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A Network of Marine Protected Areas in the Southern Ocean

Protecting one of Earth's last great wilderness areas

Overview

The Southern Ocean, surrounding Antarctica, is one of the least altered marine ecosystems on Earth. Encompassing 15 percent of the world's ocean, it is home to thousands of species found nowhere else, from brilliantly hued starfish and bioluminescent worms to pastel octopuses. It is also home to millions of penguins that depend on large swarms of krill, a tiny shrimplike crustacean, as well as other forage species that form the base of a delicate food web. Scientists believe this ecosystem is changing due to the impact of climate change and temperatures that are warming faster than nearly anywhere else on Earth.

These waters are also vital to the health of the planet, producing strong upwelling currents that carry critical nutrients to seas around the world.

To protect this spectacular region, The Pew Charitable Trusts and its partners are working with the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) and its member governments to establish a network of large-scale marine protected areas (MPAs) around Antarctica.

A Living Laboratory of Unique Biodiversity

Antarctic krill are a keystone species, serving as a major food source for more than 25 percent of the species in the diverse Antarctic food web, including penguins, seals, whales, and many fish species. The many remarkable species of the Southern Ocean make up some of the most intact marine ecosystems on the planet, where scientists are continually discovering new marine biodiversity and can study nature in the absence of human interference. **The following are some of the species that call the Southern Ocean home.**

1 Penguins

Adélie
Chinstrap
Gentoo
Emperor
King
Southern rockhopper
Macaroni

2 Whales

Blue
Southern bottlenose
Humpback
Antarctic minke
Long-finned pilot
Sperm
Sei
Arnoux's beaked
Fin
Orca

3 Seals

Antarctic fur
Crabeater
Southern elephant
Leopard
Ross
Weddell

4 Seabirds

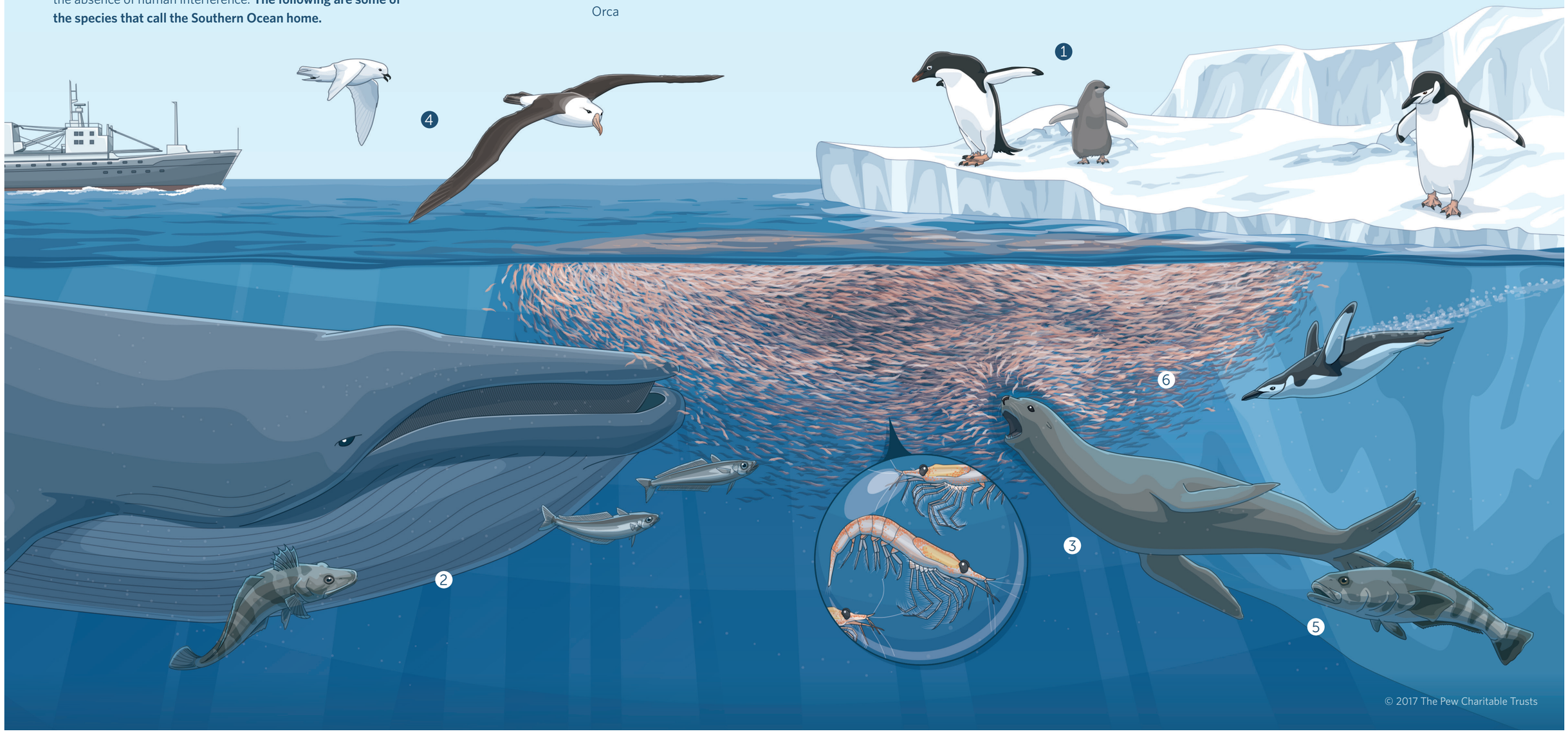
Snow petrel
Wandering albatross
Antarctic petrel
Antarctic fulmar

5 Fish

Antarctic and Patagonian toothfish (Chilean sea bass)
Icefish
Lanternfish
Antarctic eel cod
Grenadier
McCain's skate
Marbled rockcod

6 Invertebrates

Krill
Antarctic sea spider
Crawling and glass sponges
Antarctic coral
Bone-eating worm
Yeti (hairy) crab
Octopus
Starfish
Colossal squid



CCAMLR's commitment to creating a network of MPAs

CCAMLR is an international body made up of 24 countries and the European Union, established in 1982 with the primary mission of protecting the Southern Ocean's diverse marine life. While prioritizing conservation, CCAMLR allows limited fishing in some areas in accordance with its ecosystem-based management approach. The main fishing activities in these waters target toothfish and Antarctic krill.

- In 2002, CCAMLR became the first international body to commit to creating a network of MPAs following recommendations from the United Nations World Summit on Sustainable Development.
- CCAMLR's commitment was based on a mission to protect, rather than exploit, life in the Southern Ocean, as well as the precautionary principle, which errs on the side of conservation when the best available science is limited or unclear.
- In 2011, CCAMLR members agreed by consensus to adopt Conservation Measure 91-04,[1] a framework for creating a network of MPAs, and identified nine planning domains[2] for developing these protected areas.

Mitigating and adapting to climate change

Some of the most pronounced effects of climate change on Earth, like warming and acidifying seas,[3] and changes in sea-ice concentration and duration,[4] are found in Antarctica. Studies show that MPAs can help build ecosystem resilience to those changes by eliminating stresses, such as fishing.[5]

- The relatively undisturbed waters of the Southern Ocean provide a natural laboratory for studying how intact marine ecosystems react to a warming and acidifying ocean.
- MPAs can also protect important carbon pools, also known as biological reservoirs, and sinks. Over 55 percent of the biological carbon stored globally is kept by living marine organisms.[6]

Greater than the sum of its parts

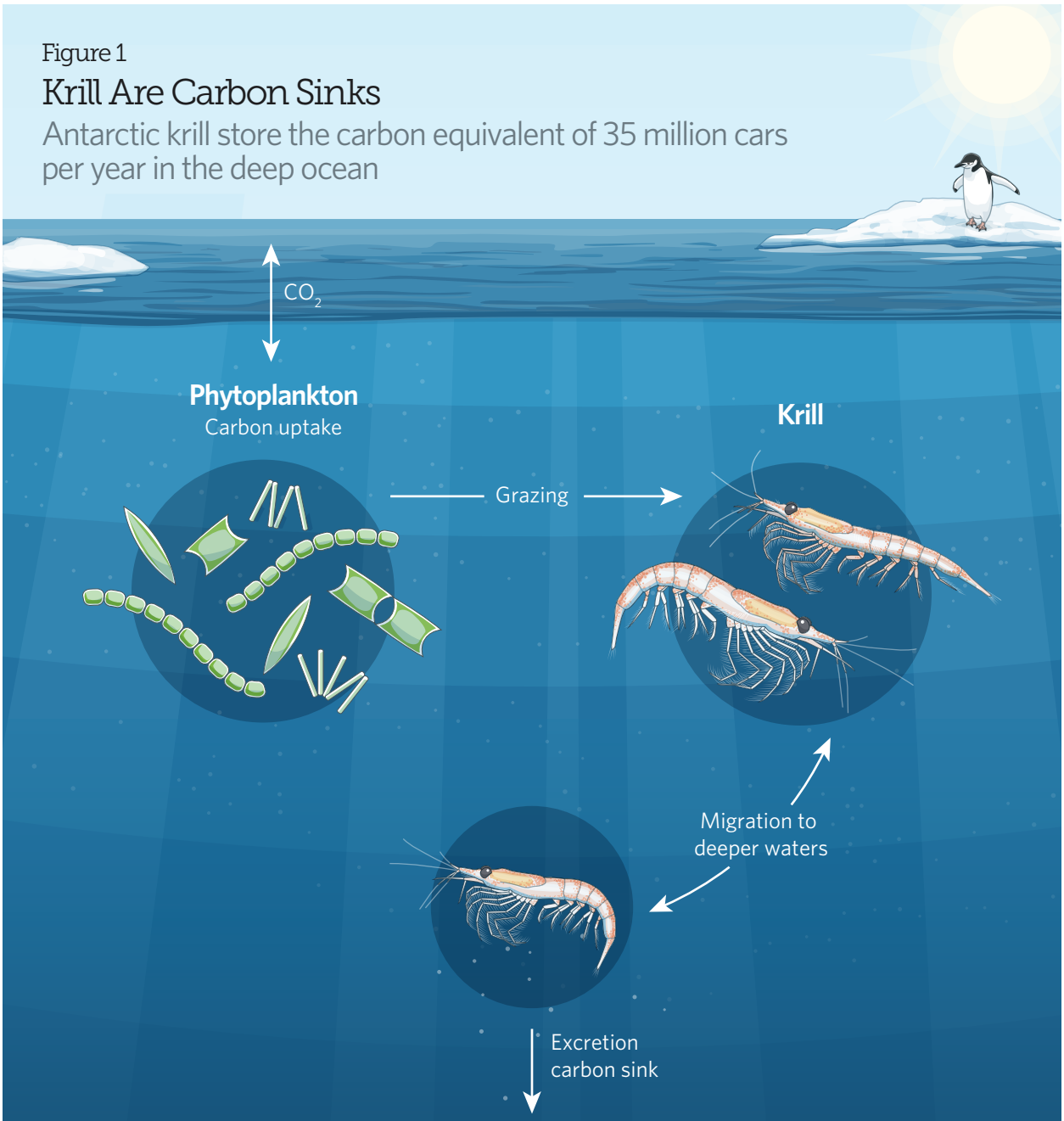
A network of MPAs would not only preserve connectivity among the many unique ecosystems of the Southern Ocean, allowing marine life to migrate between protected areas for breeding and foraging, but it would also significantly contribute to global ocean protection goals.

- In 2016, the journal *Conservation Letters* published a scientific review concluding that at least 30 percent of the global ocean needs to be set aside in MPAs to achieve effective conservation results and help manage and rebuild depleted fish stocks.[7]
- According to a 2014 study in the journal *Nature*, to be successful, an MPA should be large, isolated, well-enforced, and long-lasting, and should prohibit any extraction of fish or other resources.[8]
- MPAs that meet the above criteria create a spillover effect, improving the health of marine life in waters outside of the protected regions.[9]

Figure 1

Krill Are Carbon Sinks

Antarctic krill store the carbon equivalent of 35 million cars per year in the deep ocean



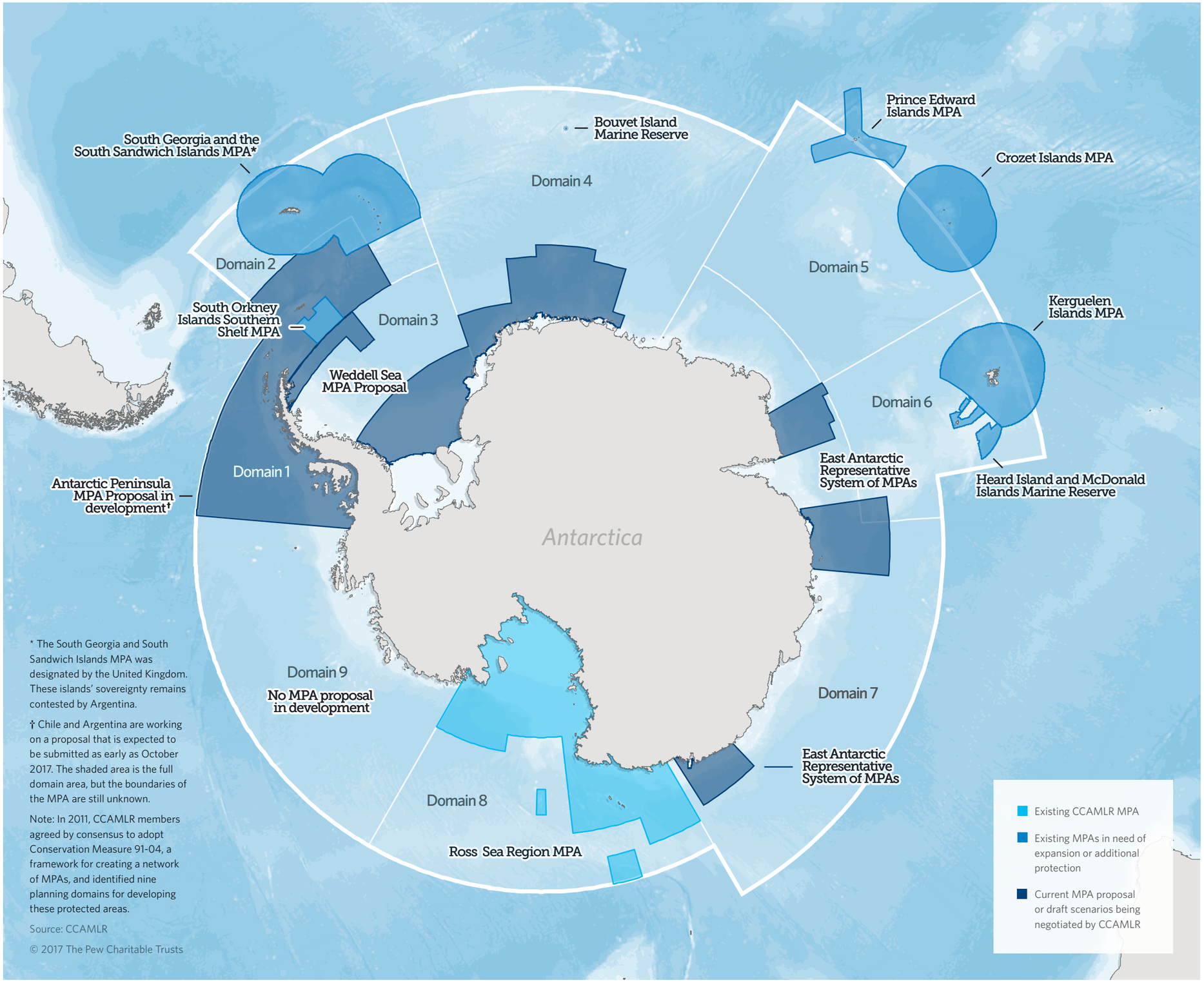
Antarctic krill feed on microscopic plankton near the ocean surface and move to much deeper waters several times in the night to avoid predators, injecting carbon dioxide into the deep water as they excrete waste. It is estimated that up to **23 million tons** of carbon are locked in this way every year, **equivalent to the carbon produced by 35 million cars**.

Source: Geraint A. Tarling and Magnus L. Johnson, "Satiation Gives Krill That Sinking Feeling," *Current Biology* 16, no. 3 (2006): R83–84, http://www.cell.com/current-biology/abstract/S0960-9822(06)01053-0

Figure 2

Southern Ocean Regions in Need of Protection

A network of MPAs would allow for conservation of distinct areas, each representing unique ecosystems



* The South Georgia and South Sandwich Islands MPA was designated by the United Kingdom. These islands' sovereignty remains contested by Argentina.

† Chile and Argentina are working on a proposal that is expected to be submitted as early as October 2017. The shaded area is the full domain area, but the boundaries of the MPA are still unknown.

Note: In 2011, CCAMLR members agreed by consensus to adopt Conservation Measure 91-04, a framework for creating a network of MPAs, and identified nine planning domains for developing these protected areas.

Source: CCAMLR

Domain 1
Western Antarctic Peninsula–South Scotia Arc

Domain 2
North Scotia Arc

Domain 3
Weddell Sea

Domain 4
Bouvet–Maud

Domain 5
Del Cano-Crozet

Domain 6
Kerguelen Plateau

Domain 7
East Antarctica

Domain 8
Ross Sea Region

Domain 9
Amundsen-Bellingshausen

Facts: The 9 planning domains


Chad Naughton/National Science Foundation

Domain 1

Western Antarctic Peninsula and South Scotia Arc

Over 1.5 million pairs of Adélie, gentoo, and chinstrap penguins call the Antarctic Peninsula home.[10]


Doug Allan

Domain 2

North Scotia Arc, including South Georgia and the South Sandwich Islands

These waters are a sanctuary of marine wonder, home to populations of albatrosses, penguins, Patagonian toothfish, squid, lanternfish, and even octopuses, sharks, and nine fish species found nowhere else.[11]


John B. Weller

Domain 3

Weddell Sea

Both seabirds and mammals are found throughout this region, including minke, humpback, blue, and fin whales,[12] as well as Weddell, crabeater and elephant seals.[13]

Domain 4
Bouvet and the Maud Rise

As the most isolated island in the world,[14] Bouvet Island is mostly covered by glaciers with a rich sea floor, including sponges, molluscs, crustaceans, and worms.[15]

Domain 5
Crozet Islands and the Del Cano Rise

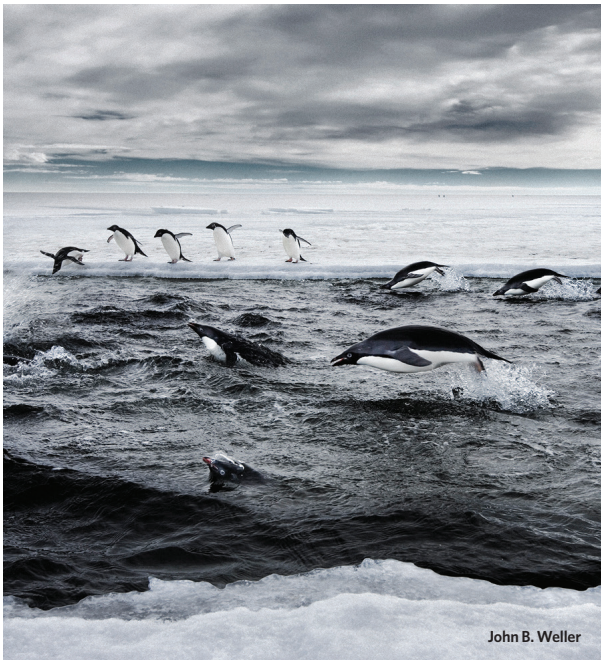
Eddies lying between two fronts of the Antarctic Circumpolar Current drive annual phytoplankton blooms,[16] drawing fish and squid that in turn feed local populations of seabirds and mammals, including globally significant breeding populations of penguins; northern and southern giant petrels; white chinned petrels; wandering, sooty, and light mantled albatrosses; and the threatened grey-headed and wandering albatrosses.[17]

Domain 6
Kerguelen Plateau

Lying between the Antarctic Convergence and the Antarctic Circumpolar Current, the Kerguelen Production Zone is an open-water, highly productive region with rugged deep-water habitat that nourishes whales and seabirds migrating through the area as well as immense populations of land-based predators, including breeding king penguins,[18] Antarctic fur seals, and elephant seals.[19]

Domain 7
East Antarctica

Toothfish, the top fish predators in East Antarctica, produce their own anti-freeze proteins to keep their blood from crystallizing[20] and can grow to nearly 2 metres in length. Recently, scientists have discovered that nearly double the amount of Adélie penguins live in East Antarctica than was previously thought.[21]



Domain 8
Ross Sea

This region supports remarkable biodiversity, including more than 150 types of starfish and urchins, 40 species of which are found nowhere else on Earth;[22] minke whales; Weddell and leopard seals; Adélie and emperor penguins; and a genetically distinct population of orca, or killer whale, referred to as ecotype-C, which is adapted to feed on Antarctic toothfish.[23]

Domain 9
Amundsen and Bellingshausen seas

These seas have significant sea ice cover, making large areas unreachable to researchers and limited to fishers. A recent survey of the sea-floor community found that 96 percent of the region's isopods, a type of crustacean, were species new to science.[24]

Looking ahead

Successfully implementing a network of MPAs in the Southern Ocean would exemplify global cooperation in the face of increasing environmental challenges.

In 2016, the annual CCAMLR meeting showcased an example of such cooperation with the consensus designation of the world's largest MPA, in the Ross Sea. The 2.06 million-square-kilometre (almost 800,000-square-mile)[25] area includes 1.55 million square kilometres of open water and extends to the coastline under the Ross Ice Shelf. The MPA, more than three times the size of France, will go into force in December 2017.

With the establishment of the Ross Sea Region MPA, CCAMLR has taken the first step needed to create a network of large-scale MPAs. The next steps towards reaching this goal must include designating the proposed Weddell Sea and East Antarctic MPAs, as well as advancing the proposal for an MPA off the Western Antarctic Peninsula.

Figure 3

Pieces of the Ecosystem Puzzle: Status of MPAs in the Southern Ocean

Pew's vision for a Southern Ocean MPA network

CCAMLR MPA planning domain	Size of existing or proposed MPA	MPA status	Pew's vision for network of MPAs
Existing CCAMLR MPA; Existing MPAs in need of expansion or additional protections established within the planning domain; Current MPA proposal or draft scenarios being negotiated by CCAMLR; No MPA currently in place			
 **Domain 1** Western Antarctic Peninsula and South Scotia Arc[a]	94,000 square kilometres (sq km)	CCAMLR South Orkney Islands Southern Shelf MPA (2009)	Expand the South Orkney Islands MPA northward to include biodiversity hotspots and key penguin foraging grounds
	In progress	CCAMLR MPA proposal expected as early as 2017 to be submitted by Chile and Argentina	No-fishing buffer zones in penguin foraging areas Protect biodiversity hotspots and representative benthic (sea floor) and pelagic (open ocean) regions, particularly in coastal areas Protect sensitive areas, including nursery habitat for krill and areas used during key life stages for birds and mammals Establish climate change reference areas

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Existing CCAMLR MPA; Existing MPAs in need of expansion or additional protections established within the planning domain; Current MPA proposal or draft scenarios being negotiated by CCAMLR; No MPA currently in place			
 **Domain 2** North Scotia Arc, including South Georgia and the South Sandwich Islands	1.07 million sq km	South Georgia and South Sandwich Islands MPA (2012) includes 12-nautical-mile no-fishing region around South Georgia, Clerke Rocks, and Shag and Black rocks, and 3-nautical-mile no-fishing region around South Sandwich Islands[b] Review of the reserve and expanding protections will be under consultation in 2018	Consider enhanced protections of biodiversity in the region
 **Domains 3 and 4** Weddell Sea, Bouvet Island, and the Maud Rise	1.8 million sq km proposed	Weddell Sea MPA proposal first submitted to CCAMLR in 2016 by the European Union, led by Germany	Key regions for protection: Polarstern Canyon, Filchner Trough, Eastern Antarctic Peninsula, western Weddell Sea, Astrid Ridge, Queen Maud Land seamounts, Maud Rise, Lazarev Sea, and a wider area around Bouvet Island Protect representative pelagic and sea ice ecosystems and habitats, and rare and unique sea floor areas with high biodiversity Protect habitat used during key life history stages for important prey species (including krill and silver-fish), birds and marine mammals, and toothfish and other fish species (including spawning areas and nesting sites)
	58 sq km	Bouvet Island Marine Reserve (1971) established by Norway to 12 nautical miles from the coast	
 **Domains 5 and 6** Crozet Islands, the Del Cano Rise, and the Kerguelen Plateau	180,000 sq km	Prince Edward Islands MPA (2013) established by South Africa	Key regions for additional protection include: Ob and Lena Banks and surrounding seamounts, Del Cano Rise region, Southwest Indian Ridge, Banzare Bank, Elan Bank, Kerguelen Plateau high seas areas, and the Kerguelen Production Zone Enhanced protections for national waters around Kerguelen and Crozet islands
	1.14 million sq km	Crozet Islands and Kerguelen Islands MPAs established by France and expanded in 2017	
	71,000 sq km	Heard Island and McDonald Islands Marine Reserve established by Australia and expanded in 2014	

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Existing CCAMLR MPA; Existing MPAs in need of expansion or additional protections established within the planning domain; Current MPA proposal or draft scenarios being negotiated by CCAMLR; No MPA currently in place			
 **Domain 7** East Antarctica	950,000 sq km	A CCAMLR proposal for an East Antarctic Representative System of MPAs was first submitted to CCAMLR in 2011 by Australia, France, and the European Union; negotiations are ongoing	Adoption in 2017 of three representative MPAs in MacRobertson, Drygalski, D'Urville-Mertz Protect representative benthic and pelagic regions Protect habitat used during key life history stages for important prey species (including krill and silver-fish), birds, and marine mammals Establish climate change and fishery reference areas Key regions for protection beyond current proposal include all of Prydz Bay, Cosmonaut polynya off Wilkes Land, Enderby Islands, and Gunnerus Ridge
 **Domain 8** Ross Sea region[c]	2.06 million sq km	CCAMLR Ross Sea Region MPA (2016)	An effective and comprehensive research and monitoring plan developed and adopted by the end of 2017 to monitor the world's largest protected area Effective MPA enforcement in place
 **Domain 9** Amundsen and Bellingshausen seas		No MPA proposed; limited planning underway	Coastal and offshore areas in the Bellingshausen Sea, including areas with ice shelves vulnerable to collapse Key areas for protection include waters around Peter I Island and seamounts to the north and open water and seamounts in the Amundsen Sea

[a] Special Areas for Scientific Study may be designated in any newly exposed marine areas after the retreat or collapse of an ice shelf, glacier, or ice tongue (a narrow sheet of ice) in the Antarctic Peninsula region (encompassing parts of Statistical Subareas 48.1, 48.5, and 88.3). While not an MPA, these areas offer protections similar to one for up to 10 years.

[b] Note that this MPA (declared by the United Kingdom), and sovereignty of the islands, remains contested by Argentina.

[c] This MPA is the largest protected area in the world. This figure includes the Ross Ice Shelf; without the ice shelf, the MPA covers 1.55 million sq km.

Endnotes

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For further information, please visit:

pewtrusts.org

Contact: Barbara Cvrkel, officer, communications
Email: bcvrkel@pewtrusts.org
Project website: pewtrusts.org