A humpback whale breaches in Antarctica. Studies show that marine protected areas positively affect global fish populations, resulting in more plentiful and bigger fish, as well as greater biodiversity. *Michael Nolan/Getty Images*

Connect to Protect: Southern Ocean Conservation Provides Global Benefits

Coupling marine protections with smart fisheries management provides an effective safeguard for the ocean's biodiversity and resilience

Overview

The health of Antarctica's Southern Ocean—remote and frigid waters housing biodiversity found nowhere else on Earth, including species uniquely adapted to its low temperatures—is critical to marine life and our global ocean. These waters are home to Antarctic krill, tiny crustaceans that remove carbon from the atmosphere and serve as a critical food source for many vital endemic species, such as emperor, chinstrap, and Adélie penguins, and leopard and crabeater seals.[1]

Yet the health of our global ocean—including in the Antarctic—is in decline, largely because of human activities such as fishing, carbon emissions, pollution, etc., that are driving the collapse of fisheries, loss of biodiversity, and warming and acidification of seawater. There is growing scientific support for the benefits of restricting or eliminating human activity—especially industrial fishing—within systems of marine protected areas (MPAs) to allow fish populations to recover in key marine areas, creating a spillover effect that can sustain adjacent fisheries.

Networks of MPAs must be complemented by precautionary ecosystem-based fisheries management (EBFM) in adjacent waters. EBFM is a holistic approach that recognizes all the interactions within an ecosystem rather than considering a single species or issue in isolation. The goal of ecosystem-based management is to maintain healthy, productive, and resilient ecosystems, and weigh how a fished species interacts with other species and the effects of environmental change, pollution, and other stressors.[2]

The Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) is the governing body responsible for protecting Southern Ocean wildlife and is composed of 26 member countries and the European Union. CCAMLR has the opportunity to make significant progress in the conservation of Antarctic marine life and turn this tide of human impacts by designating marine protected areas and advancing an EBFM plan for the krill fishery.[3]

Climate change impacts in Antarctica's Southern Ocean

The Southern Ocean's marine species are vulnerable to the changes happening from a warming climate because of their unique adaptations for surviving frigid temperatures. A 2019 report on polar regions from the International Panel on Climate Change stresses that climate scientists are concerned about changes to the Southern Ocean, including broad impacts on biodiversity, Antarctic sea ice loss, the southward contraction of habitat, and changes in the abundance of whales, birds, fish, and krill. The report also flagged additional climate impacts on krill, including changes to their growth and size, population declines due to ocean acidification, and the resulting negative impacts on krill predators and the krill fishery.[4] The stressful impacts of climate change on krill and their predators near the Antarctic Peninsula are compounded by an increase in concentrated fishing within the same area.[5]

Research indicates that proposed MPAs in the Southern Ocean will help to provide ecosystem resilience as well as positive impacts on krill, their predators, and the krill fishery, even as the climate continues to change.[6] Although addressing climate change is a global issue that will require global solutions, CCAMLR has at its disposal the ability to implement Southern Ocean MPAs and a strategic EBFM approach—precaution-based conservation measures that help to ensure that the krill-based ecosystem is protected from the overlapping impacts of climate change and fishing.

Supporting healthy fisheries

According to the U.N. Food and Agriculture Organization, more than a third of the fish stocks around the world are being overfished.[7] Scientific evidence shows that, in addition to conserving and rebuilding habitats and biodiversity, fisheries can also benefit from MPAs and EBFM, which help ensure healthy populations of fished species, among other things.[8] Through a concept known as the spillover effect, fished species within fully or strongly protected areas are more likely to supply adult and larval fish to areas outside of the MPAs, which then support healthy populations that can sustain or increase the catch of nearby fisheries.[9]

A giant feather star on the seafloor beneath ice in East Antarctica uses its frond-like arms to reach for food particles. Feather stars are animals, not plants, and some species, including this one, can swim. These cousins of sea stars are one example of the Southern Ocean's tremendous biodiversity, which includes much more than just penguins. *Laurent Ballesta/Andromède Oceanology*

Connectivity bolsters protections: MPA networks and EBFM

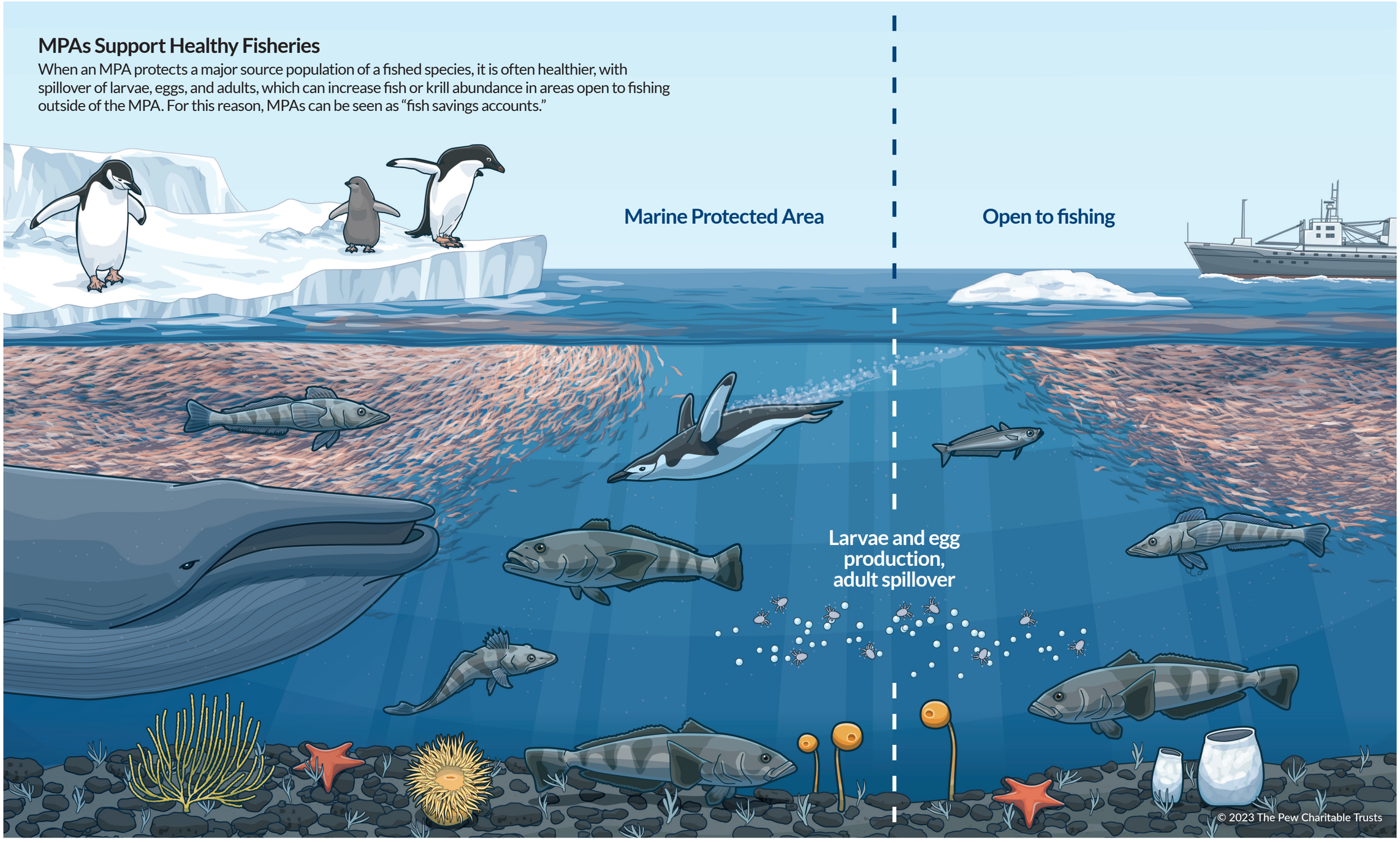
The International Union for Conservation of Nature defines a network of MPAs as "a collection of individual marine protected areas operating cooperatively and synergistically, at various spatial scales, and with a range of protection levels, in order to fulfill ecological aims more effectively and comprehensively than individual sites could alone."[10]

Marine scientists overwhelmingly agree that establishing networks of large MPAs complemented by an EBFM approach and good monitoring, control, and surveillance are essential for protecting the ocean's biodiversity and making it more resilient to climate change. Greater resilience means that marine ecosystems can better resist and recover from shocks associated with changing ocean conditions and can help to maintain the vital services they provide to wildlife and people. Conservation networks also provide species with resilience to climate change by giving them places to feed and breed without human interference and creating protected pathways for species migrations and range shifts. This is especially true in the Southern Ocean, where protected waters can serve as natural laboratories for studying how intact marine ecosystems react to a warming and acidifying ocean.

Effective EBFM measures for waters adjacent to MPAs or as integral parts of MPA networks extend the benefits of MPAs beyond their borders. As part of its commitment to apply the precautionary principle, CCAMLR's work on MPAs should be complemented with krill fisheries management measures that apply an EBFM approach that includes spreading out concentrated krill fishing to ensure that enough krill remains available for predators.

MPAs Support Healthy Fisheries

When an MPA protects a major source population of a fished species, it is often healthier, with spillover of larvae, eggs, and adults, which can increase fish or krill abundance in areas open to fishing outside of the MPA. For this reason, MPAs can be seen as "fish savings accounts."



Protecting the Southern Ocean's biodiversity safeguards ecosystem services for the planet

In Antarctica, MPAs and EBFM can help protect threatened biodiversity and improve chances for long-term ocean health and productivity, including many benefits for the global economy. An integrated network of Southern Ocean MPAs will lead to more resilient ecosystems and a healthy ocean for all of humanity, including generations to come. The Southern Ocean's unique biodiversity provides essential ecosystem services to the entire planet and has until recently remained largely free of anthropogenic impacts.[11]

It is becoming increasingly clear to Antarctic scientists that the Southern Ocean plays an important role in the biological capture and sequestration of carbon.[12] For example, Antarctic krill play a prominent role in the cycling of nutrients in the Southern Ocean through their large swarms, substantial biomass, daily vertical migrations through the water column and wide distribution. Antarctic krill influence both surface productivity (as primary prey for many species) and the increasingly important deep carbon sink of the Southern Ocean (through their dense fecal pellets that descend quickly to the deep seas).[13]

Over time, well-funded and fully protected MPAs result in more fish, bigger fish, and greater biodiversity. Research indicates that roughly 71% of MPAs have positively affected global fish populations.[14] Southern Ocean MPAs can preserve the economic benefits of tourism as well as lead to economic growth through enhanced fisheries production. The Western Antarctic Peninsula provides vital habitats to some of the ocean's most iconic species and, despite its remoteness, attracted more than 74,000 visitors in 2019-20.[15] The Antarctic tourism industry has been steadily increasing since the early 1990s, and as other tourism hot spots have demonstrated, boosts in sustainable tourism can lead to a growth in scientific investments.[16]

In addition to supporting more productive fisheries and tourism, MPAs that protect Southern Ocean biodiversity also safeguard vital genetic resources such as enzymes from sponges used to cure cancers and other infections, vast quantities of Earth's fresh water and air, global nutrient cycling, and Antarctica's irreplaceable climate regulating abilities.

Through the spillover effect, Southern Ocean MPAs help support healthy Antarctic krill and toothfish fisheries and sustain viable fish populations for current and future generations. (See graphic.) Although research to quantify the immense value of the Southern Ocean remains ongoing, scientists know it is worth protecting now—both economically and environmentally.

Recommendations

The Southern Ocean is home to unique flora and fauna found no place else on Earth. Its icy habitats are essential to regulating the Earth's climate and protecting Antarctic krill, which support the Antarctic marine food web. Therefore, it is important that CCAMLR implement a precaution-based approach to the conservation of Antarctic marine living resources by accomplishing the following:

- Follow through on its commitment to establish a network of connected MPAs that are representative of the habitat diversity by designating the three current proposals in the Weddell Sea, the East Antarctic, and the Antarctic Peninsula.
- Establish scientifically supported and precautionary EBFM conservation measures that more effectively spread out catch and account for the needs of krill predators.

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For further information, please visit:
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The Pew Bertarelli Ocean Legacy Project | The Pew Charitable Trusts and the Bertarelli Foundation joined forces in 2017 to create the Pew Bertarelli Ocean Legacy Project, with the shared goal of establishing the first generation of ecologically significant and effective marine protected areas around the world. This effort builds on a decade of work by both organizations to protect the ocean. Between them, they have helped to obtain designations to safeguard over 8 million square kilometers (3 million square miles) of ocean by working with philanthropic partners, indigenous groups, community leaders, government officials, and scientists. Since 2010, the Bertarelli Foundation has sought to protect the ocean for future generations through marine conservation and collaborative marine science research.