Photo by Dr. David Johnston

Workshop Report

TRANSBOUNDARY MARINE SPECIES AT RISK & THEIR RECOVERY IN A CHANGING CLIMATE

Taking Stock of Canadian and US Scientific and Governance Responses, Enhancing Future Cooperation

Washington, D.C., 3–4 November 2022

Lead Editor: Jonathan J. Choi

Contributing Editors: Olga Koubrak, Jess Kuesel, Michelle Nowlin, Stephen E. Roady, Susan J. Rolston, David L. VanderZwaag

DALHOUSIE UNIVERSITY
MARINE & ENVIRONMENTAL LAW INSTITUTE

Duke Law

1730 M STREET, NW, SUITE 700
WASHINGTON, DC 20036
PHONE: (202) 939-3800
FAX: (202) 939-3868
EMAIL: law@eli.org
WEB: www.eli.org
ENVIRONMENTAL LAW INSTITUTE

OCEAN FRONTIER INSTITUTE

TABLE OF CONTENTS

Land Acknowledgments

As Gould (1992) acknowledges, "there is not a university in this country that is not built on what was once native land." That is certainly true of Duke University, where much of this report was compiled. What is now Durham, North Carolina was originally the territory of several Native nations, including Tutelo (TOO-tee-lo) and Saponi (suh-POE-nee) speaking peoples. Many of their communities were displaced or killed through war, disease, and colonial expansion. Today, the Triangle is surrounded by contemporary Native nations, the descendants of Tutelo, Saponi, and other Indigenous peoples who survived early colonization. These nations include the Haliwa-Saponi (HALL-i-wa suh-POE-nee), Sappony (suh-POE-nee), and Occaneechi (oh-kuh-NEE-chee) Band of the Saponi Nation.

North Carolina's Research Triangle is also home to a thriving urban Native American community who represent Native nations from across the United States. Together, these Indigenous nations and communities contribute to North Carolina's ranking as the state with the largest Native American population east of Oklahoma. We would like to acknowledge, honor, and respect the diverse history of Indigenous peoples in North Carolina and across the settler state. We would also like to recognize their continuing connections to land, water, and culture and pay respect to their Elders, past, present and emerging. To learn more, please visit Occaneechi: A Past and Present History and the Homeland Preservation Project.

In addition, we acknowledge the overlapping histories of this land, including past violence and ongoing harm produced by the legacy of racialized slavery and oppression. We know of at least four sites where slavery was practiced on what is now considered Duke Forest land, including the Alexander Hogan Plantation in Blackwood Division, the Robson Mill and Barbee property in the Korstian Division, and the Couch property in the Durham Division. Moreover, Washington Duke owned a slave and hired slave labor to work his agricultural land before the Civil War. His son's inheritance, which helped create the wealth from which the Duke Endowment grew, was thus a product of slavery and the Jim Crow system.

For some people, it is uncomfortable to acknowledge the cruelty and exploitation that gave birth to this country, this community, and this educational institution. By acknowledging this history, we hope to better understand the legacy of Duke and our role in creating "a more perfect union."[1]

The participants from Dalhousie University acknowledge that Dalhousie is located in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq. We are all Treaty people.

[1] Modified from Hanson, J. K. Lyons, L. Rangel, & J. Whitten. 2020. "Inclusive Conservation: Improving Collaboration with Tribes in the United States." Masters Project Symposium, Duke University, 2 April 2020. See also Gould, J. 1992. The problem of being "Indian": One mixed-blood's dilemma. In S. Smith and J. Watson (Eds.), *De/colonizing the subject: The politics of gender in women's autobiography* (pp. 81–90). Minneapolis: University of Minnesota Press.; California State University San Marcos & California Indian Culture and Sovereignty Center, *Land Acknowledgment: You're on California Indian Land, Now What? Acknowledging Relationships to Space & Place* (2019).

Special thanks to Drs. Ryan Emanuel and Malinda Lowery of the Lumbee tribe for contributing lines to this acknowledgement and to members of the Duke Native American Student Association, Paul James, Sara Childs, and Rebecca Hoeffler for feedback. Also thanks to Professor Nicki Cagle for her help in developing this acknowledgment for the Nicholas School.

Acknowledgements

This Workshop was sponsored by the Duke University Environmental Law and Policy Clinic, the Marine and Environmental Law Institute at Dalhousie University, the Ocean Frontier Institute, housed at Dalhousie University, and the Environmental Law Institute. Additional funding included research and workshop support by the Next Wave Fund, Dalhousie University, the Canada First Research Excellence Fund through the Ocean Frontier Institute, the Social Sciences and Humanities Research Council of Canada through the Canada Research Chairs Program, the Duke Environmental Law and Policy Clinic, and the Bob Barker Endowment Fund for the Study of Animal Rights Law.

Abbreviations

BBNJ	Biodiversity Beyond National Jurisdiction
CMS	Convention on the Conservation of Migratory Species of Wild Animals
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
EBM	ecosystem-based management
ESA	Endangered Species Act (United States)
DFO	Fisheries and Oceans Canada
ICCAT	International Commission for the Conservation of Atlantic Tunas
MECC	Minister of Environment and Climate Change Canada
MMPA	Marine Mammal Protection Act (United States)
MPA	marine protected area
NARW	North Atlantic right whale
NMFS	National Marine Fisheries Service (NOAA Fisheries) (United States)
NOAA	National Oceanic and Atmospheric Administration (United States)
OECM	other effective area-based conservation measure
PC	Parks Canada Agency
SARA	Species at Risk Act (Canada)
UNEP	United Nations Environment Programme
USFWS	United States Fish and Wildlife Service

Background

Migratory species connect different and distant ecosystems in complex relationships by transporting nutrients and pathogens and by restructuring ecosystem food webs.[2] Migratory species are distinct from nomadic or foraging animals in that their movement is a regularly, typically seasonal departure from an established home territory to a different home territory.[3] Yet, the existence of multiple home territories raises critical management questions, as animals must have both wintering, breeding, and other habitats, as well as corridors through which to travel.[4] This challenge is difficult enough when the animal remains within a single nation's borders—the added challenge of coordination across borders requires deeper cooperation among disparate regulatory bodies.

Coordination between the United States and Canada with respect to cross-border migratory species has been ongoing for decades, beginning with the Migratory Bird Convention of 1916.[5] However, new technology, shifting marine species population distributions exacerbated by climate change, and changes in fishing activity all pose unique challenges and opportunities to deepen that collaboration.

Introduction

On November 3 and 4, 2022, a group of government officials, academics, non-governmental organization representatives, scientists and lawyers gathered at the offices of Duke University in Washington DC to discuss how to improve the management of marine migratory species that cross the US and Canadian border. The convening, sponsored by Duke University, the Marine and Environmental Law Institute at Dalhousie University, the Ocean Frontier Institute, housed at Dalhousie University, and the Environmental Law Institute, provided ample opportunity for frank discussion and highlighted numerous avenues for coordination between the United States and Canada. This report summarizes the two days of meetings, presentations, and discussions.

This report proceeds panel by panel, summarizing the themes and information provided by the panelists. At the end of each panel report brief comments and discussions from the subsequent question and answer period are presented. Duke researchers also developed a set of detailed recommendations based on this workshop which will be published separately. As the workshop was conducted under Chatham House rules, participants are only identified with the comments they made as part of presentations and only after we received their permission.

The workshop was organized under six panels:

1. Existing US and Canadian law and policy
2. Existing transboundary cooperative efforts
3. Management for transboundary cetaceans

[2] S. Bauer and B. J. Hoye, "Migratory Animals Couple Biodiversity and Ecosystem Functioning Worldwide," *Science* 344, no. 6179 (April 4, 2014): 1242552, https://doi.org/10.1126/science.1242552.
[3] Joshua J. Horns and Çağan H. Şekercioğlu, "Conservation of Migratory Species," *Current Biology* 28, no. 17 (September 10, 2018): R980–83, https://doi.org/10.1016/j.cub.2018.06.032.
[4] Horns and Şekercioğlu.
[5] "Convention Between the United States and Great Britain for the Protection of Migratory Birds," *The American Journal of International Law* 11, no. 2 (1917): 62–66, https://doi.org/10.2307/2212197.

4. Management for transboundary sharks
5. International law mechanisms that might have implications for future collaboration
6. Other international law collaborative mechanisms as potential examples of effective collaboration for potential lessons

Appendices 1 and 2 are the background briefing materials developed by students at Dalhousie University and Duke University which summarize the management mechanisms of Canada and the United States respectively. These reports also present the natural history of a few case study species that were provided as a basis for shared discussion. Appendix 3 sets out the Workshop agenda.

Workshop Scope and Objectives

The Workshop was specifically limited to the context of *marine* migratory species, namely migratory whales, sharks, and fish. The workshop had four objectives:

1. To take stock of scientific understandings related to transboundary marine species at risk, including migratory corridors

2. To compare Canadian and US national approaches and challenges in recovering marine transboundary species at risk

3. To assess the role and limitations of existing cooperative management mechanisms and consider how such measures could be strengthened to further the recovery of marine species at risk in a rapidly changing ocean

4. To explore ways in which bilateral and regional cooperation might be enhanced in the future to address shifting species migrations and distributions, including through the use of effective area-based measures and/or the establishment of a transboundary network of marine protected areas (MPAs)

Executive Summary

In November of 2022, academics, non-profit and government experts, and officials from the United States and Canada gathered for a two-day workshop focused on the conservation of marine migratory species. The workshop's objectives were to take stock of existing science, evaluate differences in national policies, and consider how to improve bilateral cooperation and conservation efforts, a need of heightened urgency considering anticipated climate change-induced distribution shifts. The workshop was held at the Duke in D.C. offices in Washington, D.C.

Numerous marine migratory species populations—defined here to include whales, fish, sharks, and sea turtles—traverse the United States-Canada border. These species are of immense ecological, cultural, and economic value. Their boundary-spanning nature demands collaboration to ensure their long-term longevity and health. Unfortunately, collaboration and bilateral cooperation are hampered by differences in the two countries' governing structure and priorities, lack of resources for research and management, as well as fundamental lack of information about the species' basic biology. These barriers must be overcome if we are to save these species and the critical role they play in the region's ocean ecosystem.

Over the two-day workshop, experts discussed existing scientific efforts and legal regimes on both sides of the border. They also discussed tools from international law and other mechanisms for international collaboration. The workshop concluded with small group discussions highlighting potential avenues for improving bilateral cooperation. Workshop participants highlighted the following ideas and proposals:

- Existing informal collaboration, particularly efforts focused on the North Atlantic right whale, is extensive but could be made more efficient. Cooperation should be broadened to include other species and should focus on interoperability. Data should be freely shared among scientists and made accessible between both nations. Both nations should coordinate on regulations for fishing and shipping to avoid duplicating efforts and working at cross-purposes. Finally, both nations should adopt comparable processes for marine protected area designation, design, and monitoring to facilitate research into management efficacy.

- Research could be significantly improved by ensuring shared access to data collection platforms—such as ships, planes, and satellite time—and by providing multi-year funding commitments to pursue longer-term research and monitoring.

- Sharks and rays remain particularly understudied and under protected. Both countries should focus on eliminating unnecessary mortality and rebuilding depleted populations.

- Internationally, both nations should continue to build regional and global cooperation for conservation of migratory species in various forums including regional fisheries management organizations, the North American Marine Protected Area Network, and larger treaty processes like the Biodiversity Beyond National Jurisdiction process.

- Broader changes in conservation paradigms, such as the inclusion of Indigenous knowledge, implementation of ecosystem-based management, and consideration of climate change-driven range shifts, are needed to improve long-term efficacy.

- Building political will is critically important, particularly when conservation action will require tradeoffs with economic activities.

Summaries of the presentations from each panel are provided below. The Workshop Report concludes with reports from each of three small breakout groups, in which workshop participants brainstormed and discussed recommendations to improve bilateral cooperation and coordination efforts. These suggestions are not meant as formal recommendations, but rather provide a springboard for further discussion and action to conserve marine migratory species.

Workshop Organizers

The workshop was planned by a steering committee comprised of representatives from the workshop's co-convening institutions: Dalhousie University's Marine & Environmental Law Institute and Ocean Frontier Institute, the Environmental Law Institute (ELI), Duke University School of Law, and the Duke Marine Lab. The members of the committee are:

- **David L. VanderZwaag**, Director, Marine & Environmental Law Institute and Canada Research Chair in Ocean Law & Governance, Schulich School of Law, Dalhousie University
- **Michelle Nowlin**, Co-Director, Duke Environmental Law and Policy Clinic, Clinical Professor of Law, Duke University School of Law and Nicholas School of the Environment
- **Stephen E. Roady**, Senior Lecturing Fellow, Duke University School of Law and Professor of the Practice, Marine Science and Conservation, Nicholas School of the Environment, Duke University
- **Boris Worm**, Marine Ecologist, Biology Department, Dalhousie University
- **Linda Malone**, Marshall-Wythe Foundation Professor of Law, William & Mary School of Law
- **Xiao Recio-Blanco**, Oceans Program Officer, Builders Initiative, Former Director, Ocean Program, Environmental Law Institute

The steering committee was assisted by an informal advisory group of government representatives: Gonzalo Cid (US National Oceanic and Atmospheric Administration), Katherine Hastings (Fisheries and Oceans Canada), Laura Wenzel (US National Oceanic and Atmospheric Administration), and Chantal Vis (Parks Canada).

Panel Chairs & Rapporteurs

Panel 1	**Chair:** David VanderZwaag, Dalhousie University **Rapporteurs:** Joanna Skrajny, Dalhousie University & John Doherty, Environmental Law Institute
Panel 2	**Chair:** Michelle Nowlin, Duke Law **Rapporteurs:** Katline Barrows & Connor Sakati, Duke University
Panel 3	**Chair:** Steve Roady, Duke Law **Rapporteurs:** Elise Boos & Melissa Skarjune, Duke University
Panel 4	**Chair:** Boris Worm, Marine Ecologist, Biology Department, Dalhousie University **Rapporteurs:** Jess Kuesel & Megan Dister, Duke University
Panel 5	**Chair:** Bette Rubin, JD Student, MEM, substituting for Linda Malone, William & Mary School of Law **Rapporteurs:** Valerie Brankovic, College of William and Mary & Katline Barrows, Duke University
Panel 6	**Chair:** Jonathan Choi, PhD Student, Duke University Nicholas School of the Environment, JD, Duke University School of Law **Rapporteurs:** Connor Sakati & Megan Dister, Duke University

Keynote Address

Vulnerability of Marine Species to Climate Change: Scientific Understandings and Limitations in a Cross-boundary Context

Rapporteurs: Bette Rubin, William & Mary School of Law & Jordan Sarah Head, Dalhousie University

Presenter: Aurore Maureaud, Postdoctoral Associate, Department of Ecology, Evolution & Natural Resources, Rutgers University

Following welcoming remarks from ELI President Jordan Diamond, Professors David VanderZwaag, Michelle Nowlin, and Steve Roady, Dr. Aurore Maureaud formally opened the conference by discussing how many shared marine species are vulnerable to climate change, efforts to improve collaboration including by expanding the spatial and temporal scales of modeling, and reiterating the need to work across disciplines to improve conservation.

Dr. Maureaud first turned our attention to estimates indicating that over 60 per cent of commercial species and more than 90 per cent of marine species generally are shared across jurisdictions, whether that is between exclusive economic zones (EEZ) or between EEZs and the high seas. That is, it is more common for a marine species to be shared across multiple boundaries than it is for a species to be found solely within one jurisdiction. This has been partially addressed by international law emphasizing cooperative management, but there are nevertheless numerous species that fall through management gaps. The problems raised by coordinating across multiple jurisdictions will only become more challenging given climate change driven range shifts. New transboundary stocks can lead to economic and political conflict, as seen in the current conflict over Atlantic mackerel stocks between Britain, Iceland, and the Faroe Islands.

In her work, Dr. Maureaud sees data integration as a major barrier to cross-boundary collaboration. She provided the example of Bering Sea bottom trawl surveys, which are conducted by the US National Oceanic and Atmospheric Administration (NOAA) and the Federal Research Institute of Fisheries and Oceanography (TINRO) in Russia. Coordinating these models to estimate cross-boundary population assessments would dramatically improve management. Cross-boundary collaboration is further complicated by asymmetries in habitat, knowledge, and activities. For example, while the United States invests heavily in giant sea bass fisheries science, much of the sea bass fishing activity is in Mexico. This example highlights the need for synthesized research and bilateral agreements. To address the challenge of data integration, Dr. Maureaud has worked with collaborators to build a broader consortium to share bottom trawl survey data. She noted the importance of trust building to facilitate data sharing.

Dr. Maureaud turned to under-represented taxa, noting that marine invertebrates, deep-sea species, and mesopelagic species remain under-sampled. She gave the example of marine crabs, of which there are over 9,000 species but only 20 per cent have detailed spatial distribution maps. She suggested that for species without extensive data, we could start with a trait-based approach to vulnerability, where we can understand how a species fits into the ecosystem to think through and estimate how the species will react to climate change.

In conclusion, she suggested the need to develop cross-boundary tools to leverage existing information, the need to strengthen open science by building trust, collaboration, and shared resources, and the need for collaboration which spans different jurisdictional scales and across different disciplines and stakeholder groups.

Panel 1: Managing Transboundary Species at Risk in the Face of Climate Change: Canadian and US Law and Policy Overviews

Rapporteurs: Joanna Skrajny, Dalhousie University & John Doherty, Environmental Law Institute

After the initial remarks from Dr. Maureaud, attorneys and program officials from both the United States and Canada provided an overview of existing law and policy. We began with a discussion of laws which focus on the protection of individual species. Peter Ross of Department of Justice Canada spoke about the Species at Risk Act (SARA) and Kristen Monsell of the Center for Biological Diversity presented about the US Endangered Species Act (ESA) and the Marine Mammal Protection Act (MMPA). Discussion then turned to mechanisms for creating and managing marine protected areas with Hilary Ibey and Derek Fenton from Fisheries and Oceans Canada (DFO) presenting the Canadian perspective and Lauren Wenzel of the National Oceanic and Atmospheric Administration (NOAA) presenting the US perspective. The summaries below are provided in order of presentation at the workshop.

Overview of the Species at Risk Act (SARA) as it Applies to Aquatic Species

Presenter: Peter Ross, Legal Counsel, Department of Justice Canada (in person)

Ross provided an overview of the 2002 Canadian Species at Risk Act (SARA)[6] with a focus on its application to aquatic species. The Act works differently with respect to species that are not aquatic species. The express purposes of SARA (s.6) are to prevent wildlife species from becoming extirpated or extinct, provide for the recovery of wildlife species that are extirpated, endangered or threatened as a result of human activity, and to manage species of special concern to prevent them from becoming endangered or threatened. The Minister of Environment and Climate Change (MECC) is responsible for the administrative aspects of SARA, but three "competent ministers" have specific powers, duties and functions related to the species for which they are responsible. The Minister of Fisheries and Oceans (MFO), who leads the Department of Fisheries and Oceans (DFO), is the competent minister with respect to aquatic species, except for individuals of such species in or on federal lands that are administered by the Parks Canada Agency (PCA).

Assessment, Recommendations & Listing of Species in Canada

The Committee on the Status of Endangered Species in Canada (COSEWIC) is an arm's length organization, the members of which must have expertise from such disciplines as conservation biology, population dynamics, taxonomy, systematics or genetics, or from community knowledge or Indigenous knowledge. Members are appointed by the MECC. COSEWIC assesses the status of each wildlife species it considers to be at risk and classifies each species as:

- Extinct
- Extirpated ("no longer exists in the wild in Canada, but exists elsewhere in the wild")
- Endangered ("facing imminent extirpation or extinction")

[6] Species at Risk Act, SC 2002, c 29 [SARA].

- Threatened ("likely to become an endangered species if nothing is done to reverse the factors leading to its extirpation or extinction"), or
- Of Special Concern ("may become a threatened or an endangered species because of a combination of biological characteristics and identified threats")

Alternatively, COSEWIC can determine that the species is not currently at risk, or that there is insufficient information to classify the species.

COSEWIC assessments are provided to the MECC, who in turn makes a recommendation to Cabinet as to whether or not the species should be listed. For aquatic species, the Minister must consult (among others) the MFO before making a recommendation. As a result, DFO is very involved with developing listing recommendations for aquatic species. The MECC and the MFO are also obliged by SARA and the common law to meet other consultation requirements, including consultations with Indigenous organizations. Depending on the species, provinces, territories, industry and non-governmental organizations will also be engaged. This, in addition to scientific and socioeconomic analysis, can result in delays between COSEWIC's assessment and a listing recommendation to Cabinet.

Cabinet has no discretion to change a classification. Its decision-making choices are limited to accepting the assessment and adding the species to the List, deciding not to list the species, or sending the assessment back to COSEWIC for further information or consideration.

Protections for Aquatic Species Listed in Canada

Aquatic species listed as threatened, endangered, or extirpated receive robust protections, including a prohibition against killing, harming, harassing, capturing, or taking of individuals, and damaging or destroying an individual's residence, and possessing, collecting, buying, selling or trading individuals. In addition, the competent minister (the MFO for aquatic species) must prepare a recovery strategy which, among other things, addresses the threats to the survival of the species and identifies the critical habitat of the species to the extent possible. The recovery strategy must also indicate when an action plan will be prepared. Simply put, an action plan implements the recovery strategy, and must include specific information. This suite of prohibitions and recovery strategy and action plan preparation are not applicable for species listed as species of special concern. For those species, the MFO must prepare management plans, which must include measures for the conservation of the species. Notably, there is no obligation to identify or protect critical habitat for species listed as species of special concern.

Critical Habitat Identification in Canada

Critical habitat, partially defined as "the habitat that is necessary for the survival or recovery of a listed wildlife species,"[7] must be identified in the recovery strategy and action plan and must be protected within 180 days of the publication of the final recovery strategy or action plan. Critical habitat includes not only the geographic area, but also particular habitat features that the species relies on.[8] For example, the Nooksack dace, a small freshwater minnow species, relies on riffles

[7] SARA, s. 2(1) ("critical habitat"/"habitat essentiel").
[8] Environmental Defence v. Canada (Fisheries and Oceans), 2009 FC 878 (2009).

(areas of shallow turbulent flow over rocky substrate). Therefore, those attributes of habitat that create riffles should also be identified as part of critical habitat.

In addition, the competent minister is not allowed to delay the identification of critical habitat; identification must be based on the best available information at the time the recovery strategy or action plan is being prepared.[9]

Canadian Critical Habitat Protection

For specific federally-protected areas, critical habitat for aquatic species is protected by the competent minister triggering a prohibition in the Act against its destruction.

For all other areas outside those federally-protected areas, the Act contemplates that critical habitat for aquatic species can be legally protected either:

1. by provisions in, and measures under, SARA or any other Act of Parliament (in the aggregate for a species' critical habitat, these provisions and measures are colloquially known as a "protection statement"), or

2. by triggering the prohibition under SARA against critical habitat destruction.

That said, a 2012 decision of the Federal Court of Appeal has made it difficult to rely on other Acts of Parliament.[10] According to the Court, provisions and measures in a protection statement must provide a level of legal protection equal to the prohibition under SARA, and must be mandatory and enforceable. Ministerial discretion, such as that found in the Fisheries Act, does not provide sufficient legal protection.[11]

Permitting Related to Species Listed in Canada

Section 73 of SARA allows the DFO Minister to enter into an agreement or issue a permit authorizing a person to engage in an activity affecting a listed species for three listed purposes: scientific research, activities that will benefit the species or increase its chances of survival, or activities whose impacts are incidental to the carrying out of the activity. Permits may not be issued to directly authorize the harming of a species (e.g., directed fishing). Among other things, a permit may not be issued if the Minister is of the opinion that the activity will jeopardize the survival or recovery of the species in question. Such a determination must be based on scientific evidence.

Emergency Orders

Ross concluded with a high level overview of the emergency orders scheme under SARA. SARA requires the competent Minister to make a recommendation to Cabinet to make an emergency order

[9] Alberta Wilderness Association v. Canada (Environment) (Sage Grouse), 2009 FC 710 (2009).
[10] Canada (Fisheries and Oceans) v. David Suzuki Foundation (Killer Whale), 2012 FCA 40.
[11] Canada (Fisheries and Oceans) v. David Suzuki Foundation, 2012 FCA 40 (2012).

when he or she is of the opinion that there is an imminent threat to the survival or recovery of the species.[12]

Marine Species Protection Laws in the United States

Presenter: Kristen Monsell, Oceans Legal Director & Senior Attorney, Center for Biological Diversity (in person)

Monsell's talk outlined two major US laws which advance conservation by protecting individual species: the Endangered Species Act of 1973 (ESA) and the Marine Mammal Protection Act of 1972 (MMPA). The ESA begins with the threshold question of whether a species is endangered (i.e., "in danger of extinction throughout all or a significant portion of its range") or threatened (i.e., likely to become endangered in the foreseeable future).[13] A species may be listed because of habitat modification, overexploitation, disease, predation, inadequate regulatory mechanisms, or "other natural or manmade factors affecting its continued existence."[14] The ESA allows listing of species found outside of the United States. The ESA listing process can be initiated by either private individuals who petition the government or through the action of the US Fish and Wildlife Service (USFWS) or NOAA Fisheries for most marine species. The listing decision must be based solely on the "best scientific and commercial data" available and cannot take economics into account.

Once a species is listed, the relevant wildlife agency (i.e., USFWS or NOAA Fisheries) must develop a written recovery plan for each listed species and designate critical habitat for the species. Critical habitat is defined as habitat that is "essential to the conservation of the species" and which "may require special management considerations or protections," both in areas currently occupied by the species and areas outside of the species' range at the time of listing.[15] The ESA also prohibits individuals from "taking" a listed species, with take defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect" a species.[16] An incidental take permit may be issued for an otherwise lawful action that is expected to nevertheless cause take, but such permits are subject to their own set of restrictions.

The ESA also creates obligations for other federal agencies. In particular, whenever a federal agency seeks to propose, authorize, permit, or carry out some action in an area that may affect an endangered species or critical habitat, the agency must consult with the agency that listed the species (i.e., either USFWS or NOAA Fisheries). If an action is likely to adversely affect a listed species, the wildlife agency will write a "biological opinion" to determine whether the action could "jeopardize" the continued existence of the species. If so, it will recommend conservation measures to be taken before the action can go forward. If the agency determines the action will not jeopardize a listed species, but could result in incidental take of members of those species, the biological opinion must include an incidental take statement with measures to minimize the impact of the take, among other requirements.

[12] Adam v. Canada (Environment), 2011 FC 962 (2011).
[13] "Endangered Species Act of 1973", 16 U.S.C. § 1531 (1973).
[14] 16 U.S.C. § 1533(a)(1).
[15] 16 U.S.C. § 1532(5)(A).
[16] 16 U.S.C. § 1532(19).

In contrast to the listing process of the ESA, the MMPA protects all marine mammals regardless of whether they are threatened or endangered.[17] Like the ESA, NOAA Fisheries has jurisdiction over whales, dolphins, porpoises, seals, and sea lions while FWS has jurisdiction over walruses, manatees, sea otters, and polar bears. The Act prohibits actions that kill or harm individual marine mammals. It also prohibits harassment of these marine mammals, defining "harassment" broadly to include any acts with the potential to disturb normal behavior. The agency may issue incidental take permits if the action only affects a small number of individuals, the action has a "negligible impact" on the species, and the actor commits to sufficient migration measures. However, there is considerable uncertainty about what is a 'small number' of individuals within a population being harassed, with one court finding that 10 per cent of the total population was 'small'[18] and another finding that 12 per cent was not.[19]

The MMPA also contains a provision which aims to reduce deaths and serious injuries of marine mammals internationally by requiring foreign fisheries seeking to import fish or fish products to the United States to meet US standards for bycatch avoidance. Under a new rule, NOAA Fisheries issued implementing this provision, Canadian fisheries will need to demonstrate that they meet US standards to keep importing fish or fish products in-to the United States. The United States currently imports billions of dollars' worth of seafood from Canada annually. In this way, the MMPA imports provision provides significant incentive for Canada to adopt measures to reduce bycatch.

Understanding Canadian Marine Protected Area (MPA) Designation and Management and Other Effective Area-based Conservation Measures (OECMs)

Presenters: Hilary Ibey, Manager, Marine Conservation Operations, Fisheries and Oceans Canada (DFO) & Derek Fenton, Marine Planner, Fisheries and Oceans Canada (DFO) (virtual)

Ibey and Fenton provided an overview of Canada's MPAs and other effective area-based conservation measures (OECMs). Though initially motivated by the Aichi Target of 10 per cent of marine and coastal areas protected by 2020, Canada has since set new targets of conserving 25 per cent of marine and coastal areas by 2025 and 30 per cent by 2030. The speakers provided a brief overview of the current various federal tools to protect Canada's oceans.

Canadian Marine Protected Areas

There are four classes of MPAs:

1. *DFO Oceans Act MPA by Governor in Council (GiC) Regulations.* Oceans Act[20] MPAs provide robust protection against the destruction of habitat and are tailored to specific conservation objectives of managed areas. However, the process to make GiC regulations requires Treasury Board approval and can thus take longer to enact, during which time the underlying

[17] "Marine Mammal Protection Act of 1972," 16 U.S.C. § 1361 *et seq.*
[18] Native Village of Chickaloon v NMFS, 947 F. Supp 2d 1031 (D. Alaska 2013).
[19] NRDC v. Evans, 232 F. Supp. 2d 1003 (N.D. Cal. 2002).
[20] Oceans Act, SC 1996, c 31.

habitat remains potentially vulnerable.

2. *DFO Oceans Act MPA by Ministerial Order.* MPAs by ministerial order freeze the development footprint in a designated area. While ongoing activities can continue, new activities are frozen for a five-year period. This regulation, while still requiring consultation and baseline science, is made at the DFO Minister's discretion and thus takes slightly less time to put in place.

3. *Parks Canada National Marine Conservation Areas.* Parks Canada can create and manage National Marine Conservation Areas under the Canada National Marine Conservation Areas (NMCAs) Act.[21] NMCAs require zoning during implementation, allowing them to function as a spatial planning tool.

4. *Environment Climate Change Canada (ECCC) Marine National Wildlife Areas.* National Wildlife Areas with marine portions (mNWAs), created under the Canada Wildlife Act,[22] are typically created to protect seabirds. Established only on federally owned lands, mNWAs are selected on the basis of biological criteria, including areas determined to be important or critical habitat.

Other Effective Area-Based Conservation Measures in Canada

Marine OECMs present an alternative conservation tool which allows for continued human use of an area so long as the area protects marine biodiversity through the provision of long-term biodiversity conservation benefits. Canada has relied heavily on marine OECMs to meet its conservation targets.

Current tools available under the Fisheries Act that may be recognized as OECMs include:

1. Marine refuges created by variation orders/license conditions

2. Marine refuges created by biodiversity protection regulations (a new provision , this process has only been used once)

3. Ecologically significant areas established by GiC regulations (has yet to be used, but could apply OECM criteria)

Marine refuges traditionally have been designed to target fishing activity, while OECMs may be more broadly targeted. Marine refuges have been used to protect sensitive benthic areas and to meet other fisheries management purposes.

In selecting the appropriate tool in the suite of federal options currently being counted towards marine conservation targets it is important to look at the nature of the ecosystem to be protected, the human activities present on the landscape, and what risks they pose to conservation objectives, along with any potential partners/stakeholders in the areas.

[21] Canada National Marine Conservation Areas Act, SC 2002, c 18.
[22] Canada Wildlife Act, RSC, c W-9.

Case Study: Scotian Shelf Bay of Fundy Bioregion

Canada, as an internal organizing principle and as administrative regions, has identified 13 marine bioregions. Fenton used the Scotian Shelf-Bay of Fundy Bioregion as a case study, highlighting its biological importance and its existing suite of MPAs and OECMs. Though the region itself is small, about 15 per cent of its water is protected, with additional areas identified for consideration in 2025 and further into the future. Areas of future protection include planning for climate change, connectivity, and endangered species.

When considering both US and Canadian protections in the Gulf of Maine and the Bay of Fundy, there is robust coverage which has been driven by deep-sea corals, but also extends to other taxa. The development of this protected area network was not coordinated and played out organically. It could be helpful to have future data products which fully integrate all conservation measures in the area across both sides of the border to tell a deeper story of conservation success in the region.

Marine Protected Areas and Other Effective Conservation Measures in US Waters

Presenter: Lauren Wenzel, Director, National Marine Protected Areas (MPA) Center, Office of National Marine Sanctuaries, NOAA (in person)

Wenzel discussed existing US area-based management tools for conservation. The Biden Administration's 'America the Beautiful' initiative has the goal of conserving 30 per cent of national lands and waters by 2030. There are independent goals to protect 30 per cent of US waters through MPAs and OECMs in line with international goals, as well as 30 per cent of US lands and waters as "conserved areas" through the America the Beautiful program. The extent of spatial overlap between the two goals is yet to be determined, but ideally they would be the same areas. The definition of a conserved area is currently being established through an inter-agency process which is focused on land-based conservation and which has significant stakeholder interest and engagement.

Marine protected areas include monuments, sanctuaries, refuges, parks, research reserves, and state and territorial MPAs, each of which confers a different degree of protection. At present, 26 per cent of all US waters are protected[23] with only 3 per cent established as no-take zones. No-take protections generally result in achieving better conservation outcomes. Further, 87 per cent of these protected waters are composed of only two parks, and most of the protections are in the remote Pacific, raising critical questions of spatial distribution. When considering MPA coverage by habitat type, most mangroves and tropical corals reside in protected habitat, as do a significant amount of seagrasses and deep-sea corals.[24]

[23] This statistic includes the Great Lakes as well as estuarine and ocean waters. NOAA, Marine Protected Areas, available at https://marineprotectedareas.noaa.gov/ (last visited May 11, 2023).
[24] Wenzel, L., M. D'Iorio, C. Wahle, G. Cid, Z. Cannizzo and K. Darr. 2020. "Marine Protected Areas 2020: Building Effective Conservation Networks", https://nmsmarineprotectedareas.blob.core.windows.net/marineprotectedareas-prod/media/docs/2020-mpa-building-effective-conservation-networks.pdf, 5.

Internationally, the United States is also working with other countries to promote transboundary conservation efforts. For example, the United States partners with various Caribbean nations to designate MPAs aimed at conserving migratory species. Additional cross-border conservation includes discussion of blue carbon, restoration, climate adaptation, and effective management strategies. There is also a growing interest in Indigenous co-management and engagement initiatives.

OECMs have not yet been identified in the United States, partially because of efforts surrounding the new America the Beautiful process. New decision tools are designed to help structure future discussions about OECMs and America the Beautiful conserved areas by asking five key questions:

1. Purpose: What is the area designed to protect? If the purpose is nature conservation, it is likely an MPA, but otherwise may be considered in a different category.

2. Governance: How is the area governed to equitably achieve long-term conservation goals? Equitable governance is difficult to define, but can be helped through processes like the sanctuary advisory councils which advise marine sanctuary management. Co-management could also be explored.

3. Regulations: How are extraction and other industrial or commercial uses regulated?

4. Monitoring: Is biodiversity monitored, is it well resourced, and how is management responsive to monitoring?

5. Ecosystem services: What ecosystem services and functions does the area support?

The tool allows for a discussion about a continuum of management strategies, acknowledging that more active management generally results in stronger conservation outcomes. Based on the answers to these questions, we can assess whether an area meets the criteria for MPAs or OECMs for the purposes of international targets.

Panel 1 Q&A

Canadian Species at Risk Act & US Endangered Species Act

Discussion began with a question about whether SARA has mechanisms that allow private individuals to petition the Canadian government to list a species as endangered, similar to petitions under the ESA. There is a process to apply to COSEWIC for an assessment of a specific species, which sets the entire SARA listing process into motion.

There was a discussion about the timelines involved in listing species for protection in the United States and Canada. In the United States, if an individual or organization files a petition, the clock starts running, and the ESA requires the wildlife agency to respond to the petition within 12 months of receiving the petition.

In Canada, after COSEWIC provides an assessment to the MECC, there is a timeline in SARA (90 days) for the MECC to indicate how the Minister intends to respond and (to the extent possible)

timelines for action. There is no timeline in the Act for the time between when the Minister receives the assessment and when the Minister makes a listing recommendation to Cabinet. In practice, the timeline can be lengthy because of consultations (some required under SARA and the Constitution), and socio-economic and scientific analysis, as discussed earlier.

Further, in both the United States and Canada, it is hard to successfully challenge a government's listing decision. In the United States, courts often defer to an agency's scientific decisions, though there have been numerous instances in which a court threw out an agency's listing decision on the basis that the agency's decision was not based on the best available science as required by law. In Canada, the Cabinet generally has wide discretion on whether or not to list and can take into account a range of factors.

Timing & Public Comment/Review

The need for public comment and review can lengthen the time required to implement regulations. In the United States, the Administrative Procedure Act requires public notice and opportunity for comment before an agency may adopt regulations, and the National Environmental Policy Act (NEPA) requires the federal government to conduct a formal assessment of environmental impacts and to consider alternatives for major federal actions. It requires public involvement and it can take a while for agencies to go through the full process. However, there are exceptions. For example, the Administrative Procedure Act allows agencies to issue emergency rules for "good cause." In the past, NOAA Fisheries has used the emergency rulemaking process, which is also found in the Marine Mammal Protection Act, to protect North Atlantic right whales from entanglements.[25] Further, NEPA does not apply when an action is considered to benefit the environment by definition (e.g., decisions to list a species under ESA).

In Canada, public review can occur through consultations (some of which are obligatory). Some are built into the law themselves (such as under SARA), some are in common law (e.g., Indigenous consultation obligations arising from the Constitution), and there are some obligations to consult with other levels of government (provinces and territories) and stakeholders as a matter of public policy (e.g., Treasury Board requirements). Also, for certain proposed projects, there is the Impact Assessment Act[26] which, among many other things, requires public input and comment, including experts from different departments depending on the expected impacts.

Marine Protected Areas

There was a question about how long it takes to establish MPAs. In Canada, timelines to establish MPAs often depend on political will and how fast internal processes take. MPA establishment takes roughly 7 years, though there are MPAs that have been listed for years that still have not been established. Once all of the required assessments have been developed, consultations have been undertaken, and the regulatory intent has been finalized, the normal regulatory process takes about

[25] In December 2022, the US Congress passed the Consolidated Appropriations Act of 2023, which includes a rider prohibiting NMFS from adopting or implementing new regulations, including emergency regulations, to restrict gear used in the American lobster and Jonah crab fisheries in an effort to protect North Atlantic right whale and other large whales. This restriction will remain in place until January 1, 2029. Pub. L. No. 117-328, Div. JJ, 136 Stat. 4459, 6089-6090 (2022).

[26] Impact Assessment Act, SC 2019, c 28, s 1.

two years (very generally speaking). In the United States, MPA establishment varies considerably by the type of instrument used and the level of government taking action. The quickest is the national monument designation, which can be enacted through a presidential executive order.

Climate Change Consideration

In discussing climate change, the challenge of climate adaptation and the need to bridge the time scales of climate change and the time scales of regulatory action was raised. In particular, the possibility of mobile reserves that could change annually as conditions change was suggested. Though there is a lot of interest in dynamic management, most of the current work goes into mitigating non-climate impacts because of capacity and capability.

An open question remains with regard to the urgency of climate change: How can we make sure that our relatively slow-moving regulatory actions match the urgency of climate impacts?

Panel 2: The Role and Achievements of Existing Transboundary Cooperative Mechanisms

Rapporteurs: Katline Barrows & Connor Sakati, Duke University

Panel 2 highlighted various examples of current cross-border cooperation, including different working groups, data collaborations, and research. Vincent Saba and Nancy Shackell of NOAA and DFO respectively presented jointly about fisheries science collaboration through the Canadian-US Ecosystem Science Working Group and the need for future collaboration on developing climate change forecasts. Fred Whoriskey shared the experience of the Canada-based Ocean Tracking Network which provides a global infrastructure to track animal movements and serves as a large repository for animal tracking data. Katherine Hastings and Jean Higgins of DFO and NOAA respectively discussed the experiences of the Canada-US Species at Risk Working Group, which has, for two decades, acted as a forum for information exchange and collaboration on issues related to the recovery of species at risk, including Atlantic salmon and the North Atlantic right whale. Finally, Maria Morgado of UN Environment Programme (UNEP) and Chantal Vis of Parks Canada discussed the efforts of the Commission for Environmental Cooperation and the North American Marine Protected Areas Network.

Canadian DFO and US NOAA Climate and Fisheries Science Collaboration to Improve Our Response to Impacts of Climate Change on Marine Ecosystems

Presenters: Vincent Saba, Northeast Fisheries Science Center, NOAA & Nancy Shackell, Senior Research Scientist, Ocean Ecology Section, Ocean and Ecosystem Sciences Division, DFO, Bedford Institute of Oceanography (virtual)

Saba and Shackell highlighted existing efforts at management and collaboration for transboundary marine species through data sharing and research. They focused on the Canada-US Ecosystem Science Working Group (CAUSES), which seeks to inform shared management of fish stocks. In addition to management and ecosystem research, CAUSES also performs climate change-related research to detect changes in ecosystems, understand the mechanisms of change, and create forecasts to inform the response strategies of the two countries.

CAUSES has collaborated to study several species. For example, in studying the American lobster and its vulnerability to climate change, CAUSES considered how changes in species distribution and population will impact coastal communities and fisheries. However, the presenters noted that scientists on either side of the border perform different types of surveys, making it difficult to integrate surveys when creating regional transboundary models.

Although the two countries have successfully collaborated on management of several fish stocks, they disagree on the protection status of Atlantic halibut. The species stock straddles both borders, but Canada certified the population to be sustainably fished in 2013 while the US designated the stock as overfished, with the current estimated biomass at 3 per cent of its target. This disagreement presents questions for future collaborative study and demonstrates why cooperation is important.

Beyond fisheries-specific research, there is also a need for increased collaboration on climate change modeling. Joint efforts to create high-resolution climate models that produce hindcast, forecast, and long-term projections would benefit both Canadian and US managers. The NOAA Climate Ecosystem Initiative is one example of a modeling-focused initiative that benefits the United States and Canada, as the future of fisheries management is heavily reliant on these models. Further, scenario planning could provide managers with the ability to understand how their management strategies may or may not respond based on climate scenarios. Currently, NOAA is conducting scenario planning for the entirety of the North American seaboard with the Atlantic Fisheries Management Council (AFMC). Identifying common priorities in climate and fisheries science for the United States and Canada could help streamline research and management into the future.

Ocean Tracking Network

Presenter: Fred Whoriskey, Executive Director, Ocean Tracking Network (OTN), Dalhousie University (in person)

Whoriskey presented about the Ocean Tracking Network (OTN), which is headquartered in Canada but operates in partnership with collaborators globally. OTN obtains data from across the world and makes it publicly available. To track species, the network uses several different technologies:

- Acoustic tags can be used in long-term research as each tag can last up to twenty years and is the primary data source for the OTN.
- Datalogging tags, though relatively expensive, yield information only on tagged individuals that are recaptured.
- Satellite tags are expensive yet provide information on animals at any given time of day. Scientists are also able to monitor animals that are never recaptured, typically the most useful individuals for scientists to study. The cost of these tags limits researchers to focus their efforts on species considered "high value."
- Gliders can measure oceanographic conditions, helping to contextualize data that tagging produces.

OTN has 3,000 affiliated researchers, works to link together the data provided by the up to 25,000 acoustic receivers currently deployed in the ocean, and has tagged 45,000 animals from 311 different species. All data will eventually become publicly available.

The Network uses these data in many ways, including the study of how protected areas may help threatened species. For example, the Network worked with DFO to monitor MPAs to determine whether protected animals use those areas, and if so, how their use changes as the ocean changes due to global climate change.[27]

OTN has been heavily involved in Canadian North Atlantic right whale dynamic ocean management, also referred to by some as dynamic marine protected areas. This management

[27] *See* Bowlby, H., Joyce, W., Winton, M.V., Coates, P.J., Skomal, G.B., 2022. *Conservation implications of white shark* (Carcharodon carharias) *behaviour at the northern extent of their range in the Northwest Atlantic*, Canadian Journal of Fisheries and Aquatic Sciences, https://cdnsciencepub.com/doi/10.1139/cjfas-2021-0313.

technique uses whale calls as "acoustic tags" to locate animals and inform shipping to reduce the probability of fatal collisions. Transport Canada uses acoustic tag data to regulate ocean shipping. As a result of Canada's monitoring efforts, which include the glider program, in the last three years, there have been no reported right whale collision fatalities in the Gulf of St. Lawrence.

While data are plentiful, there are challenges to adapting the data for management use. Scientists often lack a clear idea of what managers want, as large volumes of raw data are typically not helpful. There are limitations to providing real-time data. Harsh ocean conditions limit the locations where detection buoys can be deployed for long periods of time and there is not enough funding to continuously replace this expensive equipment. Finally, OTN wrestles with the challenge of how best to deliver this information to the appropriate levels of government. Though OTN collaborates with both NOAA and DFO, it is unclear whether the information ends up with individuals who can act on that information. This could be improved by having clearer guidance from both DFO and NOAA on what kinds of information they require. For example, the Sanctuary Watch program provides specific information that conforms to a specific ask by NOAA managers to the scientific community.[28]

Canada-US Species at Risk Working Group

Presenters: Katherine Hastings, A/Section Head, Marine Species Recovery, Fisheries and Oceans Canada (DFO), Maritimes Region (virtual) & Jean Higgins, Protected Species Conservation Branch Chief, NOAA Fisheries (virtual)

Hastings and Higgins presented on the work of the Canada-United States Species at Risk Working Group (Working Group). Coordination on species at risk between the two countries began in the 1990s and primarily centered on three species, including Atlantic salmon, but was discontinued due to staffing and management turnover. Then, when Canada's Species at Risk Act came into force in the early 2000s, the Working Group was formed under the Transboundary Resources Steering Committee, which ensures that there are bi-annual meetings between the two countries to discuss transboundary ecosystem management issues occurring in the Gulf of Maine and Georges Bank regions. The Working Group provides a forum for information exchange and collaboration on species and issues of common concern between the two countries. Initially, the Working Group focused primarily on North Atlantic right whale recovery, but its focus has expanded in recent years to include a wider array of transboundary species at risk. The terms of reference for the Working Group were updated in 2022.

Although cooperation between the two countries has increased, it has not been without challenges. Foremost, the two countries operate under different legal regimes and protect different species. Moreover, there are other regional, national, and bilateral committees and working groups that also address species at risk in some way, so it is an ongoing challenge to avoid duplication of effort. Also, the geographic scope of the Working Group (i.e., the Gulf of Maine and Georges Bank areas) is smaller than the range of most transboundary species at risk, so it does not represent all relevant regions.

[28] Integrated Ocean Observing System, *Sanctuary Watch*, https://sanctuarywatch.ioos.us/.

The Working Group is now actively working to enhance information exchange through a new approach to data management (species matrix) and to identify areas of common interest to discuss. The Working Group recently held a session for its extended membership to refresh knowledge of the legislative, regulatory, and policy mandates in each country relevant to species at risk.

The co-chairs have also surveyed the membership to determine how to maximize the value of the Working Group and identify areas to focus on next. Themes that emerged from the survey included interest in discussing the management of species facing acute risks from climate change, holding species- or threat-specific discussions to enhance transborder cooperation, and examining specific listing or recovery processes for opportunities to enhance collaboration.

North American Marine Protected Areas Network (NAMPAN) and the Commission for Environmental Cooperation (CEC)

Presenters: Maria Morgado, Programme Management Officer, Ecosystems, UN Environment Programme (UNEP) & Chantal Vis, Senior Marine Ecosystem Specialist, Conservation Programs Branch, Protected Areas Establishment and Conservation Directorate, Parks Canada (steering committee member for Canada for the CEC project on MPAs) (in person)

Morgado presented on behalf of the North American Marine Protected Areas Network (NAMPAN), and Vis presented on behalf of the MPA Project Steering Committee of the Commission for Environmental Cooperation (CEC), which facilitates cooperation and collaboration on environmental issues by increasing the connection between people, places, and agencies.

Working with the United States, Mexico, and Canada, the CEC has developed a Climate Adaptation Toolkit for Marine and Coastal Protected Areas that supports climate change adaptation and training. Looking ahead, a trilateral workshop is being organized for early 2023 to highlight current adaptation actions already in MPAs and to discuss climate change vulnerabilities and strategies to address them.

The CEC provides a forum for Indigenous leaders from Canada, Mexico, and the United States to meet and share their knowledge and experience related to marine conservation. In September 2022, the CEC supported the participation of Indigenous leaders from Canada and Mexico to attend a meeting with Indigenous leaders from Chile and the United States at which they discussed their experiences, concerns, and issues related to marine protected area establishment and management. A similar session is planned for IMPAC5 Congress in Vancouver in 2023.

An ongoing study by consultants that aims to gather information on area-based conservation measures (ABCM), with the goal to enhance connectivity between these areas. Connectivity is meant to consider both ecological and human dimensions.

NAMPAN originated in 1999 under the umbrella of the CEC, a tri-national government organization, through which the governments of Canada, Mexico and the United States collaborate to protect North America's environment. NAMPAN is a virtual community that provides collaboration opportunities for MPA managers in North America and facilitates collaboration between Parks Canada, the NOAA National Marine Protected Areas Center (NMPAC), and the

Comisión Nacional de Áreas Naturales Protegidas (CONANP). Its main objective is to strengthen the conservation of biodiversity of critical marine habitats through sharing of information and best practices. It seeks to build partnerships for the integration of conservation efforts and raise awareness of the value of MPAs.

A work plan was created with the goals to "convene, connect, and coordinate," by facilitating "deep dives" to find common approaches to regional challenges, providing multilingual platforms, and amplifying common messages. Current activities include developing story maps that show the need for connectivity to conserve areas for communities that face similar challenges, as only 11 per cent of MPAs mention connectivity within their management plans. Further, there is a need to expand MPA networks across boundaries and for that network to be inclusive.

Panel 2 Q&A

Climate Change

Panelists were asked if climate change is viewed as "just another threat" managers can address independently or if it "changes the game" completely. The panelists agreed broadly that climate change represents a fundamental challenge to marine management. One panelist contextualized climate change as part of a "triple crisis" of degradation, climate, and pollution that is often entangled in social dynamics. However, their intense interrelation requires a holistic systems approach, even if we often break the crisis into discrete portions that working groups can address. Organizations also need to consider social aspects in solutions that address system-wide issues.

Further, there is a need to reconsider the goals and objectives of individual protected areas when assessing the use of those areas as a solution for climate change-related impacts. One example of this attempt to rethink these goals is the US National Park Service's "resist, adapt, and direct" framework. This framework asks park managers to be more thoughtful about the goals and management strategies they are adopting and to consider whether they are resisting change, adapting to change, or directing change within the area they are managing.

However, there are limits to how this holistic framework is being implemented in government. One participant highlighted efforts to require government actors to consider the emissions released as a result of a permit approval or other government action and how those emissions affect the survival of vulnerable species. Such efforts are partially intended to ensure that we consider the incremental and cumulative effects of regular activities. Yet, it is also important to remind ourselves that incremental steps in the right direction are not steps to ignore, no matter how small they may be.

Further, there was discussion of how climate change is incorporated into stock assessments and individual fisheries management decisions, particularly when US and Canadian assessments do not align. On the US side, there was a distinction drawn between longer term scenario planning exercises, which operate on decadal scales and incorporate climate change and changes in human behavior, versus near term tactical management decisions which are less complex. In Canada, the incorporation of climate change is coordinated through the Canadian Science Advisory Secretariat, which advises fisheries managers. Canadians are currently working to incorporate climate change into stock assessment on the scientific side and to provide general guidance to shape whether

additional fishing licenses are issued. There is also substantial room for collaboration, including in the creation of ecosystem models for specific target areas including the Gulf of Maine/Bay of Fundy area.

Mismatch in Protections between the United States and Canada & Species at Risk Working Group

Someone asked how the Species at Risk Working Group decides which species to cooperate on, particularly if one nation has listed a species that the other has declined to protect. Currently, the Working Group itself decides on how it would like to coordinate. Most of the time, the Working Group tries to identify areas where they can coordinate even if only one nation has adopted protections, normally through scientific collaboration.

Comprehensive Frameworks for Species Protection

Panelists responded to a question asking how best to rectify the lack of a comprehensive approach to species protection. Without further elaboration, they indicated that transboundary coordination, to the extent it exists, is currently focused only on specific populations, although many related species may be just above the threshold for SARA or ESA listing.

Collaboration, Coordination, and Information Sharing

While many organizations recognize the necessity for collaboration, the reality of the situation is that everyone is overworked and overloaded. There are not enough people to properly consult on every single issue. Thus, balancing what can be delivered against expectations and needs is a major challenge.

Further, much collaboration is built on personal connections and relationships, whether that is in accessing needed information or other collaborative opportunities. To be able to collaborate in a more efficient manner, researchers need more comprehensive databases that allow for easy access to already collected information. Further, existing scientific and government networks are not coordinated, hindering the ability of both spheres to communicate efficiently. On the academic side, data management is essential, but data interoperability and maintenance work is chronically under resourced. Data management and coordination can fall to volunteers.

Trust Building with Partners

The importance of building trust with collaborators as a preliminary step before data sharing or other collaborative arrangements was noted. Panelists stressed the importance of transparency in including the specifics of how data will be used, stored, and processed and the sharing of tools created through the shared data. There are also differences in reasons for sharing data or keeping it hidden based on whether an academic institution, state agency, or federal agency is involved.

Panel 3: Case Study Efforts and Challenges in Recovering Transboundary Cetaceans (including North Atlantic Right Whale, Blue Whale, Fin Whale)

Rapporteurs: Elise Boos & Melissa Skarjune, Duke University

Panel 3 addressed Canadian and US efforts to recover cetaceans. Hilary Moors-Murphy and Melissa Landry of DFO presented on Canadian scientific and management efforts, respectively. Danielle Cholewiak and Caroline Good of NOAA presented on the US equivalent. Finally, Cathy Merriman of DFO presented on US and Canadian collaboration on fishing gear technologies for cetacean conservation.

Canadian Science

Presenter: Hilary Moors-Murphy, Research Scientist, DFO (in person)

To start the panel, Moors-Murphy gave an overview of cetaceans in the Canadian Atlantic, focusing specifically on the DFO Maritimes region (i.e., waters off Nova Scotia including the Bay of Fundy, Gulf of Maine, and Scotian Shelf). Of the fifteen cetacean species that occur in this region, five of them are listed under Schedule 1 of the SARA: North Atlantic right whale (NARW; Endangered), Scotian Shelf northern bottlenose whale (Endangered), Atlantic blue whale (Endangered), Sowerby's beaked whale (Special Concern), and Atlantic fin whale (Special Concern).

DFO Science's research efforts involve heavy investment in aerial cetacean surveys with a goal of informing multi-species abundance estimates and distribution, as well as supporting other monitoring and management needs (particularly for NARW). As of September 2022, more than 1400 flight hours had been logged for the calendar year in waters throughout eastern Canada including waters off Nova Scotia and in the Gulf of St. Lawrence. Moors-Murphy also touched on DFO's extensive passive acoustic monitoring (PAM) efforts, which support noise measurement and noise impact modeling and documents species presence. The collected acoustic recordings are run through automated signal detectors designed to identify whale sounds of interest, and detections are analyzed to confirm species identification and presence. She described some of the PAM technologies DFO uses, including bottom-moored recorders, buoyed systems, underwater gliders, vertical line arrays, and moored systems equipped with particle-motion sensors. These technologies support a combination of archival and near real-time detection of whales. She emphasized that with a lot of acoustic data there is the ability to map species presence over various spatial and temporal scales, and in some cases in near real-time. Other research efforts include (but are not limited to) satellite tagging, prey studies, species distribution modeling, and spatial risk modeling.

These efforts are particularly helpful for NARW conservation, as DFO can report NARW detections from aerial, boat, and acoustic sources in real time or near real time. These data are used to inform fisheries closures and vessel slowdowns. Sightings are also fed into the federal online platform Whale Insight (https://gisp.dfo-mpo.gc.ca/apps/WhaleInsight/eng/?locale=en). For example, if a NARW was sighted on a DFO aerial survey today, that sighting would be reported to Whale Insight as soon as possible (usually by the evening), which would then send an autogenerated

email the following day informing managers of any new sightings so they can determine whether there needs to be a closure or slow down. She also showed that visual and acoustic detection of cetaceans support other research and management needs, such as providing information on occurrence and habitat use to inform recommendations protection of for important habitat.

According to Moors-Murphy, DFO has good collaborative communication relationships with NOAA. DFO has participated in NOAA surveys, contributed to the NOAA Passive Acoustic Cetacean Map, and in some cases has even adopted analysis approaches that allow for easier comparison to NOAA studies on transboundary species.

DFO also faces scientific challenges related to resource allocation and funding. For example, government funding to support Moors-Murphy's research programs is often determined on a year-to-year basis, whereas successfully implementing long-term research and monitoring programs for SARA-listed and other species requires multiyear commitments. Further, there are fewer resources to study non-SARA-listed species. Other resource constraints include staffing for research and data analysis and limited research vessel availability. Given all of these constraints, her research is mostly limited to addressing basic knowledge gaps (i.e., where are the whales and when?) as opposed to more complex questions of animal behavior and response to disturbance.

Moors-Murphy identified some limits to the effectiveness of the current dynamic management measures (such as vessel slowdowns and fisheries closures) associated with the potential mismatch between whale movement patterns (many species can move great distances over short time frames) and the spatial and temporal scales over which management responses to identified whale presence can realistically be initiated. For example, given that closures target areas where whales *were* rather than where they are going, it is possible that management measures may be implemented only after the whale has left the area, particularly if the management measures take days to come into effect. Putting in place effective management measures to protect species is further complicated by climate change, which has led to fundamental changes in distribution for at least some species (e.g., NARW).

Canada has undertaken incredible efforts on both the science and management sides to help protect at-risk whales. Continued studies aimed at increasing our understanding of distribution, movement patterns, habitat use and behavior in their changing environment throughout Canada and the United States will continue to help inform conservation and management of cetaceans. More research would help us better understand what is going on and inform and improve management measures. Our job is not yet done!

Canadian Management

Presenter: Melissa Landry, Senior Officer, Marine Mammals, Fisheries and Resource Management, DFO

Building on the scientific presentation, Melissa Landry presented on DFO's management of whales, particularly the NARW. In 2018, changes to the Canadian Marine Mammal Regulations expanded the scope of application to include conservation and protection of marine mammals in Canadian fisheries waters. New provisions in the regulations include mandatory vessel approach distances,

reporting of human disturbances, and an updated definition for the prohibition on marine mammal "disturbance." In addition, DFO has also implemented fishery-specific measures, including gear marking for all non-tended fixed gear fisheries, reporting of lost gear, and a new ministerial emergency power for the conservation and protection of marine mammals. The 2017 NARW Unusual Mortality Event is an example of a situation in which the new emergency measures power could have been used to quickly implement protection measures.

For NARW specifically, since 2018, DFO has been focused on preventing fishing gear entanglement, which is a primary threat to the recovery of the species. DFO pursues this focus through a suite of targeted fisheries management measures. DFO's adaptive fisheries management program allows changes to open/close dates of fisheries to avoid whale and fishing gear co-occurrence. In the Gulf of St. Lawrence and Bay of Fundy, where NARW have been found to aggregate in Canadian waters, DFO has implemented a Dynamic Closure Protocol, Seasonal Closure Protocol and Shallow Water Protocol. These areas are divided into 230 km^2 grids. When a whale is detected in a grid, the 9 grids surrounding it are closed and fishers must remove their gear within 48 hours (fluctuates based on weather). Dynamic closures are in place for 15 days and can be triggered by a vessel, aerial or acoustic detection. If there is another detection during days 9 through 15 of the 15-day closure within the Gulf of St. Lawrence, the Seasonal Closure Protocol is triggered and the area is closed to fishing until November 15 of the year. Outside of the Gulf of St. Lawrence a second detection during days 9 through 15 would result in an extension of the Dynamic Closure Protocol for an additional 15 days. DFO has an additional closure protocol that is triggered anywhere during any time of the year if a mother and calf pair, or a group of 3 or more NARW are detected. Aside from closures implemented via the Seasonal Closure Protocol, other fishery closures for NARW can be lifted if there are no further detections in an area during days 9 through 15 of the closure. The monitoring and real time detections informing closure protocols come from three different types of platforms: aerial surveys, at-sea observations, and acoustic detections. To prevent marine mammal entanglements, DFO also supports a lost fishing gear retrieval program that is supported by the Ghost Gear Fund.

Canada is also directing resources into gear innovation. In addition to entanglement prevention, the government is working with the fishing industry and other partners to identify and implement gear solutions that alleviate the severity of whale entanglements. DFO hosted a gear innovation summit in 2020 and also created the $20M CAD Whalesafe Gear Adoption Fund to implement gear modifications and ropeless gear systems. DFO also supports a network of marine mammal responders on all coasts that is coordinated under the umbrella of the DFO Marine Mammal Response Program and receives $1M CAD annually to assist marine mammals in distress, including disentanglement efforts.

Landry closed out her presentation detailing upcoming DFO initiatives. These included smartWhales, which is reviewing opportunities to use satellite imagery to identify where whales are located. Landry pointed out that it is estimated that 30–40 per cent of the known NARW population spends time in the Gulf of St. Lawrence during warmer months, but it is unknown where the rest of the population resides. She explained that there is hope that the initiative will help reduce costs as satellite imagery could be more cost-effective than aerial surveys over the long term.

US Science

Presenter: Danielle Cholewiak, Large Whale Program Lead, NOAA Fisheries, Northeast Fisheries Science Center, Protected Species Branch (virtual)

On the US side, Cholewiak gave a high-level overview of the research efforts for studying highly migratory marine species. She specifically focused on NARW, blue whales, and fin whales. Similar to DFO, NOAA has an interdisciplinary research program with a variety of platforms and tools to use depending on the scientific, management, and species needs. For example, with NARW, NOAA conducts population assessments and injury (e.g., entanglement) monitoring. These studies have taken place both in US waters and in collaboration with DFO in the Gulf of St. Lawrence.

NOAA uses aerial surveys, acoustic monitoring, physical tagging, plankton sampling, and genetic work through skin biopsy samples and is exploring new methods with high resolution satellite imagery. NOAA draws on identification data from many of these tools and from various contributors. For example, NOAA studies the seasonal distribution of blue whales through both aerial surveys and whale song detection in collaboration with DFO to cover both US and Canadian waters.

NOAA faces challenges similar to those experienced by DFO, including limited staffing in the face of increased demand for data analysis and limited access to research platforms (i.e., research vessels and aircraft). Further, funding is often geared towards individual target species, leaving fewer resources to address research on other cetaceans. Year-to-year funding variability also makes long-term planning difficult, including allocation of vessels and planes for data collection.

US Management

Presenter: Caroline Good, Cetacean and Pinniped Conservation, NOAA Fisheries, Office of Protected Resources

Good shared how NOAA is approaching NARW recovery by addressing threats and monitoring progress. She noted the whale's highly endangered status—there are fewer than 350 whales in total and fewer than 70 reproductive females. In 2017, NOAA Fisheries declared an Unusual Mortality Event (UME) for the NARW, defined under the Marine Mammal Protection Act as "a stranding that is unexpected; involves a significant die-off of any marine mammal population; and demands immediate response." The UME is ongoing as 92 NARW have been documented as dead, seriously injured, or sustained sublethal injuries/illness between 2017 and 2022.

Good identified the two major threats to NARW as fishing gear entanglement and vessel strikes. For entanglement, NOAA Fisheries published its final rule amending the Atlantic Large Whale Take Reduction Plan on 17 September 2021. The four modifications are:

1. Establish three new areas restricting buoy lines in hotspots and allow ropeless fishing with an Exempted Fishing Permit (EFP)

2. Employ gear configurations that broadly reduce the number of buoy lines

3. Require weaker fishing lines

4. Change gear marking requirements to enable better identification of which fishery and geographic area the gear came from

NOAA estimates a 47 per cent reduction in entanglement from these Phase 1 measures. Phase 2 is currently in the scoping stage and will, at a minimum, seek additional entanglement risk reduction of 41–46 per cent from previous modifications to the Take Reduction Plan.[29] These additional measures will consider all fixed gear fisheries regulated under the plan, including gill nets, pot traps and Jonah crab and lobster gear.

For vessel strikes, Good presented an animation illustrating the significant amount of vessel traffic a young NARW calf will encounter as it travels up the East Coast.[30] Since 1999, there have been 24 lethal right whale strikes documented in US waters. While the vessel strikes occur all along the US coast, the data show that younger whales and females are disproportionately affected. To address this threat, NOAA has proposed speed rule amendments that would implement Seasonal Speed Zones (SSZs) and Dynamic Speed Zones (DSZs).[31]

Since 2008, NARW's shifting distributions have made old conservation boundaries obsolete. Thus, NOAA Fisheries updated SSZ boundaries and timing by looking at multiple data sources, including vessel strike risk models, updated right whale distribution data, vessel traffic patterns, NARW sightings, acoustic data, and wind energy activity. Under the proposed speed rule amendments, most vessels over 65 feet would have to transit at 10 knots or less within new seasonal management area boundaries. Notably, these changes would double the area along the coast in which vessels would be subject to speed restrictions.

The DSZs will work in tandem with the SSZs, temporarily protecting right whales outside of seasonal zones. Under this program, the mandatory dynamic zones are triggered through a two-step process. First, NOAA must detect right whales either visually or acoustically. Second, NOAA must determine that there is greater than a 50 per cent chance that right whales will remain in the area. Good explained that the two-step process is used to ensure the restrictions provide actual benefits to protecting the whales.

In addition to speed zone changes, NOAA will extend the speed restrictions to vessels less than 65 feet based on new data indicating their potential harm to the animals. For example, vessels less than 65 feet have reported at least eight NARW strikes, six of which were lethal. The proposed rule seeks to regulate vessels between 35–65 feet, a currently unregulated threat to right whales, which would bring thousands of additional vessels under speed restrictions. Good emphasized that regulation of smaller vessels is not unprecedented. For example, both Massachusetts and Canada impose speed regulations for vessels less than 65 feet. Some safety deviation provisions address exemptions for

[29] The Consolidated Appropriations Act of 2023 prevents any further regulations from taking effect through December 31, 2028. *See* 88 Fed. Reg. 7363.
[30] Animation available online. *See* NOAA Fisheries, *Reducing Vessel Strikes to North Atlantic Right Whales*, accessed May 15, 2023. https://www.fisheries.noaa.gov/national/endangered-species-conservation/reducing-vessel-strikes-north-atlantic-right-whales.
[31] NMFS has yet to finalize these rules as of May 2023. *See* 87 Fed Reg. 46921 (proposed rule).

emergency situations and severe maneuverability issues. Additionally, she touched on safety deviation reporting protocols by which vessels must report safety deviations within 48 hours to track which vessels are reporting and to monitor compliance.

Good concluded by recognizing the enforcement aspect of these proposed rule changes. These enforcement efforts include increasing capabilities for tracking vessel speeds at sea, researching new vessel tracking technologies, and modifying AIS (automatic identification system which shows the location of other vessels) carriage requirements. Importantly, most vessels shorter than 65 feet are not required to carry AIS. Good noted that efforts to protect NARW will benefit other large whale species, as well.

US and Canadian Collaboration

Presenter: Cathy Merriman, Senior Officer, Whales Team/National Programs/Integrated Resource Management, DFO (virtual)

Merriman concluded Panel 3 by highlighting collaboration on fishing gear technologies between DFO and NOAA. The Fisheries Resource Management National Program, governed under SARA, addresses issues related to species at risk and plastic reduction within fisheries management. Merriman detailed how NARW began shifting habitat use to Canadian waters in 2010 and are found more frequently in the Gulf of St. Lawrence now than in the past. This change in habitat has brought the whales into contact with a high density of human activities, leading to the 2017 mortality event. DFO measures include season closures and weak gear and low breaking strength rope that allow whales to self-release if entangled; these measures will be implemented in 2023 throughout eastern Canada.

Merriman presented a hierarchical diagram on approaching activities to reduce entanglement: preventative actions come first, then alleviation to reduce severity if there were to be entanglement, and finally emergency responses. Each of these approaches has elements undertaken by the government of Canada, with most having collaborative and transboundary elements. Management of fishing activity in Canadian waters, however, remains within DFO jurisdiction and offers less direct collaborative opportunity.

Prevention measures include area-based fishery closures and "rope on demand," also known as ropeless fishing gear. Rope on demand has four components: a trap mechanism, an anchoring system, some kind of release (either acoustic or a timer), and a geolocation marking system. Many innovative systems are being developed by private companies, and most of the work currently focuses on stowing and anchoring systems. However, Merriman stressed the need for interoperability in the underlying databases, particularly with geolocation marking. Such interoperability would facilitate communication, such that other fishers would be able to know when a particular area was already occupied and enforcement officials would be able to know whose equipment was in the water. This requires that gear be able to communicate through a unified system, much like how iOS and Android phones can still send text messages to each other regardless of which network or model of phone is being used. To arrive at interoperability, governments need to require standards and information-sharing, ideally in a way that is coordinated between the United States and Canada.

Regulations also need to change to allow gear changes. For example, Canada prohibits fishing without surface markers and buoy lines, yet the main advantage of ropeless fishing is the ability to operate in the absence of both. Canada is trying to provide this flexibility to implement ropeless fishing in 2023.

If prevention does not work, DFO aims to alleviate the severity of entanglement. Merriman described low breaking strength fishing gear, or "weak" fishing gear which makes it easier for entangled whales to release themselves. In Canada, this weak gear is likely to become a requirement. Merriman noted that while "rope on demand" has higher risk reduction, there are currently technical, enforcement, and financial obstacles to widespread implementation and the variability of fishery operations makes a complete transition to ropeless gear unlikely. Instead, Merriman suggested a mosaic approach, where fisheries use the most whale-safe gear possible given their specific conditions, crew safety, and commercial viability.

Both DFO and NOAA are collaborating through informal mechanisms, working groups, and information sharing, particularly since the challenges posed by fishing gear can be common across boundaries. DFO's $20M CAD Whalesafe Gear Adoption Fund is funding 34 gear trial projects in five provinces. The fund supports the purchase and adoption of different gear types, gear trials, and manufacturing.

Panel 3 Q&A

Challenges with Species-by-Species Conservation

Several conference attendees asked why conservation efforts continue to be species-specific rather than ecosystem-based, given that climate change and broader ocean changes affect multiple species of potential conservation interest. Some panelists noted that management agencies are best able to handle threats they are already familiar with, such as the human activities affecting the whales rather than the complexities of the oceanic food chain. Because of the complexity of climate change and the scale of the mandate given to agencies, managers may feel more confident addressing the direct threats of vessel strikes and entanglement. Further, given limited resources, managers' priorities can often focus on direct causes of mortality like vessel strikes and entanglement, rather than attempting to engage with the broader causes for slower-than-hoped recovery.

Further, while there is interest in holistic, ecosystem-based efforts, one significant barrier is the staffing and resources needed to execute it effectively. For example, near real-time NARW detection data requires staff to collect and validate those detections. Adding species for monitoring dramatically increases staffing and resource needs. In addition, agencies are already taking some actions that are expected to protect a broader suite of species from a broader range of threats, but lack the personnel or resources to quantify those benefits. For example, NOAA suggests that its proposed speed regulations will not only reduce vessel strikes, but also reduce ocean noise, fuel use, and emissions, all of which will benefit multiple species.

There are also complex issues of spatial and temporal scale, as the management decisions that are happening on the scale of hours or days based on near real-time whale detection happen at

dramatically different scales from the decadal planning stages that can span multiple states or provinces. Linking the decadal and the day-to-day time scales could present an opportunity to insert climate change and ecosystem-based management into day-to-day operations.

Ropeless Gear

A commenter raised privacy issues that may be intertwined with implementation of ropeless gear and differences between Canadian and US fisheries. One concern is that industry members may be reluctant to adopt ropeless gear if it widely broadcasts their name or vessel number, but this concern is currently being addressed.

Vessel Speed Restrictions in Other Areas

A commenter asked whether vessel speed restrictions were being considered in other areas (outside current static or dynamic management zones) or for other endangered whale species. Though there has been some internal discussion, the question of whether to act and what areas to prioritize is based on the relative exposure to the risk that the whale species faces. NOAA began with vessel speed restrictions in the US Northeast because of high vessel densities and their direct impact on whale populations.

Panel 4: Case Study of Efforts and Challenges in Recovering Transboundary Shark Species

Rapporteurs: Jess Kuesel & Megan Dister, Duke University

Panel 4 addressed Canadian and US efforts to protect and recover shark species. Heather Bowlby and Jessica Kerwin of DFO presented on Canadian scientific and management efforts respectively. Guy DuBeck of NOAA presented on the US science and management. Finally, Sonja Fordham of Shark Advocates International presented from the non-governmental perspective.

Canadian Scientific Overview

Presenter: Heather Bowlby, Research Lead for Canadian Atlantic Shark Research Laboratory, DFO

Bowlby provided context for shark research in Canada. She discussed the organizational structure of shark research, recent research results, and ideas to generate discussion. In contrast to the resourcing for other taxa, shark research is under-resourced. Bowlby is one of two people who conduct all federal shark science in Canada. She develops science for fisheries management and for the SARA process. This includes stock assessments for pelagic sharks under the International Commission for the Conservation of Atlantic Tunas (ICCAT), license reviews, advisory committees, eco-certification processes, and the Canadian Science Advisory Secretariat processes. The SARA science process involves research to inform the listing process and to inform recovery potential assessments. Additionally, her research works to address Canadian recovery goals from recovery strategies for specific listed species.

Data are also limited for these species. Acoustic monitoring is dependent on tagging, and efforts are underway to increase tagging. Satellite tagging yields important information for post-release mortality and bycatch, but costs have limited deployment. Most data are derived from fisheries-dependent monitoring, but there are no directed fisheries for sharks in Canada, so most of the data comes from bycatch and release data. Further, there are low observer coverage rates, with only 10 per cent of the pelagic long-line fishery covered, raising questions of reliability. Fishery independent monitoring happens as one-off studies, limiting usability. This also makes it difficult to standardize the data from the studies.

Despite the limited data, Bowlby's lab has conducted several studies that can aid in shark protection. She has studied seasonal and interannual species distributions, showing changes in Canadian white sharks. Studies of shark behavioral responses to environmental conditions can potentially provide some insight into future changes from climate change. Her research has also shown broader species-wide distribution, patterns including shortfin mako spatial aggregations at different life stages and thresher shark responses to changes in water temperature.

Future challenges include data limitations and the need for data sharing. This lack of data complicates basic questions of distribution and abundance, let alone more complex question of how species change their behavior given climatic changes or how vulnerable life stages are distributed. Given our current understanding of vulnerable life stages being widely distributed for many species, protecting nursery habitats and/or vulnerable life stages may not be possible with small spatial

closures. Further, Canada-only recovery actions will only benefit a small proportion of a given population given the seasonal movement of sharks into Canadian waters.

Canadian Management Overview

Presenter: Jessica Kerwin, Senior Fisheries and Aquaculture Management Officer, Fisheries and Oceans Canada (DFO)

Kerwin described Canadian shark fishery management measures. Sharks are caught in Canada as bycatch from commercial fishing, during derbies for blue shark, and in catch and release recreational fisheries. Use of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), COSEWIC, and SARA are typically tools of last resort. Instead, the primary management tools are provided by the Fisheries Act,[32] the National Plan of Action, Integrated Fisheries Management Plans (IFMPs), and the Sustainable Fisheries Framework Bycatch Policy. In particular, the Fisheries Act directs managers to rebuild fish stocks and authorizes the Minister of Fisheries and Oceans to issue fishing licenses each year. The 2007 National Plan of Action aims to increase research, reduce and report bycatch, and work with international fisheries management organizations. IFMPs articulate goals for conservation and science, and shark bycatch is regulated within each IFMP.

In Canadian waters, sharks are primarily caught as bycatch in the pelagic longline fishery. In the pelagic longline fishery, fishermen may retain blue and porbeagle sharks (only if they are dead) and they must be sold whole with fins attached. To enforce these restrictions, there is 10 per cent observer coverage and 100 per cent dockside monitoring for the longline fishery. The bluefin tuna fishery includes a rod and reel fishery and a smaller harpoon fishery. The blue shark is the only shark that may be landed in the bluefin tuna rod and reel fishery, and all other sharks must be released by cutting as close as possible to the hook.

Canada's party status to ICCAT also influences shark management. ICCAT prohibits the retention of shortfin mako sharks but allows the retention of both porbeagle and blue sharks under certain conditions. However, since the listing of porbeagle sharks under CITES, landings have dropped significantly. Blue shark landings are similarly low because of market forces.

DFO's focus is on eliminating fisheries interactions with shark species because such species are generally not landed. DFO is focusing on the pelagic longline fishery but faces challenges because longlines are an unselective gear type and climate change may increase other species interactions as species distributions shift. To reduce bycatch interactions, DFO recently introduced a new buoy gear system in which the vessel patrols the gear and can quickly notice when a bite indicator buoy submerges and can check to see what is caught, releasing non-intended species quickly (which should reduce mortality). This system is still in the early stages as DFO analyzes its effectiveness.

[32] Fisheries Act, RSC 1985, c F-14.

US Scientific and Management Overview

Presenter: Guy DuBeck, Branch Chief (Acting), Office of Sustainable Fisheries, Highly Migratory Species (HMS) Management Division, NOAA

DuBeck began by noting that unlike Canada, the United States has several directed shark fisheries, a fact that changes the management regime considerably. NOAA's Highly Migratory Species (HMS) Management Division manages 43 shark species in the Atlantic, Gulf of Mexico, and Caribbean directly through Fishery Management Plans (FMPs) under the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and the Atlantic Tunas Convention Act (ATCA). Since shark species are highly migratory species, they are not managed under the typical fisheries management council structure and instead are managed directly by NOAA Fisheries.

HMS conducts research independently and as part of cooperative research programs, collaborating with a wide range of stakeholders, including recreational fishers. This research supports development of stock assessments that underlie the FMPs. These assessments compile the best available science to "predict [the] catch levels that maximize the number of fish that can be caught every year while preventing overfishing." NOAA has also worked with other countries to conduct stock assessments. Upcoming domestic stock assessments will focus on hammerhead sharks and several coastal sharks (bull, spinner, tiger, and finetooth sharks), while international assessments will focus on blue and shortfin mako sharks.

These stock assessments are then used to update fishery management plans. Though NOAA has focused on improving flexibility and creating species-specific management tools, the building blocks for management were built in the 1990s. HMS anticipates more significant changes to the Consolidated Atlantic Highly Migratory Species FMP through the upcoming Amendment 14, a "framework action for the establishment of acceptable biological catch…and annual catch limits…for Atlantic shark fisheries." Amendment 14 will allow for a more comprehensive review of existing management tools to improve flexibility and transparency.

Non-Governmental Organization Perspective

Presenter: Sonja Fordham, President, Shark Advocates International

Fordham began her presentation by promoting better integration of work on wildlife and fisheries issues, given sharks' dual status as wildlife and commodities. Since the primary threat to shark conservation is overfishing, conservation efforts must grapple directly with fisheries management. She also emphasized that conservation of sharks must extend beyond large, charismatic sharks to other elasmobranchs like skates, rays, and smaller shark species.

Fordham next discussed potential measures to improve management of the workshop's focus species. First, for white sharks, she recommended that the United States move beyond the federal retention ban and prohibit targeted catch and release. For porbeagle sharks, she recommended that the United States and Canada cooperate to improve the ICCAT assessment, reduce bycatch, and consider implementing retention bans. For shortfin mako sharks, Fordham suggested that the United States join Canada in its long-term commitment to a North Atlantic retention ban through

ICCAT, given expectations that the species will continue to decline. She also recommended that both countries support the European Union (EU) proposals fora South Atlantic retention ban[33] and continue bycatch reduction efforts.

Fordham next highlighted more successful recovery efforts. She began with discussion of the Northwest Atlantic spiny dogfish, which was being targeted in the 1990s. In response to population decline, the United States adopted very low, science-based quotas beginning around 2000. Even without bilateral management coordination, the population recovered, though it has been doing poorly in the past few years. However, the spiny dogfish was a rare example of bilateral shark science and presents opportunities for transboundary management.

She then discussed the mixed legacy of US management for skate species. Barndoor skate, which were subject to a fishing ban, have recovered. Winter skate, managed under a total allowable catch regime, have also recovered. However, thorny skate have declined significantly despite being subject to a fishing ban. Efforts to reduce the Northwest Atlantic Fisheries Organization (NAFO) total allowable catch (TAC) for thorny skate could help, though US leadership has waned. Specifically, the United States could help Canada reach a deal with the EU to align the NAFO thorny skate TAC with scientific advice, and both countries should work to improve the stock assessment.

Third, she celebrated the recent NAFO retention ban for Greenland sharks as an example of successful cooperation between the United States and Canada with opportunity for further coordination toward compliance and research. Finally, she recommended that Canada consider signing the Convention on the Conservation of Migratory Species Memorandum of Understanding on Migratory Sharks to help conserve basking sharks, in particular, and help the US push for meaningful progress, in general.

Fordham also identified opportunities for the two countries to cooperate globally. She advocated continued collaboration within regional fisheries management organizations regarding compliance, data reporting, observer coverage, bycatch, and discard mortality. Additionally, at upcoming CITES meetings, she recommended that the United States support proposals on listing elasmobranchs and that both countries support a review of significant trade for commercially valuable shark species.

Panel 4 Q&A

After the panel presentations, workshop participants discussed additional ways to improve shark management. The discussion began by noting that unexplained declines, such as that of the thorny skate, may indicate a need for an ecosystem-based approach. Workshop participants also noted the contrast in science and management between Canada, which has no directed shark fishery, and the United States, which has multiple.

[33] ICCAT has since established a quota for shortfin mako in the South Atlantic based on this proposal. "ICCAT Agreed the Implementation of a Management Procedure for Atlantic Bluefin Tuna and a New Conservation Measure for Tropical Tunas." ICCAT, 22 Nov. 2022, p. 1, https://www.iccat.int/Documents/Meetings/Docs/2022/Press_release_2022_ENG.pdf.

Promoting International Collaboration

Participants discussed how to motivate other countries to better protect sharks. While the United States and Canada have attempted to champion enforcement and data reporting requirements in international forums like ICCAT, there is a distinct need for other countries to support such efforts. While non-governmental organizations (NGOs) and scientists have attempted to encourage nations to collaborate, these efforts have their limits. They also noted the possibility of using trade sanctions, similar to the Marine Mammal Protection Act's Import Provisions Rule, and/or working bilaterally with countries that significantly overfish sharks. They also highlighted the importance of fostering public attention and getting countries to champion shark conservation.

Much of the discussion centered on shortfin mako sharks. As mentioned above, ICCAT passed a North Atlantic shortfin mako retention ban in 2021 and South Atlantic shortfin mako catch limits in 2022. Further, EU assessment under CITES may be shifting the perception of the sustainability of this fishery. This may be evidenced by the EU's ICCAT proposal to reduce fishing for the species in the South Atlantic.[34]

There are also examples within the shortfin mako shark fishery of incentives for improvement. Namely, ICCAT's North Atlantic shortfin mako shark ban is structured to be temporary; the lifting of the ban depends on countries reporting sustainable levels of mortality, thus potentially improving overall discard estimates. This approach encourages countries to improve their data reporting to allow for future landings. Despite these potential benefits, one participant noted that a two-year ban is insufficient for the species to recover, given its expected continued decline.

Participants also noted limitations to actions at ICCAT, including uncertainty in country-reported data, particularly regarding dead discards, a need for more countries to champion enforcement and compliance, and ICCAT's tendency for unanimous decisions (reluctance to vote). However, US leadership may motivate other countries to improve their practices.

[34] As above, ICCAT has since established a quota for shortfin mako in the South Atlantic based on this proposal. ICCAT (2022).

Panel 5: Charting International Law and Policy Coordinates

Rapporteurs: Valerie Brankovic, College of William and Mary & Katline Barrows, Duke University

The second day of the conference began with Panel 5, which turned away from both the species-specific and United States-Canada specific discussions of the previous day to the existing international law landscape. Barbara Lausche of the International Union for Conservation of Nature (IUCN) began the day with a discussion of international responsibilities for marine conservation, with special consideration of marine connectivity conservation. Cymie Payne, also of IUCN, then discussed the ongoing biodiversity beyond national jurisdiction (BBNJ) treaty negotiations and their potential implications for marine migratory species conservation. Sofia O'Connor of the Environmental Law Institute presented on transboundary marine spatial planning and its potential and challenges. Melanie Virtue presented on the Convention for Migratory Species and its connections to the UN Environment Program. Finally, David Wiley of NOAA presented on novel uses of animal tracking of great shearwaters as a potential management tool for whales in Stellwagen Banks National Marine Sanctuary, off the coast of Massachusetts.

International Responsibilities and Guidelines for Transboundary Marine Conservation–Special Focus on Marine Connectivity

Presenter: Barbara Lausche, IUCN/WCEL Specialist Group, Chair of the IUCN/WCPA Marine Connectivity Working Group, and Director of Marine Policy at Mote Marine Laboratory (virtual)

Lausche described the increasing emphasis that international organizations are placing on marine connectivity in transboundary marine conservation. The requirements are largely prescribed through "soft law" instruments which do not create legally binding obligations, but do provide important guidance for states. (The exception where a 'hard law' instrument is anticipated to address marine connectivity is the new draft BBNJ convention discussed by the next panelist.)

A key new soft law instrument are the IUCN Guidelines for Conserving Connectivity through Ecological Networks and Corridors (2020).[35] The Guidelines aim to consolidate knowledge, provide tools and examples for how to apply ecological connectivity on both land and sea, advance best practices, and achieve formal guidance for use of ecological connectivity and ecological corridors, including for marine environments, to advance conservation outputs overall. The Guidelines define ecological connectivity as "unimpeded movement of species and the flow of natural processes that sustain life on Earth […] For species, this includes both functional and structural connectivity."[36]

[35] Jodi Hilty et al., *Guidelines for Conserving Connectivity through Ecological Networks and Corridors*, ed. Craig Groves (IUCN, International Union for Conservation of Nature, 2020), https://doi.org/10.2305/IUCN.CH.2020.PAG.30.en.
[36] Hilty et al., 4.

The Guidelines define an ecological corridor as "a clearly defined geographical space that is governed and managed over the long-term to maintain or restore effective ecological connectivity."[37]

In developing these distinctions, the Guidelines also distinguish between protected areas, other effective conservation measures, and ecological corridors, noting the support role that corridors play in building broader networks (See Table 1 from Hilty et al. at 17).

	Protected areas	OECMs	Ecological corridors
MUST conserve *in situ* biodiversity	●	●	
MAY conserve *in situ* biodiversity			●
MUST conserve connectivity			●
MAY conserve connectivity	●	●	

Table 1: The guidelines draw new distinctions between protected areas, other effective conservation measures, and ecological corridors, noting the support role that corridors play in creating broader networks.

The IUCN Guidelines also emphasize the need for connectivity across conservation networks, as connectivity can help maintain and enhance the productivity and stability of ecosystems and marine species throughout their life cycles. The emphasis on connectivity also highlights the transboundary nature of the marine environment and the resulting need for transboundary collaboration.

Using these IUCN guidelines as the framework, the IUCN World Protected Areas Commission and its Marine Connectivity Working Group (MCWG) developed initial guidance for designing marine connectivity needs into MPAs and MPA networks. Because scientific and management knowledge about the marine environment is not as advanced as for the terrestrial environment, MCWG developed general rules of thumb in the face of complicated and incomplete science.[38]

In the presentation, Lausche highlighted three of the 13 rules of thumb in the MCWG report:

1. Ecological connectivity should always be considered in the design of an MPA/network using the best available science.

2. Management strategies and spatial plans for MPAs/networks should include the role of marine connectivity with current and anticipated climate change, and possible shifts in species ranges or ecosystem functions.

3. The design and management of MPA networks should take into account the effects of ocean processes, such as currents, vertical movements, and temperature variation, and land-based processes (for example, nutrient flows, sedimentation) on connectivity of affected target species and as part of adaptive management.

Lausche also highlighted opportunities to incorporate marine connectivity into existing international hard law instruments. Lausche recommended that the comparatively weaker marine connectivity

[37] Hilty et al., 16.
[38] Barbara Lausche, Aaron Laur, and Mary Collins, "Marine Connectivity Conservation Rules of Thumb for MPA and MPA Network Design" (IUCN WCPA Connectivity Conservation Specialist Group's Marine Connectivity Working Group, August 9, 2021), https://doi.org/10.53847/jxqa6585.

provisions of the UN Framework Convention on Climate Change could be strengthened to the same level as their terrestrial and freshwater counterparts. State parties could improve these provisions by recognizing shifting fish ranges due to marine heatwaves and other climate impacts. The United Nations Convention on the Law of the Sea also provides a promising start, but it lacks a clear mandate to control high seas fishing and rests on outdated guiding principles.

Lausche highlighted three challenges. First, the deep sea remains under-researched. Second, fisheries connectivity research should go beyond its focus on sustaining current levels of exploitation and instead consider what is needed for species recovery. Finally, emerging technologies to increase the use and extraction of ocean resources must be regulated by international organizations to prevent major negative environmental impacts that impair connectivity needs of species and to restore that connectivity where such areas are degraded.

Implications of a New BBNJ Agreement

Presenter: Cymie Payne, Chair, IUCN World Commission on Environmental Law's Specialist Group on Ocean Law

Payne summarized ongoing negotiations for the new UN treaty on biodiversity beyond national jurisdiction (BBNJ), which is hoping to have a finalized agreement in 2023.[39] This treaty will cover the ocean outside of the exclusive economic zone of each nation, which generally ends 200 nautical miles seaward from any nation's shoreline. The UN General Assembly voted to launch development of the new treaty because state parties recognized the lack of tools and resources to address the conservation needs of marine environments and the high seas. The draft treaty is especially significant for its ecosystem-based approach to conservation. Moreover, its drafters are focused on dealing with cumulative and transboundary impacts that take into account the dynamism of ocean environments. So far, there has been robust participation with 132 countries in the negotiations, including the United States and Canada.

The BBNJ agreement has two conservation elements: (1) the ability to establish area-based management tools including marine protected areas and (2) a requirement to conduct environmental impact assessments. By focusing on area-based management, the agreement will take an ecosystem approach, rather than a species approach. Further, civil society organizations have been attempting to ensure that the final treaty will include considerations for cumulative impacts, transboundary effects, and marine connectivity.

Article 51 establishes the innovative Clearing-House Mechanism, designed to serve as a forum for states to convene on these matters beyond the normal Conference of Parties (COP) mechanism. The Mechanism is also expected to facilitate access to information, although the exact format of the body is still under consideration.

[39] The UN has produced a draft agreement which, as of May 2023, is still being checked and translated. See *Draft agreement under the United Nations Convention on the Law of the Sea on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction*, March 5, 2023, https://www.un.org/bbnj/sites/www.un.org.bbnj/files/draft_agreement_advanced_unedited_for_posting_v1.pdf.

Despite this innovative set of provisions, negotiators are currently grappling with language which requires that the BBNJ "should not undermine existing relevant legal frameworks." This language may cause conflict with existing bodies, particularly if organizations argue that their existing conservation or area-based management efforts preclude the establishment of protected areas under BBNJ.

The Role of Regulatory Integration in Transboundary Marine Spatial Planning

Presenter: Sofia O'Connor, Staff Attorney and Acting Director of the Ocean Program, Environmental Law Institute (virtual)

O'Connor presented on transboundary marine spatial planning (MSP), which goes beyond planning uses within one nation's borders and instead actively considers the transboundary nature of marine ecosystems, species, and stressors to encourage management harmonization across borders. MSP combines science and management practices to analyze and allocate the distribution of human activities in marine areas, ideally balancing and coordinating the needs of multiple sectors and user groups. However, MSP is generally carried out at the national or subnational level, which can lead to less consideration of transboundary natural processes.

To facilitate management cohesion between neighboring jurisdictions, practitioners should consider the relevant governing bodies, laws, and coordination mechanisms with neighboring nations. Ask questions such as, what do the laws of neighboring countries say about species preservation, data collection, or zoning of potentially dangerous activities? Are there bilateral or multilateral treaties in place? On the management side, it is important to think through which entity should lead coordination and planning efforts. International governing councils, transboundary data protocols for climate, animal distribution, and animal movement data, and structures to ensure coordination between existing agencies and local stakeholders would all facilitate collaborative planning.

There are a few international examples of successful transboundary MSP. In the EU, there is a directive that requires member states to cooperate on coherent marine spatial plans. Managers there realized that there did not necessarily have to be a single joint plan, but that coordination, especially data sharing, was very important. Another example is the Gulf of Maine Council on the Marine Environment which operates as a partnership between US and Canadian state and federal agencies. The Council convenes governmental and non-governmental representatives, provides a forum for knowledge sharing, and sets forth policy goals that align with federal policy priorities and existing laws.

In considering transboundary MSP, managers need to consider which relevant government and non-governmental organizations are important, as well as whether any informal organizations or networks should be brought into the conversation. Managers need to consider which entity should be created or empowered to lead coordination. Further, they should ask which existing processes could facilitate or inhibit collaboration and how might those be changed. What are the key drivers for collaboration and which issues could be addressed to facilitate collaboration?

Potential Roles for UNEP and Possible Future Linkages Under the Convention on Migratory Species

Presenter: Melanie Virtue, Head of Aquatic Species Team, Convention on Migratory Species (CMS), UNEP (virtual)

Virtue discussed the Convention on Migratory Species (CMS), which is a global platform for international conservation cooperation for migratory species including cetaceans, sharks, and birds. CMS-listed species include the Humpback whale, Northern Atlantic right whale, Blue whale, porbeagle shark, and leatherback turtle. CMS operates by listing species on its appendices. Species can be listed under Appendix I as an endangered species and/or under Appendix II as a species that would benefit from international cooperation.

CMS is working on multiple threats to migratory species, including pollution (marine debris, light pollution, and anthropogenic noise) and bycatch. CMS is also working with IUCN on area-based conservation measures including Important Marine Mammal Areas (IMMAs) and Important Shark and Ray Areas, which are still being launched. CMS is also working on ecological connectivity and offshore wind energy issues.

CMS also establishes legal binding or non-binding agreements between nations which can focus on a particular region or taxonomic group. The 2010 Sharks Memorandum of Understanding (MOU) is particularly applicable for Canadian and US waters. It currently has 49 signatory nations, including the United States but not Canada, and it protects 37 different shark and ray species. The MOU on the Conservation and Management of Marine Turtles and their Habitats of the Indian Ocean and South-East Asia (IOSEA) has been in effect since 2001, and the United States has been a signatory even as a non-party to CMS.

Through these various initiatives and specific regional or taxonomic agreements, CMS provides a platform for cooperation, facilitating conservation by sharing best practices and guidelines. Further US and Canadian participation in both the Convention and in any of the MOUs would be helpful and welcome.

Transboundary Movement of Great Shearwater Seabirds and Their Potential for Use as a Tool for Dynamic Ocean Management

Presenter: David Wiley, Marine Ecologist and Research Coordinator, Stellwagen Bank National Marine Sanctuary, NOAA

Wiley offered a departure from the previous discussion on international mechanisms for cooperation to discuss the use of great shearwater seabirds to identify areas for dynamic ocean management. Dynamic ocean management allows management to shift in space and time in response to near real-time biological, oceanographic, social, or economic data. Though this tool reduces conflict, balances ecological and economic values, and refines management scales, there is little existing infrastructure for implementation.

Shearwaters are transboundary seabirds which are often observed in the same areas as, and are seen foraging with, humpback whales in the Stellwagen Bank National Marine Sanctuary (SBNMS). Shearwaters are also much easier to track and monitor than humpback whales, given that they can be easily seen visually and can be outfitted with satellite tags. By studying shearwater movement behavior over multiple spatial (SBNMS and Gulf of Maine (GOM)) and temporal scales (years, months, and weeks), researchers hoped to determine whether shearwater presence could be used to inform dynamic management to protect whale populations.

Wiley and colleagues used four data sets: shearwater satellite telemetry data, humpback satellite telemetry data, GOM humpback sightings data, and SBNMS humpback sightings data. Data analysis showed that tagged shearwaters could be used as near real-time tools to locate humpback whale aggregations and potentially identify areas of increased entanglement risk. However, there is some variability in the overlap between shearwaters and humpbacks, potentially because of differences in prey availability. For example, in 39 of the 93 weeks of SBNMS data, over 90 per cent of the humpback population was found in areas that were being used by the shearwaters. Thus, while the shearwaters are helpful near real-time indicators, they are not infallible and their utility may vary. In addition, there was poor overlap between shearwaters and North Atlantic right whale (NARW), limiting its utility for protecting that species. However, the dataset was limited to tagging 10 birds per year, and tagging additional birds could provide better data.

When thinking about implementation strategies, the best tactic seems to be combining a static MPA with further management action warranted when shearwaters identify potential whale activity in overlapping areas. Creating dynamic management areas coinciding with bird activity could be a tool that minimizes impact on stakeholders by implementing MPA restrictions only when shearwater activity identified the need for action. Wiley also discussed transboundary scientific efforts across taxa including sand lance forage fish, sharks, and seabirds.

Panel 5 Q&A

Establishing Trust in Science and Management

A participant asked how to bridge the constant uncertainty in science against the need for certainty and clear rules in management. For policymakers, an important approach is to give a sense of levels of certainty and probable outcomes if recommended actions are not taken, even with some uncertainty. Some of this uncertainty is internal, with management needs directly informing the type of science conducted and science influencing management decisions. However, there is also difficulty in communicating this tension to stakeholders who need to both understand the underlying uncertainty of science, and the need for decisions based on as much information as possible to prevent harm where there are threats of serious damage (the precautionary principle). Uncertainty in such cases should never result in inaction. The perceived lack of certainty or transparency can cause distrust by some stakeholders, who believe that scientists and managers are not making decisions that properly include the voices of those stakeholders. Thus, it is paramount that scientists and managers be transparent about the degree of scientific uncertainty when weighing the cost of inaction against action.

A panelist referenced their own research working directly with stakeholders as a way build trust. By bringing stakeholders directly on to research vessels, researchers can help stakeholders get a better understanding of how the data are collected and used. In this way, researchers can better communicate the value of a species at risk, facilitate connection between the species and the regulated community, and enhance overall trust and community. This direct incorporation of community members into the management science has been done with gillnet fishers and shearwater research and lobstermen and right whale research. NOAA also has a shark research fishery. This fishery has 100 per cent observer coverage and is by application only, but it allows fishers to both land sharks for profit and to participate in the science that underlies the shark fishery stock assessments.

Building this trust is immensely important. If stakeholders have no reason to trust researchers then they will continue to criticize the work and suggestions that are put forth. Building trust and fostering a collaborative environment is key to bridging the gap between the application of science and policy.

Dynamic Ocean Management, Sand Lance, and Ecosystem-Based Management

There was extensive discussion stemming from the last presentation on dynamic ocean management using shearwaters, sand lance, and humpback whales. Panelists discussed the possibility of using ever-shrinking tracking technology to track different species of birds or deploying tags on birds further from the coast to tailor management for other whale species.

Sand lance could be a potential future commercial fishery, as they are currently caught as forage fish in the North Sea but not along the Canadian and US Atlantic coast. Currently, there are bans on the harvesting of more than 200 pounds of sand lance in Massachusetts, Rhode Island, and Connecticut and there is work to implement those same bans in New York and New Jersey. Management of humpback and shearwaters is possible because they both use sand lance as a food resource. While NARW does not feed on sand lance, sand lance and NARW do feed on copepods. Using copepods to manage NARW and other endangered species could be explored in the future. Further, using dimethyl sulfide as a proxy for copepod abundance could be another way to forecast NARW aggregations.

For this dynamic management to be adopted in practice there needs to be proof of a relationship that is reliable enough that it convinces managers to act. Further, creating stakeholder coalitions that want to ensure conservation-focused regulations move forward could build the available social and political capital for this issue.

Incorporation of Migratory Species Conservation under BBNJ

A panelist asked what the mechanics of incorporating migratory species conservation within the BBNJ will potentially look like. The treaty first needs to finish its negotiation process and have countries ratify it. If enough nations ratify the treaty, it will then come into force and participating nations can begin to meet, putting forward proposals for area-based management tools or marine protected areas. The proposing nation will decide whether it fits within the definition of an area-based management tool or an MPA. If it is approved, then the participating nations will need to implement those protections into their national legal frameworks.

Transboundary Modeling for NARW

In previous discussions, it had been noted that a transboundary NARW model spanning Canadian and US waters does not exist. A panelist wondered why such a model did not exist, particularly given the extent of existing management and scientific cooperation for NARW conservation. Modelers noted that research efforts have been adjusted because of the unexpected geographical shift of NARW northwards. This resulted in a need for Canada to increase their data collection efforts.

Given the currently available data, there are two approaches for building a transboundary model. The first is to use data collected in US waters and extrapolate to Canadian waters. However, these models do not appear to be doing a good job predicting actual NARW presence in Canadian waters. The second is to combine data collected in both regions. However, there had not been a preexisting collaborative relationship and so there are now ongoing efforts to establish trust and divide responsibilities.

Marine Spatial Planning

A participant asked about how MSP can be implemented, particularly given that marine spatial plans became politicized in the United States, causing MSP to become a data repository as opposed to a plan with legal force. A panelist noted the importance of including MSP directly into legislation to give a plan the force of law. The extent to which MSP is incorporated into various jurisdictional structures will affect the degree the plan can be enforced. While MSP is formally a different concept from ocean zoning, MSP as a planning and management tool for large area-based conservation and sustainable use goals can still be very effectively applied if appropriate government agencies have the authority and capacity to develop such plans based on stakeholder participation, good science about the geographic area involved, and compliance with international commitments (e.g., under the Convention on Biological Diversity for biodiversity conservation including connectivity or under the CMS for endangered migratory marine species).

Panel 6: Enhancing Transboundary Marine Ecosystem Governance for Long-term Ocean Governance Integration: Lessons from Other Regions

Rapporteurs: Connor Sakati & Megan Dister, Duke University

The last panel of the workshop looked at regions other than the United States/Canada border in the northwest Atlantic Ocean, and at species other than whales and sharks, to better understand transboundary migratory species management and other potential governance mechanisms. Olga Koubrak of Dalhousie University began the panel by discussing the UNEP Regional Seas Programme and its potential to protect at-risk species. Boris Worm of Dalhousie University presented on his joint work with Derek Tittensor about how marine protected areas are (or are not) incorporating climate change into their management plans. David Freestone of the Sargasso Sea Commission presented on the Commission's work and their current efforts to develop baseline information about ecosystem health. Carolina Behe of NOAA addressed Indigenous knowledge, Indigenous management, and the co-production of knowledge. Verónica Cáceres of the Inter-American Sea Turtle Convention discussed regional efforts to protect sea turtles. Finally, Meaghen McCord of Parks Canada discussed her experiences both in coastal East Africa and the Pacific Northwest to protect sharks and whales respectively.

UNEP's Regional Seas Programme and Marine Species at Risk Protection

Presenter: Olga Koubrak, PhD student, Marine & Environmental Law Institute, Schulich School of Law, Dalhousie University

Koubrak detailed her recent study examining how UNEP's Regional Seas Programme protected species at risk. The Regional Seas Programme is a series of regional action plans and conventions concluded since 1972 aimed at increasing marine conservation. Koubrak argued that these agreements reflect political feasibility, not ecology, and that despite covering much of the world, the actual efficacy of the Regional Seas agreements remains understudied.

To better understand the impacts of these agreements on species at risk, Koubrak studied four different Regional Seas arrangements: the OSPAR Convention (covering the northeast Atlantic Ocean), the Cartagena Convention (covering the Caribbean Sea), the Barcelona Convention (covering the Mediterranean Sea), and the Nairobi Convention (covering the western Indian Ocean). She looked at the obligations each agreement created, the species covered, the recovery activities required, and efforts at cross-sectoral cooperation. She found that three of the agreements imposed direct requirements on parties to protect species at risk, including no-take rules. OSPAR was an outlier as it created general obligations to protect marine biodiversity.

Though these agreements are ambitious in their species coverage, seeking to protect between 42 and 256 species each, implementation has been lacking as few parties possess the capacity to develop management plans for so many species. Recovery efforts are significantly less ambitious than agreement goals and often generalize across categories of species (creating, for example, one plan for all turtles or for all cetaceans). However, these agreements arguably have contributed to increased

cross-sectoral cooperation, leading to several conservation MOUs with the shipping and fishing bodies.

Koubrak then identified several challenges common to Regional Seas agreements. Foremost, countries in the Global North and South generally possess quite different levels of state capacity, reflecting differences in the ability to develop species management plans and other tools for conservation. Secondly, progress is driven by individual states and not UNEP. UNEP appears to have shown little leadership in ensuring that actions are taken to protect species at risk.

The Regional Seas Programme has the potential for effective conservation of marine species at risk. Each agreement allows observers, such as NGOs, universities, and international development groups, and these observers do participate; per Koubrak, these groups should work to drive change and accountability at state and regional levels. Cross-sectoral partners also have a role to play; they should support each other's work toward common objectives.

The Incorporation of Climate Change into Marine Protected Area Planning: An International Comparison

Presenter: Boris Worm, Marine Ecologist, Biology Department, Dalhousie University & Derek Tittensor, Senior Marine Biodiversity Scientist, UNEP World Conservation Monitoring Centre (UNEP-WCMC) and Biology Department, Dalhousie University (virtual)

Worm, presenting on his joint work with Derek Tittensor, critiqued the lack of climate change considerations in guiding documents for marine protected areas. To begin, only 8 per cent of the ocean is protected while more than double that proportion of land is protected. Although marine protected areas promote climate resilience, buffer ocean acidification, reduce human stressors and sediment release, and protect predators, climate change has largely not factored into their management. Further, since climate change alters species' range, future protected areas must be forward-looking. Moreover, marine protected areas should emphasize connectivity and protect locations where species undergo critical life stages.

Worm then described how marine protected area management plans grapple with climate change, concluding that plans are not climate change robust and suffer from a biodiversity adaptation gap: our actions to protect biodiversity from the effects of climate change differ from what we know to be necessary to protect that biodiversity. After examining 657 plans, Worm and Tittensor found that only 18 per cent included any climate change-related actions. They found only 10 plans with climate-change biodiversity adaptation measures. In addition, although the United States led the world in incorporating climate change into its management plans, Canada ranked the worst among developed nations on that point, and Canada's plans have become decreasingly climate change robust over time.

To help marine protected areas planners integrate climate into their management strategies, Worm and Tittensor offered several recommendations:

1. Create a centralized resource to catalog climate adaptation in protected area management plans to identify who is already moving ahead of the curve.

2. When creating new MPAs, make sure that a connected network spans the full range of past and future climatic conditions along multiple axes of change.

3. Make sure climate change adaptation measures are included in all existing management plans.

4. Ensure that a future global MPA network is anchored around static management measures, supplemented by dynamic, climate-responsive measures.

5. Develop specific targets for the proportion of MPAs and OECMs that integrate climate adaptation and provide incentives to meet those targets.

6. Develop new legislative tools to enable rapid-response, multisectoral dynamic ocean management with an eye towards conservation that can be deployed specifically in response to climate change.

7. Center management around diverse stakeholder inclusion and capacity transfer.

Towards the First High Seas Ecosystem Diagnostic Analysis - The Crucial Role of Migratory Species

Presenter: David Freestone, Executive Secretary, Sargasso Sea Commission

Freestone provided an overview of his work on the Sargasso Sea Commission and related considerations of migratory species issues. The Sargasso Sea provides many ecosystem services and the Sargassum itself provides vital habitat for species that live there for at least parts of the year, including commercial species, threatened and endangered whale and turtle species, eels, and other endemic species. Human impacts to the area include climate change, ocean acidification, plastics, heavy vessel traffic, growing fishing activity, future deep sea mining, and underwater cables.

The Commission was established through the Hamilton Declaration on Collaboration for the Conservation of the Sargasso Sea, which was ratified by ten countries, including the United States and Canada. It is structured as an independent body with many collaborators from NGOs, international organizations, and universities.

Freestone shared details of a four-year, Global Environment Facility-funded project to support ecosystem diagnostic analysis for the Sargasso Sea. This project aims to create baselines to inform monitoring and adaptive management, a road map to develop an ecosystem-based approach to governance and conservation, a strategic action program to define management or stewardship measures, and plans for knowledge management, monitoring, and evaluation. Preliminary data highlight the dynamic nature of the Sargassum and thus the need for dynamic management. Vessel traffic data suggest the need to manage shipping in the Sea during certain seasons. Additionally, the Sargasso Sea is a vital breeding place for many migratory species, including anguillid eels which reside for many years in Europe and Canada and return to the Sargasso Sea to reproduce.

Going forward, Freestone sees opportunities to use big data and artificial intelligence for ocean governance. He also emphasized how the new GEF-funded project breaks new ground and sets the groundwork for future conservation, including plans to propose the first high sea Particularly Sensitive Sea Area at the International Maritime Organization.

Indigenous Knowledge and Equitable Partnerships with Indigenous Peoples

Presenter: Carolina Behe, Cultural Resource Coordinator with the Office of National Marine Sanctuaries, National Oceanic and Atmospheric Administration (NOAA Federal) (virtual)

Behe provided an overview of the importance of Indigenous knowledge and partnerships with Indigenous peoples in natural resources management. Behe noted that Indigenous peoples are rights holders that hold sovereignty rights. She explained that Indigenous peoples hold thousands of years of knowledge and practices and that many of these practices continue today. Behe noted that while there is a growing appreciation for Indigenous peoples' knowledge, it remains challenging to get government officials to integrate this approach into decision-making.

Behe shared the Inuit Circumpolar Council's definition of Indigenous knowledge as:

> A systematic way of thinking applied to phenomena across biological, physical, cultural, and spiritual systems. It includes insights based on evidence and acquired through direct and long-term experiences and extensive and multigenerational observation, lessons, and skills. It has developed over millennia and is still developing in a living process, including knowledge acquired today and in the future, and it is passed on from generation to generation.

Rather than considering "knowledge" as just that which can be easily plugged into western scientific and management models, Behe emphasized that Indigenous knowledge encompasses an entire Indigenous worldview which contains its own evaluation methodologies.

Behe shared visuals to demonstrate Indigenous knowledge at work. Her description focused on the connectivity between cultural, biotic, and abiotic components of an ecosystem and the importance of taking a holistic view, accounting for the relationships between these components, to understand the environment and cumulative impacts. This Indigenous knowledge approach differs from an ecosystem approach, as it places a strong emphasis on those relationships and brings in more attributes defined by Indigenous knowledge holders that are not often included in a scientific ecosystem-based approach. Through the imagery she provided, Behe explained that one cannot look at one component to understand the entire system.

Behe emphasized the importance of a co-production of knowledge approach through an equitable process in which Indigenous knowledge holders and scientists work collectively. This process requires trust and respect for each person's knowledge and perspectives. She noted the importance of building relationships, empowerment, capacity-building, and reciprocity in ensuring the overall

success of co-produced knowledge and management approaches.[40] She also shared guides from other Indigenous organizations for co-production of knowledge approaches, and emphasized that each focuses on respect, reciprocity, and listening.[41]

Behe concluded with her overarching messages: there are multiple ways of knowing, it is good for different groups to be asking different questions, and successful co-production of knowledge is rooted in equitable partnerships. To address the concerns discussed in the workshop she recommended a meeting that brings Indigenous knowledge holders, scientists and policymakers together through an equitable platform. She also noted that as part of this meeting there should be space for Indigenous peoples to meet together in advance.

The Inter-American Sea Turtle Convention

Presenter: Verónica Cáceres, Executive Secretary, Inter-American Sea Turtle Convention (IAC)

Cáceres discussed the Inter-American Sea Turtle Convention and lessons learned from IAC's partnerships. The IAC began in 2002 to protect, conserve, and recover six species of sea turtles and their habitats. The treaty has sixteen signatories, including the United States, but not Canada. The IAC's Conference of the Parties meets every two years, while the Scientific Committee and Consultative Committee of Experts meet annually to prepare recommendations to be taken up at the Conference of the Parties.

Cáceres discussed some of the resolutions passed by the IAC over the years. These resolutions are prepared with guidance from scientific research and are often passed in response to threats from fisheries, climate change, or destruction of habitat. The resolutions often focus on critically endangered species.

Cáceres shared some lessons learned from her regional work. She emphasized the importance of this work because migratory species protection requires efforts from countries throughout the range of the species. She described a collaboration between gillnet fishermen in Peru and sea turtle community leaders in Mexico, where Peruvian fishermen traveled to Mexico to participate in hands-on conservation and assisted in bycatch-reduction knowledge-sharing after the trip. She found this hands-on experience helped raise awareness and unite diverse groups to act on shared issues.

Cáceres also highlighted the decision by the IAC to sign a memorandum of understanding (MOU) with the Inter-American Tropical Tuna Commission (IATTC) to perform a collaborative modeling exercise for the leatherback turtle. This partnership exemplifies the importance of MOUs for facilitating collaboration with regional scientists and government representatives from countries that

[40] Ellam Yua et al., "A Framework for Co-Production of Knowledge in the Context of Arctic Research," *Ecology and Society* 27, no. 1 (2022): art34, https://doi.org/10.5751/ES-12960-270134.
[41] Inuit Circumpolar Council, "Circumpolar Inuit Protocols for Equitable and Ethical Engagement," 2022, https://iccalaska.org/wp-icc/wp-content/uploads/2022/06/EEE-Protocols-LR-1.pdf. Kūlana Noiʻi Working Group, "Kūlana Noiʻi v. 2" (University of Hawaiʻi Sea Grant College Program, 2021), https://seagrant.soest.hawaii.edu/wp-content/uploads/2021/09/Kulana-Noii-2.0_LowRes.pdf. Inuit Circumpolar Council Alaska, "The Role of Providing - Inuit Management Practices: Youth, Elders, Active Hunters and Gatherers Workshop Report," 2019, https://iccalaska.org/wp-icc/wp-content/uploads/2022/03/YEAH-Workshop-Report.pdf.

are not members of the IAC. She also discussed IAC's efforts to increase IAC membership to benefit the northwest Atlantic leatherback turtle. This effort involves collaboration with NGOs from non-member countries and some member governments to help entice non-member countries to join the IAC.

Mobilizing Efforts for Improved Conservation and Management of Transboundary Marine Species at Risk: Sharks and Southern Resident Killer Whales in Changing Seas

Presenter: Meaghen McCord, Senior Marine Advisor for Pacific Region with Parks Canada

Meaghen McCord compared her experience working on shark conservation at an environmental NGO in East Africa with her current role at Parks Canada helping protect the Southern Resident killer whale.

McCord began by discussing her East African NGO experience. Coastal East Africa is home to over three hundred distinct ecosystems governed by 10 different low-income countries. Marine conservation is difficult due to pollution, climate change, geopolitical instability, and illegal, unregulated, and unreported fishing. Although the region has many MPAs and OECMs, numerous ecosystems are not covered.

McCord noted several impediments to creating effective cross-boundary MPAs, including insufficient capacity and conflicts with economic development priorities. Yet, despite these challenges, NGOs worked together with certain East African governments to build trust, and in some places, NGOs are now welcomed at the decision-making table. Both sides benefit: the government learns from subject-matter experts, while NGOs learn how to support the government to achieve their goals.

Turning to her more recent Canadian experience, McCord discussed her work on the Southern Resident killer whale, whose Pacific Northwest population has dwindled to 73 individuals. Despite government regulation and enforcement, climate change has devastated this species, demonstrating the need to better incorporate climate considerations into species management.

Beyond killer whales, three shark species listed under SARA range from Canada down to Mexico, and trilateral government cooperation has blossomed to save these species. These efforts have highlighted how climate-driven range shifts add additional complexity and difficulty to existing efforts.

McCord highlighted three critical lessons from her conservation experiences: First, it is important to develop forums and working groups and to give those groups the ability to make changes. Second, managers must integrate Indigenous knowledge into decision-making. Lastly, conservation can become more successful when biodiversity efforts are linked with blue economy aspirations.

Panel 6 Q&A

Making Progress in International Conservation

An audience member asked how we motivate countries to act on these issues. Panelists emphasized the importance of diplomatic leadership, particularly with influential countries that can help other countries see additional value to joining. Another panelist emphasized the importance of individuals who are mission-driven and can champion efforts to move forward.

Shark Conservation

Panelists and audience members then discussed challenges facing sharks. Participants critiqued the Northeast Atlantic Fisheries Commission (NEAFC) for not regulating shark bycatch, as NEAFC bans directed fishing only for certain sharks. The challenge is determining whether shark landings were directed and intentional or bycatch.

Additionally, one participant noted that the East African region is crucial for shark conservation and needs more than MPAs; the region must have strong, species-specific regulations too. Although Regional Seas can list species to protect them, it is difficult to know how these obligations are implemented domestically.

Improving the Regional Seas Programme

Some panelists argued for Regional Seas Programme parties, observers, and UNEP to do more to work together. Particularly, UNEP should provide leadership. Yet, panelists critical of UNEP and others admitted that limited funding is an impediment for all actors. However, the attendees highlighted new Convention on Biological Diversity conservation targets as hopefully motivating actors to take serious conservation measures, particularly if specific, concrete targets emerge.

Enforcing Rules on the High Seas

Panelists concluded by discussing the perennial question of how to operationalize and enforce high seas rules. This is an implementation issue for any biodiversity beyond national jurisdiction efforts. The solution, per some panelists, is that any such agreements create party-based enforcement measures, where signatories hold their own nationals accountable.

Small Group Discussions

Rapporteurs: Elise Boos, Valerie Brankovic, Jonathan Choi, John Doherty, Jordan Sarah Head, Olga Koubrak, Bette Rubin and Melissa Skarjune

Following the panel presentations, the workshop divided into three groups to discuss broader take aways and areas for future work. Participants were tasked broadly with answering the following six questions:

1. What stands out as positive **achievements** in transboundary ocean governance?
2. What are the main **constraints or challenges** in transboundary ocean governance?
3. Are there **national** law or policy actions that might advance transboundary species recovery?
4. Are there **bilateral** law or policy actions?
5. Are there **regional** law or policy actions?
6. Are there **global** law or policy actions?

These group discussions generated a wide variety of responses. Following are summaries of main themes that emerged.

1. Achievements and Successes

Participants identified scientific collaboration as easier than management collaboration because scientific interactions were less constrained by legal and political considerations. In that vein, participants highlighted the breadth and depth of formal and informal scientific collaboration across the United States-Canada border on migratory species. This spirit of collaboration was a resounding high point for many of the participants. Much of the current collaboration is taking place as part of projects related to the North Atlantic right whale. In particular, the North Atlantic Right Whale Consortium (NARWC) is leading a lot of collaborative science with an emphasis on management implications in the wake of the 2017 Unusual Mortality Event.

There is also some management-oriented collaboration, including efforts to develop ropeless gear and marked gear to identify nation of origin. Further, the Gulf of Maine Council's efforts towards joint management and collaboration between states, provinces, and federal governments was seen as a promising start. Beyond the North Atlantic, others identified the work of the International Commission for the Conservation of Atlantic Tunas (ICCAT) in beginning to rebuild Atlantic bluefin tuna stocks and the work of NAMPAN as other high points.

Finally, participants identified new efforts to increase stakeholder engagement, including engaging fishermen on the water to help conduct surveys for whales, fish, and sharks. Including these stakeholders in broader scientific and management convenings could be particularly helpful, acting as a potential nucleus for broader coalition building. Participants believed that scientific forums may be easier settings to begin this work because they are less bound by specific legal obligations and management goals.

2. Constraints and Challenges

Workshop participants identified numerous constraints and challenges for migratory species conservation. The challenges fell largely into four categories: coordination, paradigm shifting, politics, and personnel challenges.

Coordination Challenges

Data Management

The extent of existing collaboration highlighted the immense amount of data currently being generated, as well as the need to avoid duplicating efforts in the creation of the data. Making data available and usable, rather than merely viewable, could go a long way towards improving science and management between both nations. A few existing models of data collaboration include the NARWC, the International Whaling Commission, and the Commission for the Conservation of Antarctic Marine Living Resources. By improving data access between countries and different interest groups, joint studies would be easier to conduct and would hopefully reduce the pressing need for additional data collection. However, there is an understandable need for researchers to protect their data in order to publish and conduct their own research as well as other institutional and structural barriers, including firewalls, that would need to be considered further.

Some of this coordination could be made easier through the use of individual memorandums of understanding between organizations and governments, though this process itself can prove time-consuming. For instance, though the IAC was able to access IATTC data through an MOU,it nonetheless was required to contact individual governments to hammer out data sharing agreements.

Harmonizing US and Canadian Species Listing & Management

Workshop participants identified mismatched regulations and species conservation status across boundaries as resulting in both inconsistent levels of protection and a duplication of efforts. Potential harmonization of these regulations and species conservation status using IUCN or some other standard could significantly streamline efforts across both nations. For example, a law requiring SARA-listed species in Canada to be automatically considered for listing under the ESA in the United States (and vice versa) could reduce rule-making review costs. Transboundary and migratory species could be afforded similar levels of protection by standardizing listing protocols and standards and regulatory/management tools.

Intragovernmental Coordination

Participants highlighted the need for coordination within governments, particularly between agencies with overlapping issue areas. For example, different delegations from the same government would appear at different regional and international fora with different agendas and mandates. This mismatch was particularly evident between environmental and fisheries agencies.

Further, incorporating science into policy decisions was seen as a problem. Recommendations for action that appear in scientific papers are often ignored, instead of being directly incorporated into

policy. Participants noted that, notwithstanding an abundance of solid scientific collaboration, the resulting information simply was not getting into the hands of policymakers. This suggested that lawyers and policymakers may need to be incorporated into research from the start, helping to suggest policy-oriented research questions earlier in the process and co-creating studies. In addition to helping move the science more immediately into policy considerations, such an approach could spark policymakers to champion new science to help inform decision-making.

Research Infrastructure

Research is also limited by access to research platforms, including research vessels, submarines, aircraft, drones and satellites. While general data using satellites and other existing equipment is helpful, lack of funding and equipment hinders research on species beyond charismatic and endangered species. This hinders the ability to understand ecosystem assemblages, which is necessary to support ecosystem-based management, as well as the ability to engage in behavioral studies to understand how particular species will respond to climate change and other disturbances.

Linguistic Barriers

Language barriers can hamper collaboration outside of the US-Canadian context, as nuances can be difficult to grasp without fluency. Investment in translating various working documents would allow broader lessons to be drawn.

Financial Differences

Beyond the US-Canadian context, there needs to be flexibility to allow different approaches and levels of commitment that reflect economic imbalances between countries.

Paradigm Shifting Challenges

This set of challenges asks us to go beyond additional science and management within our existing systems and to instead consider more fundamental reforms. These challenges include the need to better incorporate Indigenous knowledge, develop ecosystem-based management, address temporal and spatial mismatches between science and management, and better incorporate climate change into management paradigms.

Single Species Management

Many conservation laws including the US Magnuson-Stevens Act and the ESA adopt a species-by-species approach. While this has been effective at protecting charismatic or commercially important species, such an approach can lead to neglect for other species that similarly would benefit from at least baseline science. Conservation efforts have been stuck in this species-by-species approach, focusing instead on keystone species or umbrella species in the hopes that concentrating on a single species will save their underlying ecosystem. However, moving away from this paradigm is difficult because of the need for broader life history information on transboundary species to understand management scales and to identify partners for transboundary governance.

The Colonial Lens

Even beyond this single-species management paradigm, existing management paradigms often use a colonial lens that fails to incorporate Indigenous knowledge, acknowledge Indigenous rights, or encourage collaboration with Indigenous peoples. Indigenous knowledge emphasizes the relationships between the biotic and abiotic parts of the environment as well as their interaction with human well-being and thus refocuses conversations on holistic ecosystem health and the relationships that underlie that health. Incorporating Indigenous knowledge is crucial to longstanding engagement requirements with Indigenous rights holders and also vital to the efficacy of conservation efforts. However, this knowledge cannot be easily plugged into existing Western science and management paradigms.

The challenges presented in reformulating existing paradigms to incorporate Indigenous knowledge are large and present fertile opportunity for cooperation. Starting with principles of free, prior, and informed consent, the US and Canadian governments need to collaborate with Indigenous Nations to understand how to help ensure that each country improves its collaborative approach to managing transboundary ocean resources.

Time & Space Mismatch

Migratory species are uniquely difficult to manage given the distances they traverse and the different seasonality of their movements. Management actions are very rarely matched to the spatial and temporal dimensions of their movement. The processes involved are often slow-moving and brought by under-resourced agencies that are required to wade through significant bureaucracy before acting. Further, the proposed management arrangements often request a level of certainty that scientific models and research simply are not able to provide. Addressing these issues of scale requires sufficient flexibility as well as an understanding of the long-term planning horizons that need to be incorporated.

Climate Change

Climate change is bound to reshuffle marine environments in unpredictable ways. It will thus be essential that management regimes for United States/Canada transboundary species are prepared to be adaptive in the face of uncertainty.

Political Challenges

Participants recognized that all of these challenges, as well as the broader societal changes needed to move towards sustainability, require building political will. Without political will there is not a clear way to answer fundamental questions of funding and ultimate responsibility for executing these management actions.

However, there is a tradeoff between harnessing any existing political will to act on conservation and making conservation efforts as effective as possible. Some believe that not enough conservationists

are asking for short-term changes, such that countries are getting away without implementing basic changes.

There was some sense that conservation is largely reactive rather than proactive, which is problematic when considering future impacts of climate change. For example, participants noted that the political will to act on North Atlantic right whales and killer whales only emerged when the whales became critically endangered.

Others felt that the increased acceptability of rudeness in culture generally has led to the degradation of formerly constructive negotiations, with some threats of violence at different local or regional meetings. This could also be reflected in different standards of conduct between NGO representatives and fishers.

Personnel & Capacity Building

A recurring theme among discussion group participants was the lack of "champions" who could drive forward conservation efforts. Cultivating mission-driven, passionate individuals who could build projects across boundaries and organizations and were resilient to criticism and pressure was seen as particularly important. However, staff turnover within agencies and other organizations can make this difficult, particularly when much of the work is built on personal relationships and trust.

3. National Action

Workshop participants identified discrete changes to be made to the national laws and policy of either Canada or the United States in order to improve the conservation and management of transboundary marine species. Potential changes to existing laws and regulations are first discussed before a review of broader policy recommendations.

Changes to Laws and Regulations

Strengthen Existing Species Protection Laws

Participants believe that both nations should strengthen their existing species protection laws (i.e., ESA & SARA) by emphasizing the need to recover a species' population, rather than simply ensuring its survival. Both laws should focus on cross-boundary collaborations, including streamlining the listing process such that a species listed as endangered in Canada will automatically be considered for listing as endangered in the United States and vice versa. The laws should also require collaborative cross-boundary recovery strategies. Finally, the laws should require explicit consideration for climate change in enacting regulations. In particular, regulators should be encouraged to be proactive and anticipate range shifts, drawing lessons from the current experience with the North Atlantic right whale's shift northward.

Establish MPA Minimum Standards

Participants are of the view that both nations should adopt minimum standards for marine protected areas such as those adopted by policy in Canada. Such a minimum set of standards would allow for ease of definition and improve interoperability.

Advance Shark Conservation

Several specific suggestions regarding shark conservation emerged from the group discussions. First, the United States should end the exception for targeted catch and release fishing for white sharks. Second, the United States should also adopt and bolster Canada's long-term commitment to maintaining the North Atlantic shortfin mako retention ban as a cornerstone to a broader rebuilding plan. Third, the United States should work specifically towards minimizing shark bycatch mortality. Finally, Canada should reengage in transboundary spiny dogfish shark assessments.

Identify Essential Fish Habitat

Participants suggested that the United States should expand existing requirements under the Magnuson-Stevens Act to identify and protect essential fish habitat for highly migratory species beyond just the United States to other species and to other countries.

General Policy Recommendations

Advance Indigenous Management

Participants recognized that the United States and Canada should work cooperatively to advance Indigenous knowledge and Indigenous management to support migratory species conservation (see further below under Bilateral Actions). However, as part of these efforts, both nations should create protected areas centered on Indigenous knowledge with explicit collaborative or co-governance areas. Incorporating traditional Indigenous knowledge would emphasize the relationships within the environment, going beyond a both ecosystem-based and species-specific management.

Expand Marine Spatial Planning

Marine spatial planning (MSP) efforts in both nations suffer from lack of clarity. In Canada, legislation should clarify MSP implementation as it seeks to integrate multiple uses. In the United States, MSP efforts need additional guidance, particularly after efforts stalled during the Trump Administration. In both nations, MSP will need to directly address the conflicting uses of multiple stakeholders, presenting a critical opportunity for a democratic process grounded in democratic stakeholder processes.

Improve Intragovernmental Collaboration

Participants agreed that nations should improve inter-agency collaboration, particularly between fisheries agencies and wildlife conservation agencies. While coordination has been underway at regional offices, it can be difficult to collaborate at the headquarters level. Further, regional offices

can be under-resourced and overloaded with work, requiring leadership from headquarters to ensure that such collaboration is made a priority.

Encourage Science and Regulatory Collaboration

Participants believed that both nations should encourage regulators and scientific researchers to coordinate, such that research can be directly incorporated into management and regulators can keep apace of the latest breaking science. Such efforts could include conferences, newsletters, or collaborative funding opportunities.

Compensate Fisheries for Gear Changes and Fishery Closures

Participants felt that federal governments should compensate both directly impacted fishers and fish processors when implementing new regulations encouraging or requiring fisheries to change gear or to close. These efforts ought to be designed to ensure that the critical support infrastructure for fisheries, beyond the fishers themselves, can remain intact during times of transition, ensuring the long-term longevity of working waterfronts. Such a program not only advances conservation goals but also reflects compassion and respect for fishing communities, which is vital to the long-term success of conservation efforts.

Remove Dams

Participants noted that dam removal helps to protect migratory species that rely on rivers for some part of their life cycle. New efforts to remove aging dams, along with investments in fish ladders and other equipment to improve connectivity, could help marine migratory species like Atlantic salmon recover.

Encourage Stakeholder Engagement

Participants agreed that both nations should encourage stakeholder engagement by broadly considering who should be considered a stakeholder and developing additional co-governance arrangements. In this manner, management of transboundary marine species would be informed by the full range of players, including Indigenous groups, fishing and other industries, academics, and NGOs.

4. Bilateral Action

In addition to considering national-level actions, participants devoted some attention to the question of the kinds of actions the United States and Canada could take together.

Indigenous Knowledge

Canada and the United States should work collaboratively to build Indigenous knowledge and directly incorporate it into current management paradigms. The agenda below is based on recommendations provided by Ms. Carolina Behe.

1. Host a meeting that brings Indigenous knowledge holders, scientists, decision-, and policy-makers to discuss transboundary species, climate change, connectivity, and other related topics.
2. Work with Indigenous Partners to develop an agenda and outline additional pieces that should be included.
3. Include a format that puts at the forefront Indigenous Peoples' management, knowledge, and approaches being applied across the world regardless of borders.
4. As part of this type of meeting or symposium, consider space for Indigenous Peoples first to exchange and learn from Indigenous knowledge.
5. Work to support a paradigm shift toward more robust community-led initiatives and approaches. This will aid in bringing forward innovative solutions and inform holistic and adaptive decision-making.
6. Focus on crossing geographic and temporal scales in modeling, monitoring, assessments, decision- and policy-making through equitable partnerships with Indigenous Peoples and co-production of knowledge (bringing together Indigenous knowledge and science).
7. Work toward genuine co-production of knowledge and joint decision and policy-making through a focus on equity.
8. Recognize and utilize tools provided by Indigenous Peoples', such as the Role of Providing (report sharing Inuit management practices), the Circumpolar Inuit Protocols for Equitable and Ethical Engagement, and the Kūlana Noii (research standards co-developed by community groups in Hawaii and representatives from the University of Hawaii).

Build Scientific Collaboration

Workshop participants noted the numerous US-Canadian collaborations, particularly related to cetaceans generally and the North Atlantic right whale specifically. They suggested that the nations should enhance the efforts of the United States-Canada cetacean working group and build upon the collaborative work of groups like the Gulf of Maine Council, the NARWC, and other research collaborations. Specifically, both nations should expand coverage of collaborations to include both the Atlantic and Pacific and to extend beyond NARWs and even cetaceans. Joint programs should also identify and cover knowledge gaps, especially in species that are not directly interacting with fisheries.

Beyond research collaborations, both nations need to continue to share and publish readily accessible, open-source data as a result of publicly-funded research. Though there are reasonable questions of privacy, particularly for species where locations may lead to poaching or may be tied to sensitive fishing areas, both nations should work towards providing data that can be readily used by regulators and scientists alike.

Finally, participants believe that both nations should consider collaborating on access to critical research infrastructure, including access to satellites, deep sea remote vehicles, aircraft, and research vessels. This could help to reduce operating and research costs for both nations.

Unify Standards

Participants recognized that duplicating efforts between Canadian and US agencies slows down both governments. By unifying standards and processes between the United States and Canada, science and management efforts would be directly interoperable. For example, streamlining the species listing process between 'SARA and the ESA could potentially reduce redundancy.

Similarly, unifying the minimum standards for MPAs across both nations would allow for better comparison of data and management measures and efficacy. This would also help to build harmonized, connected MPA networks.

Advance Shark Conservation

Emerging from the group discussions was the notion that nations should focus efforts on the spiny dogfish and porbeagle shark populations. The spiny dogfish, which had been successfully managed bilateraly, is currently in decline. Both nations should develop a bilateral plan to halt this decline and rebuild the population. For the porbeagle, they should consider ending allowances for domestic retention to guard against population declines and to accelerate recovery.

Strategic Assessments

Given the increasing industrialization of the North Atlantic, participants were of the view that both nations should conduct strategic assessments and long-term planning with a particular eye towards future offshore wind energy development.

Legally-binding Commitments

Consider the need to move from largely informal cooperative arrangements to more formal, legally-binding commitments, for example, through a bilateral cetacean conservation agreement, one or more fisheries agreements or even a broader transboundary ocean cooperation framework.

5. Regional Action

In the view of the participants, both nations, beyond direct bilateral collaboration, should also consider the broader regional context, including Mexico, the Caribbean, and Latin America. This should include efforts to encourage grassroots environmentalism, build the North American Marine Protected Area Network and similar collaborations, and expand collaboration in existing regional fisheries management organizations.

Encourage Grassroots Organizing

Participants regularly noted the importance of local champions who can push conservation initiatives. Grassroots efforts have occasionally led to successful policy initiatives with local buy in. Participants were hopeful that encouraging grassroots efforts through education or funding for existing initiatives across the continent could create unexpected solutions that advance conservation.

Marine Protected Area Networks

Participants observed that regional and global efforts to improve marine protected area network connectivity are a particularly promising area for future efforts. Funding initiatives to build scientific and management networks like NAMPAN can help to transfer information, skills and strategies across the region. There are many different potential frameworks to learn from, including the Ramsar Convention on Wetlands, the CMS, the bilateral United States-Mexico and United States-Canada migratory bird treaties, the Convention on International Trade in Endangered Species (CITES), the Global Environment Facility's Large Marine Ecosystem Program, the Convention for Biological Diversity's Ecologically and Biologically Significant Area program, the Protocol for Specially Protected Areas and Wildlife, and the UN Environment Programme's Regional Seas Programme.

Diplomatic Leadership in Regional Organizations

There are numerous international fora at which both Canada and the United States can exercise significant leadership roles by supporting science and encouraging migratory species conservation. For example, participants suggested that the United States should bolster Canada's long-term commitment to maintaining the shortfin mako shark retention ban at the ICCAT in order to help rebuild the stock.

In NAFO, which manages Northwest Atlantic high seas non-tuna species, both nations should prioritize improving thorny skate assessments, including cleaning and collecting additional data. This should also involve brokering cooperation with the European Union.

Finally, participants believe that Canada should join the United States in the Inter-American Sea Turtle Convention to ensure the long-term health of migratory turtles.

6. Global Action

Beyond efforts in the Americas and the North Atlantic, it was the view of the participants that both the United States and Canada can protect marine migratory species by (1) ratifying the Biodiversity Beyond National Jurisdiction (BBNJ) treaty when it is finalized, (2) encouraging efforts to decrease carbon emissions and advance adaptation plans through the UN Framework Convention on Climate Change and (3) actively encouraging global data sharing and forecasting to improve science-informed proactive management. Further, both nations should join the CMS and collaborate under existing MOUs for migratory sharks.

Finally, given the baseline importance of reliable data, both the United States and Canada should encourage data reporting, observer coverage, and bycatch reduction in each of the regional fisheries management organizations to which they belong.

Appendix 1

Atlantic Canada Briefing Document

DALHOUSIE UNIVERSITY
MARINE & ENVIRONMENTAL LAW INSTITUTE

Briefing on the Federal Legal Framework for Protecting Marine Species at Risk in Atlantic Canada

Prepared for the Workshop on Transboundary Marine Species at Risk Recovery in a Changing Climate: Taking Stock of Canadian–US Scientific and Governance Responses, Enhancing Future Cooperation, Duke Conference Facility, Washington DC, 3–4 November 2022

by

Jordan Sarah Head, Olga Koubrak, and David L. VanderZwaag,
Marine & Environmental Law Institute, Dalhousie University, with research assistance from Joanna Skrajny and Alex Hayward.

Professor VanderZwaag wishes to acknowledge the support of the Social Sciences and Humanities Research Council (SSHRC) through the Canada Research Chairs Program.

Dalhousie University is located in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq. We are all Treaty people.

November 2022

TABLE OF CONTENTS

Introduction

The purpose of this document is to provide a brief overview of the Canadian Species at Risk Act (SARA), as well as a summary of marine species that are currently listed under SARA or are being considered which are especially relevant to this transboundary workshop. Part I provides an overview of SARA and the role played by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in implementing SARA. Part II highlights COSEWIC assessments and recovery efforts for six selected transboundary marine species presently listed under SARA. Part III summarizes the status of two shark species currently being considered for listing under SARA and key management measures. Finally, the Appendix provides a summary table of selected Atlantic species and their assessment and listing history under COSEWIC and SARA.

Part I: Introductory Overview

What Is COSEWIC?

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) is an independent expert body charged with assessing the conservation status of wild species in Canada and identifying threats to their survival.[42] Assessments apply the best available information (including scientific, community and traditional knowledge[43]) against criteria closely aligned with the IUCN Red List criteria.[44] Five indicators are considered in the assessment: a decline in the total number of mature individuals; small distribution range and decline or fluctuation in the population; small and declining number of mature individuals; very small or restricted total Canadian population; or population projections showing the probability of extinction or extirpation in the wild greater than the set percentage. Based on the assessment, COSEWIC assigns a species to one of its status categories: *Extinct*, *Extirpated*, *Endangered*, *Threatened*, *Special Concern*, *Data Deficient* or *Not At Risk*.

COSEWIC has the authority to identify species for assessments, with priority given to species that are more likely to become extinct.[45] Only biological factors are used to prioritize species for assessment.[46] SARA allows any person to apply to COSEWIC for an assessment of a species,[47] although no guidance is provided on the application process. COSEWIC is required to review the classification of each species at risk once every 10 years or sooner if there are significant changes in the species' status;[48] COSEWIC is currently experiencing a backlog of reassessments.[49]

---

[42] *Species at Risk Act* (SARA), SC 2002, c. 29, s. 15(1).
[43] SARA, s. 15(2).
[44] COSEWIC Assessment Process, Categories and Guidelines (2021), https://www.cosewic.ca/images/cosewic/pdf/Assessment_process_criteria_Nov_2021_en.pdf (accessed 20 October 2022).
[45] SARA, s. 15(b).
[46] COSEWIC Assessment Process, Categories and Guidelines (2021), p. 4.
[47] SARA, s. 22(1).
[48] SARA, s. 24.
[49] COSEWIC Annual Report (2020–2021), p. 12, https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/Rapport-Cescc-Report-v01-2021oct-Eng.pdf (accessed 20 October 2022).

What Is SARA?

The *Species at Risk Act* (SARA) is a federal statute enacted in 2002 in response to Canada's commitments under the Convention on Biological Diversity. It applies to federal lands, including the territorial sea and the exclusive economic zone (EEZ), as well as to sedentary species on or under the continental shelf beyond the EEZ.[50]

Responsibilities under SARA are shared among two federal departments and one agency.[51] The Minister of Environment and Climate Change (ECCC) carries the primary responsibility and is advised by the Minister of Fisheries and Oceans with respect to aquatic species. SARA is also linked to the *Impact Assessment Act*, an environmental impact assessment statute, and requires projects to have mitigation measures in place to lessen the identified adverse effects on the listed species and their habitat.[52]

Prohibitions, Obligations and Exceptions

Species under SARA are listed on Schedule 1 based on their conservation status. Species that are *Endangered* and *Threatened* receive significantly stronger legal protections than species that are *Special Concern*. For *Endangered* and *Threatened* species, SARA prohibits killing, harming, harassing, capturing or taking.[53] Possession, collection and trade in species and their derivatives are also prohibited,[54] along with damaging the residence or destroying any part of the critical habitat.[55] The Minister of Fisheries and Oceans is required to prepare a recovery strategy for *Endangered* and *Threatened* species followed by at least one action plan.[56]

SARA does provide for exemptions to the above prohibitions. Section 73 of SARA allows the Minister of Fisheries and Oceans to enter into an agreement or issue a permit authorizing a person to engage in an activity affecting a listed species. Agreements or permits may be given for scientific research, an activity benefitting the species or enhancing its chance of survival in the wild, or an activity causing incidental harm.[57] These are subject to conditions such as all reasonable alternatives have to be considered first; all feasible mitigation measures to minimize the impact of the activity on the species or its habitat are adopted; and the Minister has to believe that the activity will not jeopardize the survival or recovery of the species.[58]

Furthermore, prohibitions do not apply to activities that are permitted by a recovery strategy, action plan or a management plan and that are authorized by another federal statute, such as the *Fisheries Act*.[59]

---

[50] Application of SARA to the EEZ, while not explicit in the Act, is clear from section 8(2.1) of the *Interpretation Act*, RSC 1985, c. I-21, which provides that every enactment respecting the conservation of natural resources applies to the EEZ unless a contrary intention is expressed in the enactment. Also see SARA, s. 4(1).
[51] SARA, s. 2(1) "competent minister." These are Environment and Climate Change Canada, Fisheries and Oceans Canada, and Parks Canada.
[52] SARA, s. 79; *Impact Assessment Act*, SC 2019, c. 28.
[53] SARA, s. 32(1).
[54] SARA, s. 32(2).
[55] SARA, s. 33.
[56] SARA, ss. 37, 47.
[57] See Government of Canada, Guidelines for Permitting Under Section 73 of the *Species at Risk Act* (2016).
[58] SARA, s. 73(3).
[59] SARA, s. 83(4); *Fisheries Act*, RSC 1985, c. F-14.

There are no prohibitions with respect to the species listed as *Special Concern*. Instead, the Minister is required to prepare management plans for these species and their habitat.[60]

How Does a Species or Population Gain Protection under SARA?

Once COSEWIC makes a designation of a species and releases a report on its populations, these designations are recommendations for the federal government concerning SARA status. If the species/population is deemed to be at risk by COSEWIC (if it is given any of the following COSEWIC designations: *Extirpated, Critically Endangered, Endangered, Threatened, Special Concern*), then it must be decided whether to list that species under the Act.

Moving from a COSEWIC assessment of a marine species at risk to a listing determination has been problematic. Following the receipt of a COSEWIC assessment, the Minister of ECCC has 90 days to include a report in the public registry on how the Minister intends to respond and timelines for action.[61] SARA does not set out timelines for consultations or for when the Minister of ECCC must submit the COSEWIC assessment and a listing recommendation to the Governor in Council (GIC). The GIC has nine months after receiving the COSEWIC assessment to accept the assessment and list the species, to decide not to list the species', or to refer the matter back to COSEWIC for further consideration.[62]

Consultations, especially for marine fishes, have often been lengthy and even after consultations, delays in submitting the assessment and recommendation to the GIC have been common.[63] A recommended timeline has been set for aquatic species requiring significant consultations with the Minister of ECCC expected to seek a GIC decision within 36 months after COSEWIC submits a species status assessment to the Minister.[64]

SARA is silent with respect to the factors that the GIC needs to take into account in their listing decision. Nevertheless, there is a requirement to provide reasons for deciding not to list the species under SARA or referring the matter back to COSEWIC.[65] In the case of commercially important species, the GIC has frequently cited socio-economic considerations as the reason for not listing the species.[66]

---

[60] SARA, s. 65.
[61] SARA, s. 25(3).
[62] SARA, s. 27(1.1).
[63] See Jeffrey A. Hutchings, Tim Stephens and David L. VanderZwaag, "Marine Species at Risk Protection in Australia and Canada: Paper Promises, Paltry Progressions" (2016) 47 *Ocean Development & International Law* 233–254 at 241.
[64] "Timeline for amendments to Schedule 1 of the *Species at Risk Act*" (2017) at 1, online (pdf): *Species at Risk Public Registry*, https://www.registrelep-sararegistry.gc.ca/virtual_sara/files/policies/Pg-TimelineAmdmtS1-v00-2017NovEng.pdf [perma.cc/CVJ7-QX4C].
[65] SARA, s. 27(1.2).
[66] For Atlantic species see: Order Giving Notice of Decisions Not to Add Certain Species to the List of Endangered Species, SI/2006-61 (Newfoundland and Labrador population, the Laurentian North population, the Maritimes population of Atlantic Cod (*Gadus morhua*)); Order Giving Notice of Decisions Not to Add Certain Species to the List of Endangered Species, SI/2006-110 (porbeagle shark (*Lamna nasus*)); List of Wildlife Species at Risk (Decisions Not to Add Certain Species) Order, SI/2013-27 (Striped Bass (*Morone saxatilis*) (Southern Gulf of St. Lawrence population) and Cusk (*Brosme brosme*)); List of Wildlife Species at Risk (Decisions Not to Add Certain Species) Order, SI 2017-24 (Atlantic Bluefin Tuna (*Thunnus thynnus*)).

Are There Emergency Powers?

SARA provides two sets of emergency powers: power to list a species and power to issue a protective order. Under s. 29(1), if the Minister of ECCC is of the opinion that there is an imminent threat to the survival of a species, the Minister must recommend to the GIC that the species be added to Schedule 1 as *Endangered*. The Minister of ECCC has to consult with the Minister of Fisheries and Oceans before proceeding with the recommendation.[67] COSEWIC has one year after the emergency listing to prepare a report which either confirms the status of the species or recommends that the species be reclassified.[68]

The Minister of Fisheries and Oceans has to recommend that the GIC issue an emergency protection order if the Minister is of the opinion that the species is facing imminent threats to its survival or recovery.[69] For aquatic species, the order may identify habitat necessary for the survival or recovery of the species and outline activities that need to be carried out in order to protect the species and its habitat.[70] The Minister does not have to recommend an emergency protection order if they are of the opinion that equivalent measures have been taken under another statute.[71]

In 2018, the Minister formed an opinion that the killer whale Northeast Pacific southern resident population faced imminent threats to its survival and recovery and recommended that an emergency protection order be issued by the GIC, as required by SARA.[72] The GIC declined to issue a protection order citing conservation measures already in place and considering "social, economic, policy and other factors, and the broader public interest." To date, emergency orders have been granted to protect two species: chorus frog and greater sage-grouse.[73]

What Is a Critical Habitat?

Subject to some qualifications, SARA prohibits any person from destroying any part of the critical habitat of any listed *Endangered* or *Threatened* species.[74] Critical habitat refers to the habitat that is necessary for the species' survival and recovery;[75] and it is to be identified to the extent possible in the recovery strategy and relevant action plans.[76]

For critical habitats located in protected areas, such as national parks or marine protected areas under the *Oceans Act*, a description of the critical habitat must be published in the *Canada Gazette* 90 days after a recovery or action plan that identified the critical habitat is included in the public

---

[67] SARA, s. 29(1).
[68] SARA, s. 30(1).
[69] SARA, s. 80.
[70] SARA, s. 80(4)(a).
[71] SARA, s. 81.
[72] Order Declining to make an Emergency Order for the protection of the Killer Whale Northeast Pacific Southern Resident Population, SI/2018-102.
[73] Emergency Order for the Protection of the Western Chorus Frog Great Lakes/St. Lawrence–Canadian Shield Population (Longueuil), SOR/ 2021-231; Emergency Order for the Protection of the Western Chorus Frog (Great Lakes/St. Lawrence–Canadian Shield Population), SOR/ 2016-211; Emergency Order for the Protection of the Greater Sage-Grouse, SOR/ 2013-202.
[74] SARA, s. 58(1).
[75] SARA, s. 2(1) "critical habitat."
[76] SARA, ss. 2(1) "critical habitat," 41(1)(c), 49(1)(c).

registry[77] and the prohibition on destruction applies 90 days thereafter.[78] For critical habitat outside protected areas, the competent Minister, within 180 days after a recovery strategy or action plan that identifies the critical habitat is included in the public registry, must either make a ministerial order invoking the prohibition or include a statement in the public registry setting out how the critical habitat or portions of it are legally protected under other acts or agreements.[79]

What constitutes destruction of critical habitat remains unclear.[80] SARA does not define destruction. A guidance document, issued by the Department of Fisheries and Oceans (DFO), suggests a case-by-case approach will be followed on a site-specific basis to determine if destruction will occur with destruction involving a temporary or permanent loss of a function of critical habitat.[81]

What Is a Recovery Strategy?

The Minister of Fisheries and Oceans is required to prepare a recovery strategy for *Endangered* and *Threatened* species.[82] A recovery strategy is a planning document that identifies what needs to be done to ensure that the decline is stopped or reversed and the likelihood of the species continuing in the wild is improved.[83] When developing a recovery strategy, the Minister has to determine whether the recovery of the species is technically and biologically feasible, based on the best available information.[84] If recovery is feasible, then the recovery strategy has to contain the following information: description of the species and its needs; threats to the species and its habitat and a broad strategy to address these threats; identification of the critical habitat, to the extent possible, based on the best available information, and examples of activities that are likely to result in its destruction; research schedule to identify critical habitat where adequate information is not available; statement of objectives and description of the research and management measures needed to meet these objectives; any information gaps; and timelines for one or more action plans based on the recovery strategy.[85] The Minister is allowed to adopt a multi-species or an ecosystem approach when developing recovery strategies.[86]

SARA requires that a proposed recovery strategy be published in the SARA public registry within one year after the species is listed as *Endangered*, or two years if the species is listed as *Threatened* or *Extirpated*.[87] These are to be finalized within 30 days following a 60-day consultation period.[88]

---

[77] SARA, s. 58(2); *Oceans Act*, SC 1996, c. 31.
[78] SARA, s. 58(3)
[79] SARA, s. 58(5)
[80] See Olga Koubrak, David L VanderZwaag and Boris Worm, "Saving the North Atlantic Right Whale in a Changing Ocean: Gauging Scientific and Law and Policy Responses" (2021) 200 *Ocean and Coastal Management* 105109 at 3–4.
[81] Fisheries and Ocean Canada, Directive on the Identification of Critical Habitat for Aquatic Species at Risk (January 2015).
[82] SARA, s. 37(1).
[83] Fisheries and Oceans Canada, *Recovery Strategy for the Atlantic salmon (Salmo Salar), Inner Bay of Fundy Populations [Final]* (Ottawa: Fisheries and Oceans, 2010) at ii, online: *SARA Public Registry*, https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/plans/rs_atlantic_salmon_ibof_0510a_e.pdf.
[84] SARA, s. 40(1).
[85] SARA, s. 41(1).
[86] SARA, s. 41(3).
[87] SARA, s. 42(1).
[88] SARA, s. 43.

Further, the implementation of the recovery strategy is subject to mandatory reporting every five years.[89]

What Is an Action Plan?

An action plan identifies the specific measures to implement the recovery strategy, but SARA does not include a time limit for an action plan to be published following the recovery strategy.[90] An action plan must include identification of the species' critical habitat; a statement of the measures that are proposed to be taken to protect the species' critical habitat; identification of the species' critical habitat that has not been protected; a statement of the measures that are to be taken to implement the recovery strategy, including timelines; the methods to be used to monitor the recovery of the species and its long-term viability; and an evaluation of the socio-economic costs of the action plan and the benefits to be derived from its implementation.[91]

A proposed action plan has to be finalized within 30 days, following a 60-day consultation period.[92]

What Is a Management Plan?

The Minister of Fisheries and Oceans has to prepare management plans for species listed as *Special Concern* and their habitats.[93] SARA does not provide guidance with respect to the content of the management plans, other than to say that they have to contain conservation measures that the Minister considers appropriate. The Minister is allowed to adopt a multi-species or an ecosystem approach in the development of the management plans.[94]

The Minister has three years to include a proposed management plan in the SARA Registry.[95] Following a 60-day comments period, the Minister has 30 days to finalize the proposed management plan.[96]

What Happens to Species Proposed But Not Listed under SARA?

If the Minister of Fisheries and Oceans recommends that a species assessed as at risk by COSEWIC is not listed under SARA, then he or she is required to provide a "compelling rationale" explaining the decision.[97] According to the Directive for "Do Not List" Advice, compelling rationale has to include at a minimum considerations of the COSEWIC assessment, results of the consultation process, the impacts of the management scenarios, and a qualitative analysis of benefits and costs. It also has to address an alternative management approach for the species, the expected outcome of

---

[89] SARA, s. 46.
[90] Olga Koubrak, David L. VanderZwaag and Boris Worm, "Endangered Blue Whale Survival in the North Atlantic: Lagging Scientific and Governance Responses, Charting Future Courses" (2022) 37:1 *International Journal of Marine and Coastal Law* 89–136 at 100.
[91] SARA, s. 49(1).
[92] SARA, s. 50(2)–(3).
[93] SARA, s. 65.
[94] SARA, s. 67.
[95] SARA, s. 68(1).
[96] SARA, s. 68(3)–(4).
[97] Fisheries and Oceans Canada, "Species at Risk Act Listing Policy and Directive for 'Do Not List' Advice" https://www.dfo-mpo.gc.ca/species-especes/publications/sara-lep/policy-politique/index-eng.html (accessed 30 October 2022).

this approach, and the net benefits to Canadians of a "do not list" decision. Alternative management approaches refers to regulatory tools available under legislation other than SARA, in particular the *Fisheries Act*, regulations and policies.

The DFO may also be required to develop a work plan, if the alternative management approaches identify activities that need to be implemented by the department. A work plan has to span at least five years, identify financial and human resources committed by the department to implementation, and include performance indicators.[98]

Part II: Key Transboundary Species Listed under SARA

BLUE WHALE (Atlantic Population)

Introduction

The blue whale (*Balaenoptera musculus)* is the largest animal known to have existed on earth.[99] The species is found in all oceans and is known to migrate long distances.[100] The International Whaling Commission banned hunting for blue whales in 1966.[101] The species' distribution in Canadian Atlantic waters is widespread in the Northwest Atlantic with important habit both offshore and inshore in the Gulf of St. Lawrence.[102]

COSEWIC Assessment

COSEWIC has released two reports on the Atlantic population of the blue whale, the first in May 2002 and the second in January 2013. Both reports designated the population as *Endangered*. The 2002 report indicates that the percentage decline in the last three generations is greater than 50%, with the generation time being defined as 32 years.[103] The 2012 report updates this percentage decline to greater than 70%, with the generation time defined as 10 to 30 years.[104]

The primary cause of the species' low population numbers is due to commercial whaling in the first half of the 20th century.[105] Current threats include entrapment (by ice), predation (by killer whales),

---

[98] *Ibid.*
[99] COSEWIC, *COSEWIC Assessment and Status Report on the Blue Whale*, *Balaenoptera musculus, in Canada* (Ottawa: Committee on the Status of Endangered Wildlife in Canada, 2002) at 4 [COSEWIC 2002], online: *SARA Public Registry*, https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sr_blue_whale_e.pdf.
[100] *Ibid.*, at 4.
[101] Koubrak, VanderZwaag and Worm (n 90), at 90.
[102] Fisheries and Oceans Canada, *Action Plan for the Blue Whale (Balaenoptera musculus), Northwest Atlantic Population, in Canada [Final]* (Ottawa: Fisheries and Oceans Canada, 2020) at 2 [Blue Whale Action Plan], online: *SARA Public Registry*, https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/plans/Ap-BlueWhaleNwRorqualBleu-v00-2020Juil-Eng.pdf.
[103] COSEWIC, *COSEWIC Status Appraisal Summary on the Blue Whale, Balaenoptera musculus (Atlantic population) in Canada* (Ottawa: Committee on the Status of Endangered Wildlife in Canada, 2012) at ix [COSEWIC Status Summary 2012], online: *SARA Public Registry*, https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sas_rorqual_bleu_atl_blue_whale_0912_e.pdf.
[104] COSEWIC 2002 at 21.
[105] COSEWIC 2012 at v.

ship strikes because of both shipping and whale watching activities, entanglement in fishing gear, and pollution.[106]

Both the 2002 and 2012 COSEWIC reports include a discussion on climate change as a possible threat to blue whales. The 2002 report identifies changes in food availability due to changes to the ecosystems as a potential threat.[107] The 2012 report expands on climate change as a potential threat to the blue whale, but only discusses the effects of climate change on blue whales in the context of the Pacific waters off the coast of California.[108] Effects that could have negative impacts on blue whales include declines in zooplankton and increased surface water temperature. [109] The report notes that blue whales in the Atlantic potentially face similar threats.[110]

SARA Status

The Atlantic population of the blue whale was listed as *Endangered* under SARA in January 2005.

Recovery Strategy

The DFO published a final recovery strategy in December 2009. In addition to whaling, the recovery strategy identifies the following threats: ice (crushing or suffocation), predation by killer whales, anthropogenic noise, food availability, contaminants, ship strikes, entanglement in fishing gear, epizootics and toxic algal blooms, and toxic spills.[111] Climate change is mentioned multiple times. It is noted that climate change will likely affect prey abundance, interactions with ice, and predation.[112] Potential reductions in food sources due to changes in temperature are emphasized.[113] It is also noted that decreases in pH levels and acidification will increase sound propagation and overall anthropogenic noise in the blue whale habitat, potentially negatively impacting the species.[114] Furthermore, it is noted that climate change is likely to lead to new marine animals habituating the St. Lawrence Estuary, which could expose the blue whale to new diseases and exotic pathogens.[115] Changes in rainfall could also increase algal blooms, making them a significant threat to blue whales.[116]

The Recovery Goal for the Atlantic population of the blue whale is "to reach a level of 1000 mature individuals."[117] Three recovery objectives are outlined:

---

[106] *Ibid.*, at 19.
[107] COSEWIC 2002 at x.
[108] COSEWIC 2012 at 19.
[109] *Ibid.*
[110] *Ibid.*, at iii.
[111] Fisheries and Oceans Canada, *Recovery Strategy for the Blue Whale (Balaenoptera musculus), Northwest Atlantic Population, in Canada [Final]* (Ottawa: Fisheries and Oceans, 2009) at 18 [Recovery Strategy 2009], online: *SARA Public Registry*, https://www.sararegistry.gc.ca/virtual_sara/files/plans/rs_blue_whale_nw_atlantic_pop_0210_e.pdf.
[112] *Ibid.*, at 7.
[113] *Ibid.*, at 12.
[114] *Ibid.*, at 10.
[115] *Ibid.*, at 17.
[116] *Ibid.*
[117] *Ibid.*, at 26.

1) Define and undertake a long-term assessment of the number of Northwest Atlantic blue whales, the structure and trends of the population, and determine their range (and) critical habitat within Canadian waters;
2) Implement control and follow-up measures for activities which could disrupt the recovery of the blue whale in its Canadian range by prioritizing measures that reduce anthropogenic noise and other disturbances;
3) Increase knowledge of the main threats to the recovery of the blue whale in Canadian waters in order to determine their true impact and identify effective mitigation measures.[118]

Several specific measures supplement each objective. Noteworthy is an approach under objective (2), which recommends that Canada "enhance participation in international conservation efforts for marine animals in general."[119] Also recommended are multiple research measures on food sources for the blue whale, prey distribution, fluctuation, and threats, factors which all have probable links to climate change.[120]

Critical Habitat

The 2009 Recovery Strategy states that at the time of its publication, there is not enough information to identify a critical habitat for the blue whale.[121] It does however outline two research objectives to help identify a critical habitat to be completed by 2014: to "improve knowledge of blue whale distribution" and to "improve knowledge of feeding areas."[122]

A report on the progress of the implementation of the 2009 Recovery Strategy was published in April 2016 detailing the period from 2009 to 2014. While this report does not include a description or identification of the blue whale's critical habitat, it does detail several research projects undertaken to help identify the species' critical habitat. Further, while the report details a few undertaken studies on blue whale prey, there is not an explicit link to climate change made.[123]

As such, the blue whale has no critical habitat protected under SARA.

Action Plan

An action plan concerning the Atlantic population of the blue whale was published in July 2020. It includes 38 recovery measures, designated high, medium, and low priority. Of noteworthiness is measure 22, which is to "establish international research partnerships to enhance understanding of Blue Whale distribution and migration routes." This measure is designated as low priority, is given a timeline of 10 years, and partners include the United States National Oceanic and Atmospheric

---

[118] *Ibid.*
[119] *Ibid.*, at 30.
[120] *Ibid.*, at 31.
[121] Fisheries and Oceans Canada, *Report on the Progress of Recovery Strategy Implementation for the Blue Whale (Balaenoptera musculus), Northwest Atlantic Population, in Canada for the Period 2009–2014* (Ottawa: Fisheries and Oceans, 2016) at 33, online: *SARA Public Registry*, https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/ProgressReport-BlueWhaleDfo-v00-2016May03-Eng.pdf.
[122] *Ibid.*, at 34.
[123] *Ibid.*, at 6.

Administration.[124] No studies are explicitly linked to climate change, but many initiatives are focused on food sources for blue whales that have been linked to climate change. For example, measure 10 says the following: "By enacting regulations, designate a marine protected area in the American Bank area located off the Gaspé Peninsula. This site is, among other things, considered a high-density Blue Whale area. Examples of potential conservation measures (include)… measures aimed at protecting forage species, such as krill, the Blue Whale's main prey."[125] It is noted that such regulations were designated in March 2019, so the measure is considered complete.[126]

It should also be noted that the blue whale may benefit from the action plan aimed at reducing noise effects on the beluga whale and other marine species in the St. Lawrence Estuary. There are 32 measures in this action plan, including reducing marine traffic, analyzing the behaviour of marine animals when interacting with noise, and introducing measures to reduce the noise from coastal and offshore projects.[127]

FIN WHALE

Introduction

The fin whale (*Balaenoptera physalus*) is the second largest animal on earth, reaching about 23 m long and 45 tonnes in weight.[128] Their generation time is 25 years, but it is speculated that they could live as long as 100 years.[129] They are an important species to the whale-watching industry in Atlantic Canada, including in the Bay of Fundy and the St. Lawrence Estuary.[130] Fin whales tend to inhabit temperate to polar latitudes and have been observed in the Northwest Atlantic as far south as the Bay of Fundy and into American waters.[131]

COSEWIC Assessment

Two reports have been released by COSEWIC on the fin whale: the first published in August 2005 and the second in December 2019. Both assessed the Atlantic population of the fin whale as *Special Concern*. While the decline in fin whales over the past three generations is deemed "very likely," neither of the COSEWIC reports quantifies the population's decline.[132]

---

[124] Blue Whale Action Plan at 10.
[125] *Ibid.*, at 6.
[126] *Ibid.*
[127] Fisheries and Oceans Canada, *Action Plan to Reduce the Impact of Noise on the Beluga Whale (Delphinapterus leucas) and Other Marine Mammals at Risk in the St. Lawrence Estuary [Final]* (Ottawa: Fisheries and Oceans Canada, 2020) at 15, online: *SARA Public Registry*, https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/plans/Ap_Bruit-Noise-StLawrEstuary-v00-2020Feb.
[128] COSEWIC, *COSEWIC Assessment and Status Report on the Fin Whale, Balaenoptera physalus, in Canada* (Ottawa: Committee on the Status of Endangered Wildlife in Canada, 2019) at 5 [COSEWIC 2019], online: *SARA Public Registry*, https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sr-RoqualCommunFinWhale-v00-2019-Eng.pdf.
[129] *Ibid.*, at 26.
[130] *Ibid.*, at 10.
[131] *Ibid.*, at 24.
[132] COSEWIC, *COSEWIC Assessment and Status Report on the Fin Whale, Balaenoptera physalus, in Canada* (Ottawa: Committee on the Status of Endangered Wildlife in Canada, 2005) at 25 [COSEWIC 2005], online: *SARA Public Registry*, https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sr_fin_whale_e.pdf; COSEWIC 2019 at vii.

The 2005 COSEWIC report indicates that entanglement and interactions with fisheries are likely the primary threats to fin whales. Fin whales are vulnerable to ship strikes, though it is difficult to quantify the severity of this threat.[133] Noise pollution, in particular from offshore oil and gas development, is also thought to threaten fin whales.[134]

The 2019 COSEWIC report provides a more detailed description of the threats to the fin whale. Overall, it lists four main threats by the level of highest impact to least: oil and gas exploration/drilling (including noise); ships (collisions and noise); effects of fisheries (entanglement in gear); naval exercises (noise and explosions); and persistent whaling in Iceland and Greenland.[135] Other threats include offshore windfarm noise[136] and climate change.[137] The analysis of climate change is not detailed, but it is suggested that it could affect (negatively or beneficially) prey distribution[138] and overall habitat suitability.[139]

SARA Status

The Atlantic population of the fin whale was listed as *Special Concern* under SARA in August 2006.[140]

Management Plan

A finalized management plan was published by the DFO on the fin whale in January 2017. The plan includes a comprehensive assessment of 12 current and anticipated threats organized into high, medium, and low levels of concern.[141] High concern includes anthropogenic noise from navigation, seismic exploration and military sonar. Medium concern includes anthropogenic noise from onshore and offshore development; whaling; changes in availability, quantity and quality of prey; toxic spills; and ship strikes. Low concern includes epizootic diseases; entanglement in fishing gear; whale watching activities; contaminants; and harmful algal blooms.[142] The plan reiterates that the effects of climate change will likely alter the fin whales' habitat. The plan says climate change likely will affect or exacerbate listed threats, particularly the availability, quantity and quality of prey.

The objective of the management plan is to "ensure that anthropogenic threats in Canadian waters do not provoke a decline in the population or a reduction in the currently observed Canadian range."[143] Four main approaches to prevent the decline of the Atlantic fin whale population are listed:

---

133 COSEWIC 2005 at 21.
134 *Ibid.*, at 22.
135 COSEWIC 2019 at viii.
136 *Ibid.*, at 36.
137 *Ibid.*
138 *Ibid.*, at 35.
139 *Ibid.*, at 40.
140 "Species at Risk Public Registry: species search: Fin Whale (*Balaenoptera physalus*)," online: *Government of Canada*, https://species-registry.canada.ca/index-en.html#/species/874-592.
141 Fisheries and Oceans Canada, *Management Plan for the Fin Whale (Balaenoptera physalus), Atlantic Population in Canada* (Ottawa: Fisheries and Oceans Canada, 2017), https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/management-plans/fin-whale-atlantic-population.html (accessed 30 October 2022).
142 *Ibid.*
143 *Ibid.*

1) Conservation and management: these measures aim to protect fin whales and their habitat through policies and regulations, as well as their enforcement.
2) Outreach and education: these measures aim to educate and raise awareness of the stakeholders of their activities' impact on fin whales.
3) Stewardship and protection of individuals: these measures aim to protect threatened fin whales through direct actions.
4) Research and monitoring: these measures aim to fill the knowledge gaps on the population and the threats affecting it.

Twenty-two more specific measures are outlined in the management plan. Under "conservation and management," two measures are assigned high priority: improve and extend the scope of the Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment so that it applies to all noise-producing activities; and ensure that all commercial fishery of forage species does not affect the integrity of the ecosystem or the energy needs of the fin whale population.[144]

Under "research and monitoring" three measures are given high priority: "assess the population numbers and trends concentration areas and stock structure of fin whales in Atlantic Canadian waters; characterize sources and levels of sound in different sectors of the distribution range, identify problematic areas, and conduct research on the effects of noise pollution; and monitor mitigation measures in inshore or offshore projects producing noise pollution."[145]

Action Plan

Fin whales are included as beneficiaries in an action plan concerning the reduction of noise in the St. Lawrence Estuary to protect the beluga whale, published in March 2020.[146]

NORTH ATLANTIC RIGHT WHALE

Introduction

The North Atlantic right whale (*Eubalaena glacialis*) (NARW) is historically significant due to its commercial exploitation and its role in the development of the whaling industry.[147] The right whale historically had wide distribution across the North Atlantic, excluding tropical and Arctic waters.[148]

---

[144] *Ibid.*
[145] *Ibid.*
[146] Fisheries and Oceans Canada, *Action Plan to Reduce the Impact of Noise on the Beluga Whale (Delphinapterus leucas) and Other Marine Mammals at Risk in the St. Lawrence Estuary [Final]* (Ottawa: Fisheries and Oceans Canada, 2020) at 1, online: *SARA Public Registry*, https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/plans/Ap_Bruit-Noise-StLawrEstuary-v00-2020Feb.
[147] COSEWIC, *COSEWIC Assessment and Status Report on the North Atlantic Right Whale, Eubalana glacialis, in Canada* (Ottawa: Committee on the Status of Endangered Wildlife in Canada, 2003) at 16 [COSEWIC 2003], online: *SARA Public Registry*, https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sr_north_atlantic_right_whale_e.pdf.
[148] COSEWIC, *COSEWIC Assessment and Status Report on the North Atlantic Right Whale, Eubalana glacialis, in Canada* (Ottawa: Committee on the Status of Endangered Wildlife in Canada, 2013) at 10 [COSEWIC 2013], online: *SARA*

In the western North Atlantic, right whales range from Newfoundland and the Gulf of St. Lawrence to Florida.[149]

COSEWIC Assessment

COSEWIC has released two reports on NARW: the first in December 2003 and the second in October 2013. Both reports assessed the species as *Endangered*. While the 2003 report indicates a lack of data on a specific trend in population size,[150] the 2013 report indicates an observed increase in the total number of mature individuals over the last ten years to 24%.[151]

The 2003 COSEWIC report identifies ship strikes and entanglements in fishing gear as the most observed threat to the NARW.[152] Other listed threats include reductions in reproduction rates (potentially due to food limitation, changes in habitat use, disease and biotoxins, pollutants, and genetic factors), habitat degradation, and disturbance due to noise from whale watching.[153]

The 2013 COSEWIC report again identifies vessel strikes and fishing gear entanglement as the primary documented threat to the North Atlantic right whale.[154] The report notes several measures implemented to reduce the likelihood of vessel strikes, including the shifting of a shipping lane extending from the opening of the Bay of Fundy to the port of Saint John.[155] Other listed threats include parasites, disease, contaminants, industrial activities, genetic effects of a small population, and nutritional stress.[156]

SARA Status

The North Atlantic right whale was listed as *Endangered* under SARA in January 2005.[157]

Recovery Strategy

The DFO has published two finalized NARW recovery strategies. The first was published in June 2009 and the second in April 2014. Both recovery strategies include the same list and description of threats to the North Atlantic right whale, verbatim. Whaling is listed as the primary historic threat to NARW.[158] Current threats listed include vessel strikes, entanglement in fishing gear, and disturbance

---

Public Registry, https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sr_North%20Atlantic%20Right%20Whale_2013_e.pdf.

[149] *Ibid.*, at iv.

[150] COSEWIC 2003 at 19.

[151] COSEWIC 2013 at vii.

[152] COSEWIC 2003 at 14.

[153] *Ibid.*, at 15.

[154] COSEWIC 2013 at 19.

[155] *Ibid.*, at 32.

[156] *Ibid.*, at 35.

[157] "Species at Risk Public Registry: species search: North Atlantic Right Whale (*Eubalaena glacialis*)," online: *Government of Canada*, https://species-registry.canada.ca/index-en.html#/species/780-298.

[158] Fisheries and Oceans Canada, *Recovery Strategy for the North Atlantic Right Whale (Eubalaena glacialis) in Atlantic Canadian Waters [Final]* (Ottawa: Fisheries and Oceans, 2009) at 21 [Recovery Strategy 2009], online: *SARA Public Registry*, https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/plans/rs_north_atl_right_whale_0609_e.pdf; Fisheries and Oceans Canada, *Recovery Strategy for the North Atlantic Right Whale (Eubalaena glacialis) in Canadian Waters* [Final] (Ottawa: Fisheries and Oceans, 2014) at 19 [Recovery Strategy 2014], online: *SARA Public Registry*, https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/plans/rs_bnan_narw_am_0414_e.pdf.

and habitat reduction or degradation due to contaminants, acoustic disturbances, vessel presence disturbance, and changes in food supply. Both strategies include a brief note saying that "global climate change could be affecting both the local spring and summer distribution of right whales in the Gulf of Maine and the calving rate of the North Atlantic population."[159]

The overall recovery goal for both recovery strategies is "to achieve an increasing trend in population abundance over three generations."[160] It is noted that this goal is an "interim goal" until more firm estimates of the species' historical and current abundance are made.[161]
Seven specific recovery objectives/strategies are identified in both strategies:

1) Reduce mortality and injury as a result of vessel strikes
2) Reduce mortality and injury as a result of fishing gear interactions (entanglement and entrapment)
3) Reduce injury and disturbance as a result of vessel presence or exposure to contaminants and other forms of habitat degradation
4) Monitor population and threats
5) Increase understanding of life history characteristics, low reproductive rate, habitat and threats to recovery through research
6) Support and promote collaboration for recovery between government agencies, academia, environmental non-governmental groups, Aboriginal groups, coastal communities and international agencies and bodies
7) Develop and implement education and stewardship activities that promote recovery[162]

Each objective has three to six specific strategies for implementation. Two specific implementation strategies under objective six are noteworthy:

> e. Continue to collaborate with government agencies in the United States on transboundary right whale initiatives; and
> f. Work with international bodies on right whale conservation issues of interest to Canada.[163]

[159]Recovery Strategy 2009 at 27; Recovery Strategy 2014 at 26.
[160] Recovery Strategy 2009 at 33; Recovery Strategy 2014 at 34.
[161] Recovery Strategy 2014 at 34.
[162] *Ibid.*
[163] *Ibid.*, at 38.

Critical Habitat

The 2014 Recovery Strategy identifies the Grand Manan Basin and the Roseway Basin as areas of critical habitat for NARW.[164] These two areas were determined to be critical habitats for the species due to an abundance of sightings and because they possess features conducive to right whale inhabitation, including prey quantity, acoustic environment, and quality of water and air.[165]

Further, the 2014 Recovery Strategy includes a schedule of three studies to be completed to adjust the species' critical habitat. They are as follows:

1) Evaluate prey distribution in Roseway Basin, Grand Manan Basin and surrounding areas to refine critical habitat boundaries.
2) Evaluate the right whale's use of areas outside of the Scotia-Fundy region.
3) Determine migratory routes of right whales into and out of Canadian waters during their annual migration and evaluate potential as critical habitat.[166]

The Minister of Fisheries and Oceans has published two orders of protection for the NARW in the *Canada Gazette*. The first was published in May 2016 and the second in December 2017. They both serve to protect the Grand Manan and Roseway Basins.[167]

Action Plan

A finalized action plan for the North Atlantic right whale was published by the DFO in March 2021. The action plan includes 54 recovery measures.[168] Ten of these measures address objective six (support and promote collaboration for recovery between government agencies, academia, environmental non-governmental groups, Aboriginal groups, coastal communities and international agencies and bodies). One of the recovery measures is to collaborate and coordinate with other countries on recovery planning, management, and research.[169] Another recovery measure is a population viability analysis to be performed in collaboration with American government departments.[170] There is also a recovery initiative that will conduct scenario planning to prepare for the uncertain future environmental conditions and vulnerabilities under climate change.[171]

The action plan goes on to detail several initiatives that the DFO has completed or is performing in collaboration with US government agencies.[172] Included is the Canada-US Transboundary Resources Steering Committee, which meets biannually and has a specific Species at Risk Working Group that

---

[164] *Ibid.*, at 29.
[165] *Ibid.*, at 28.
[166] *Ibid.*, at 31.
[167] Government of Canada, *Canada Gazette*, Vol 150 No 20 (Ottawa: Queens Printer for Canada, 2019) at 1510.
[168] Fisheries and Oceans Canada, *Action Plan for the North Atlantic Right Whale (Eubalaena glacialis) in Canada* (Ottawa: Fisheries and Oceans Canada, 2021) at 7–12, online: *SARA Public Registry*, https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/plans/Ap-Bnan-Narw-v01-2021Mar-Eng.pdf.
[169] *Ibid.*, at 7.
[170] *Ibid.*, at 11.
[171] *Ibid.*, at 29.
[172] *Ibid.*, at 16.

focuses on transboundary management of the right whale.[173] It is also noted that the DFO and the NMFS participate in each other country's right whale recovery initiatives.[174]

LEATHERBACK SEA TURTLE (Atlantic Population)

Introduction

The leatherback sea turtle (*Dermochelys coriacea*) is the largest turtle species, often reaching more than 2 m in length.[175] They have a wide distribution around the world and in Atlantic Canada.[176] Their global distribution ranges from 71° N to 47°S latitude. In Atlantic Canadian distribution of the leatherback sea turtle is widespread offshore and throughout the Gulf of Maine and Bay of Fundy.[177]

Further, leatherback sea turtles undertake long distance migrations across ocean basins. Migration routes of leatherback sea turtles tagged off Nova Scotia in 2005 showed a range into the Gulf of St. Lawrence and off the southern coast of Newfoundland south of waters off the coast of South America.[178]

COSEWIC Assessment

COSEWIC assessed the leatherback in 2013 as *Endangered*. While the report indicates a lack of data on the decline of the Atlantic leatherback turtle, it noted the global decline of over 90% for the species.[179]

In Canadian waters, fisheries interactions pose the primary direct threat, while habitat degradation through marine debris, offshore oil and gas production, and other forms of water contamination present an indirect threat.[180] Outside of Canadian waters, additional threats such as egg harvesting and loss of nesting beaches to sea level rise and erosion contribute to the species' decline.

SARA Status

The Atlantic population of the leatherback sea turtle was listed as *Endangered* under SARA in June 2003.[181]

---

[173] *Ibid.*, at 17.
[174] *Ibid.*
[175] COSEWIC, *COSEWIC Assessment and Status Report on the Leatherback Sea Turtle, Dermochelys coriacea, in Canada* (Ottawa: Committee on the Status of Endangered Wildlife in Canada, 2012) at 7, online: *SARA Public Registry*, https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sr-LeatherbackSeaTurtle-v00-2012-eng.pdf.
[176] *Ibid.*, at 12.
[177] *Ibid.*, Fig 5 at 13.
[178] *Ibid.*, Fig 6 at 14.
[179] *Ibid.*, at vii.
[180] *Ibid.*
[181] "Species at Risk Public Registry: species search: Leatherback Sea Turtle," online: *Government of Canada*, https://species-registry.canada.ca/index-en.html#/species/1191-861.

Recovery Strategy

A recovery strategy was published by the DFO on the Atlantic population of the leatherback sea turtle in February 2007.[182] It details threats specific to the leatherback sea turtle in Atlantic Canada. Within their marine environment threats include entanglement in fishing gear, collisions with boats, pollution, and noise disturbances.[183] The species' nesting environment face threats, including coastal construction, light pollution, and climate change.[184] Climate change may affect leatherback sea turtles by skewing sex ratios because of temperature-dependent sex determination, increased hurricane activity resulting in habitat loss/disturbance, and changing migration patterns.[185]

The overall recovery goal is to "increase the population such that the long-term viability of the leatherback turtles frequenting Atlantic Canadian waters is achieved."[186] Six key objectives are highlighted:

1) Understanding Threats: identify and understand anthropogenic threats to leatherback turtles in Canadian waters;
2) Understanding Life History Characteristics of the Species: support research and monitoring that will fill knowledge gaps concerning general organismal traits of leatherback turtles in Canadian waters;
3) Habitat Identification and Protection: identify and protect habitat of leatherback turtles in Canadian waters;
4) Risk Reduction: minimize the risk of harm to leatherback turtles from anthropogenic activities under Canadian jurisdiction;
5) Education: develop and implement educational activities that support leatherback turtle recovery in Canada; and
6) International Initiatives: promote international initiatives contributing to the recovery of leatherback turtles.[187]

Each objective is supplemented by more detailed strategies. Objective (6) is particularly noteworthy, and includes the following strategies:

a) Investigate options for Canadian participation in and promotion of international agreements and conventions that promote leatherback turtle protection and recovery.
b) Collaborate with US agencies, other range nations, and international bodies on leatherback turtle conservation initiatives when possible.

---

[182] At the time that the recovery strategy was published the leatherback sea turtle Atlantic and Pacific populations were not distinguished from each other. However, the recovery strategy is specific to the leatherback turtle in Atlantic Canada.
[183] Fisheries and Oceans Canada, *Recovery Strategy for the Leatherback Turtle (Dermochelys coriacea) in Atlantic Canada* [Final] (Ottawa: Fisheries and Oceans, 2006) at 11, online: *SARA Public Registry*, https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/plans/rs_Leatherback_turtle_Atlantic_population_0207_e.pdf.
[184] *Ibid.*
[185] *Ibid.*
[186] *Ibid.*, at 19.
[187] *Ibid.*

Critical Habitat

The 2007 Recovery Strategy states that there were not enough data to identify the critical habitat of the leatherback sea turtle in Atlantic waters.[188] It does, however, include a schedule of studies to identify the critical habitat of the species.[189] The 2020 Action Plan indicates that the critical habitat of the Atlantic leatherback sea turtle will be identified by the DFO in an amended recovery strategy, in development as of 2020.[190] As of June 2022, no critical habitat has been identified or protected in Canada under SARA for the leatherback sea turtle.

Action Plan

A finalized action plan was published for the Atlantic leatherback sea turtle in March 2020. The plan identifies 27 recovery measures to implement the DFO's recovery strategy.[191] Four of these are to be undertaken by the DFO exclusively, and 23 of them are to be undertaken by the DFO in collaboration with partners. The measures are distinguished by priority level: 12 are given high priority status, 6 medium priority status, and 9 low priority. Most of the high-priority initiatives focus on further research and monitoring of the leatherback sea turtle to develop mitigation strategies. Of noteworthiness is measure 27 (under recovery objective 6 from the 2007 Recovery Strategy), which is to "collaborate with the U.S. government, other countries, and international organizations on leatherback sea turtle conservation initiatives."[192] This measure is given high priority status. The report highlights the continuation of the DFO's work on the leatherback sea turtle in the Canada/United States Species at Risk Working Group.[193]

LOGGERHEAD SEA TURTLE

Introduction

The loggerhead sea turtle (*Caretta caretta*) is noteworthy due to its wide migratory range.[194] The species inhabits regions in the Atlantic, Pacific, and Indian Oceans, and can be found both in oceanic zones (with depths greater than 200 m) and neritic zones (less than 200 m depth) generally corresponding with the continental shelf.[195] Loggerhead sea turtles in Atlantic Canada are distributed throughout offshore waters from Georges Bank to the Flemish Cap.[196]

---

[188] *Ibid.*, at 17.
[189] *Ibid.*, at 21.
[190] *Ibid.*, at 21
[191] Fisheries and Oceans Canada, *Action Plan for the Leatherback Sea Turtle (Dermochelys coriacea), Atlantic population, in Canada* (Ottawa: Fisheries and Oceans Canada, 2020) at Tables 1 and 2, online: *SARA Public Registry*, https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/plans/Ap-TortueLuthAtlLeatherback-v00-2020Mar-Eng.pdf.
[192] *Ibid.*, at 9.
[193] *Ibid.*, at 21.
[194] COSEWIC, *COSEWIC Assessment and Status Report on the Loggerhead Sea Turtle, Caretta caretta, in Canada* (Ottawa: Committee on the Status of Endangered Wildlife in Canada, 2010) at vi [COSEWIC 2010], online: *SARA Public Registry*, https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sr_Loggerhead%20Sea%20Turtle_0810_e.pdf.
[195] *Ibid.*, at 10.
[196] Fisheries and Oceans Canada, *Information Summary for Consultations on the Proposed Listing of Loggerhead Sea Turtle as "Endangered" Under the Species at Risk Act* (Ottawa: Fisheries and Oceans Canada, 2012), online: *SARA Public Registry*,

COSEWIC Assessment

COSEWIC released one report on the loggerhead sea turtle, with no distinction of populations between the Atlantic and Pacific oceans, in September 2010. The report designated the loggerhead sea turtle as *Endangered*. The report indicates a reduction in the total number of mature individuals in the Atlantic Ocean over the last three generations (or 10 years) of about 9.1%.[197]

Loggerhead sea turtles do not nest in Canada.[198] The primary threat to loggerhead sea turtles in Atlantic Canadian waters is fishery bycatch, particularly of juvenile turtles.[199] Other threats in the Canadian Atlantic include pollution, offshore oil and gas production, and climate change.[200] Climate change may affect the loggerhead sea turtle by changing the abundance and distribution of prey and reducing nesting and recruitment due to higher temperatures.[201]

The COSEWIC report also references the findings of the 2008 Recovery Plan by the National Marine Fisheries Service (NMFS) and the US Fish and Wildlife Service (USFWS).[202] As loggerhead sea turtles utilize both marine and land environments in the United States, the NMFS and USFWS Recovery Plan provides a comprehensive list of threats to them.[203]

SARA Status

The loggerhead sea turtle was listed as *Endangered* under SARA in April 2017.[204]

Recovery Strategy

DFO published a recovery strategy on the loggerhead sea turtle in Atlantic Canada in December 2020. The recovery strategy organizes threats into four categories of high, medium, low, and unknown risk. High-risk threats include bycatch in the pelagic longline fishery, legal and illegal harvesting, and light pollution on nesting beaches.[205] Medium risk threats include entanglement in Northwest Atlantic fisheries gear, marine pollution, and coastal development.[206] Low-risk threats include entanglement, underwater noise, and vessel strikes.[207] Unknown threat-level includes marine pollution.[208]

---

https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/public/cd_tortue_caouanne_loggerhead_turtle_0112_eng.pdf.

[197] COSEWIC 2010 at 46.

[198] *Ibid.*, at 35.

[199] *Ibid.*, at vi.

[200] *Ibid.*, at 41–42.

[201] *Ibid.*, at 42.

[202] *Ibid.*, at 36.

[203] *Ibid.*, at 39.

[204] "Species at Risk Public Registry: species search: Loggerhead Sea Turtle," online: *Government of Canada*, https://species-registry.canada.ca/index-en.html#/species/1090-753.

[205] Fisheries and Oceans Canada, *Recovery Strategy for the Loggerhead Sea Turtle (Caretta caretta) in Atlantic Canada* (Ottawa: Fisheries and Oceans, 2020) at 9, online: *SARA Public Registry*, https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/plans/Rs-TortueCaouanneLoggerhead-v00-2020Nov-eng.pdf.

[206] *Ibid.*

[207] *Ibid.*

[208] *Ibid.*

The overall recovery goal is less quantifiable than in other DFO recovery strategies due to a lack of data on population numbers and distribution. Instead, a "threat reduction approach" is adopted to serve as the central objective for species recovery.[209] The objective is to "ensure human-induced harm and mortality rates in Atlantic Canadian waters do not exceed levels that would impede the recovery of the Northwest Atlantic Ocean Distinct Population Segment of Loggerhead Sea Turtles. Until those measures can be quantified, take measures to reduce human-induced harm and mortality rates."[210]

The recovery strategy distinguishes between actions already completed or underway and strategic directions for recovery. Actions completed or underway include four strategies, with specific programs highlighted:

1) research and monitoring[211]
2) management and protection[212]
3) engagement, stewardship, and public outreach[213]
4) international collaboration[214]

The fourth element highlights research partnerships, international agreements, and regional fisheries management organizations (RFMOs). Under research partnerships the following efforts are included: the DFO's loggerhead sea turtle research program with the US National Oceanic and Atmospheric Administration and their membership in the International Working Group for the Conservation of the Northwest Atlantic Loggerhead Nesting Population, which includes Canada, the Bahamas, Cuba, Italy, Mexico, Morocco, Portugal, Spain, and the United States.[215]

Under international agreements, Canada's participation in the Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC), an agreement between 15 countries which seeks to promote the multilateral coordination of sea turtle recovery efforts, is noted.[216] Under RFMOs, the following efforts are highlighted: Canada's participation in the Kobe Process, which included a workshop on fishery bycatch of five species, including sea turtles, and Canada's participation in the 2010 International Commission for the Conservation of Atlantic Tunas (ICCAT) meeting which adopted a recommendation on sea turtle bycatch.[217]

Strategic direction(s) for recovery includes 12 approaches, organized by the four approaches identified above as well as high, medium, and low priority. Three of these twelve approaches are categorized under international collaboration: "continue sharing data with international bodies such as the ICCAT, and explore new opportunities to collaborate with other international bodies (for example, Northwest Atlantic Fisheries Organization)" (low priority); "continue and develop new research partnerships with collaborators throughout the population's range" (medium priority); and

---

[209] *Ibid.*, at iii.
[210] *Ibid.*
[211] *Ibid.*, at 15.
[212] *Ibid.*, at 16.
[213] *Ibid.*, at 18.
[214] *Ibid.*, at 19.
[215] *Ibid.*
[216] *Ibid.*
[217] *Ibid.*

"explore opportunities for collaboration through the IAC for the Protection and Conservation of Sea Turtles and other relevant international agreements or conventions" (low priority).[218]

Critical Habitat

The 2020 Recovery Strategy states that "the identification of critical habitat is not possible at this time because of the limited information currently available."[219] However, the Recovery Strategy includes a description of three studies to identify the species' critical habitat, with the first to be completed by 2025.[220]

Action Plan

No action plan has been published on the loggerhead sea turtle in the Atlantic Ocean. The 2020 Recovery Strategy states that an "action plan for the Loggerhead Sea Turtle will be completed within three years of posting the final recovery strategy."[221] This means the deadline for the action plan is December 2023.

WHITE SHARK (Atlantic Population)

Introduction

The white shark (*Carcharodon carcharias)* is significant due to its predatory role in marine ecosystems.[222] White shark sightings show wide global distribution, stretching from 60°N to 60°S latitude.[223] The species has been recorded inhabiting temperatures ranging from 5 to 27°C.[224]

Sightings in Atlantic Canada include the Newfoundland shelf, the Bay of Fundy, off Grand Manan Island, and more.[225]

---

[218] *Ibid.*, at 21.
[219] *Ibid.*, at 23.
[220] *Ibid.*
[221] *Ibid.*, at 25.
[222] COSEWIC, *COSEWIC Assessment and Status Report on the White Shark, Carcharodon carcharias, (Atlantic population) in Canada* (Ottawa: Committee on the Status of Endangered Wildlife in Canada, 2021) at 8 [COSEWIC 2021], online: *SARA Public Registry*, https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sr%20White%20Shark%202021_e.pdf.
[223] *Ibid.*, at 12.
[224] COSEWIC, *COSEWIC Assessment and Status Report on the White Shark, Carcharodon carcharias, in Canada* (Ottawa: Committee on the Status of Endangered Wildlife in Canada, 2006) at 10 [COSEWIC 2006], online: *SARA Public Registry*, https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sr_white_shark_e.pdf.
[225] *Ibid.*, at 13.

COSEWIC Assessment

COSEWIC has released two reports on the white shark. The first one in 2006 assessed the Atlantic population as *Endangered*.[226] This status was confirmed in 2021.[227] The 2021 report estimates about a 75% decline in numbers over the past 1.5 generations (generation time of 42 years).[228]

The 2006 report identifies the following threats to the Atlantic population of the white shark: commercial fishery bycatch, international market for white shark jaws, teeth and fins, coastal habitat modification, and pollution.[229] The 2021 report indicates that human activity (including sport fishing, commercial bycatch and the international market for body parts) is the primary threat to white sharks.[230] It is also noted that the white shark is vulnerable to environmental toxins.[231]

Neither report lists climate change as a threat or potential threat. It is, however, noted that the adult white shark is fairly adaptable to climate change due to its ability to adapt to changes in prey type, increased water temperatures and ocean acidification.[232] However, such factors could negatively affect young white sharks because they cannot travel the same distances as adults to adapt.[233]

SARA Status

The Atlantic population of the white shark was added to SARA as *Endangered* in June 2011.[234]

Recovery Strategy

No recovery strategy has been published for the Atlantic population of the white shark. However, the 2021 COSEWIC report does include a brief section on species protection. It is noted that, in Canada, finning was made illegal in 1993.[235]

---

[226] COSEWIC 2006 at i.
[227] COSEWIC 2021 at i.
[228] *Ibid.*, at vii.
[229] COSEWIC 2016 at 22.
[230] COSEWIC 2021 at v.
[231] *Ibid.*
[232] *Ibid.*, at 35.
[233] *Ibid.*
[234] "Species at Risk Public Registry: species search: White Shark (*Carcharodon carcharias*)," online: *Government of Canada*, https://species-registry.canada.ca/index-en.html#/species/899-633.
[235] COSEWIC 2021 at 36.

Part III: Key Transboundary Sharks Currently Under Consideration for Listing under SARA

PORBEAGLE

Introduction

The porbeagle shark *(Lamna nasus)* is a large, highly migratory shark that lives in temperate and cold waters.[236] Its meat is among the most valued of shark meats.[237] This is a long-lived, late-maturing species with low reproductive capacity.[238]

COSEWIC Assessment

COSEWIC released two assessments, the first in 2004 and the second in 2014, concluding that the species is *Endangered*.[239] In the most recent assessment, COSEWIC confirmed that overfishing is the primary threat to porbeagle recovery. Although the directed fishery was closed in 2013, the species continues to be caught as bycatch in tuna and swordfish longline fisheries, groundfish longlines fisheries, as well as gillnet and bottom trawl fisheries in Atlantic Canada. These fisheries do not have sufficient observer coverage, and therefore the catch levels are likely underestimated due to unreported catches and discards. Climate change is not mentioned in the 2014 assessment.

SARA Status

In 2006, the GIC issued a decision *Not To List* porbeagle under SARA because of the projected economic losses associated with the elimination of the directed fishery at the time and the prohibition on trade in porbeagle incidentally caught in other fisheries.[240]

The DFO undertook consultations in 2018 to determine whether porbeagle should be listed under SARA.[241] The results of the consultations are not publically available.

Management

Porbeagle is the only shark species in Canada that is managed with comprehensive stock assessments.[242] Nevertheless, recovery targets have not yet been established, and there is no recovery plan in place.[243] There is a 50 metric tonnes landing cap on bycatch of porbeagles in swordfish and

---

[236] Government of Canada, "Porbeagle (*Lamna nasus*)," online: *SARA Public Registry*, <https://species-registry.canada.ca/index-en.html#/species/810-368>.
[237] COSEWIC, *COSEWIC Assessment and Status Report on the Porbeagle Lamna nasus in Canada* (Ottawa: COSEWIC, 2014).
[238] *Ibid.*
[239] *Ibid.*; COSEWIC, *COSEWIC Assessment and Status Report on the Porbeagle Shark Lamna nasus in Canada* (Ottawa: COSEWIC, 2004).
[240] *Order Giving Notice of Decisions not to add Certain Species to the List of Endangered Species*, SI/2006-110.
[241] Government of Canada, "Porbeagle: Consultations on listing under the Species at Risk Act," https://species-registry.canada.ca/index-en.html#/consultations/3317 (accessed 30 October 2022).
[242] COSEWIC 2014.
[243] *Ibid.*

other tuna fisheries.[244] Live sharks are supposed to be released with minimum harm. The DFO is relying on the 2005 Recovery Potential Assessment which determined that human-induced mortality has to be kept to below four percent of the population or about 185 metric tonnes per year in setting its landing cap.[245] The Recovery Potential Assessment has since been updated to show that a two percent mortality rate from all sources, amounting to 110 metric tonnes of bycatch mortality, would increase the rate of recovery.[246]

Canada has prohibited shark finning as a condition of a fishing license since 1994.[247] In 2014, that measure was strengthened to require all sharks to be landed with fins naturally attached.[248]

SHORTFIN MAKO

Introduction

The shortfin mako (*Isurus oxyrinchus*) is a shark species with wide global distribution in temperate and tropical waters.[249] The species is particularly noteworthy due to their highly migratory nature and a strong association with Gulf Stream waters.[250] In Atlantic Canada the shortfin mako is found extending from Georges Bank to off the Scotian Shelf and the (primarily Outer) Bay of Fundy.[251] The species' range also extends north into the Gulf of St. Lawrence and off the southeast coast of Newfoundland, though much more sparsely than in southern Atlantic Canada waters.[252] The northern border of their range is technically considered to be 60°N.[253]

COSEWIC Assessment

The shortfin mako was re-assessed as *Endangered* in May 2019 in response to the status report produced by the International Commission for the Conservation of Atlantic Tunas (ICCAT). It had previously been assessed as *Special concern* in April 2017 and *Threatened* in 2006. In the 2006 COSEWIC report, fishing was listed as the primary threat to the species.[254] Subsequent reports

---

[244] Government of Canada, "Canadian Atlantic swordfish and other tunas," https://www.dfo-mpo.gc.ca/fisheries-peches/ifmp-gmp/swordfish-espadon/NEW-swordfish-2013-espado-eng.html (accessed 30 October 2022).
[245] *Ibid.*
[246] Fisheries and Oceans Canada, "Recovery Potential Assessment for Porbeagle (*Lamna Nasus*) in Atlantic Canada," Canadian Science Advisory Secretariat, Science Advisory Report 2015/048, https://waves-vagues.dfo-mpo.gc.ca/library-bibliotheque/365107.pdf (accessed 30 October 2022).
[247] Fisheries and Oceans Canada, "Government of Canada bans shark finning," News Release (20 June 2019), https://www.canada.ca/en/fisheries-oceans/news/2019/06/government-of-canada-bans-shark-finning.html (accessed 30 October 2022).
[248] *Ibid.*
[249] COSEWIC, *COSEWIC Assessment and Status Report on the Shortfin Mako (Isurus oxyrunchus) Atlantic Population in Canada* (Ottawa: Committee on the Status of Endangered Wildlife in Canada, 2019) at 9 [COSEWIC 2019] , online: *SARA Public Registry*, <https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/Sr-RequinTaupeBleuShortfinMako-v00-2019-Eng.pdf>.
[250] *Ibid.*, at iv.
[251] *Ibid.*, at 11.
[252] *Ibid.*
[253] *Ibid.*
[254] COSEWIC, *COSEWIC Assessment and Status Report on the Shortfin Mako (Isurus oxyrunchus) Atlantic Population in Canada* (Ottawa: Committee on the Status of Endangered Wildlife in Canada, 2006) at v, online: *SARA Public Registry*, <https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sr_shortfin_mako_e.pdf>.

reiterated this, noting that effects of overfishing were exacerbated by the species' relatively slow growth rate, late age of maturity, and low reproductive rates.[255] There is no targeted fishery for shortfin makos, but these sharks are caught as bycatch in longline fisheries targeting tunas and swordfish.[256]

The 2017 and 2019 COSEWIC reports both make brief, identical references to the effects of climate change on the shortfin mako. They note that the species is likely adaptable to the effects of climate change due to their migratory nature and many prey sources.[257]

SARA Status

In March 2019, the GIC referred shortfin mako back to COSEWIC for further consideration in response to the new information provided in the ICCAT status report.[258] The listing decision in response to the 2019 COSEWIC re-assessment was due in October 2022.[259]

Management

Mandatory release of live shortfin makos has been in place since 2018.[260] However, there is no limit on the total fishing mortality or discarding at sea.[261]

In 2020, the DFO modified licence conditions for large pelagic fisheries to ban any retention of dead or alive shortfin makos.[262]

---

[255] COSEWIC 2019; COSEWIC, *COSEWIC Assessment and Status Report on the Shortfin Mako (Isurus oxyrunchus) Atlantic Population in Canada* (Ottawa: Committee on the Status of Endangered Wildlife in Canada, 2017) at vi, online: *SARA Public Registry*, <https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sr_Shortfin%20Mako_2017_e.pdf>.
[256] *Ibid.*
[257] *Ibid.*, at 16.
[258] *List of Wildlife Species at Risk (referral back to COSEWIC) Order,* PC 2019-140, 28 February 2019.
[259] Canada, Minister of the Environment, *Response Statement – Shortfin Mako, Atlantic population* (Ottawa: Minister of the Environment, 7 January 2020), online (pdf): <https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/statements/rs_909_1048_2019-10_e.pdf>.
[260] COSEWIC 2019.
[261] *Ibid.*
[262] Fisheries and Oceans Canada, *North Atlantic Shortfin Mako Management 2020–2021* (DFO, 2020), http://www.sharkleague.org/wp-content/uploads/2020/04/shortfin-mako.pdf (accessed 31 October 2022).

Appendix: Summary of Selected Atlantic Species and Their Status under COSEWIC and SARA

***Note*:** This information has been drawn from the SARA Public Registry (https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry.html); shaded entries are listed under SARA; NA=Not applicable

		COSEWIC Assessment		SARA Listing	
Species	**Population**	**Current Status**	**Date of Assessment(s)**	**SARA Status**	**Date of Listing**
Acadian redfish	Atlantic	Threatened	September 2010	Under consideration for addition	
	Bonne Bay population	Special Concern	September 2010	Under consideration for addition	
American eel	NA	Threatened	May 2012	Under consideration for addition	
American plaice	Arctic	Data Deficient	August 2009	No status	
	Maritime	Threatened	August 2009	Under consideration for addition	
	Newfoundland and Labrador	Threatened	August 2009	Under consideration for addition	
Atlantic bluefin tuna		Endangered	May 2011	Decision not to list (May 2017)	
Atlantic cod	Laurentian North	Endangered	April 2010	Under consideration for addition	
	Laurentian South	Endangered	April 2010	Under consideration for addition	
	Maritimes	Non-active	April 2010	No status	
	Newfoundland and Labrador	Endangered	April 2010	Under consideration for addition	
	Southern	Endangered	April 2010	Under consideration for addition	
Atlantic halibut	NA	Not at Risk	November 2011		
Atlantic mud-piddock	NA	Threatened	November 2009	Threatened	April 2017
Atlantic salmon	Inner Bay of Fundy	Endangered	May 2001	Endangered	June 2003
	Outer Bay of Fundy	Endangered	November 2010	Under consideration for addition	
	Nova Scotia Southern Upland	Endangered	November 2010	Under consideration for addition	

	Eastern Cape Breton	Endangered	November 2010	Under consideration for addition	
	Northeast Newfoundland	Not at Risk	November 2010	No status	
	Northwest Newfoundland	Not at Risk	November 2010	No status	
	South Newfoundland	Threatened	November 2010	Under consideration for addition	
	Southwest Newfoundland	Not at risk	November 2010	No status	
	Labrador	Not at Risk	November 2010	No status	
	Inner St. Lawrence	Special Concern	November 2010	Under consideration for addition	
	Anticosti Island	Endangered	November 2010	Under consideration for addition	
	Quebec Eastern North Shore	Special Concern	November 2010	Under consideration for addition	
	Quebec Western North Shore	Special Concern	November 2010	Under consideration for addition	
	Nunavik	Data Deficient	November 2010	No status	
	Lake Ontario	Extinct	April 2006	No status	
Atlantic sturgeon	Maritimes	Threatened	May 2011	Under consideration for addition	
	St. Lawrence	Threatened	May 2011	Under consideration for addition	
Atlantic walrus	Central/Low Arctic	Special Concern	April 2017	Under consideration for addition	
	Northwest Atlantic	De-activated	April 2006	Extirpated	June 2003
	Nova Scotia – Newfoundland – Gulf of St. Lawrence	Extinct	April 2017		
Atlantic wolffish	NA	Special Concern	November 2000	Special Concern	June 2003
Basking shark	Atlantic Population	Special Concern	November 2009	Under consideration for addition	
Beluga whale	Eastern Hudson Bay	Threatened	November 2020	Under consideration for addition	
	St. Lawrence Estuary	Endangered	November 2014	Endangered	July 2005
	Ungava Bay	Endangered	April 2020	Under consideration for addition	
	Western Hudson Bay	Not at Risk	November 2020	NA	

Blue shark	North Atlantic Population	Not at Risk	November 2016		
Blue whale	Atlantic Population	Endangered	May 2002	Endangered	January 2005
Cusk	NA	Endangered	November 2012	Under consideration for addition	
Deepwater redfish	Gulf of St. Lawrence - Laurentian Channel	Endangered	April 2010	Under consideration for addition	
	Northern	Threatened	April 2010	Under consideration for addition	
Fin whale	Atlantic	Special Concern	May 2019	Special Concern	August 2006
Grey whale	Atlantic	Extinct	May 2022	Extirpated	June 2003
Harbour porpoise	Northwest Atlantic	Special Concern	May 2022		
Humpback whale	Western North Atlantic	Not at Risk	May 2003		
Killer whale	Northwest Atlantic/Eastern Arctic	Special Concern	November 2008	Under consideration for addition	
Leatherback sea turtle	Atlantic	Endangered	June 2003	Endangered	January 2013
Loggerhead sea turtle	NA	Endangered	April 2017	Endangered	September 2010
Lumpfish	NA	Threatened	November 2017	Under consideration for addition	
North Atlantic right whale	NA	Endangered	November 2013	Endangered	January 2005
Northern bottlenose whale	Davis Strait-Baffin Bay-Labrador Sea	Special Concern	May 2011	Under consideration for addition	
	Scotian Shelf	Endangered	November 2002	Endangered	April 2006
Northern wolffish	NA	Threatened	May 2001	Threatened	June 2003
Porbeagle	NA	Endangered	May 2014	Under consideration for addition	
Ringed Seal	NA	Special Concern	November 2019	Under consideration for addition	
Roundnose grenadier	NA	Endangered	November 2008	Under consideration for addition	
Sei whale	Atlantic population	Endangered	May 2019	Under consideration for addition	

Shortfin mako shark	Atlantic population	Endangered	May 2019	Under consideration for addition	
Smooth skate	Funk Island Deep	Endangered	May 2012	Under consideration for addition	
	Hopedale Channel	Data Deficient	May 2012	No status	
	Laurentian Scotia Population	Special Concern	May 2012	Under consideration for addition	
	Nose of the Grand Bank	Data Deficient	May 2012	No status	
Sowerby's beaked whale	NA	Special Concern	May 2019	Special Concern	June 2011
Spiny dogfish	Atlantic population	Special Concern	April 2010	Under consideration for addition	
Spotted wolffish	NA	Threatened	November 2012	Threatened	June 2003
Striped bass	Bay of Fundy	Endangered	November 2012	Under consideration for addition	
	Southern Gulf of St Lawrence	Special Concern	November 2012	Under consideration for addition	
Thorny skate	NA	Special Concern	May 2012	Under consideration for addition	
White hake	Atlantic and Northern Gulf of St Lawrence	Threatened	November 2013	Under consideration for addition	
	Southern Gulf of St Lawrence	Endangered	November 2013	Under consideration for addition	
White shark	Atlantic	Endangered	May 2021	Endangered	June 2011
Winter skate	Eastern Scotian Shelf-Newfoundland	Endangered	May 2015	Under consideration for addition	
	Gulf of St. Lawrence	Endangered	May 2015	Under consideration for addition	
	Western Scotian Shelf – Georges Bank	Not at Risk	May 2015	No status	

Appendix 2

Eastern United States Briefing Document

TRANSBOUNDARY MARINE SPECIES AT RISK RECOVERY IN A CHANGING CLIMATE: TAKING STOCK OF CANADIAN AND US SCIENTIFIC AND GOVERNANCE RESPONSES, ENHANCINGUTURE COOPERATION WORKSHOP

Briefing Documents Assembled for Canada – US Workshop
Duke University Conference Facility, Washington, DC
November 3 – 4, 2022

Duke University Research Tutorial
Katline Barrows, Elise Boos, Jonathan Choi, Megan Dister, Jess Kuesel, Michelle Nowlin, Steve Roady, Bette Rubin, Connor Sakati, & Melissa Skarjune

TABLE OF CONTENTS

Emerging Threats

Emerging Technologies

Glossary

Acronyms

ABMT	Area Based Management Tool
ASMFC	Atlantic States Marine Fisheries Council
CZMA	Coastal Zone Management Act
DFO	Fisheries and Oceans Canada
ESA	Endangered Species Act
GLM	Generalized Linear Model (a type of species distribution model)
GAM	Generalized Additive Model (a type of species distribution model)
MaxEnt	Maximum Entropy Model (a type of species distribution model)
MMPA	Marine Mammal Protection Act
NEPA	National Environmental Policy Act
NMSA	National Marine Sanctuaries Act
NMFS	National Marine Fisheries Service (now NOAA Fisheries)
OCSLA	Outer Continental Shelf Lands Act
RFMO	Regional Fisheries Management Organization (international law)
RS	Remote Sensing
SDM	Species Distribution Model
UNCLOS	United Nations Convention on the Law of the Sea
USFWS	United States Fish and Wildlife Service

Important Definitions

Endangered Species	Under the Endangered Species Act: "any species which is in danger of extinction throughout all or a significant portion of its range."
Highly Migratory Species (HMS)	Under the UN Convention on the Law of the Sea: tunas including albacore, bluefin, bigeye, skipjack, yellowfin, black fin, little, and southern bluefin, frigate mackerel, pomfrets, marlins, sail-fishes, swordfish, sauries, dolphin, oceanic sharks, and cetaceans. NOAA Fisheries defines HMS as tunas, swordfish, billfishes, and sharks.
Threatened Species	Under the Endangered Species Act: "any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range."

Land Acknowledgments

Washington D.C.

Nearly every community in the United States, including Washington D.C., was built on lands stolen from Native Americans through settler colonialism or was constructed and enriched through the labor of enslaved people. Recognizing this truth is critical to building mutual respect and to grounding us in a shared truth.

The lands of Washington DC are the lands of the Nacotchtank and the Piscataway People. We pay respects to their elders past and present. The Nacotchtank lived within the modern borders of Washington DC until the 1600s, when the expansion of tobacco farming in the Maryland colony forced them to ultimately join the Piscataway people. The Piscataway themselves had their land claims nullified by Maryland in the 1700s and many subsequently moved to join the Meherrin people of northeastern North Carolina and the Haudenosaunee near Detroit.

Over the next 200 years, the Piscataway were subjected to continued efforts to undermine their cultural heritage and self-determination. However, their descendants continue to survive and protect their cultural heritage. For more information, please visit the websites of the Piscataway Conoy Tribe and the Piscataway Indian Nation.

Duke University

As Gould (1992) acknowledges, "there is not a university in this country that is not built on what was once native land." That is true for Duke University. What is now Durham was originally the territory of several Native nations, including Tutelo (TOO-tee-lo) and Saponi (suh-POE-nee) - speaking peoples. Many of their communities were displaced or killed through war, disease, and colonial expansion. Today, the Triangle is surrounded by contemporary Native nations, the descendants of Tutelo, Saponi, and other Indigenous peoples who survived early colonization. These nations include the Haliwa-Saponi (HALL-i-wa suh-POE-nee), Sappony (suh-POE-nee), and Occaneechi (oh-kuh-NEE-chee) Band of the Saponi Nation.

North Carolina's Research Triangle is also home to a thriving urban Native American community who represent Native nations from across the United States. Together, these Indigenous nations and communities contribute to North Carolina's ranking as the state with the largest Native American population east of Oklahoma. We would like to acknowledge, honor, and respect the diverse history of Indigenous peoples in North Carolina and across the settler state. We would also like to recognize their continuing connections to land, water, and culture and pay respect to their Elders, past, present and emerging. To learn more, please visit Occaneechi: A Past and Present History and the Homeland Preservation Project.

In addition, we acknowledge the overlapping histories of this land, including past violence and ongoing harm produced by the legacy of racialized slavery and oppression. Washington Duke owned a slave and hired slave labor to work his agricultural land before the Civil War. His son's inheritance,

which helped create the wealth from which the Duke Endowment grew, was thus a product of slavery and the Jim Crow system.[263]

Executive Summary

A variety of ocean life forms inhabit waters offshore Canada and the United States. Because their life histories routinely carry them across national boundaries, these species are subject to management by both Canada and the United States.

There is growing concern about the fate of many of these species. The aim of this workshop, therefore, is to help facilitate continued cooperation between the two countries in the cross-border species management process, and to explore ways to enhance that cooperation.

As background to spark the workshop discussion, this Briefing Document focuses attention on a handful of illustrative cross-border species that inhabit the waters of the northwest Atlantic Ocean: the American eel, Atlantic salmon, three whale species (blue, fin, and North Atlantic right whale), and three shark species (white, porbeagle, and shortfin mako shark). Each of these species is in need of protection and careful management.

This Background Document provides brief life histories for each of these eight species, along with a snapshot of U.S. laws that apply to their management and protection. Dalhousie University has prepared a separate document that focuses on Canadian laws.

Life History High-Level Overview

Both the American eel and the Atlantic salmon are suffering from depleted populations as a result of (1) historic overfishing, and (2) habitat destruction caused by a plethora of dams.

The population counts for each of the three whale species are worryingly low. All suffer from continued mortality as a result of fishing gear entanglement and ship strikes.

Data for the shark species covered here are not robust, but there is concern that their populations are being reduced as a result of bycatch and that sufficient monitoring is not in place to identify problematic trends.

---

[263] Modified from Hanson, J. K. Lyons, L. Rangel, & J. Whitten. 2020. "Inclusive Conservation: Improving Collaboration with Tribes in the United States." Masters Project Symposium, Duke University, 2 April 2020. See also Gould, J. 1992. The problem of being "Indian": One mixed-blood's dilemma. In S. Smith and J. Watson (Eds.), *De/colonizing the subject: The politics of gender in women's autobiography* (pp. 81-90). Minneapolis: University of Minnesota Press.; California State University San Marcos & California Indian Culture and Sovereignty Center, *Land Acknowledgment: You're on California Indian Land, Now What? Acknowledging Relationships to Space & Place* (2019).

Special thanks to Drs. Ryan Emanuel and Malinda Lowery of the Lumbee tribe for contributing lines to this acknowledgement and to members of the Duke Native American Student Association, Paul James, Sara Childs, and Rebecca Hoeffler for feedback. Also thanks to Professor Nicki Cagle for her help in developing this acknowledgment for the Nicholas School.

U.S. Laws High-Level Overview

A welter of laws and regulations provide the basis for management and protection of these species while they are in U.S. waters. These include federal laws, interstate compacts, and state laws. However, not all of these species are currently being managed in a sustainable fashion. The situation with respect to the U.S. Endangered Species Act (ESA) is illustrative.

The purpose of the ESA is to prevent species from going extinct, and to recover the populations of species that are either in danger of extinction, or are threatened with the possibility of extinction, to levels that will remain sustainable over time.

The Gulf of Maine population of the salmon is protected under the U.S. Endangered Species Act. But American eel populations are not covered by that Act.

All three of the whale species that are the focus of this workshop are listed as endangered in the U.S. But despite being protected as critically endangered under the ESA, the mortality rate for the North Atlantic right whale is not currently sustainable.

None of the shark species of interest here are currently protected by the Endangered Species Act. Data on shark populations are fragmentary, thus the chances for ESA protection are slim.
A variety of other U.S. statutes, including (for example) the Marine Mammal Protection Act (MMPA), the National Environmental Policy Act (NEPA), the Magnuson-Stevens Fishery Conservation and Management Act (MSA), the National Marine Sanctuaries Act (NMSA), and the Antiquities Act, have the potential to help protect these marine species. But that potential is not being fully realized for many of these cross-border species.

The MMPA requires that populations be assessed and managed in a way that assures the "optimal sustainable population" is maintained. Yet the MMPA has not prevented right whale numbers from declining to a perilous state.

NEPA requires U.S. federal agencies to consider closely the environmental effects of any major actions they contemplate, including (for example) actions permitting the construction and operation of offshore wind facilities that have the potential to harm whales, fish, and seabirds. Yet NEPA cannot prevent the construction of any particular project; so long as the "action agency" has conducted a thorough environmental analysis, and the requirements of other applicable laws are met, the action may proceed.

The NMSA has potential to provide a vehicle for creating protected areas that could serve as refuges from fishing and vessel traffic that otherwise could harm these species. Yet the history of the NMSA suggests that it could prove difficult to establish sanctuaries that contain robust protections against harmful human uses.

The Antiquities Act allows the U.S. President to set aside areas of the ocean and protect them from the adverse effects of human uses. However, this authority is rarely invoked, and the Chief Justice of the U.S. Supreme Court recently questioned the scope of that authority.

Under these circumstances, there is a real need for the U.S. and Canada to continue to work together, and to assist each other, in the efficient management and protection of these cross-border

ocean species. Indeed, absent a purposeful and focused effort by each country to deploy relevant statutes with an eye on both protection and recovery, there is a concern that many of the species discussed in this Background Document could be facing serious challenges in the years ahead.

Introduction

For generations, migratory species have connected disparate ecosystems and peoples. Their migrations remind us of the connections we share and the responsibilities we have to communities around the world. In this workshop, we seek to advance our responsibility to manage and protect these species carefully for generations to come. Climate change, overfishing, bycatch, and other anthropogenic stressors threaten numerous marine migratory species. But if we have driven many of these changes, we also can moderate them.

Here, we present case studies of several fish, whale, and shark species that migrate through U.S. and Canadian waters, along with summaries of relevant U.S. law and a brief overview of emerging technologies that are useful in species management. We have written these documents for a general audience—Canadian scientists should be able to learn about U.S. statutes and U.S. lawyers should be able to learn about species distribution modeling. We hope this information will provide a baseline for productive discussion in improving U.S.-Canada cooperation for stewarding these shared treasures.

We have assembled a few geospatial datasets that can be accessed online. These maps show the distribution of the marine species that are the subject of this workshop, along with a snapshot of human activities that can affect those species.

Species Case Studies

To narrow the scope of our workshop, we chose to focus on a handful of fish, whale, and shark species, thus excluding other transboundary migratory species including birds, insects, bats, sea turtles, and terrestrial mammals. Here, we consider the American eel, the Atlantic salmon, the blue whale, the fin whale, the white shark, the porbeagle shark, and the shortfin mako shark. We present information about their known life histories as well as threats to their future conservation and recovery.

Table 1: Table summarizing the conservation status and major threats to our case study species

Species	Major Threats	Endangered Species Act	IUCN Status
American eel	Historic overfishing, dams	Declined to list	Endangered
Atlantic salmon	Historic overfishing, dams	Gulf of Maine population is endangered	Least Concern
Blue whale	Historic overfishing, vessel strikes, fishing gear entanglement, ocean noise	Endangered	Endangered

Fin whale	Historic overfishing, vessel strikes, fishing gear entanglement, ocean noise	Endangered	Vulnerable
N. Atl. right whale	Historic overfishing, vessel strikes, fishing gear entanglement, ocean noise	Endangered	Critically Endangered
White shark	Bycatch, bioaccumulation	Not listed	Vulnerable
Porbeagle shark	Bycatch, bioaccumulation	Declined to list	Vulnerable
Shortfin mako shark	Overfishing, bycatch, bioaccumulation	Under review	Vulnerable

Fish

Migratory fish present unique management challenges as they can be directly pursued as part of a fishery and be threatened by bycatch. Further, the life history of migratory fish can tie onshore effects to offshore consequences for the species, as is the case for both the American eel and the Atlantic salmon. Both species spend a portion of their lives in freshwater rivers along the US-Canada border as well as in the open ocean.

American Eel (Anguilla rostrata)

Eel Life History

The American eel's unique catadromous life cycle connects adult eels living in the rivers that feed the St. Lawrence Seaway, Great Lakes, and U.S. Gulf Coast to larval eels in the Sargasso Sea near Bermuda. These oceanic larval stages grow and metamorphose as ocean currents carry them coastward, gradually gaining color as they approach the shore. Approximately twelve to fourteen months after birth, the eels finally reach shore, migrating upriver to reach either brackish estuaries or freshwater rivers and lakes.[264] In these freshwater habitats, eels live under rocky substrate or dense vegetation, spending much of their day camouflaged underwater, hiding from predators.[265] The eels may spend up to twenty years in their freshwater homes before metamorphosing a final time, migrating back to the Sargasso Sea, mating, and then dying.[266] Little is known of their end-of-life behavior, though scientists have found that the entire species shares one gene pool across its extensive range.[267]

Eel Threats

Habitat development (particularly dams), predation, human exploitation, and lack of information about migration and spawning grounds threaten this species. Dams and other vertical structures

[264] Virginia Institute of Marine Science, "Life History," American Eel Monitoring Program, 2022, https://www.vims.edu/research/departments/fisheries/programs/eel_survey/life_history/index.php.
[265] Cecilia Engler-Palma et al., "Sustaining American Eels: A Slippery Special for Science and Governance Special Issue: Tracking and Protecting Marine Species at Risk: Scientific Advances, Sea of Governance Challenges, Part 1," *Journal of International Wildlife Law and Policy* 16, no. 2–3 (2013): 138–39.
[266] Virginia Institute of Marine Science, "Life History."
[267] Engler-Palma et al., "Sustaining American Eels," 130.

impede the migration of any eel longer than 10 cm long (approximately 4 inches),[268] including most adult eels.[269] Hydraulic turbines also pose a deadly threat; two turbines in Canada kill forty percent of the migrating eels in that specific river.[270] Predators, including porbeagle sharks, which feed on the juvenile pelagic stages,[271] and invasive parasites (*Anguillicoloides crassus*)[272] threaten the population's continued longevity. Commercial fisheries also threaten the American eel, though Canadian and U.S. officials have declined to pursue further regulation. Despite the conclusion of the Atlantic States Marine Fisheries Commission (ASMFC) that the population is "at or near low levels" and has "declined in the past two decades," the U.S. has declined to list the population under the Endangered Species Act.[273] Harvesting is allowed by state fisheries regulations, although only Maine allows large-scale harvesting of juvenile eels.[274] In Canada, the eel is not listed as endangered or threatened under the Species At Risk Act but is listed as endangered under Ontario law.[275]

Atlantic Salmon (Salmo salar)

Atlantic Salmon Life History

Unlike eels, Atlantic salmon are anadromous; juveniles spawn in streams and the adults spend most of their lives in the Atlantic. Most North American Atlantic salmon (distinct from Pacific salmon and the Baltic and European populations of Atlantic salmon) inhabit Canadian waters with only one distinct population—the Gulf of Maine population (GoM)—remaining in U.S. waters.[276] Their historic range once extended as far south as Long Island Sound.[277] They can reach 3.6 – 5.5 kg (8 – 12 pounds) in weight, range anywhere between 7 – 85 cm (2.5 – 33.5 inches) in size, and have an average life span of 3 – 8 years.[278]

The salmon are born in rivers, migrate to the ocean after 2 or 3 years, mature at sea, and return to their natal rivers to spawn.[279] Adult females lay their eggs in the fall after nesting in gravel stream beds.[280] After hatching and a few years of further growth, the juveniles leave Maine rivers in the spring and reach Newfoundland and Labrador, Canada by mid-summer.[281] After 1 – 2 years, the smolts return to the rivers where they were born to lay eggs.[282] Females on average lay 7,500 eggs, of

---

[268] Engler-Palma et al., 139.
[269] The average male eel is 40 cm long with females generally being longer. Annie Langlois, "American Eel," Hinterland Who's Who, 2017, https://www.hww.ca/en/wildlife/fish-amphibians-and-reptiles/american-eel.html.
[270] Engler-Palma et al., "Sustaining American Eels," 140.
[271] Engler-Palma et al., 165.
[272] Engler-Palma et al., 140.
[273] Engler-Palma et al., 150.
[274] Engler-Palma et al., 151.
[275] Engler-Palma et al., 162–63.
[276] NOAA Fisheries, "Atlantic Salmon (Protected)," Species Directory, August 12, 2022, New England/Mid-Atlantic, https://www.fisheries.noaa.gov/species/atlantic-salmon-protected.
[277] NOAA Fisheries, "Species in the Spotlight: Priority Actions 2021-2025 | Atlantic Salmon," Species in the Spotlight (National Marine Fisheries Service, March 2021); NOAA Fisheries, "Atlantic Salmon (Protected)."
[278] NOAA Fisheries, "Atlantic Salmon," Species Directory, August 12, 2022, New England/Mid-Atlantic, https://www.fisheries.noaa.gov/species/atlantic-salmon.
[279] NOAA Fisheries, "Atlantic Salmon (Protected)."
[280] NOAA Fisheries.
[281] NOAA Fisheries.
[282] NOAA Fisheries.

which only 15-35% live to the fry stage.[283] Unlike female Pacific salmon, which die shortly after laying eggs, female Atlantic salmon can lay eggs more than once.[284] Older female Atlantic salmon are much more valuable, as they produce over 11,000 eggs, which are larger and have a better chance of survival than those laid by younger females.[285]

Atlantic Salmon Threats

Dams and culverts, climate change, and loss of genetic diversity threaten this species.[286] There are 400 dams along spawning rivers and streams in Maine that limit or block access to essential spawning and rearing habitat, kill or injure migrating salmon, and that also limit access to cooler water habitats in higher elevation areas.[287] Currently, only 75 of those dams have fishways.[288] These dams have hampered reproduction, limited genetic diversity, and thus adversely affected the population's resilience.[289] In 2019, Boggaard et al. noted that restoring access to as much DPS habitat as possible will support efforts in building a more resilient population with respect to climate change.[290] Further, the GoM population has historically been overharvested, though the U.S. Atlantic salmon fishery was closed in 1948 and remains closed to both commercial and recreational fishing.[291]

NOAA Fisheries listed the GoM population as endangered under the Endangered Species Act (ESA) in 2000.[292] NOAA has prioritized recovery efforts for the species, including funding additional research to understand the major threats to the species and developing management strategies to stabilize the population.[293] In 2009, NOAA's Recovery Plan was released with a "75-year timeframe to achieve delisting of the GoM DPS."[294] In 2021, NOAA released an updated 5-year Priority Action Plan that aims to reconnect the Gulf of Maine with headwater streams and improve habitat productivity.[295]

Whales

[283] NOAA Fisheries; C M Legault, "Salmon PVA: A Population Viability Analysis Model for Atlantic Salmon in the Maine Distinct Population Segment," Northeast Fisheries Science Center Reference Documents (Northeast Fisheries Science Center, January 2004).
[284] NOAA Fisheries, "Atlantic Salmon (Protected)"; U.S. Fish & Wildlife Service, "Atlantic Salmon (Salmo Salar)," Species, 2021, https://www.fws.gov/species/atlantic-salmon-salmo-salar.
[285] U.S. Fish & Wildlife Service, "Atlantic Salmon (Salmo Salar)."
[286] NOAA Fisheries, "Atlantic Salmon (Protected)"; NOAA Fisheries, "Species in the Spotlight: Priority Actions 2021-2025 | Atlantic Salmon."
[287] NOAA Fisheries, "Species in the Spotlight: Priority Actions 2021-2025 | Atlantic Salmon."
[288] NOAA Fisheries.
[289] NOAA Fisheries.
[290] NOAA Fisheries.
[291] NOAA Fisheries, "Atlantic Salmon (Protected)."
[292] U.S. Department of Commerce and U.S. Department of Interior, "Endangered and Threatened Species; Final Endangered Status for a Distinct Population Segment of Anadromous Atlantic Salmon (Salmo Salar) in the Gulf of Maine," vol. 65, 223, 2000, 69459, https://www.fws.gov/policy/library/2000/00fr69459.pdf.
[293] NOAA Fisheries, "Atlantic Salmon (Protected)."
[294] U.S. Department of Commerce and U.S. Department of Interior, "Recovery Plan for the Guld of Maine Distinct Population Segment of Atlantic Salmon (Salmo Salar)," 2009, https://media.fisheries.noaa.gov/dam-migration/final_recovery_plan2.pdf.
[295] NOAA Fisheries, "Species in the Spotlight: Priority Actions 2021-2025 | Atlantic Salmon."

Whales may be among the most well-known transboundary marine species, given their size and charismatic nature. Despite this broad recognition, there are aspects of the life history of some whales that remain unknown, such as exact migration paths or locations of breeding grounds. Further, the three whale species of focus in this workshop have all suffered detrimental impacts from the long history of commercial whaling, making them even more susceptible to ongoing threats like vessel strikes and entanglement.

Blue Whale (Balaenoptera musculus)

Blue Whale Life History

The blue whale (*Balaenoptera musculus)* is the largest animal on earth and is found in all oceans except the Arctic.[296] Blue whales are massive, with a slender body, a broad, flattened head, and a unique blue-grey mottled skin coloration.[297] At maturity, they can reach 30m in length and weigh up to 181 metric tons. These whales are fast and strong swimmers capable of reaching speeds up to 48.3 kph (30 mph).[298] Like humpback whales, blue whales use infrasonic frequency (17-20 Hz) to communicate; while too low for humans to hear, the sound can reach 188 decibels.[299] Blue whales feed in depths less than 100m and eat up to 6 tons of krill per day.[300] Scientists estimate that blue whales can live 80-90 years, reaching sexual maturity at 5-15 years.[301] Best available science suggests a gestation period of 10-12 months, a weaning period of 6-7 months and a calving interval of 2-3 years.[302]

Blue whales can be found singularly or in small groups, typically pairs. Blue whales migrate seasonally between summer feeding grounds near the poles, and winter breeding grounds near the equator, although there is evidence that some may not migrate at all.[303] Of the 5 subspecies of blue whales, the Western North Atlantic Stock is typically sighted off eastern Canada, mainly within the Gulf of St. Lawrence, with winter feeding grounds located off southern Newfoundland and summer breeding areas in Davis Strait.[304] This stock may also extend into the US Atlantic EEZ as a southern limit of its range, possibly as far as Florida or the Gulf of Mexico.[305] As of 2019, the minimum population estimate for the Western North Atlantic Stock is 402 individuals, with most of the data coming from the Gulf of St. Lawrence.[306]

---

[296] NOAA Fisheries, "Blue Whale," NOAA, September 2, 2022, Alaska, New England/Mid-Atlantic, Pacific Islands, Southeast, West Coast, https://www.fisheries.noaa.gov/species/blue-whale.
[297] International Whaling Commission, "Blue Whale," text/html, Whale Watching Handbook (Whale Watching Handbook, September 4, 2022), https://wwhandbook.iwc.int/en/, https://wwhandbook.iwc.int/en/species/blue-whale.
[298] MarineBio Conservation Society, "Blue Whales ~ MarineBio Conservation Society," May 18, 2017, https://www.marinebio.org/species/blue-whales/balaenoptera-musculus/.
[299] International Whaling Commission, "Blue Whale," September 4, 2022.
[300] MarineBio Conservation Society, "Blue Whales ~ MarineBio Conservation Society."
[301] NOAA Fisheries, "Blue Whale," September 2, 2022.
[302] NOAA Fisheries.
[303] NOAA Fisheries.
[304] NOAA Fisheries, "BLUE WHALE (Balaenoptera Musculus Musculus): Western North Atlantic Stock," April 2020.
[305] NOAA Fisheries.
[306] NOAA Fisheries.

Blue Whale Threats

While historic commercial whaling depleted blue whale stocks globally, current threats include vessel strikes, entanglement in fishing gear, ocean noise, and disruptions in krill abundance and distribution. The blue whale is currently listed as Endangered under the ESA and the IUCN Red List and is depleted and protected under the Marine Mammal Protection Act.[307]

Vessel strikes, particularly in coastal areas with heavy vessel traffic, pose a significant threat to blue whales, though the impact of strikes on the overall population can be hard to quantify as most whale carcasses do not wash ashore. Due to this uncertainty, actual mortality could be ten times higher than that suggested from documented strandings.[308]

Fishing gear entanglement, particularly with nets, traps, and pots, can cause animals to become anchored down and ultimately drown and can cause extensive sublethal effects, including fatigue, compromised feeding abilities, and other harm that ultimately may lead to reduced reproductive success or death.[309] Approximately 12% of blue whales in eastern Canadian waters show scarring resulting from interactions with fishing gear.[310] A recent drone study conducted in the Gulf of St. Lawrence found 60% of blue whales captured had been entangled in fishing nets at some point in their lives.[311]

Given their communication through soundwaves, blue whales are also particularly vulnerable to ocean noise.[312] Excessive or loud noises cause a stress response and disrupt behaviors such as feeding, breeding, nursing, migration, and communication.[313] Ocean noise like that from vessel traffic can lead to temporary or permanent hearing loss and alter the low-frequency environment in which blue whales are communicating.[314]

The blue whale is also sensitive to population changes in its prey species, especially krill, which is its main source of food.[315] Climate change is negatively affecting krill populations: there has been an estimated 50% decline in surface krill abundance in the North Atlantic, with no associated range shift to expected higher latitudes.[316]

---

[307] NOAA Fisheries, "Blue Whale," September 2, 2022.
[308] Cascadia Research Collective, "Blue Whale Ship Strikes," August 23, 2015, https://cascadiaresearch.org/project/blue-whale-ship-strikes/.
[309] NOAA Fisheries, "Blue Whale," September 2, 2022.
[310] International Whaling Commission, "Blue Whale," text/html, Whale Watching Handbook (Whale Watching Handbook, September 4, 2022), https://wwhandbook.iwc.int/en/, https://wwhandbook.iwc.int/en/species/blue-whale.
[311] Helen Briggs, "Whale Threats from Fishing Gear 'Underestimated,'" *BBC News*, February 9, 2021, sec. Science & Environment, https://www.bbc.com/news/science-environment-55987350.
[312] NOAA Fisheries, "Ocean Noise," NOAA, May 5, 2022, National, https://www.fisheries.noaa.gov/national/science-data/ocean-noise.
[313] NOAA Fisheries.
[314] Megan Frances McKenna, "Blue Whale Response to Underwater Noise from Commercial Ships" (Ph.D., United States -- California, University of California, San Diego), accessed September 19, 2022, https://www.proquest.com/docview/873806850/abstract/3EF861438C1041D5PQ/1.
[315] NOAA Fisheries, "Blue Whale," NOAA, September 2, 2022, Alaska, New England/Mid-Atlantic, Pacific Islands, Southeast, West Coast, https://www.fisheries.noaa.gov/species/blue-whale.
[316] Martin Edwards et al., "North Atlantic Warming over Six Decades Drives Decreases in Krill Abundance with No Associated Range Shift," *Communications Biology* 4, no. 1 (May 31, 2021): 1–10, https://doi.org/10.1038/s42003-021-02159-1.

Fin Whale (Balaenoptera physalus)

Fin Whale Life History

The fin whale, *Balaenoptera physalus*, is the second largest whale species on earth behind the blue whale.[317] Fin whales are typically found in deep, offshore waters, which makes them especially difficult to track.[318] However, they have been observed in shallow areas where there are concentrations of Atlantic herring and euphausiids (krill).[319] Fin whales can weigh between 40 – 80 tons, stretch from 75 – 85 feet (23 – 26 m) in length, and reach physical maturity around 25 years.[320] While they can live from 80 to 90 years, they face natural mortality from killer whales, sharks, parasites, and disease.[321] Males reach sexual maturity around 6 – 10 years, while females reach sexual maturity around 7 – 12 years.[322] Gestation typically lasts between 11 – 12 months for a single calf.[323] Interestingly, hybrids have been documented indicating that sometimes blue whales mate with fin whales.[324] One theory is that when female blue whales are unable to find a mate, they will settle for a fin whale instead.[325] Fin whales also associate with other cetaceans and have been observed feeding in large groups with humpback whales, minke whales, and Atlantic white-sided dolphins.[326]

Of the four stocks of fin whales in U.S. waters,[327] the Western North Atlantic stock is estimated to have 6,802 whales.[328] The International Whaling Commission's proposed stock boundaries for the North Atlantic fin whale include the eastern U.S., Novia Scotia, and the southeast coast of Newfoundland.[329] However, subpopulations exist within the North Atlantic stock.[330]

Fin whales are frequently found in the U.S. Atlantic Exclusive Economic Zone from Cape Hatteras, NC northward.[331] In the summer, they live in New England, along the coasts of Newfoundland and Labrador, the Bay of Fundy, and Nova Scotia, where they follow cool waters and oceanic fronts and feed on krill, copepods, squid, and fish (herring, capelin, and sand lance).[332]

---

[317] NOAA Fisheries, "Fin Whale," NOAA Fisheries, September 15, 2022, Alaska, New England/Mid-Atlantic, Pacific Islands, Southeast, West Coast, https://www.fisheries.noaa.gov/species/fin-whale.
[318] NOAA Fisheries.
[319] Fisheries and Oceans Canada, "Management Plan for the Fin Whale (Balaenoptera Physalus), Atlantic Population in Canada," Species at Risk Act Management Plan Series (Ottawa, Canada: Fisheries and Oceans Canada, January 25, 2017), https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/management-plans/fin-whale-atlantic-population.html.
[320] NOAA Fisheries, "Fin Whale," September 15, 2022.
[321] NOAA Fisheries.
[322] NOAA Fisheries.
[323] NOAA Fisheries.
[324] NOAA Fisheries.
[325] Christophe Pampoulie et al., "Evidence of Unidirectional Hybridization and Second-Generation Adult Hybrid between the Two Largest Animals on Earth, the Fin and Blue Whales," *Evolutionary Applications* 14, no. 2 (2021): 319, https://doi.org/10.1111/eva.13091.
[326] NOAA Fisheries, "Fin Whale," September 15, 2022.
[327] NOAA Fisheries.
[328] Sean H. Hayes et al., "U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments 2021," NOAA Technical Memorandum NMFS-NE (Northeast Fisheries Science Center, 2021), 37, https://repository.library.noaa.gov/view/noaa/45014.
[329] Hayes et al., 36.
[330] Hayes et al., 36.
[331] Hayes et al., 37.
[332] Hayes et al., 37; Fisheries and Oceans Canada, "Fin Whale (Balaenoptera Physalus), Atlantic Population."

In the winter, fin whales fast and migrate to tropical latitudes for breeding and calving.[333] Remarkably, however, the exact location of winter breeding grounds remains unknown.[334] A general southward "flow" has been hypothesized, where fin whales will travel from the Labrador-Newfoundland region, down to Bermuda, and into the West Indies.[335]

Fin Whale Threats

Commercial whaling devastated the population globally, with an estimated 725,000 whales killed in the Southern hemisphere alone.[336] While commercial whaling is no longer a threat, the whales face similar threats as those facing blue whales and thus remain threatened by vessel strikes, entanglement in fishing gear, ocean noise, and climate change.[337] Other threats include epizootic disease, toxic spills, contaminants, and algal blooms.[338]

Vessel strikes are a significant concern because of general increases in marine traffic and the presence of several shipping routes that overlap with fin whale population distribution.[339] However, ship strikes are likely underreported as many whales can sink before observation.[340] Meanwhile, entanglement in fishing gear can cause injury, infection, and death for fin whales.[341] One study estimated that between 44.1% and 54.7% of fin whales observed in the Gulf of St. Lawrence become entangled in fishing gear.[342] While entanglement was inferred from the presence of scars, the research is less clear on which specific fisheries are causing the entanglement.[343]

Anthropogenic noise threatens the ability of fin whales to communicate, navigate, and feed.[344] The noise comes from a variety of sources, including motorized watercraft, seismic exploration from the oil and gas industry, military sonar, and construction of on- or off-shore infrastructure projects.[345] Increases in ocean noise can make communication sounds difficult to hear, disrupt diving behavior, and cause whales to avoid areas where the noise disturbance is located.[346]

Finally, climate change threatens the fin whale due to impacts on prey distribution and abundance.[347] These changes can affect feeding behavior, lead to nutritional stress, and contribute to reduced reproductive success.[348] Warming waters could also disrupt environmental cues for navigation and feeding.[349]

---

333 NOAA Fisheries, "Fin Whale," September 15, 2022.
334 Hayes et al., "U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments 2021," 37; Fisheries and Oceans Canada, "Fin Whale (Balaenoptera Physalus), Atlantic Population."
335 NOAA Fisheries, "Fin Whale," September 15, 2022.
336 NOAA Fisheries.
337 NOAA Fisheries.
338 Fisheries and Oceans Canada, "Fin Whale (Balaenoptera Physalus), Atlantic Population."
339 Fisheries and Oceans Canada.
340 Fisheries and Oceans Canada.
341 Fisheries and Oceans Canada.
342 Christian Ramp et al., "Up in the Air: Drone Images Reveal Underestimation of Entanglement Rates in Large Rorqual Whales," *Endangered Species Research* 44 (January 28, 2021): 40, https://doi.org/10.3354/esr01084.
343 Ramp et al., "Up in the Air."
344 Fisheries and Oceans Canada, "Fin Whale (Balaenoptera Physalus), Atlantic Population."
345 Fisheries and Oceans Canada.
346 Fisheries and Oceans Canada.
347 Fisheries and Oceans Canada.
348 NOAA Fisheries, "Fin Whale," September 15, 2022.
349 NOAA Fisheries.

Given these various threats, fin whales have protected status under several regulations.[350] The fin whale is listed as endangered under the Endangered Species Act and depleted under the Marine Mammal Protection Act.[351] The fin whale also has protected status under CITES and the SPAW Protocol.[352] CITES is an international agreement that regulates wildlife trade.[353] The SPAW Protocol, also known as the Protocol for Specially Protected Areas and Wildlife, is a commitment among nations in the Caribbean to take "measures to protect, preserve, and sustainably manage areas that need conservation to safeguard their special value and the threatened or endangered flora and fauna they contain."[354]

North Atlantic Right Whale (Eubalaena glacialis)

North Atlantic Right Whale Life History

The North Atlantic right whale (NARW) is the Atlantic population of one of the world's most endangered whale species.[355] Marked by its black coloration, light-growths on its head, and V-shaped blowhole, the whale can weigh up to 90 metric tons and grow up to 16 m in length.[356] The NARW prefers habitat within coastlines and large bays but will also spend time in the open sea. The species is temperature sensitive, requiring 13–15-degree Celsius water temperatures for calving.[357] Plankton, which comprises most of the NARW's diet, is also dependent on ocean temperatures.[358] NOAA Fisheries has designated two areas along the U.S. Atlantic coastline as critical habitat for the species: the coast of New England for foraging, and from Cape Fear, North Carolina south to Cape Canaveral, Florida for calving.[359] The species is critically endangered, with an estimated population size of fewer than 350 individuals, fewer than 100 breeding females, and a below-average number of calves being born each year.[360]

North Atlantic Right Whale Threats

Like most whales, the North Atlantic right whale was a victim of commercial whaling.[361] In fact, the name "right whale" comes from them being considered the "right" type of whale to hunt because their carcasses floated after they were killed.[362] However, unlike other whales, the North Atlantic

---

350 NOAA Fisheries.
351 NOAA Fisheries.
352 NOAA Fisheries.
353 Convention on International Trade in Endangered Species of Wild Fauna and Flora, "What Is CITES?," accessed October 23, 2022, https://cites.org/eng/disc/what.php.
354 NOAA Fisheries, "Protocol for Specially Protected Areas and Wildlife," NOAA, March 5, 2021, National, https://www.fisheries.noaa.gov/national/endangered-species-conservation/protocol-specially-protected-areas-and-wildlife.
355 NOAA Fisheries, "North Atlantic Right Whale," NOAA, September 16, 2022, New England/Mid-Atlantic, Southeast, https://www.fisheries.noaa.gov/species/north-atlantic-right-whale.
356 "North Atlantic Right Whale, Eubalaena Glacialis," n.d., 2.
357 Center for Biological Diversity, "Natural History | North Atlantic Right Whale," Center for Biological Diversity, accessed October 4, 2022, https://www.biologicaldiversity.org/species/mammals/North_Atlantic_right_whale/natural_history.html.
358 Center for Biological Diversity.
359 NOAA Fisheries, "North Atlantic Right Whale," September 16, 2022.
360 NOAA Fisheries.
361 NOAA Fisheries.
362 NOAA Fisheries.

right whale has remained in precipitous decline, with fewer than 350 surviving individuals.[363] Indeed, beginning in 2017, NOAA declared an "Unusual Mortality Event" under the Marine Mammal Protection Act, as they had documented 34 deaths and 21 serious injuries between 2017 and the present, mostly from rope entanglements and vessel strikes.[364]

Counts of North Atlantic Right Whale UME Mortality, Serious Injury, and Morbidity (Sublethal Injury or Illness) Cases

Year	Mortalities			Serious Injuries		Morbidity (Sublethal Injury or Illness)				Total
	VS*	ENT*	UNK*	VS*	ENT*	VS**	ENT**	INJ-UNK**	BC-UNK**	
2017	5	4	8	0	2	0	10	1	1	**31**
2018	0	3	0	0	5	0	8	0	2	**18**
2019	4	1	5	0	1	0	6	1	0	**18**
2020	1	0	1	1	3	1	3	1	0	**11**
2021	1	1	0	1	4	0	1	0	0	**8**
2022	0	0	0	0	4	0	0	0	1	**5**
Total	**11**	**9**	**14**	**2**	**19**	**1**	**28**	**3**	**4**	**91**

*Vessel strike (VS), Entanglement (ENT), Unknown/undetermined (UNK)

**Vessel strike (VS), Entanglements (ENT), or Unknown injury (INJ-UNK), or Poor body condition caused by unknown (BC-UNK).

Figure 1: Table courtesy of National Marine Fisheries Service (https://www.fisheries.noaa.gov/national/marine-life-distress/2017-2022-north-atlantic-right-whale-unusual-mortality-event).

This Unusual Mortality Event highlights the biggest threats to right whales: fishing gear entanglement and vessel strikes.[365] More than "85 percent of right whales [are estimated to] have been entangled in fishing gear at least once."[366] This interference is especially troublesome because entanglement can cause serious injury, restricted feeding, infection, stress, and even death.[367] Meanwhile, vessel strikes are also a concern because the right whale's habitat and migration paths overlap with shipping routes.[368] Collisions with boats, especially large shipping vessels (but also sometimes including smaller vessels), can cause internal and external injury and death.[369]

[363] NOAA Fisheries.
[364] NOAA Fisheries, "2017–2022 North Atlantic Right Whale Unusual Mortality Event," NOAA Fisheries, October 20, 2022, New England/Mid-Atlantic, Southeast, https://www.fisheries.noaa.gov/national/marine-life-distress/2017-2022-north-atlantic-right-whale-unusual-mortality-event.
[365] Mj Moore et al., "REVIEW: Assessing North Atlantic Right Whale Health: Threats, and Development of Tools Critical for Conservation of the Species," *Diseases of Aquatic Organisms* 143 (February 25, 2021): 219, https://doi.org/10.3354/dao03578.
[366] NOAA Fisheries, "North Atlantic Right Whale," September 16, 2022.
[367] NOAA Fisheries.
[368] NOAA Fisheries.
[369] NOAA Fisheries.

Another threat to right whales is noise pollution from human activities, which interferes with communication, navigation, and feeding behavior and can increase stress levels.[370] Similar to other whales, climate change also affects the right whale by altering migratory patterns and feeding areas, as well as prey abundance.[371] As a result, right whales have followed their prey to new locations.[372] Several U.S. laws seek to protect the right whale from these threats.[373] The right whale is listed as endangered under the Endangered Species Act and depleted under the Marine Mammal Protection Act.[374] The right whale also has protected status under CITES and the SPAW Protocol.[375] Unfortunately, its population continues to decline despite these legal protections.[376]

Sharks

Shark species are well-known apex predators and migratory species that face multiple threats, including bycatch, climate change, and illegal fishing. Shark life histories amplify these threats, as their low reproduction rate and late ages of maturity make it difficult to offset increases in mortality. The species highlighted below—the white shark, porbeagle shark, and shortfin mako shark—are all vulnerable to harm from both current threats and developing threats and warrant evaluation for potential improvements in the transboundary management of their stocks.

White Shark (Carcharodon carcharias)

White Shark Life History

White sharks are apex predators that grow from about 1.2 – 1.5 m (3.94 – 4.92 ft) long at birth to approximately 6.4 m (21 ft) long in adulthood, weighing up to 2,041 kg (4,500 lbs).[377] They can live up to 70 years.[378] White sharks consume a wide variety of prey, including fish, sea turtles, marine mammals, and invertebrates.[379] They mature late, with females generally maturing at 12 – 17 years of age and males maturing at 7 – 9 years of age.[380] Female white shark reproductive cycles are estimated to be 3 years, with females giving birth to 2 – 17 pups per litter.[381] They remain pregnant for 12 – 18 months.[382]

---

370 NOAA Fisheries.
371 Nicholas Record et al., "Rapid Climate-Driven Circulation Changes Threaten Conservation of Endangered North Atlantic Right Whales," *Oceanography* 32, no. 2 (June 1, 2019): 163, https://doi.org/10.5670/oceanog.2019.201.
372 NOAA Fisheries, "North Atlantic Right Whale," September 16, 2022.
373 NOAA Fisheries.
374 NOAA Fisheries.
375 NOAA Fisheries.
376 NOAA Fisheries.
377 Barry D. Bruce, "The Biology and Ecology of the White Shark, Carcharodon Carcharias," in *Sharks of the Open Ocean* (John Wiley & Sons, Ltd, 2008), 69–81, https://doi.org/10.1002/9781444302516.ch5; NOAA Fisheries, "White Shark," NOAA Fisheries, September 7, 2022, Alaska, New England/Mid-Atlantic, Pacific Islands, Southeast, West Coast, https://www.fisheries.noaa.gov/species/white-shark.
378 NOAA Fisheries, "White Shark."
379 Bruce, "The Biology and Ecology of the White Shark, Carcharodon Carcharias."
380 Bruce.
381 Bruce.
382 Bruce.

The species occurs in temperate and subtropical waters globally, including both the Atlantic and Pacific coasts of North America.[383] Along the Atlantic coast, white sharks span waters from Canada "to the Gulf of Mexico and the U.S. Caribbean."[384] Additionally, the species' range may be expanding farther into Canada as a result of climate change, increased prey availability, and/or population recovery.[385] White sharks often migrate seasonally to remain in waters between about 10 – 27 °C (50 – 80 °F).[386] One study found white sharks to be most common off the Southeast U.S. during the winter, and off Canada, New England, and the Mid-Atlantic in the summer.[387] White sharks swim in both nearshore and offshore waters, and may move between them seasonally.[388] Additionally, juveniles often remain nearshore, while adults move between pinniped rookeries and open ocean areas.[389] The waters off Long Island, northern New Jersey, and Cape Canaveral, Florida are considered nursery areas for juveniles.[390]

NOAA Fisheries has not completed any stock assessments for white sharks in U.S. waters and considers the species' stock status to be unknown.[391] Evidence suggests that white sharks have increased in the northwest Atlantic since the 1990s,[392] though the species remains vulnerable globally.[393]

White Shark Threats

White sharks' late maturity and relatively low rate of reproduction increases their susceptibility to threats.[394] Globally, white sharks likely face little natural mortality due to their status as apex predators,[395] but they face multiple anthropogenic threats.[396] White sharks are caught as bycatch in many different fisheries, including longline, gillnet, and trawl fisheries.[397] The sharks are also hunted for their jaws, teeth, fins, and oil.[398] White sharks may also be targeted due to negative media

---

383 G. Bastien et al., "Inconspicuous, Recovering, or Northward Shift: Status and Management of the White Shark (Carcharodon Carcharias) in Atlantic Canada," *Canadian Journal of Fisheries and Aquatic Sciences = Journal Canadien Des Sciences Halieutiques et Aquatiques* 77, no. 10 (2020): 1666–77, https://doi.org/10.1139/cjfas-2020-0055; Bruce, "The Biology and Ecology of the White Shark, Carcharodon Carcharias." NOAA Fisheries, "White Shark."
384 NOAA Fisheries, "White Shark."
385 Bastien et al., "Inconspicuous, Recovering, or Northward Shift."
386 NOAA Fisheries, "White Shark."
387 Tobey H. Curtis et al., "Seasonal Distribution and Historic Trends in Abundance of White Sharks, Carcharodon Carcharias, in the Western North Atlantic Ocean," ed. A. Peter Klimley, *PLoS ONE* 9, no. 6 (June 11, 2014): e99240, https://doi.org/10.1371/journal.pone.0099240.
388 Bruce, "The Biology and Ecology of the White Shark, Carcharodon Carcharias"; NOAA Fisheries, "White Shark."
389 NOAA Fisheries, "White Shark."
390 Megan Gamble, "Final Consolidated Atlantic Highly Migratory Species Fishery Management Plan" (NOAA Fisheries, 2006).
391 NOAA Fisheries, "White Shark."
392 NOAA Fisheries.
393 Sonja Fordham (Shark Advocates International) et al., "IUCN Red List of Threatened Species: Carcharodon Carcharias," *IUCN Red List of Threatened Species*, November 7, 2018, https://www.iucnredlist.org/en.
394 Derek Julio, "Circling the Blood in the Water: The Difficulties in Endangered Species Protections for the Great White Shark," *Natural Resources* 05, no. 11 (2014): 666–80, https://doi.org/10.4236/nr.2014.511058.
395 Bruce, "The Biology and Ecology of the White Shark, Carcharodon Carcharias."
396 NOAA Fisheries, "White Shark."
397 International) et al., "IUCN Red List of Threatened Species."
398 Curtis et al., "Seasonal Distribution and Historic Trends in Abundance of White Sharks, Carcharodon Carcharias, in the Western North Atlantic Ocean"; NOAA Fisheries, "White Shark."

attention following shark bites.[399] Additionally, the survival rates of white sharks caught and released through recreational fishing is unknown.[400] Degradation of coastal habitats may also reduce areas available for juvenile white sharks.[401] Bioaccumulation of contaminants like DDT and heavy metals may also threaten the sharks' health.[402]

In 2011, Canada listed the Atlantic population of white shark as an endangered species protected under the Species at Risk Act.[403] By contrast, the northwestern Atlantic population is not listed by the U.S. under the Endangered Species Act.[404] White sharks are also protected under Appendix II of CITES as a species that could become threatened without sufficient controls on trade.[405]

Porbeagle Shark (Lamna nasus)

Porbeagle Life History

Porbeagle sharks are long-lived predators, estimated to live up to 46 years.[406] When porbeagles are born, they are approximately 58 – 67 cm (1.9 – 2.2 ft) in length.[407] For individuals in the Northwest Atlantic, mature females reach sizes of 200 – 219 cm (6.56 – 7.19 ft) while mature males are slightly smaller at 155 – 177 cm (5.09 – 5.81 ft).[408] Male individuals reach maturity at 6 – 10 years, while females reach maturity later, at 12 – 16 years.[409] Female porbeagle sharks are estimated to have a one-year reproductive cycle and produce an average of four pups per litter.[410] Within this cycle, they have an 8-9-month gestation period.[411] Porbeagles primarily consume cephalopods and fish, though individuals may also consume crabs and gastropods.[412] Additionally, evidence suggests that porbeagle sharks may prey heavily upon American eels, a species that has faced significant declines in its population, as detailed above.[413]

---

399 WildEarth Guardians, "Petition to List the Northeastern Pacific Ocean Distinct Population Segment of Great White Shark (Carcharodon Carcharias) Under the U.S. Endangered Species Act" (WildEarth Guardians, 2012), https://media.fisheries.noaa.gov/dam-migration/great_white_shark_dps_petition-accessible.pdf.
400 WildEarth Guardians.
401 WildEarth Guardians.
402 WildEarth Guardians.
403 Fisheries and Oceans Canada, "Order Amending Schedule 1 to the Species at Risk Act," § P.C. 2011-728 June 23, 2011 (2011), https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/orders/schedule-1-volume-145-14-july-2011.html.
404 Greater Farallones National Marine Sanctuary, NOAA, "White Shark Conservation, White Shark Stewardship Project," accessed October 3, 2022, https://farallones.noaa.gov/eco/sharks/sharks_conservation.html. In 2013, the United States considered and declined a petition to list the northeastern Pacific population under the Endangered Species Act, determining that the population was likely larger than suggested in the petition. Dewar, Heidi et al., "Status Review of the Northeastern Pacific Population of White Sharks (Carcharodon Carcharias) Under the Endangered Species Act," 2013, https://repository.library.noaa.gov/view/noaa/17705.
405 Convention on International Trade in Endangered Species of Wild Fauna and Flora, "Appendix II" (n.d.).
406 Curtis Tobey et al., "Status Review Report: Porbeagle Shark (Lamna Nasus)," Final Report to National Marine Fisheries Service, Office of Protected Resources, February 2016, https://repository.library.noaa.gov/view/noaa/17712.
407 Tobey et al.
408 Tobey et al.
409 Malcolm P. Francis, Lisa J. Natanson, and Steven E. Campana, "The Biology and Ecology of the Porbeagle Shark, Lamna Nasus," in *Sharks of the Open Ocean* (John Wiley & Sons, Ltd, 2008), 105–13, https://doi.org/10.1002/9781444302516.ch9.
410 Francis, Natanson, and Campana; Tobey et al., "Status Review Report: Porbeagle Shark (Lamna Nasus)."
411 Tobey et al., "Status Review Report: Porbeagle Shark (Lamna Nasus)."
412 Tobey et al.
413 Engler-Palma et al., "Sustaining American Eels."

Porbeagle sharks have a wide habitat range: they are found in the Atlantic, Pacific, and Indian Oceans, primarily in waters ranging from the continental shelf to the open ocean, though occasionally in coastal waters as well.[414] The species has been found in waters 1 – 26°C (33.8 – 78.8°F), but prefers waters below 18°C (64.4°F).[415] They may separate spatially by both sex and size.[416] Porbeagles move up to 1,500 km (932.06 mi) along continental shelves.[417] Within the northwest Atlantic, the sharks migrate north during spring and summer and return south during the fall.[418]

Porbeagle Threats

Overutilization remains one of the biggest threats to the porbeagle. In the twentieth century, porbeagles were part of directed fisheries in some countries and caught as bycatch in longline fisheries targeting species like tunas and swordfish.[419] Bycatch in longline fisheries remains a large threat to porbeagles, especially because there are concerns over "landing statistics that grossly underrepresent actual catches, unreported discards that often exceed landings, and high discard mortality rates."[420] The International Commission for the Conservation of Atlantic Tunas (ICCAT) stock assessment found that in the Northwest Atlantic stock, "the quantities of porbeagle taken in high-seas longline fleets are unclear, as there is widespread non-reporting and generic reporting of sharks."[421]

Additionally, the porbeagle's low abundance and life history traits may make it harder for the species to recover quickly, contributing to its vulnerability.[422] Climate change may also cause its distribution of prey to shift along with increasing competition for resources.[423] Increases in carbon dioxide may also affect the shark's pH levels.[424] Some heavy-metal pollutants impact the porbeagle, but likely less so than is the case with other sharks.[425] Studies are inconclusive on the question why heavy metals affect porbeagles less than other species of shark.[426]

The International Union for Conservation of Nature (IUCN) classifies the porbeagle as threatened because the North Atlantic subpopulation declined 50 – 79% over three generations, and the

---

414 Tobey et al., "Status Review Report: Porbeagle Shark (Lamna Nasus)"; Francis, Natanson, and Campana, "The Biology and Ecology of the Porbeagle Shark, Lamna Nasus."
415 Tobey et al., "Status Review Report: Porbeagle Shark (Lamna Nasus)." Tobey et al.
416 Francis, Natanson, and Campana, "The Biology and Ecology of the Porbeagle Shark, Lamna Nasus."
417 Francis, Natanson, and Campana.
418 Francis, Natanson, and Campana.
419 Tobey et al., "Status Review Report: Porbeagle Shark (Lamna Nasus)," 24.
420 Steven E. Campana, "Transboundary Movements, Unmonitored Fishing Mortality, and Ineffective International Fisheries Management Pose Risks for Pelagic Sharks in the Northwest Atlantic," *Canadian Journal of Fisheries and Aquatic Sciences* 73, no. 10 (October 2016): 1599, https://doi.org/10.1139/cjfas-2015-0502.
421 ICCAT, "Report of the 2009 Porbeagle Stock Assessments Meeting" (Copenhagen, Denmark: ICES and ICCAT, January 22, 2009), 1922, https://www.iccat.int/Documents/Meetings/Docs/2009_POR_ASSESS_ENG.pdf.
422 Tobey et al., "Status Review Report: Porbeagle Shark (Lamna Nasus)," iii.
423 Tobey et al., 22.
424 Tobey et al., 22.
425 Tobey et al., 22; Victoria A. Bendall et al., "Organohalogen Contaminants and Trace Metals in North-East Atlantic Porbeagle Shark (Lamna Nasus)," *Marine Pollution Bulletin* 85, no. 1 (August 2014): 284, https://doi.org/10.1016/j.marpolbul.2014.05.054.
426 Tobey et al., "Status Review Report: Porbeagle Shark (Lamna Nasus)," 22.

Southern Hemisphere population declined around 20% over three generations.[427] In 2010, Wild Earth Guardians and the Humane Society petitioned NOAA Fisheries to list the Porbeagle under the Endangered Species Act.[428] NOAA Fisheries conducted a status review and decided not to list it. Although the agency found that "some populations have declined by up to 90% due to overfishing,"[429] the agency determined that the porbeagle is not "currently in danger of extinction throughout all or a significant portion of its range or likely to become so in the foreseeable future."[430] Nevertheless, the status review found that stock assessments indicate that porbeagles are overfished, although overfishing is not occurring.[431] United States fishery regulations define "overfished" as a fish stock that is below capacity to achieve maximum sustainable yield.[432] Overfishing "pertains to a rate or level of removal of fish from a stock or stock complex" where the level of fishing threatens the capacity of the stock to achieve maximum sustainable yield.[433] Here porbeagle population numbers are currently low, thus they are considered overfished.[434] But their stocks are increasing, so the current fishing rate does not threaten the stock's capacity to achieve maximum sustainable yield; therefore overfishing is not occurring.[435]

Shortfin Mako Shark (Isurus oxyrinchus)

Shortfin Mako Life History

Adult male shortfin mako sharks grow to around 2 meters and adult females grow to 4 meters or more.[436] Their lifespan typically is between 11 and 17 years, but some may live up to 45 years.[437] Females reach sexual maturity around eighteen years and males reach sexual maturity around 8 years.[438] Mako sharks have an average litter size of twelve with an eighteen-month gestation period.[439] They breed every 3 years, and their nurseries are near the coast.[440] They tend to give birth in the later winter to spring.[441] Mako sharks are apex predators with a diverse diet that is dependent

---

427 C. Rigby et al., "Lamna Nasus: The IUCN Red List of Threatened Species" (International Union for Conservation of Nature, November 6, 2018), 1, https://doi.org/10.2305/IUCN.UK.2019-3.RLTS.T11200A500969.en.
428 Tobey et al., "Status Review Report: Porbeagle Shark (Lamna Nasus)," iii.
429 Tobey et al., iii.
430 NOAA Fisheries, "Endangered and Threatened Wildlife and Plants; Notice of 12-Month Finding on Petitions To List Porbeagle Shark as Threatened or Endangered Under the Endangered Species Act (ESA)" (NOAA Fisheries, August 1, 2016), https://www.federalregister.gov/documents/2016/08/01/2016-18101/endangered-and-threatened-wildlife-and-plants-notice-of-12-month-finding-on-petitions-to-list.
431 ICCAT, "Report of the 2009 Porbeagle Stock Assessments Meeting"; Tobey et al., "Status Review Report: Porbeagle Shark (Lamna Nasus)," 19.
432 "National Standard 1 - Optimum Yield," 50 Code of Federal Regulations § § 600.310(e)(2)(i)(A)-(B) (n.d.).
433 National Standard 1 - Optimum Yield.
434 Tobey et al., "Status Review Report: Porbeagle Shark (Lamna Nasus)," 18.
435 Tobey et al., 18.
436 Merry D. Camhi, Ellen K. Pikitch, and Elizabeth A. Babcock, eds., *Sharks of the Open Ocean: Biology, Fisheries and Conservation*, 1st ed. (Wiley, 2008), 88, https://doi.org/10.1002/9781444302516.
437 Camhi, Pikitch, and Babcock, 88.
438 Lisa J. Natanson et al., "Validated Age and Growth Estimates for the Shortfin Mako, Isurus Oxyrinchus, in the North Atlantic Ocean," in *Special Issue: Age and Growth of Chondrichthyan Fishes: New Methods, Techniques and Analysis*, ed. John K. Carlson and Kenneth J. Goldman, vol. 25, Developments in Environmental Biology of Fishes (Dordrecht: Springer Netherlands, 2006), 367, https://doi.org/10.1007/978-1-4020-5570-6_16.
439 Camhi, Pikitch, and Babcock, *Sharks of the Open Ocean*, 89; Henry F. Mollet et al., "Reproductive Biology of the Female Shortfin Mako, Isurus Oxyrinchus Rafinesque, 1810, with Comments on the Embryonic Development of Lamnoids," *Fishery Bulletin* 98 (2000): 300.
440 Camhi, Pikitch, and Babcock, *Sharks of the Open Ocean*, 89.
441 Camhi, Pikitch, and Babcock, 89.

on the location, time of year, and depth of their current habitat.[442] They feed on a wide range of species including anchovies, blue fish, sardines, cephalopods, and dolphins.[443]

Mako sharks are found in all temperate and tropical oceans.[444] They live in all ocean habitats, including open ocean, continental shelf, shelf edge, and shelf slope habitats.[445] Tagging studies indicate Mako sharks migrate long distances, from 4,500 km to 5,500 km.[446] Researchers hypothesize that sharks in the North Atlantic move from the western margin of the Gulf Stream to Cape Hatteras from January to April.[447] In April and May they move onto the continental shelf between Cape Hatteras and Georges Bank, which may be the primary feeding grounds for juvenile mako sharks.[448] In the autumn and winter the sharks spend time in the Gulf Steam and Sargasso Sea.[449]

Shortfin Mako Threats

Overfishing is the largest cause of the decline in mako shark populations. In July 2022, NOAA Fisheries issued a final rule setting the retention limit to zero for commercial and recreational mako shark fisheries.[450] There is some targeting of mako sharks as high value meat, but not in the North Atlantic populations.[451] In the North Atlantic, mako sharks are primarily threatened by bycatch from longline fishing for tuna, billfish, and swordfish in both national and international waters.[452] There is also a history of overutilization of mako sharks for recreational fishing and concerns about high levels of post-release mortality.[453]

Additionally, mako sharks face threats from the bioaccumulation of pollutants and from climate change. In comparison to other shark species, mako sharks tend to have higher pollutant accumulation levels of chemicals such as PCBs, mercury, and pesticides because of their high metabolic rate and relatively high trophic position.[454] Studies show female mako sharks transfer contaminants to their young at a higher magnitude than other sharks, which may affect the health of

---

[442] Antonella Preti et al., "Comparative Feeding Ecology of Shortfin Mako, Blue and Thresher Sharks in the California Current," *Environmental Biology of Fishes* 95, no. 1 (September 2012): 127, https://doi.org/10.1007/s10641-012-9980-x.
[443] Preti et al., 136.
[444] Malcolm P. Francis et al., "Oceanic Nomad or Coastal Resident? Behavioural Switching in the Shortfin Mako Shark (Isurus Oxyrinchus)," *Marine Biology* 166, no. 1 (January 2019): 5, https://doi.org/10.1007/s00227-018-3453-5.
[445] Paul J. Rogers et al., "Living on the Continental Shelf Edge: Habitat Use of Juvenile Shortfin Makos *Isurus Oxyrinchus* in the Great Australian Bight, Southern Australia," *Fisheries Oceanography* 24, no. 3 (May 2015): 205, https://doi.org/10.1111/fog.12103.
[446] Camhi, Pikitch, and Babcock, *Sharks of the Open Ocean*, 90.
[447] Camhi, Pikitch, and Babcock, 90.
[448] Camhi, Pikitch, and Babcock, 90.
[449] Camhi, Pikitch, and Babcock, 90.
[450] NOAA Fisheries, "Atlantic Highly Migratory Species; Shortfin Mako Shark Retention Limit," July 1, 2022, 39372, https://www.federalregister.gov/documents/2022/07/01/2022-14116/atlantic-highly-migratory-species-shortfin-mako-shark-retention-limit.
[451] Kelsey C. James et al., "Drivers of Retention and Discards of Elasmobranch Non-Target Catch," *Environmental Conservation* 43, no. 1 (March 2016): 8, https://doi.org/10.1017/S0376892915000168.
[452] Camhi, Pikitch, and Babcock, *Sharks of the Open Ocean*, 90–91, 399.
[453] Camhi, Pikitch, and Babcock, 90–91, 399.
[454] Kady Lyons et al., "Species-Specific Characteristics Influence Contaminant Accumulation Trajectories and Signatures Across Ontogeny in Three Pelagic Shark Species," *Environmental Science & Technology* 53, no. 12 (June 18, 2019): 3, https://doi.org/10.1021/acs.est.8b07355; Kady Lyons et al., "Organic Contaminants as an Ecological Tool to Explore Niche Partitioning: A Case Study Using Three Pelagic Shark Species," *Scientific Reports* 9, no. 1 (December 2019): 2, https://doi.org/10.1038/s41598-019-48521-6.

juvenile mako and the recovery of the species.[455] Climate change will also likely affect mako sharks because warming oceans may shift its habitat and prey.[456]

In 2019, the IUCN designated the mako shark endangered because the population was declining in all populations but one.[457] The International Commission for the Conservation of Atlantic Tunas (ICCAT) estimated 40 – 60% chances of rebuilding the mako shark stock by 2070, and predicted that even if the total allowable catch of mako sharks is reduced to zero, the stock will decline until 2035. [458] In January 2021, Defenders of Wildlife filed a petition to list the mako as threatened or endangered under the Endangered Species Act.[459] In April 2021, NOAA Fisheries issued a 90-day finding that the petition presented substantial information that listing under the ESA may be warranted.[460] NOAA Fisheries then initiated a status review to determine whether listing under ESA was warranted.[461] Defenders of Wildlife and the Center for Biological Diversity submitted a 60-day notice of intent to sue in June 2022 because NOAA Fisheries "fail[ed] to issue a timely 12-month finding on Defenders' petition to list the shortfin mako shark" as required under the ESA.[462]

United States Law

In this section, we provide a brief, non-technical overview of U.S. law related to the species that are the focus of the workshop. This document provides a high-level overview of relevant laws and is not meant to constitute legal advice.

---

[455] Kady Lyons et al., "Effects of Trophic Ecology and Habitat Use on Maternal Transfer of Contaminants in Four Species of Young of the Year Lamniform Sharks," *Marine Environmental Research* 90 (September 2013): 32–33, https://doi.org/10.1016/j.marenvres.2013.05.009.

[456] Jeremy J. Vaudo et al., "Long-Term Satellite Tracking Reveals Region-Specific Movements of a Large Pelagic Predator, the Shortfin Mako Shark, in the Western North Atlantic Ocean," ed. Verena Trenkel, *Journal of Applied Ecology* 54, no. 6 (December 2017): 1766, https://doi.org/10.1111/1365-2664.12852.

[457] C. Rigby et al., "Isurus Oxyrinchus: The IUCN Red List of Threatened Species 2019" (International Union for Conservation of Nature, November 5, 2018), 1, 5, https://doi.org/10.2305/IUCN.UK.2019-1.RLTS.T39341A2903170.en.

[458] ICCAT, "Report of the Standing Committee on Research and Statistics (SCRS)," October 4, 2019, 18, https://www.iccat.int/Documents/Meetings/Docs/2019/REPORTS/2019_SCRS_ENG.pdf.

[459] Jane Davenport and Cecilia Diedrich, "Petition to List the Shortfin Mako Shark (Isurus Oxyrinchus) as Endangered or Threatened Under the Endangered Species Act" (Defenders of Wildlife, January 25, 2021), i–ii, https://defenders.org/sites/default/files/inline-files/Petition%20to%20List%20the%20Shortfin%20Mako%20Shark%20%28Isurus%20oxyrinchus%29%20as%20Endangered%20or%20Threatened%20under%20the%20ESA_Sybmitted%20by%20Defenders%20of%20Wildlife%20%28Jan.%2025%2C%202021%29.pdf.

[460] NOAA Fisheries, "Endangered and Threatened Wildlife; 90-Day Finding on a Petition To List the Shortfin Mako Shark as Threatened or Endangered Under the Endangered Species Act," April 15, 2021, 19864, https://www.federalregister.gov/documents/2021/04/15/2021-07714/endangered-and-threatened-wildlife-90-day-finding-on-a-petition-to-list-the-shortfin-mako-shark-as.

[461] NOAA Fisheries, 19864.

[462] Davenport, Jane and Defenders of Wildlife, "Notice of Intent to Sue for Violation of the Endangered Species Act; Failure to Make a Timely 12-Month Determination on Petition to List the Shortfin Mako Shark," June 28, 2022, 1, https://defenders.org/sites/default/files/2022-06/Defenders_Center_notice%20of%20intent%20to%20sue_overdue%20shortfin%20mako%2012%20month_6%2028%2022.pdf.

U.S. Constitution & Administrative Agencies

Shortly after the Revolutionary War, the states were fearful of a strong federal government and thus attempted to restrict the authority of the federal government to the powers they explicitly enumerated in the Constitution. The structure for the new federal government provided for an executive (the President), a legislature (Congress, divided between the more numerous House of Representatives and the smaller Senate), and a judiciary (the Supreme Court). Congress was authorized to write laws based on the authority that the states gave it in the Constitution. Under this system, Congress could, among other things, raise armies, collect taxes, and regulate interstate commerce. The President would execute laws enacted by Congress, and the Supreme Court would interpret those laws and settle disputes.

Over the intervening 250 years and particularly in first half of the 20th Century, the United States realized that having Congress write legislation to make every specific decision was untenable. Thus, during the New Deal and the Second World War, Congress used its Constitutional authority to regulate interstate commerce to create new administrative agencies. These agencies combined the functions of the legislative, executive, and judicial branches within certain specific areas of responsibility. Thus, they had the ability to create new law (i.e., regulations), enforce those new regulations, and adjudicate disputes related to those regulations. The scope of agency authority could still be modified by Congress, the head of the agency was still appointed by the President, and final agency decisions were still reviewable by courts, but the day-to-day details of writing and enforcing regulations was delegated to these agencies. For instance, rather than have a full Congressional debate about how to regulate a particular chemical, Congress delegated the authority to regulate chemicals in interstate commerce to the Environmental Protection Agency (EPA). The EPA is headed by the EPA Administrator, who is appointed by the President, and EPA's final decisions can generally be challenged in court.

Most modern U.S. environmental law operates through agencies, either by authorizing an agency to regulate or restricting an agency from taking an action. For example, the Endangered Species Act not only empowers the U.S. Fish and Wildlife Service (USFWS) and NOAA Fisheries to list species as threatened or endangered, but it also prevents other federal agencies from taking any action that may jeopardize the continued existence of such a species. In the following sections, we will provide broad overviews of these laws.

Federal Environmental Laws

In this section, we cover the major federal environmental laws that govern endangered species protection. The National Environmental Policy Act (NEPA) requires that the federal government carefully assess the anticipated environmental impacts of any major federal action, often by writing an Environmental Impact Statement. The Endangered Species Act (ESA) allows NOAA Fisheries to list threatened and endangered species. All federal agencies must then consult either NOAA Fisheries or USFWS before they take or authorize any action that may jeopardize the continued survival of a species. Finally, the Marine Mammal Protection Act (MMPA) provides similar protection to all marine mammals with added mechanisms designed to resolve marine mammal and fisheries conflicts. We provide further detail for each act below.

National Environmental Policy Act

The National Environmental Policy Act (NEPA) establishes a procedure that the federal government must follow to ensure it adequately evaluates and transparently discloses the environmental impacts of its "major" actions. NEPA applies to all executive branch agencies and requires them to prepare either an environmental assessment or an environmental impact statement (unless the action is "categorically excluded") before taking the underlying action (typically issuance of a permit). Although NEPA requires an agency to compare alternatives—including taking no action—NEPA does not impose any substantive environmental guidelines. However, the NEPA process can be the springboard for identifying conflicts with other substantive laws that may affect an agency action.[463]

The NEPA process follows three different pathways, depending on the anticipated impact of the agency action: categorical exclusions, environmental assessments, and environment impact statements. Categorical exclusions are applied to the smallest agency actions, generally those that have previously been shown to have little to no impact. In these small actions, if no special circumstances exist, then the agency may proceed with its action without first analyzing the environmental effects of that action.[464]

Agencies must conduct environmental assessments whenever an action may have significant environmental impacts. The environmental assessment process allows the agency to determine whether a project will have a significant impact, compare alternatives, and consult with other agencies or the public.[465] If the agency determines the impact will be significant, it must then prepare a more detailed environmental impact statement (EIS) and follow a more intensive process for public involvement. This process requires public notification and input, beginning with notice of the proposal in the Federal Register that includes an invitation for public input. Then, the agency must include interested stakeholders in the initial consultation to determine the scope of concerns and topics the EIS should address. After a period of study, the agency will publish a draft environmental impact statement for a public comment period and may also hold a public hearing. In this draft statement, the agency must include reasonable project alternatives (including a no-action alternative) that accomplish the same goal as the original proposal.

Once the public comment period concludes, the agency will review the comments received, consider new information submitted, and conduct any additional research and analysis warranted by the comments. If significant new information is discovered or the agency selects a different alternative, it may issue a second draft EIS for public review and comment. The agency will then publish notice of the availability of the final EIS, which must include the agency's response to comments received during the comment period and explain the basis for the agency's decision. After thirty days elapses, the agency may then publish its record of decision.[466] Pursuant to the Administrative Procedure Act, an interested party may file a lawsuit challenging the agency's final decision.

---

[463] Council for Environmental Quality, "Citizens' Guide to NEPA," NEPA.gov, 2021, https://ceq.doe.gov/get-involved/citizens_guide_to_nepa.html.
[464] Council for Environmental Quality.
[465] Council for Environmental Quality.
[466] Council for Environmental Quality.

Endangered Species Act

The Endangered Species Act (ESA) was enacted in 1973 with the intent of upholding international commitments and addressing domestic concerns about extinction and depletion of fish, wildlife, and plant species.[467] The foundation of the Act is the assumption that species have value: esthetic, ecological, educational, historical, recreational, and scientific.[468] The ESA provides a means for protecting and conserving – and, ideally, restoring - species in danger of extinction and the ecosystems upon which they depend. Two federal agencies have primary responsibility for implementing and enforcing the ESA: USFWS for terrestrial species and aquatic species found within state waters, and NOAA Fisheries for marine species; the agencies share responsibility for species like sea turtles that nest on shore but spend most of their lives in the marine environment. The ESA establishes protections based on species classification: an *endangered species* is in danger of extinction throughout all or a significant part of its range; a *threatened species* is likely to become endangered in the foreseeable future;[469] a species, subspecies or distinct population segment may be listed. The statute prohibits the *taking* of any listed species, and statute broadly defines *take* as to "harass, harm pursue, hunt, shoot, wound, kill, trap, capture, collect or attempt to do any of these things."[470]

The statute also seeks to protect the *critical habitat* of a listed species, i.e., specific geographical areas that are essential for the species' conservation. Critical habitat may be located on private land as well as public land. Notably, the statute includes harm to critical habitat in its definition of *take;* therefore, critical habitat designations can impose restrictions on property use and development. Consequently, critical habitat designations can be quite controversial, and agencies must account for economic effect, national security and other relevant interests, as well as use the "best available scientific data," in making these determinations.[471] Although USFWS and NOAA Fisheries have primary responsibility for implementing the ESA, all federal departments and agencies are required to conserve species and uphold the statute.[472]

Any person or organization may petition the agency to list a species pursuant to the ESA.[473] Once the agency receives such a petition, a screening period of 90 days begins.[474] The agency will deny the petition if there is not substantial evidence to support listing. If there is substantial support for listing, the agency will initiate a "status review," examining the species' status and existing threats.[475] If the agency determines that listing is warranted, it must publish a proposed rule within 12 months of the petition date and accept public comment on the proposal; it must make a final decision on listing within one year of the proposed rule.[476]

Once the agency lists a species as endangered, it must identify and designate critical habitat (where appropriate) and develop a species recovery plan. Although the statute requires the agency to

---

[467] 16 U.S.C. § 1531.
[468] 16 U.S.C. § 1531.
[469] 16 U.S.C. § 1532.
[470] 16 U.S.C. § 1532.
[471] 16 U.S.C. § 1532.
[472] 16 U.S.C. § 1536(a).
[473] 16 U.S.C. § 1533(b)(3)(A).
[474] 16 U.S.C. § 1533.
[475] 16 U.S.C. § 1533.
[476] 16 U.S.C. § 1533.

designate critical habitat at the time of listing or within a year thereof, the agencies often delay this process or forgo it entirely due to the controversial nature of designation and the resources required to pursue designation. In contrast, the agencies almost always develop a recovery plan for a listed species. It includes any site-specific management actions needed for the conservation and survival of the species, the time and cost of these actions, and the criteria for determining whether the species has recovered and can be delisted.[477]

Perhaps the most powerful portion of the ESA is found in Section 7, which requires every federal agency to certify that its actions (i.e., permit issuance, federal approval, funding) are "not likely to jeopardize the continued existence" of a listed species or adversely modify critical habitat.[478] If a listed species may be affected by an agency's proposed action, it must notify USFWS or NOAA Fisheries, which will then conduct a biological assessment to determine the level of impact. If the agency determines the action is likely to adversely affect a listed species, it must conduct a more detailed analysis, called a biological opinion (BiOp), using the best scientific and commercial data available.[479] If the BiOp finds that the action will likely "jeopardize" the species' continued existence, the agency must implement alternatives, terminate the action, or seek an exemption for the proposed project.[480] If the BiOp determines the impacts will not jeopardize the species' existence but will still result in "taking" of the species, the permit applicant must apply for an "incidental take permit" (ITP). The incidental take statement will detail the likely impact due to incidental taking of the species and the measures necessary to minimize such impacts; the ITP will limit the number of individuals of the species that may be harmed, *i.e.*, taken, by the activity.[481] For marine mammals, the measures and incidental take provisions must also comply with the Marine Mammal Protection Act of 1972.[482]

Marine Mammal Protection Act

The Marine Mammal Protection Act of 1972 (MMPA)[483] was enacted in response to concerns about human impacts on marine mammal survival.[484] The statute seeks to protect both marine mammals and their roles in their ecosystems.[485] Each of the whale species discussed above—the blue whale, fin whale, and North Atlantic right whale—are protected under the MMPA.[486]

Like the ESA, administration and enforcement of the MMPA is divided between two agencies: NOAA Fisheries administers the statute's protections for "whales, dolphins, porpoises, seals, and

---

[477] NOAA Fisheries, "Recovery of Species Under the Endangered Species Act," NOAA, July 5, 2022, National, https://www.fisheries.noaa.gov/national/endangered-species-conservation/recovery-species-under-endangered-species-act.
[478] 16 U.S.C. § 1536.
[479] 16 U.S.C. § 1536.
[480] 16 U.S.C. § 1536.
[481] 16 U.S.C. § 1536.
[482] 16 U.S.C. § 1536.
[483] Pub. L. No. 92-533, 86 Stat. 1027 (codified as amended at 16 U.S.C. §§ 1361–1423h).
[484] 16 U.S.C. § 1361(2).
[485] 16 U.S.C. § 1361.
[486] NOAA Fisheries, "Blue Whale," NOAA, September 15, 2022, Alaska, New England/Mid-Atlantic, Pacific Islands, Southeast, West Coast, https://www.fisheries.noaa.gov/species/blue-whale; NOAA Fisheries, "Fin Whale," NOAA, September 15, 2022, Alaska, New England/Mid-Atlantic, Pacific Islands, Southeast, West Coast, https://www.fisheries.noaa.gov/species/fin-whale; NOAA Fisheries, "North Atlantic Right Whale," NOAA, October 14, 2022, New England/Mid-Atlantic, Southeast, https://www.fisheries.noaa.gov/species/north-atlantic-right-whale.

sea lions,"[487] while the USFWS administers the statute's protections for walruses, sea otters, polar bears, manatees, and dugongs.[488] Additionally, the Marine Mammal Commission, an independent body comprised of three Presidential appointees who have expertise in "marine ecology and resource management," provides oversight of and recommendations to improve actions under the act.[489]

The MMPA contains two main provisions: (1) a prohibition on takes of marine mammals and (2) a prohibition on imports of marine mammals and associated products into the U.S.[490] It also includes additional provisions outlining responses to significant stranding and mortality events.[491]

Prohibition on Takes of Marine Mammals

The MMPA prohibits takes of marine mammals, regardless of whether they are listed as endangered or threatened pursuant to the ESA.[492] "Take" is defined broadly to mean "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal."[493] The act further defines "harass" to include any pursuit or annoyance that could disturb marine mammals by disrupting behaviors such as "migration, breathing, nursing, breeding, feeding, or sheltering."[494]

Despite this broad definition and prohibition, the statute includes exceptions for both intentional and incidental takes.[495] NOAA Fisheries and the USFWS may issue permits for intentional takes for various purposes, including scientific research and public display.[496] The statute also includes a broad exemption for takes by Alaskan Natives for subsistence hunting and the creation of native handicrafts and clothing.[497]

Regulation of incidental takes is divided between commercial fishing and non-fishing activities.[498] All vessel owners and owners of non-vessel fishing gear participating in commercial fisheries classified as posing occasional or frequent risk of death and serious injury to marine mammals must obtain a Certificate of Authorization allowing incidental takes.[499] NOAA Fisheries may allow takes of marine mammals even from depleted stocks if the takes will have a negligible impact on the stock and the agency has developed or is developing a recovery plan for the species under the ESA.[500] Additionally, NOAA Fisheries may impose additional protections for these stocks, including by

---

[487] NOAA Fisheries, "Conservation and Management in Protecting Marine Mammals," n.d., National, https://www.fisheries.noaa.gov/topic/marine-mammal-protection/conservation-&-management.
[488] USFWS, "Marine Mammal Protection Act," FWS.gov, accessed October 4, 2022, https://www.fws.gov/law/marine-mammal-protection-act.
[489] Marine Mammal Commission, "About the Commission," Marine Mammal Commission, n.d., https://www.mmc.gov/about-the-commission/.16 U.S.C. §§ 1401–07.
[490] 16 U.S.C. § 1371(a).
[491] 16 U.S.C. § 1421c.
[492] 16 U.S.C. § 1371(a).
[493] 16 U.S.C. § 1362(13).
[494] 16 U.S.C. § 1362(18)(A)(ii).
[495] 16 U.S.C. §§ 1371, 1387.
[496] 16 U.S.C. § 1371(a)(1).
[497] 16 U.S.C. § 1371(b).
[498] 50 C.F.R. § 229.4.
[499] 50 C.F.R. §§ 229.2, 229.4(a).
[500] 50 C.F.R. § 229.20; NOAA Fisheries, "Recovery of Species Under the Endangered Species Act," NOAA, September 27, 2022, National, https://www.fisheries.noaa.gov/national/endangered-species-conservation/recovery-species-under-endangered-species-act.

establishing a monitoring program and vessel registration requirements, as well as developing a take reduction plan for the species, before allowing incidental takes.[501]

NOAA Fisheries has implemented an Atlantic Large Whale Take Reduction Plan to help reduce entanglement and mortality of North Atlantic right whales, fin whales, and humpback whales in commercial trap/pot and gillnet fisheries along the Atlantic coast.[502] This plan includes gear marking requirements for fishers in the "lobster and Jonah crab . . . trap/pot gear" fishery, with the markings' colors specific to the gear type and the area where the gear is located.[503] It also includes area and season closures, requirements to use sinking groundline and weak links in fishing line, and "minimum number[s] of traps per trawl."[504] These management measures are paired with research into these whale species and ways to reduce entanglement, as well as outreach efforts.[505] Additionally, the plan implements a disentanglement program.[506]

Incidental takes by non-fishing activities are also permitted.[507] Common activities for which incidental takes are authorized include military use of sonar; activities related to oil, gas, and other energy development; scientific research; and construction activities.[508] These activities may take "small numbers" of marine mammals if the takes will have only a "negligible impact" on the stocks and do not have "an unmitigable adverse impact on" use of the stock for subsistence fishing.[509] NOAA Fisheries uses two types of authorizations for non-fishing activities.[510] First, an Incidental Harassment Authorization (IHA) allows incidental takes if the expected take will only harass marine mammals and the activity is only occurring for up to one year.[511] To obtain an IHA, an applicant must submit an application 5-8 months before the intended start of the project.[512] Once an application is submitted, NOAA Fisheries reviews the application, performs any needed NEPA and ESA processes, holds a 30-day public comment period on the IHA, and makes a final determination about whether to grant the IHA.[513] These authorizations may be extended for an additional year "on a case-by-case basis," if needed.[514] Second, a Letter of Authorization (LOA) allows incidental takes when the activity (a) would harass marine mammals for up to 5 years or (b) would cause serious injury and/or mortality of marine mammals.[515] To obtain an LOA, an applicant must apply at least 9

[501] 50 C.F.R. § 229.20.
[502] 50 C.F.R. § 229.32.
[503] 50 C.F.R. § 229.32(b)(1), (3).
[504] 50 C.F.R. § 229.32(c)
[505] NOAA Fisheries, "Atlantic Large Whale Take Reduction Plan," NOAA, October 17, 2022, New England/Mid-Atlantic, https://www.fisheries.noaa.gov/new-england-mid-atlantic/marine-mammal-protection/atlantic-large-whale-take-reduction-plan.
[506] NOAA Fisheries.
[507] 16 U.S.C. § 1371(a)(5); NOAA Fisheries, "Incidental Take Authorizations Under the Marine Mammal Protection Act," NOAA, June 24, 2020, National, https://www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection-act.
[508] NOAA Fisheries, "Incidental Take Authorizations Under the Marine Mammal Protection Act," NOAA, October 18, 2022, National, https://www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection-act.
[509] 16 U.S.C. § 1371(a)(5).
[510] NOAA Fisheries, "Incidental Take Authorizations Under the Marine Mammal Protection Act," October 18, 2022.
[511] NOAA Fisheries.
[512] NOAA Fisheries.
[513] NOAA Fisheries.
[514] NOAA Fisheries.
[515] NOAA Fisheries.

months before the intended start of the project.[516] NOAA Fisheries reviews the application, holds a 30 day public comment period informing the public about the application, and then incorporates the comments, while also performing any needed processes under NEPA and ESA.[517] NOAA Fisheries then publishes a proposed rule about the requested takes for another 30-60 day public comment period, reviews the comments, finalizes the NEPA and ESA processes, and publishes a final decision about whether the agency is issuing the LOA.[518] The LOA is issued 30 days after the final rule is published.[519]

The take provisions are supported by measures to evaluate the statute's effectiveness. Most notably, the agencies must conduct stock assessments for all marine mammal stocks.[520] These assessments include estimates of species abundance and bycatch.[521] They also include calculations of the potential biological removal (PBR), defined as "the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population."[522]

Prohibition on Imports

The MMPA prohibits imports of "commercial fish or products from fish which have been caught with commercial fishing technology which results in the incidental kill or incidental serious injury of ocean mammals in excess of United States standards."[523] In 2016, NOAA Fisheries promulgated a final rule that outlined requirements for compliance with this provision.[524] Each fishery with "more than a remote likelihood of" takes must receive a "comparability finding" from NOAA Fisheries certifying that the exporting country regulates bycatch in a manner at least comparable to regulations in U.S. fisheries.[525] Enforcement of the rule is scheduled to begin in January 2024.[526]

Unusual Mortality Events

The MMPA also includes provisions outlining actions required during Unusual Mortality Events (UMEs).[527] A UME is defined as an unexpected stranding "involv[ing] a significant die-off of any marine mammal population" that requires an "immediate response."[528] When a UME is declared, the Secretary of Commerce establishes a "marine mammal unusual mortality event working group" with which she will develop a contingency plan for responding to the UME.[529] NOAA Fisheries has declared Unusual Mortality Events (UMEs) for blue whales, fin whales, and North Atlantic right

[516] NOAA Fisheries.
[517] NOAA Fisheries.
[518] NOAA Fisheries.
[519] NOAA Fisheries.
[520] 16 U.S.C. § 1386(a), (c).
[521] 16 U.S.C. § 1386(a)(2)–(4).
[522] 16 U.S.C. §§ 1362(20), 1386(a)(6).
[523] 16 U.S.C. § 1371(a)(2).
[524] 81 Fed. Reg. 54,390.
[525] NOAA Fisheries, "List of Foreign Fisheries," NOAA, April 28, 2021, National, https://www.fisheries.noaa.gov/foreign/international-affairs/list-foreign-fisheries.
[526] 85 Fed. Reg. 69,515; modified by 87 Fed. Reg. 63955.
[527] 16 U.S.C. § 1421c.
[528] 16 U.S.C 1421h(6).
[529] 16 U.S.C. 1421c(a)-(b).

whales in the past.[530] However, only the North Atlantic right whale is currently experiencing a UME, due to the high threats the species is facing from ship strikes and entanglement in fishing gear.[531]

Fisheries Management

This section provides an overview of U.S. fisheries management under varying state, interstate, and federal regimes. It starts with a discussion of federal fisheries management under the Magnuson-Stevens Fisheries Conservation and Management Act, as well as a discussion of federal legislation that provides financial support to fishers in cases of fisheries disasters. It then moves to a discussion of fisheries management in state waters, as governed in part by the Atlantic States Marine Fisheries Commission (ASMFC). It closes by describing in more detail the state regulations that exist for American eel and American lobster, with a particular focus on the states of Maine, New Hampshire, and Massachusetts.

Federal Fisheries Management & the Magnuson-Stevens Fisheries Conservation and Management Act

The Magnuson-Stevens Fisheries Conservation and Management Act outlines the federal fisheries management framework in the United States. With limited exceptions in the Gulf of Mexico (where state laws apply out to nine miles offshore), it applies from three nautical miles offshore to the edge of the United States exclusive economic zone, two hundred nautical miles offshore.[532]

The Magnuson-Stevens Act, enacted in 1976, aimed to reverse the collapse of major U.S. fisheries. The Act seeks to rehabilitate and manage fisheries for the long-term benefit of domestic resource users, noting that "commercial and recreational fishing constitutes a major source of employment and contributes significantly to the economy of the Nation."[533] To accomplish this goal, the Act creates "a national program for the conservation and management" that balances realizing "the full potential of the Nation's fishery resources" with the need to "prevent overfishing to rebuild overfished stocks, [and] to ensure conservation."[534] The Act also seeks to promote "underutilized" fisheries, protect habitat, and improve data collection.[535]

The regional fisheries management councils are delegated much decision-making power. Although federal officials sit on these regional councils as nonvoting members, local stakeholders representing commercial fishing, environmental groups, state government, and other resource users make the actual fisheries management decisions. These decisions must, however, abide by ten national standards, including using the best available science and achieving an optimum yield that does not lead to overfishing. The councils must also identify essential fish habitat, assess bycatch, determine whether overfishing is occurring, and create plans to rehabilitate overfished stocks. The regional councils have the power (and obligation) to set annual catch limits for different species that do not

[530] NOAA Fisheries, "Blue Whale," September 15, 2022; NOAA Fisheries, "Fin Whale," September 15, 2022; NOAA Fisheries, "North Atlantic Right Whale," October 14, 2022.
[531] NOAA Fisheries, "Active and Closed Unusual Mortality Events," NOAA, July 26, 2022, National, https://www.fisheries.noaa.gov/national/marine-life-distress/active-and-closed-unusual-mortality-events.
[532] NOAA Fisheries, "Laws & Policies," NOAA, October 4, 2022, https://www.fisheries.noaa.gov/topic/laws-policies.
[533] 16 U.S.C. § 1801.
[534] 16 U.S.C. § 1801.
[535] 16 U.S.C. § 1801.

allow overfishing, and also to order accountability measures, such as implementing gear restrictions, closing fisheries, or requiring on-board vessel monitoring. Although councils of state and local actors set these rules, federal agencies, including the National Marine Fisheries Service, review and enforce them.[536]

The New England Regional Fishery Management Council sets fisheries policy in the waters immediately south of Canada. It includes representatives from each of the five coastal New England states: Connecticut, Rhode Island, Massachusetts, New Hampshire, and Maine. Additionally, nonprofits, such as the Cape Cod Commercial Fishermen's Alliance, sit on the Council.[537] This Council also has a transboundary management guidance committee that works with Canadian officials to manage cod, haddock, and flounder populations.[538]

Fisheries Disaster Response Legislation

Two federal laws—the Magnuson Stevens Fisheries Conservation and Management Act and the Interjurisdictional Fisheries Act—offer financial support to commercial fishers and their communities when fisheries close. Procedurally, a U.S. federal representative or governor representing the fishing community can petition the U.S. Secretary of Commerce to declare a fisheries disaster. Upon the Secretary's determination that fisheries disaster has occurred, funding becomes available to that community, provided Congress has appropriated sufficient money. Different kinds of funding are available to different groups depending on the cause and severity of the fisheries disaster. Of particular note, Magnuson-Stevens Act Section 312(a) will provide fishers monetary relief when regulatory bodies—including courts—close a fishery. This money may be used to determine the cause of the fishery closure or strengthen the fishery against future closures. The Secretary's determination that a "catastrophic regional fishery disaster" has occurred can unlock additional funding for processors and other fishery-adjacent industries. However, some of this funding is for programs like job retraining and fleet size reductions to transition the economy away from fishing. Other provisions provide relief after natural disasters or undetermined causes.[539]

Fisheries Management in State Waters: Atlantic States Marine Fisheries Commission

In the United States, fisheries in waters up to 3 miles from shore are managed by the states.[540] However, to promote better utilization and conservation of fisheries resources, coastal states have formed agreements that allow more cohesive fisheries management across state lines.[541] In 1942, Congress approved an interstate compact establishing ASMFC as a body to promote "the better utilization of the fisheries (marine, shell and anadromous) of the Atlantic seaboard."[542] As a body

---

[536] NOAA Fisheries, "Laws & Policies."
[537] NEFMC, "Council Members," May 19, 2020, https://www.nefmc.org/about/council-members.
[538] NEFMC, "Transboundary Management Guidance Committee (TMGC)," New England Fishery Management Council, May 13, 2014, https://www.nefmc.org/committees/transboundary-management-guidance-committee-tmgc.
[539] Fisheries, NOAA. "Relevant Legislation and Resources—Fishery Disaster Assistance | NOAA Fisheries." NOAA, June 15, 2022. https://www.fisheries.noaa.gov/national/funding-and-financial-services/relevant-legislation-and-resources-fishery-disaster.
[540] 43 U.S.C. 1312.
[541] Atlantic States Marine Fisheries Commission, "Management 101," accessed October 28, 2022, http://www.asmfc.org/fisheries-management/management-101.
[542] Atlantic States Marine Fisheries Commission, "Compact & Rules and Regulations," 2016, http://www.asmfc.org/files/pub/CompactRulesRegs_Feb2016.pdf. Soon after, similar interstate commission were established for the Gulf and Pacific coast states. Gulf States Marine Fisheries Commission, "About Us," accessed

created through an interstate compact, some courts do not consider the ASMFC a federal agency, but rather a mechanism for states to collaborate when making decisions about fisheries that exist in multiple states' waters, a regulatory area that has traditionally been under state authority.[543] ASMFC's goals include to maintain, rebuild, and allocate the fisheries it manages; to conduct stock assessments to underlie management decisions; to promote compliance with management plans; and to protect fish habitat and ecosystems.[544]

ASMFC's Structure

ASMFC is composed of a series of boards and committees that pass management measures and support the development of scientific information about the species managed.[545] ASMFC has a management body dedicated to each species, or group of species, that makes decisions about enacting and revising Fishery Management Plans (FMP).[546] These boards are composed of Commissioners from each state or jurisdiction that has declared an interest in the fishery's management.[547] While each state has three representatives to the Commission (an executive officer of the state fisheries agency, a member of the state legislature, and a representative knowledgeable about marine fisheries regulation), each state and jurisdiction receives one vote for each management decision.[548] These boards also generally have voting representatives from USFWS and NOAA Fisheries.[549]

The species-specific boards are supported by ASMFC committees that conduct stock assessments, inform the boards about scientific information, share input from stakeholders (e.g., fishers), and help develop and revise the species' FMPs.[550] Committee composition varies based on the type of committee.[551] For example, Technical Committees and Stock Assessment Sub-Committees are primarily composed of representatives from "each state, jurisdiction, and federal agency with a declared interest in the fishery."[552] In contrast, Advisory Panels are composed of stakeholders, including representatives from the commercial and recreational fisheries.[553] Decisions made by each species-specific board are reviewed by the Interstate Fisheries Management Program Policy Board.[554]

October 25, 2022, https://www.gsmfc.org/compact.php; Pacific States Marine Fisheries Commission, "Compact Document," 1947, https://www.psmfc.org/wp-content/uploads/2012/02/Publications_PSMFC_Compact_2010_compact1.pdf.

[543] *New York v. Atlantic States Marine Fisheries Comm'n*, 609 F.3d 524, 527, 532–33 (2d Cir. 2010). Note: the authors of this report do not concede the correctness of this ruling.

[544] Atlantic States Marine Fisheries Commission, "Five-Year Strategic Plan 2019-2023," n.d., http://www.asmfc.org/files/pub/2019-2023StrategicPlan_Final.pdf.

[545] Atlantic States Marine Fisheries Commission, "Interstate Fisheries Management Program Charter," 2019, http://www.asmfc.org/files/pub/ISFMPCharter_Aug2019.pdf.

[546] Atlantic States Marine Fisheries Commission.

[547] Atlantic States Marine Fisheries Commission, "Compact & Rules and Regulations"; Atlantic States Marine Fisheries Commission, "Interstate Fisheries Management Program Charter."

[548] Atlantic States Marine Fisheries Commission, "Compact & Rules and Regulations."

[549] Atlantic States Marine Fisheries Commission, "Interstate Fisheries Management Program Charter."

[550] Atlantic States Marine Fisheries Commission.

[551] Atlantic States Marine Fisheries Commission, "Management 101."

[552] Atlantic States Marine Fisheries Commission; Atlantic States Marine Fisheries Commission, "Interstate Fisheries Management Program Charter."

[553] Atlantic States Marine Fisheries Commission, "Management 101."

[554] Atlantic States Marine Fisheries Commission.

ASMFC Fisheries Management

ASMFC manages 27 species through the use of FMPs that outline management measures for each species within state waters, as well as research priorities and monitoring requirements.[555] FMPs may include gear requirements, quotas, size limits, or area and season closures, among other measures.[556] The species-specific boards meet quarterly to discuss updated information about the species and to consider any proposed revisions to the FMPs.[557] While ASMFC is the exclusive manager for many of the species under its jurisdiction, there are several fisheries for which ASMFC develops management measures jointly or in a complementary fashion with NOAA Fisheries and the regional fisheries councils, such as the NEFMC (e.g., summer flounder, coastal sharks).[558]

FMPs are generally species-specific, though several FMPs cover multiple species (e.g., coastal sharks).[559] FMPs are based on the available science, including stock assessments.[560] When considering adoption of an FMP, ASMFC holds public hearings in states with a declared interest in the fishery and holds a public comment period extending from 30 days before the start of public hearings until 14 days after the hearings end.[561] FMPs can be revised through two types of documents.[562] Amendments are significant revisions meant to replace an existing FMP and are subject to the same public hearings and public comment period requirements as an FMP.[563] Addenda are more minor revisions updating management of issues that an FMP has classified as subject to adaptive management.[564] Addenda generally take 3-6 months to adopt, with the process including a mandatory 30-day comment period, as well as potentially including public hearings.[565] Once an FMP (or an amendment or addendum to an FMP) is approved, each state agency must implement the management measures within its state's boundaries.[566] The Atlantic Coastal Fisheries Cooperative Management Act implemented a procedure that established meaningful consequences when a state does not comply with necessary management measures.[567] The act provides that ASMFC can send a finding of non-compliance to the Secretaries of Commerce and the Interior, arguing that non-compliance threatens the species' conservation and outlining the actions that a state must take to comply with the measures.[568] If the Secretaries determine that the finding is

[555] Atlantic States Marine Fisheries Commission.
[556] Atlantic States Marine Fisheries Commission; Atlantic States Marine Fisheries Commission, "Compact & Rules and Regulations."
[557] Atlantic States Marine Fisheries Commission, "Management 101."
[558] Atlantic States Marine Fisheries Commission; Atlantic States Marine Fisheries Commission, "Interstate Fisheries Management Program Charter."
[559] Atlantic States Marine Fisheries Commission, "Management 101."
[560] Atlantic States Marine Fisheries Commission; Atlantic States Marine Fisheries Commission, "Compact & Rules and Regulations."
[561] Atlantic States Marine Fisheries Commission, "Management 101"; Atlantic States Marine Fisheries Commission, "Interstate Fisheries Management Program Charter."
[562] Atlantic States Marine Fisheries Commission, "Management 101."
[563] Atlantic States Marine Fisheries Commission; Atlantic States Marine Fisheries Commission, "Interstate Fisheries Management Program Charter."
[564] Atlantic States Marine Fisheries Commission, "Management 101"; Atlantic States Marine Fisheries Commission, "Interstate Fisheries Management Program Charter."
[565] Atlantic States Marine Fisheries Commission, "Management 101"; Atlantic States Marine Fisheries Commission, "Interstate Fisheries Management Program Charter."
[566] Atlantic States Marine Fisheries Commission, "Interstate Fisheries Management Program Charter."
[567] Atlantic Coastal Fisheries Management Act, Pub. L. No. 103-206, 107 Stat. 2447 (codified at 16 U.S.C. §§ 5101–08).
[568] 16 U.S.C. §§ 1505–06.

warranted, they may announce a moratorium for the fishery in that state, pending state action to resolve the issue.[569]

ASMFC Management of Highlighted Species

Below are descriptions of ASMFC's management of American eel and American lobster in state waters. Notably, ASMFC also manages shortfin mako within state waters in a multi-species coastal sharks FMP.[570] However, this FMP is complementary to NOAA Fisheries' Highly Migratory Species regulations, so that measures in state and federal waters are generally consistent, although the state and federal plans may not be updated on the same timeframe.[571]

American Eel

ASMFC manages the American eel "in the territorial seas and inland waters along the Atlantic coast from Maine to Florida."[572] All states along the coast, as well as the District of Columbia and the Potomac River Fisheries Commission, have declared an interest in the fishery and sit on the American Eel Management Board.[573] The current management regime outlines fisheries regulations for American eels in three of their life stages: yellow, glass, and silver.

With the exception of Pennsylvania and the District of Columbia, all jurisdictions represented on the ASMFC board participate in the yellow eel fishery.[574] ASMFC has established a coastwide cap of approximately 415,705 kg (916,473 lbs).[575] Additionally, if the "cap is exceeded by 10%...for two consecutive years," states with over 1% of the coastwide landings must take management action to further limit catch.[576] Even so, landings are currently below the cap due to low market demand, with approximately 117,871 kg (259,862 lbs) of yellow eel landed in 2020.[577] In 2020, Maine landed approximately 3,180 kg (7,010 lbs) of yellow eel.[578] New Hampshire and Massachusetts have declared *de minimis* status for this fishery, which exempts the states from adopting regulations for yellow eel fisheries in recognition that each state landed "less than 1% of the coastwide commercial landings" of yellow eels in the last two years.[579] These states recorded no landings in 2020.[580]

---

569 16 U.S.C. §§ 1506.
570 Atlantic States Marine Fisheries Commission, "Coastal Sharks," accessed October 3, 2022, http://www.asmfc.org/species/coastal-sharks.
571 Atlantic States Marine Fisheries Commission, "Management 101."
572 Atlantic States Marine Fisheries Commission, "Addendum IV to the Interstate Fishery Management Plan for American Eel," 2014, http://www.asmfc.org/uploads/file/57336cfcAmericanEel_AddendumIV_Oct2014.pdf.
573 American Eel Plan Review Team, "Review of the Interstate Fishery Management Plan: American Eel (Anguilla Rostrata): 2020 FISHING YEAR" (Atlantic States Marine Fisheries Commission, 2021), http://www.asmfc.org/uploads/file/618400f4AmericanEelFMPReview2020.pdf.
574 American Eel Plan Review Team.
575 Atlantic States Marine Fisheries Commission, "Addendum V to the Interstate Fishery Management Plan for American Eel: Commercial Yellow and Glass/Elver Eel Allocation and Management," 2018, http://www.asmfc.org/uploads/file/5e1636f1AmEelAddendumV_Aug2018_updated.pdf.
576 Atlantic States Marine Fisheries Commission.
577 American Eel Plan Review Team, "Review of the Interstate Fishery Management Plan: American Eel (Anguilla Rostrata): 2020 FISHING YEAR."
578 American Eel Plan Review Team.
579 American Eel Plan Review Team.
580 American Eel Plan Review Team.

Maine and South Carolina are the only states with active glass eel fisheries.[581] Since 2015, Maine's glass eel fishery has had an annual quota of approximately 4,394 kg (9,688 lbs).[582] In 2020, preliminary landings estimated that Maine landed 4,377 kg (9,650 lbs) of glass eels, while South Carolina landed less than 340 kg (750 lbs).[583]

The American Eel FMP also provides for several smaller fisheries. It includes a provision for states to submit plans to harvest up to "200 pounds of glass eels annually from within their waters for use in domestic aquaculture facilities."[584] As of 2020, only Maine and North Carolina had been approved for harvesting under this provision.[585] Additionally, New York has a silver eel weir fishery in "the Delaware River and its…tributaries."[586] Finally, each state has regulations for recreational fisheries, though recreational fishers generally do not target American eel.[587]

American Lobster

In the United States, American lobster (*Homarus americanus*) is managed by both Northeast and Mid-Atlantic states (Maine, Massachusetts, New Hampshire, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia, and North Carolina) and federal entities.[588] American lobster is jointly managed between state and federal levels.[589] In state waters (0 – 3 nautical miles), the fishery is managed under the Interstate Fishery Management Plan.[590] In federal waters (3 – 200 nautical miles), management plans for American lobster are created pursuant to the authority of the Atlantic Coastal Fisheries Cooperative Management Act, not the Magnuson-Stevens Fishery Conservation and Management Act.[591] The Atlantic Coastal Fisheries Cooperative Management Act states that regulations must be "compatible with the effective implementation of an Interstate Fishery Management Plan" put in place by the ASMFC and consistent with the National Standards of the MSA.[592]

State of Maine

The Maine Department of Marine Resources (DMR) has a Lobster Advisory Council that "advise[s] the commissioner" of the Maine Department of Environmental Protection on activities related to

[581] American Eel Plan Review Team.
[582] Atlantic States Marine Fisheries Commission, "Addendum V to the Interstate Fishery Management Plan for American Eel: Commercial Yellow and Glass/Elver Eel Allocation and Management."
[583] American Eel Plan Review Team, "Review of the Interstate Fishery Management Plan: American Eel (Anguilla Rostrata): 2020 FISHING YEAR."
[584] Atlantic States Marine Fisheries Commission, "Addendum V to the Interstate Fishery Management Plan for American Eel: Commercial Yellow and Glass/Elver Eel Allocation and Management."
[585] Atlantic States Marine Fisheries Commission, "American Eel," accessed October 3, 2022, http://www.asmfc.org/species/american-eel.
[586] Atlantic States Marine Fisheries Commission, "Addendum IV to the Interstate Fishery Management Plan for American Eel."
[587] American Eel Plan Review Team, "Review of the Interstate Fishery Management Plan: American Eel (Anguilla Rostrata): 2020 FISHING YEAR."
[588] NOAA Fisheries, "American Lobster," NOAA, August 1, 2022, New England/Mid-Atlantic, https://www.fisheries.noaa.gov/species/american-lobster.
[589] NOAA Fisheries.
[590] NOAA Fisheries.
[591] NOAA Fisheries.
[592] U.S. Congress, "Atlantic Coastal Fisheries Cooperative Management Act," Pub. L. No. 103–206, § 5103, 16 U.S.C., accessed October 3, 2022, https://uscode.house.gov/view.xhtml?path=/prelim@title16/chapter71&edition=prelim.

the lobster fishery, reviews research plans, and settles disputes brought to the department.[593] The council consists of representatives from each of the lobster management zones, non-lobstermen stakeholders, and general public members.[594]

The State of Maine defines seven management zones within state waters to which lobstermen are assigned when obtaining their fishing license (labeled A-G).[595] Management measures, such as trap limits and the number of active licensed lobstermen allowed, vary among the zones.[596] In addition to zone assignments and trap limits, DMR defines how lobstermen are to tag their traps, imposes fishery closures, vessel restrictions, and restricts the take of "egg-bearing lobsters" including a system that notches the tail of a female egg-bearing lobster so that lobstermen refrain from harvesting until the lobster has fully molted the notch.[597]

State of New Hampshire

New Hampshire regulates harvesting in its inland waters and adjoining ocean out to three nautical miles off its short coastline. When fishing in both New Hampshire and federal waters, New Hampshire law requires fishers to follow more restrictive federal rules. Lobster fishing requires a state license. Minimum sizes and catch limits apply, catching egg-bearing female lobsters is forbidden (their tails must be v-notched, and they must be immediately returned to the water), and traps must follow specific rules. All traps must be hauled at least every thirty days, they must be distinctively marked with a mark also emblazoned on the license and fishing vessel, and traps must feature certain biodegradable and escape features.[598]

State of Massachusetts

Commercial and recreational lobster fishing in the State of Massachusetts requires fishermen to hold a permit issued by the state. Both commercial and recreational lobstermen must abide by certain size restrictions, gender restrictions, and trap restrictions when fishing.[599] State regulations indicate that it is unlawful to take any lobster that is either egg bearing or that has a v-shaped notch or indentation.[600] Gear restrictions for recreational fishing limit the use of spear guns, pole spears, dipnets, or snares.[601] Additionally, buoy lines must meet certain diameters and escape vents in traps

---

[593] Maine Legislature, "Lobster and Crab Fishing Licenses," 12 § 6412 - 6482, accessed October 3, 2022, https://legislature.maine.gov/statutes/12/title12ch619sec0.html.
[594] Maine Legislature.
[595] Maine Legislature.
[596] Maine Legislature.
[597] Maine Legislature.
[598] eRegulations. "[22NHSW] Lobster & Crab." Accessed October 7, 2022. https://www.eregulations.com/newhampshire/fishing/saltwater/lobster-crab.
[599] eRegulations. *Recreational Lobster & Crabbing.* https://www.eregulations.com/massachusetts/fishing/saltwater/recreational-lobster-crabbing. Accessed 07 Oct. 2022.; Massachusetts DMF. *Commercial Lobster & Crab Regulations | Mass.Gov.* https://www.mass.gov/service-details/commercial-lobster-crab-regulations. Accessed 07 Oct. 2022.
[600] eRegulations. *Recreational Lobster & Crabbing.* https://www.eregulations.com/massachusetts/fishing/saltwater/recreational-lobster-crabbing. Accessed 07 Oct. 2022.
[601] eRegulations. *Recreational Lobster & Crabbing.* https://www.eregulations.com/massachusetts/fishing/saltwater/recreational-lobster-crabbing. Accessed 07 Oct. 2022.

must abide by certain size restrictions based on the area.[602] Recreational fishing is limited to 10 traps per household while commercial fishing has no trap limit.[603] If commercial lobstermen have a permit to fish in multiple Lobster Conservation Management Areas, they must adhere to the most restrictive standards.[604]

Laws Enabling Area-Based Management

The Property Clause of the Constitution allows Congress to regulate federal lands and waters, allowing Congress or agencies to establish protected areas in the US Exclusive Economic Zone (EEZ). This provides federal authority for area-based management including marine spatial planning. Here, we briefly review some of the existing authority and models for area-based management efforts.

National Parks System

While the National Park Service—an agency under the Department of the Interior—manages all units within the National Park System, there is not one uniform set of rules that governs these units. Instead, Congress establishes, though a separate act, each park, delimits its borders, and provides for any particular management rules. While generally the parks are managed for conservation and recreational purposes, some allow for consumptive uses, such as hunting, as well. Indeed, the 423 units in the National Park System fall into 20 different categories; some, such as Wolf Trap National Park for the Performing Arts, are in a class of their own. Even within these categories, management rules vary.[605]

Designating a new national park is a difficult process. Many in Congress believe that no new parks should be added or that existing funding and staffing cannot support additional parks at this time. Additionally, while Congress could designate a new park without commissioning a study, as a practical matter Congress designates new parks only after a detailed study including public comment and a full National Environmental Policy Act review. Studies themselves often take longer than three years and require a Congressionally authorized budget. By law, new national park studies must consider strict criteria, including the potential park's "national significance," and whether it protects "one of the most important examples of a type of resource." Even then, the study must also determine whether the park would serve as a "suitable and feasible addition" to the system overall or whether another type of designation is more appropriate for the resource.[606]

---

[602] eRegulations. *Recreational Lobster & Crabbing.* https://www.eregulations.com/massachusetts/fishing/saltwater/recreational-lobster-crabbing. Accessed 07 Oct. 2022.
[603] eRegulations. *Recreational Lobster & Crabbing.* https://www.eregulations.com/massachusetts/fishing/saltwater/recreational-lobster-crabbing. Accessed 07 Oct. 2022.; Massachusetts DMF. *Commercial Lobster & Crab Regulations | Mass.Gov.* https://www.mass.gov/service-details/commercial-lobster-crab-regulations. Accessed 07 Oct. 2022.
[604] Massachusetts DMF. *Commercial Lobster & Crab Regulations | Mass.Gov.* https://www.mass.gov/service-details/commercial-lobster-crab-regulations. Accessed 07 Oct. 2022.
[605] Laura B. Comay and Carol Hardy Vincent, "National Park System: Establishing New Units," *Congressional Research Service*, April 6, 2022, https://crsreports.congress.gov/product/pdf/RS/RS20158.
[606] Comay and Vincent.

National Marine Sanctuaries Act

First enacted as Title III under the 1927 Marine Protection, Research, and Sanctuaries Act (MPRSA), the National Marine Sanctuaries Act (NMSA) was given its short title with the 1992 amendment of the MPRSA.[607] The purpose of the NMSA is to "identify and designate national marine sanctuaries," provide a conservation and management framework for "these marine areas, and activities affecting them," "protect, …restore and enhance natural habitats, populations, and ecological processes," "enhance public awareness, understanding, appreciation, and wise and sustainable use of the marine environment," promote scientific research and long-term monitoring of the resources of these areas, facilitate "all public and private use of the resources of these marine areas not prohibited pursuant to other authorities," develop and oversee the implementation of coordinated protection and management plans, create models and incentives to "conserve and manage these areas," and cooperate with "global programs encouraging conservation of marine resources."[608] Although the statute confers authority to designate and regulate marine sanctuaries on the Secretary of Commerce, day-to-day management is delegated to NOAA's Office of National Marine Sanctuaries. [609]

Sanctuary designation can take form through multiple processes: direct designation from the Secretary of Commerce, Congressional designation, and a community-based sanctuary nomination process. Additionally, the President can make use of the Antiquities Act to establish national monuments that are managed as part of the National Marine Sanctuary System.[610] Several standards must be met for an area to be designated as a marine sanctuary: the marine area must be considered an area of national significance due to "conservation, recreational, historical, scientific, cultural, archeological, educational, or esthetic qualities," "the communities of living marine resources it harbors," or its "resource or human-use values."[611] Additionally, any existing State and Federal regulations must be proven to be "inadequate" or in need of supplementation "to ensure coordination and comprehensive conservation and management of the area."[612] Any sanctuary designation decision must be made with consultation from numerous parties, including various House of Representative and Senate Committees, (Committee on Resources of the House of Representatives and the Senate Committee on Commerce, Science, and Transportation) and Cabinet Secretaries, relevant agency heads from State and local government entities, officials from Regional Fishery Management Councils that may be affected by the proposed designation, and other interested parties.[613] Prior to designation, the Secretary of Commerce must issue a notice of the proposal in the Federal Register including the "proposed regulations… and a summary of the draft management plan," and must circulate the proposal to the communities that may be affected, the Governors of each State in which "any part of the proposed sanctuary would be located," and the Senate and House of Representative Committees mentioned above.[614]

---

[607] "National Marine Sanctuaries Amendments Act of 2000," 16 U.S.C. § 1431-1445 (2000).
[608] National Marine Sanctuaries Amendments Act of 2000, sec. 1431b.
[609] National Marine Sanctuaries, "National Marine Sanctuaries Act and Legislation," Office of National Marine Sanctuaries, accessed September 26, 2022, https://sanctuaries.noaa.gov/about/legislation/.
[610] National Marine Sanctuaries, "National Marine Sanctuary Frequently Asked Questions," accessed September 26, 2022, https://sanctuaries.noaa.gov/about/faqs/.
[611] National Marine Sanctuaries Amendments Act of 2000, sec. 1433a.
[612] National Marine Sanctuaries Amendments Act of 2000, sec. 1433a.
[613] National Marine Sanctuaries Amendments Act of 2000, sec. 1433b.
[614] National Marine Sanctuaries Amendments Act of 2000, sec. 1434a.

The NMSA provides various tools for the Secretary of Commerce to protect designated marine sanctuaries. For example, the Secretary must implement regulations for each sanctuary, and the system as a whole, that specify activities that may and may not occur within the sanctuary.[615] In addition, the Secretary must prepare and periodically update management plans for the sanctuaries.[616] NOAA also is authorized to "assess civil penalties (up to $130,000 per day per violation) for violations of the NMSA or its implementing regulations and damages against people that injure sanctuary resources."[617] Federal agencies must consult with the sanctuary program before taking actions that are "likely to destroy, cause the loss of, or injure a sanctuary resource."[618] Although the NMSA has been cited as an important tool to achieve initiatives such as protecting 30% of global waters by 2030, there is much debate as to whether the NMSA and its marine sanctuaries are effective.[619]

Antiquities Act

In 1906, Congress passed the Antiquities Act, which gave the President the authority to designate national monuments on federal lands and to protect them from future exploitation or development.[620] The statute, originally passed in response to theft of antiquities from archaeological sites, provides that monuments can be established to protect historic landmarks, structures, and "other objects of historic or scientific interest."[621]

Since the President can declare monuments without the additional authorization of Congress, the Act itself has been quite controversial, with debate over the scope of the President's authority, the size of protected areas, the types of resources that can be protected, whether nonfederal lands can be included, what types of uses may be regulated, the role of state, local, and tribal governments, and the role of local consultation.[622] Congress has considered revising the Antiquities Act several times, with a wide variety of goals: expanding the President's authority, reducing or eliminating the President's authority, limiting the size and/or type of designated monuments, requiring an opportunity for public participation prior to establishing monuments, and other types of updates.[623] In June 2006, President George W. Bush established the first marine national monument, the Northwestern Hawaiian Islands Marine National Monument, now known as Papahānaumokuākea

---

615 National Marine Sanctuaries Amendments Act of 2000, sec. 1439.
616 National Marine Sanctuaries Amendments Act of 2000, secs. 1434a, e.
617 National Marine Sanctuaries Amendments Act of 2000, secs. 1436–37, 1443.
618 National Marine Sanctuaries Amendments Act of 2000, sec. 1434d; National Marine Sanctuaries, "National Marine Sanctuaries Act and Legislation."
619 Zainab Mirza et al., "To Protect 30 Percent of the Ocean, the United States Must Invest in the National Marine Sanctuaries Program," Center for American Progress, December 16, 2021, https://www.americanprogress.org/article/to-protect-30-percent-of-the-ocean-the-united-states-must-invest-in-the-national-marine-sanctuaries-program/; Dave Owen, "The Disappointing History of the National Marine Sanctuaries Act," 2003, https://repository.uchastings.edu/cgi/viewcontent.cgi?article=2235&context=faculty_scholarship.
620 Tatiana Schlossberg, "What Is the Antiquities Act and Why Does President Trump Want to Change It?," *The New York Times*, April 26, 2017, sec. Climate, https://www.nytimes.com/2017/04/26/climate/antiquities-act-federal-lands-donald-trump.html.
621 "American Antiquities Act," 54 U.S.C. § 320301 (1906); Carol Hardy Vincent, "National Monuments and the Antiquities Act," Congressional Research Service (Congressional Research Service, January 30, 2017).
622 Vincent, "National Monuments and the Antiquities Act," 1–2, 9; Mark Squillace, "The Monumental Legacy of the Antiquities Act of 1906," *Georgia Law Review* 37 (2003): 475–76.
623 Vincent, "National Monuments and the Antiquities Act," 16.

Marine National Monument.[624] This was followed by the Marianas Trench, Pacific Remote Islands, and Rose Atoll Marine National Monuments in 2009.[625] In September 2016, President Barack Obama established the Northeast Canyons and Seamounts Marine National Monument.[626] This designation was opposed and litigation ultimately made its way to the Supreme Court, which ultimately upheld the monument and declared the litigation untimely, though Chief Justice Roberts did indicate an interest in considering whether the scope of the areas that could be protected under the Act should be limited.[627]

Other Federal Laws

In this section, we review a few remaining miscellaneous laws that have implications for wildlife and coastal management. The Lacey Act criminalizes the transport or sale of wildlife acquired in a way that violates other laws including foreign law and treaties, functioning essentially as an international anti-poaching measure. The Outer Continental Shelf Lands Act prescribes leasing for offshore energy development, including wind energy. Finally, the Coastal Zone Management Act sets up a structure through which coastal states and the federal government jointly cooperate to manage coastal land use.

Lacey Act

The Lacey Act, 16 U.S.C. §§ 3371–78, was first enacted in 1900,[628] with the goal of preventing hunters from illegally killing game in one state and avoiding prosecution by escaping to another state.[629] This law creates strong prohibitions against illegal wildlife trade and transport, but it also contains exceptions for fisheries management plans and highly migratory species. It makes it unlawful for any person to "import, export, transport, sell, receive, acquire, or purchase any fish or wildlife or plant taken, possessed, transported, or sold in violation of any law, treaty, or regulation of the United States or in violation of any Indian tribal law."[630] The prohibitions apply to any person including individuals, corporations, government officials, and government agencies.[631] The USFWS, NOAA, Customs and Border Patrol, the Animal and Plant Health Inspection Service, and the Forest Service all administer the act.[632]

Congress amended the Lacey Act many times over its history. Notably in 1969, Congress expanded the Lacey act to cover amphibians, reptiles, mollusks, and crustaceans.[633] In 1981 Congress

---

[624] Harvard Law School, "Marine National Monuments & Marine Sanctuaries," Environmental & Energy Law Program, January 24, 2020, https://eelp.law.harvard.edu/2020/01/marine-national-monuments-and-marine-sanctuaries/.
[625] NOAA Fisheries, "Marine National Monuments in the Pacific," NOAA, February 24, 2021, Pacific Islands, https://www.fisheries.noaa.gov/pacific-islands/habitat-conservation/marine-national-monuments-pacific.
[626] Vincent, "National Monuments and the Antiquities Act," 21.
[627] Massachusetts Lobstermen's Association v. Raimondo, 141 S. Ct. 979 (2021).
[628] "Act of May 25, 1900," Pub. L. No. 56–553, § 187, 31 Stat. (1900).
[629] Kristina Alexander, "The Lacey Act: Protecting the Environment by Restricting Trade" (Congressional Research Service, January 14, 2014), 1, https://sgp.fas.org/crs/misc/R42067.pdf.
[630] "Lacey Act," 16 United States Code § 3371-78 (n.d.), 3372(a)(1).
[631] Lacey Act, 3371(e).
[632] Lacey Act, 3371(h), 3373(a).
[633] "Act of Dec. 5, 1969," Pub. L. No. 91–35, § 275, 83 Stat. (1969), 279, https://www.govinfo.gov/content/pkg/STATUTE-83/pdf/STATUTE-83-Pg275.pdf.

strengthened the Lacey Act by increasing civil and criminal penalties.[634] In 2008, Congress expanded the act to trees and plant products, but these amendments were controversial because the amendments sought to both promote conservation and preserve United States timber jobs.[635] Prosecution under the Lacey Act requires two parts, a person first violates a predicate law and then violates the Lacey Act itself.[636] The predicate law could be any state, federal, foreign, or tribal "laws, treaties, [or] regulations . . . which regulate the taking, possession, importation, exportation, transportation, or sale of fish or wildlife or plants."[637] Violating the Lacey act itself involves any person who "import[s], export[s], transport[s], sell[s], receive[s], acquire[s], or purchase[s] any fish or wildlife or plant taken" in violation of the predicate law.[638]

There are three significant exceptions to the act in the marine context. The act's prohibitions do "not apply to any activity regulated by a fishery management plan in effect under the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1801 et seq.)."[639] Additionally, the act's prohibitions do not "apply to any activity regulated by the Tuna Conventions Act of 1950 (16 U.S.C. 951–961) or the Atlantic Tunas Convention Act of 1975 (16 U.S.C. 971–971(h))."[640] The act's prohibitions also do not apply to "any activity involving the harvesting of highly migratory species . . . taken on the high seas. . . if such species are taken in violation of the laws of a foreign nation and the United States does not recognize the jurisdiction of the foreign nation over such species."[641] There is little case law interpreting these provisions, but in *United States v. Ertsgaard*, a court of appeals found Individual Fishing Quota regulations for halibut do not constitute fisheries management plans, so violations of those halibut regulations "do not fall within the Lacey Act's exemptions and are subject to prosecution under that Act."[642]

Outer Continental Shelf Lands Act

The Outer Continental Shelf Lands Act (OCSLA) was enacted on August 7, 1953[643] and is codified in Chapter 29 of Title 43, § § 1331 – 1356b. OCSLA was passed in the context of a booming oil industry where oil production was the second-largest revenue generator in the United States.[644] In 1953, the U.S. Submerged Lands Act recognized that the federal government had title and ownership of submerged lands three miles from a state's coastline.[645] Subsequently, OCSLA made two notable changes: (1) it "established federal jurisdiction over submerged lands of the Outer Continental Shelf" and (2) it "authorized the Secretary of the Interior to lease those lands for mineral development."[646] Currently, the Bureau of Ocean Energy Management (BOEM) is

---

634 "Act of Nov. 16, 1981," Pub. L. No. 97–79, § 1073, 95 Stat. (1981), https://www.govinfo.gov/content/pkg/STATUTE-95/pdf/STATUTE-95-Pg1073.pdf.
635 U.S. House of Representatives, "Food, Conservation, and Energy Act of 2008 Conference Report," House Report, 2008, https://www.congress.gov/congressional-report/110th-congress/house-report/627.
636 Alexander, "The Lacey Act: Protecting the Environment by Restricting Trade," 1.
637 Alexander, 1; Lacey Act, 3371(d).
638 Lacey Act, 3372(a)(1).
639 Lacey Act, 377(a).
640 Lacey Act, 3377(b).
641 Lacey Act, 3377(b)(2).
642 United States v. Ertsgaard, 3d Federal Reporter 615 (9th Circuit 2000).
643 Bureau of Ocean Energy Management, "OCS Lands Act History," accessed October 3, 2022, https://www.boem.gov/oil-gas-energy/leasing/ocs-lands-act-history.
644 Bureau of Ocean Energy Management.
645 Bureau of Ocean Energy Management.
646 Bureau of Ocean Energy Management.

"responsible for mineral leasing of submerged [outer continental shelf] lands and the supervising offshore developments."[647] OCSLA defined the outer continental shelf as "all submerged lands lying seaward and outside of the area of lands beneath navigable waters…and of which the subsoil and seabed appertain to the United States…."[648] The Act recognizes that "the outer Continental shelf is a vital national resource…which should be made available for expeditious and orderly development, subject to environmental safeguards."[649]

There have been several amendments to OCSLA since its enactment. The Energy Policy Act of 2005 grants jurisdiction to the Department of the Interior over "alternate energy-related uses (including renewable energy projects) on the outer [C]ontinental [S]helf."[650] Other amendments include the creation of an oil spill liability fund and a process to distribute part of "the receipts from the leasing of mineral resources of the [outer Continental Shelf] to coastal states."[651]

Current case law outlines a four-stage process for potential oil and gas production under OCSLA.[652] First is the preparation stage where the Department of the Interior (Interior) "creates a leasing program by preparing a five-year schedule of proposed lease sales."[653] Second is the lease-sale stage where "Interior solicits bids and issues leases for particular offshore leasing areas."[654] Third is the exploration stage where Interior reviews the lessees' exploration plans. Importantly, exploration can only proceed if Interior determines that the pan "will not be unduly harmful to aquatic life in the area, result in pollution, create hazardous or unsafe conditions, unreasonably interfere with other uses of the area, or disturb any site, structure, or object of historical or archeological significance."[655] Fourth is the development and production stage where a more detailed plan from the lessee is reviewed by Interior, state, and local governments.[656] Importantly, "[i]f Interior finds that the plan would 'probably cause serious harm or damage… to the marine, coastal or human environments,' then the plan, and consequently the leasing program, may be terminated."[657]

Under 43 U.S.C. § 1344(a), BOEM must take into account "economic, social, and environmental values of the renewable and nonrenewable resources contained in the outer Continental Shelf." In particular, 43 U.S.C. § 1344(a)(2) provides several factors the Secretary of the Interior must consider. These include, among others, "the ecological characteristics of such regions," "the relative environmental sensitivity and marine productivity of different areas of the outer Continental Shelf," and the "laws, goals, and policies of affected States." Additionally, 43 U.S.C. § 1346 of OCSLA covers environmental studies of regions involving a lease sale. This provision instructs the Secretary to conduct studies "to establish information needed for assessment and management of environmental impacts on the human, marine, and coastal environments of the outer Continental Shelf and the coastal areas which may be affected by oil and gas or other mineral development in such area or region."

---

[647] Bureau of Ocean Energy Management.
[648] 43 U.S.C. § 1331(a).
[649] 43 U.S.C. § 1332(3).
[650] "Energy Policy Act of 2005," § 388.
[651] Bureau of Ocean Energy Management, "OCS Lands Act History."
[652] Friends of the Earth v. Haaland, 583 F. Supp. 3d 113 (D.D.C. 2022).
[653] Ctr. for Biological Diversity v. U.S. Dep't of Interior, 563 F.3d 466 (D.C. Cir. 2009).
[654] Ctr. for Biological Diversity v. U.S. Dep't of Interior, 563 F.3d at 473.
[655] Ctr. for Biological Diversity v. U.S. Dep't of Interior, 563 F.3d at 473.
[656] Ctr. for Biological Diversity v. U.S. Dep't of Interior, 563 F.3d at 473.
[657] Ctr. for Biological Diversity v. U.S. Dep't of Interior, 563 F.3d at 473.

Coastal Zone Management Act

The Coastal Zone Management Act (CZMA) was passed in 1972, has been amended several times, and is codified at 16 U.S.C. §§ 1451 – 1466.[658] The act was passed in the context of a national concern about environmental degradation.[659] Under the CZMA, Congress declared in 16 U.S.C. § 1452(1), among other policies, a national policy "to preserve, protect, develop, and where possible, to restore or enhance, the resources of the Nation's coastal zone for this and succeeding generations." Within the CZMA, three national programs are outlined; the most relevant is the National Coastal Zone Management Program (NCZMP). [660] The CZMA calls for management programs that will provide for "the protection of natural resources, including wetlands, floodplains, estuaries, beaches, dunes, barrier islands, coral reefs, and fish and wildlife and their habitat, within the coastal zone."[661]

There are several levels of government involvement in the implementation of the NCZMP. Federally, the NOAA Office for Coastal Management (OCM) implements the policies and procedures of the CZMA.[662] However, the states and territories are responsible for choosing what to address in the coastal management program, "including the boundaries of their coastal zones, issues of most interest to the state, and policies to address these issues, among other factors." [663] Finally, local governments employ land use regulation to carry out the coastal management plan once approved.[664]

If a state or territory chooses to develop a management program, it must submit the program for review to the Secretary of Commerce.[665] Each management plan requires certain findings for approval by the Secretary of Commerce which are listed under 16 U.S.C. § 1455(d). Once approved, the state or territory will be eligible for federal grants as provided under 16 U.S.C. § 1455 and can review federal agency actions in coastal areas. These federal consistency determination reviews grant the power to states to object to federal activities that states believe are not consistent with state coastal management plans. [666] Management plans are subject to performance reviews by the Secretary of Commerce and a finding of failure to adhere to the management program may lead to suspension of financial assistance.[667]

In total, 35 states and territories are eligible to participate in this program. [668] In addition to the ability to object to federal actions that states deem inconsistent with their coastal management plans, the main attraction to participating is to receive federal grants "related to program administration (Section 306), coastal resource improvement (Section 306A), coastal and estuarine land conservation (Section 307A), coastal enhancement objectives (Section 309), technical assistance (Section 310), and

---

[658] Eva Lipiec, "Coastal Zone Management Act (CZMA): Overview and Issues for Congress," January 15, 2019, 1.
[659] Lipiec, 1.
[660] "Coastal Zone Management Act," accessed October 3, 2022, https://coast.noaa.gov/czm/act/.
[661] 16 U.S.C. § 1452(2).
[662] Lipiec, "Coastal Zone Management Act (CZMA): Overview and Issues for Congress," January 15, 2019, 2.
[663] Lipiec, 2.
[664] Lipiec, 2.
[665] 16 U.S.C. § 1453(16); 16 U.S.C. § 1454.
[666] Lipiec, "Coastal Zone Management Act (CZMA): Overview and Issues for Congress," January 15, 2019, 1.
[667] 16 U.S.C. § 1458.
[668] Lipiec, "Coastal Zone Management Act (CZMA): Overview and Issues for Congress," January 15, 2019, 2.

coastal nonpoint pollution control (Section 6217)."[669] Historically, NOAA has disbursed most of the CZMA funds under Sections 306 and 306A.[670]

The continued effectiveness of CZMA implementation is an important issue for Congress.[671] Several amendments have been proposed in the past including "additional grant programs related to offshore activities, such as renewable energy siting surveys (e.g., H.R. 1690, 111th Congress)," and "responses to oil spills and other disasters related to outer continental shelf energy activity (e.g., H.R. 3757, 112th Congress)."[672] Other issues that have been noted for implementation include performance measurement and use of collected performance data.[673]

Emerging Threats

In addition to existing laws and regulations, there are also new regulations and federal actions that have the potential to drastically alter the conservation landscape. In particular, efforts to massively increase offshore wind energy development as well as fishing gear restrictions and vessel speed limits to help protect right whales provide important context for future Canada/U.S. cooperation.

Offshore Wind Energy Development

Numerous proposals to construct wind farms along the east coast of the U.S. are pending: the Bureau of Ocean Energy Management (BOEM) has designated more than 3 million acres on the Outer Continental Shelf for wind-energy leasing and, along the Atlantic coast alone, there are 16 active leases in various stages of regulatory review. At the moment, however, only one, the Vineyard Wind 1 project, has received federal approval for construction (although two others are close to receiving approval). Numerous lawsuits challenging that approval were filed in the summer of 2021 and are currently pending in federal district court in Boston. The federal government is defending each suit, and the Vineyard Wind 1 project is intervening on the side of the government in at least each of the first three. *See, e.g., Allco Renewable Energy, Ltd. v. Haaland*, No. 1:21-cv-11171; *Nantucket Residents Against Turbines v. U.S. Bureau of Energy Management*, No. 1:21-cv-11390); *Seafreeze Shoreside v. U.S. Department of the Interior*, No. 1:21-cv-03276. Briefing in these cases is underway, with rulings expected next year.

The Biden Administration is convinced that offshore wind projects are vital to the climate change effort. It contends that these projects will reduce the use of fossil fuels significantly, thereby lowering the overall emissions of greenhouse gases. To that end, the most recent projections estimate that the energy generated by Vineyard Wind 1 would be sufficient to power more than 400,000 homes and reduce carbon emissions by more than 1.6 million metric tons annually. Moreover, local project proponents predict that Vineyard Wind 1 would create more than 3500 new jobs. The recently enacted Inflation Reduction Act of 2022 contains numerous provisions and significant funding that support additional offshore wind development.

[669] Lipiec, 4.
[670] Lipiec, 6.
[671] Lipiec, 12.
[672] Lipiec, 12.
[673] Lipiec, 12.

Given the political energy behind offshore wind, it is likely that numerous wind farms will be approved over the next several years. In the event these projects can survive legal challenges, the east coast of the United States will be festooned with hundreds, perhaps even thousands, of wind turbines by the year 2030. Construction and operation of these wind farms has the potential to adversely affect the North Atlantic right whale and other cetaceans, through a combination of increased vessel traffic (and attendant vessel strikes) and the introduction of anthropogenic sound into the ocean, and to adversely affect fish species through destruction of benthic habitat. Scientists have raised concerns about impacts to sea birds, as well.

Fishing Gear Restrictions

The federal government has been attempting to protect North Atlantic right whales from being entangled in fishing gear (lobster pots and lines) for many years. In August 2021, the National Marine Fisheries Service issued a rule that prohibited lobster fishing with vertical buoy lines (the most common form of lobster fishing) in a 967 square mile zone of the Atlantic Ocean roughly thirty nautical miles off the Maine coast (the "LMA 1 Restricted Area") between the months of October and January. The purpose of this seasonal closure was to protect right whales that NOAA Fisheries estimated could travel through that area during those months from possible entanglement in lobster gear. The lobster industry then unsuccessfully challenged that closure in court. *See District 4 Lodge of the International Association of Machinists v. Raimondo*, 40 F. 4th 36 (1st Cir. 2022). As a result, lobster fishing has been curtailed in the affected area.

In a separate case that is currently ongoing, a federal court in Washington, D.C. ruled in July of this year that the government violated both the Endangered Species Act and the Marine Mammal Protection Act by allowing lobster fishing in New England to proceed in the absence of careful restrictions on gear. *Center for Biological Diversity v. Raimondo*, 2022 WL 2643535 (D.D.C. 2022). The parties to that case have now filed their final papers with the court outlining their requests for an appropriate remedy. A ruling in that case could be issued before the end of this year; it is possible that the court will order further limitations on the lobster fishery in New England.

These continuing court battles over the nature and extent of lobster fishing in New England waters have the potential to reduce the amount of fishing gear that would otherwise entangle right whales and other cetaceans. Whether or not these reductions will be sufficient to put the right whale population back on the road to recovery remains to be seen.

Vessel Speed Limitations

In addition to gear entanglement, vessel strikes are a leading cause of mortality among right whales and other cetaceans. In recognition of this fact, the federal government published a proposed rule on August 1, 2022 that would require a wide range of vessels to reduce speeds along the east coast during specified times of year. 87 Federal Register 46921-46936.

At present, the government has placed a 10-knot (5.1 m/s) speed restriction for certain areas that are frequented by the right whale for vessels that exceed 65 feet (19.8 m) in length. *Inter alia*, the August 1, 2022 proposed rule expands the area covered by these speed restrictions and makes it applicable to smaller boats that had heretofore escaped speed restriction regulations.

With respect to the area covered by speed restrictions, the proposed rule would establish seasonal speed zones along much of the U.S. east coast, from Massachusetts southward to Florida. These zones would enforce the speed restrictions starting on November 1 and ending in April each year. As a result, if the rule goes into effect, the restrictions would be in place during nearly the entire time the right whales are migrating up and down the coast.

With respect to vessels covered by the speed restrictions, the rule would increase the number of affected vessels by imposing speed restrictions on vessels greater than 35 feet (10.7.m) in size (whereas the existing restrictions apply only to vessels greater than 65 feet (19.8 m) in size). This proposed rule is proving controversial. On one hand, environmental groups are generally pleased with the expansion in time and space of the seasonal speed zones, as well as with the proposed regulation of the smaller class size of vessels. On the other hand, industry groups, including recreational fishermen, are concerned about the proposal to regulate 35-foot vessels. The comment period on the rule has been extended, and it remains to be seen whether the final rule will be unchanged, or whether it will be made less comprehensive, in response to public input.

Emerging Technologies

Overlain on this tapestry of law and natural history are new technological advances which are dramatically improving our ability to learn about these marine animals. Here, we summarize new tracking techniques for understanding where animals are moving in the ocean, the use of satellites in understanding species habitats, models for where species occur, and the use of drones.

Radio Telemetry

Telemetry is the remote monitoring of animals.[674] Traditionally, this was done by attaching or implanting either a radio or acoustic transmitter to an animal and tracking it using a handheld receiver. The specific radio or acoustic frequency allows researchers to identify the individual that they are studying.

With new technology, the transmitters have grown smaller and more powerful, though the selection of a particular transmitter is dependent on the size of the species.[675] Receivers have also become more complex—fixed stations which automatically log detections have become increasingly common, allowing researchers to track when individual animals return to the same spot, whether that is a nest or an oil rig. These fixed stations also allow for more extensive coverage spatially and temporally, as they are not reliant on having technicians in the field monitoring equipment overnight.[676] By creating a network of fixed stations, researchers can track individuals across entire migratory pathways.[677]

---

[674] Kim Woriskey et al., "Current and Emerging Statistical Techniques for Aquatic Telemetry Data: A Guide to Analysing Spatially Discrete Animal Detections," *Methods in Ecology and Evolution* 10, no. 7 (2019): 935–48, https://doi.org/10.1111/2041-210X.13188.
[675] Whoriskey et al.
[676] Whoriskey et al.
[677] Philip Taylor et al., "The Motus Wildlife Tracking System: A Collaborative Research Network to Enhance the Understanding of Wildlife Movement," *Avian Conservation and Ecology* 12, no. 1 (March 28, 2017), https://doi.org/10.5751/ACE-00953-120108.

Detachable Satellite Tags (DTags) & Pop-Up Satellite Tags (PSAT)

Satellite tags are used to study animal behavior and migration.[678] The basic principle is that after they are attached to an animal, they collect environmental and movement data, float to the surface, and either emit a signal that allows researchers to recover the tag or transmit the data to satellites in the event that the tag is too far removed from the researchers to be recovered. The exact set of instruments used in these tags depends on research needs, but they can be equipped with hydrophones to record sound, movement sensors (similar to those in a smart phone) to record movement including speed, pitch, heading, roll, and depth, and other environmental sensors to record temperature, salinity, etc.[679] After researchers attach the tag to an animal, either using a suction cup or through a more invasive method, the tags will begin recording and then release at a preprogrammed time, ranging from minutes to months. After releasing, the tags can either be recovered and the data downloaded, or the tags can transmit the data to overhead satellites.[680] These tags can thus be used for studying minute by minute animal behavior or broader patterns of animal migration.

Remote Sensing

Broadly, remote sensing refers to a class of methods to gather information about a physical surface from a distance.[681] These methods range from using satellites to image entire continents, sonar used to map the ocean floor, and aircraft or drone-mounted systems to examine discrete areas in detail.[682] Satellite and other image based remote sensing is done by examining the spectral signature, or the unique combination of wavelengths, in each pixel of an image to calculate various different attributes. For example, given the unique spectral signature of plants that reflect near- infrared and absorb visible red light, we can classify different types of vegetation in an image.[683] Given that each individual pixel in an image can thus have an immense amount of information associated with it (e.g., the different frequencies of visible light that are being reflected from the pixel), researchers have begun to use automated methods for classifying the imagery. For example, a team led by Google recently developed a method to take satellite data where each cell is a 10m by 10m square and classify each cell by land use type in near-real time.[684]

---

[678] NOAA Fisheries, "Southern Resident Killer Whale Digital Acoustic Recording Tag Research," NOAA, July 18, 2022, West Coast, https://www.fisheries.noaa.gov/west-coast/science-data/southern-resident-killer-whale-digital-acoustic-recording-tag-research.
[679] NOAA Fisheries.
[680] Whoriskey et al., "Current and Emerging Statistical Techniques for Aquatic Telemetry Data"; Ocean Tracks, "Pop-up Satellite Archival Tags (PSATs)," The Library, accessed October 19, 2022, https://oceantracks.org/library/tags/pop-up-archival-satellite-tags; Marine Mammal Behavioral Laboratory, "DTAG: A Digital Acoustic Recording Tag," Woods Hole Oceanographic Institution, accessed October 7, 2022, https://www2.whoi.edu/site/marinemammalbehaviorlab/dtag/.
[681] U.S. Geological Survey, "What Is Remote Sensing and What Is It Used For?," Mapping, Remote Sensing, and Geospatial Data, accessed October 20, 2022, https://www.usgs.gov/faqs/what-remote-sensing-and-what-it-used.
[682] U.S. Geological Survey.
[683] Yichun Xie, Zongyao Sha, and Mei Yu, "Remote Sensing Imagery in Vegetation Mapping: A Review," *Journal of Plant Ecology* 1, no. 1 (March 1, 2008): 9–23, https://doi.org/10.1093/jpe/rtm005.
[684] Christopher F. Brown et al., "Dynamic World, Near Real-Time Global 10 m Land Use Land Cover Mapping," *Scientific Data* 9, no. 1 (June 9, 2022): 251, https://doi.org/10.1038/s41597-022-01307-4.

Though the method is typically used for environmental variables like temperature or chlorophyll count, remote sensing with high resolution imagery can allow for monitoring marine species.[685] For example, researchers have used high resolution satellite imagery available on Google Earth and machine learning methods to detect and count whales with good (though not perfect) success.[686]

Species Distribution Models

Species distribution models are statistical analyses that predict the habitat suitability of an area or the abundance of a species expected in an area over broad geographic ranges based on spatial data about the environment.[687] They are often necessary for implementing management plans as they predict species range and give insight into where species are found.[688]

The process begins by observing the target animal and finding what the environmental conditions are like in areas where the animal is observed (presence) and where they are not (absence). In so doing, researchers can compile data on whether a particular species likes hot or cold water, deep or shallow water, etc. Of course, these methods are not perfect. One of the chief difficulties is that fish, whales, and sharks move continually, complicating the question of whether the area surveyed is truly not habitat or if the animals are just elsewhere at the minute (or are hiding from the survey vessel). Having collected so-called presence-absence data (or just presence data since exhaustively surveying an area to determine whether a species is truly absent can be prohibitively expensive), researchers then can use a variety of statistical models. Here, we discuss three different models: the generalized linear model (GLM), the generalized additive model (GAM), and Maximum Entropy (MaxEnt). To discuss these models, we use a fictitious animal, a white whale named Wally, and his relationship to water temperature.

Generalized Linear Models

A generalized linear model (GLM) is the simplest of the three models. In such a model, the relationship between a particular environmental factor and the likelihood of either an animal being there or that the area is suitable for habitat is assumed to be a straight line. No matter what our data look like relating the probability of finding an animal and an environmental variable, a GLM will try its best to use a straight line to explain the relationship.

Though all models will use several environmental variables (e.g., salinity, temperature, depth, etc.), here we focus on temperature to illustrate this point. If we know that Wally tends to like cold water, a GLM assumes that the likelihood that we will encounter Wally changes linearly as water temperature changes. A GLM then combines all of the calculated relationships between

---

[685] Esteban N. Rodofili, Vincent Lecours, and Michelle LaRue, "Remote Sensing Techniques for Automated Marine Mammals Detection: A Review of Methods and Current Challenges," *PeerJ* 10 (June 20, 2022): e13540, https://doi.org/10.7717/peerj.13540.
[686] Emilio Guirado et al., "Whale Counting in Satellite and Aerial Images with Deep Learning," *Scientific Reports* 9, no. 1 (October 3, 2019): 14259, https://doi.org/10.1038/s41598-019-50795-9.
[687] Christine N. Meynard and James F. Quinn, "Predicting Species Distributions: A Critical Comparison of the Most Common Statistical Models Using Artificial Species," *Journal of Biogeography* 34, no. 8 (August 1, 2007): 1455–69, https://doi.org/10.1111/j.1365-2699.2007.01720.x.
[688] Sana Sharifian, Mohammad Seddiq Mortazavi, and Seyedeh Laili Mohebbi-Nozar, "Modeling Present Distribution Commercial Fish and Shrimps Using MaxEnt," *Wetlands* 42, no. 5 (April 29, 2022): 39, https://doi.org/10.1007/s13157-022-01554-6.

environmental variables and the likelihood of encountering Wally to tell us whether a particular location is likely to be habitat or not.

This assumption may work for a while, but if the actual relationship between the environmental variable and the likelihood of finding the species is not linear, the model begins to break down (See Fig. 2). For example, for Wally, we may find that Wally tends to like colder water but that Wally finds frozen water intolerable. Here, the assumption that we will always find Wally in cooler water breaks down.

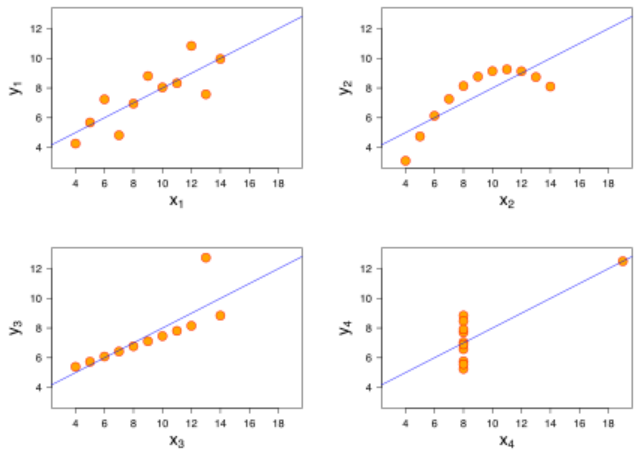

Figure 2: Graph showing linear models with different datasets (graph of Anscombe's Quartet from Wikipedia, based on Anscombe, Francis J. (1973) Graphs in statistical analysis. American Statistician, 27, 17-21) Image source: https://en.wikipedia.org/wiki/File:Anscombe%27s_quartet_3.svg)

Generalized Additive Models

Generalized additive models (GAM) allow for the addition of nonlinear features to a model. While GLMs assume that the relationship would always be linear, GAMs allow for nonlinear relationships.[689] Relationships in nature are rarely linear, which makes GAMs useful for explaining these complex mechanisms. Returning to Wally, a GAM would be able to capture Wally's tendency to dislike overly hot and overly cold waters, as the relationship between finding Wally and water temperature is not assumed to be linear, but can instead be a curved relationship (i.e., a quadratic function). Of course, this model combines multiple different environmental factors much like the GLM.

Maximum Entropy

Maximum Entropy (MaxEnt) is another form of species distribution model. This widely used and popular software applies machine learning to species distribution modeling.[690] MaxEnt is particularly useful for marine species as it is meant to be used with presence-only data, avoiding the need to

[689] Adam Shafi, "What Is a Generalised Additive Model?," Medium, May 18, 2021, https://towardsdatascience.com/generalised-additive-models-6dfbedf1350a.
[690] Steven J. Phillips et al., "Opening the Black Box: An Open-Source Release of Maxent," *Ecography* 40, no. 7 (2017): 887–93, https://doi.org/10.1111/ecog.03049.

collect data on whether a species is truly absent from a particular habitat.[691] MaxEnt operates similar to a GLM or a GAM in that it is trying to find a relationship between presences and environmental variables. However, while a GLM required the relationship to be a line and a GAM allowed the relationship to be a line or a curve, MaxEnt tests numerous different combinations of relationships until it finds a set of relationships that best describes the observed data.

For instance, while a GLM may predict that Wally likes ever colder water and a GAM may allow for the water to eventually be too cold, MaxEnt may find that between 60 and 40 °F, Wally tends to prefer colder water, that Wally is equally happy with water between 40 and 30 °F, and that Wally hates anything at 29 °F and cooler. At each different temperature interval, MaxEnt will attempt to select the best potential model to apply, whether that's a line, a curved line, etc. Instead of forcing a curve to fit all of those different relationships, it may piece together an assemblage of mathematical equations to describe this relationship.[692]

Ensemble Models

Species distribution models generally output a grid with the probability that a particular species will be found in a particular area at a particular time. An ensemble model is when we average outputs of multiple models to produce a combined prediction likelihood. For example, if we were predicting the probability that a particular 10km by 10km patch of the ocean held humpback whales, we might have three different predictions produced by a GLM, a GAM, and MaxEnt. If the GLM says that the probability of encountering the whale is 30%, the GAM says 60%, and MaxEnt says 70%, averaging the models would give us a 53% prediction. This 53% prediction is thus an ensemble result of the three input models.

Drones

Drones, often referred to as unmanned aerial vehicles (UAVs), have become an increasingly popular way to study marine species over the past decade. While studying marine species using UAVs has been underway since the mid-2000s, 2010 marked the boom in drone studies because decreased costs allowed them to become commercially accessible.[693] The benefits to using drones in place of other methods such as boat surveys is that they allow for quick surveys of an area at a distance closer to what is acceptable or possible by boat.[694] UAVs also add an aerial angle of data collection and can survey areas that were previously inaccessible.[695] The functionality of drones is not limited to pictures and video; advancements have been made to include thermal imaging and more.[696] The

---

[691] Jane Elith et al., "Novel Methods Improve Prediction of Species' Distributions from Occurrence Data," *Ecography* 29, no. 2 (2006): 129–51, https://doi.org/10.1111/j.2006.0906-7590.04596.x; Sharifian, Mortazavi, and Mohebbi-Nozar, "Modeling Present Distribution Commercial Fish and Shrimps Using MaxEnt."
[692] Jane Elith et al., "A Statistical Explanation of MaxEnt for Ecologists," *Diversity and Distributions* 17, no. 1 (2011): 43–57, https://doi.org/10.1111/j.1472-4642.2010.00725.x.
[693] Gail Schofield et al., "Drones for Research on Sea Turtles and Other Marine Vertebrates – A Review," *Biological Conservation* 238 (October 1, 2019): 108214, https://doi.org/10.1016/j.biocon.2019.108214.
[694] Ticiana Fettermann et al., "Drone Surveys Are More Accurate Than Boat-Based Surveys of Bottlenose Dolphins (Tursiops Truncatus)," *Drones* 6, no. 4 (April 2022): 82, https://doi.org/10.3390/drones6040082.
[695] Fettermann et al.
[696] NOAA Fisheries, "New Drone Technology Could Revolutionize Marine Mammal Monitoring," NOAA, February 22, 2022, Alaska, https://www.fisheries.noaa.gov/feature-story/new-drone-technology-could-revolutionize-marine-mammal-monitoring.

affordability of many of drone models allows for agencies and organizations to cut costs associated with manpower needed for surveys and the time and effort needed to complete them.[697]

[697] NOAA Fisheries.

Appendix 3

Workshop Agenda

Day 1.	Taking Stock of Canadian & US Responses
8:30 – 9:00 AM	**Breakfast** *(light continental breakfast)*
9:00 – 9:10 AM	**Opening Remarks:** • Michelle Nowlin, Co-Director, Duke Environmental Law and Policy Clinic, Duke University School of Law • Steve Roady, Senior Lecturing Fellow, Duke University School of Law and Professor of Practice, Marine Science and Conservation, Nicholas School of the Environment, Duke University • Jordan Diamond, President, Environmental Law Institute *(virtual)* • David VanderZwaag, Director, Marine & Environmental Law Institute, Dalhousie University
9:10 – 9:40 AM	**Keynote Address:** Vulnerability of Marine Species to Climate Change: Scientific Understandings and Limitations in a Cross-boundary Context • Aurore Maureaud, Postdoctoral Associate, Department of Ecology, Evolution & Natural Resources, Rutgers University
9:40 – 10:40 AM	**PANEL 1:** Managing Transboundary Species at Risk in the Face of Climate Change: Canadian and US Law and Policy Overviews
	Chair: David VanderZwaag, Director, Marine & Environmental Law Institute and Canada Research Chair in Ocean Law & Governance, Schulich School of Law, Dalhousie University **Comparing Canadian and US Species At Risk Laws and Policies** • Peter Ross, Legal Counsel, Department of Justice Canada • Kristen Monsell, Oceans Legal Director & Senior Attorney, Center for Biological Diversity **Understanding Canadian Marine Protected Area (MPA) Designation and Management and Other Eeffective Area-based Conservation Measures (OECMs)** • Hilary Ibey, Manager, Marine Conservation Operations, Fisheries and Oceans Canada (DFO)

	• Derek Fenton, Marine Planner, Fisheries and Oceans Canada (DFO) *(virtual)* **Understanding US Marine Protected Area (MPA) Designation and Management and Other Effective Area-based Conservation Measures (OECMs)** • Lauren Wenzel, Director, National Marine Protected Areas (MPA) Center, Office of National Marine Sanctuaries, National Oceanic and Atmospheric Administration (NOAA)
10:40 – 11:10 AM	Discussion
11:10 – 11:25 AM	Break
11:25 – 12:35 PM	**PANEL 2:** The Role and Achievements of Existing Transboundary Cooperative Mechanisms
	Chair: Michelle Nowlin, Co-Director, Duke Environmental Law and Policy Clinic, Duke University School of Law **Canada (DFO) and US (NOAA) Climate and Fisheries Science Collaboration to Improve Our Response to Impacts of Climate Change on Marine Ecosystems** • Vincent Saba, Northeast Fisheries Science Center, National Oceanic and Atmospheric Administration (NOAA) • Nancy Shackell, Senior Research Scientist, Ocean Ecology Section, Ocean and Ecosystem Sciences Division, Fisheries and Oceans Canada (DFO), Bedford Institute of Oceanography *(virtual)* **Ocean Tracking Network** • Fred Whoriskey, Executive Director, Ocean Tracking Network (OTN), Dalhousie University **Canada-US Species at Risk Working Group** • Katherine Hastings, A/Section Head, Marine Species Recovery, Fisheries and Oceans Canada (DFO), Maritimes Region *(virtual)* • Jean Higgins, Protected Species Conservation Branch Chief, NOAA Fisheries *(virtual)* **North American Marine Protected Areas Network (NAMPAN) and North American Commission for Environmental Cooperation**

	• Maria Morgado, Programme Management Officer, Ecosystems, UN Environment Programme (UNEP) • Chantal Vis, Senior Marine Ecosystem Specialist, Conservation Programs Branch, Protected Areas Establishment and Conservation Directorate, Parks Canada
12:35 – 1:05 PM	Discussion
1:05 – 1:35 PM	Lunch *(catered)*
1:35 – 2:45 PM	**PANEL 3:** Case Study of Efforts and Challenges in Recovering Transboundary Cetaceans (including North Atlantic Right Whale, Blue Whale, Fin Whale)
	Chair: Steve Roady, Senior Lecturing Fellow, Duke University School of Law and Professor of Practice, Marine Science and Conservation, Nicholas School of the Environment, Duke University **Canadian Scientific Overview** • Hilary Moors-Murphy, Research Scientist, Fisheries and Oceans Canada (DFO) **Canadian Management Overview** • Melissa Landry, Senior Officer, Marine Mammals, Fisheries and Resource Management, Fisheries and Oceans Canada (DFO) *(virtual)* **US Scientific Overview** • Danielle Cholewiak, Large Whale Program Lead, NOAA Fisheries, Northeast Fisheries Science Center, Protected Species Branch *(virtual)* **US Management Overview** • Caroline Good, Cetacean and Pinniped Conservation NOAA Fisheries, Office of Protected Resources **DFO and NOAA Collaboration in Fishing Gear Technologies** • Cathy Merriman, Senior Officer, Whales Team/National Programs/ Integrated Resource Management, Fisheries and Oceans Canada (DFO) *(virtual)*
2:45 – 3:15 PM	Discussion
3:15 – 3:30 PM	Break

3:30 – 4:30 PM	**PANEL 4:** Case Study of Efforts and Challenges in Recovering Transboundary Shark Species
	Chair: Boris Worm, Marine Ecologist, Biology Department, Dalhousie University **Canadian Scientific Overview** • Heather Bowlby, Research lead for Canadian Atlantic Shark Research Laboratory, Fisheries and Oceans Canada (DFO) **Canadian Management Overview** • Jessica Kerwin, Senior Fisheries and Aquaculture Management Officer, Fisheries and Oceans Canada (DFO) **US Scientific and Management Overview** • Guy DuBeck, Branch Chief (Acting), Office of Sustainable Fisheries, Highly Migratory Species Management Division, National Oceanic and Atmospheric Administration (NOAA) **NGO Perspective** • Sonja Fordham, President, Shark Advocates International
4:30 – 5:00 PM	Discussion

Day 2.	**Taking Stock (continued) and Enhancing Future Cooperation**
8:30 – 9:00 AM	**Breakfast** *(light continental breakfast)*
9:00 – 9:05 AM	Opening remarks. Overview of Day 1: *(Steering Committee Members)*
9:05 – 10:30 AM	**PANEL 5:** Charting International Law and Policy Coordinates
	Chair: Linda Malone, Visiting Scholar, Environmental Law Institute **International Responsibilities and Guidelines for Transboundary Marine Conservation (e.g., IUCN Guidelines for Conserving Connectivity Through Ecological Networks and Corridors (2020))** • Barbara Lausche, IUCN/WCEL Specialist Group, Chair of the IUCN/WCPA Marine Connectivity Working Group, and Director of Marine Policy at Mote Marine Laboratory *(virtual)* **Implications of the New BBNJ Agreement**

	• Cymie Payne, Chair, IUCN World Commission on Environmental Law's Specialist Group on Ocean Law **The Role of Regulatory Integration in Transboundary Marine Spatial Planning** • Sofia O'Connor, Staff Attorney and Acting Director of the Ocean Program, Environmental Law Institute *(virtual)* • Patience Whitten, Associate Director, Blue Growth Law and Governance Initiative, Ocean Program, Environmental Law Institute (ELI) **Potential Roles for UNEP and Possible Future Linkages Under The Convention on Migratory Species** • Melanie Virtue, Head of Aquatic Species Team, Convention of Migratory Species Group (CMS), UNEP *(virtual)* **Transboundary Movement of Great Shearwater Seabirds and Their Potential to Use as a Tool for Dynamic Ocean Management** • David Wiley, Marine Ecologist and Research Coordinator, Stellwagen Bank National Marine Sanctuary, National Oceanic and Atmospheric Administration (NOAA)
10:30 – 11:00 AM	Discussion
11:00 – 11:15 AM	Break
11:15 – 12:45 PM	**PANEL 6:** Enhancing Transboundary Marine Ecosystem Governance for Long-term Ocean Governance Integration: Lessons from Other Regions?
	Chair: Jonathan Choi, PhD student, Nicholas School of Environment, Duke University School of Law **UNEP's Regional Seas Programs and Marine Species at Risk Protection** • Olga Koubrak, PhD student, Marine & Environmental Law Institute, Schulich School of Law, Dalhousie University **The Incorporation of Climate Change into Marine Protected Area Planning: An International Comparison** • Derek Tittensor, Senior Marine Biodiversity Scientist, United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC) and Biology Department, Dalhousie University *(virtual)*

	• Boris Worm, Worm, Marine Ecologist, Biology Department, Dalhousie University **Towards the First High Seas Ecosystem Diagnostic Analysis - The Crucial Role of Migratory Species** • David Freestone, Executive Secretary, Sargasso Sea Commission **Indigenous Knowledge and Equitable Partnerships with Indigenous Peoples** • Carolina Behe, Cultural Resource Coordinator with the Office of National Marine Sanctuaries, National Oceanic and Atmospheric Administration (NOAA Federal) *(virtual)* **The Inter-American Sea Turtle Convention** • Verónica Cáceres, Executive Secretary, Inter-American Sea Turtle Convention (IAC) **Mobilizing Efforts for Improved Conservation and Management of Transboundary Marine Species at Risk: Sharks and Southern Resident Killer Whales in Changing Seas** • Meaghen McCord, Marine Management Advisor, Office of the Executive Director (BC/Yukon Region), Parks Canada
12:45 – 1:15 PM	Discussion
1:15 – 1:45 PM	Lunch *(catered)*
1:45 – 3:45 PM	**Breakout Groups:** Constraints and Options for Enhancing Transboundary Scientific, Management, and Regulatory Cooperation
3:45 – 4:00 PM	Break
4:00 – 4:45 PM	Breakout Group Reporting
4:45 – 5:00 PM	Workshop Takeaways & Closing Remarks *(Steering Committee Members)*