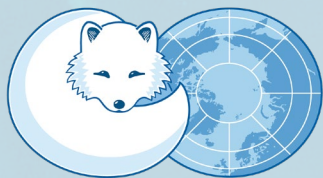


MARINE PROTECTED AREAS IN A CHANGING ARCTIC

This brief summarizes how climate change affects the Arctic marine environment, from ecosystem and habitat impacts to driving changes in human activities, and highlights [marine protected areas](#) as a tool for Arctic resilience.

INFORMATION BRIEF
2021



ARCTIC COUNCIL

PAME

Protection of the Arctic Marine Environment

Marine Protected Areas as a Conservation Tool

Marine protected areas (MPAs) are a proven tool for conserving species, habitats and ecosystems, and provide social and economic benefits to Arctic communities. Under the Convention for Biological Diversity (CBD), Aichi Target 11 called for the protection of 10% of coastal and ocean waters by 2020, with a focus on areas of particular importance for biodiversity and ecosystem services. In 2016, 4.7% of marine waters in the Arctic and 7.4% globally were protected.¹

The CBD is now establishing a post-2020 Global Biodiversity Framework, which will set global conservation goals for the coming decades. Many scientists have stated that the 10% goal for marine protection is insufficient to sustain a healthy ocean and the ecosystem services it

provides, and have called for broader protection goals of 30% or more through MPA networks that represent and connect diverse ecosystems.² The CBD and International Union for the Conservation of Nature also recognized that well-managed areas that are not MPAs can contribute to conservation outcomes, and that these “other effective conservation measures (OECMs)” can be an important component of MPA networks. The recognition of OECMs provides the opportunity to promote additional partnerships in global conservation.

Arctic MPAs are diverse in their objectives, locations and scale, extending from coastal and estuarine waters to deep sea canyons, and in some cases designed for social and cultural outcomes as well as conservation. Biodiversity

benefits are closely linked to levels of protection, with higher levels of protection providing the greatest scope for ecosystem resilience and recovery.³ However, given the scale and pace of global climate change impacts and biodiversity loss, MPAs are only part of the solution for a healthy ocean, and can be complemented by other measures to manage human activities (e.g., fisheries management, pollution management). With new species arriving in Arctic waters, and ice-dependent species concentrated in shrinking ice areas, scientists and managers have also identified a growing need for dynamic place-based measures that can manage species in rapidly changing conditions.⁴

An “other” effective conservation measure (OECM) is a geographically defined area other than a protected area, which is governed and managed in ways that achieve positive and sustained long-term outcomes for the in-situ conservation of biodiversity, with associated ecosystem functions and services and where applicable, cultural, spiritual, socioeconomic, and other locally relevant values.

A **protected area** is a clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values.



CAFF/PAME Protected Areas
2021

Climate Drivers

The Arctic is one of the most rapidly changing regions on Earth. In recent decades, Arctic air temperatures have risen at more than double the average rate of the Northern hemisphere,⁵ with the potential for some areas within the Arctic, such as the Barents Sea, to see winter air temperatures rise by as much as 20°C by the end of the century.^{6, 7} In the Arctic Ocean, melting sea ice,^{8, 9} ocean warming,^{8, 10} sea-level rise,^{11, 12} and rapidly acidifying waters^{13, 14} are altering the environment at an unprecedented rate, while emerging issues such as changing winds and weather patterns, stratification of the water column, deoxygenation, and changes to ocean circulation could greatly alter the Arctic over the coming decades. Tracking, understanding, and projecting these drivers is key to understanding the role of Arctic MPA networks in conserving species, habitats, and ecosystems and the benefits they provide within the context of a changing ocean.

Sea Ice Change

What is Happening

- Sea ice extent has shown decreasing trends in all months and virtually all regions of the Arctic (*very high confidence*).^{8, 9}
- The 2018 sea ice cover minimum ice extent was 26% less than the 1981-2000 average⁹ and observed reductions in sea ice volume are likely unprecedented in at least the past 1,000 years.⁸
- Sea ice has undergone a transition from thick multi-year ice to thinner seasonal ice (*high confidence*).^{8, 10}
- The Barents Sea has seen particularly large declines in seasonal sea ice.⁶

What Could Happen

- Arctic sea ice extent will continue to decline in all months of the year (*high confidence*).⁸
- According to some models, if global warming is stabilized at 2°C, the probability of an ice-free summer occurring in any given year after mid-century would be 19–34%^{8, 10} (*high confidence*). The Barents Sea is expected to become the first Arctic region free of ice year round by mid-century.^{6, 7}

Note: Confidence ratings were applied as available in the cited source literature.

Ocean Warming

What is Happening

- Sea surface temperatures are increasing over much of the Arctic,^{8, 10} largely due to increased absorption of solar radiation as a result of sea ice loss (*virtually certain*).⁸
- Over large sectors of the ice-free Arctic, summer upper mixed-layer temperatures have increased at 0.5°C per decade since 1982 (*high confidence*),⁸ with linear warming trends of up to 1°C per decade in some locations.¹⁵

What Could Happen

- Marine heatwaves in the Arctic will increase in frequency, duration, and extent (*high confidence*).⁸

Sea-Level Rise

What is Happening

- Arctic glaciers, such as the Greenland Ice Sheet, are the largest land-ice contributors to global sea-level rise.⁵
- Sea-level rise contributes to coastal erosion, potentially threatening coastal habitats and human communities.
- The rate of relative sea-level rise is highly variable around the Arctic, rising in some regions but falling in many others due to the land moving upward since the last ice age and changes in gravitational pull from Greenland ice loss.^{11,12,16}

What Could Happen

- Relative sea-level rise is expected to continue to vary from place to place dependent on crustal uplift and other factors.
- Arctic glaciers will continue to lose mass over the course of this century (*very likely*),^{5, 8} further contributing to global sea-level rise.

Ocean Acidification

What is Happening

- The Arctic Ocean is experiencing some of the fastest rates of acidification in the world due to the higher capacity of cold water to absorb CO₂, the inflow of naturally low pH waters from the Pacific, dilution by river runoff and ice melt.^{13, 14}
- Some areas of the Arctic Ocean were among the first regions of the ocean to experience surface and near-surface waters corrosive to aragonite,^{16, 17, 18} one of the primary minerals used by calcifying organisms to make skeletons and shells.

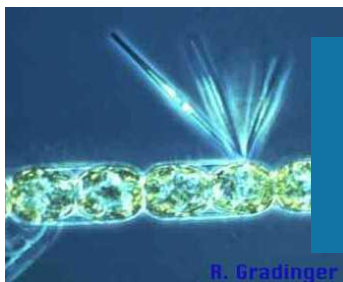
What Could Happen

- The acidification of the Arctic ocean will continue to increase (*high confidence*).^{8, 11, 12}
- The water column above the continental shelves of the Beaufort and Chukchi Seas are especially vulnerable to ocean acidification because of low pH water from the Pacific and dilution by high freshwater inflows.^{11, 12}

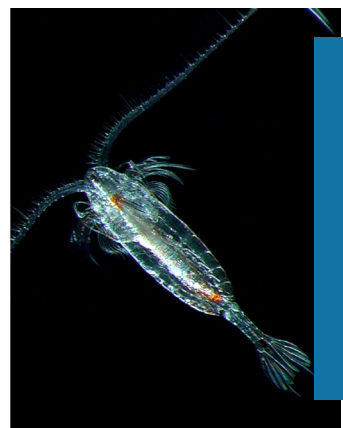
Ecosystems, Habitats and Species

What Is Happening

The Arctic contains a great diversity of species and ecosystems, all of which are experiencing multiple pressures due to changes in the physical, chemical, and biological environments.^{19,20} Individually, a single climate driver may put relatively little, or much, pressure on the environment. However, in combination, multiple drivers can create cumulative effects in the environment with surprising and hard-to-predict results.²⁰ While many impacts are likely to continue or worsen in the future, warming waters, melting sea ice, and ocean acidification are already stressing the ability of organisms to adapt to rapidly changing conditions. Some of these changes, such as reductions in sea ice leading to higher phytoplankton productivity at the expense of ice algae in the Barents region,⁶ are already causing major ecosystem-level changes in the Arctic (*high confidence*).^{8, 20}

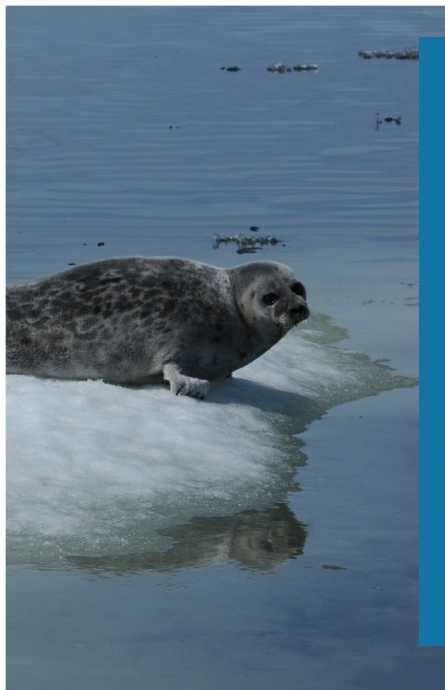
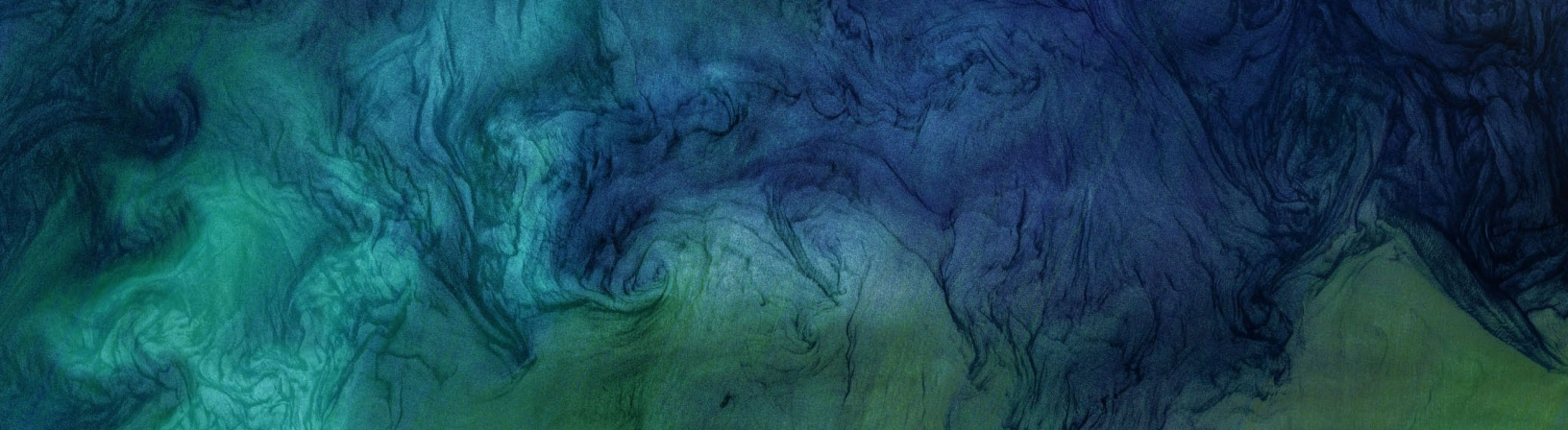


Primary production, the building block of food webs, increased by 20% from 1998 to 2009, driven by a 45-day increase in the open-ice period and a reduction in summer ice cover of 27%.²⁰



Northward range shifts are the most prominent climate related changes to biodiversity in the Arctic and have been documented across a wide range of taxa (*high confidence*).^{8, 17, 18, 20, 21} These shifts include increasing numbers of southern species moving into Arctic waters (*high confidence*),⁸ such as Atlantic zooplankton replacing Arctic species,²¹ with unknown consequences for Arctic species and ecosystems.^{21, 23}

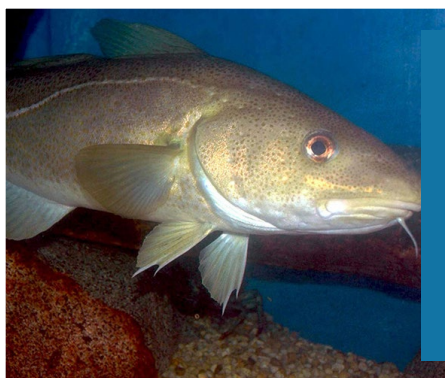
Note: Confidence ratings were applied as available in the cited source literature.



Climate impacts that reduce the availability of food sources can, and are, negatively impacting Arctic animals (*very high confidence*).^{8, 21} In many instances, reductions in prey driven by a loss of sea ice are forcing individuals to travel further to feed, expending more energy, which is leading to concerns about individual and population health (*high confidence*).²¹ In fact, Ringed seals on Svalbard have experienced major reductions in breeding habitat since 2006, when local land-fast sea ice suddenly declined.⁶ In addition, they now must travel further to reach summer foraging areas and, once there, must spend more time travelling and diving and less time resting.⁶



Some seabird species have adapted their feeding behaviours because of shifts in their food supply due to climate change and reduced ice-cover—in some cases travelling farther for food or foraging on less nutritious species. The consequences vary, but have resulted in lower breeding success for some species.²¹



In the Barents Sea region, the size of the polar cod (*Boreogadus saida*) stock has decreased since 2007 due to reduced recruitment driven by warming and associated reductions in sea ice and well as the expansion of Atlantic cod (*Gadus morhua*) into the region.⁶

What Could Happen

Rising temperatures, changing ocean circulation, melting sea ice, and alterations to ocean chemistry could alter biological communities with unknown consequences for ecosystem function. Changes to the productivity of Arctic plankton, benthos, and fishes as a result of these climate drivers is expected to further affect a range of species from seabirds to marine mammals through ecosystem interactions.⁸ Further, sea ice loss could have large impacts on the many Arctic species that have highly seasonal and specialized feeding, reproduction, and migration patterns dependent on the timing and duration of ice retreat and the ice-free ocean (*high confidence*).²¹ While species reliant on sea ice could experience range reductions,²¹ those dependent on open water may benefit from climate change,⁶ highlighting the complex possible future impacts of climate change on Arctic ecosystems and biodiversity.²¹

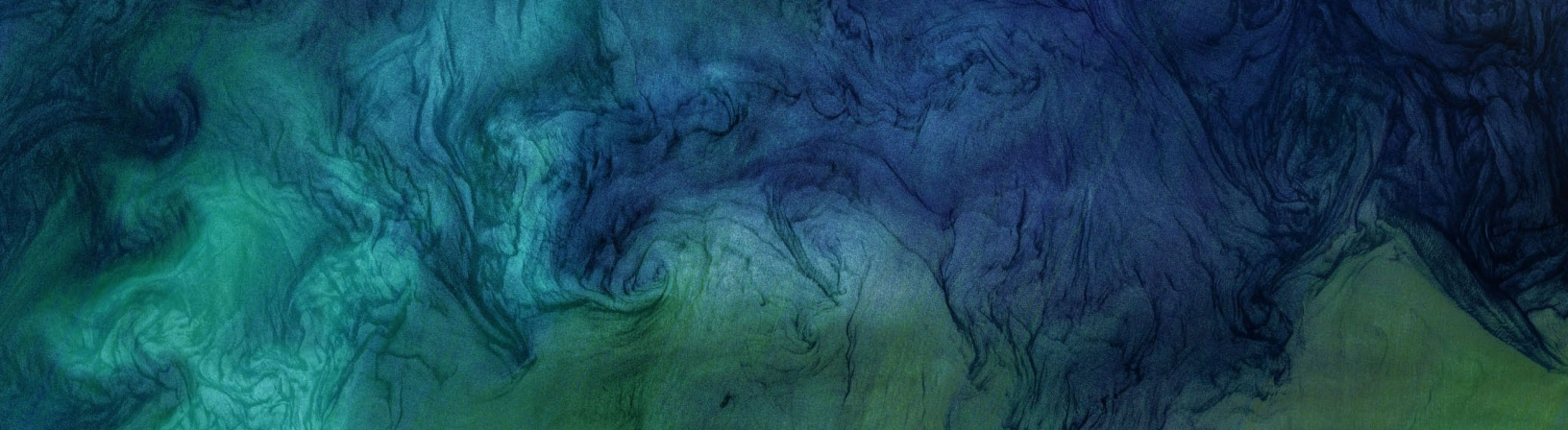


The expansion of other species into the Arctic could also alter ecosystems. The replacement of Arctic species of zooplankton and fishes by less energy-rich southern species could have cascading effects throughout the food web (*high confidence*).^{8, 19-21}



In Norway, acidification, in combination with warming, could strongly reduce green sea urchin populations, reducing the harvest potential of this unexploited fishery sevenfold by 2050.^{13, 14}

Note: Confidence ratings were applied as available in the cited source literature.



Whether directly or indirectly through prey species and ecological cascades, ocean acidification will impact a wide range of organisms (*high confidence*)⁸ including plankton, shellfish, deep-sea corals, fishes, and marine mammals, altering the composition of the Arctic ecosystem.^{22, 24} These effects could have ecological and societal impacts.²⁰

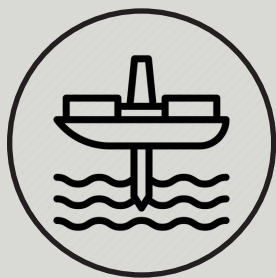
Changes in Human Activities

Sea ice retreat in the Arctic is opening up the region to increased shipping, driven by new economic activity and changes in existing human uses. Cruise tourism, commercial fishing activity, and other natural resource extraction such as oil and gas and mining all contribute to the rise in shipping, though usually on a seasonal timeframe and in localized areas. While coastal communities can benefit from increased economic activity, sea ice decline, in particular multi-year ice loss, can negatively affect local food security by altering species migratory pathways and introducing safety risks to accessing hunting grounds. Furthermore, impacts from new and expanded commercial activity can further exacerbate the challenges communities and ecosystems face from the impacts of a changing climate. For example, while oil spills are the most significant threat associated with Arctic marine shipping,²⁵ longer navigation seasons could also result in increased risk of introducing non-indigenous species, underwater noise, and ship strikes of marine mammals, as well as impacts to migration patterns and habitat.⁶



Shipping

Shipping is increasing in the Arctic, with contributions from the sectors described below. The number of unique ships entering the Arctic increased by 25% between 2013 and 2019, from 784 to 977, as defined by the International Maritime Organization's Polar Code.²⁶



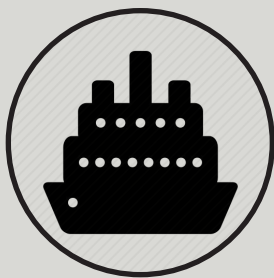
Mineral Resource Extraction

- Oil and gas development has the potential to be one of the most important drivers of additional change. Oil prices, technological developments, sovereignty, and energy security all play a role in setting the pace and magnitude of future development in the region.²⁶
- Land-based mining also contributes to increased shipping. For example, the Mary River mine on Baffin Island, Nunavut, Canada is one of the northernmost mines in the world and involves shipping of 3.5 million tons of iron ore during open water season.²⁵



Fishing

- In some areas, such as the Barents Sea⁶ and Baffin Bay,¹⁷ ice retreat is opening new opportunities for fishing.
- Warming-induced changes in the spatial distribution and abundance of some fish and shellfish stocks have had positive and negative impacts on catches, economic benefits, livelihoods, and local culture.⁸
- In 2019 fishing vessels accounted for the largest portion (41%) of all unique vessels in the region.²⁶



Tourism

- Summertime Arctic ship-based tourism increased over the past two decades concurrent with sea ice reductions.⁸
- Some of the main impacts to marine ecosystems from tourism are environmental degradation, disturbance of wildlife, introduction of non-indigenous species, and pollution.⁶
- In some areas, climate-driven events such as harmful algal blooms have had negative impacts on food security, tourism, local economy, and human health.⁸



International Governance

The international community has come together to address some of these activities, including through two landmark agreements:

- The International Maritime Organization developed an International Code for Ships Operating in Polar Waters (Polar Code) to improve shipping safety through regulations on ice navigation and ship design. It entered into force on January 1, 2017.
- Nine countries and the European Union have signed an agreement to prevent unregulated commercial fishing in the Central Arctic Ocean and conduct science and monitoring to inform future management decisions. Nine signatories have ratified, and the agreement will enter into force with the tenth ratification.

Addressing Climate Change in Marine Protected Areas





1

CASE STUDY

New Siberian Islands Nature Reserve (Russia)

The New Siberian Islands Nature Reserve was created in 2018 to protect 66,000 km² of pristine seascapes and landscapes of the northern Laptev and East-Siberian Seas, including the Great Siberian Polynya. The MPA protects a high-Arctic sea shelf ecosystem, supporting polar bears, bearded and ringed seals, Arctic cod and seabirds. The area is known for its high benthic biomass providing food for the rare Laptev walrus, which are present year-round.

The area was identified as a priority for conservation through a systematic planning process conducted for the Russian Arctic Seas in 2015-2017 to create an Arctic MPA network. The New Siberian Islands is one of the most stable climate refugia for marine animals in the Russian Arctic. The area was once home to many thousands of mammoths, and now has one of the highest densities of valuable mammoth tusks in the world. The establishment of the protected area has reduced the destructive removal of tusks, which led to accelerated coastal erosion and illegal hunting and gathering.

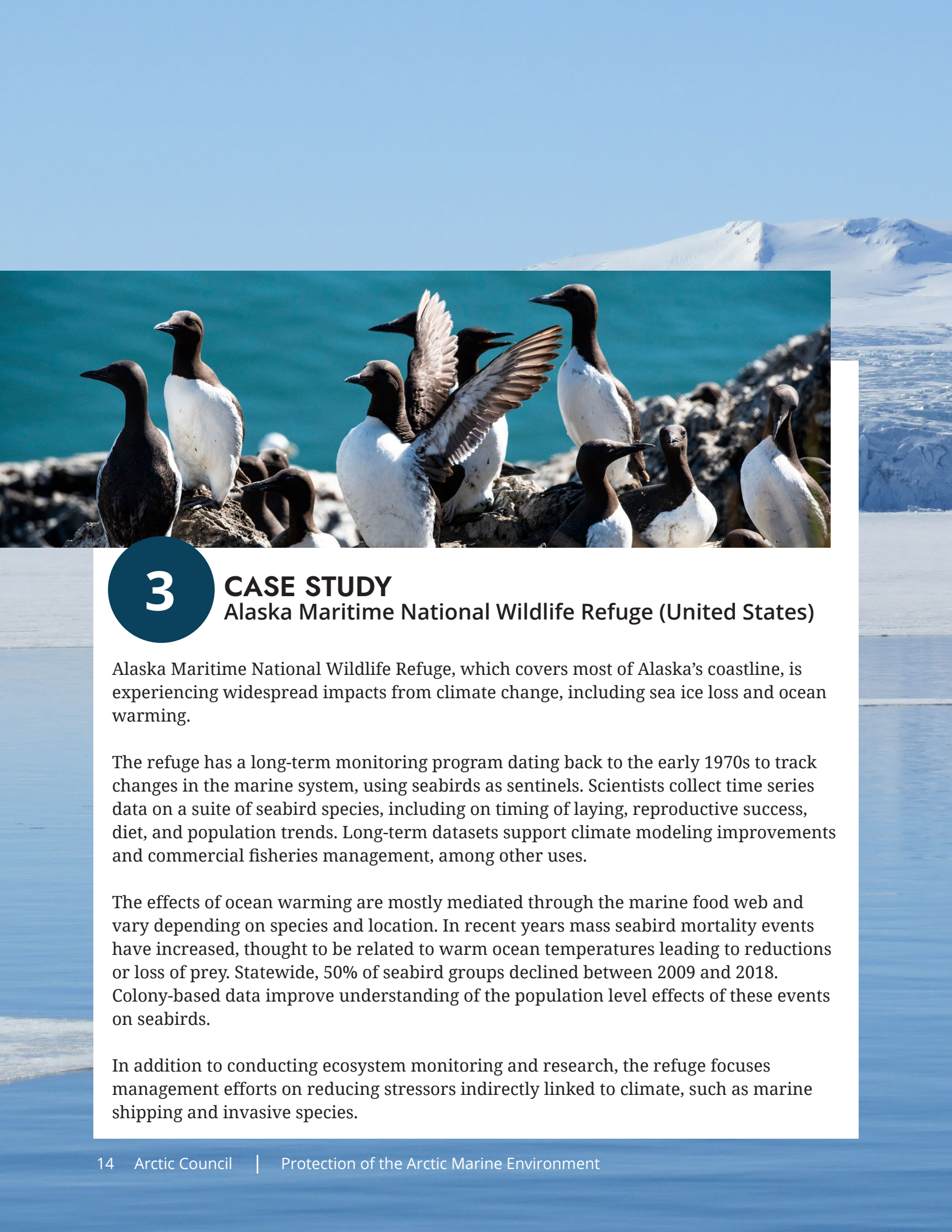
2

CASE STUDY

Tuvaijuittuq Marine Protected Area (Canada)

Canada's Tuvaijuittuq, meaning “the place where the ice never melts” in Inuktitut, has some of the oldest and thickest sea ice in the Arctic Ocean—ice that is expected to last the longest in the face of climate change. This makes the area unique and potentially important as a future summer habitat for ice-dependent species, including walrus, polar bears, bowhead whales, narwhals, belugas, bearded and ringed seals. However, a possible increase in Arctic activities, particularly ice breaking, could negatively impact the multi-year ice environment.

In August 2019, Tuvaijuittuq became the first MPA designated for interim protection for up to five years while Qikiqtani Inuit Association, the Government of Nunavut and the Government of Canada work with Inuit and northern partners to explore the feasibility of longer-term protection. The potential ecological, economic, social and cultural benefits of designation are expected to outweigh costs through research support, ecosystem and biodiversity maintenance, and its intrinsic value.



3

CASE STUDY

Alaska Maritime National Wildlife Refuge (United States)

Alaska Maritime National Wildlife Refuge, which covers most of Alaska's coastline, is experiencing widespread impacts from climate change, including sea ice loss and ocean warming.

The refuge has a long-term monitoring program dating back to the early 1970s to track changes in the marine system, using seabirds as sentinels. Scientists collect time series data on a suite of seabird species, including on timing of laying, reproductive success, diet, and population trends. Long-term datasets support climate modeling improvements and commercial fisheries management, among other uses.

The effects of ocean warming are mostly mediated through the marine food web and vary depending on species and location. In recent years mass seabird mortality events have increased, thought to be related to warm ocean temperatures leading to reductions or loss of prey. Statewide, 50% of seabird groups declined between 2009 and 2018. Colony-based data improve understanding of the population level effects of these events on seabirds.

In addition to conducting ecosystem monitoring and research, the refuge focuses management efforts on reducing stressors indirectly linked to climate, such as marine shipping and invasive species.



4

CASE STUDY **Svalbard Marine Protected Areas (Norway)**

Almost the entire territorial waters of the Svalbard archipelago are covered by three MPAs (Svalbard West, Svalbard East and Bjørnøya) with a total area of 78,411 km² and varying levels of protection.²⁷ Most of the area is within the Norwegian portion of the Barents Sea, the management of which is advised by a regularly updated integrated management plan—most recently updated in 2020. Svalbard and the sea territory out to 12 nm are protected through the Svalbard Environmental Act.

The management plan is guided by scientific information, including on climate impacts, and addresses oil and gas development, fisheries, marine transport, and marine conservation. It is one of the few plans anywhere in the world that integrates fisheries management actions with those in other marine sectors.

The Barents Sea is experiencing several climate change impacts, including sea ice loss, resulting in changes in the type, amount, and distribution of ice-dependent species. New fisheries regulations were implemented in 2019, as shrinking sea ice around Svalbard opened new areas to fishing. The area is also seeing an increase in temperate fish and marine mammal species.

HOW MARINE PROTECTED AREAS (MPAS) HELP ADDRESS CLIMATE IMPACTS

Effective, well designed networks of MPAs can play a key role in promoting resilience to climate change as part of an ecosystem approach to management.⁴

WHAT IS AN MPA?

MPAs are clearly defined geographic areas in the ocean that are dedicated to and managed for the long-term conservation of nature, together with the ecosystem services and cultural values they provide.

Protect coastlines and coastal communities from storm impacts (e.g., wetland buffers).



Protect carbon-storing habitats, such as salt marshes and seagrasses, as well as the carbon stored in other marine life.

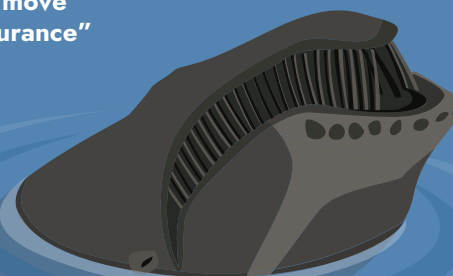


Protect climate refugia—areas that are less affected by climate impacts, where species may have more time to adapt to climate change and which act as sources for the dispersal of native species.

MPA networks protect species on the move due to climate impacts and **provide “insurance”** if some MPA resources are harmed due to climate-driven warming, storms, or disease, by protecting them in other areas.^{2,5}



Support food security, livelihoods and ways of life for Indigenous Peoples.



Protect marine ecosystems by reducing harmful impacts from non-climate stressors such as new or expanded ocean uses, so healthy resources can better withstand climate impacts and sustain livelihoods.





Published

Arctic Council, Protection of the Arctic Marine Environment
May 2021

Layout and design

Nina Chambers, U.S. National Park Service

Photo Credits

Cover: NOAA (Bowhead whale, Beaufort Sea)
p. 4-5: NOAA (ice on the Beaufort Sea)
p. 6-7: NASA (Chukchi Sea phytoplankton bloom);
NOAA (species), National Audubon Society (ivory gull)
p. 8-9: NASA (Chukchi Sea phytoplankton bloom);
NOAA (species, corals and brittle stars)
p.10-11: Nina Chambers (Svalbard)
p. 12-13: Stuart Leidner (walrus in Svalbard)
p. 14-15: Nina Chambers (Svalbard); U.S. Geological
Survey/Sarah Schoen (murre); Nina Chambers (polar
bear, Svalbard)
p. 16: Infographic by NOAA Office of National Marine
Sanctuaries
p. 17: Nina Chambers (polar bear tracks)
p. 18: National Weather Service (ice balls)

References

1. CAFF/PAME Indicators Report, 2017.
2. Woodley, S., Locke, H., Laffoley, D., MacKinnon, K., Sandwith, T., and Smart, J., 2019. A Review of Evidence for Area-based Conservation Targets for the Post-2020 Global Biodiversity Framework. IN: *PARKS the International Journal of Protected Areas and Conservation*.
3. Edgar, G., Stuart-Smith, R., Willis, T. et al. Global conservation outcomes depend on marine protected areas with five key features. *Nature* 506, 216–220 (2014). <https://doi.org/10.1038/nature13022>
4. PAME Marine Protected Areas Workshop, 2017. *Understanding MPA Networks as Tools for Resilience in a Changing Arctic*. <https://www.pame.is/index.php/projects/marine-protected-areas/mpa-workshops/mpa-workshop-february-2017>
5. AMAP, 2019. AMAP Climate Change Update 2019: An Update to Key Findings of Snow, Water, Ice and Permafrost in the Arctic (SWIPA) 2017. Arctic Monitoring and Assessment Programme (AMAP), Oslo, Norway. 12 pp
6. AMAP, 2017. Adaptation Actions for a Changing Arctic: Perspectives from the Barents Area. Arctic Monitoring and Assessment Programme (AMAP), Oslo, Norway. 267 pp.
7. AMAP, 2017. Adaptation Actions for a Changing Arctic (AACA) - Barents Area Overview report. Arctic Monitoring and Assessment Programme (AMAP), Oslo, Norway. 24 pp.
8. IPCC, 2019: IPCC Special Report on the Ocean and Cryosphere in a Changing Climate [H.-O. Pörtner, D.C. Roberts, V. Masson-Delmotte, P. Zhai, M. Tignor, E. Poloczanska, K. Mintenbeck, A. Alegria, M. Nicolai, A. Okem, J. Petzold, B. Rama, N.M. Weyer (eds.)]. In press.
9. Perovich, D., et al, 2018: Sea Ice [in Arctic Report Card 2018], <https://www.arctic.noaa.gov/Report-Card>.
10. AMAP, 2019. AMAP Climate Change Update 2019: An Update to Key Findings of Snow, Water, Ice and Permafrost in the Arctic (SWIPA) 2017. Arctic Monitoring and Assessment Programme (AMAP), Oslo, Norway. 12 pp.
11. AMAP, 2017. Adaptation Actions for a Changing Arctic: Perspectives from the Bering-Chukchi-Beaufort Region. Arctic Monitoring and Assessment Programme (AMAP), Oslo, Norway. 255 pp.
12. AMAP, 2017. Adaptation Actions for a Changing Arctic (AACA) - Bering/Chukchi/Beaufort Region Overview report. Arctic Monitoring and Assessment Programme (AMAP), Oslo, Norway. 24 pp.
13. AMAP, 2019. Arctic Ocean Acidification Assessment 2018: Summary for Policy-Makers. Arctic Monitoring and Assessment Programme (AMAP), Oslo, Norway. 16 pp.
14. AMAP, 2018. AMAP Assessment 2018: Arctic Ocean Acidification. Arctic Monitoring and Assessment Programme (AMAP), Tromsø, Norway. 187 pp.
15. Timmermans, M. -L., and C. Ladd, 2018: Sea Surface Temperature [in Arctic Report Card 2018], <https://www.arctic.noaa.gov/Report-Card>.
16. AMAP, 2014. Arctic Ocean Acidification 2013: An Overview. Arctic Monitoring and Assessment Programme (AMAP), Oslo, Norway. 27 pp.
17. AMAP, 2017. Adaptation Actions for a Changing Arctic (AACA) - Baffin Bay / Davis Strait Region Overview report. Arctic Monitoring and Assessment Programme (AMAP), Oslo, Norway. 24 pp
18. AMAP, 2013. AMAP Assessment 2013: Arctic Ocean Acidification. Arctic Monitoring and Assessment Programme (AMAP), Oslo, Norway. 99 pp.
19. CAFF. 2013. Arctic Biodiversity Assessment. CAFF, Akureyri, Iceland.
20. Eamer, J., Donaldson, G.M., Daston, A.J., Kosobokova, K.N., Lárusson, K.F., Melnikov, I.A., Reist, J.D., Richardson, E., Staples, L., von Quillfeldt, C.H. 2013. Life linked to ice: A guide to sea-ice-associated biodiversity in this time of rapid change. CAFF Assessment Series No. 10. Conservation of Arctic Flora and Fauna, Iceland. ISBN: 978-9935-431-25-7.
21. CAFF. 2017. State of the Arctic Marine Biodiversity Report. Conservation of Arctic Flora and Fauna International Secretariat, Akureyri, Iceland. 978-9935-431-63-9
22. IPBES (2019): Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. E. S. Brondizio, J. Settele, S. Díaz, and H. T. Ngo (editors). IPBES secretariat, Bonn, Germany.
23. CAFF and PAME. 2017. Arctic Invasive Alien Species: Strategy and Action Plan, Conservation of Arctic Flora and Fauna and Protection of the Arctic Marine Environment Akureyri, Iceland. ISBN: 978-9935-431-65-3
24. PAME. 2015. Framework for a Pan-Arctic Network of Marine Protected Areas, Iqaluit, Canada. 52 pp.
25. AMAP, CAFF, and SDWG, 2013. Identification of Arctic marine areas of heightened ecological and cultural significance: Arctic Marine Shipping Assessment (AMSA) IIc. Oslo. 114 pp
26. PAME, 2020. Arctic Shipping Status Report #1. <https://storymaps.arcgis.com/s/592bfe70251741b48b0a9786b75ff5d0>
27. Faglig forum for norske havområder 2019. Særlig verdifulle og sårbare områder. Faggrunnlag for revisjon og oppdatering av forvaltningsplanene for norske havområder. M-1303/2019. OSPAR Commission 2013. Publication Number: 618/2013, ISBN 978-1-909159-51-8