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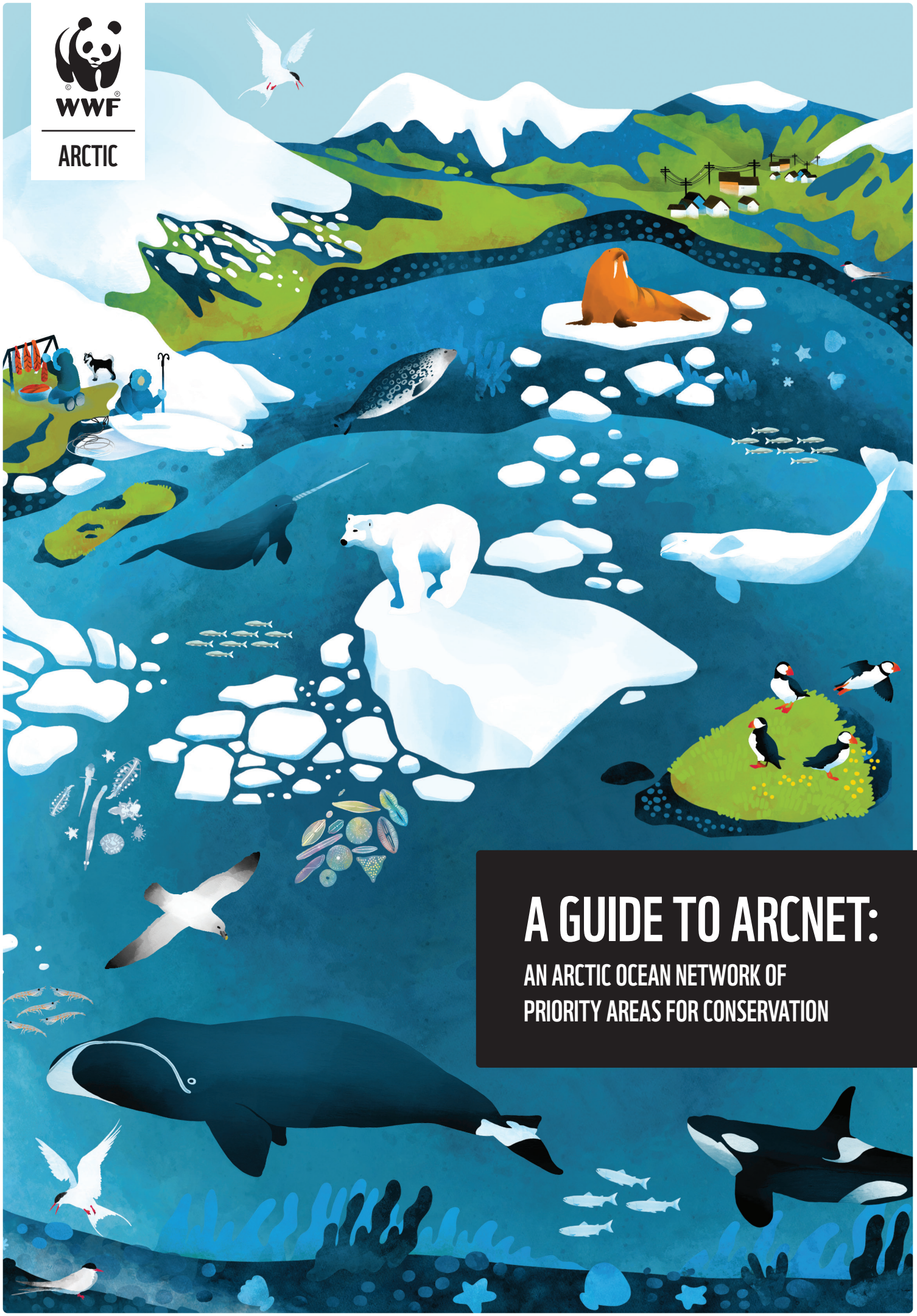

A GUIDE TO ARCNET:

AN ARCTIC OCEAN NETWORK OF PRIORITY AREAS FOR CONSERVATION

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GLOSSARY OF TERMS

Aichi biodiversity targets The Convention on Biological Diversity's targets for the 2011 to 2020 period as agreed at the 10th meeting of the Conference of the Parties held in October 2010 in Nagoya, Aichi Prefecture, Japan.

Biotopes Areas of uniform environmental conditions providing a living place for specific assemblages of species.

Community of practice A group of people with a shared concern or passion who support and learn from each other through regular interaction as they work toward a common goal.

Ecological connectivity The degree to which landscapes and seascapes facilitate or impede movement of organisms and the function of ecological processes.

Ecosystem-based management The comprehensive, integrated management of human activities based on best-available scientific and Indigenous knowledge about the ecosystem and its dynamics; intended to identify and act on influences that are critical to the health of ecosystems to achieve sustainable use of ecosystem goods and services and maintain ecosystem integrity. Ecosystem-based management recognises the full spectrum of interactions within an ecosystem, including humans, rather than considering single issues, species or ecosystem services in isolation.

Ecosystem services The benefits to humans that healthy ecosystems provide. Indigenous Peoples often refer to these as nature's gifts.

Marine protected area MPA's involve the protective management of natural areas according to predefined objectives to achieve diverse goals. They are created by delineating zones with permitted and non-permitted uses. The IUCN defines a protected area as a "clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values.[9]

MPA network The IUCN World Commission on Protected Areas defines an MPA network as a collection of individual MPAs or reserves operating cooperatively and synergistically, at various spatial scales, and with a range of protection levels that are designed to meet objectives that a single reserve cannot achieve.[1]

Other effective area-based conservation measures The IUCN-WCPA Task Force on OECMs defines an OECM as "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, socio–economic, and other locally relevant values" (pg. v, IUCN-WCPA Task Force on OECMs, 2019).

Priority area for conservation An area of the marine environment of documented biodiversity value that should be prioritised for future conservation and management efforts.

Planning unit The standardised minimum size of a region whose conservation features can be represented in Marxan.

ABBREVIATIONS USED

ArcNet
Arctic Ocean Network of Priority Areas for Conservation

CBD
Convention on Biological Diversity

CF
conservation feature

GIS
geographic information system

IUCN
International Union for the Conservation of Nature

LME
large marine ecosystem

MPA
marine protected area

OECM
other effective area-based conservation measures

PAC
priority area for conservation

PAME
Protection of the Arctic Marine Environment

WCPA
World Commission on Protected Areas

SUMMARY

The Arctic Ocean is globally significant because it is home to diverse marine species in unique ecosystems that play a key role in moderating the global climate and provide food, livelihoods and cultural identity for many people. The loss of even one important link in the complex Arctic could cause the degradation or loss of delicate ecosystems. Increasing human activity and the changing climate are threatening this finely tuned system.

In response, WWF has developed ArcNet – a network of priority areas for marine conservation – across the entire Arctic Ocean and adjacent seas. The network is based on comprehensive, rigorous scientific analysis and best-available data. ArcNet reflects the web of marine life and ecological functions across a connected ocean that underpins the diverse values of people in the region and beyond.

The conservation of ecosystems and species facilitated by ArcNet will not only safeguard Arctic biodiversity but support their resilience and persistence in an ocean affected by rapid climate change. ArcNet will contribute to securing the future of species and the critical ecosystem functions upon which we depend. It will also help the world meet ambitious international conversation targets—like the United Nations Convention on Biological Diversity (CBD) anticipated target to protect and conserve at least 30 per cent of the planet by 2030.

ArcNet identifies priority areas for conservation through:

- **A PROPOSED WHOLE-OCEAN NETWORK**
- **AN EXTENSIVE DATABASE** of best-available spatial information of marine life,
- **ANALYSIS TOOLS**; and
- **A COMMUNITY OF PRACTICE** to assist with engagement and cooperation as network implementation and refinement progresses.


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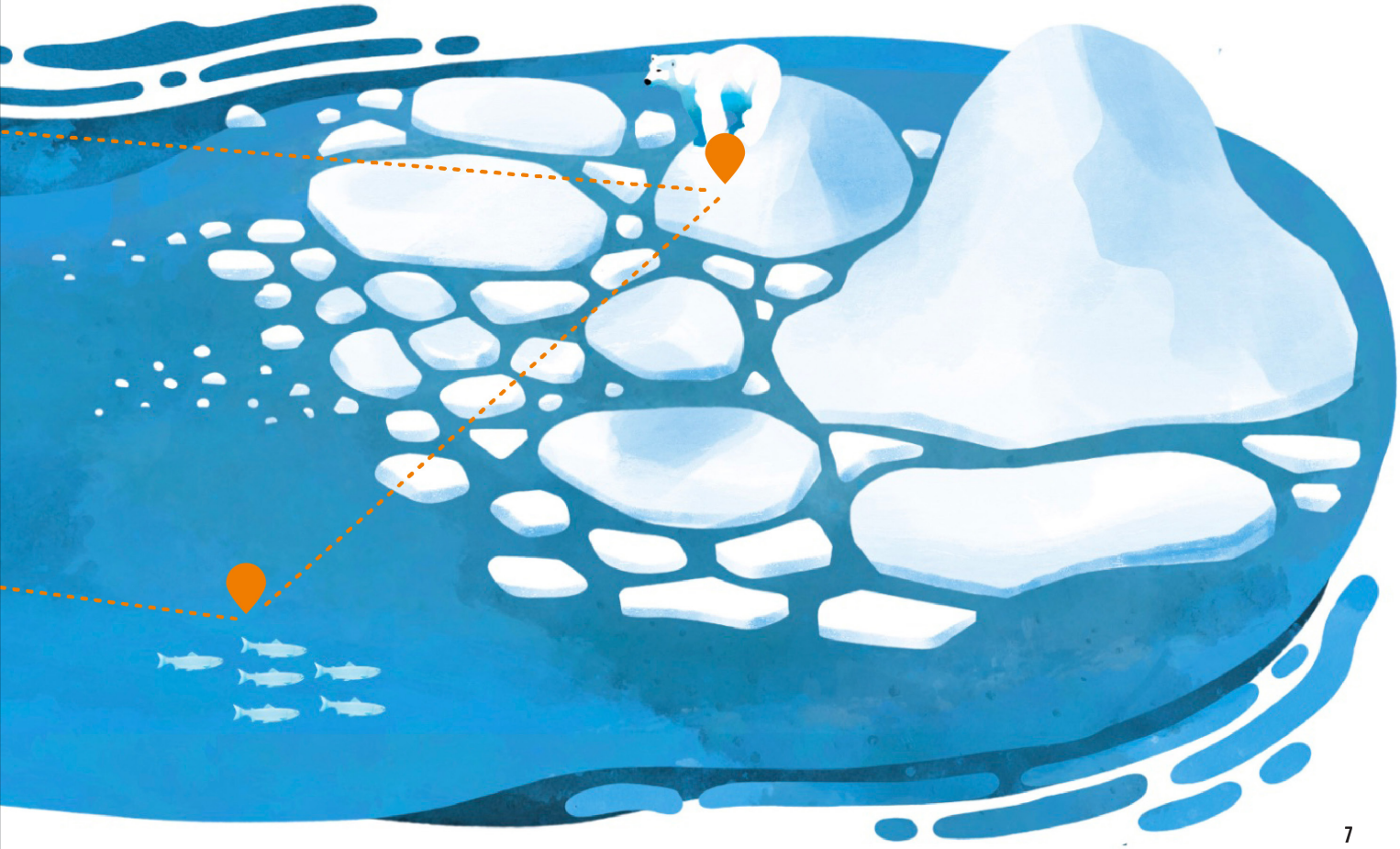
Establishing a whole-ocean conservation network across the Arctic is a shared responsibility. Achieving international conservation targets requires unprecedented, inclusive cooperation. To help facilitate ArcNet's implementation, WWF asks:

- **ARCTIC GOVERNMENTS** to lead by establishing conservation measures for priority areas identified by ArcNet and to apply an ArcNet-approach to creating networks of protected and conserved marine areas;
- **THE ARCTIC COUNCIL** to support ArcNet's ocean-scale ambitions;
- **MARINE SCIENTISTS, INDIGENOUS KNOWLEDGE AND LOCAL KNOWLEDGE HOLDERS,** and Arctic peoples generally to participate in conservation planning and design;
- **MARINE MANAGERS** and **CONSERVATION PROFESSIONALS** to collaborate when identifying, developing, establishing, and assessing the effectiveness of conservation measures; and
- **MARINE INDUSTRIES** to recognize the ArcNet PACs and support effective conservation.

ArcNet lays the foundation for an Arctic Ocean network of conservation areas to support the marine life we rely upon. Collectively working with this approach can significantly contribute to a more resilient and sustainable Arctic.

ARCNET HAS IDENTIFIED AN ARCTIC OCEAN NETWORK FOR MARINE CONSERVATION THAT PRIORITISES MARINE LIFE AND THE IMPORTANT FUNCTIONS AND VALUES OF THE REGION'S UNIQUE ECOSYSTEMS. WWF IS NOW REACHING OUT TO THE INTERNATIONAL ARCTIC COMMUNITY TO HELP ESTABLISH ARCNET AS A CONSERVATION REALITY.

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1. INTRODUCTION TO ARCNET:

AN ARCTIC OCEAN NETWORK OF PRIORITY AREAS FOR CONSERVATION

The Arctic Ocean is home to diverse marine species and ecosystems that play a globally significant role in moderating climate. Its vast resources are important for people around the world. For example, Arctic fisheries are an important food source. The Arctic marine environment is also a source of cultural identity, food security and income for many of its 4 million inhabitants.

The marine waters of the Arctic, as well as the species, ecosystems and cultures they support, are under threat due to our changing climate and increasing industrial activities. In response, Arctic Council Ministers approved a framework for a pan-Arctic *marine protected areas (MPAs)* network (box, left).

Beginning in May 2017—with this framework in mind and motivated by the slow pace of progress toward implementing a network of Arctic MPAs—WWF created an Arctic Ocean Network of Priority Areas for Conservation (ArcNet) to act as a proposed Arctic Ocean network of conserved and protected areas. WWF also developed tools to guide ArcNet's implementation, management and ongoing refinement.

WWF identified the proposed network through a comprehensive, rigorous conservation analysis, engaging experts and incorporating best-available knowledge and scientific data. ArcNet represents an efficient, effective solution for conserving and protecting biodiversity, ecological processes and associated ecosystem services across the Arctic. It represents the first time marine conservation planning has been carried out at the scale of an entire ocean. Formally implementing it is of paramount importance in achieving the anticipated target of the United Nations Convention on Biological Diversity (CBD): to protect and conserve at least 30 per cent of the planet through systems of protected areas and other effective area-based conservation measures by 2030.

The **Arctic Council framework**, developed in 2015 by the **Protection of the Arctic Marine Environment (PAME)** Working Group, describes a pan-Arctic MPA network as an "an ecologically representative and well-connected collection of individual marine protected areas and *other effective area-based conservation measures (OECMs)* in the Arctic that operate cooperatively, at various spatial scales, and with a range of protection levels, in order to achieve the long-term conservation of the marine environment with associated ecosystem services and cultural values more effectively and comprehensively than individual sites could alone." [1]

AIMS AND OBJECTIVES

1. ArcNet has two central aims. The first is to identify an ecologically representative and well-connected Arctic network of priority areas for conservation (PACs) (**Figure 1**). This network would support the resilience and long-term conservation of biological diversity and ecological processes across the Arctic marine environment.

   To achieve this aim ArcNet:

   - Completed a **COMPREHENSIVE, RIGOROUS, WHOLE-OCEAN CONSERVATION ANALYSIS** with well-defined ecological objectives (see **Technical Report**). The analysis is methodical, repeatable and transparent. This step was achieved using the best-available data with Marxan (**Section 4**), an iterative, multi-objective conservation planning tool.
   - Produced **MAPS AND AN EXTENSIVE DATABASE** for the recommended PAC network. These products are a resource for ecosystem-based planning and support the implementation of an Arctic network of marine conservation areas across the wider seascape. The maps and database are available to use.
   - **WILL COMPREHENSIVELY ADDRESS CONNECTIVITY, CONSERVATION IN A CHANGING CLIMATE AND HUMAN USES** to strengthen the network through dedicated analyses. This work is ongoing.

2. The second aim—and the purpose of this report—is to ensure that the resources and outputs from the analysis are used to help design, implement and manage a conservation network in the Arctic Ocean.

   This will require:

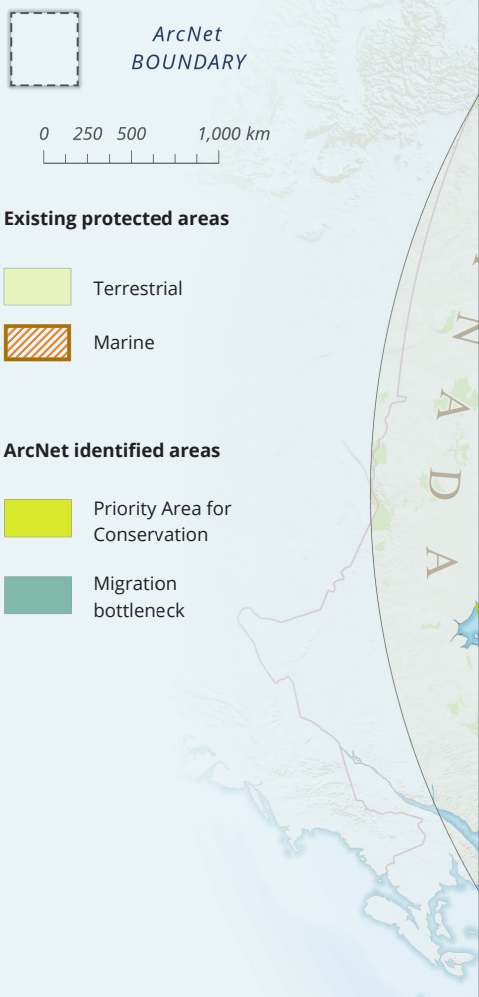
   - **INITIATING AND ENGAGING A COMMUNITY OF PRACTICE** for open, inclusive marine conservation area network planning throughout the Arctic;
   - **INVITING THE INTERNATIONAL COMMUNITY** of Arctic marine rights-holders and stakeholders to be part of an unprecedented collaboration to make ArcNet a conservation reality; and
   - **INFORMING AND ENCOURAGING MARINE CONSERVATION AND PLANNING PROCESSES** at all levels of Arctic government—local to international—so ArcNet can help implement a conservation network across the Arctic.

GEOGRAPHIC SCOPE OF THE ARCNET ANALYSIS

The geographic scope of the ArcNet analysis (**Figure 1**), with some modifications, is the southern border of the area covered by the 18 PAME-defined regions of the Arctic Ocean and adjacent seas, known as the **Arctic Large Marine Ecosystems** (LMEs). The modifications were recommended by Arctic biodiversity experts to focus the ArcNet analysis on the Arctic Realm (according to the **Marine Ecoregions of the World**). Based on this advice, the Faroe Plateau, Norwegian Sea and Aleutian Islands LMEs were removed from the analysis. For the east and west Bering Sea LMEs, ArcNet considers only the Bering Sea shelf.

FIGURE 1
THE ARCNET MAP

The ArcNet map shows the study area with the network of ArcNet's 83 PACs that were generated using a systematic planning approach (Section 4). Here, the network is shown in the context of existing protected areas, which were considered in the analysis.



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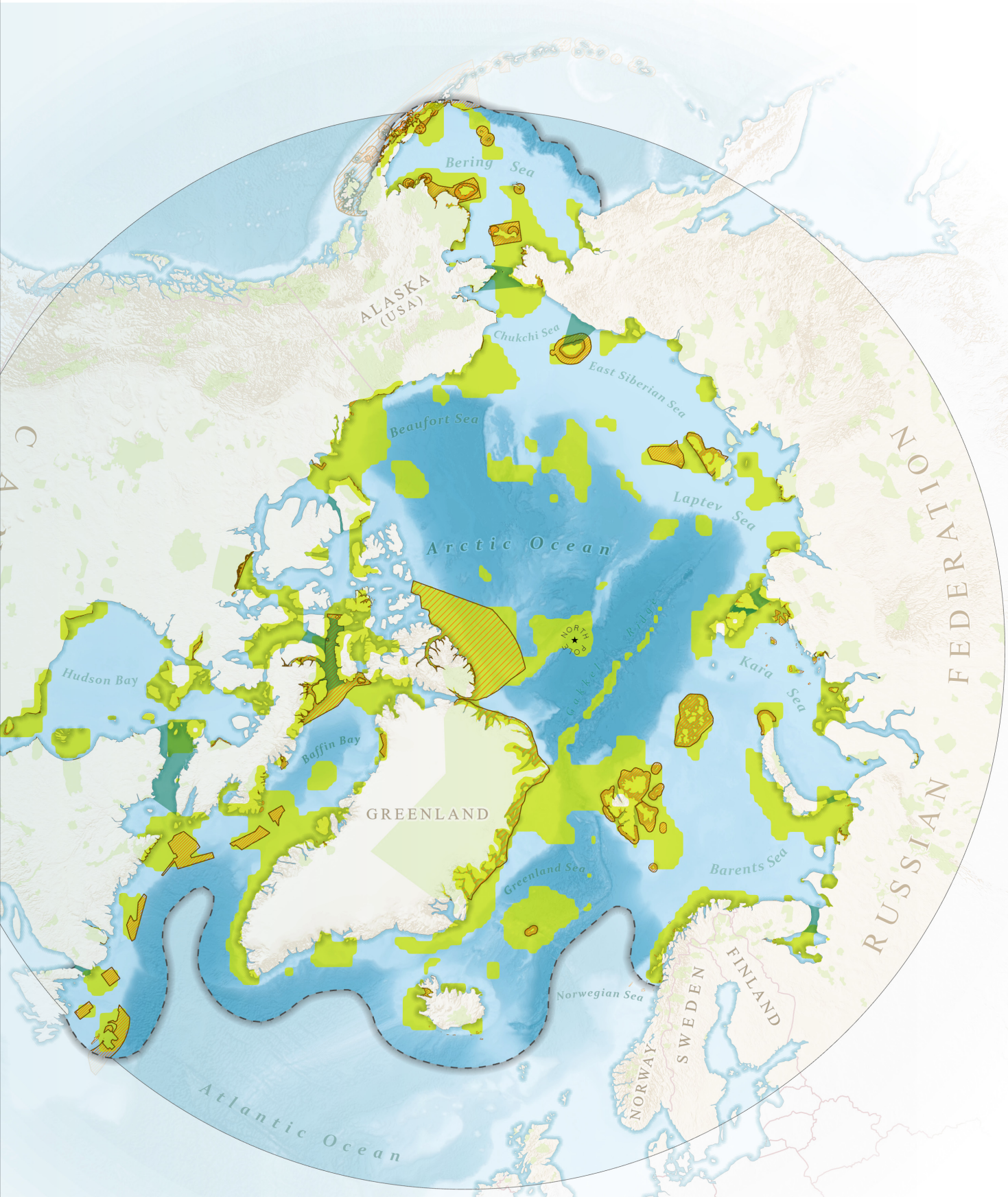
Bering Sea
ALASKA (USA)
Chukchi Sea
East Siberian Sea
Beaufort Sea
Laptev Sea
Arctic Ocean
NORTH POLE
Gakkel Ridge
Kara Sea
Hudson Bay
Baffin Bay
GREENLAND
Barents Sea
Greenland Sea
Norwegian Sea
RUSSIAN FEDERATION
NORWAY
SWEDEN
FINLAND
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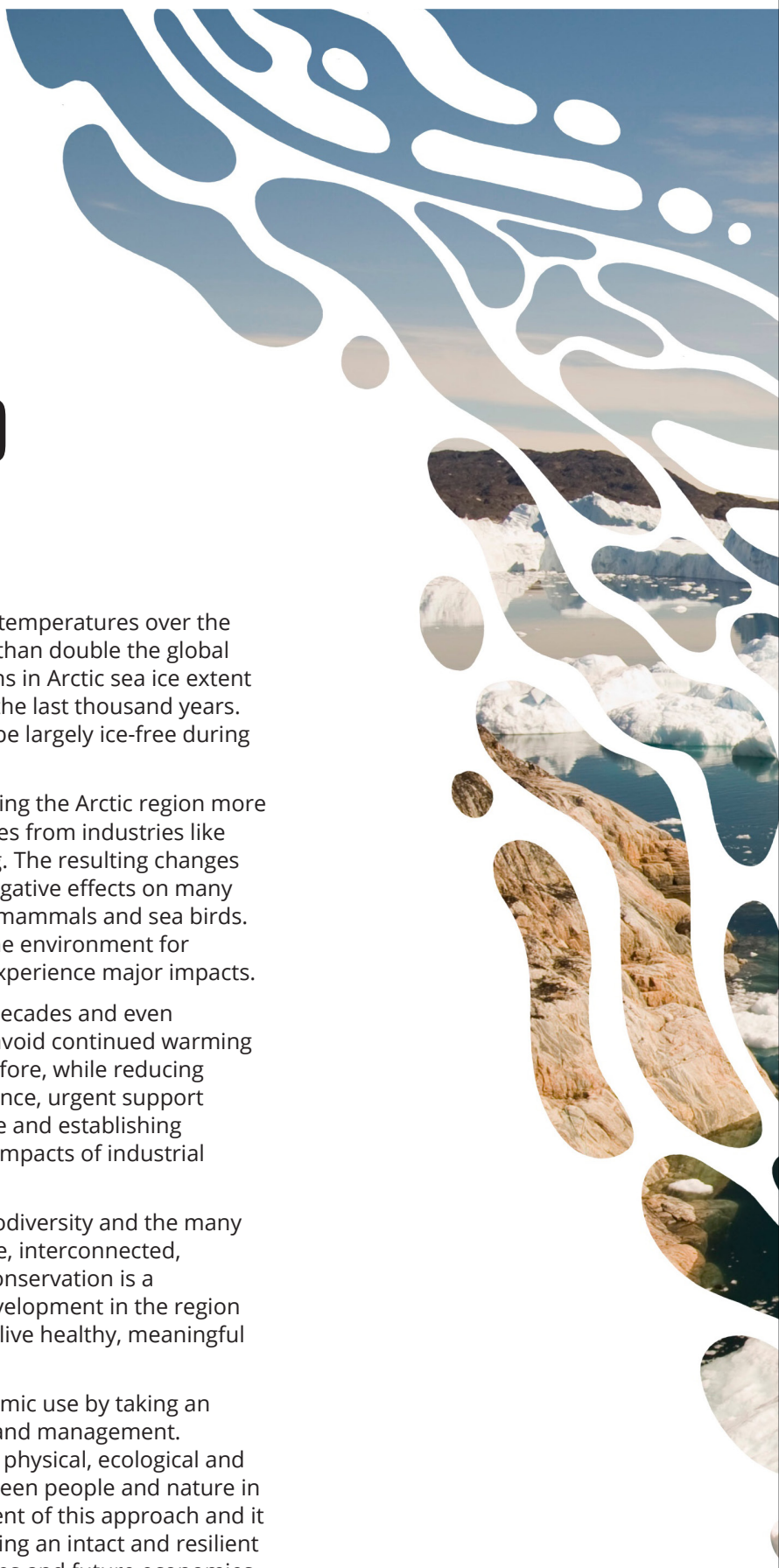

2. THE CHANGING ARCTIC OCEAN:

CHALLENGES AND OPPORTUNITIES

The Arctic is changing rapidly. Surface air temperatures over the last two decades have increased at more than double the global average. This warming is driving reductions in Arctic sea ice extent that are thought to be unprecedented in the last thousand years. As this continues, the Arctic Ocean could be largely ice-free during summers by mid-century (**Figure 2**).[2]

These dramatic physical changes are making the Arctic region more accessible, resulting in increasing pressures from industries like resource extraction, tourism and shipping. The resulting changes to the Arctic Ocean will have cascading negative effects on many ecosystems, from algae to fish to marine mammals and sea birds. Communities that rely on the Arctic marine environment for subsistence, livelihoods and culture will experience major impacts.

Climatic effects lag emissions by several decades and even centuries. This means there is no way to avoid continued warming across the globe until at least 2050. Therefore, while reducing emissions remains of paramount importance, urgent support for ecosystem resilience to climate change and establishing conservation measures that mitigate the impacts of industrial pressures are also needed.

It will be challenging to conserve Arctic biodiversity and the many ecosystem services it provides in this large, interconnected, dynamic marine system. But successful conservation is a prerequisite for sustainable economic development in the region and is essential to Artic peoples' ability to live healthy, meaningful lives and adapt to climate change.

Conservation can be balanced with economic use by taking an ecosystem approach to marine planning and management. Ecosystem-based management considers physical, ecological and trophic connections alongside those between people and nature in a single system. ArcNet is a core component of this approach and it makes a critical contribution to safeguarding an intact and resilient marine system that supports Arctic cultures and future economies. It is an ambitious undertaking.


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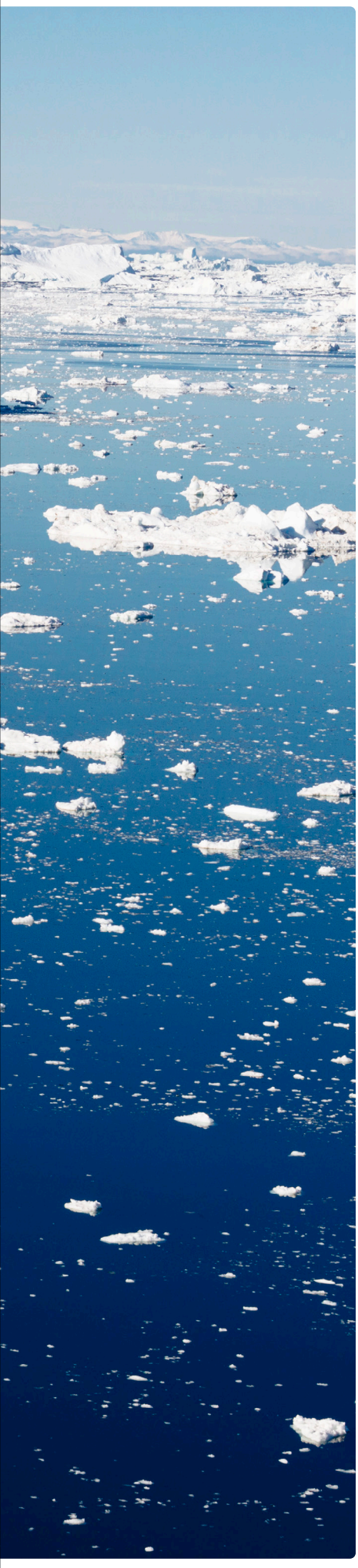


Fortunately, the Arctic region provides unique opportunities for achieving these objectives at this scale of conservation.

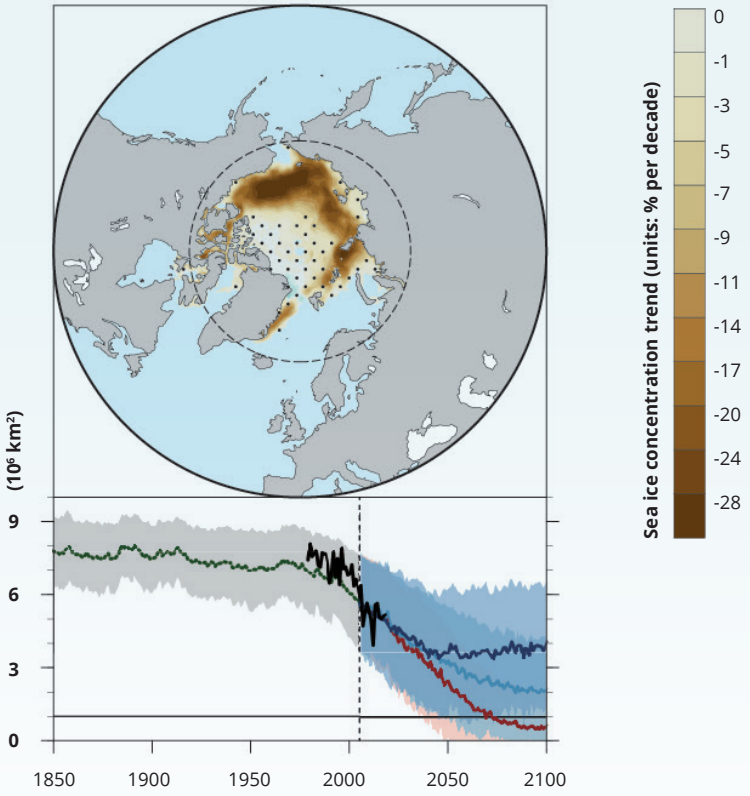
First, despite the urgency to protect Arctic waters, the Arctic Ocean is still a relatively intact ecosystem. Taking a precautionary approach to conservation now, rather than a remedial approach later, will help preserve biodiversity and support the ocean's resilience to mounting pressures, securing its life-supporting gifts for current and future generations.

Second, the Arctic is generally a region with a long track record of international cooperation in conservation and research. It is also home to a sustainably minded and nature-oriented populace. Nature is at the foundation of Indigenous cultures, Arctic livelihoods and food supply.

Together with ArcNet, these opportunities provide an ideal setting for the unprecedented, proactive response that is needed to navigate conservation successfully in the context of national boundaries, international waters, diverse human society and intense international interest.

FIGURE 2
ARCTIC SUMMER SEA ICE TRENDS

Top: Map of Arctic September sea ice concentration trends for 1982-2017 (in % per decade). Stippled regions indicate the trends that are statistically insignificant. The dashed circle indicates the Arctic Circle. **Bottom:** Time series of Arctic September sea ice extent (in million square kilometers). Black, green, blue, turquoise, and red curves indicate observations, Coupled Model Intercomparison Project Phase 5 (CMIP5) historical simulation, Representative Concentration Pathway (RCP)2.6, RCP4.5 and RCP8.5 projections respectively; shading indicates ± standard deviation of multi-models. Figure was reproduced from IPCC SROCC, Figure 3.3.



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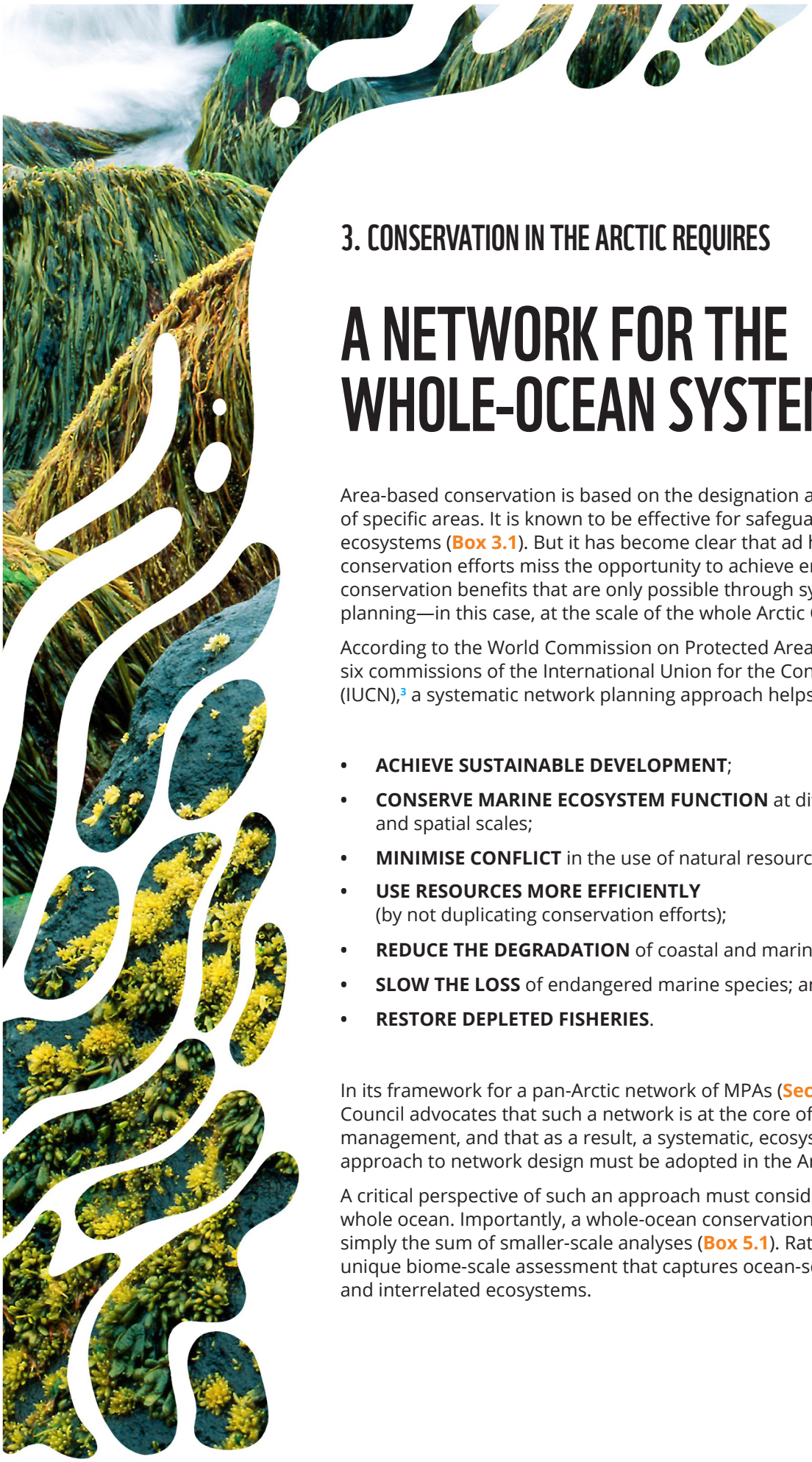

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3. CONSERVATION IN THE ARCTIC REQUIRES

A NETWORK FOR THE WHOLE-OCEAN SYSTEM

Area-based conservation is based on the designation and management of specific areas. It is known to be effective for safeguarding marine ecosystems (**Box 3.1**). But it has become clear that ad hoc or disjointed conservation efforts miss the opportunity to achieve enhanced conservation benefits that are only possible through systematic network planning—in this case, at the scale of the whole Arctic Ocean.

According to the World Commission on Protected Areas (WCPA), one of six commissions of the International Union for the Conservation of Nature (IUCN),[3] a systematic network planning approach helps to:

- **ACHIEVE SUSTAINABLE DEVELOPMENT**;
- **CONSERVE MARINE ECOSYSTEM FUNCTION** at different temporal and spatial scales;
- **MINIMISE CONFLICT** in the use of natural resources;
- **USE RESOURCES MORE EFFICIENTLY** (by not duplicating conservation efforts);
- **REDUCE THE DEGRADATION** of coastal and marine habitats;
- **SLOW THE LOSS** of endangered marine species; and
- **RESTORE DEPLETED FISHERIES**.

In its framework for a pan-Arctic network of MPAs (**Section 1**), the Arctic Council advocates that such a network is at the core of ecosystem-based management, and that as a result, a systematic, ecosystems-based approach to network design must be adopted in the Arctic.

A critical perspective of such an approach must consider the scale of the whole ocean. Importantly, a whole-ocean conservation analysis is not simply the sum of smaller-scale analyses (**Box 5.1**). Rather, it provides a unique biome-scale assessment that captures ocean-scale connectivity and interrelated ecosystems.


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BOX 3.1

CONSERVATION AND PROTECTION IN ARCNET

Effective conservation, which includes measures for protection and management, ensures that ecosystems and species not only continue to exist, but continue to provide people with diverse ecosystem goods and services/nature's gifts. Conserving marine biodiversity will help safeguard human health and well-being, food security, livelihoods and cultures, and will promote sustainable development, economic use and the ability to adapt to change. Importantly, the need for conservation has become urgent as ecosystems and their species are increasingly subjected to significant, even existentially threatening shifts in climate, ocean and ice conditions—which are only projected to increase. ArcNet's PAC network is a foundation for establishing urgently needed conservation measures that support biodiversity resilience to these rapidly unfolding changes.

The ArcNet analysis has identified key areas in the Arctic that can actively be protected from non-climate, human-induced pressures, such as fishing and harvesting, extraction and disturbance of seabed material, oil spills, ship strikes and noise. The idea is that by protecting the ecosystems and species in these areas from non-climate threats, Arctic biodiversity and ecosystem functions will have the best chance of surviving as the climate crisis worsens.

However, various forms of protection and management of PACs are needed to respond to the variety of values driving the need for conservation and to achieve an effective level of conservation in the context of current and expected use and pressures. While some sensitive areas may require relatively strict protections, others may simply require careful management of certain activities. In some cases, combinations of different area-based management tools may be most effective (side box). Although MPAs are a core tool, they are just one of many possible forms of protection and can incorporate different zoning (to manage different human activities) as required. Other OECMs—non-conservation measures that can achieve positive outcomes for biodiversity—are enriching the available tools. ArcNet provides information for processes in and across Arctic nations at finer administrative levels as well as decision-support tools to help determine what conservation measures (such as different protection or management regimes) are most appropriate for individual PACs (Box 6.1).

An important element of all area-based conservation processes will be to adopt a whole-ocean network perspective like that provided by ArcNet. This perspective will be needed at all scales because of the interconnected nature of the marine environment. For example, animals migrating between sites are transported by currents from one area to another. The loss of one key link has local impact, but also could affect distant locations and even the entire system. Similarly, conservation action in one location may benefit other parts of the connected Arctic Ocean. This need for a whole-ocean, network perspective to Arctic conservation was a driving factor behind the ArcNet initiative.

CBD PARTIES AND OTHER ORGANISATIONS ARE INCREASINGLY REFERRING TO "PROTECTED AND CONSERVED AREAS"

According to the IUCN, "Marine Protected Areas involve the protective management of natural areas according to pre-defined management objectives. [...] They are created by delineating zones with permitted and non-permitted uses within that zone."

"Conserved Areas include areas that may satisfy the criteria for Other Effective Area-based Conservation Measures (OECMs)[11]".

Only a whole-ocean Arctic MPA network can support the resilience of interrelated ecosystems in a connected ocean where climate change is expected to drive increasingly large shifts in oceanographic conditions, habitats, populations and biological communities across administrative boundaries.

Such a network would lend resilience to species and ecosystems by:

- **MAINTAINING ECOSYSTEM PROCESSES AND CONNECTIVITY**;
- **SUPPORTING SPECIES** with extensive distributions and migrations;
- **SUPPORTING MARINE COMMUNITY STRUCTURE, PRODUCTIVITY AND FOOD WEB COMPLEXITY**;
- **PROTECTING SPATIALLY SEPARATE HABITATS**, especially for trans-boundary marine species;
- **PROVIDING REFUGIA** for marine species;
- **SPREADING RISK** in the case of localised disasters, climate change and other hazards;
- **PROTECTING AND CONNECTING FEATURES AND HABITATS** that support species' resilience and ability to adapt to climate change; and
- **SECURING LINKAGES** between freshwater, coastal and marine habitats.

While several Arctic MPA network planning and design processes are underway at the national or sub-national scale, including WWF-led initiatives in Canada[4] and Russia[5], significant conservation gaps remain. While some progress was made toward Aichi Biodiversity Target 11 (conserving 10 per cent of coastal and marine areas by 2020),[6] this goal was not achieved in the Arctic. As a result, conservation efforts will need to ramp up significantly to satisfy the 2015 Arctic Council decision to develop a pan-Arctic MPA network and achieve CBD's expected 30 per cent by 2030 area-based protection target.

This is where ArcNet comes in. **Box 3.2** explains how ArcNet satisfies the requirements of conservation planning for a whole-ocean network, while **Section 4** explains the process behind ArcNet's approach.

CLIMATE CHANGE IS EXPECTED TO DRIVE INCREASINGLY LARGE SHIFTS IN OCEANOGRAPHIC CONDITIONS, HABITATS, POPULATIONS AND BIOLOGICAL COMMUNITIES ACROSS BOUNDARIES.

BOX 3.2

WHAT MAKES ARCNET A WHOLE-OCEAN ARCTIC NETWORK?

As explained in Section 1, PAME[1] defines a pan-Arctic MPA network as an ecologically representative and well-connected collection of conservation areas that work cooperatively to achieve conservation objectives more effectively and comprehensively than individual sites can alone. Such a network will consist of national and regional networks distributed across the globe.[3] But as Section 3 shows, a whole-ocean perspective is also needed to achieve effective conservation in the Arctic.

ArcNet provides this whole-ocean perspective with its network of PACs. The network was generated using a dedicated, systematic analysis (Section 4) with the best-available knowledge of and spatial data related to marine biodiversity. These data represent a comprehensive, whole-Arctic assessment of marine life, including biodiversity on the seafloor (benthic), in the open water (pelagic), associated with sea ice (sympagic) and along shorelines (coastal). The data provide spatial information on Arctic marine species and their populations and habitats. They also shed light on dimensions of biological and ecological interactions, such as assemblages of species and their shared living spaces (communities and biotopes), different life history stages, food webs (trophic connectivity) and migration bottlenecks (geographic connectivity). The network considers seasonal and inter-annual ranges of dynamic features, provides replication of priority areas and makes progress toward identifying refugia.

It is important to note that ArcNet does not reflect the spatial distribution of Arctic biodiversity in real time. It is based on a wealth of data that were collected over many years. As better spatial information becomes available, it will be important for ensuring that ArcNet continues to represent biodiversity across the Arctic region. This is particularly important because the rapid climate-driven changes now underway in the Arctic may decrease the relevance of certain datasets over time. While efforts have been made to design ArcNet's PACs to help Arctic marine biodiversity remain resilient and adapt to these changes, this issue must be addressed further using a modelling-based approach. This is discussed in Section 8.

FIGURE 3
THE ARCTIC OCEAN AND ITS CONNECTED ECOSYSTEMS, FOODWEBS AND (EXEMPLARY) SPECIES

1. Narwhal
2. Harp seal
3. Bowhead whale
4. Atlantic puffins
5. Beluga whale
6. Polar bear
7. Walrus
8. Ringed seal
9. Zooplanktons
10. Phytoplanktons
11. Killer whale
12. Northern fulmar

13 Crustaceans (krill)
14 Arctic tern
15 Salmon
16 Arctic/polar cod
17 Boreal fish
18 Benthic communities
19 Ice algae
20 Estuary and tundra
21 Glacier
22 Indigenous harvest of Beluga whale and fish
23 Fisherman
24 Settlement

4. ARCNET'S SYSTEMATIC AND COLLABORATIVE

WHOLE-OCEAN NETWORK PLANNING

Achieving a whole-ocean conservation network for the Arctic required a process to identify areas for protecting biodiversity effectively while minimising conflict between conservation, human uses and sustainable economic development. To accomplish this, ArcNet employed systematic conservation planning, which offered an objective, repeatable and transparent approach.

The analysis began with the systematic collection of an unprecedented spatial dataset representing more than 800 features of the Arctic marine environment. These features included key habitats of important[3] and rare species, areas of high productivity and vulnerable marine ecosystems (for selection criteria see **Technical Report**). This vast dataset was analysed using Marxan, a powerful decision-support package that provides alternative solutions to complex spatial natural resource management problems (**Box 4.1**). Marxan has been used around the world to provide scientists, policy-makers, managers and stakeholders with the tools to understand and achieve conservation goals.

The ArcNet analysis depended heavily on Arctic biology and conservation/planning experts. These experts played key roles in driving the supply, evaluation and selection of data to include in the analysis, setting conservation targets for the different data layers, and evaluating and interpreting the results of different analysis stages.

The final network of PACs that emerged from ArcNet's analysis is shown in **Figure 1**. The underlying processes are discussed in greater depth in **Box 4.2**.

ArcNet is an effective whole-ocean solution for conserving Arctic marine life. However, it is also an adaptable blueprint that national governments can use for planning at finer scales and an unprecedented resource for facilitating stakeholder engagement and implementing ecosystem-based management. These important traits—as well as the steps required to move ArcNet toward an internationally agreed conservation reality —are discussed in the following sections.


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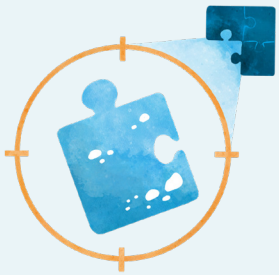
BOX 4.1

MARXAN: A TOOL TO GUIDE SYSTEMATIC, MULTI-OBJECTIVE CONSERVATION PLANNING

Marxan is the most widely used software for systematic marine conservation planning. It uses an optimisation algorithm to find multiple "good" spatial solutions to achieve predefined conservation goals. This process addresses the fact that conservation goals compete in space with social, economic and management constraints.

As a decision-support tool, Marxan does not provide just one optimised solution. It offers various spatial scenarios that achieve the conservation goals through iterative analysis cycles and expert review and adjustment. The process is based on the data used in the analysis (the *conservation features*); a set of *conservation targets* for the features; and a function that defines the "cost" of prioritising areas for the purpose of conservation:

CLICK HERE
TO READ THE FULL ACCOUNT OF THE ARCNET MARXAN ANALYSIS IN THE TECHNICAL REPORT



The conservation features

included in the ArcNet analysis, represented by the 800+ spatial data layers, were selected to capture examples of typical habitats within a region (*representative features*) in addition to geophysical and/or biological anomalies of particular importance for biodiversity (*distinctive features*).

The conservation targets

are quantitative parameters set to determine the level of spatial inclusion of each conservation feature in the resulting solution. For example, a target of 30 per cent for beluga feeding habitat would result in at least 30 per cent of these areas being included in any Marxan solution. In ArcNet, conservation target-setting was based on a careful and systematic process (**Box 4.2**).

The "cost"

can be any parameter that represents an expense incurred by undertaking conservation (such as lost revenue), ArcNet defined cost simply as the total area required by a conservation solution. Accordingly, a solution that requires a larger area is considered more costly than one that requires a smaller area.

ARCNET'S DATABASE INCLUDES MORE THAN 800 SPATIAL REPRESENTATIONS OF CONSERVATION FEATURES, INCLUDING THE ARCTIC OCEAN'S SPECIES, HABITATS AND BIOLOGICAL COMMUNITIES.

BOX 4.2

THE UNIQUE ARCNET APPROACH

Various elements of the ArcNet approach to conservation analysis illustrate the initiative's ambitious and unprecedented nature and included participation from more than 30 people over a two year period. This work was essential to developing the ArcNet whole-ocean PAC network.

The conservation features spatial database:

The collection of more than 800 spatial data layers required an immense data mining effort to represent existing knowledge of Arctic biodiversity from both published and unpublished sources. These layers were used to represent the conservation features in subsequent analyses. They were selected systematically, building on sets of accepted criteria to ensure critical biodiversity was well-represented.

Capturing dynamics and ecological connectivity:

The Arctic is characterised by strong inter-annual, seasonal and daily changes; sporadic and localised periods of intense activity and trophic interactions; and substantial distances between areas for different life-stages of organisms. It is difficult to reflect these elements in systematic conservation planning, but they were included in ArcNet by strategically selecting appropriate conservation features for the analysis. For example, features were chosen to represent seasonal habitats or captured so their extent would reflect the full range of their variable spatial distributions from year to year. Some conservation features were chosen to reflect linkages between marine, freshwater and coastal habitats, as well as those extending beyond the Arctic. ArcNet also identifies migration bottlenecks for marine mammals and fish.

Expert-driven:

Teams of world-class experts who are deeply familiar with regions, species and/or ecosystems have been instrumental to ArcNet's success. The teams were formed into thematic groups focussing on marine mammals, seabirds, fish, sea ice biota and benthos. They advised on defining principles and parameters, took charge of the data mining and evaluated the Marxan outputs. An analysis group was also formed to provide expertise in systematic conservation planning, computer programming, modelling and geographic information systems (GIS). Finally, the ArcNet steering committee—with representation from the WWF Arctic Programme and the WWF national offices of Canada, Denmark, Norway, Russia and the USA—facilitated the overall process, provided guidance for key decisions and led the production of project outputs.

Vast study area:

Finally, the whole-ocean, spatial and iterative nature of the ArcNet analysis and the large number of data layers meant the analysis was unprecedented in scale and scope. As a result, the analyses were also computationally intensive. To enable this scale of analysis, ArcNet chose to work with a spatial resolution of 30 × 30 kilometres, resulting in 22,678 planning units across the study area. Conservation planning for smaller areas, such as in national analyses, often uses a higher resolution.

The evaluation of the analysis continued iteratively until the steering committee approved a final Marxan solution. In the end, four full cycles of analyses, expert consultation and adjustment were undertaken to arrive at the final set of ArcNet PACs (**Figure 1**). This systematic, expert-driven process makes ArcNet a powerful conservation tool.

Iterative review:

The ArcNet expert groups systematically reviewed each stage of the Marxan analysis. They assessed:

- **REDUNDANCY** (i.e., in how many PACs does the feature appear?);
- **ADEQUACY** (i.e., are sufficiently large core areas represented in the PACs for each conservation feature?);
- **RESILIENCE TO CLIMATE CHANGE** (i.e., are PACs located along the expected gradient of potential change?); and
- **CONNECTIVITY** (i.e., are seasonal habitats and migration routes represented?).

Preliminary results were shared with external consultants and reviewers as well as experts from each coastal Arctic nation.

KEY STATISTICS ON ARCNET'S CONSERVATION FEATURES

ArcNet's database includes more than 800 spatial representations of conservation features, including the Arctic Ocean's species, habitats and biological communities.

	NUMBER OF SPECIES	NUMBER OF COMMUNITIES/BIOTOPES/ TYPES OF BIOTOPES	NUMBER OF CONSERVATION FEATURES (DISTINCTIVE – REPRESENTATIVE*)
Marine mammals	26	1	234 (234 – 0)
Birds	19	-	106 (106 – 0)
Fish	56	24	95 (71 – 24)
Sea ice biota	-	4	89 (89 – 0)
Benthic communities	-	198	264 (54 – 190)
Coastal features	-	4	29 (29 – 0)
TOTAL CONSERVATION FEATURES			817

** For an explanation of distinctive and representative features please see Box 4.1*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5. THE ARCNET RESOURCE:

PURPOSE-BUILT TOOLS FOR ARCTIC MARINE CONSERVATION PLANNING

The ArcNet PACs—a set of 83 marine areas covering 5,087,000 square kilometres identified as conservation priorities (**Figure 1**)—emerged from the analysis described in **Section 4**. This represents 31 per cent of the study area and captures the target percentage assigned to each identified conservation feature (**Box 3.2**). Establishing effective conservation measures for the ArcNet PACs would deliver the expected CBD target of 30 per cent protection by 2030. Therefore, the ArcNet PACs should be considered for direct implementation as a stand-alone protected area network. That said, ArcNet also has an important role to play in providing input into finer-scale planning nationally and sub-nationally, where it can offer the whole ocean perspective (**Box 5.1**).

In both roles, ArcNet's real power lies in the vast spatial data set and analyses. These can be updated as new data become available (**Section 8**). Together they are a unique resource for conservation planning, advocacy and engagement that can help establish conservation measures across an entire ocean.

To facilitate data access, support finer-scale conservation planning and guide the establishment of conservation measures using ArcNet, two web portals were created for database query and custom analysis:

- **CHIKORY** is a portal for exploring the data layers that underpin each of the 83 PACs. It allows the user to query PACs by ID number or through a clickable map and to generate a report with any available information—for example, overlapping existing protected areas and the conservation features within the selected PAC.
- **ACCENTER** was developed with government planners, NGO advocates and other stakeholders in mind and acts as a web-based mini-GIS. It includes desktop GIS identification tools for instantaneously querying the Marxan analysis outputs through interactive spatial requests.

Box 5.2 explores the substance behind ArcNet's PACs by providing an example that uses the ArcNet web portals.

ArcNet also provides access to a supporting community of practice with experts available to assist in implementation. ArcNet and its suite of resources provide a strong basis for an Arctic Ocean network of conserved and protected areas, a big-picture tool for stimulating, adjusting and finalising finer-scale conservation initiatives, and a supportive community of practice.

BOX 5.1

ARCNET AND FINER-SCALE CONSERVATION PLANNING: A PECHORA SEA CASE STUDY

A central objective of ArcNet was to identify a PAC network that would act as a foundation for further conservation planning efforts at finer scales. **ArcNet ensures that conservation planning in the Arctic does not lose sight of the big picture** by contributing areas of significance for whole-ocean scale conservation that are missed or undervalued at finer scales of analyses. To demonstrate, this is a case study from WWF Russia of the Pechora Sea[5]—an area in the southeast sector of the Barents Sea—at three scales of analysis: whole-ocean (i.e., Arctic), national (i.e., Russian Arctic), and regional (i.e., Pechora Sea).

The resulting PACs from these three analyses are shown in Figures 5–7. The clear differences between the areas selected as PACs reflect the varying parameters required when looking at different scales, such as spatial resolution, data availability, conservation features and their targets (see **Technical Report** for more information).

In this example, while ArcNet highlighted the entire Pechora Sea at the global Arctic scale, the smaller-scale studies identified smaller areas within the region, three areas in the Russian Arctic study, and 12 smaller, more coastal areas in the regional study.

ArcNet's whole-ocean perspective (after the finer-scale analyses were undertaken) shows that the Pechora Sea region, as a whole, has been undervalued at the scale of national and regional analyses. Conversely, national and regional analyses will be able to assess conservation objectives at a level of detail that would not be possible for the whole ocean. This will result in PACs that, while not identified at the ocean scale, are important at smaller scales.

This comparison demonstrates the role of ArcNet in finer-scale conservation planning to ensure the big picture is not lost. While the whole-ocean perspective can help identify areas in need of more detailed planning, it also provides information about the importance of identified areas across a whole ocean, lending weight to areas that have been identified at finer scales.

ArcNet is not the sum of related national-level efforts, nor does it replace them. Instead, it makes an important contribution to overcome the limitations of smaller-scale conservation analyses while informing and complementing such important ongoing and future efforts. The resulting network of ArcNet PACs is the basis for establishing effective measures to conserve the spectrum of Arctic marine biodiversity—a blueprint for a regional Arctic conservation network that incorporates the visions of both the IUCN7,[8] and the Arctic Council.[1]

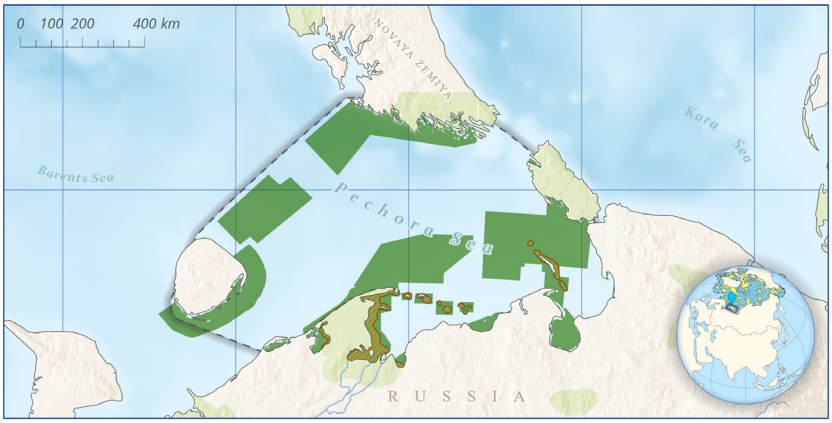


FIGURE 4 - ARCTIC OCEAN SCALE — ARCNET PACS IN THE PECHORA SEA

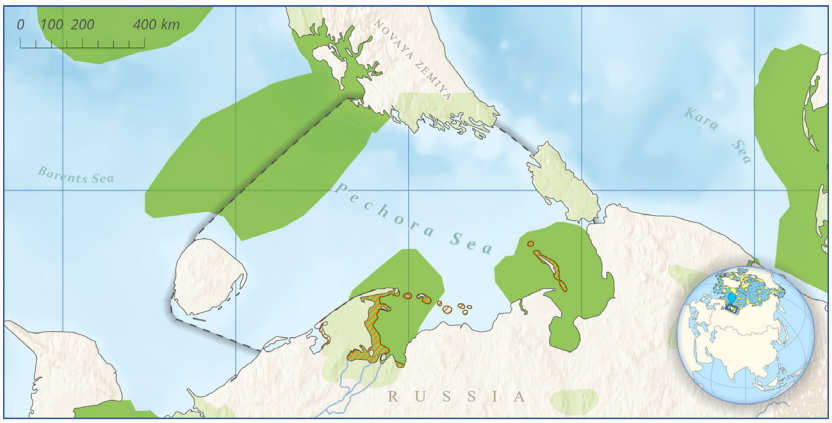


FIGURE 5 - NATIONAL SCALE — RUSSIAN ARCTIC PACS IN THE PECHORA SEA

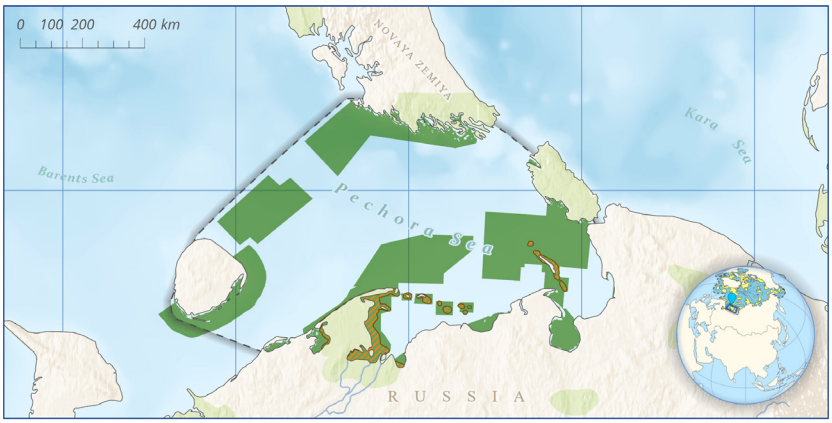


FIGURE 6 - REGIONAL SCALE — PECHORA SEA PACS

BOX 5.2

WHAT CONSTITUTES A PRIORITY AREA FOR CONSERVATION?

For ArcNet, Marxan looks for ways to identify a network of PACs that collectively meets all the conservation targets while minimising the area needed to do so. It achieves this by locating places where many conservation features intersect, satisfying multiple targets simultaneously. Therefore, individual PACs are typically areas with the most diverse characteristics relevant for biodiversity. When identified targets are not met, areas important for these conservation features are sought to complete the PAC network.

For example, consider the case of **PAC #19**, north of the Novaya Zemlya archipelago in the Russian Arctic (**Figure 7**). Exploring this PAC through **Accenter** shows that it was first selected because it encompasses some well-defined, spatially restricted habitats that are important for Arctic species—such as Atlantic walrus **haulout sites** and **winter habitats**, **denning areas** for the Kara Sea subpopulation of polar bears, and little auk colonies and **feeding areas**.

There are also important, spatially restricted biotopes in this area, such as: **glacial termini** and **kelp forests**; **stationary polynyas** and a **marginal ice zone** that indicate areas of elevated productivity and diversity; and ice conditions that are important in **bearded seal whelping habitat**.

The area also contributes to habitat conservation for some widely distributed Arctic species (such as **narwhal**, **beluga** and **polar cod**) and contains representative features, such as **shelf troughs**.

Interestingly, Accenter reveals that 40 per cent of PAC #19 is covered by an existing protected area, the Russian Arctic National Park. This finding confirms the importance of this protected area from both whole-ocean and national conservation perspectives. However, this comparison also reveals that existing measures motivated by national analyses do not fully capture the importance of the area and highlights where additional conservation measures are warranted.

The ArcNet analysis and underlying data reveal that this particular PAC's role in the network is to represent a typical coastal-pelagic High Arctic ecosystem with typical Arctic species and communities year-round. The presence of the polynyas and a marginal ice zone highlights its importance and contributes to the conservation of areas with elevated productivity and diversity.

This mix of spatially restricted and wide general habitats and biotopes and distinctive ecosystem characteristics and the representation of biogeographic and geomorphic features is typical of most of the PACs. While the majority are identified for multiple reasons, some have roles that are restricted to a specific important feature and others are selected solely because of particular benthic biotopes or seasonal importance for certain species.

By accessing ArcNet through **Chikory** or **Accenter**, stakeholders can explore how its conservation features contribute to the selection of each PAC and how they relate to their own values and interests.

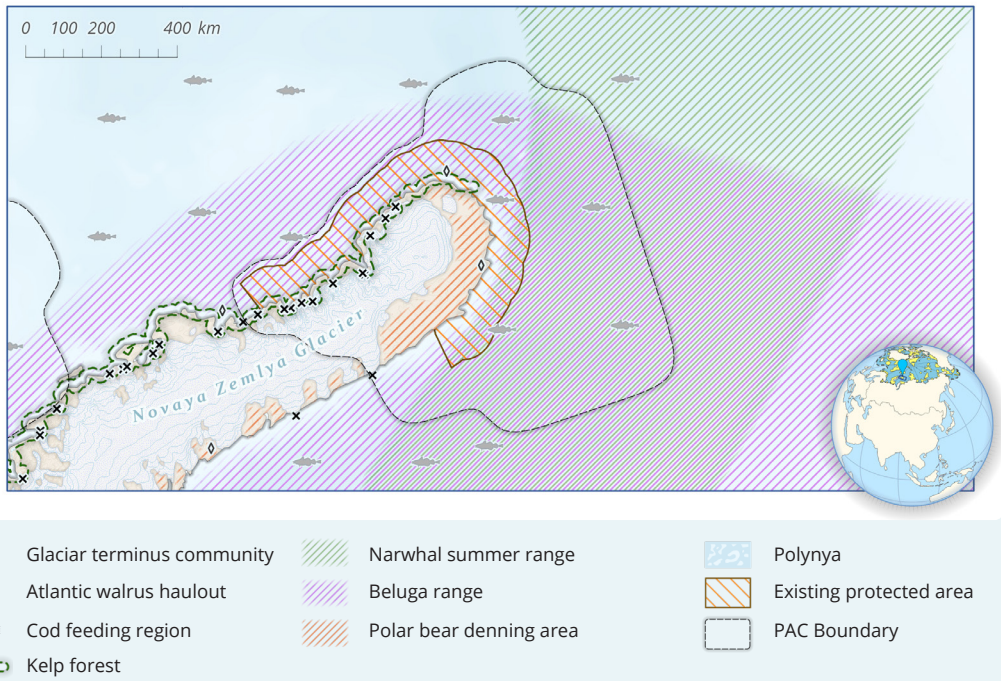
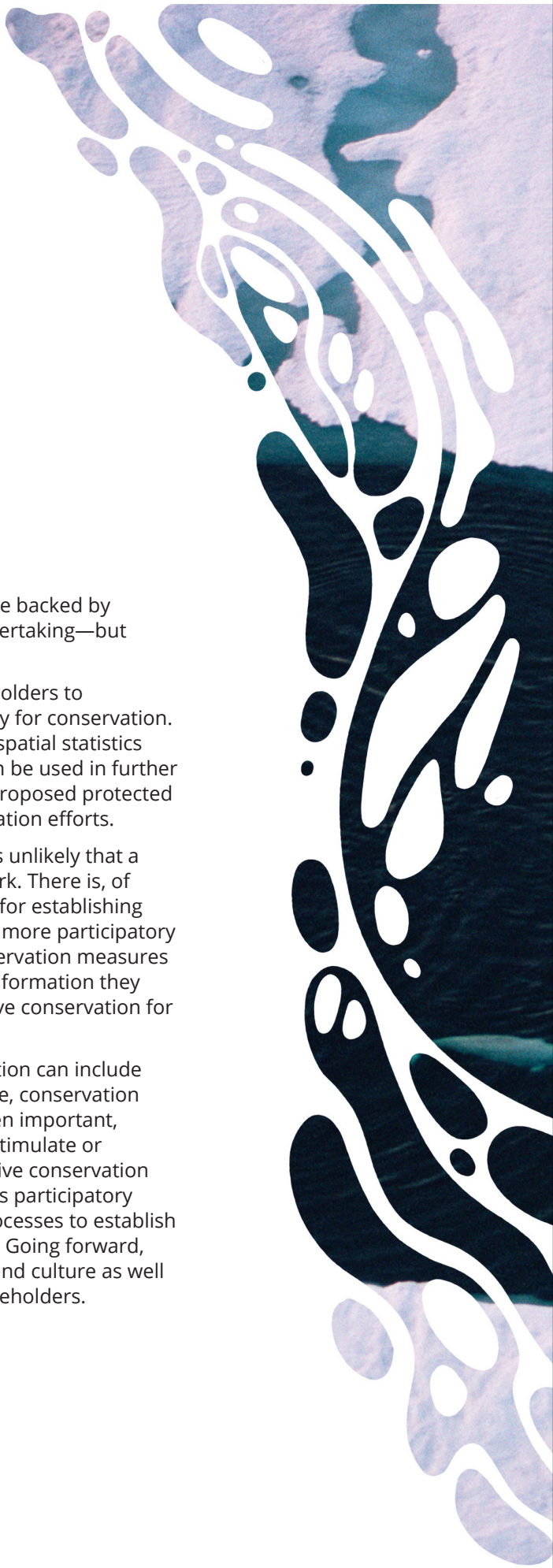


FIGURE 7
PAC#19, NORTH OF THE NOVAYA ZEMLYA ARCHIPELAGO

is characterised by a number of spatially restricted habitats and biotopes linked to oceanographic and coastal features. The ranges of several key species extend well beyond the limits of existing marine protection measures and of the PAC itself.



6. FROM PROPOSAL TO IMPLEMENTATION:

MOVING FORWARD WITH ARCNET

ArcNet is moving from a proposed network of PACs to one backed by legislation, meeting its second aim. This is a complex undertaking—but ArcNet was designed to facilitate this process.

At the outset, it will be important for planners and stakeholders to understand why each area identified in ArcNet is a priority for conservation. The features represented in each PAC and their relevant spatial statistics are readily available through the ArcNet resource and can be used in further analyses. Overlap between ArcNet PACs and existing or proposed protected areas can complement pre-existing and ongoing conservation efforts.

With 83 PACs identified in ArcNet across a vast ocean, it is unlikely that a uniform conservation approach will suit the whole network. There is, of course, a wide range of conservation measures available for establishing marine protection—from strict protection to other (often more participatory or dynamic in time and space), effective area-based conservation measures (**Box 3.1**). ArcNet's powerful tools will give planners the information they need to tailor and fine-tune measures that enable effective conservation for the specific features of each PAC.

Importantly, it is now understood that effective conservation can include rational usage where required and appropriate. Therefore, conservation measures that limit or prohibit all use (or take), while often important, may not always be needed. Indeed, sustainable use can stimulate or enable effective conservation in the same way that effective conservation can enable enhanced and sustainable use. ArcNet, with its participatory approach and transparent tools, facilitates interactive processes to establish conservation measures as part of different societal goals. Going forward, ArcNet will prioritise considerations of Arctic livelihoods and culture as well as engagement with Indigenous Peoples and marine stakeholders.

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Also of critical importance is the ability for ArcNet to meet the challenges involved in conservation planning under the threat of climate change. This will require its PACs to be evaluated for:

- **THE CURRENT STATUS AND FUTURE PERSISTENCE** of their environmental and ecological functions;
- **VULNERABILITIES, RESILIENCE AND ANTICIPATED CHANGES** in connectivity; and
- **EFFECTS ON EXISTING AND FUTURE FOOD WEBS**.

Uncertainties in the magnitude, spatial pattern and timing of anticipated changes will require adaptive planning and management (**Section 8**). WWF is looking to assess and refine ArcNet so it can systematically support biodiversity resilience and adaptation to climate-induced ocean change.

Finally, a key component of taking ArcNet to the next level —and the purpose of this report—is to reach out to the wider Arctic community: those with interest, stakes and rights to engage and cooperate to move forward with ArcNet. The ArcNet resource and its community of practice will facilitate engagement and communication between all interested parties.

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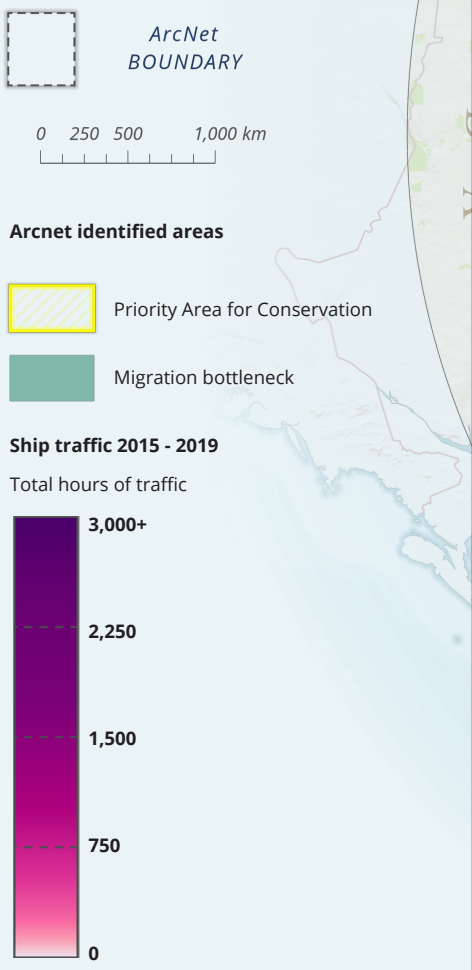
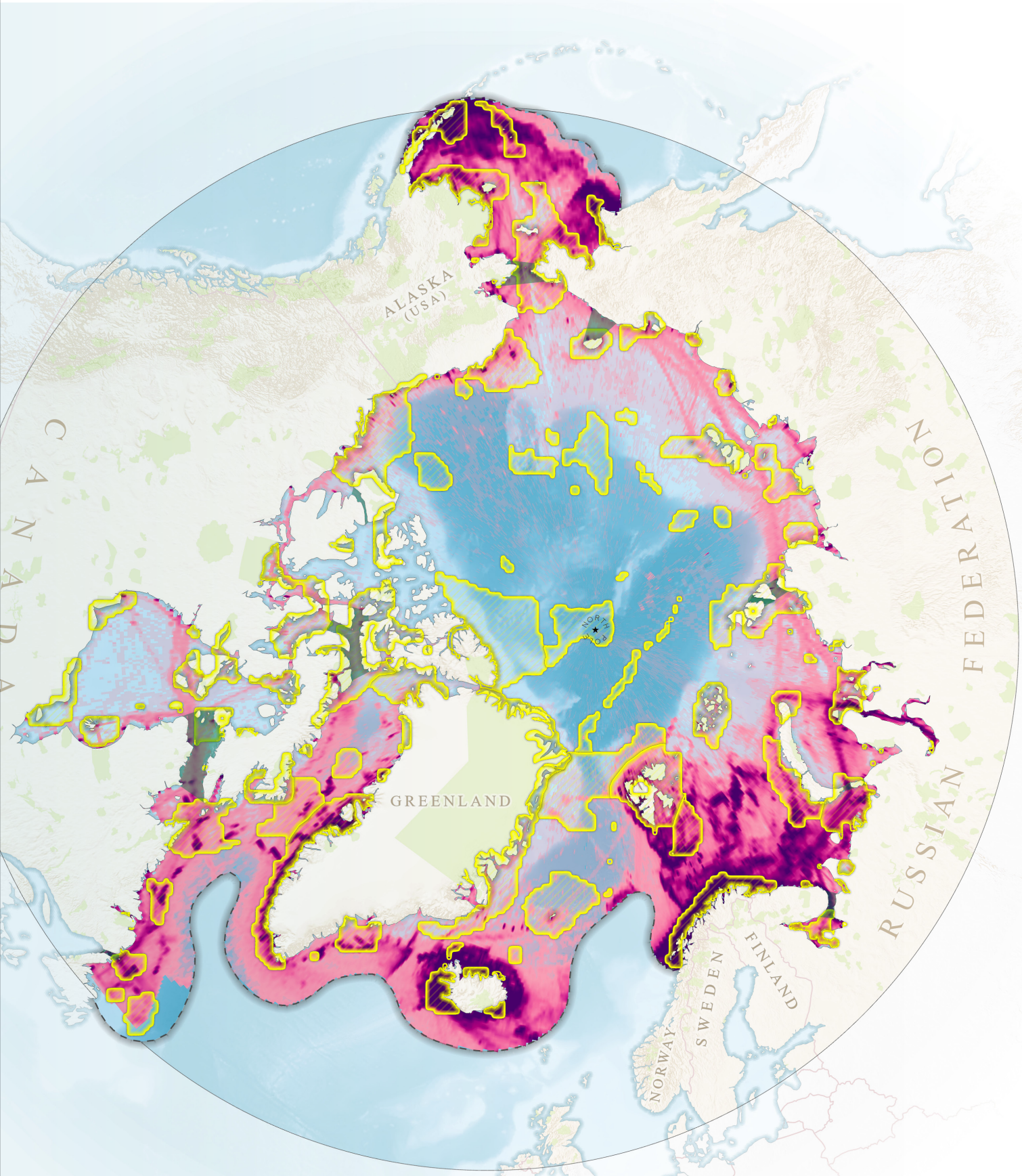
FIGURE 8
OVERLAY MAP OF ARCNET PACS AND MIGRATION BOTTLENECKS WITH SHIP TRAFFIC

Marine biodiversity is under increasing pressure from industrial uses. As this map shows, those pressures are not distributed uniformly across the Arctic Ocean. When ship traffic is overlaid with ArcNet's PACs and their suite of conservation features, it is easy to identify where establishing conservation measures is most effective and can also inform and support the development of industry-specific guidelines, standards and legal instruments.

Ship traffic is displayed as total hours from 2015-2019 and the underlying data are from PAME Arctic Ship Traffic Data (ASTD).




ALASKA (USA)
CANADA
GREENLAND
RUSSIAN FEDERATION
NORWAY
SWEDEN
FINLAND

BOX 6.1

HOW DOES ARCNET HELP IDENTIFY EFFECTIVE CONSERVATION MEASURES?

While ArcNet is designed to inform and help establish an ocean-spanning network of conservation measures that support the long-term conservation of Arctic marine biodiversity and its associated functions, it also plays a key role in identifying effective conservation measures for individual PACs.

As previously discussed, ArcNet offers tools to explore the conservation features represented in each PAC and how they contribute to the conservation target of each feature (**Section 5**). In doing so, ArcNet supports decision-making processes to establish effective conservation objectives and measures for individual PACs in the context of the entire network (**Box 3.1**). In the same way, these resources also inform marine spatial planning and ecosystem-based management for the surrounding seascapes, including important areas for ecological connectivity, such as the ArcNet-identified bottlenecks for migration.

Among the wide range of potential conservation measures for ArcNet's PACs, MPAs form the backbone, with objective-specific categories that range from strictly controlled access to managed sustainable usage and from conserving individual species or habitats to conserving entire seascapes. The IUCN provides guidance for applying these categories[8] to ensure the selected measures will be effective and contribute to coherence in the network.

The effectiveness of Indigenous-managed areas and the contribution of OECMs is increasingly recognised[1, 10,11] where a different and broader form of governance provides opportunities for inclusive and participatory forms of ocean conservation.

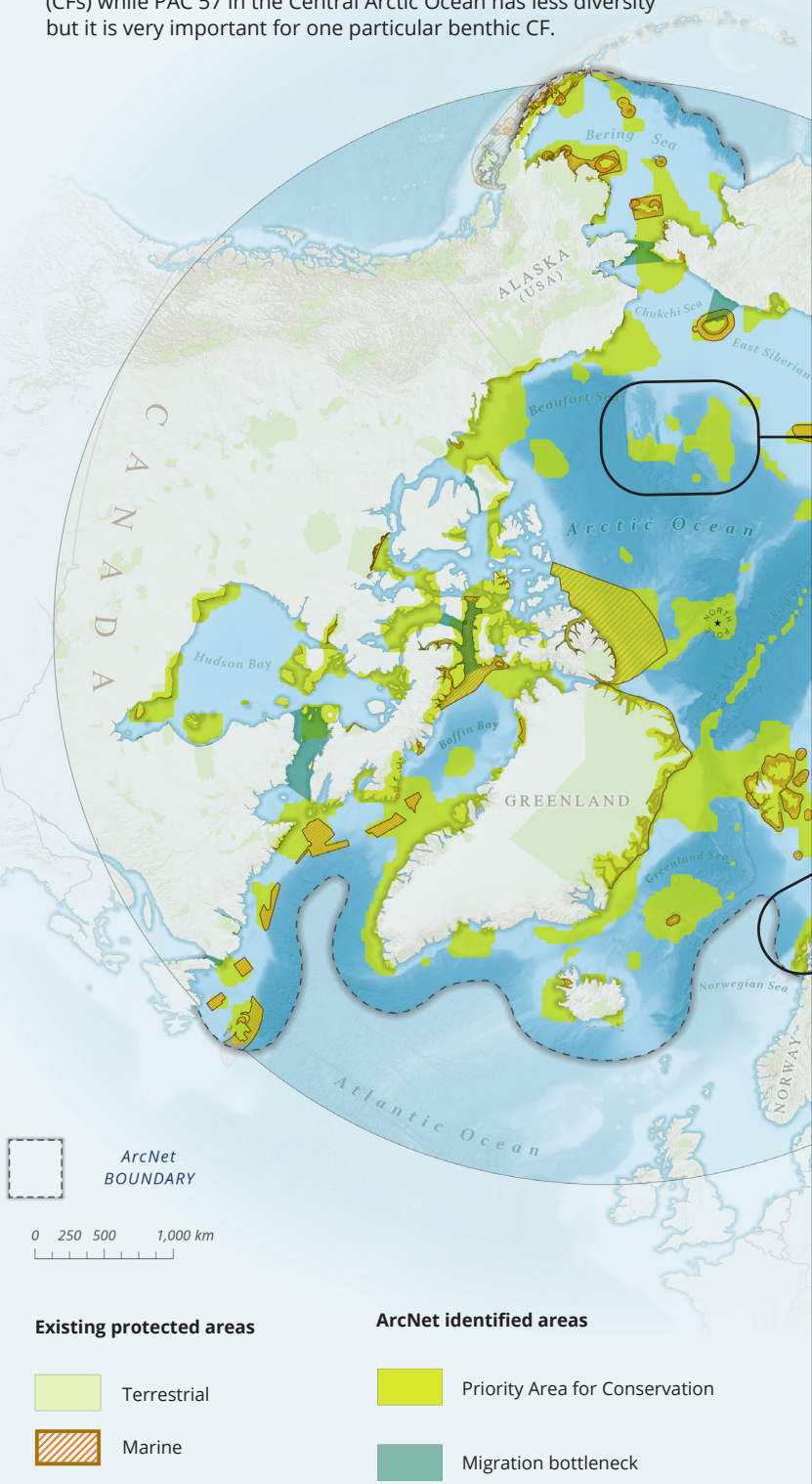
Finally, new measures to conserve marine features and biodiversity are being developed. These include, for example, mobile area-based measures with boundaries that can shift over space and time.

The ArcNet resource, via the web tools, can provide the information needed to establish effective conservation for features in individual PACs or parts of them. Planners must consider:

- The network-wide significance of individual conservation features in a PAC;
- Their ecological relationships, which constitute ecosystem processes, functions and resilience at local through regional scales; and
- The coherence of the entire Arctic Ocean network.

FIGURE 9
ARCNET TOOLS SUPPORTS THE IDENTIFICATION OF EFFECTIVE CONSERVATION MEASURES FOR PACS

Chikory reveals the different suites of CFs for a Central Arctic Ocean PAC (**PAC57**) and a Barents Sea coastal PAC (**PAC27**). While PAC 57 is driven by sea ice and benthos, PAC 27 is most important for fish and birds. PAC 27 contributes to reaching conservation targets for a large and diverse group of species (CFs) while PAC 57 in the Central Arctic Ocean has less diversity but it is very important for one particular benthic CF.



ARCNET PAC 57

Precentage of CFs found in the PAC

Marine mammals	10%
Sea birds	0%
Fish	14%
Ice biota	24%
Benthos	76%
Coastal features	0%

How this PAC helps achieve CF targets

1 CF ACHIEVES TARGET ENTIRELY WITHIN THE PAC

4 CFs ACHIEVE THEIR TARGETS WITHIN THE PAC

8 CFs ACHIEVE A QUARTER OF THEIR TARGET WITHIN THE PAC

11 CFs ACHIEVE AT LEAST HALF THEIR TARGET WITHIN THE PAC

ARCNET PAC 27

Precentage of CFs found in the PAC

Marine mammals	16%
Sea birds	24%
Fish	36%
Ice biota	0%
Benthos	24%
Coastal features	0%

How this PAC helps achieve CF targets

0 CF ACHIEVES TARGET ENTIRELY WITHIN THE PAC

19 CFs ACHIEVE THEIR TARGETS WITHIN THE PAC

13 CFs ACHIEVE A QUARTER OF THEIR TARGET WITHIN THE PAC

34 CFs ACHIEVE AT LEAST HALF THEIR TARGET WITHIN THE PAC

7. ARCNET:

ESSENTIAL FOR IMPLEMENTING ECOSYSTEM-BASED MANAGEMENT

While some environmental management approaches focus on individual species or habitats, the *ecosystem approach*, or *ecosystem-based management*, considers how people and nature interact as part of a single system (CBD, 2004). Through continuous, iterative monitoring, assessments and management of human pressures on essential structures, processes and functions, this approach aims to achieve a healthy ecosystem that can continue to provide the services upon which we depend.

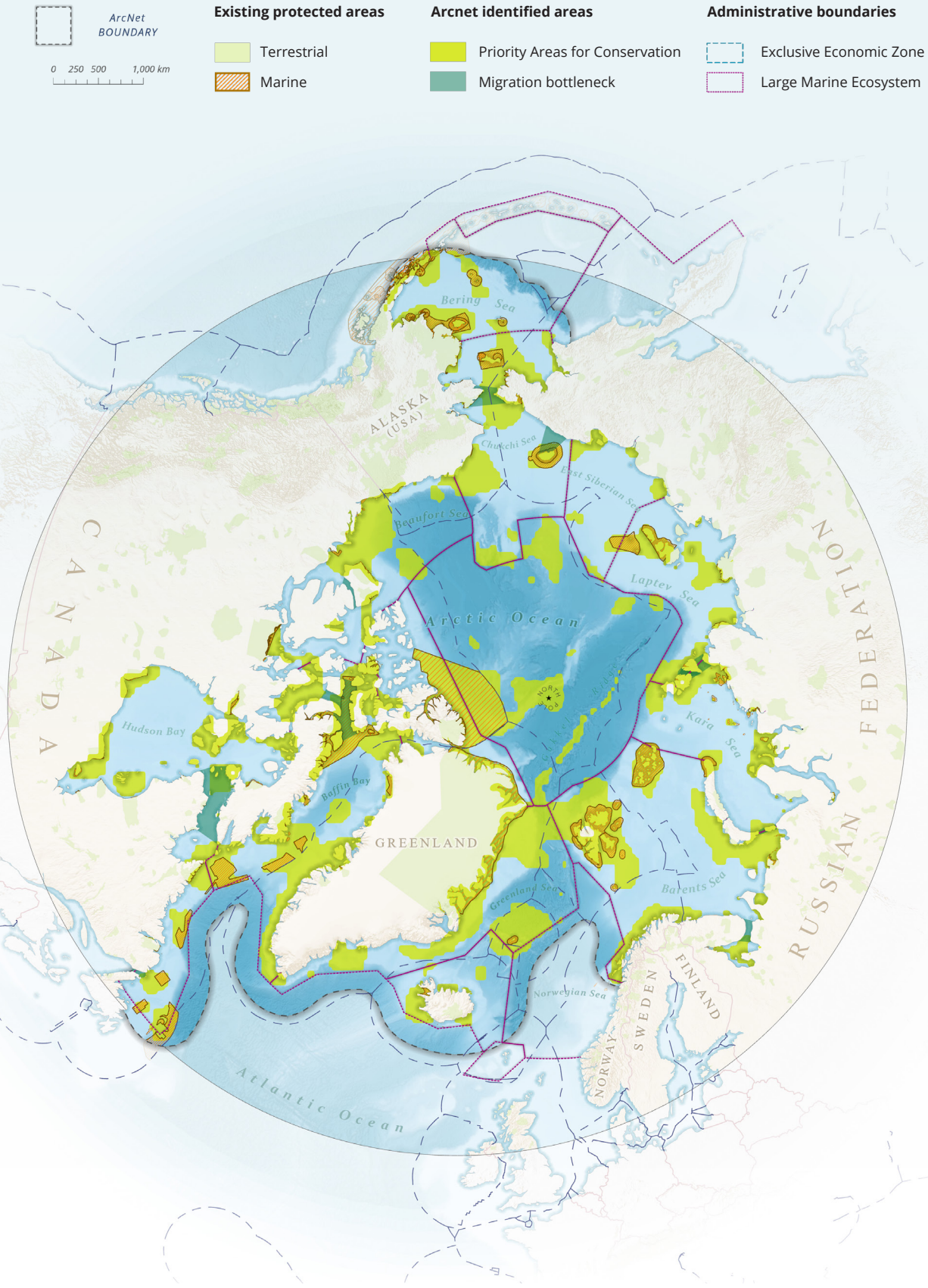
The Arctic Council's PAME working group argues that a pan-Arctic MPA network, like ArcNet, can "contribute a major conservation element to and benefit from marine spatial planning and ecosystem-based management in the circumpolar region" (pg. 5)[1]. Indeed, a whole-ocean network of conserved and protected areas established using ArcNet is seen as a central tool for implementing ecosystem-based ocean management.

The network of ArcNet PACs demonstrates the areas needed to secure biodiversity and ecosystem functions for sustained benefits and—of increasing importance, in light of the rapidly changing Arctic Ocean—will help secure sustainability of use in the face of management failures and catastrophic events. That said, ArcNet's effectiveness will depend on establishing and connecting it with other elements of the ecosystem approach in the seascapes and LMEs surrounding the PACs. Since ArcNet's PACs only represent "priority areas," there is a need to establish ecosystem-approach schemes for the wider seascape that incorporate regular, integrated ecosystem assessments and associated monitoring and integrated management of human uses.

The ArcNet PACs represent an essential contribution to the implementation of an ecosystem approach to management in the Arctic Ocean and its LMEs. However, it will require tailored management strategies. These are discussed in the next section.

FIGURE 10
OVERLAY OF ARCNET PACs WITH THE ARCTIC LMEs

The effectiveness of implementing an ArcNet approach to ecosystems-based management also depends upon the existing ecosystem-based measures and management processing in the surrounding seascapes and LMEs.

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8. ARCNET AND BEYOND:

ADAPTIVE DESIGN APPROACH FOR THE FUTURE AND CLIMATE CHANGE

A key attribute of ArcNet's ecosystem approach is the ability to adapt in the face of the changing climate and the uncertainties that characterize complex, dynamic ecosystems.[12] To account for the effects of climate change in its network design, ArcNet will need to be adjusted iteratively based on modelled or observed data related to changing biodiversity and environmental conditions.

Mindful of this need, ArcNet was designed as a blueprint for establishing a network of PACs now, but also as an iterative process to:

- **ADJUST STRATEGIES** in light of new data availability and coverage;
- **ADJUST CONSERVATION MEASURES** in response to climate-driven changes in the spatial distribution of species and habitats;
- **INCORPORATE NEW KNOWLEDGE SOURCES** (such as Indigenous Knowledge, and local knowledge), enabling more inclusive approaches to conservation;
- **IMPROVE NETWORK EFFECTIVENESS** using lessons from conservation successes and failures; and
- **ACHIEVE REGULAR NETWORK REFINEMENT** at the local and sub-regional levels.

Since new information and continuingly evolving processes will, over time, bring into question the ability of any network to meet its conservation objectives, an adaptive conservation approach, as provided by ArcNet, is required to increase the likelihood of successful conservation outcomes and ecosystem sustainability. However, implementing this adaptive approach will require the development of dedicated processes for implementing elements like monitoring, data quality control, assessment of conservation effectiveness and re-analysis as needed.

Therefore, establishing ArcNet and taking it into the future will require institutions and parties across the Arctic to become involved and cooperate. This is discussed in the next section.


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A KEY ATTRIBUTE OF ARCNET'S ECOSYSTEM APPROACH IS THE ABILITY TO ADAPT IN THE FACE OF THE CHANGING CLIMATE AND THE UNCERTAINTIES THAT CHARACTERIZE COMPLEX, DYNAMIC ECOSYSTEMS.


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9. ARCTIC MARINE CONSERVATION:

A SHARED RESPONSIBILITY AND INVITATION TO COLLABORATE

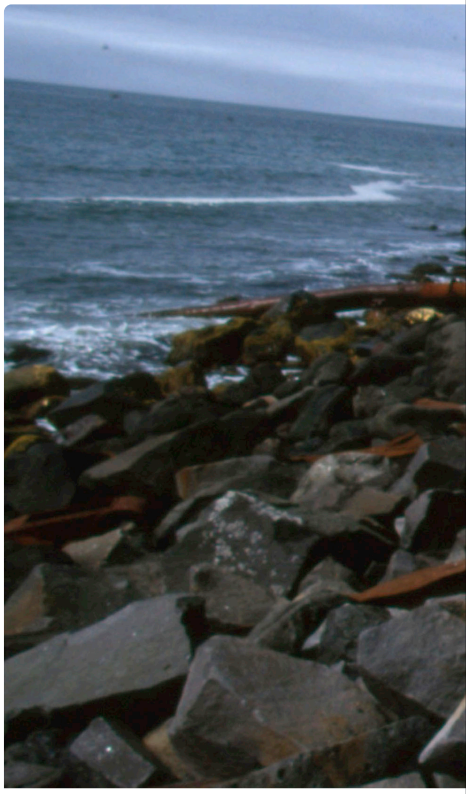
Everyone benefits from Arctic marine ecosystems through the life-supporting services and resources they provide. Therefore, establishing a whole-ocean conservation network in the Arctic is a shared responsibility. These ecosystems and the life they sustain are part of one connected ocean. A successful conservation plan must function at that scale.

Taking ArcNet forward to a nationally and internationally designated Arctic Ocean network of conserved and protected areas will require unprecedented cooperation across the Arctic. To this end, WWF is reaching out to Arctic governments, the Arctic Council and key rights-holders and stakeholders to invite them to participate in the world's first attempt to tackle conservation for an entire ocean—for the benefit of all.

The CBD is expected to adopt a target of 30 per cent protection by 2030. Taking unprecedented action to implement ArcNet will help Arctic countries fulfil their obligations. WWF asks:

- **ARCTIC GOVERNMENTS** to cooperate with rights-holders, stakeholders, scientists, Indigenous knowledge holders, Arctic communities, marine managers and industries in international processes to:
    * create national marine networks of protected and conserved areas that integrate the ArcNet PACs and apply an ArcNet-style systematic and participatory approach to conservation; and
    * establish effective conservation measures for all ArcNet PACs.
- **THE ARCTIC COUNCIL** to support ArcNet's ocean-scale dimension by:
    * developing and sustaining programmes across its working groups to establish, monitor and assess the conservation effectiveness of the emerging Arctic Ocean network of conserved and protected areas; and
    * facilitating collaborative government processes to establish conservation measures for ArcNet PACs that are situated fully or partly in Arctic Ocean Areas Beyond National Jurisdiction.
- **PEOPLE LIVING IN THE ARCTIC** with rights, stakes or values linked to the Arctic Ocean to participate in conservation planning and design processes to ensure conservation features and measures for ArcNet PACs reflect societal values;
- **INDIGENOUS KNOWLEDGE HOLDERS AND LOCAL KNOWLEDGE HOLDERS** to develop or lead co-designing processes and tools that incorporate their perspectives in conservation planning, network design and effective conservation measures;
- **MARINE MANAGERS AND CONSERVATION PROFESSIONALS** to engage in collaborative processes to identify, develop, establish and assess the effectiveness of conservation measures for the ArcNet PACs and to advise on their integration with ecosystem-based planning and management of the surrounding seascapes;
- **MARINE SCIENTISTS** to contribute to refining, establishing and adjusting ArcNet by:
    * refining its knowledge base through monitoring, compiling, assessing and reporting best-available spatial and status information of Arctic marine biodiversity; and
    * engaging in sub-national, national and international marine protected and conserved area networks processes using an ArcNet-style systematic approach and integrating ArcNet's ocean-scale results.
- **MARINE INDUSTRIES** to acknowledge the ArcNet PACs and support effective conservation by:
    * participating in multi-stakeholder processes at sub-national, national and international levels to establish conservation measures for ArcNet PACs; and
    * contributing to the development and establishment of industry-specific guidelines, standards and legal instruments that contribute to effective conservation for ArcNet PACs and the surrounding seascape and comply with them.

In support of these asks and invitations, WWF will continue to convene or facilitate cooperative processes to implement ArcNet.



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QUESTIONS?

GET IN TOUCH WITH A MEMBER OF OUR STEERING GROUP LISTED AT THE FRONT OF THIS REPORT

DELVE INTO THE TECHNICAL REPORT

END NOTES

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THIS REPORT IS DEDICATED TO THE MEMORY OF DR. VASILY SPIRIDONOV FOR HIS CONTRIBUTIONS TO WWF'S WORK AND HIS COMMITMENT TO ARCTIC MARINE CONSERVATION.

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