesting of marine living resources for food or economic benefit). This increase in the ratio of fishing States may be challenging CCAMLR’s ability to achieve consensus on the MPAs or other future measures that may limit fishing to meet the Convention’s objectives.

**Conclusion**

With the changing composition of CCAMLR Member States, the new economy for toothfish and a consensus-based decision-making structure that enables even a single Member State to block all forward progress, CCAMLR is faced with a daunting task in pursuing the directive articulated in its very name: the conservation of Antarctic marine living resources. CCAMLR Members have beaten the odds before. The very existence of the Antarctic Treaty System is a testament to their ability to enact profound protections in the face of extreme contentious debates.

CCAMLR evolved as the ocean counterpart to the Treaty, exemplifying many of the same foundational values with the visionary aspiration of managing whole ecosystems based on the best available science. Yet in the years leading up to CCAMLR, the Southern Ocean was hardly an ideal fishing grounds. The Soviet fishing fleet, which at the time was one of the largest in the world, came to the Antarctic largely because it was being displaced by the development of countries’ EEZs under the United Nations Law of the Sea Convention. Krill, while incredibly
abundant, were never a high-value food product. By the time CCAMLR was negotiated, most known finfish stocks were already overexploited. Toothfish were largely undiscovered around Antarctica. But with their discovery, the Southern Ocean became prime fishing grounds with many States competing for access to this lucrative common resource and few willing to forgo their right to fish.

The Ross Sea toothfish fishery, which provides about 20–30 million $NZD to the New Zealand economy each year, divided the USA and New Zealand with their respective MPA proposals and nearly stalled negotiations between even these two States. Toothfish will likely prove to be a continuing source of contention in MPA negotiations, especially in the Ross Sea, where approximately a dozen other countries, deploying up to a total of 20 vessels, have also engaged in the fishery there.

Because CCAMLR has not yet developed a management strategy for limiting fishing capacity, the Ross Sea fishery has grown more crowded, despite Commission requests that Member States exhibit restraint.

Overcapacity in an Olympic-style “race-to-fish” fishery has already led to vessels exceeding the TAC in the Ross Sea, and likely contributed to the many vessel accidents in recent years (e.g. the sinking of a Korean vessel in 2010 leaving 22 dead and another catching fire in 2011 killing three). Meanwhile, consumer demand for toothfish may continue to grow due to more toothfish stocks achieving the Marine Stewardship Council eco-label and green listing from consumer information programmes such as the Monterey Bay Aquarium’s Seafood Watch, even though there are substantial uncertainties concerning the sustainability and ecosystem impacts of the fisheries. In a search for more “White Gold” CCAMLR Member States continue to actively pursue exploratory and research toothfish fisheries in other regions around the continent. Most recently, despite the strong advice from the Scientific Committee against fishing due to uncertain and potential dangerous ice conditions, Russia initiated research fishing for toothfish in the Weddell Sea during the 2012/13 season. If fishers are willing to travel such great distances, risking lives in the process, then how will fishing nations possibly support measures that limit fishing in the Antarctic?

The Southern Ocean comprises 10% of the global oceans, which under the Antarctic Treaty System and international law, is part of the global commons. The public goods imbedded in the Southern Ocean are of high value to science, exploration, commerce, diplomacy and peace, not to mention their massive ecological value in maintaining global oceanographic and atmospheric cycles. CCAMLR has made great progress towards its original 2012 goal. The international target for a network of global MPAs has been extended to 2020 by States party to the Convention on Biological Diversity as part of the Aichi Biodiversity Targets.

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85CCAMLR, XXX, Appendix R.
86CCAMLR, XXX, para 12.53.
87CCAMLR, XXXI, para 5.21 (i).
88Cressey, “Accidents highlight risk.”
91CCAMLR, XXXI, paras 5.37–5.43; SC-CAMLR, XXVI, paras 9.1–9.16.
92CBD, Strategic Plan, Target 11; United Nations, Future We Want Resolution, para 177.
and further endorsed by the United Nations Future We Want Resolution – a very reasonable goal for CCAMLR to meet. Members have collectively agreed that MPAs will help conserve the ecological integrity of the Southern Ocean. Now they have the great challenge and responsibility to find the political will to see them through.

Acknowledgements

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References


Appendix A. CCAMLR Members over the history of the Convention (1982–2012). “M” indicates the years of membership in the Commission. *indicates the years that a Member State engaged in fishing. The European Union (EEC) is not listed in the above table – while they have Member status in decision-making, the EU does not engage in fishing except at the individual Nation State level (e.g. France, Germany, etc.). Compiled from CCAMLR annual meeting reports, I-XXXI.

| Year | ARG | AUS | BEL | BRA | CHL | CHN | FRA | DEU | ITA | JPN | KOR | NAM | NZL | NOR | POL | RUS | ZAF | ESP | SWE | UKR | GBR | USA |URY |
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Country Abbreviations:

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