Arctic Winter College 2021

Policy Briefs #2

Marine and Maritime Issues 1

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THE ARCTIC INSTITUTE

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Marine and Maritime Issues 2

Foreword

Through a partnership with the National Science Foundation-funded Migration in Harmony Research Coordination Network and the Ecologic Institute, The Arctic Institute is publishing a series of briefs on Arctic migrations and mobilities written by Fellows of the 2021 Arctic Winter College. The Arctic Winter College brought together 60 emerging leaders and experts from across the world for 10 weeks in a free series of web-based seminars, the videos of which can be viewed on YouTube here. The program builds a lasting, policy-oriented network of Arctic professionals to strengthen communication between peoples and nations, scientific disciplines, policy areas, and across the science-policy interface to improve collaborations, research, and decision-making in the Arctic. Weekly webinars focused on the theme "Arctic on the Move." Urbanization, globalization, and the impacts of climate change are activating the simultaneous migrations of species, ecosystems, settlements, and cultures across Arctic coastlines in new and unpredictable ways. Each of these intersecting mobilities challenge the quality of life, sustainable development, and environmental health of the circumpolar north. Participants engaged with Arctic researchers, traditional knowledge holders, and practitioners in a variety of fields related to movement to deepen their understanding of a rapidly changing region and its global connections.

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Arctic Council Sustainable Development Working Group (SDWG) meeting in Barrow, Alaska March 11-12 2016. Photo credit: Arctic Council Secretariat / Kseniia Iartceva (creative commons license CC BY-NC-ND)

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Marine and Maritime Issues 2

Table of Contents

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THE BURGEONING THREAT OF NAVAL MINES IN THE ARCTIC

Andro Mathewson

Andro Mathewson is a capability support officer at The HALO Trust and works to develop new programs and R&D initiatives. Before joining HALO, Mathewson received his Masters from the University of Edinburgh and worked as a research fellow at Perry World House at the University of Pennsylvania where he received his B.A. in Politics, Philosophy, and Economics.

EXECUTIVE SUMMARY

- Naval mines present a continuous and unique challenge to allied naval forces.*
- With the opening of the Arctic Ocean, the use of naval mines in the region will possibly increase, especially by Russian naval forces due to their extensive Arctic coastline.
- NATO naval forces must be prepared to counter this underwater threat over the coming years.
- Increased mine-hunting capabilities, intelligence sharing, and legal measures to understand and restrict the use and proliferation of naval mines in the Arctic are all essential first steps.

THE CHANGING ENVIRONMENT OF THE ARCTIC

With the continued loss of sea ice, the Arctic is becoming more accessible, allowing states to access the abundance of natural resources in the region. This includes large deposits of valuable minerals and fossil fuels, the mining and use of which will further contribute to global warming. The effects of climate change are also exposing new shipping routes, such as the Northern Sea Route and the Northwest Passage, previously almost impassable due to ever-present Arctic ice. Their accessibility will greatly benefit the global economy due to reduced shipping times and costs; however, to access these resources and guarantee safe passages along these new sea routes, Arctic nations have more recently attempted to solidify their presence and secure their territorial claims in the region. This has led to increased tensions between Arctic states and increased militarization of the region. Such military investments have been primarily led by Russia, which is revamping its military capabilities in the region to secure its vast northern shores.[1,2,3] With the rise of new economic opportunities in the region, non-Arctic states are also vying for influence in the region, including China[4], India[5], Japan[6], and South Korea[7], increasing the likelihood of conflict in the region.[8]

NAVAL MINES IN THE ARCTIC

The existence of older naval mines and the global proliferation of more advanced newer variants continues to represent a unique challenge to the maritime security of the United States and its allies on a global scale.[9,10] Naval mines are relatively inexpensive but carry significant tactical, operational, and strategic value. As states regard naval mines as legal weapons *per* se and there is no international legal definition of what constitutes one, international cooperation on limiting their proliferation is limited.[11] The legality of naval mines is enshrined under the 1907 Hague Convention VIII and within the 1995 San Remo Manual on International Law Applicable to Armed Conflicts at Sea.[12]

As climate change opens the frozen waters of the Arctic, naval mines, both new and old, are likely to present a danger to the freedom of navigation and shipping, both military and civilian, in the far North. While most Arctic nations have not made extensive use of naval mines in the region, there have been precedent cases

* While naval mines are becoming increasingly multifaceted due to advances in automation, artificial intelligence, and explosives, for the purposes of this policy brief, the term *naval mine* is used to only denote explosive devices placed in water and, later, damage or destroy surface or underwater vessels. To differentiate them from underwater drones and smart torpedoes, naval mines must carry an explosive load, but not have an on-board propulsion power source. They can be broadly split into six groups: moored, drifting/floating, bottom, remotely controlled, submarine launched, and rising/rocket mines. The term *mine warfare* follows the definition of the Naval Studies Board, which includes both naval mining and countermine warfare. For an in-depth overview of naval mines, their history, and usages, see National Research Council. 2000. Oceanography and Mine Warfare. Washington, DC: The National Academies Press. https://doi.org/10.17226/9773.

of their use in the region, especially for the defense or attack of naval ports and shipping lanes.[13] During World War Two, many areas in the North Atlantic from Iceland to the Russian ports of Murmansk, Archangel, and Kola, were mined by German minelayers.[14] With new advancements in underwater and autonomous technologies, nations and their navies, including Russia, have begun to develop new naval mines, increasing the likelihood of deployment in the Arctic.[15,16,17] The United States, NATO, and other allied naval forces must be prepared to counter this underwater threat over the coming years, while simultaneously attempting to limit the continued proliferation of naval mines.

Underwater (In)Security in the Arctic

While most maritime missions are still conducted on the surface, and this is especially true for the still mostly frozen waters of the Arctic†, an increasing number of underwater technologies, including new submarines, smart mines and torpedoes, and underwater drones are being developed and deployed in the region.‡ While this increase has yet to directly lead to an outbreak of violent conflict, it has contributed to raised tensions as, for example, in the South China Sea, where a Chinese Navy vessel seized a United States Navy uninhabited underwater vehicle (UUV).[18] The likelihood of a similar incident happening in the open ocean is unlikely. However, in the more enclosed Arctic Ocean, which, like the South China Sea, borders a great number of independent states with well-developed naval forces, the majority of which include UUVs and mines, the probability of such an incident occurring is considerable. In the case of naval mines, the likelihood of their proliferation in the Arctic is directly related to two characteristics of naval mines: their intrinsically furtive underwater nature and the lack of specific international laws concerning naval mines, including the vagueness surrounding their place within the United Nations Convention for the Law of the Sea (UNCLOS).[19]

Naval mines are an inherently furtive technology due to their relatively small size and underwater nature. Additionally, they are easy to deploy and highly efficient enabling smaller navies to counter larger and more technologically sophisticated adversaries. Given these characteristics, naval mines are thus difficult and expensive to track, trace, and destroy. This is compounded in the frozen and relatively unexplored waters of the Arctic. While countermine warfare has also developed over time, "mine technology has managed to stay ahead of the game."[20] Additionally, mine proliferation is increasing at an alarming rate: in 1986, approximately 30 nations possessed naval mines. By 2005, 50 states owned mines, and at least 30 had demonstrated mine-production capabilities, while 20 had attempted to export them.[21] This has also contributed to the complex legal stature of naval mines.

The use of naval mines in naval conflicts is governed primarily by the Convention of 1907: Relative to the Laying of Automatic Submarine Mines (known as Hague VIII). Although the convention has acquired the standing of customary international law, thus making it legally binding on all states, the treaty only concerns the use of automatic contact mines (and torpedoes). As such mines continue to be used widely by states the treaty remains relevant to current naval operations. Additionally, most countries, including Russia, aren't party to the convention and more technologically advanced mines (and torpedoes and underwater drones) are not governed by the treaty, so their use is only limited by the general rules of customary international humanitarian law. Yet, the biggest remaining issue is the enforceability of said international law. As previously seen by, for example, the invasion of Crimea, Russia rarely abides by international conventions and legal statutes.

While Russia is a party to UNCLOS, the latter does not expressly discuss mines, mine-laying, or the right of states to undertake mine countermeasure operations. The clauses within UNCLOS, which do affect

† This may be perceived as a paradox, but surface ships, primarily icebreakers, are the most common vessel used in the Arctic. While it may seem that as the Arctic Ocean is still mainly frozen, underwater technology might be more suited to naval missions in the region, current limitations in underwater technology, such as limited communications and movement range, limit the benefits of controlled underwater devices in the region. However, as most naval mines do not require communications from a surface vessel but detonate based on proximity or contact, these limitations is not valid for most naval mines.

‡ An increasing number of underwater technologies are being developed including more advanced naval mines, smart torpedoes, and underwater drones. While these all pose a threat to shipping and the freedom of navigation and there is often much overlap in their use and onboard technologies, this policy brief focuses primarily on the likely increase of naval mine usage in the Arctic, as defined in the previous footnote.

states' ability to use mines concern the right of innocent passage through the territorial sea and archipelagic waters - a state's right to lay armed mines in these waters is mitigated by its responsibility not to hamper the passage of foreign ships. In no circumstance can states legally lay naval mines in the territorial seas, internal waters, or the archipelagic waters of another state – this would violate that state's sovereignty and represent the use of force (unless done under the request or with the consent of the receiving state). However, as aforementioned, tracking and tracing naval mines is near-impossible, thus any infringement on UNCLOS concerning minelaying is rarely made known. In addition, while most Arctic nations have ratified the convention, the United States has not, and others, such as Russia, consistently criticize and question its validity, further limiting its true effectiveness.[§]

COUNTERING THE THREAT

Countering naval mines requires effective countermine techniques and technologies, increased intelligence and technology sharing with allies, and the use of legal measures to restrict further unrestricted proliferation. Such a three-pronged approach can enable the United States and its allies to combat the direct threat of naval mines and ensure the continued freedom of navigation of the seas, while also restricting non-aligned states' access to naval mines or the technology to achieve domestic production capacity.

Developing cost-effective minesweeping and mine hunting technology, capable of deploying in the Arctic, is the vital first step in countering any potential threat from naval mines in the region. While the United States is the leader in underwater and countermine warfare, mine technology is decidedly ahead of the game and continuously advancing. While new developments in minesweeping technology, and UUVs with mine hunting capabilities, are impressive, a renewed sense of urgency is needed to address the issue with an Arctic context.[22] While sea ice is thinning and waning, much of the Arctic is still frozen year-round, and Russia is the only nation with nuclear icebreakers capable of clearing passages through the ice on a perennial basis, enabling its minelayers to access frozen regions, which will only thaw over the following summer. Consequently, NATO's countermine warfare technologies must be able to perform in the freezing temperatures and under the ice of the Arctic Ocean.

Increased intelligence & technology sharing amongst NATO allies and aligned nations is another important move to enable equal anti-mine capabilities amongst allied naval forces to shore up all potential weak points in Northern maritime borders, and indeed beyond. While states must generally declare the broad location of naval minefields, many perform this as vaguely as possible. For example, during World War Two, the United Kingdom declared that it had simply mined the English Channel, the North Sea, and the French coast.[23] Sharing information regarding any known minefields or minelaying across the Arctic is vital to protect both civilian and military shipping from the underwater threat. Simultaneously, sharing countermine technologies with allied nations allows for the establishment of domestic production capabilities in the latter and increases interoperability of naval forces, increasing cost-effectiveness and efficiency. Concurrently, limiting non-aligned nations from accessing technological advancements in this sphere is also vital to the successful implementation of the latter policy.

A final, but no less important, step to countering a threat of naval mines is advancing an explicit international legal status for naval mines and marine minefields. While as aforementioned naval mines are covered by Hague VIII and indirectly by UNCLOS, a revised UNCLOS, which unambiguously and expressly discusses the use of naval mines, at least, in international waters during peacetime can help clarify any uncertainty regarding their legal use and the geographic extent to which they may be used. While the United States has yet to ratify UNCLOS, it could use its positive relations with allied signatories' states to affect such a change within the treaty. Another possibility is to discuss the use of naval mines within the context of an opening Arctic Ocean at the Arctic Council to specifically address the issue of naval mines within the Arctic circle. A previous binding treaty, established under the Arctic Council is the Arctic Search and Rescue Agreement, which coordinates international search and rescue coverage and response in the region and establishes responsibilities for the Arctic states within the agreed areas. A similar treaty under the Arctic Council focusing on a requirement to share in detail the location of, at least, older minefields in

[§] For an in-depth discussion on international applicable to naval mines, see Chatham House. 2014. International Law Applicable to Naval Mines". and Letts, "Beyond Hague VIII: Other Legal Limits on Naval Mine Warfare".

the region is an important first step in limiting legacy naval mine threats to shipping and building further cooperation in the Arctic.

Conclusion

With the increased melting of Arctic ice and subsequent new accessibility of the region, tensions between neighboring nations are rising. Simultaneously, Russia and China are developing increased underwater capabilities, primarily armed UUVS, and smart naval mines. The combination of these two factors is likely to result in increased insecurity of the region and the heavy use of naval mines to protect ports and shipping lanes, especially along Russia's extensive Arctic coastline. The United States and NATO naval forces must be prepared to counter this underwater threat over the coming years.

LINKING UNCLOS AND UNDRIP - A WAY TO MAKE OCEAN GOVERNANCE OF ARCTIC MARINE SPACES INCLUSIVE?

Katharina Heinrich

Katharina Heinrich (M.A. Polar Law) is a Junior Researcher in the Arctic Governance Research Group at the Arctic Centre, University of Lapland in Rovaniemi, Finland. Her research focuses mainly on Environmental Law, Law of the Sea, Marine Biodiversity Conservation and Management, and Indigenous Peoples Rights in connection to climate change impacts.

EXECUTIVE SUMMARY

- Climate change impacts can threaten Indigenous peoples' rights to resources and the use of marine spaces
- There are possible links between UNDRIP and UNCLOS, despite their different levels of authoritativeness, regarding their reference to the use of the ocean and resources by Indigenous peoples
- The incorporation of Indigenous peoples' rights in law of the sea would provide necessary recognition of Indigenous peoples' use of and their relationship with the marine environment

INTRODUCTION

Arctic sea ice is melting at an accelerated rate, and predictions state that the Arctic could be seasonally ice-free by 2030.[24] As a result, shifts in the ecosystem and increased human activities, such as shipping, can be seen. This also has spill-over effects on Indigenous peoples and local communities in the Arctic. The UN Convention on the Law of the Sea (UNCLOS)[25] is the main instrument governing marine spaces and focuses on nations' rights and responsibilities concerning their use of the oceans. However, it does not include any specific reference to the oceans' use and their resources by Indigenous peoples. The United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP)[26], on the other hand, sets out a series of territorial and resource use rights that might apply to ocean space and links their unique spiritual relationship to, amongst others, the use of ocean spaces.[27] Hence, it seems like the two instruments can be linked, considering increasing anthropogenic impacts on the oceans and coasts, especially in the Arctic. Therefore, this briefer presents the possibilities of linking the two instruments and incorporating an Indigenous people's perspective into UNCLOS as a way forward to improve the governance of marine biodiversity and create a more comprehensive and inclusive ocean governance. As such, this briefer aims to outline the complexity of the changes in the Arctic and their effect on the environment and its Indigenous peoples. It aims to show that changes in the environment need to be reflected in a more dynamic legal framework on ocean governance that respects and recognizes Indigenous peoples' rights.

A CHANGING ARCTIC ENVIRONMENT

The Arctic is warming at more than twice the global rate and is, along with the sub-Arctic, expected to warm the most in response to anthropogenic increases of greenhouse gases in the atmosphere.[28] This increased warming is adversely impacting the Arctic sea ice extent and results, based on the increased melting of ice sheets and sea ice, in a lower albedo effect warming the atmosphere up. The decline in Arctic sea ice is the most visually evident consequence of warning climate resulting from anthropogenic impacts and is commonly discussed as an indicator for the warming of the whole Arctic region.[29]

The loss of sea ice affects Arctic biodiversity in many ways. For Arctic biota, it serves as a living medium, a transport structure, and a resource filter for example.[30] As a result, the decrease of sea ice leaves keystone marine mammals, such as ice-based seals and walruses, highly vulnerable, as they follow the ice edge and use sea ice for mating and raising pups.[31] Additionally, primary producers, which are the base of the Arctic marine food web, are affected by the loss of sea ice, as their habitat is lost at the same time. Sea ice algae and sub-ice phytoplankton alone account for 57% of the total annual primary production in the Arctic Ocean.[32] With the loss of sea ice, which represents their habitat, algal blooms can lead to a possible mismatch in the production of zooplankton.[33] However, uncertainty regarding the exact effects that Arctic biota will experience from the loss of sea ice remains, and further research needs to be undertaken in the future. On the other hand, indirect effects result from a chain of events and involve the modification of components of the physical system and/or biotic interactions, such as the change of biological interactions that can also include human activities.[34] In addition, the decline in sea ice creates increased access to coastal and near-shore areas for industrial development and increased shipping activities, which can pose an additional pressure to communities in the region.

THE RECOGNITION OF ARCTIC CHANGES, REFERRING TO INDIGENOUS PEOPLES, IN INTERNATIONAL OCEAN GOVERNANCE

As the Arctic region is projected to open up for commercial activities, such as shipping, fishing, tourism, and natural resource extraction, it is expected to become busier in the future. The decrease of sea ice, amongst others, provides the basis for increasing interest in natural resources in the Arctic and provides more opportunities for economic activities. While these changes might present opportunities, increased pressure on the environment and inhabitants of the region arises simultaneously.

Impacts on Arctic biota also affect native communities that historically relied and still rely on the marine environment. Especially in the high North, sea ice still represents a platform for hunting, fishing, and transportation.[35] With the shifting seasonality of the sea ice and less stable ice conditions, the access to marine mammals for Indigenous peoples and Arctic residents decreases. In addition, the increase of commercial activities might minimize their pool of resources even further, and access to culturally important species is considerably reduced.[36] An ice-covered space that is almost exclusively used by Indigenous peoples and an example for ice-covered ocean space serving as a transportation and movement medium is the transboundary North Water Polynya (Pikalasorsuaq). This ice bridge across the maritime boundary between Greenland and Ellesmere Island is of high importance for Canada and Greenland's Inuit to maintain regular contact.[37] Through climate change effects and the resulting sea ice melt, safe movement across the ice bridge is threatened in the near future. This shows that traditional activities will and need to adapt to the changing future. Indigenous peoples are resilient and always have, and will continue, to adapt to changing situations. Nevertheless, changes in the environment resulting from anthropogenic impacts such as climate change inherently threaten their rights to land and resource use.

Various legal frameworks exist in international law that refer to the use of marine spaces and Indigenous peoples' inclusion and their rights. The main instruments are the United Nations Convention on the Law of the Sea (UNCLOS) and the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP). While this briefer only includes these instruments, it acknowledges that other international frameworks and instruments refer to marine spaces with the inclusion of Indigenous peoples' rights.

International regulations, such as the United Nations Convention on the Law of the Sea (UNCLOS), already include the obligation to protect and preserve the marine environment, which is represented in various provisions (Arts. 56, 145, 234, 235, 237, 240, 277 UNCLOS). However, based on the fact that UNCLOS was established in 1982, the consideration of newly emerging issues relating to the use of marine spaces, especially referring to Indigenous peoples' subsistence activities, is largely underrepresented. Additionally, regulations often do not take the current and future changes in the environment and their effects on Indigenous peoples' culture, livelihoods, and traditions adequately into

account. UNDRIP, for example, only includes possible links to marine spaces and does not provide specific provisions on the use of marine spaces for Indigenous peoples.

UNCLOS has been adapted in the past by establishing agreements under the convention itself, such as the Agreement for the Implementation of the Provisions of UNCLOS relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (UN Fish Stocks Agreement, 2001), for example. This agreement responds to increased Illegal, Unreported, and Unregulated (IUU) fishing activities in the world's oceans. It aims to ensure the long-term conservation and sustainable use of straddling and highly migratory fish stocks within the framework of UNCLOS. Further, the negotiations of a new international legally binding instrument under UNCLOS on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction extend the sphere of international frameworks relating to the adaptation to future changes and impacts. It additionally includes a human rights perspective by including traditional activities but is not solely focused on the protection of Indigenous Peoples Rights relating to marine spaces but instead focuses on future commercial uses of the ocean and how to achieve the sustainable use of marine spaces in consideration of increasing interest in the high seas.

Hence, it needs to be investigated whether it would be worth to adapt UNCLOS specifically to emerging issues concerning coastal communities and Indigenous peoples or whether UNDRIP is enough to guarantee their rights to marine spaces and resources. This briefer is merely intended to start the thought process and further research needs to be undertaken in the future.

UNDRIP

The United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) was adopted on 13 September 2007 by the UN General Assembly and expands the scope of existing human rights for Indigenous peoples significantly.[38] UNDRIP recognizes the rights of Indigenous peoples and their right to self-determination. As UNDRIP is an UNGA resolution, it is as such not legally binding. However, it is partially codifying, at least some, customary international law rights of Indigenous peoples.

Under UNDRIP, Indigenous peoples have the right to the lands, territories, and resources, which they have traditionally owned, occupied, or otherwise used or acquired (Art. 26(1) UNDRIP). It is further stated that Indigenous peoples have the right to practice and revitalize their cultural traditions and customs (Art. 11 UNDRIP). The movement of indigenous peoples to maintain contacts, relations and cooperation across borders is governed under Art. 36(1) UNDRIP. Though not specifically mentioned, it is suggested to include marine spaces and marine spaces covered with sea ice that are traditionally used by Indigenous peoples for transport and mobility. Further, article 25 of UNDRIP recognizes their right to engage freely in traditional and other economic activities and acknowledges their "distinctive spiritual relationship with their traditionally owned and acquired […]" lands, territories, and resources. Article 25 provides a possible reference of Indigenous peoples' resources rights to ocean space, referring to "waters and coastal seas." In that sense, Indigenous land in international law extends to the total environment, including ocean spaces.[39] These areas might also include ice-covered marine areas.[40]

However, the provisions of UNDRIP are in its essence of domestic nature and therefore fall under coastal state jurisdiction. As such, the extent to which a coastal state recognizes and implements domestic Indigenous rights is not governed by UNCLOS.[41]

UNCLOS

UNCLOS is one of the largest multilateral conventions in international law. It established a legal order of the seas to facilitate international communication and promote the peaceful use of the oceans, the equitable utilization of its resources, the conservation of the living resources, and the protection of the marine environment.[42]

However, UNCLOS does not refer to Indigenous rights specifically apart from a provision on archipelagic waters, which refers to the state's duty to recognize traditional fishing rights.[43] Besides, UNCLOS does not recognize the use of ocean space and resources by Indigenous peoples and additionally does not refer to transboundary movements of people for kinship and traditional resource use reasons.[44]

Article 192 of UNCLOS provides the obligation of state parties to "protect and preserve the marine environment". This can be complemented by different frameworks in international environmental law, such as UNDRIP and the Indigenous and Tribal Peoples Convention (ILO169)[45] for example, as they provide more specific rules for the protection, conservation and sustainable use of the environment. Hence, this can be seen as a possible link between UNCLOS and UNDRIP in light of environmental protection and the Indigenous use of ocean space. However, as these provisions do not clearly or specifically refer to Indigenous use of marine space nor to marine space. This link between the documents needs to be investigated further in future research and seems rather weak.

LINKING UNCLOS AND UNDRIP?

As previously stated, Indigenous Peoples Rights are in its essence domestic and are implemented through domestic legislation by the respective coastal state. As such, UNCLOS does not govern these rights. However, the question posed in this regard is where that leaves coastal communities and Indigenous peoples. Additionally, it shall be asked whether they should be represented in the significant multilateral convention regulating the use and conservation of the oceans and whether these two documents could or should be linked.

As Chircop et al., note in their research as well, both instruments mandate different authoritativeness levels.[46] UNCLOS is a multilateral convention and UNDRIP is a resolution that is per se not legally binding. However, in a future where ocean uses intertwine with Indigenous peoples' rights and most likely increase to be intertwined, especially in the Arctic, Indigenous perspectives and their intrinsic connection with the marine environment should be made more visible. Additionally, even though Indigenous peoples are increasingly well-represented at the UN, only a few links between Indigenous peoples, climate change, and the environment are currently present in international law.[47]

The nature of Indigenous ocean governance includes a more holistic understanding of the environment and its relationship with humans.[48] Therefore, it could provide a legal basis for the protection of the oceans, which is lacking to a large extent in the existing frameworks on ocean governance. As such, an inclusion of the Indigenous perspective in ocean governance would give recognition of the use of marine space by Indigenous peoples on a broader scale, especially when recognized under UNCLOS. Such an approach could support the protection of Indigenous peoples' rights and their right to (marine) resources and spaces and ensure that also in a changing environment state parties are obliged to protect the environment also, in consideration of Indigenous use.

THE WAY FORWARD

It has been shown that there is a weak link between UNCLOS and UNDRIP in relation to the use of marine spaces by Indigenous peoples. Further, it has been outlined that impacts of climate change have and will continue to have negative effects on Indigenous peoples and coastal communities in the Arctic. These impacts could threaten their rights to resources, mobility and territories within marine spaces, that are provided within UNDRIP. As a result, it has been argued that by linking or incorporating the Indigenous perspectives in a major international law instrument, such as UNCLOS, the necessary recognition of Indigenous rights to resources under the consideration of future changes is provided. However, the difference in their authoritativeness, leaves an important question unanswered: to what extent an incorporation of Indigenous Peoples Rights provisions in UNCLOS would be possible and useful? By linking the two instruments, a more inclusive and comprehensive governance of marine resources and the

use of marine space can be achieved. However, this is solely depended on how the coastal state incorporates and interprets Indigenous peoples' rights within the scope of international law. As such the potential role of UNDRIP in the law of the sea, as proposed by Chircop et al., through customary law incorporated into the preamble of UNCLOS would create a possibility to regulate matters that are not incorporated under UNCLOS. As such, matters would continue to be governed by the principles of general international law.[49] However, this leaves the rights of Indigenous peoples regarding the use of marine spaces still relatively unregulated and vague, as there is no specific reference, especially relating to future changes, incorporated in international frameworks.

EMERGENCE OF INDIGENOUS-LED COMMERCIAL FISHERIES IN THE ARCTIC

Samantha Danielle Farquhar[1,2]

[1]Integrated Coastal Sciences PhD Program
East Carolina University, Greenville, NC, USA

[2]Coastal Studies Institute
Wanchese, NC, US

As new fisheries move into the Arctic, Indigenous Nations seek to move into new industries

CHANGE IN ARCTIC FISHERIES

As climate change continues to impact the Arctic, fish species are expected to shift distribution and the catch potential of Arctic fisheries is expected to increase. It is estimated that total revenue generated by Arctic fisheries may increase 39% by 2050[1]. These changes in distribution are driven by increased temperatures and reduction in sea-ice which in turn increase primary productivity [2]. Consequently, many Arctic and Non-Arctic actors have begun positioning themselves to take advantage of this fishing potential. Of these Arctic actors, this includes the many Indigenous communities who have lived in the circumpolar North for thousands of years.

INDIGENOUS ECONOMY AND DEVELOPMENT

As Indigenous communities are becoming more politically powerful and mobile, they are purposefully working to improve their circumstances through economic development initiatives. These schemes largely depend on participation in the global economy and the concept of entrepreneurship. Entrepreneurship has been identified as a tool for Indigenous self-empowerment, economic development, and poverty reduction. Particularly, Indigenous entrepreneurship has been defined as the creation, management and development of new ventures by Indigenous people for the benefit of Indigenous people [3], and it has been argued that Indigenous entrepreneurship is a separate and distinctive research field from mainstream, non-Indigenous entrepreneurship [4].

Given that Indigenous entrepreneurship is a very new field of study, it can be argued that Indigenous economic development is also new. Most theories of economic development operate under assumptions surrounding capitalism[5] . Given that capitalism is deeply intertwined with colonialism, it has been established that capitalism is not compatible with Indigenous sovereignty and should be "decolonized". Thus, many Indigenous communities are actively trying to model economic development in their own image. The Indigenous approach to economic development is a predominantly collective one centered on the community or 'nation'. The main objectives of Indigenous economic development are to: end dependency through economic self-sufficiency; control activities on traditional lands; improve the socioeconomic circumstances of its people; and to strengthen traditional culture, values, and languages. These goals are achieved through creating and operating businesses that can compete profitably over the long run in the global economy; forming alliances and joint ventures among themselves and with non-Indigenous partners; building capacity through education, training and institution building; and the realization of more legal protection[6]. The acknowledgment of the importance of economic development to Indigenous peoples has been increasing in the global arena. Articles 3, 20, 23, and 32 of the UN Declaration of Indigenous Rights all exclusively refer to the rights of Indigenous people to economic development.

FISHERIES DEVELOPMENT AND EMERGING COMMERCIAL FISHERIES

Fisheries economic development schemes have typically been implemented in low-income countries by foreign development agencies. Many of these initiatives failed because of a lack of understanding and respect for local social and cultural characteristics of communities; reliance on technical capacity rather than

human capacity; or corrupt development only favored the elite rather than the community as a whole [7,8]. Yet, there has been some success in fisheries economic schemes led by Indigenous communities. However, in most cases of Indigenous communities securing access to commercial fishing activities, they first had to establish legal claims and secure access to their historical fisheries resources--often after decades of exhausting legal battles. Similarly, it is imperative to note that there is a distinction between Indigenous-led commercial fisheries and Indigenous participation in commercial fisheries. The latter of which can cause more harm than good. For example, in the Aleutian Islands, Indigenous Alutiiq have found livelihoods that develop around a successful commercial fishery but as the commercial fishery continues to grow, they struggle with their identity, culture, and outside competition [9,10].

Notably, in Arctic communities in present day Canada, there has been a wave of Land Claims Agreements and interest in securing access to commercial fisheries quota. This includes Nunavut, Nunavik, and Nunatsivut. All of which are interested in commercially developing fisheries for northern shrimp, turbot, and other appearing fisheries. In some of these regions

The Future

While most studies on climate change in the Arctic have highlighted potential negative impacts, climate change could also bring about new opportunities that may aid in Arctic Indigenous nations' overall development and political goals[11]. Fisheries development could potentially act as an important tool for adaptation and growth. Nevertheless, as the impacts of climate change modify the distribution of fisheries [12], there will be new issues in fisheries access and competition [13,14]. Treaties and fishing agreements are the usual tool of choice to remedy fisheries issues. Yet, given the rapid change of fisheries in the Arctic alongside various competing claims to Arctic spaces [15], there may be inadequate legal frameworks in place to help facilitate negotiations especially for Indigenous communities [16,17]. Consequently, Indigenous communities that are working to secure their tenure rights, invest in commercial fisheries, and ensure that they will be a principal decision-maker in that fishery will likely have the advantage in the future.

THE IMPACT OF ANTHROPOGENIC NOISE ON ARCTIC CETACEANS AND THE NEED FOR ACTION

Barbara K. Neubarth,
Coastal and Marine Management, University Centre of the Westfjords

SUMMARY

- Direct and indirect climate change effects will inevitably influence the Arctic soundscape.
- Arctic cetaceans may be more susceptible to changes within their audible environment and sub-Arctic cetacean species that will move further north will likely be adversely impacted seasonally.
- Knowledge gaps need to be filled to identify priority areas for monitoring and to assess effective mitigation strategies.
- In the Arctic's current relatively silent environment, policymakers have the chance to be proactive and take a precautionary approach.
- Arctic-wide standards are needed before a small issue becomes a larger problem.

INTRODUCTION

Climate change-induced sea ice loss is perhaps the most visual proof for a fast-changing Arctic environment. Ice-free summers allow anthropogenic activities such as shipping, oil and gas exploration, and seismic surveys to move further North than ever, posing new risks for the Arctic's endemic inhabitants and allowing new species to venture into higher latitudes. These changes are not only visible but also audibly affecting the Arctic soundscape. The Arctic acoustic environment is unique[50] and highly influenced by the presence or absence of sea ice.[51] So far, Arctic marine mammals have been living in a relatively pristine acoustic environment and might therefore have relatively low threshold levels for changes in ambient sound levels or react strongly to anthropogenic noise disturbances.[52] Cetaceans' (whales, dolphins, and porpoises) and pinnipeds' reactions to noise disturbance differ and have been studied insufficiently.[53] Still, within cetaceans, effects can range from behavioral change over hearing loss to mortality events.[54] As noise pollution becomes a circumpolar problem, a united response from Arctic states is required to silence this amplifying issue.

Drivers of Sound in the Arctic

Pijanowski et al. (2011) divide drivers of sound into three different categories: Geophony, biophony, and antrophony. In the Arctic, wind and ice concentration are the main environmental drivers (geophony), as biophony can be considered the sounds marine animals produce, and vessel traffic, seismic air guns, ice breakers are the main sources of antrophony.[55] Stormy seas increase ambient sound levels and ice conditions can influence the antrophony. Hence, decreased sea ice levels will lead to more anthropogenic activities for a longer period of time.[56]
Four aspects differentiate the current ambient sound levels in the Arctic from non-Arctic waters. The Arctic sound channel is causing sound to propagate differently, non-Arctic waters are not covered by solid sea ice, different biota is affecting the soundscape and non-Arctic waters are generally exposed to higher levels of anthropogenic activities.[57]

Anthropogenic Drivers

With an ice-free Northwest Passage (NWP) and Northern Sea Route (NSR), shipping has increased dramatically in the last 10 years. PAME reported a 25% rise in vessel numbers and a 75% increase in distance sailed by all vessels in the Arctic Polar Code area between 2013 and 2019.[58] The distance sailed within the NWP experienced an exceptional growth of 107% with most ships being bulk carriers.[59]

Oil exploration continues further north causing air gun blasts to reach previously quiet areas. Future anthropogenic drivers of sound might include pile-driving for wind turbine construction[60], increasing drone usage[61] , or naval activity.[62]

Impacts on Arctic Cetaceans

For all marine animals sound is critically important. Cetaceans both produce and detect sound to forage, navigate, reproduce, communicate, and avoid predators. Depending on the species, they use low or high-frequency sounds which can be heard over short and long distances.[63] If anthropogenic noise competes or even outcompetes cetacean sounds, it might lead to masking, change in behavior, reduced hearing sensitivity, cease of communication, increased stress levels, and can even cause death.[64]
PAME (2019) defines bowhead, beluga, and narwhals as the only three cetacean species endemic to the Arctic. Other species such as humpback, grey, northern bottlenose, sperm, minke, and killer whales are considered sub-Arctic species that only spend part of the year in Arctic waters.[65] While Arctic species might be more sensitive to noise disturbance since they had not been exposed to intensive anthropogenic noise previously, sub-Arctic species might be more accustomed due to their annual migration into lower latitudes.[66]

Since beluga and bowhead whales' migration leads them through the busiest areas of the Pacific Arctic, they could be exposed to acoustic disturbance events in three national jurisdictions (Russia, Canada, USA).[67] Currently, the peak period of bowhead whales' singing in the Fram Strait does not overlap with anthropogenic noise but is expected to with increasing and longer vessel traffic.[68] Hauser et al. (2018) estimated that narwhals are the most vulnerable Arctic cetacean species to vessel impacts since they are highly exposed and are believed to be the most sensitive. Loud vessels can be heard underwater more than 100 km away. Hence, icebreakers within 2 km and tankers within 52 kilometers are believed to affect marine mammal behavior.[69]

Sub-arctic species might be temporarily affected by noise disturbance when entering Arctic waters on their yearly migration. Effects vary between species and depend on the hearing of the animal, the distance to the source, the loudness of the signal, and the frequency of the cetacean's communication.[70] Northern bottlenose whales, for example, have strongly responded to controlled experiments with naval sonar exposure by showing avoidance and a change in dive behavior. [71] This is in contrast to minke whales, who, when exposed to naval sonar, indicated avoidance behavior through an increase in speed.[72]

POLICY IMPLICATIONS

As the Marine Mammal Commission pointed out in 2007, the management framework around noise pollution has been of limited effectiveness, mainly due to the considerable uncertainty regarding those effects. Moreover, inadequate attention to the management of sound producers, nonoptimal monitoring and mitigation methods to characterize, avoid, or minimize effects, and insufficient implementation strategies have negatively influenced any mitigation or control efforts.[73] A preliminary study conducted by Thomson and Barclay (2020) verified a sharp decline in underwater noise around the port of Vancouver caused by the effects of the global covid-19 pandemic. This was only possible because long-term data was available and permanently moored hydrophones were installed in multiple areas.[74] The example highlights the need for long-term ambient noise level monitoring, further research in the Arctic, and the high level of uncertainty associated with the issue. This need is also acknowledged by various scholars, the Arctic member states, and PAME. [75] Chou et al. (2021) suggest four action points to better combine the potential impacts of noise with corresponding mitigation and noise reducing efforts; "1) collaboration to address the transboundary and cumulative nature of underwater noise; 2) differing countries' implementation capabilities for addressing noise; 3) time and intensity tradeoffs (e.g., louder noise for a shorter time period versus quieter but for longer); and 4) variable noise impacts depending on specific life-history stages and life functions."[76] These can be considered very relevant for the case of Arctic cetaceans and should be applied where possible at the regional and national level.

Mitigating noise pollution in the Arctic will require more research given the amount of high uncertainty regarding long-term effects and specific risks for marine mammals. Engaging coastal communities in

cetacean monitoring through citizen science efforts might offer additional possibilities for data collection in the future. However, an acceptance that some uncertainty will remain is required to move beyond recognizing the threat to enacting new governing structures. Ship traffic will rise, and the shipping season will be prolonged leading to increasing acoustic disturbances over a longer period of time.[77] Especially since new sound sources such as drones [78] are entering the Arctic and large vessels like bulk carriers are constantly increasing in numbers,[79] the Arctic might not have the luxury to wait for long-term scientific data from all Arctic waters. Areas where studies have been conducted should be taken as an example to apply a precautionary and proactive management principle in other Arctic waters. Marine protected areas, buffer zones, speed limits, and rerouting shipping lanes around important cetacean habitats are only a few of many options. Since any migratory species are not bound to state borders, collaborative approaches in research and management will be essential for an effective response to acoustic disturbances.

Many international organizations such as the International Maritime Organization (IMO) recognize the threat of noise pollution and suggest measures to minimize these disturbances but have not issued any binding agreements.[80] The EU, Canada, United States, and various other regional and multinational organizations have adopted regulations that target underwater noise pollution but often face implementation challenges.[81] Moreover, if policies in a state exist, they are not Arctic specific[82] , and given the difference in ambient noise levels and environment lower threshold levels can be expected. Spatial and temporal coverage has been identified as the greatest knowledge gaps for ambient sound levels.[83]All evidence presented here calls for a collaborative, circumpolar approach from both researchers and policymakers. Given that no Arctic-wide mitigation effort currently exists, it might be a good idea to trial noise mitigating measures in areas where baseline data is available while establishing a monitoring and mitigation network. Arctic noise pollution is a growing problem that still can be contained if Arctic states act now.

ARCTIC MARINE CONSERVATION: HIGH TIME TO PREPARE FOR THE COMING MELT

Nicole Wienrich, Institute for Advanced Sustainability Studies (IASS)
ORCID ID: 0000-0001-9621-4924

SUMMARY

- *Climate change impacts cause rapid and profound changes in Arctic marine ecosystems*
- *Protecting migratory Arctic marine species as well as dynamic habitats such as sea ice and frontal zones requires innovative, dynamic tools*
- *Cooperation across the region and collaboration with Indigenous communities will be crucial to ensure the success of marine conservation in the Arctic*

INTRODUCTION

Unique marine ecosystems exist in the Arctic. These unique ecosystems are increasingly under threat as the decrease in sea ice coverage as well as warming water temperatures and changes in ocean circulation cause profound changes. In addition, human activities such as oil and gas exploitation, seabed mining, commercial fishing, cruise tourism and shipping are expected to intensify as the sea ice retreats, further adding to the threats to Arctic marine ecosystems.[84]

Against this background, area-based management tools (ABMTs), such as marine protected areas (MPAs), pollution control zones, or fisheries closures are increasingly critical instruments to ensure the conservation of the biodiversity in the region. However, many of these tools are applied to static locations, meaning they may not be able to offer protection to those habitats or species, which react to climate change impacts by shifting their ranges.[85]

This problem will likely become greater in the near future, as the scale of climate change induced changes in the composition of Arctic marine ecosystems may lead to many MPAs no longer containing the species or assemblages they were created to protect.[86] Climate change is having a profound impact on Arctic marine ecosystems and people depending on sea ice-associated species The Arctic is warming faster than any other region on Earth, and rapidly becoming a warmer, wetter, and more variable environment. Over the past 49 years, the Arctic's temperature has risen at a rate more than three times the global average.[87] As a direct consequence of this warming, the extent of the Arctic sea ice has decreased at an alarming rate in recent years (figure 1). This trend is projected to further continue, possibly leaving the Arctic Ocean ice-free as soon as the late 2030s.[88]

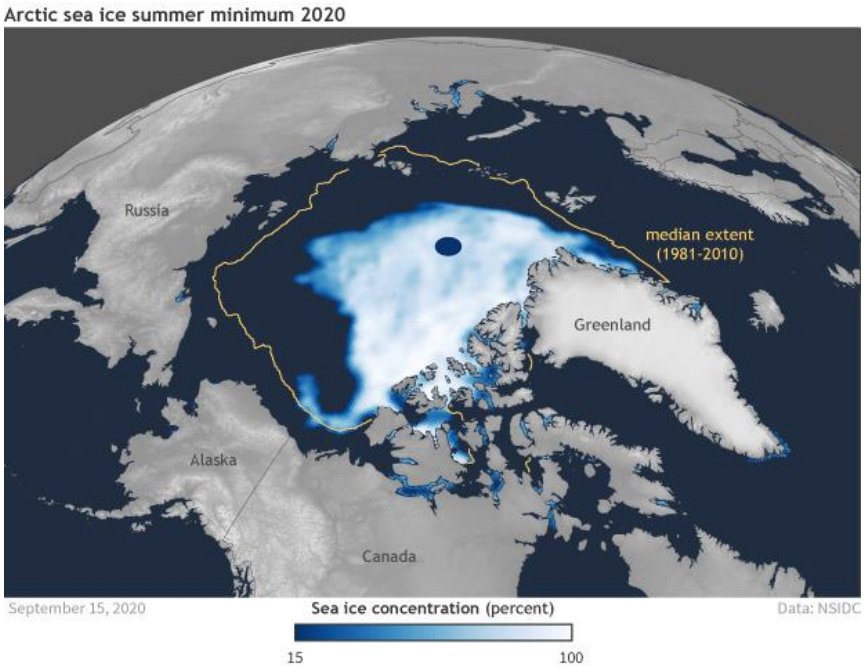

Figure 1. Map of the Arctic indicating 2020 Arctic sea ice summer minimum and sea ice summer minimum median extent from 1981-2010 (yellow line). Source: NOAA Climate.gov based on data from the National Snow and Ice Data Center. Available at https://www.climate.gov/news-features/featured-images/2020-arctic-sea-ice-minimum-second-lowest-record

Arctic sea ice provides a unique habitat for many species, including ivory gulls, ringed seals, polar bears, narwhals, beluga whales, and bowhead whales, some of which are endemic to the Arctic and depend on the sea ice for their survival. In a warmer Arctic, sea ice dependent species will face extreme levels of habitat change, likely leading to dramatic reductions in population size, which will in turn also challenge the livelihoods and cultures of Indigenous people.[89] Warming water temperatures and changes in ocean circulation furthermore lead to northwards shifts in the distribution of fish, seabirds, marine mammals and benthos[90] and the influx of species from more southern waters.[91] This trend is expected to continue, ultimately leading to both the Arctic and the Antarctic region increasingly becoming hotspots of species richness.[92]

LITTLE (DYNAMIC) PROTECTION TO DATE

In its 2013 Arctic biodiversity assessment, the Arctic Council working group on Conservation of Arctic Flora and Fauna (CAFF) recommended that Arctic States "*Advance the protection of large areas of ecologically important marine […] habitats, taking into account ecological resilience in a changing climate*".[93] The 2015 Framework for a Pan-Arctic Network of Marine Protected Areas elaborated by the Arctic Council working group on the Protection of the Arctic Marine Environment (PAME) provided a sound foundation for future regional collaboration in marine conservation by setting out a common vision for the development and management of MPAs in the Arctic Ocean.[94]

Despite these promising regional assessments, the coverage of MPAs in Arctic waters is still rather small when compared to other marine regions. In the 2017 Arctic Protected Areas Indicator Report, the marine area under protection was determined to be 4.7 percent.[95] While a major success was reached since then by Canada's designation of parts of the 'last ice area' above Canada's Arctic Archipelago and north- west Greenland as protected areas (Tuvaijuittuq MPA and Tallurutiup Imanga National marine conservation

area), marine protection in the Arctic region did not reach the Aichi Biodiversity Target 11 goal of 10 percent of coastal and marine areas to be protected by 2020 (Figure 2).[**]

Research shows that existing MPAs in the Arctic Ocean offer little or no protection to many habitats and

Figure 2. Marine protected areas in the Arctic classified according to IUCN protected area management categories. Source: PAME (2021). Available at: https://pame.is/projects/marine-protected-areas

deep seafloor features that coincide spatially with areas likely to be of interest to industry[96], indicating the need for greater protection. In addition, the MPAs existing to date have static locations and boundaries. While dynamic area-based management partly occurs in fisheries, it is not a central consideration in the current planning of MPAs in the Arctic.

OBSTACLES TO DYNAMIC MARINE CONSERVATION IN THE ARCTIC

[**] In 2010, the Conference of the Parties to the Convention on Biological Diversity (CBD) adopted a Strategic Plan for Biodiversity for 2011-2020. As part of the Strategic Plan, 20 Aichi Biodiversity Targets were agreed upon. According to Aichi Biodiversity Target 11, 10 per cent of marine and coastal areas shall be conserved through protected areas and other effective area-based conservation measures by 2020.

The governance structures present in the Arctic arguably render dynamic marine conservation a challenge since the level and type of protection which can be provided to certain features such as the sea ice or certain species depend on their location within a certain coastal state's maritime jurisdiction or the high seas. Also, the establishment of MPAs is usually a lengthy process. Tarium Niryutait, the first MPA established in the Canadian Arctic for example took 12 years from the first public consultations to establishment.[97] In a similar manner, revisions of existing plans and spatial changes would likely again involve considerable negotiations among stakeholders and rights holders in the region, even more so when proposed areas conflict with areas of economic interest.[98] In addition, uncertainties remain as to how exactly species will respond to climate change.[99]

POLICY RECOMMENDATIONS

- *Promote initiatives for regional conservation planning considering climate change impacts*

Building on the efforts undertaken by the Arctic states as well as under the auspices of the Arctic Council and elsewhere, the design of an interconnected, transboundary, pan-Arctic MPA network should be supported. Such a network should also link to existing MPA networks (such as under OSPAR) and create connectivity with sub-arctic regions. As part of this network, it will be crucial to define areas which are or will be important against the backdrop of expected climate change impacts. Conservation planning for these areas should be designed around climate change impacts from the start, thus avoiding lengthy processes for adapting areas in the future.

- *Protect climate refugia and dynamic features*

So-called climate refugia need to be identified and protected. These are areas which are changing slower than the average environment, meaning that species, habitats or ecosystems in these areas may be more likely to persist. It will for example be crucial to protect the areas where sea ice is projected to persist longest as these areas will become ever more vital for sea-ice dependent species, as well as to the people whose cultures and livelihoods depend on these species. The protection of Tuvaijuittuq and Tallurutiup Imanga in Canada's High Arctic is a great start in this regard. These initiatives should be further strengthened, and more areas should be set aside for conservation in the future. To protect mobile species and dynamic oceanographic habitats such as fronts, currents, or eddies, dynamic conservation tools should be developed and implemented. These could also be used to offer protection to key species or habitats which shift outside the boundaries of static MPAs.[100] The boundaries of mobile or dynamic MPAs could for example be defined by environmental features, such as sea surface temperature bands, the presence of specific species which would need to be visually or acoustically detected, or by modelling or forecasting exercises which predict certain habitats or species to be present.[101]

- *Improve data availability through (regional) cooperation and coordination*

To determine where species or dynamic habitats occur, relevant information needs to be collected and disseminated widely and monitoring schemes need to be put in place.[102] The Circumpolar Biodiversity Monitoring Programme (CBMP) set up under the auspices of the Arctic Council is a vital initiative in this regard which should be strengthened in order to expand the knowledge about status and trends in Arctic biodiversity. The use of technologies related to animal tracking, satellite imagery, computing capacity[103] as well as community-based monitoring networks will be crucial for obtaining the relevant data.[104]

- *Engage all relevant stakeholders and rights holders*

A multi-stakeholder approach bringing together governments, administration, NGOs, industry, Indigenous rights holders and local stakeholders will be needed to develop effective conservation strategies in the Arctic. Especially the involvement of Indigenous communities is key in the region as it not only allows for an improved understanding of relationships and changes underway in Arctic ecosystems, current and historical trends[105], but is also key to ensuring sustainable livelihoods.

- *Explore the opportunities for improving conservation through sector-based AMBTs*

Apart from MPAs, other ABMTs are much needed in order to mitigate cumulative impacts from industrial activities. Especially for wide-ranging species, dynamic ABMTs may be the only practicable way to ensure adequate protection.[106] Possible dynamic measures could for example include ship- routing measures which are responsive to the current distribution of whales or special responsive gear restrictions to avoid bycatch. These measures could be introduced by states as well as recommended for adoption more widely by the relevant international sectoral organizations.[107]

REFERENCES

[1] Buixadé Farré, Albert, Scott R. Stephenson, Linling Chen, Michael Czub, Ying Dai, Denis Demchev, Yaroslav Efimov, et al. "Commercial Arctic Shipping through the Northeast Passage: Routes, Resources, Governance, Technology, and Infrastructure." Polar Geography 37, no. 4 (2014): 298–324. https://doi.org/10.1080/1088937x.2014.965769.

[2] Goble, Paul. "Moscow Pushing Even More Expansive Claims on Arctic." Jamestown, April 22, 2021. https://jamestown.org/program/moscow-pushing-even-more-expansive-claims-on-arctic/.

[3] Walsh, Nick Paton. "Satellite Images Show Huge Russian Military Buildup in the Arctic." CNN. Cable News Network, April 5, 2021. https://edition.cnn.com/2021/04/05/europe/russia-arctic-nato-military-intl-cmd/index.html.

[4] Koh, Swee Lean Collin. "China's Strategic Interest in the Arctic Goes beyond Economics." Defense News. Defense News, May 11, 2020. https://www.defensenews.com/opinion/commentary/2020/05/11/chinas-strategic-interest-in-the-arctic-goes-beyond-economics/.

[5] Aggarwal, Sahana Ghosh and Mayank. "India's Draft Arctic Policy Explores What the Two Regions Can Do for Each Other." The Wire Science, January 23, 2021. https://science.thewire.in/environment/india-draft-arctic-policy/.

[6] "What Is Japan's Arctic Interest?" The Polar Connection, January 24, 2017. https://polarconnection.org/japan-arctic-interest/.

[7] Overthecircle. "South Korea's Arctic Journeys." Over the Circle, February 10, 2018. https://overthecircle.com/2018/02/10/south-koreas-arctic-journeys/.

[8] Sittlow, Brian. 2020. *What's at Stake With Rising Competition in the Arctic?* 1 May. Accessed October 31, 2021. https://www.cfr.org/inbrief/whats-stake-rising-competition-arctic.

[9] Rios, John J. 2005. "Naval Mines in the 21ST Century: Can NATO Navies Meet the Challenge?" Monterey: Naval Postgraduate School, June.

[10] Edwards, Joshua. 2019. "Preparing Today for the Mines of Tomorrow." Naval War College Review 40-61.

[11] Chatham House. 2014. International Law Applicable to Naval Mines. Workshop Summary, London: Chatham House.

[12] Geneva Call. 2021. *Naval Mines and International Humanitarian Law.* 31 October. https://www.genevacall.org/news/naval-mines-and-international-humanitarian-law/.

[13] Youngblood, Norman. 2006. The Development of Mine Warfare: A Most Murderous and Barbarous Conduct. Greenwood.

[14] Gnam, Carl. "The Murmansk Run: Running the Gauntlet of WWII's Arctic Convoys." Warfare History Network, October 24, 2020. https://warfarehistorynetwork.com/2017/04/03/the-murmansk-run-running-the-gauntlet-of-wwiis-arctic-convoys/.

[15] Peck, Michael. 2020. Russia Wants To Use AI-Sea Mines To Sink America's Navy. 8 February. Accessed May 2021. https://nationalinterest.org/blog/buzz/russia-wants-use-ai-sea-mines-sink-americas-navy-120951.

[16] Goldstein, Lyle J. 2021. China and Russia Love Naval Mines: Here's Why America Should Too. 3 March. Accessed May 2021. https://nationalinterest.org/blog/reboot/china-and-russia-love-naval-mines-here%E2%80%99s-why-america-should-too-179236

[17] "Sea Bottom Mine (Mod.1) MDM-2: Catalog Rosoboronexport." Рособоронэкспорт. Accessed May 25, 2021. http://roe.ru/eng/catalog/naval-systems/shipborne-weapons/mdm-2/.

[18] "Chinese Seize U.S. Navy Underwater Drone in South China Sea." U.S. DEPARTMENT OF DEFENSE. Accessed May 25, 2021. https://www.defense.gov/Explore/News/Article/Article/1032823/chinese-seize-us-navy-underwater-drone-in-south-china-sea/.

[19] Geneva Call. 2021. *Naval Mines and International Humanitarian Law.* 31 October. https://www.genevacall.org/news/naval-mines-and-international-humanitarian-law/.

[20] Rios, John J. 2005. "Naval Mines in the 21ST Century: Can NATO Navies Meet the Challenge?" Monterey: Naval Postgraduate School.

[21] Ibid.

[22] Mathewson, Andro R. 2021. *Un-crewed Underwater Technologies in the Arctic.* 28 July. Accessed October 31, 2021. https://wavellroom.com/2021/07/28/uncrewed-underwater-vehicles-artic/.

[23] Mason, Geoffrey B. 2006. *Naval History.* Accessed October 31, 2021. http://www.naval-history.net/xGM-Ops-Minelaying.htm#1.

[24] Harris, P. T., Macmillan-Lawler, M., Kullerud, L., & Rice, J. C. (2018). *Arctic marine conservation is not prepared for the coming melt.* ICES Journal of Marine Science, 75(1), 61-71.

[25] UN General Assembly, Convention on the Law of the Sea, 10 December 1982. https://www.refworld.org/docid/3dd8fd1b4.html, last accessed 21 January 2021.

[26] United Nations. (2011). United Nations Declaration on the Rights of Indigenous Peoples.

[27] Chircop, A., Koivurova, T., & Singh, K. (2019). *Is There a Relationship between UNDRIP and UNCLOS?.* Ocean Yearbook Online, 33(1), 90-130.

[28] 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

[29] Post, E., Bhatt, U. S., Bitz, C. M., Brodie, J. F., Fulton, T. L., Hebblewhite, M., ... & Walker, D. A. (2013). Ecological consequences of sea-ice decline. Science, 341(6145), 519-524.

[30] Macias-Fauria, M., & Post, E. (2018). Effects of sea ice on Arctic biota: An emerging crisis discipline. Biology letters, 14(3), 20170702.

[31] Johannessen, O. M., & Miles, M. W. (2011). Critical vulnerabilities of marine and sea ice–based ecosystems in the high Arctic. Regional Environmental Change, 11(1), 239-248.

[32] Post, E., Bhatt, U. S., Bitz, C. M., Brodie, J. F., Fulton, T. L., Hebblewhite, M., ... & Walker, D. A. (2013). Ecological consequences of sea-ice decline. Science, 341(6145), 519-524.

[33] Ibid.

[34] Macias-Fauria, M., & Post, E. (2018). Effects of sea ice on Arctic biota: An emerging crisis discipline. Biology letters, 14(3), 20170702.

[35] Meier, W. N., Hovelsrud, G. K., Van Oort, B. E., Key, J. R., Kovacs, K. M., Michel, C., Haas, C., Granskrog, M.A., Gerland, S., Perovich, D.K., Makshtas, and Reist, J. D. (2014). Arctic sea ice in transformation: A review of recent observed changes and impacts on biology and human activity. Reviews of Geophysics, 52(3), 185-217.

[36] Vogel, B., & Bullock, R. C. (2020). Institutions, indigenous peoples, and climate change adaptation in the Canadian Arctic. GeoJournal, 1-18.

[37] Chircop, A., Koivurova, T., & Singh, K. (2019). *Is There a Relationship between UNDRIP and UNCLOS?.* Ocean Yearbook Online, 33(1), 90-130.

[38] Gómez Isa, F. (2019). The UNDRIP: an increasingly robust legal parameter. The International Journal of Human Rights, 23(1-2), 7-21.

[39] Johnstone, R. L. (2017). Indigenous rights in the marine Arctic. Governance of Arctic offshore oil and gas, 72-91.

[40] Chircop, A., Koivurova, T., & Singh, K. (2019). *Is There a Relationship between UNDRIP and UNCLOS?*. Ocean Yearbook Online, 33(1), 90-130.

[41] Ibid.

[42] Hassan, D., & Alam, A. (2018). *Future of international marine environmental law and policy*. International Marine Environmental Law and Policy, 52.

[43] Chircop, A., Koivurova, T., & Singh, K. (2019). *Is There a Relationship between UNDRIP and UNCLOS?*. Ocean Yearbook Online, 33(1), 90-130.

[44] Ibid.

[45] International Labour Organization (ILO), Indigenous and Tribal Peoples Convention, C169, 27 June 1989, C169, available at: https://www.refworld.org/docid/3ddb6d514.html [accessed 15 September 2021]

[47] Kirton, J., & Warren, B. (2020). A Fragile First Step? G7 and G20 Governance of Climate Change, the Environment, Health and Indigenous Peoples. In annual convention of the International Studies Association, Hawaii.

[48] Chang, W. B. (2013). Indigenous Values and the Law of the Sea. In Governing Ocean Resources (pp. 427-445). Brill Nijhoff.

[49] Chircop, A., Koivurova, T., & Singh, K. (2019). *Is There a Relationship between UNDRIP and UNCLOS?*. Ocean Yearbook Online, 33(1), 90-130.
[50] William D. Halliday, Matthew K. Pine, and Stephen J. Insley, "Underwater Noise and Arctic Marine Mammals: Review and Policy Recommendations," *Environmental Reviews* 28, no. 4 (December 2020): 438–48, https://doi.org/10.1139/er-2019-0033.
[51] Brandon L. Southall et al., "Seasonal Trends in Underwater Ambient Noise near St. Lawrence Island and the Bering Strait," *Marine Pollution Bulletin* 157 (August 2020): 111283, https://doi.org/10.1016/j.marpolbul.2020.111283.
[52] PAME, "Underwater Noise in the Arctic A State of Knowledge Report" (Rovaniemi: Protection of the Arctic Marine Environment (PAME) Secretariat, Akureyri, May 2019).
[53] Donna D. W. Hauser, Kristin L. Laidre, and Harry L. Stern, "Vulnerability of Arctic Marine Mammals to Vessel Traffic in the Increasingly Ice-Free Northwest Passage and Northern Sea Route," *Proceedings of the National Academy of Sciences* 115, no. 29 (July 17, 2018): 7617–22, https://doi.org/10.1073/pnas.1803543115; PAME, "Underwater Noise in the Arctic A State of Knowledge Report."
[54] Christine Erbe et al., "Managing the Effects of Noise From Ship Traffic, Seismic Surveying and Construction on Marine Mammals in Antarctica," *Frontiers in Marine Science* 6 (November 6, 2019): 647, https://doi.org/10.3389/fmars.2019.00647; Kathleen M. Stafford et al., "Seasonal Acoustic Environments of Beluga and Bowhead Whale Core-Use Regions in the Pacific Arctic," *Deep Sea Research Part II: Topical Studies in Oceanography* 152 (June 2018): 108–20, https://doi.org/10.1016/j.dsr2.2017.08.003; PAME, "Underwater Noise in the Arctic A State of Knowledge Report."
[55] Bryan C. Pijanowski et al., "Soundscape Ecology: The Science of Sound in the Landscape," *BioScience* 61, no. 3 (March 1, 2011): 203–16, https://doi.org/10.1525/bio.2011.61.3.6; Halliday, Pine, and Insley, "Underwater Noise and Arctic Marine Mammals."
[56] Halliday, Pine, and Insley, "Underwater Noise and Arctic Marine Mammals."
[57] Halliday, Pine, and Insley.
[58] PAME, "The Increase in Arctic Shipping 2013-2019," Status Report, Arctic Shipping Status Report (Protection of the Arctic Marine Environment (PAME) Secretariat, Akureyri, March 2020).

[59] PAME, "Shipping in the Northwest Passage: Comparing 2013 with 2019," Status Report, Arctic Shipping Status Report (Protection of the Arctic Marine Environment (PAME) Secretariat, Akureyri, April 2021).
[60] Charla Basran and Marianne Rasmussen, "Conflicts Between Arctic Industries and Cetaceans," 2020, 95–115, https://doi.org/10.1007/978-3-030-28404-6_5.
[61] Albert Palomino-González et al., "Drones and Marine Mammals in Svalbard, Norway," *Marine Mammal Science* n/a, no. n/a, accessed April 20, 2021, https://doi.org/10.1111/mms.12802.
[62] Petter Kvadsheim et al., "Behavioural Response Studies of Cetaceans to Naval Sonar Signals in Norwegian Waters - 3S-2011 Cruise Report," November 1, 2011, 179.
[63] Brandon L. Southall et al., "Underwater Noise from Large Commercial Ships—International Collaboration for Noise Reduction," in *Encyclopedia of Maritime and Offshore Engineering* (American Cancer Society, 2017), 1–9, https://doi.org/10.1002/9781118476406.emoe056.
[64] Marine Mammal Commission, "Marine Mammals and Noise: A Sound Approach to Research and Management," May 2007, 370; Southall et al., "Underwater Noise from Large Commercial Ships—International Collaboration for Noise Reduction."
[65] PAME, "Underwater Noise in the Arctic A State of Knowledge Report."
[66] Halliday, Pine, and Insley, "Underwater Noise and Arctic Marine Mammals."
[67] William D. Halliday et al., "Potential Exposure of Beluga and Bowhead Whales to Underwater Noise from Ship Traffic in the Beaufort and Chukchi Seas," *Ocean & Coastal Management* 204 (April 15, 2021): 105473, https://doi.org/10.1016/j.ocecoaman.2020.105473.
[68] Heidi Ahonen et al., "The Underwater Soundscape in Western Fram Strait: Breeding Ground of Spitsbergen's Endangered Bowhead Whales," *Marine Pollution Bulletin* 123, no. 1–2 (October 2017): 97–112, https://doi.org/10.1016/j.marpolbul.2017.09.019.
[69] William D. Halliday et al., "Potential Impacts of Shipping Noise on Marine Mammals in the Western Canadian Arctic," *Marine Pollution Bulletin* 123, no. 1–2 (October 2017): 73–82, https://doi.org/10.1016/j.marpolbul.2017.09.027.
[70] Basran and Rasmussen, "Conflicts Between Arctic Industries and Cetaceans."
[71] P. J. O. Miller et al., "First Indications That Northern Bottlenose Whales Are Sensitive to Behavioural Disturbance from Anthropogenic Noise," *Royal Society Open Science* 2, no. 6 (n.d.): 140484, https://doi.org/10.1098/rsos.140484; Paul J. Wensveen et al., "Northern Bottlenose Whales in a Pristine Environment Respond Strongly to Close and Distant Navy Sonar Signals," *Proceedings of the Royal Society B: Biological Sciences* 286, no. 1899 (March 27, 2019): 20182592, https://doi.org/10.1098/rspb.2018.2592.
[72] Petter H. Kvadsheim et al., "Avoidance Responses of Minke Whales to 1-4kHz Naval Sonar," *Marine Pollution Bulletin* 121, no. 1–2 (August 15, 2017): 60–68, https://doi.org/10.1016/j.marpolbul.2017.05.037.
[73] Marine Mammal Commission, "Marine Mammals and Noise: A Sound Approach to Research and Management."
[74] Dugald J. M. Thomson and David R. Barclay, "Real-Time Observations of the Impact of COVID-19 on Underwater Noise," *The Journal of the Acoustical Society of America* 147, no. 5 (May 1, 2020): 3390–96, https://doi.org/10.1121/10.0001271.
[75] PAME, "Underwater Noise in the Arctic A State of Knowledge Report"; Halliday, Pine, and Insley, "Underwater Noise and Arctic Marine Mammals."
[76] Emily Chou et al., "International Policy, Recommendations, Actions and Mitigation Efforts of Anthropogenic Underwater Noise," *Ocean & Coastal Management* 202 (March 1, 2021): 105427, https://doi.org/10.1016/j.ocecoaman.2020.105427.
[77] Halliday et al., "Potential Exposure of Beluga and Bowhead Whales to Underwater Noise from Ship Traffic in the Beaufort and Chukchi Seas."
[78] Palomino-González et al., "Drones and Marine Mammals in Svalbard, Norway."
[79] PAME, "Shipping in the Northwest Passage: Comparing 2013 with 2019."
[80] International Maritime Organization, "Guidelines for the Reduction of Underwater Noise from Commercial Shipping to Address Adverse Impacts on Marine Life," April 7, 2014.
[81] Benjamin R. Colbert, "Trends and Developments in International Regulation of Anthropogenic Sound in Aquatic Habitats," *The Journal of the Acoustical Society of America* 147, no. 5 (May 1, 2020): 3100–3107, https://doi.org/10.1121/10.0001139.
[82] Halliday, Pine, and Insley, "Underwater Noise and Arctic Marine Mammals."
[83] Halliday, Pine, and Insley.

[84] Dalaklis, D., Drewniak, M. L., & Schröder-Hinrichs, J. U. (2018). Shipping operations support in the "High North": examining availability of icebreakers along the Northern Sea Route. *WMU Journal of Maritime Affairs*, *17*(2), 129–147. https://doi.org/10.1007/s13437-018-0142-7

[85] Cashion, T., Nguyen, T., Brink, T. ten, Mook, A., Palacios-Abrantes, J., & Roberts, S. M. (2020). Shifting seas, shifting boundaries: Dynamic marine protected area designs for a changing climate. *PLoS ONE*, *15*(11), 1–17. https://doi.org/10.1371/journal.pone.0241771

[86] Fredston-Hermann, A., Gaines, S. D., & Halpern, B. S. (2018). Biogeographic constraints to marine conservation in a changing climate. *Annals of the New York Academy of Sciences*, *1429*, 5–17. https://doi.org/10.1111/nyas.13597

[87] *AMAP. (2021). Arctic Climate Change Update 2021: Key Trends and Impacts.*

[88] AMAP. (2017). *Snow, Water, Ice and Permafrost in the Arctic. Summary for Policy-makers.*
[89] CAFF. (2017). *State of the Arctic Marine Biodiversity Report.* https://doi.org/978-9935-431-63-9
[90] Harris, P. T., Macmillan-Lawler, M., Kullerud, L., & Rice, J. C. (2018). Arctic marine conservation is not prepared for the coming melt. *ICES Journal of Marine Science*, *75*(1), 61–71. https://doi.org/10.1093/icesjms/fsx153
[91] CAFF. (2017). *State of the Arctic Marine Biodiversity Report.* https://doi.org/978-9935-431-63-9
[92] Fredston-Hermann, A., Gaines, S. D., & Halpern, B. S. (2018). Biogeographic constraints to marine conservation in a changing climate. *Annals of the New York Academy of Sciences*, *1429*, 5–17. https://doi.org/10.1111/nyas.13597

[93] CAFF. (2013). *Arctic Biodiversity Assessment 2013: Status and Trends in Arctic Biodiversity*.

[94] PAME. (2015). *Framework for a Pan-Arctic Network of Marine Protected Areas*.

[95] Barry, T., Helgason, H., & Gudmundsdottir, S. (2017). Arctic Protected Areas Indicator Report 2017. *CAFF and PAME*.

[96] Harris, P. T., Macmillan-Lawler, M., Kullerud, L., & Rice, J. C. (2018). Arctic marine conservation is not prepared for the coming melt. *ICES Journal of Marine Science*, *75*(1), 61–71. https://doi.org/10.1093/icesjms/fsx153
[97] Wenzel, L., Gilbert, N., Goldsworthy, L., Tesar, C., Mcconnell, M., & Okter, M. (2016). Polar opposites? Marine conservation tools and experiences in the changing Arctic and Antarctic. *Aquatic Conservation: Marine and Freshwater Ecosystems*, *26*, 61–84. https://doi.org/10.1002/aqc.2649
[98] Pinsky, M. L., Rogers, L. A., Morley, J. W., & Frölicher, T. L. (2020). Ocean planning for species on the move provides substantial benefits and requires few trade-offs. *Science Advances*, *6*(50). https://doi.org/10.1126/sciadv.abb8428

[99] Maxwell, S. M., Gjerde, K. M., Conners, M. G., & Crowder, L. B. (2020). Mobile protected areas for biodiversity on the high seas. Science, 367(6475). https://doi.org/10.1126/science.aaz9327

[100] Maxwell, S. M., Gjerde, K. M., Conners, M. G., & Crowder, L. B. (2020). Mobile protected areas for biodiversity on the high seas. Science, 367(6475). https://doi.org/10.1126/science.aaz9327

[101] Maxwell, S. M., Gjerde, K. M., Conners, M. G., & Crowder, L. B. (2020). Mobile protected areas for biodiversity on the high seas. Science, 367(6475). https://doi.org/10.1126/science.aaz9327

[102] CAFF. (2017). *State of the Arctic Marine Biodiversity Report.* https://doi.org/978-9935-431-63-9

[103] Maxwell, S. M., Gjerde, K. M., Conners, M. G., & Crowder, L. B. (2020). Mobile protected areas for biodiversity on the high seas. Science, 367(6475). https://doi.org/10.1126/science.aaz9327

[104] CAFF. (2017). *State of the Arctic Marine Biodiversity Report*. https://doi.org/978-9935-431-63-9

[105] CAFF. (2017). *State of the Arctic Marine Biodiversity Report*. https://doi.org/978-9935-431-63-9

[106] Maxwell, S. M., Gjerde, K. M., Conners, M. G., & Crowder, L. B. (2020). Mobile protected areas for biodiversity on the high seas. Science, 367(6475). https://doi.org/10.1126/science.aaz9327

[107] Maxwell, S. M., Gjerde, K. M., Conners, M. G., & Crowder, L. B. (2020). Mobile protected areas for biodiversity on the high seas. Science, 367(6475). https://doi.org/10.1126/science.aaz9327


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