Antarctic Ocean Legacy: Securing Enduring Protection for the Ross Sea Region

Updated AOA Report

Submitted by ASOC
Antarctic Ocean Legacy:  
Securing Enduring Protection for the Ross Sea Region

In February 2012 the Antarctic Ocean Alliance (AOA), a coalition of environmental organisations advocating marine protection initiatives in the Southern Ocean, proposed the creation of a fully protected marine reserve of approximately 3.6 million square kilometers in the Ross Sea region.

The near-pristine Ross Sea ecosystem is recognized as the least impacted large marine ecosystem left on Earth. It is one of the last open-ocean, continental shelf ecosystems in which the food web has not been subjected to serious or permanent change as a result of human activities. The region offers unprecedented opportunities for science to help us understand how a large-scale fully functioning ecosystem works, as well as providing a unique global reference zone for studying how it is influenced by climate change and ocean acidification. The Ross Sea is predicted to be the last part of the Southern Ocean with year-round sea ice according to the Intergovernmental Panel on Climate Change (IPCC 2007).

The biologically productive Ross Sea teems with large populations of top predators and contains many species that are found nowhere else. It is home to large proportions of the world’s populations of some of the most well-known and charismatic Antarctic species, including whales, seals, and of course, penguins. An estimated one quarter of the total phytoplankton production south of 50° south is contributed by the Ross Sea, making it one of the most productive stretches of the ocean south of the Polar Front. There are few if any remaining marine ecosystems like the Ross Sea that retain a full complement of top predators in such abundance.

The AOA urges that all the areas in the current joint US-New Zealand Ross Sea proposal should be designated in 2013 as the foundation for protecting all key ecosystems in the Ross Sea region. The proposed areas include a fully protected 1.6 million km2 General Protection Zone, a Spawning Protection Zone and a Special Research Zone.

The US-NZ proposal could and should be improved in subsequent years by the Commission, to provide the Ross Sea the full protection it deserves.
ANTARCTIC OCEAN LEGACY: SECURING ENDURING PROTECTION FOR THE ROSS SEA REGION

2013 UPDATE
In February 2012, the Antarctic Ocean Alliance (AOA), a coalition of environmental organisations advocating marine protection of the Southern Ocean, proposed the creation of a fully protected marine reserve of approximately 3.6 million square kilometres in the Ross Sea region.

The near-pristine Ross Sea ecosystem is recognised as the least impacted large marine ecosystem on Earth. It is one of the last open-ocean, continental shelf ecosystems in which the food web has not been subjected to serious or permanent change as a result of human activities. The region offers unprecedented opportunities for science and for understanding how a large-scale fully functioning ecosystem works and is influenced by climate change and ocean acidification. The biologically productive Ross Sea teems with large populations of top predators and contains many species that are found nowhere else.

In recognition of these unique qualities, the governments of the United States and New Zealand presented a joint proposal for a Ross Sea MPA at the 2012 meeting of the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR). Unfortunately, this joint proposal did not achieve consensus in the Commission.

The AOA urges that all the areas in the current joint US–New Zealand Ross Sea proposal should be designated in 2013 as the foundation for protecting all key ecosystems in the Ross Sea region. The proposed areas include the fully protected 1.6 million km² General Protection Zone, and two further areas, the Spawning Protection Zone and Special Research Zone.

The current proposal should be improved in subsequent years by CCAMLR to provide the Ross Sea the full protection it requires.

AOA submits that this joint proposal provides a strong starting point for a Ross Sea MPA, which should be accepted by all Members. AOA calls on CCAMLR to designate a permanent MPA in the Ross Sea at the intersessional meeting in Bremerhaven this year.

AOA indicative map of a representative network of marine protected areas and marine reserves in the Southern Ocean.
The AOA urges that all the areas in the current joint US–New Zealand Ross Sea proposal should be designated in 2013 as the foundation for protecting all key ecosystems in the Ross Sea region. The proposed areas include the fully protected 1.6 million km² General Protection Zone, and two further areas, the Spawning Protection Zone and Special Research Zone.

The current proposal should be improved in subsequent years by the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) to provide the Ross Sea the full protection it requires.
Since its discovery in 1841, the Ross Sea has been an important region for science and exploration. When explorers set out to reach the South Pole, during the heroic age of Antarctic exploration a century ago, they based their operations on the Ross Sea. The Ross Sea penetrates the Antarctic continent to higher latitudes than anywhere else. This feature combines with the annual break up of sea ice and persistent areas of incredibly biologically productive ice-free water called polynyas to enable navigation to the Ross Shelf. These are just three of the key features of the Ross Sea that contribute to its diverse and unique ecology making it a high seas gem in need of comprehensive protection.

The near-pristine Ross Sea is one of the last open-ocean, continental shelf ecosystems in which the food web has not been subjected to serious or permanent change as a result of human activities. It is recognised as the least impacted open ocean marine area on Earth1. The region offers unprecedented opportunities for science and for understanding how a large-scale, fully functioning ecosystem works and is influenced by climate change and ocean acidification.

The Ross Sea region is one of the areas the Antarctic Ocean Alliance (AOA) identified for inclusion in a system of Southern Ocean marine protected areas (MPAs) and marine reserves. Its designation as a marine reserve has been justified extensively by the work of scientists, governments and non-government organisations (NGOs) over the past seven years, highlighting the environmental importance of the region. This is an update of the report ‘Antarctic Ocean Legacy: A Marine Reserve for the Ross Sea’, reviewing why it should be protected, updating the latest developments and calling for the Ross Sea marine reserve to be designated as one of the keystones of a Southern Ocean system of marine protected areas and marine reserves.

Current US–NZ Ross Sea Proposal

![Map of the Current US–NZ Ross Sea Proposal](image)

- **No-take Marine Reserve**: 1.6 million km²
- **Limited Fishing Zone**: (Research Fishing)
- **Spawning Protection Zone**
- **Seamounts, Ocean Shelf and Slope**


1. The region offers unprecedented opportunities for science and for understanding how a large-scale, fully functioning ecosystem works and is influenced by climate change and ocean acidification.
GEOGRAPHY

The Ross Sea region includes waters lying between 150° east and 150° west, bounded by the Antarctic continent to the south and the 60° south parallel to the north. This area corresponds to the Ross Sea planning domain defined by CCAMLR in 2011. This region includes the whole continental shelf and slope, the Balleny Islands, the seamounts of the Pacific – Antarctic Ridge and other important seamounts such as the Scott and Admiralty seamounts, which are considered to be ecological hotspots.

The Ross Sea is one of two areas of the Southern Ocean with a wide and deep continental shelf – the other being the Weddell Sea. In most other parts of the Antarctic coast the shelf is narrow or absent. The Ross Sea shelf is notable because it is shallower at its northern extent, getting deeper moving southward towards the Ross Ice Shelf. The Ross Ice shelf, the world’s largest floating ice sheet and an extension of the West Antarctic continental ice sheet, overlies half a million square kilometres of the southern Ross Sea.

A series of open water areas called polynyas, including the large Ross Sea polynya, permit light to enter the water column in early spring, driving photosynthesis, resulting in huge plankton blooms. These polynyas are also the source of a large portion of ‘Antarctic Bottom Water’ that eventually finds its way into the northern hemisphere as part of the global ocean conveyor belt, a key component of the global climate system.

Geography is an important influence on the Ross Sea’s biodiversity. It is physically isolated not only by the Southern Ocean, but also from the rest of the Southern Ocean due to the combination of Antarctica’s mostly narrow continental shelf and ocean currents. Due to this isolation, over 40 species have been documented in the Ross Sea and nowhere else with new species frequently discovered including the recently recognised Ross Sea (type C) killer whale. One research expedition alone more than doubled the number of a particular type of known small crustacean species. The physical separation and the large number of endemic species are unusual in the world’s oceans, making the Ross Sea an ideal place to study how marine species evolve, adapt and diverge to fill available ecological niches.

BIOLOGY

The Ross Sea is the largest continental shelf ecosystem south of the Antarctic Polar Front with biodiversity far greater than that of many other polar areas. It is home to large proportions of the world’s populations of some of the most well-known and charismatic Antarctic species, including whales, seals and of course, penguins. There are few remaining marine ecosystems like the Ross Sea that retain a full complement of top predators in such abundance.

An estimated one quarter of the total phytoplankton production south of 50° south is contributed by the Ross Sea, making it one of the most productive stretches of the ocean south of the Polar Front. This unusually high productivity is owed to an abundant nutrient supply of nitrogen, phosphorus and iron from melting ice, atmospheric deposition and ocean depths, regional climate patterns driving the upwelling of nutrient-rich water, and the large Ross Sea polynya. The immense phytoplankton blooms support large populations of zooplankton and other prey species such as three species of krill, a small shrimp-like crustacean, and Antarctic silverfish, which in turn support huge numbers of seafloor creatures and top predators.
Major components of the Ross Sea’s seafloor communities include globally significant populations of glass sponges, moss-like bryozoans, sea stars, brittle stars, sea urchins, polychaete worms, molluscs and crustaceans numbering in the hundreds of species, many of which are found only in the Ross Sea and nowhere else. The exceptionally diverse structure and distribution of the Ross Sea’s seafloor communities are only able to thrive due to the absence of predators such as crabs, sharks and barnacles from Antarctic waters.

Notothenioid fish, ranging from the key prey species silverfish to the top predator Antarctic toothfish, demonstrate the incomparable nature of the Ross Sea. These fish, found only in the Southern Ocean, have proteins akin to antifreeze in their blood that prevent them from freezing, and they dominate the Ross Sea. They fill ecological niches across all habitats from the seafloor to the sea surface, comprising almost two thirds of all the fish species found in the Ross Sea. As such they represent a unique evolutionary case study for scientists to understand how new species emerge and develop different adaptations to fill ecological niches.

Antarctic toothfish grow up to 200cm long and can weigh over 100 kilograms. They are the Ross Sea’s top fish predator, occupying a role similar to that of sharks in other ocean ecosystems. They are a key prey species for other top predators including Weddell seals, Ross Sea killer whales, colossal squid and sperm whales. Antarctic toothfish are a relatively long-lived and slow maturing fish making them highly vulnerable to overfishing.

Penguins, toothfish, and Weddell seal populations require the entire Ross Sea shelf and slope to complete their annual cycle.
Top predators in the Ross Sea include:

- One million pairs of Adélie penguins, 38% of the world's breeding population
- Two of the largest emperor penguin colonies, with over 25% of all emperors in the world
- Globally significant populations of petrels, fulmars and prions
- Over 200,000 crab-eater seals plus Weddell, leopard, Ross, and southern elephant seals
- Iconic blue, minke, fin, humpback, sei and dwarf minke baleen whales feeding on krill and silverfish
- Six species of toothed whales including sperm whales and the endemic Ross Sea killer whale
- The mysterious, rarely seen colossal squid, which grows up to 14 metres long and has eyes the size of dinner plates.

**CLIMATE CHANGE**

Climate change and ocean acidification are affecting all parts of the earth\(^\text{21}\), and some of the impacts in Antarctica are among the most pronounced on the planet. These two effects of atmospheric greenhouse gas pollution, which are occurring in tandem with fishing, will continue to put increasing pressure on the marine ecosystems of the Southern Ocean. There is strong potential for impacts to be mutually reinforcing, resulting in greater ecosystem stress.

The Ross Sea is predicted to be the last part of the Southern Ocean with year-round sea ice according to Intergovernmental Panel on Climate Change (IPCC 2007)\(^\text{22}\). The sea ice is expected to continue to expand over the next few decades, stabilise but then decline thereafter. Consequently, the Ross Sea region will provide a refuge for many iconic ice dependent species in the medium term as other parts of the Antarctic experience warming temperatures\(^\text{23}\).

In addition to providing a possible refuge for many Southern Ocean species, a fully protected large-scale marine reserve in the Ross Sea region offers an outstanding natural laboratory to study how a relatively undisturbed large marine ecosystem responds to environmental change with the onset and acceleration of climate change and ocean acidification free from the convoluting influence of other forms of human activity. Many scientists support full protection in order to facilitate empirical research that can be used to study how different species and communities adapt or fail to adapt to changes in sea ice and ocean temperature. Observed changes can be compared with climate and physical modelling, to contrast areas experiencing no direct impact from humans with areas experiencing direct impacts\(^\text{24}\).

Furthermore, the Ross Sea region now boasts one of the largest and longest time series of scientific data anywhere in the Southern Ocean\(^\text{25}\). As time goes on, and climate impacts increase, this data will increase in value, providing that climate and ecosystems research can be conducted, without the distortions caused by fishing.
The Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) agreed to designate a representative system of MPAs in the Southern Ocean by 2012, in line with the commitments of Member governments at the 2002 World Summit on Sustainable Development (WSSD). Yet at CCAMLR’s 31st meeting in November 2012 consensus could not be reached on the MPA proposals put forward, including a joint New Zealand–United States proposal for a large-scale marine reserve in the Ross Sea.

CCAMLR entered into force in 1982 as part of the Antarctic Treaty System with the central objective of conserving Antarctic marine life while managing its rational use according to several conservation principles. These principles establish a mandate for CCAMLR to apply the ecosystem approach to ensure that activities in the Southern Ocean do not decrease the overall health of Antarctic ecosystems. This includes using the best available science to designate MPAs and marine reserves according to the precautionary approach to preserve ecosystem function.

From the earliest work on MPAs, the Ross Sea region stood out as a priority for inclusion within an MPA network. In 2008, CCAMLR identified 11 priority areas to focus work on developing and designating MPAs in the Southern Ocean. Those priority areas were then refined in 2011 to nine planning domains, which included the Ross Sea.

The Ross Sea meets the criteria for MPAs agreed to by CCAMLR in its MPA General Conservation Measure 91-04:

i. Protection of representative examples of marine ecosystems, biodiversity and habitats at an appropriate scale to maintain their viability and integrity in the long term;

ii. Protection of key ecosystem processes, habitats and species, including populations and life-history stages;

iii. Establishment of scientific reference areas for monitoring natural variability and long-term change or for monitoring the effects of harvesting and other human activities on Antarctic marine living resources and on the ecosystems of which they form part;

iv. Protection of areas vulnerable to impact by human activities, including unique, rare or highly biodiverse habitats and features;

v. Protection of features critical to the function of local ecosystems;

vi. Protection of areas to maintain resilience or the ability to adapt to the effects of climate change.

It is time for CCAMLR Members to once again demonstrate the considerable leadership that they have in the past, and designate a large scale Ross Sea marine reserve.

Over 500 scientists worldwide have supported the call to protect vital Ross Sea habitats including the whole continental slope and shelf because of their environmental and scientific significance.
In February 2012, the AOA published a proposal for a marine reserve seeking to protect large-scale ecosystem processes in their entirety. The report, ‘Antarctic Ocean Legacy – A Marine Reserve for the Ross Sea’ called for 3.6 million square kilometres of Ross Sea habitat to be permanently protected as a no-take marine reserve based on their merits and supported by the latest scientific research. This includes the:

1. Protection of the biodiversity and ecological processes associated with the Ross Sea gyre.
2. Protection of areas critical to the life-history stages of the Antarctic toothfish – the region’s top fish predator. These include the feeding and spawning grounds of the toothfish.
3. Protection of critical geomorphic features including the seamounts, ridges and troughs of the Pacific-Antarctic Ridge, and associated life forms.
4. Broad protection that facilitates the continuation and expansion of long-term datasets that underpin crucial research into ecosystem function and environmental change, including the impacts of climate change, particularly ocean acidification.
5. Protection of biodiversity hot spots such as the Ross Sea shelf and slope, Balleny Islands, Pacific-Antarctic Ridge and the Scott Seamounts.
6. Protection of the Ross Sea region as a critical climate reference area, and climate refugium for ice-dependent species.

Since publishing the report public support for Antarctic marine protection has grown significantly with more than 1.2 million people taking action for large-scale protection. This is in addition to the more than 500 scientists worldwide who have supported the call to protect vital Ross Sea habitats including the whole continental slope and shelf because of the Ross Sea’s environmental and scientific significance.
At the 31st CCAMLR meeting in 2012, the governments of New Zealand and the United States agreed to combine earlier separate proposals into a single proposal encompassing 2.3 million km². This proposed MPA is made up of three zones: i) the General Protection Zone; ii) the Special Research Zone; and iii) the Spawning Protection Zone.

The General Protection Zone constitutes a 1.6 million km² no-take marine reserve. If designated, would be the largest marine reserve in the world. Nevertheless the joint New Zealand–United States proposal makes several compromises and excludes the two areas detailed below that deserve protection.

a. The Spawning Protection Zone recognises the value of the north-western part of the Ross Sea region. However, fishing for toothfish (Dissostichus spp.) is permitted in the zone between December 1st and March 31st. The Ross Sea toothfish fishery is usually closed by early March and often in early February. The zone therefore offers protection from toothfish harvesting only at times of the year when there is already no fishing. The area should be upgraded to full protection extending over the whole year.

b. The Special Research Zone recognises the importance of a central section of the Ross Sea slope and shelf. However fishing for toothfish is permitted according to limits of no more than 500 tonnes in any one season and totalling no more than 1450 tonnes over a five year period. Fishers are also required to contribute to scientific research via an intensified tag and release of three fish per tonne caught compared to the normal one fish per tonne. The level of protection the zone deserves is not met by allowing such commercial fishing for research to occur, even with the science benefits provided by the higher tagging rate.

The AOA urges that all the areas in the joint New Zealand–United States proposal be designated in 2013 as the foundation for protecting all key ecosystems in the Ross Sea region. It is critically important that any designation for the Ross Sea provides enduring protection. All widely accepted definitions of international MPA and marine reserves do not provide for their expiration. The AOA submits that a Ross Sea MPA with a sunset clause that automatically ends the designation at a certain date is not in line with the central concept of MPAs. Such a designation would not meet long-term conservation objectives and could not be considered an MPA. The AOA is calling on CCAMLR to reject sunset clauses and agree standard review clauses.

The AOA urges that all the areas in the joint New Zealand–United States proposal be designated in 2013 as the foundation for protecting all key ecosystems in the Ross Sea region.
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REFERENCES


Weddell seal. Image by John B. Weller.
The following organisations make up the Antarctic Ocean Alliance:

Associate AOA organisations: