



CCAMLR

Commission for the Conservation of Antarctic Marine Living Resources
Commission pour la conservation de la faune et la flore marines de l'Antarctique
Комиссия по сохранению морских живых ресурсов Антарктики
Comisión para la Conservación de los Recursos Vivos Marinos Antárticos

CCAMLR-XXXVII/31

07 September 2018

Original: English

COMMISSION

Proposal on a conservation measure establishing a marine protected area in the Domain 1 (Western Antarctic Peninsula and South Scotia Arc)

Delegations of Argentina and Chile



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Proposal on a Conservation Measure establishing a Marine Protected Area in the Domain 1
(Western Antarctic Peninsula and South Scotia Arc)

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Abstract

1. Since 2002, CCAMLR has been working on the development of a network of Marine Protected Areas (MPAs) with the aim of conserving marine biodiversity in the Convention Area. Consistent with this goal and taking into account the singularities of the Western Antarctic Peninsula (WAP) and South Scotia Arc region, the delegations of Argentina and Chile propose the establishment of an MPA in the Planning Domain 1 (D1MPA), to protect representative habitats for marine living resources, preserve ecosystem processes, protect vital areas for zooplankton, fish, mammal and bird life-cycles, and maintain reference areas for scientific research and monitoring. This proposal is consistent with Conservation Measure 91-04 (2011) and the recommendations and scientific conclusions discussed since 2012 by the Commission, Scientific Committee and its Working Groups, including those of the Domain 1 Expert Group.

Background

2. The main objective for establishing a system of MPAs is to conserve marine biodiversity, which can only be achieved by maintaining a healthy ecosystem in the Convention Area. Indeed, MPAs aim to contribute to sustaining ecosystem structure and function, including areas outside the MPAs. Further, conserving the unique Antarctic biological biodiversity will, in turn, contribute to food security.
3. One of the most productive areas of the southern oceans is the Southwest Atlantic sector, from the Antarctic Peninsula to the Antarctic Convergence and the Scotia Arc. In fact, about 75% of the circumpolar krill population is located in this area. Because of the characteristics of the coastal regions of the Antarctic Peninsula, the complex coastal circulation serves to retain and transport plankton within the coastal regions. In this area, during the austral summer and autumn, large aggregations of birds and krill-feeding whales have been observed.
4. The West Antarctic Peninsula (WAP) is subject to on-going environmental changes including atmosphere and ocean warming, changes in the extension and duration of sea ice, changes in precipitation, ice break collapses, ocean acidification and changes in the wind regime. In particular, the North-South oriented WAP presents a strong latitudinal climate gradient both in temperature and sea ice, characterized by a shorter ice season and more maritime conditions in the North, and a longer ice season and more continental conditions in the South. In addition, recent evidence has highlighted the importance of the warming of Circumpolar Deep Water forcing glacier retreat in the southern part of the WAP, which has

been linked to warming of air temperatures. In contrast, glaciers in the north of the WAP that are more exposed to cooler waters coming from the Weddell Sea, are more stable.

5. Current and projected physical changes may result in altered species distributions, community composition and food web structure, as well as changes in ecosystem functioning. The combined effects of multiple stressors such as increased sea temperature, changes in the timing and coverage of sea ice, and reduced chlorophyll availability may result in further negative effects, for example on krill habitats. The current highly complex scenario is already producing changes in key food trophic levels that are likely to impact both planktonic and benthic communities. In this regard, benthic communities may also be impacted by changes in seafloor temperature over the next hundred years, producing a substantial redistribution of species as some species will respond either positively or negatively to warming, with the WAP showing a projected overall reduction in species numbers. In fact, recent experimental research has already demonstrated how warming can have dramatic effects on the composition of benthic communities, altering species diversity and evenness, which may also affect their roles hence altering ecosystem functioning. The projected changes highlight the importance of protecting benthic habitats in order to minimize the impacts of warming on benthic ecosystems.
6. Krill fishery activity began in 1961 but it became more active by the 1970s. After an exploratory period, since the early 1990s it is focused almost entirely in the Atlantic Ocean sector. In the past 10 years, and most likely due to the decrease of sea ice extension, the spatial distribution of the fishery has been moving to the south, where nowadays it is mainly concentrated in i) the region of the Bransfield Strait/Mar de la Flota, ii) the Northwest of Coronation Island, and iii) the north of Statistical Subarea 48.3 (CCAMLR Krill Fishery Report 2017).
7. Because of the increasing variability of the environment recorded in the area and the increasing capability of the fisheries, the interest in harvesting activities is growing. Thus, there is a need for a multinational research effort aimed to understand the on-going processes in the region. Climate change is one of the main factors affecting the Antarctic marine ecosystem, imposing a new set of pressures that will affect productivity, species distribution and ecosystem processes. These changes are currently more prevalent on the WAP, but may threaten the rest of the Antarctic in the future. Thus, there is an urgent need to incorporate climate change into the management of fisheries, in order to help to understand and disentangle the effects of the different drivers. A rigorous understanding of the different drivers of changes in Antarctica will improve our ability to detect and adapt to future changes, hence helping to minimize the disruption to marine ecosystems and human food supplies.
8. Since 2002, CCAMLR has been working on the development of a network of MPAs, in accordance with Articles II and IX of the Convention. In 2005, the development of a system of protected areas was required in order to assist CCAMLR in achieving its broader

conservation objectives, obtaining scientific knowledge at a broad-scale (bioregionalisation) and also at a fine-scale (subdivision). Later on, in 2009, to further preserve the significant marine biodiversity of the Convention Area, the Commission endorsed the Scientific Committee's work program to develop a representative system of Antarctic MPAs. In 2011, eleven priority areas were identified, and then reviewed and re-scaled into nine large-scale MPA Planning Domains, to better reflect the scale and location of current and planned research effort, considered to be more helpful at monitoring units. Later that year, Conservation Measure 91-04 (2011) was adopted, providing a general framework for the establishment of CCAMLR MPAs, including overarching MPA objectives, key elements and limitations of MPA Conservation Measures, and requirements for management, and research and monitoring plans.

9. Marine ecosystems that surround the Antarctic have similarities but also have unique characteristics on different areas, both in several aspects of their ecology and in the potential threats they might face. A network of MPAs that cover ecological gradients and different environmental characteristics will help in protecting the Antarctic, as well as enhance its resilience for the future. For this reason, individual MPAs should complement each other based on the differential conservation objectives and threats present in each of CCAMLR's Planning Domains.
10. The DIMPA planning process consisted in a comprehensive compilation and integrative analysis of a significant amount of information through a multinational approach in all stages of the decision-making process. After a series of international workshops and informal meetings carried out since 2012, and based on 143 spatial data layers, Priority Areas for Conservation (PAC) in Domain 1 were described and a DIMPA preliminary proposal was introduced for discussion during 2017 (SC-CAMLR-XXXVI/17 and 18).
11. The DIMPA includes important marine areas of the WAP and the South Scotia Arc regions that contribute to achieving the following objectives:
 - (i) to protect representative examples of benthic habitats;
 - (ii) to protect representative examples of pelagic habitats;
 - (iii) to protect important benthic ecosystem processes that constitute predictable high sources of productivity, including canyons;
 - (iv) to protect large-scale pelagic ecosystem processes that contribute to preserve foreseen features for primary productivity or food concentration;
 - (v) to protect important areas for mammal and bird life-cycles, including their foraging distributions during the breeding and non breeding seasons, and the distributions of their prey;
 - (vi) to protect important areas for fish life-cycles, with particular emphasis on species that were commercially overexploited in the past;

- (vii) to protect important areas for zooplankton life-cycles, with emphasis on Antarctic krill (*Euphausia superba*);
 - (viii) to protect known rare or vulnerable benthic habitats;
 - (ix) to establish scientific reference areas to: a) assess the potential impacts of krill fisheries on dependent predators, b) evaluate the potential impacts of climate change on the Antarctic marine ecosystem, and c) monitor the efficacy of the MPA; and
 - (x) to promote multinational research and other scientific activities including monitoring of marine living resources; and generate synergies between National Antarctic Programs and the fishing industry.
12. The D1MPA will protect important areas for iconic Antarctic species such as emperor penguins (*Aptenodytes forsteri*), chinstrap penguins (*Pygoscelis antarcticus*), and Adélie penguins (*P. adeliae*), all of which show a decreasing trend in their population in the WAP; recently, large colonies of Adélie penguins have been discovered at the northern tip of the Antarctic Peninsula and are included in the D1MPA. Also, it will protect Antarctic krill nurseries that include vulnerable stages of their life cycle, important areas for over exploited fish in the past, and early stages of *Dissosthicus mawsoni*. In the region of Marguerite Bay, important benthic and pelagic bioregions are protected, such as canyons and cross shelf valleys, and polynyas margins which are important areas for birds and mammals such as those of the non-breeding foraging distribution of killer whales (*Orcinus orca*) type B1. The North West Antarctic Peninsula (NWAP) is an area of high biodiversity and concentration of large population of birds and mammals, during both breeding and non-breeding periods. The D1MPA also protects important areas for fish life-cycles such as spawning/early stages habitats and occurrence areas for exploited species; and important areas for zooplankton life-cycles, including the krill nurseries in the Gerlache Strait and Weddell Sea. In the South Orkney Islands region, high protection is also given to important areas for birds and mammals, including breeding foraging distribution of pygoscelid penguins, and important areas for zooplankton life cycles.
13. The D1MPA model has an extension of approximately 466,000 km² comprising three different management zones: General Protection Zone (GPZ), Krill Fishery Research Zone (KFRZ) and Special Fishery Management Zone (SFMZ). These incorporate the conservation of different objectives, the need for a better understanding of the krill fishery activity and the current fishery management strategy (Conservation Measure 51-07).
14. Regarding krill fishery activities, we recognized the D1MPA includes current and potential fishing grounds for the krill fishery and, as such, it requires special attention. Information on krill fishery has been included in the model considering the krill fishery displacement. In this regard, Krill Fishery Research Zones (KFRZ) for understanding the potential effects of fishery on the ecosystem have been included in the model, based on

the availability of scientific information, spatio-temporal variability of harvesting activities, and the existence of scientific long-term monitoring programs or study sites.

15. In Domain 1, other management strategies for the krill fishery are currently in the process of being developed, such as risk assessment and Feedback Management Strategy (FBM) (SC- CCAMLR-XXXV, para. 5.8). Given the complexity of this decision, which has been a subject of discussions within CCAMLR for the last years, there is a recognized need to consider how to integrate the existing and proposed management approaches for Domain 1 (WG-EMM-17, paragraph 4.16; SC-CAMLR-XXXVI, paragraph 5.28; CCAMLR-XXXVI, paragraph 5.66).
16. Direct toothfish fishery is currently closed in Domain 1 (Conservation Measure 32-02). However, several research fisheries have been developed in subareas 48.2 and 88.3 and others are under consideration in subareas 48.1 and 88.3. The recent “CCAMLR workshop for the development of a *Dissostichus mawsoni* population hypothesis for Statistical Subarea 48” provided a comprehensive compilation of information available on *Dissostichus spp.* identifying information about distribution of different life stages of toothfish and also identifying critical data gaps. In this regard, the information provided by current and future research programmes on toothfish species will be critical to improve our knowledge about this species in terms of distribution of different life stages, areas and seasons of spawning, potential nursery areas, among others.
17. Scientific reference areas are a key tool for understanding the relative impacts of climate change and other human activities. Such information will be critical in monitoring the achievement of MPA objectives, particularly where protected species or habitats undergo change or are no longer present within a designated area. MPAs also provide the framework to focus research and monitoring efforts to observe climate trends. The DIMPA has assessed this issue by identifying potential reference areas for climate change (SC-CAMLR-XXXVII/BG/XX (Part A)) and by including this topic in the Scientific Research and Monitoring Plan (Annex C).
18. The delegations of Argentina and Chile invite all Members to consider the following Conservation Measure to establish a Marine Protected Area in Domain 1 for the purpose of achieving the conservation of Antarctic marine living resources, where conservation includes rational use.

CONSERVATION MEASURE 91-XX (201X)

Marine Protected Area in the Domain 1

The Commission,

Seeking to comply with Article IX of the CAMLR Convention, which in its paragraphs 1(f) and 2(g) provides that Conservation Measures, formulated upon the best scientific evidence available, may order the opening and closing of areas, regions or sub-regions for purposes of scientific study or conservation, including special areas for protection and scientific study;

Mindful that the objective of the Convention consists of the conservation of Antarctic marine living resources, where conservation includes rational use in the terms of the Convention and the conservation principles listed in Article II;

Acknowledging the work program of the Scientific Committee to develop a representative system of Marine Protected Areas (MPAs) aimed at the conservation of marine biodiversity within the Convention Area and the achievement of its objectives, as endorsed in 2010 in accordance with the decision adopted in the World Summit on Sustainable Development in 2002 to achieve a representative system of MPAs by 2012;

Recognizing also the decision at the 2012 United Nations Conference on Sustainable Development noting the importance of measures to conserve, by 2020, important areas for biodiversity and ecosystem services, which includes the creation of a representative and inter-connected system of MPAs;

Conscious of CCAMLR's international leading role in the conservation of marine living resources and marine biodiversity, including through the ongoing development of a representative system of MPAs;

Noting the main objective for the creation of MPAs in the Convention Area consists in the conservation of marine biodiversity and that MPAs should be mutually complementary, according to the different conservation objectives and threats in each CCAMLR Planning Domain;

Recognizing the general framework for the establishment of CCAMLR MPAs, adopted by Conservation Measure 91-04, as a fundamental contribution for the creation of a representative system of CCAMLR MPAs;

Recognizing the importance of collaboration and cooperation among CCAMLR Members in conducting research and monitoring to fulfill the objectives of the MPA;

Acknowledging that the establishment of zones provides a mechanism for establishing spatially explicit management regimes, which allow protection and scientific objectives as well as rational use of marine living resources to occur in specific areas within MPAs;

Recognizing that the area between the western side of the Antarctic Peninsula and both the Antarctic Convergence and Scotia Arc is one of the most productive ecosystems in the Convention Area, and is of paramount ecological and scientific importance;

Conscious that the Antarctic Peninsula area is substantially affected by climate change and that the establishment of CCAMLR MPAs can provide important opportunities to understand the ecosystem impacts of climate change separately from those of fishing;

Noting that for the last ten years, reduced sea ice extension and new available technologies, have enabled fisheries, including that of Antarctic krill, to operate further southwards around the Antarctic Peninsula;

Acknowledging the significant logistical and scientific activities that take place in the Antarctic Peninsula area, as well as the growing tourist activities in the region;

Recognizing that Priority Areas for Conservation (PACs) have been identified in Planning Domain 1 and justified by the best available science;

Acknowledging these areas are important to protect marine living resources and mitigate the impacts of both climate change and fishing;

Acknowledging the transparent, participative and open manner in which the present MPA proposal has been developed;

Recalling that CCAMLR is an integral part of the Antarctic Treaty System, and that Article III.1(c) of the Antarctic Treaty provides that, to the greatest extent feasible and practicable, scientific observations and results shall be exchanged and made freely available;

Anticipating that the establishment and ongoing management of CCAMLR MPAs will benefit from the exchange of information between CCAMLR and the Antarctic Treaty Consultative Meeting, as well as the Committee on Environmental Protection and the Scientific Committee on Antarctic Research;

hereby adopts the following Conservation Measure in accordance with Articles II and IX of the Convention to establish an MPA in the Planning Domain 1, for the purpose of achieving the conservation of Antarctic marine living resources, where conservation includes rational use:

1. The area defined in Annex 91-XX/A is designated as the Domain 1 MPA (the MPA), pursuant to Conservation Measure 91-04. The provisions of Conservation Measure 91-04 apply to this MPA.
2. Nothing in this Conservation Measure shall be interpreted or applied in a manner that prejudices the rights or obligations of any State under international law, in particular, as reflected in the United Nations Convention on the Law of the Sea.
3. The MPA includes important marine areas within the Western Antarctic Peninsula and the South Scotia Arc regions, and it is designated in line with Article II of the CCAMLR Convention to contribute to the following specific objectives:

- i. to protect representative examples of benthic habitats;
 - ii. to protect representative examples of pelagic habitats;
 - iii. to protect important benthic ecosystem processes that constitute predictable high sources of productivity, including canyons;
 - iv. to protect large-scale pelagic ecosystem processes that contribute to preserve foreseen features for primary productivity or food concentration;
 - v. to protect important areas for mammal and bird life-cycles, including their foraging distributions during the breeding and non breeding seasons, and the distributions of their prey;
 - vi. to protect important areas for fish life-cycles, with particular emphasis on species that were commercially overexploited in the past;
 - vii. to protect important areas for zooplankton life-cycles, with emphasis on Antarctic krill (*Euphausia superba*);
 - viii. to protect known rare or vulnerable benthic habitats;
 - ix. to establish scientific reference areas to: a) assess the potential impacts of krill fisheries on dependent predators, b) evaluate the potential impacts of climate change on the Antarctic marine ecosystem, and c) monitor the efficacy of the MPA; and
 - x. to promote multinational research and other scientific activities including monitoring of marine living resources; and generate synergies between National Antarctic Programs and the fishing industry.
4. Further details about the specific objectives in paragraph 3 and the features or areas within the MPA associated with those objectives are set forth in the MPA Management Plan (Annex 91-XX/B).
5. The MPA shall be divided into the following three zones, as defined in Annex 91-XX/A (Figure 1) and further described in Annex 91-XX/B:
 - i. The General Protection Zone (GPZ),
 - ii. The Krill Fishery Research Zone (KFRZ-1, -2, -3 and -4), and
 - iii. The Special Fishery Management Zone (SFMZ).
6. Research fishing activities in the MPA for all species except krill shall be conducted in accordance with Conservation Measures 24-01 and 24-05, and shall be consistent with the specific objectives of the MPA. Research fishing activities for krill in the GPZs and KFRZs shall be conducted in accordance with Conservation Measure 24-01 paragraph 3 irrespective of the expected catch, Conservation Measure 24-05, the provisions set in this Conservation Measure, and shall be consistent with the specific objectives of the MPA.

Restricted, prohibited and managed activities

7. Except as authorized under paragraphs 6, 8 and 9 fishing activities are prohibited within the MPA.
8. Beginning with the [XXXX/XX] fishing season, Members may conduct directed fishing for *Euphausia superba* in the Krill Fishery Research Zones (KFRZ-1, -2, -3, -4) in accordance with Conservation Measures 21-03, 23-06, 51-01 and 51-07 and consistent with the specific objectives of the MPA, subject to the following conditions:
 - i. The combined catch limit in the KFRZ-1, KFRZ-2, KFRZ-3 in Statistical Subarea 48.1 shall be [30,000 tonnes] of the total catch limit for that Subarea. From the [XXXX/XX+1] fishing season, the catch limits shall be divided as follows:
 - i. the catch limit in the KFRZ-1 (Antarctic Peninsula) shall be [26,500 tonnes] of the total catch limit for Statistical Subarea 48.1.
 - ii. the catch limit in either KFRZ-2 or KFRZ-3 (South Shetland Islands) shall be [3,500 tonnes] of the total catch limit for Statistical Subarea 48.1, subject to the following conditions:
 1. For the first 10-year period (from fishing season [XXXX/XX+1 to XXXX/XX+10]) the catch limit shall be allocated entirely to the KFRZ-2.
 2. For the next 10-year period (from fishing season [XXXX/XX+11 to XXXX/XX+20]), the catch limit shall be allocated entirely to the KFRZ-3.
 3. When the catch limit for either KFRZ-2 or KFRZ-3 is set at zero, said zone shall be considered as General Protection Zone in accordance with paragraph 6.
 - ii. The catch limit in the Krill Fishery Research Zone in Statistical Subarea 48.2 (KFRZ-4) shall be [33,500 tonnes] of the total catch limit for that Subarea.
 - iii. Fishing vessels engaging in the krill fishery within the KFRZs shall carry on board at least one scientific observer appointed in accordance with the CCAMLR scheme of international Scientific Observation.
9. Beginning with the [XXXX/XX] fishing season, Members may conduct directed fishing for *Euphausia superba* in the SFMZs in accordance with Conservation Measures 21-03, 23-06, 51-01, 51-06 and 51-07, and consistent with the specific objectives of the MPA. In addition, krill fishing operations shall be conducted in water depths greater than 250 meters.

10. The objectives of the KFRZs, included in paragraph 3.ix, shall be accomplished through the development of research plans designed to contrast the impacts of the krill fishery in the KFRZs and included in the Scientific Research and Monitoring Plan. The KFRZs shall be considered as GPZs until the Commission has approved these plans upon advice of the Scientific Committee. If the Commission has not approved these plans after a 10-year period (from fishing season [XXXX/XX+1 to XXXX/XX+10]), the KFRZs shall be considered as SFMZs managed in accordance with paragraph 9.
11. Fishing vessels and vessels conducting scientific research activities on Antarctic marine living resources should avoid dumping or discharging wastes or other matter within the MPA. At a minimum, the provisions of Conservation Measure 26-01 shall apply within the MPA.
12. Notwithstanding Conservation Measure 10-09, no fishing vessel may engage in transshipment¹ activities within the GPZs, except in cases where vessels are involved in an emergency relating to safety of human life at sea or engaged in a search and rescue operation

Management Plan

13. The management measures and administrative arrangements required to achieve the specific objectives of the MPA are further specified in the MPA Management Plan (Annex 91-XX/B).

Scientific Research and Monitoring Plan

14. Priority elements for scientific research and monitoring associated with this MPA are identified in Annex 91-XX/C.
15. A Scientific Research and Monitoring Plan shall be introduced to the Scientific Committee and Commission no later than at their next annual meeting after the MPA is agreed.

Reporting

16. Unless otherwise agreed by the Commission, every five years Members shall submit to the Secretariat, for review by the Scientific Committee, a report on their activities conducted according to, or related to, the MPA Scientific Research and Monitoring Plan, including any preliminary results. These reports shall be compiled by the Secretariat and provided to the Scientific Committee no later than 6 months in advance of its annual meeting in [XXXX/XX+5] and every five years thereafter. The Secretariat shall make these reports available in a timely manner to Members on the CCAMLR website.

17. Notwithstanding paragraph 16, Members are encouraged to submit to the Secretariat as they become available:
- i. data collected according or related to the MPA Scientific Research and Monitoring Plan, which shall be made available by the Secretariat to Members under normal rules and procedures for data access within CCAMLR;
 - ii. published papers or reports of relevance to the Domain 1 MPA, which shall be made available by the Secretariat in a timely manner to Members on the CCAMLR website.

Review of the MPA

18. Unless otherwise agreed by the Commission upon advice of the Scientific Committee, the Scientific Committee shall review the management regime and research plans for the KFRZs with the aim of determining whether the specific objectives relevant to the KFRZs (Annex 91-XX/B) are being achieved, taking into account the reports submitted pursuant to paragraph 16.
19. Unless otherwise agreed by the Commission upon advice of the Scientific Committee, the Commission shall review this Conservation Measure at least every ten years to assess whether the specific objectives of the MPA are still relevant or being achieved, as well as to evaluate the delivery of the Scientific Research and Monitoring Plan, taking into account the advice of the Scientific Committee and the reports submitted pursuant to paragraph 16.
20. The Commission, with due consideration of the advice by the Scientific Committee may amend this Conservation Measure and its annexes at any time, including based on the finding of the reviews specified in paragraph 19.

Period of designation

21. The period of designation of this Conservation Measure is [70 years]. If the Commission does not reach consensus to reaffirm or modify this MPA, or adopt a new MPA at its meeting in [XXXX/XX+70], taking into account the results of reviews conducted in accordance with paragraph 19, this Conservation Measure shall expire at the end of the [XXXX/XX+70] fishing season.

Compliance and monitoring

22. CCAMLR Contracting Parties shall provide a copy of this Conservation Measure to all vessels licensed to fish in the CAMLR Convention Area.

23. Members participating in the CCAMLR System of Inspection are encouraged to carry out surveillance and inspection activities within the MPA to verify compliance with this Conservation Measure and other applicable Conservation Measures.
24. For the purpose of monitoring traffic within the MPA, vessels transiting the area, not bound by Conservation Measure 10-04, are encouraged to inform the Secretariat of their passage through the MPA, and provide vessel details including name, Flag State, size, radio call sign and IMO number.

Cooperation with other States and organizations

25. The Commission shall draw this Conservation Measure to the attention of any State that is not a Party to the Convention, whose nationals or vessels operate in the Convention Area.
26. The Commission shall communicate information about the MPA to the Antarctic Treaty Consultative Meeting, and shall encourage the Antarctic Treaty Consultative Meeting to take appropriate actions within its competence to contribute to the achievement of the specific objectives set forth in paragraph 3, particularly with regard to the designation and implementation of Antarctic Specially Protected Areas and Antarctic Specially Managed Areas in the Domain 1 and the management of human activities, including tourism activities.
27. Members are encouraged to work together to actively engage:
 - i. the International Maritime Organization with regard to ship traffic, vessel safety, and environmental protection issues, and
 - ii. other international organizations and non governmental organizations, to take complementary actions within their competence to contribute to the achievement of the specific objectives set forth in paragraph 3.

Related Provisions

28. Within the MPA, areas can be designated as Special Areas for Scientific Study following ice shelf retreat or collapse in accordance with the provisions and procedures set out in Conservation Measure 24-04. In such Special Areas for Scientific Study, the management measures set out within Conservation Measure 24-04 shall apply.

¹ Transshipment means the transfer of harvested marine living resources and any other goods or materials to or from fishing vessels

DOMAIN 1 MARINE PROTECTED AREA BOUNDARIES AND MAP, INCLUDING DEFINITIONS OF ZONES WITHIN THE MPA

1. The General Protection Zone (GPZ) is comprised by six areas (Figure 1):

- Emperor (GPZ-E): The area bounded by a line starting at 73°5'S 81°30'W, thence due north to 71°47'S, thence due east to 76°24'W, thence due south to 73°5'S and west to the starting point.
- Alexander I Is. (GPZ-AI): The area bounded by a line starting at 71°5'S 77°35'W, thence due northwest to 69°24'S 80°30'W, thence due northeast to 66°42'S 75°54'W, thence due southeast to 68°35'S 72°30'W, thence due southwest to 70°35'S 74°54'W, thence due northwest 71°5'S 76°24'W, and thence due west to the starting point.
- Marguerite Bay (GPZ-MB): The area bounded by the line starting where the parallel at 68°35'S intersects the coastline, thence due west to 71°24'W, thence due north to 66°5'S, and thence due east to where the meridian at 67°W intersects the coastline.
- Antarctic Peninsula (GPZ-AP): The area is formed by two polygons - south and north – interrupted by the KFRZ-1. The south polygon is bounded by the line starting where the parallel at 66°5'S intersects the coastline, thence due west to 66°42'W, thence due north to 65°42'S, thence due northeast to 64°0'S 63°42'W, thence due northeast to 63°23'S 59°47'W, and thence due south to where the parallel at 63°53'S intersects the coastline. The north polygon is bounded by the line starting where the meridian at 57°12'W intersects the coastline, thence due northeast to 62°42'S 56°42'W, thence due east to 53°23'W, thence due south where the meridian at 53°23'W intersects the limits of Domain 1, and thence along the limits of Domain 1 to where it intersects the coastline.
- South Shetland Is. (GPZ-SSI): The area is formed by three polygons – ‘Shetland Southwest’, ‘Shetland Northeast’, ‘Elephant Is.’ – interrupted by KFRZ-2 and -3. The ‘Shetland Southwest’ polygon is bounded by the line starting at 63°17'S 60°23'W, thence due northwest to 63°0'S 62°0'W, thence due northeast 62°25'S 59°32'W, thence due southwest to 62°50'S 58°59'W, and thence due to the starting point. The ‘Shetland Northeast’ polygon is bounded by the line starting at 62°25'S 59°32'W, thence due northwest 61°47'S 60°27'W, thence due northeast to 61°12'S 57°47'W, thence due southeast to 61°48'S 57°12'W, and thence due southwest to the starting point. The ‘Elephant Is.’ polygon is bounded by the line

starting at 61°53'S 56°30'W, thence due north to 60°42'S, thence due east to 53°23'W, thence due south to 61°53'S, and thence due west to the starting point.

- South Orkney Is. (GPZ-SOI): The area is bounded by a line starting at 61°12'S 47°17'W, thence due northeast to 60°1'S 45°0'W, thence due east to 43°6'W, thence due south to 61°12'S, and thence due west to the starting point.

2. The Krill Fishery Research Zone (KFRZ) is comprised by four areas (Figure 1):

- KFRZ-1 (Antarctic Peninsula): The area is formed by a line starting where the parallel at 63°53'S intersects the coastline, thence due northeast to 63°23'S 59°47'W, thence due northeast to 62°42'S 56°42'W, and thence due southwest to where the meridian at 57°12'W intersects the coastline.
- KFRZ-2 (South Shetland Is.): The area is bounded by the line starting at 63°0'S 62°0'W, thence due north to 62°6'S, thence due northeast to 61°47'S 60°27'W, thence due southeast to 62°25'S 59°32'W, and thence due southwest to the starting point.
- KFRZ-3 (South Shetland Is.): The area is bounded by the line starting at 62°50'S 58°59'W, thence due northwest to 62°25'S 59°32'W, thence due northeast to 61°48'S 57°12'W, thence due southeast to 62°6'S 56°53'W, and thence due southwest to the starting point.
- KFRZ-4 (South Orkney Is.): The area is bounded by the line starting at 61°12'S 47°30'W, thence due north to 60°S, thence due southeast to 60°1'S 45°0'W, thence due southeast to 61°12'S 47°17'W, and thence west to the starting point.

3. The Special Fishery Management Zone (SFMZ) is comprised by two areas (Figure 1):

- North West Antarctic Peninsula (SFMZ-NWAP): The area is bounded by the line starting at 65°42'S 66°42'W, thence due north to 63°30'S, thence due northeast to 61°36'S 63°W, thence due northeast to 60°42'S 58°30'W, thence due east to 56°30'W, thence due south to 61°53'S, thence due east to 53°23'W, thence due south to 62°42'S, thence due west to 56°42'W, thence due southwest to 63°23'S 59°47'W, thence due southwest to 64°S 63°42'W, thence due southwest to the starting point. The inner area bounded by the line starting at 63°17'S 60°23'W, thence due northwest to 63°S 62°W, thence due north to 62°6'S, thence due northeast to 61°12'S 57°47'W, thence due southeast to 62°6'S 56°53'W, and thence due southwest to the starting point, is excluded.
- South Orkney Is. (SFMZ-SOI): The area is bounded by the line starting at 61°12'S 47°30'W, thence due west to 49°42'W, thence due north to 60°6'S, thence due

northeast to 58°23'S 45°6'W, thence due east to 43°6'W, thence due south to 60°S, thence due west to 47°30'W, and thence due south to the starting point.

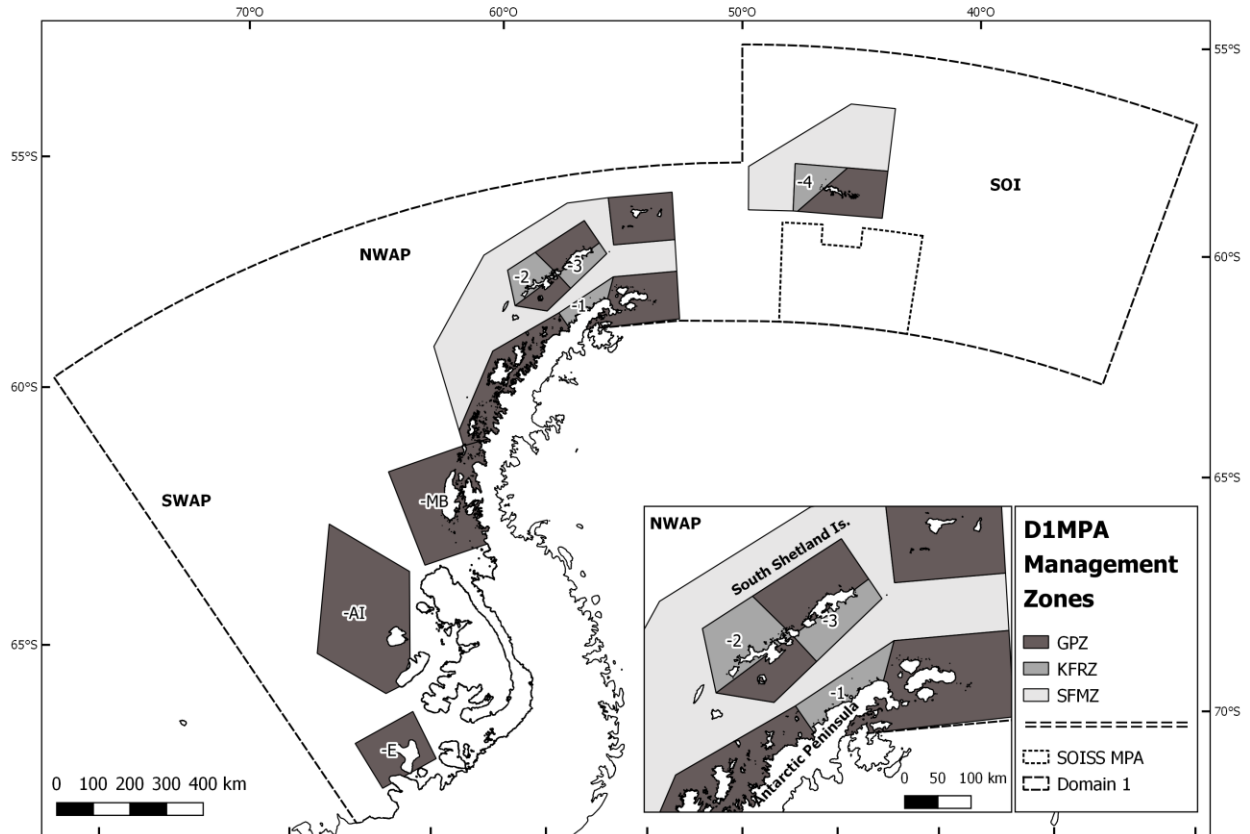


Figure 1. The Domain 1 Marine Protected Area, including the boundaries for the General Protection Zone, composed of areas GPZ-EI, GPZ-AI, GPZ-MB, GPZ-AP, GP-SSI, and GPZ-SOI; the Krill Fishery Research Zone, composed of areas KRFZ-1, -2, -3 and -4; and the Special Fishery Management Zone, composed of SFMZ-NWAP and SFMZ-SOI. SOISS MPA shall be managed in accordance with Conservation Measure 91-03.

DOMAIN 1 MARINE PROTECTED AREA MANAGEMENT PLAN

This management plan provides further details about the features or areas within the Domain 1 Marine Protected Area (the MPA) associated with the specific objectives in paragraph 3 of Conservation Measure 91-XX (201X), as well as the management measures and administrative arrangements for achieving them.

1. Specific objectives (with, where applicable, citations for additional information included in SC-CAMLR-XXXVI/BG/22, Annex 1) are:
 - i). to protect representative examples of benthic habitats (see Figures 1a, 1b and 1c);
 - ii). to protect representative examples of pelagic habitats (see Figure 2);
 - iii). to protect important benthic ecosystem processes, that constitute predictable high sources of productivity, including canyons (shelf incising and blind, see Figure 3);
 - iv). to protect large-scale pelagic ecosystem processes that contribute to preserve foreseen features for primary productivity or food concentration (see Figure 4):
 - a. Polynyas,
 - b. Marginal ice zone (during winter and summer),
 - c. Antarctic Circumpolar Current Front,
 - d. High productivity areas (Chlorophyll-a);
 - v). to protect important areas for mammal and bird life-cycles, including their foraging distributions during the breeding and non breeding seasons, and the distributions of their prey (see Figures 5 a-g):
 - a. Foraging distributions of central place foragers during breeding season (see Figure 5a):
 1. Adélie penguins (*Pygoscelis adeliae*),
 2. Chinstrap penguins (*Pygoscelis antarcticus*),
 3. Gentoo penguin (*Pygoscelis papua*),
 4. Emperor penguins (*Aptenodytes forsteri*), and
 5. Antarctic fur seals (*Arctocephalus gazella*);
 - b. Prey distribution, including Antarctic krill (*Euphausia superba*), crystal krill (*Euphausia chrysallophias*), *Thysanoessa macrura* and salps (see Figure 5b-e);

- c. Foraging distribution of central place foragers during non breeding season (see figures 5f-g):
 - 1. Adélie penguins,
 - 2. Chinstrap penguins,
 - 3. Gentoo penguin,
 - 4. Antarctic fur seals,
 - 5. Leopard seals (*Hydrurga leptonyx*),
 - 6. Weddell seals (*Leptonychotes weddellii*),
 - 7. Southern elephant seals (*Mirounga leonina*),
 - 8. Minke whales (*Balaenoptera acutorostrata*),
 - 9. Humpback whales (*Megaptera novaeangliae*),
 - 10. Type A killer whales (*Orcinus orca*),
 - 11. Types B1 killers whales, and
 - 12. Type B2 killer whales;
- vi). to protect important (spatially constrained/predictable) areas for fish life-cycles, with particular emphasis on species that were commercially overexploited in the past (see Figure 6):
 - a. spawning/recruitment areas of commercially exploited notothenioid species,
 - b. occurrence areas of historically commercially exploited fish populations;
- vii). to protect important (spatially constrained/predictable) areas for zooplankton life-cycles (see Figure 7):
 - a. krill nurseries;
 - b. sources of krill larvae and juveniles (e.g. intrusions of the Circumpolar Deep Water onto the continental shelf);
- viii). to protect known rare or vulnerable benthic habitats;
- ix). to establish scientific reference areas to: a) assess the potential impact of fisheries on dependent predators, b) evaluate the potential impacts of climate change on the Antarctic marine ecosystem, and, c) monitor the efficacy of the MPA; and
- x). to promote multinational research and other scientific activities including monitoring on marine living resources; and generate synergies between National Antarctic Programs and the fishing industry.

MPA zones

- The Domain 1 MPA includes three zones that are designed to achieve specific protection and scientific objectives while permitting rational use of the resources within the MPA. The General Protection Zone (identified by areas GPZ-E, GPZ-AI, GPZ-MB, GPZ-AP, GPZ-SSI, and GPZ-SOI in Figure 1) is designed to provide representative protection of different habitats and bioregions, to protect key life-history stages of fishes, birds, mammals and their preys, to mitigate or eliminate a number of specifically identified potential ecosystem threats from fishing and to support existing and future scientific research and monitoring. The Krill Fishery Research Zone (identified by areas KFRZ-1 to -4 in Figure 1), in addition to contributing to representative protection and specific benthic protection objectives, includes important fishing areas around the Antarctic Peninsula, the South Shetland Islands and the South Orkney Islands. It is designed to serve as a scientific reference area for monitoring the effects of harvesting in order to improve our understanding of the effects of natural variability and long-term change on the Antarctic marine ecosystem, and to continue to inform the science-based management of the krill fishery in statistical Subareas 48.1 and 48.2. The Special Fishery Management Zone (identified by areas SFMZ-NWAP and SFMZ-SOI in Figure 1) is designed to contribute to the representative protection and specific benthic objectives, and to mitigate potential threats from fishing through an integrated system of management within the MPA. The specific objectives pertinent to each zone in the MPA are described in Table 1 below.

Table 1: Specific objectives to be achieved within each zone of the Domain 1 MPA

| Zone (see Annex 91-XX/A, Figure 1) | Ecoregion | Geographic location | Code | Specific objectives (see Annex 91-XX/B, paragraph 1) |
|--|---------------------------------------|----------------------------|---|---|
| General Protection Zone (GPZ) | South West Antarctic Peninsula (SWAP) | Emperor (Smiley Island) | GPZ-EI | i), ii), iv)abd, v)a.4, v)c.7, vi)ab, ix)bc, x) |
| | | Alexander I Is. | GPZ-AI | i), ii), iii), iv)abcd, v)b, v)c.7.12, vi)ab, vii)ab, ix)bc, x) |
| | | Marguerite Bay | GPZ-MB | i), ii), iv)acd, v)a.1, v)b, v)c.4.7.8.9.11.12, vi)ab, vii)b, ix)bc, x) |
| | North West Antarctic Peninsula (NWAP) | Antarctic Peninsula | GPZ-AP | i), ii), iv)d, v)a.1.2.3.4, v)b, v)c.1.2.3.4.5.7.8.9.10.11.12, vi)ab, vii)ab, ix)bc, x) |
| | | South Shetlands Is. | GPZ-SSI | i), ii), iii), iv)bc, v)a.2.3.5, v)b, v)c.2.3.4.5.6.7.9.10.12, vi)ab, vii)ab, ix)bc, x) |
| South Orkney Is. (SOI) | South Orkney Is. | GPZ-SOI | i), ii), iii), iv)c, v)a.1.2.3, v)b, v)c.1.2.7, vi)ab, vii)a, ix)bc, x) | |
| Krill Fishery | North West Antarctic | Antarctic Peninsula | KFRZ-1 | i), x) |

| Zone (see Annex 91-XX/A, Figure 1) | Ecoregion | Geographic location | Code | Specific objectives (see Annex 91-XX/B, paragraph 1) |
|--|--------------------------------|--------------------------------|---------------|--|
| Research Zone (KFRZ) | Peninsula | South Shetlands Is. | KFRZ-2 and -3 | i), iii), x) |
| | South Orkney Is. | South Orkney Is. | KFRZ-4 | i), iii), viii), x) |
| Special Fishery Management Zone (SFMZ) | North West Antarctic Peninsula | North West Antarctic Peninsula | SFMZ-NWAP | i), iii), x) |
| | South Orkney Is. | South Orkney Is. | SFMZ-SOI | i), viii), x) |

Management and administrative arrangements

3. Responsibilities of the Commission include the following:

- i). consider advice from SC-CAMLR and SCIC relevant to reviews of the Conservation Measure establishing the MPA;
- ii). communicate with other organizations to promote consistency of complementary initiatives, protection measures, or activities being pursued or managed by such organizations, with this Conservation Measure, as appropriate; and
- iii). decide on research fishing activity to be conducted in the MPA as required in paragraph 6 of this Conservation Measure.

4. Responsibilities of the Scientific Committee include the following:

- i). pursuant to paragraph 6 of this Conservation Measure, review and provide advice to the Commission regarding proposals for research fishing in the Convention Area, noting whether the proposed research fishing is consistent with Annex 91-XX/C and the specific objectives of the MPA as identified in paragraph 3 of the Conservation Measure;
- ii). pursuant to paragraph 16 of this Conservation Measure, review reports of research activities that have been undertaken, and advise the Commission on issues identified in Annex 91-XX/C paragraph 6;
- iii). provide recommendations and advice regarding the optimal use of fishing vessels to collect data needed to support the Scientific Research and Monitoring Plan of the MPA; and
- iv). evaluate the implementation of the KFRZs and SFMZs, based on available data and at least every five years once implemented, to ensure that research objectives are being met;

5. Responsibilities of the Secretariat include the following:

- i). warehouse, manage and disseminate information and data that are pertinent to the development, management and review of the MPA (e.g. data collected during research surveys);
- ii). support Members' monitoring and compliance of activities within the MPA; and provide URLs on the Secretariat website that link to the management plans, maps, and coordinates for Antarctic Specially Protected Areas and Antarctic Specially Managed Areas within or adjacent to the MPA.

6. Responsibilities of Members include the following:

- i). when possible, participate in, and cooperate to conduct, research and monitoring consistent with activities outlined in the Scientific Research and Monitoring Plan;
- ii). take action as appropriate based on advice from the Scientific Committee related to paragraph 4(iii) above; and
- iii). submit reports to the Secretariat on research activities pursuant to paragraph 16 of this Conservation Measure.

PRIORITIES FOR SCIENTIFIC RESEARCH AND MONITORING PLAN IN SUPPORT OF THE DOMAIN 1 MARINE PROTECTED AREA

This annex identifies priorities for scientific research² pursuant to the specific conservation objectives of the Domain 1 Marine Protected Area (the MPA) and monitoring to evaluate the extent to which these objectives are being achieved. Because of the specific characteristics of Domain 1, the evaluation of climate change impacts and the potential effects of the krill fishery activity on the ecosystem is needed. Other research that is consistent with the specific objectives of the MPA but not explicitly outlined here, is encouraged.

The Scientific Research and Monitoring Plan will be a participative, multinational, and standardized framework under which all Members interested collect, access and analyze data, including relevant indicators and parameters. The data will be used as a basis to evaluate the effectiveness of the MPA.

The data collected by any Member shall be standardized where appropriate and made available directly or via the Secretariat consistent with the Rules for Access and Use of CCAMLR Data. The timeline for establishing baseline data needed to evaluate the effectiveness of the MPA will be included in the Scientific Research and Monitoring Plan.

1. Research and monitoring undertaken in accordance with the Scientific Research and Monitoring Plan should seek to address the following questions:
 - (i). Do the MPA boundaries continue to adequately encompass the priority populations, features and areas included pursuant of the MPA objectives?
 - (ii). How do habitats, processes, populations or other priority features inside the MPA influence ecosystem dynamics?
 - (iii). How will Priority Areas for Conservation (PAC) or other important features be affected by climate change, environmental variability and other impacts, including those attributable to fishing?
 - (iv). How are important habitats affected by physical and biological changes, including those related to ocean circulation, sea ice, primary production and climate change?
 - (v). How will krill and dependent predator populations and life histories change in response to climate change and possible fishery effects?
 - (vi). How will prey availability to predators be influenced by fishing and climate change?

- (vii). What physical drivers determine the distribution and diversity of benthic organisms, and what are the potential effects of climate change on these organisms and their populations?
 - (viii). Does the structure and function of the marine ecosystem differ between areas inside the MPA and areas outside the MPA, or do the populations or subpopulations of marine organisms that occur or forage inside the MPA differ from those that occur or forage outside the MPA?
2. The MPA objectives fall into three main categories: representativeness, threat mitigation and scientific reference areas. Research associated with the MPA should seek to address these categories as follows:
- (i). Representativeness – Research and monitoring to assess whether the MPA is protecting an adequate proportion of all benthic and pelagic environments in Planning Domain 1.
 - (ii). Threat mitigation – Research and monitoring to assess the extent to which threats to the achievement of Article II.3 and the specific objectives of the MPA are being effectively avoided or mitigated by the MPA, in locations where the risk of ecosystem impacts from harvesting activities may otherwise be high.
 - (iii). Scientific reference areas – Research and monitoring where the MPA provides opportunities to examine Antarctic marine ecosystems where no or limited fishing has taken or is taking place, to understand, among others, the effects of fishing, environmental variability and climate change on Antarctic marine living resources.
3. In addition, understanding the life histories of target species is important to achieve the aims of CCAMLR, including within and adjacent to areas affected by the MPA. Therefore research and monitoring to improve scientific understanding of target species in the area of the MPA are included in the Scientific Research and Monitoring Plan – for example: 1) understanding krill flux and krill aggregations dynamics around the Antarctic Peninsula, 2) understanding toothfish distribution and movement within Planning Domain 1 and assessing potential stock linkages with the adjacent region.
4. The Scientific Research and Monitoring Plan shall be updated as and when information and data become available, but no less than every 10 years following the reviews conducted pursuant to paragraph 19, and the review conducted pursuant to paragraph 18 of this Conservation Measure. The Scientific Research and Monitoring Plan shall provide flexibility to respond to potential changes in the ecosystem and the requirements for new information. To facilitate updates of the Scientific Research and Monitoring Plan, Members should collaborate to provide:
- (i) baseline data;

- (ii) measurable criteria and indicators of the performance of the MPA; and
- (iii) data on present or future threats to achieving the objectives of the MPA.

The baseline data for the Domain 1 MPA is contained within the 143 data layers included in the preliminary proposal (2017, SC-CAMLR-XXXVI-BG-22). Shapefiles and supplementary data will be available on the CCAMLR website. These include: the benthic and pelagic bioregionalizations; important oceanographic features (marginal sea ice, polynyas, ACC, high productivity areas and canyons); prey distributions (Antarctic krill, ice krill, *T. macrura* and salps); predators colonies and foraging distributions during breeding season (pygoscelid penguins, emperor penguins and Antarctic fur seals); predators distributions during the non-breeding season (pygoscelid penguins, Antarctic fur seals, Weddell seals, leopard seals, crabeater seals, southern elephant seals, humpback whales, minke whales and Type A, B1, B2 killer whales); important areas for fish life cycles including spawning, recruitment and occurrence areas of commercially exploited fish populations; important areas for zooplankton life cycles including krill nurseries; and rare or unique geomorphic habitats that hold relevant marine biodiversity.

5. The Scientific Research and Monitoring Plan will be organized by the MPA management zones and geographically (ecoregions) (Figure 1), as follows:
 - (i). GPZ-E, -AI, - MB (SWAP);
 - (ii). GPZ-AP, -SSI (NWAP);
 - (iii). GPZ-SOI;
 - (iv). KFRZ-1 to -4 (NWAP and SOI);
 - (v). SFMZ-NWAP, -SOI;
6. Priority research and monitoring activities are identified in Table 2. Members and Observers, including the fishing industry, SCAR and NGOs, are encouraged, as far as possible, to collaborate and repeat the types of activities identified in Table 2.
7. Members undertaking research and monitoring should, as far as possible, invite the participation of other Members and Observers in such activities, including field activities, data analysis and publication of research findings.
8. The Scientific Committee will evaluate results arising from research and monitoring activities and, pursuant to paragraphs 18 and 19 of this Conservation Measure, advise the Commission on:
 - (i). the implementation of the KFRZs, including relevant catch limits;
 - (ii). the implementation of the SFMZs;
 - (iii). the degree to which the specific objectives of the MPA are being achieved;

- (iv). the degree to which the specific objectives are still relevant in different areas of the MPA;
- (v). what management actions may be required to improve the achievement of the specific objectives of the MPA.

² In accordance with Article VI of the CAMLR Convention

Table 2. Scientific research and monitoring priorities by the MPA management zones and ecoregions

| <i>Type of research</i> | GPZ-E,-AI,-MB (SWAP) | GPZ-AP,-SSI (NWAP) | GPZ-SOI | KFRZ-1 to -4 | SMFZ-NWAP, -SOI | Priority elements for scientific research and monitoring |
|-------------------------|-------------------------|-----------------------|---------|--------------|--------------------|---|
| <i>Oceanography</i> | X | X | X | X | X | Meteorological and oceanographic research, including satellite remote sensing, moorings to characterize physical and chemical properties and dynamics of phyto- and zooplankton |
| | X | X | X | X | X | Sea-ice remote sensing (type, concentration and extent) along the stations and years |
| | X | X | X | X | X | Long-term monitoring of benthic ecosystem function including geochemical and granulometry analysis of the surface sediments in order to: incorporate the information from sedimentation traps; determine the characteristics of the organic matter deposited on the bottom; estimate sedimentation rates and fluxes towards the benthic system. |
| | X | X | X | X | X | Modeling of biophysical interactions. Development and validation of high-resolution models, for understanding the role of circulation dynamics as driver for retention and advection of key species (e.g krill and toothfish larvae habitat). |
| | X | X | X | X | X | Determining the influence of glacial discharge and freshening to the circulation and the input of micronutrients to coastal embayment. |
| | X | X | | X | X | Investigate the dynamics and consequences of intrusions of Circumpolar Deep water into the continental shelf and coastal environments and the cross-shelf nutrient exchange |
| <i>Ecosystem</i> | X | X | X | X | X | Directed studies to address biological and ecological questions related to species demography and life history |
| | X | X | X | X | X | Monitoring and research on marine mammals, and seabirds, including studies of reproductive biology and success as well as diets, foraging dynamics, foraging behavior, and tracking movements |
| | X | X | X | X | X | At-sea surveys or censuses to estimate the distribution and abundance of marine mammals, |

| Type of research | GPZ-E,-AI, -MB (SWAP) | GPZ-AP, -SSI (NWAP) | GPZ-SOI | KFRZ-1 to -4 | SMFZ-NWAP, -SOI | Priority elements for scientific research and monitoring |
|---------------------|--------------------------|------------------------|---------|--------------|--------------------|---|
| Ecosystem (cont) | | | | | | seabirds, fishes and invertebrates |
| | | X | X | X | X | Acoustic surveys to map distribution and abundance of Antarctic krill |
| | X | X | X | X | X | Ecosystem modelling, informed by diet and stable isotope sampling of key trophic components and estimation of biomass consumption |
| | X | X | X | | | Development of food web models and species/population models. Coupling of biophysical models to understand connectivity between areas during the pelagic life stages of Antarctic toothfish <i>D. mawsoni</i> |
| | X | X | X | | | Omics studies of Antarctic toothfish <i>D. mawsoni</i> for population structure, molecular characterization and adaptations |
| Fisheries | | X | | X | X | Research Surveys and sampling to investigate life history hypotheses, biological parameters, ecological relationships and variations in biomass and production of Antarctic krill |
| | | | | X | | Experimental design framework to assess and monitor effects of fishing on Antarctic krill and associated predators |
| | X | X | | | | Surveys and sampling to investigate population and stock hypotheses of Antarctic toothfish <i>D. Mawsoni</i> |
| | X | X | | | | Surveys to improve knowledge of spawning and distribution and abundance of eggs/larvae/early life stages of Antarctic toothfish <i>D. Mawsoni</i> |
| | X | X | | | | Focused tag deployments and/or electronic archival or acoustic tags to examine/ validate toothfish life-cycle, abundance, movement and hypotheses |
| | X | | | | | Paired stratified surveys of slope habitats with contrasting local exploitation rates to monitor effects of fishing on Antarctic toothfish <i>D. mawsoni</i> and demersal fishes |
| | | X | X | X | X | Effects of fishing activities on habitats/ ecosystems by comparing fished vs unfished areas |
| Climate change | X | X | X | X | X | Effects of climate change on species at risk, including critical thresholds that would give produce irreversible impacts |
| | X | X | X | X | X | Monitor species and areas identified as more resilient to the impacts of climate change |
| | | X | X | X | X | Monitor areas where the impacts of climate change are likely to be most significant |
| | X | X | X | X | X | Monitor natural variability and long-term change and compare reference areas with other areas (e.g. fished vs un-fished areas). Consider the potentially confounding impacts of climate change and |

| <i>Type of research</i> | GPZ-E, -AI, -MB (SWAP) | GPZ-AP, -SSI (NWAP) | GPZ-SOI | KFRZ-1 to -4 | SMFZ-NWAP, -SOI | Priority elements for scientific research and monitoring |
|-----------------------------------|---------------------------|------------------------|---------|--------------|--------------------|--|
| <i>Climate change (cont.)</i> | | | | | | harvesting |
| | X | X | X | X | X | Studies of the relationship between species and climate change impacts in important locations, especially range extensions |
| | X | X | X | X | X | Studies to identify systematic changes to community structure and ecosystem functioning |
| | X | X | X | X | X | Models of the plausible scenarios for changes in Antarctic marine living resource populations over the next 2 to 3 decades |
| | | | | X | X | Models of seasonal sea ice extension and its effects on the accessibility of fishing areas |

References

SC-CAMLR-XXXVI/17 (2017) Domain 1 Marine Protected Area Preliminary Proposal PART A-1: Priority Areas for Conservation. Delegations of Argentina and Chile.

SC-CAMLR-XXXVI/18 (2017) Domain 1 Marine Protected Area Preliminary Proposal PART A-2: MPA Model. Delegations of Argentina and Chile.

SC-CAMLR-XXXVI BG/22 (2017) Domain 1 Marine Protected Area Preliminary Proposal PART B: Conservation Objectives. Delegations of Argentina and Chile.