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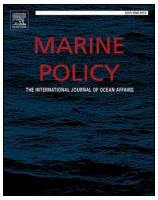

Short communication

The Ross Sea, Antarctica: A highly protected MPA in international waters

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ABSTRACT

As the first large-scale (>150,000 km^2) marine protected area (MPA) on the high seas, the Ross Sea region MPA sets a precedent for other MPAs in areas beyond national jurisdiction. In the myriad of MPA guides and rankings (including the new "MPA Guide"), categorization and evaluation of the Ross Sea region MPA also sets precedent for categorizing and evaluating future protected areas on the high seas. Here, we provide clarity on the governance of the Ross Sea region MPA, and evaluate the status of its General Protection Zone (comprising ~80% of the MPA) with respect to level of protection. We outline the extensive restrictions and science-based management in place within the Ross Sea region MPA General Protection Zone and support its status as highly protected. We further conclude that if an MPA as regulated as the Ross Sea region MPA, especially its General Protection Zone, cannot meet the threshold of a "highly protected" MPA, it may prove difficult for other high seas MPA to be categorized as such.

1. Introduction

On October 28, 2016 States made history by adopting, through consensus, the world's largest marine protected area (MPA) in a region that includes one of the most productive and healthy stretches of ocean: the Ross Sea, Antarctica [1]. Designating the MPA required the efforts of hundreds of scientists and officials, thousands of conservationists, and millions of global citizens over the course of more than a decade [2]. In the end, it involved achieving the consensus of the more than two dozen States that comprise the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), the decision-making body that manages relevant marine issues in the Southern Ocean. Article IX of the CAMLR Convention allows for adopting and implementing closed areas for science or conservation, thus providing a legal basis for MPAs [3]. CCAMLR is among the few multi-national bodies that have developed high seas MPAs; CCAMLR is also committed to developing a system of Southern Ocean MPAs in line with international targets [2]. The Ross Sea region MPA was the second MPA CCAMLR adopted in developing such a system. The South Orkney Islands Southern Shelf MPA was CCAMLR's, and the world's, first high seas MPA; it was adopted in 2009 (~94,000 km^2 in size) [4].

As the first large-scale MPA (i.e., >150,000 km^2) [5] in areas beyond national jurisdiction, the Ross Sea region MPA sets a precedent for design, adoption and implementation of other MPAs on the high seas. In the myriad of MPA guides and rankings, including the recently published *MPA Guide* – which seeks to provide a new, consistent, and authoritative scientific framework for evaluating MPAs [6], the Ross Sea region MPA may also determine how other protected areas beyond national jurisdiction are evaluated. We outline why we support the status of the General Protection Zone (comprising ~80% of the MPA) as "highly protected," a term described in the new*MPA Guide* as places where only light extractive activities are allowed [6]. Here, we provide clarity on the governance and implementation of the Ross Sea region MPA, including with regard to its various zones. We outline the restrictions and management in place within the Ross Sea region MPA, particularly within the General Protection Zone, and conclude that if this is not categorized as highly protected in the *MPA Guide* or any similar guidelines for MPAs, it may prove difficult to categorize other

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high seas MPA as such.

2. The Ross Sea region MPA

The Ross Sea region MPA covers 2.09 million km^2, with almost 80% (1.66 million km^2) closed to commercial fishing [1]. It is designed to achieve a suite of specific objectives, which include: to conserve biodiversity, ecological structure, and ecosystem dynamics and function throughout the Ross Sea region; to protect ecosystem processes, core distributions of species, vulnerable habitats, and areas of importance to the life cycles of toothfish, seals and penguins; to promote research (including monitoring); and to provide reference areas for studying and separating the impacts of environmental change and fishing [1]. The majority of the MPA is encompassed in a large General Protection Zone (Table 1, Fig. 1). Commercial fishing is prohibited in the General Protection Zone, but pre-planned research fishing can be permitted by consensus of all CCAMLR Member States. The MPA also includes two research fishing zones in which limited commercial fishing is permitted – a Special Research Zone over the central Ross Sea shelf and slope and a Krill Research Zone on the western margin of the Ross Sea region (Table 1, Fig. 1) [1]. Exploratory commercial fishing for Antarctic krill (*Euphausia superba)* can be permitted within both research zones, and limited commercial fishing for Antarctic toothfish (*Dissostichus mawsoni*) is permitted within the Special Research Zone (but not within the Krill Research Zone) [1]. Fishing in these research zones is permitted pursuant to specific CCAMLR Conservation Measures (41–09 for toothfish and 51–04 for krill, respectively) [7,8]. All fishing within the MPA must not jeopardize either the conservation objective stipulated in Article II of the CAMLR Convention or the specific objectives of the Ross Sea region MPA (as summarized above and laid out in CCAMLR Conservation Measure 91–05) [1].

Commercial krill fishing does not currently occur in the Ross Sea region [11], and other than indications that the population is ecologically significant, little is known about Antarctic krill in this region [12]. The Krill Research Zone was designed, in part, to facilitate research on krill (as laid out in objectives 3 and 11 of the MPA) [1]. Toothfish fishing has occurred for more than 20 years in the Ross Sea [13], and the Special Research Zone was designed to meet multiple objectives [1]. Limited commercial fishing in this area was deemed important for continuing a tag-recapture program that informs the understanding of toothfish fish life history, population status, and movement (in support of objectives 2, 3, and 9 of the MPA) [1,14]. Further, by instituting a reduced catch level in this zone, CCAMLR seeks to contrast outcomes in the Special Research Zone against those from more heavily fished areas outside the MPA and those from unfished areas inside the General Protection Zone (as laid out in objective 2 of the MPA) [1]. Aside from toothfish fishing, occasional tourism operations are the only other commercial activities that occur in the Ross Sea region.

Table 1
Zones of the Ross Sea region Marine Protected Area, including size, prohibitions and allowances (CM refers to CCAMLR Conservation Measure).

	General Protection Zone (GPZ)	Special Research Zone (SRZ)	Krill Research Zone (KRZ)
Size (km^2)	~1,660,000	~110,000	~322,000
Fishing Prohibitions	All commercial fishing.	All commercial fishing except for krill and toothfish (see below).	All commercial fishing except for krill (see below).
Allowances	Research fishing for toothfish (via CM 24–01[9] and in accordance with MPA objectives in CM 91–05[1]).	Limited krill fishing (via CM 51–04 [8] and in accordance with MPA objectives in CM 91–05); limited toothfish fishing (in accordance with MPA objectives in CM 91–05% and 15% of region-wide total allowable catch per CMs 41–09[7] and 41–10 [10] and increased tagging rate).	Limited krill fishing (per CM 51–04 and in accordance with MPA objectives in CM 91–05).
Other prohibitions & restrictions	Mining, whaling, dumping, discharge, transhipment		

Beyond the prohibitions explicitly listed in Conservation Measure 91–05 (Ross Sea region MPA), a variety of other CCAMLR Conservation Measures apply in the Ross Sea region (Table 2), providing multiple layers of protection. CCAMLR designed, adopted and now implements the Ross Sea region MPA within the context of Conservation Measure 91–04, which outlines general objectives for MPAs and requirements for associated management and research and monitoring [15]. Additional examples include prohibitions on bottom trawling, gillnetting, and directed fishing for sharks; prohibitions on toothfish fishing in waters shallower than 550 m; limitations on bycatch of fishes not targeted by longlining; minimization of seabird mortality during longline fishing; and protection of vulnerable marine ecosystems and the environment in general [16] (Table 2). Most of these examples apply to the whole Convention Area.

3. Multi-national and institutional governance of the Ross Sea region MPA

CCAMLR is a multi-national institution comprised of 25 States plus the European Union, as well as a number of other acceding States. CCAMLR as a whole is responsible for managing the Ross Sea region MPA, but many technical aspects of work (e.g., compiling data, supporting monitoring and compliance, publishing maps) are the responsibility of the CCAMLR Secretariat, which is based in Hobart, Australia [1]. Research and monitoring, assessment, and enforcement are the responsibilities of Member States. CCAMLR's Scientific Committee developed and endorsed a Ross Sea region Research and Monitoring Plan in 2017 [17]. While this plan has not yet been agreed to by CCAMLR [18], it is intended to guide research and monitoring through identifying topics and priority elements relevant to the objectives of the MPA. The Research and Monitoring Plan also identifies indicator species for evaluating ecosystem change [17]. The United States helped gather and organize candidate baseline data studies for the MPA in 2018 [19], which were added to CCAMLR's online MPA Information Repository [20]. Current research and monitoring projects focused on the Ross Sea are extensive, with the United States alone having 25 active federal research grants, and hundreds of studies focused on topics pertinent to the MPA [21]. Other CCAMLR Member States, including New Zealand, Italy, and South Korea are also conducting research and monitoring that is relevant to the Ross Sea region MPA [22,23]. Some CCAMLR Members have also been involved in enforcing the MPA. For example, New Zealand has conducted enforcement activities through maritime surveillance and patrols carried out with the support of its Defence Force, Ministry for Primary Industries and Ministry of Foreign Affairs and Trade [24]. CCAMLR has not confirmed any illegal, unregulated or unreported fishing within the boundaries of the MPA since implementation [18,23,25].

CCAMLR also integrates with other competent multinational regimes, relevant to the goals of the of the Ross Sea region MPA. This includes the International Whaling Commission (IWC) and the Convention on the Conservation of Antarctic Seals (CCAS) that respectively manage commercial activities regarding whales and seals [26,27]. The IWC has designated the Southern Ocean as a Whale Sanctuary, thus prohibiting commercial whaling (though research exemptions can be granted) [28]. Commercial sealing, while technically allowed under

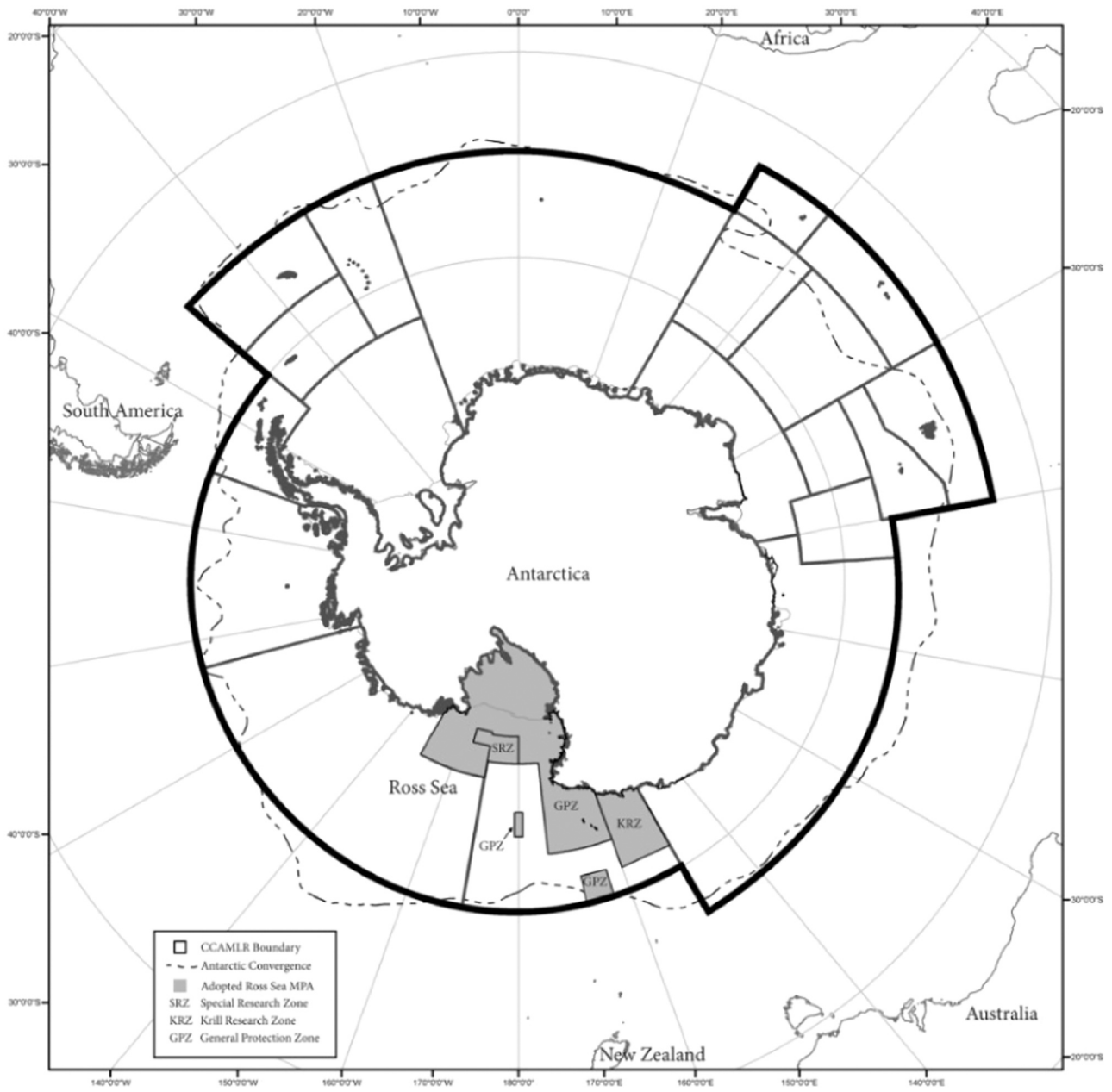

Fig. 1. The CAMLR Convention Area is represented by the bold black boundary that approximates the Antarctic Convergence. The GPZ refers to the General Protection Zone; commercial fishing is prohibited in this zone. SRZ refers to the Special Research Zone; exploratory fishing for krill and limited commercial fishing for toothfish is permitted in the SRZ. The KRZ refers to the Krill Research Zone; exploratory fishing for krill is permitted in the KRZ but commercial fishing for toothfish is prohibited therein (MPA boundaries and CCAMLR boundaries from gis.ccamlr.org). Ross Sea region Marine Protected Area (MPA; in gray) adopted by the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) in 2016 and entered into force in 2017.

CCAS (which sets precautionary catch limits as well as seasonal, geographical and species prohibitions) [26], has not occurred since the 1960 s, nor is there any indication of commercial interest. Further, CCAS has designated two closed areas within the Ross Sea [29]. Antarctic seabed mining and other mineral resources activities are banned under the Environmental Protocol to the Antarctic Treaty [30]. States party to the Antarctic Treaty also protect relatively small marine areas (i.e., Antarctic Specially Protected/Managed Areas, including multiple in the Ross Sea region), manage tourism, and act to limit the introduction of alien species to the Southern Ocean [31]. Discharge from ships operating in the Southern Ocean (and elsewhere) is subject to regulation by the International Maritime Organization [32]. Coordination could certainly be improved among these various managing bodies, including towards improving mechanisms for promoting the objectives of the MPA and greater coordination of regulations within the protected area.

The Ross Sea region MPA will be continuously reviewed. Every five years, beginning in 2022, Member States will report on their research and monitoring activities that are relevant to the MPA. Every 10 years, beginning in 2027, the MPA will undergo a formal review during which its efficacy towards meeting the specific objectives of the MPA will be assessed by Member States and CCAMLR's Scientific Committee (an advisory body). Reporting and review of the MPA will continue, every five and 10 years respectively, until 2052. In 2052, after being in force for 35 years, the conservation measure establishing the Ross Sea region MPA will expire. At that time, CCAMLR will have the opportunity to end the MPA or decide, by consensus, to continue the MPA as it is or modify it [1]. While the 35-year duration was a compromise necessary to achieve consensus, this finite duration of the MPA is still long-enduring [33]

Table 2
List of CCAMLR Conservation Measures and other Conventions relevant to the Ross Sea region Marine Protected Area.

CCAMLR Conservation Measure	
91–05	Ross Sea region Marine Protected Area
91–04	General Framework for the establishment of CCAMLR Marine Protected Areas
41–09	Limits on the exploratory fishery for *Dissostichus mawsoni* in Statistical Subarea 88.1 in the 2020/21 season
41–10	Limits on the exploratory fishery for *Dissostichus mawsoni* in Statistical Subarea 88.2 in the 2020/21 season
51–04	General measure for exploratory fisheries for *Euphausia superba* in the Convention Area in the 2020/21 season
24–01	The application of conservation measures to scientific research
22–05	Restrictions on the use of bottom trawling gear in high-seas areas of the Convention Area
22–06	Bottom fishing in the Convention Area
22–08	Prohibition on fishing for *Dissostichus* spp. in depths shallower than 550 m in exploratory fisheries.
22–09	Protection of registered vulnerable marine ecosystems, in subareas, divisions, small-scale research units, or management areas open to bottom fishing
25–02	Minimization of the incidental mortality of seabirds in the course of longline fishing or longline fishing research in the Convention Area
26–01	General environmental protection during fishing
32–18	Conservation of sharks
Other Conventions	
Antarctic Treaty and its Environmental Protocol	Prohibition on mineral resource activities that includes any seabed mining, provisions for small-scale protected areas, invasive species management, coordination with managing tourism
International Convention for the Regulation of Whaling	Regulates whaling and designates the Southern Ocean a Whale Sanctuary
Convention on the Conservation of Antarctic Seals	Designates seasonal, geographical and species take prohibitions
Convention under the International Maritime Organization	i.e., International Convention for the Prevention of Pollution from Ships

and intended to provide CCAMLR a mandatory reassessment of its values and objectives for the region. To meet its stated conservation objectives for protecting the life history of long-lived species (e.g., toothfish, Emperor Penguins), the MPA will ideally continue after 35 years, perhaps being revised if necessary to ensure the current suite of objectives can be achieved after 2052.

4. Research fishing

Conservation Measure 24-01, *The application of conservation measures to scientific research,* applies to the entire CAMLR Convention area, including within the Ross Sea region MPA and the General Protection Zone therein [1,9]. While research fishing might seem inconsistent with "no-take" provisions, in the case of the Southern Ocean, this measure is important given the sheer remoteness and lack of resources available for fisheries-independent research. Research by the fishing industry has lent insight towards understanding the basic life history and ecology of Antarctic fishes. For example, much of what is known about the life history of Antarctic toothfish in the Ross Sea region and the connectivity of these fish to those in other regions is due to industry-supported research and data collected by fisheries observers aboard commercial vessels (e.g., [13,34–36]). Ideally fisheries-independent research focused on toothfish would occur, however, this has proved costly and logistically difficult.

CCAMLR has strict rules concerning all extractive activities, including research fishing; these rules include a multi-year process during which multiple scientific advisory bodies evaluate proposed activities (Fig. 2). Any country wanting to conduct research fishing under Conservation Measure 24–01 must develop a research proposal, spanning up to three years, and present clear hypotheses and a research plan [9]. Multi-country research is preferred. Once a CCAMLR Member develops a research plan, it must then submit it to CCAMLR's scientific Working Groups on Statistics, Assessments and Modeling as well as Fish Stock Assessment, both of which critically evaluate the proposal. The Working Groups ask questions like: Is the research design sound? Is it doable in the location and timeframe proposed (e.g., will sea ice preempt successful conclusion of the research)? Will it answer the research questions proposed? In the case of the Ross Sea region MPA, evaluation must also consider if the research jeopardizes the objectives of the MPA [1].

Once a plan for research fishing is assessed, the Working Groups then pass their recommendations to CCAMLR's Scientific Committee. Usually these recommendations indicate whether or not the research should be approved, or not approved, and why. CCAMLR's Scientific Committee must then similarly evaluate the research proposal and consider the Working Groups' advice. The Scientific Committee then provides its advice to CCAMLR, which ultimately makes the decision whether or not to approve the proposed research fishing. To summarize, for research fishing under Conservation Measure 24–01 to be approved it must pass the scrutiny of two Working Groups and the Scientific Committee, then gain consensus support by the Commission (Fig. 2).

Research fishing plans are not always approved. If a plan is poorly designed, countries can take the Working Groups' advice and revise their plan. Sometimes, a State does not sufficiently revise a plan, and its research is thus not approved. For plans that are approved, the proposing Member must report on the fishing and research every year in which it is undertaken. If the research or reporting is insufficient, future activities may not be approved by CCAMLR (based again on the advice of the Working Groups and Scientific Committee), as happened in 2014 for toothfish research fishing in the Weddell Sea which produced data that could not be validated [37,38]. Catch from research fishing can be sold commercially, as this is supposed to cover the costs of the science and incentivize participation in research activities.

Currently, New Zealand is the only CCAMLR Member State which carries out research fishing for toothfish within the General Protection Zone of the Ross Sea region MPA [22,40,41]. The research, using

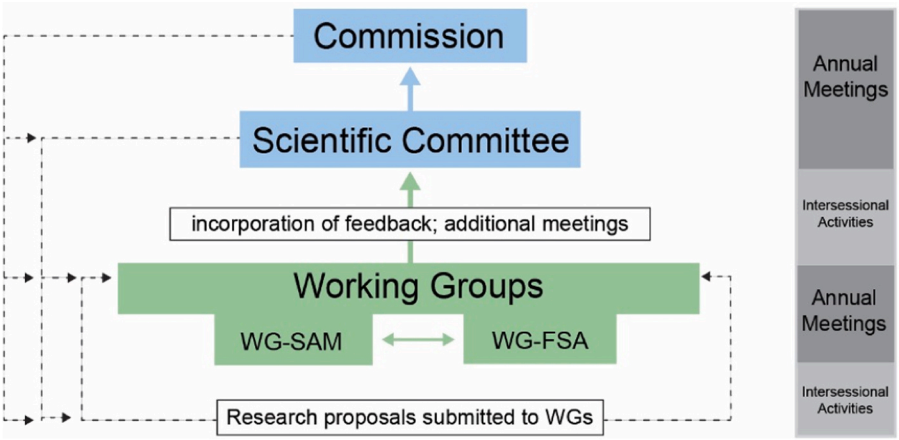

Fig. 2. The process by which research fishing is proposed and approved in CCAMLR. From the bottom up, research proposals are submitted by Member States to the relevant working groups (WGs). Two working groups - WG-SAM (Statistics, Assessments, and Modeling) and WG-FSA (Fish Stock Assessment) review the proposals. Each October, the Scientific Committee meets to review advice from the WGs, including advice on research proposals. At the close of its annual meeting, the Scientific Committee drafts a formal report of the meeting that includes advice for the Commission. The Commission then decides, via consensus (and based on advice from the Scientific Committee and WGs) if the research should proceed. Members may revise their proposals throughout the approval process. Figure modified after Sylvester & Brooks [39].

longlines, commenced in 2012, prior to the inception of the MPA, and the survey has provided key data, including on the life history of young fish and their recruitment to the population (pertinent to MPA objectives 2, 3, and 9) [22]. Currently, this research is limited to a catch of no more than 65 tonnes, or roughly 2% of the total catch in the Ross Sea fishery (~3100 tonnes). In the context of the scale of the General Protection Zone, this equates to about 30 g/km^2 of fish being taken. This research cannot be conducted elsewhere because the Ross Sea shelf, which is fully encompassed by the General Protection Zone, is known to be the habitat utilized by young toothfish. This research has potential to improve management of the fishery generally and provide insight into whether the MPA is effectively protecting toothfish populations [22] specifically. One other CCAMLR Member State has proposed research fishing in the MPA (in the Special Research Zone), but due to issues raised with the research design, it has not been endorsed by the Working Group on Fish Stock Assessment nor by the Scientific Committee, and thus has not been approved by the Commission [23,25].

New Zealand's research fishing in the Ross Sea region MPA aligns with the Industrial Fishing Motion (#066) adopted by the International Union for Conservation of Nature (IUCN) in November 2020 which allows for scientific research to be carried out in MPAs if it is: "*low-impact scientific research activities and ecological monitoring related to and consistent with the values and restrictions of the protected area can be carried out, particularly when collection cannot be conducted elsewhere*" [42]. This research fishing – strictly permitted and regulated by CCAMLR and consistent with the objectives of the Ross Sea region MPA – meets the IUCN resolution criterion, thereby making it compatible with the General Protection Zone as a highly protected area. Nevertheless, additional measures could be taken to strengthen this research, such as attaching cameras to fishing gear to better assess potential impacts of the gear on communities of benthic invertebrates.

As noted previously, fishing within the Krill Research Zone and Special Research Zone are respectively managed under CCAMLR Conservation Measures 51–04 and 41–09 [7,8]. In contrast to research fishing permitted under Conservation Measure 24–01, these measures regulate "exploratory fisheries," which are open to any CCAMLR Member and in which vessels compete to catch fish up to a total catch limit. Up to 15,000 tonnes of krill could be commercially taken in either of these research zones, however, to do so, a State must conduct a krill survey or monitor the performance of krill-dependent predators like penguins. Conservation Measures 41–09 and 41–10 set the Total Allowable Catch for toothfish in the Ross Sea region, which is roughly ~3100 tonnes; 15% of this catch is permitted to be taken from the Special Research Zone, with the additional requirement that more extensive tagging research is conducted (three fish must be tagged per tonne caught) [1]. These commercial fisheries, with large catches and competition between vessels, are very different from research fishing under Conservation Measure 24–01. In the latter case, a quota is allocated to a specific Member State(s) carrying out an approved research plan in a specific place to answer a specific scientific question.

Most of the research conducted in the Ross Sea region MPA is not, and does not need to be, conducted pursuant to Conservation Measure 24–01. Further, the majority of research conducted in the Ross Sea region is not research fishing. As noted above, CCAMLR Member States are collectively carrying out extensive research relevant to assessing the broad ecosystem objectives of the MPA; this research is generally supported by national Antarctic programs. Only research related to extraction of marine living resources in commercial quantities needs to be approved by CCAMLR.

5. Precedent for the high seas

As the first large-scale MPA in international waters, the Ross Sea region MPA can set a precedent for design, adoption and implementation of other MPAs on the high seas. While the MPA has not been formally classified into IUCN protected area categories (see, e.g., Protected Planet database [43]), Nicoll and Day [44] have expressed the view that the Ross Sea region MPA does not meet IUCN criteria due to limited duration, however others define long duration as greater than 10 years [33], a criteria which the Ross Sea region MPA meets. We further note that based on its conservation objectives, the General Protection Zone is comprised of no-take regions that could qualify as Category Ia, equivalent to a strict nature reserve, while the Special Research Zone and Krill Research Zone could qualify as Category VI, equivalent to a protected area with sustainable use [45]. The Ross Sea region MPA was nominated under the Marine Conservation Institute's Blue Park Awards [46], but did not receive the award; no high seas MPA has [47]. The Marine Protection Atlas formally categorizes the Ross Sea region MPA as fully/highly protected [48]. The new *MPA Guide* [6] seeks to provide a consistent and unified framework, but it has yet to be applied to the high seas; and assessing international MPAs like the one in the Ross Sea region may prove challenging due to the complexity of its governance structure. However, we support the majority of the MPA (the General Protection Zone) qualifying as highly protected based on the reasons highlighted here.

Designating MPAs areas beyond national jurisdiction is possible, but has only occurred in a few circumstances (e.g., CCAMLR and OSPAR); globally, governance of high-seas MPAs is fragmented [49–51]. Currently, there are ongoing negotiations at the United Nations of an international legally binding instrument under the United Nations Convention on the Law of Sea on the conservation and sustainable use of marine biological diversity in areas beyond national jurisdiction (BBNJ Treaty) [52]. Current drafts of the BBNJ Treaty contemplate inclusion of a dedicated section that would allow for establishment of high seas

MPAs under the rubric of area-based management tools [53]. Yet, it is unclear how this new treaty might handle coordination across all relevant high-seas stakeholder groups to promote the creation of MPAs [50].

The BBNJ negotiations demonstrate the international community's interest in promoting the establishment of high seas MPAs to promote a variety of conservation objectives, and the Ross Sea region MPA can provide guidance as an example for future high seas MPAs. It is thus important, in that context at least, that the highly-protective nature of the Ross Sea example is recognized. Recognizing this example will demonstrate that both highly and fully protective MPAs have a role to play in conservation and sustainable use of areas beyond national jurisdiction. Availability of a suite of options for high seas protected areas would allow flexibility in how BBNJ negotiators can approach establishment of MPAs, thus making arriving at an acceptable position among numerous countries at the United Nations with a myriad of interests more likely.

The reality of reaching consensus on the Ross Sea region MPA demanded compromise [2]. This included addition of fishing zones in ~20% of the MPA, a duration clause and provisions for research fishing within the whole of the MPA. For reasons discussed herein, we think that an MPA can be considered "highly protective" even if it, as here, does not have unlimited duration or allows for limited research fishing in an otherwise no-take area. Noting the vulnerability of toothfish as a deep-dwelling, long-lived fish that is vulnerable to overfishing [54], we support research which further investigates its life history. However, the rigid process by which this fishing is approved is extremely important. Provisions in international MPA standards which allow fishing to be carried out for scientific research should not be utilized as loopholes to allow commercial fishing activity.

As CCAMLR moves towards establishing a network of Southern Ocean MPAs and the BBNJ negotiations work towards creating a mechanisms to establish high seas MPAs worldwide, the Ross Sea region MPA can provide valuable guidance. Currently, three additional Southern Ocean MPAs remain under negotiation – in East Antarctica, the Weddell Sea, and around the Antarctic Peninsula. CCAMLR has, and continues to, learn from the experience of adopting and implementing the Ross Sea region MPA. The prohibitions and restrictions coordinated through CCAMLR's Conservation Measures, and the active management, research, monitoring and enforcement of the Ross Sea region MPA illustrate that CCAMLR and its Member States can and will actively manage and enforce MPAs. Looking forward, coordination among institutions with jurisdiction in the Southern Ocean could be improved. Nonetheless, the Ross Sea region MPA is currently, and for the foreseeable future, highly protected from potentially destructive human activities, and is thus exemplary of a large-scale highly protected MPA.

CRediT authorship contribution statement

Cassandra Brooks: Conceptualization, Supervision, Visualization, Writing – original draft, Writing – review & editing. **Evan Bloom**: Writing – original draft, Writing – review & editing. **Andrea Kavanagh**: Conceptualization, Writing – original draft, Writing – review & editing. **Emily Nocito**: Conceptualization, Writing – original draft, Writing – review & editing. **George M. Watters**: Conceptualization, Writing – original draft, Writing - review & editing. **John Weller**: Writing – original draft, Writing – review & editing.

Declaration of Competing Interest

C.M.B. declares that she has an active research grant with the Pew Charitable Trusts and that she was a core member of the Last Ocean Project. E.B. is a former U.S. State Department official; he was the U.S. Commissioner for CCAMLR and was lead U.S. negotiator for the Ross Sea region MPA. A.K declares that she works for The Pew Charitable Trusts, an organization that works to encourage the designation of MPAs around the world including on the Ross Sea region MPA. G.M.W. declares that he is a U.S. Govt. employee, and the Ross Sea region MPA was a major policy initiative of the United States. J.W. was a founding member of the Last Ocean Project.

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