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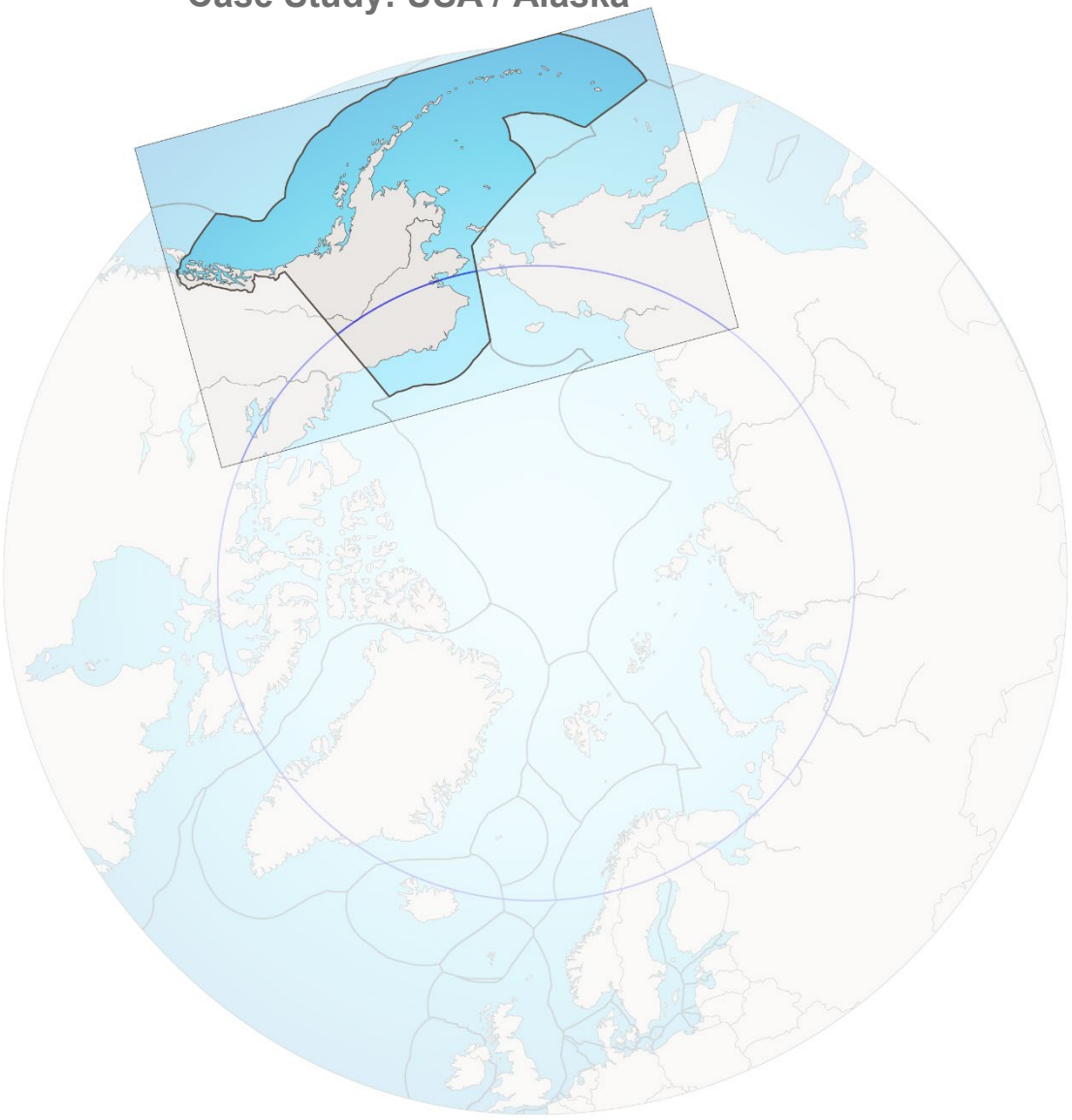
Marine Conservation in the Alaskan Arctic

Case Study: USA / Alaska



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Report

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Abstract

This report contains one of six case studies of the ArkMPA project, which includes five studies on marine policies in states bordering the Arctic Ocean and one overarching regional report.

The report provides an overview of the Alaskan Arctic marine environment in terms of: 1) the state and status of its ecosystems and their biodiversity; 2) the drivers and associated pressures that impact marine ecosystem health, as well as 3) the policies in place to protect the marine environment, in particular through marine protected areas.

Indigenous Peoples are heavily affected by both changes to the ecosystem and Alaskan marine policies. This case study provides some elements in the respective context, and offers a separate section with additional details.

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Executive summary

The Alaskan marine area of the Arctic under state management spreads across 91,000 square miles and hosts many hundreds of fish, bird and mammal species. The area is also home to around 10,000 residents, many of whom rely on the wildlife to support their livelihoods, as they operate as subsistence fishers in coastal marine waters of the Arctic area to harvest finfish such as the Chinook salmon (*Oncorhynchus*). In comparison to the U.S. mainland, and according to its authorities, Alaska's fish and wildlife populations can be considered as healthy, with only 20 species listed as endangered (Alaska Department of Fish and Game 2022). The federally designated Arctic National Wildlife Refuge covers 30 miles of Arctic Ocean coastline and provides a safe habitat for marine mammals such as polar bears that den along the coast.

The management regime depends on the distance of marine waters from the coastline: Waters within 3 miles of Alaska's coast are under jurisdiction of the Alaskan Department of National Resources' (DNR) Division of Mining, Land and Water. Waters beyond the 3-mile limit are managed by the National Oceanic and Atmospheric Administration (NOAA) on the federal level.

On paper, the Alaskan marine Arctic is under strict federal guidance for nature protection. However, it may see challenges to its richness of species in the future, due to several factors:

1) the government's ambition in its environmental and economic policies has shifted several times in the last years, and continues to allow access, for instance, to Arctic waters for drilling; and
2) climate change continues to rapidly impact the ecosystems in a number of ways, e.g. the decreasing extent of the sea ice. The emerging drivers of biodiversity loss in the Alaskan marine Arctic are offshore oil and gas development activities, pollution and contaminants in the region, and global warming. Each of these conservation concerns has associated transboundary, regional and international implications that pose significant threats to Arctic marine and coastal ecosystems in Alaska.

The ecological implications of the reduction in sea ice extent and duration on Arctic habitats are of great importance. Nine species of mammals were found as early as the 1980s to link strongly and positively with the occurrence of sea ice in western and northern Alaska: The Arctic fox; polar bear; beluga and bowhead whale; the walrus; and the bearded, ringed, spotted, and ribbon seal (Burns et al. 1980). Each of these nine species requires a specific type of sea ice for resting, molting, socialising, breeding, rearing, migration, and access to prey (ADFG 2015).

Historically, the transportation of oil associated with Arctic hydrocarbon development has been identified as the single largest source of oil pollution in the Arctic (Smith 2001). In recent years, Alaska's Arctic waters have additionally experienced a continuous increase in maritime traffic, more than doubling between 2008 and 2018 (USA Committee on the Marine Transportation System, 2019). There are significant challenges to responding to oil spills within the Arctic environment, and large research gaps and uncertainties (Wilkinson et al 2017). Contaminants remain toxic longer and are more difficult to clean up once trapped in ice. They also take longer to break down in the Arctic's colder temperature regime (ADFG 2015). An additional concern

is that fuel spills concentrate in open waters in between the surrounding sea ice (also called polynyas) and in breathing holes where animals surface and congregate (ADFG 2015). While state legislation provides comprehensive protection policy for the conservation of endangered species, ongoing and increasing climate impacts as well as shifting ambitions of the federal government can cut across environmental strategies.

1 Introduction

Global interest and a range of activities in the Arctic have increased greatly in recent decades. The Arctic is warming at three times the global average rate. These rapidly increasing temperatures are already profoundly changing – and will continue to change – the Arctic with yet unknown consequences for the people, environment, and economy in the region as well as worldwide (SDWG 2021).

The diminishing sea ice extent and the changing distribution of marine living resources have led to an increase in economic interest in the region, as well as concerns about the sustainability of economic activities in the Arctic (Raspotnik et al. 2021). The challenge now is to identify development pathways that can ensure the sustainable use and conservation of the Arctic marine environment (SDWG,2021).

Determining how to ensure both conservation and sustainable use of the Arctic marine environment requires a comprehensive understanding of the marine environment, the pressures affecting it, and relevant regulations.

Ecologic Institute and the Institute for Advanced Sustainability Studies aim to provide an overview of relevant information through a series of reports on marine conservation in the Arctic. The reports focus on the five Arctic coastal states: Canada, Denmark (by virtue of Greenland), Norway, the Russian Federation, and the United States. In addition, a regional report provides a broader overview and summarises relevant international and regional regulations. The reports were published in 2022 and are available for download on the websites of the Ecologic Institute and the Institute for Advanced Sustainability Studies.

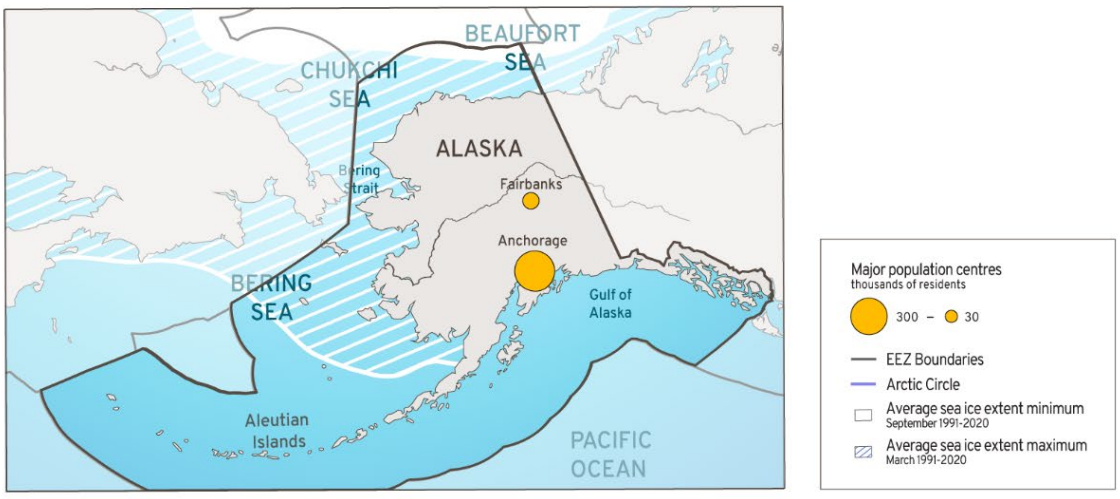


Figure 1: Map of Alaskan waters and sea ice minimum/maximum extent. IASS visualisation based on Flanders Marine Institute (2019), GRID-Arendal (2019),

This report presents an overview of information relevant to marine conservation in the Arctic waters along the Alaskan coastline that are under the jurisdiction of the United States of

America (USA). The report covers the following main issues: it gives a brief overview on key characteristics of the Alaskan Arctic marine environment (section 2). It then examines significant drivers and pressures impacting marine biodiversity in the region. It also provides an examination of the sociocultural and economic role, the environmental impact of the main sea-based human activities in the Alaskan Arctic, and the relevant US – and, in particular, Alaskan – ocean governance system (section 3). This includes a brief overview of the relevant national authorities and institutions as well as rules, regulations and tools which are, or could be, employed to protect Alaskan Arctic marine biodiversity and ensure its sustainable use. While relevant throughout the previous sections, the role of Indigenous Peoples in Arctic marine biodiversity conservation is additionally highlighted in section 4.

The data presented in this report was mainly collated during the global COVID-19 pandemic and prior to the 2022 Russian invasion of Ukraine. The (further) political and economic impacts of these events cannot be foreseen at this point in time and some of the developments and trends presented in this report may change substantially.

2 The Alaskan Arctic Marine Environment

2.1 Study Area

The Alaskan waters cover waters both north and south of the Arctic Circle. Defining the study area in the context of this case study requires balancing two aspects: The location of large marine ecosystems (LMEs) of relevance in the Arctic region, as well as the availability of blue economy data for Alaskan waters as a whole.

The National Oceanic and Atmospheric Administration (NOAA), for instance, identifies 32 ecologically distinct regions in Alaska, including five large marine ecosystems (NOAA 2022a) which are linked to geographical features marked in Figure 2 below: The Gulf of Alaska in the southeast, the Aleutian Islands in the central south, the Eastern Bering Sea in the center, the Bering-Chukchi Sea in the center north, and the Beaufort Sea in the northeast. In the context of its Alaska Marine Ecosystem Status Reports (NOAA 2022b), however, the administration only refers to the "Arctic" for one of the specific LMEs. It aligned its understanding (NOAA 2015) with the Arctic Council's boundaries for large marine ecosystems, which uses the term "Northern Bering-Chukchi Sea LME" for this region (PAME 2013).

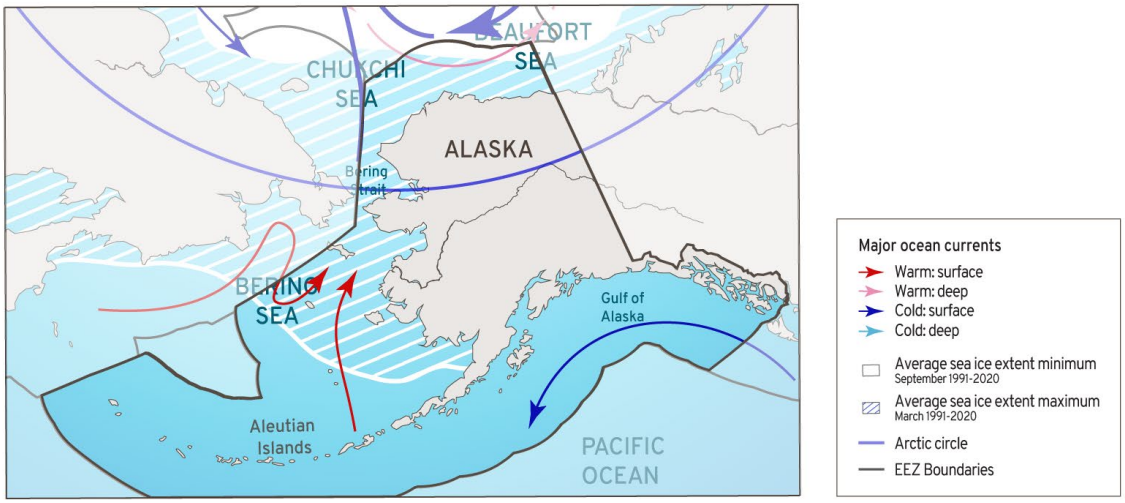


Figure 2: Main oceanic currents and Arctic sea ice extent with a focus on the exclusive economic zone off Alaska. IASS visualisation based on Copernicus Climate Change Service/ECMWF (2021a, 2021b), Flanders Marine Institute (2019), GRID-Arendal (2019), Hunt et al. (2016).

This is mirrored in the Alaskan definition of the Arctic Management Area (see Figure 3 below) which covers all marine waters in the U.S. exclusive economic zone of the Chukchi and Beaufort Seas from three nautical miles off the coast of Alaska to 200 nautical miles offshore, north of the Bering Strait (from Cape Prince of Wales to Cape Dezhneva),westward to the 1990 U.S. and Russia maritime boundary line and eastward to the U.S. and Canada maritime boundary (NPFMC 2009). The State of Alaska is responsible within the three nautical miles from the coast.

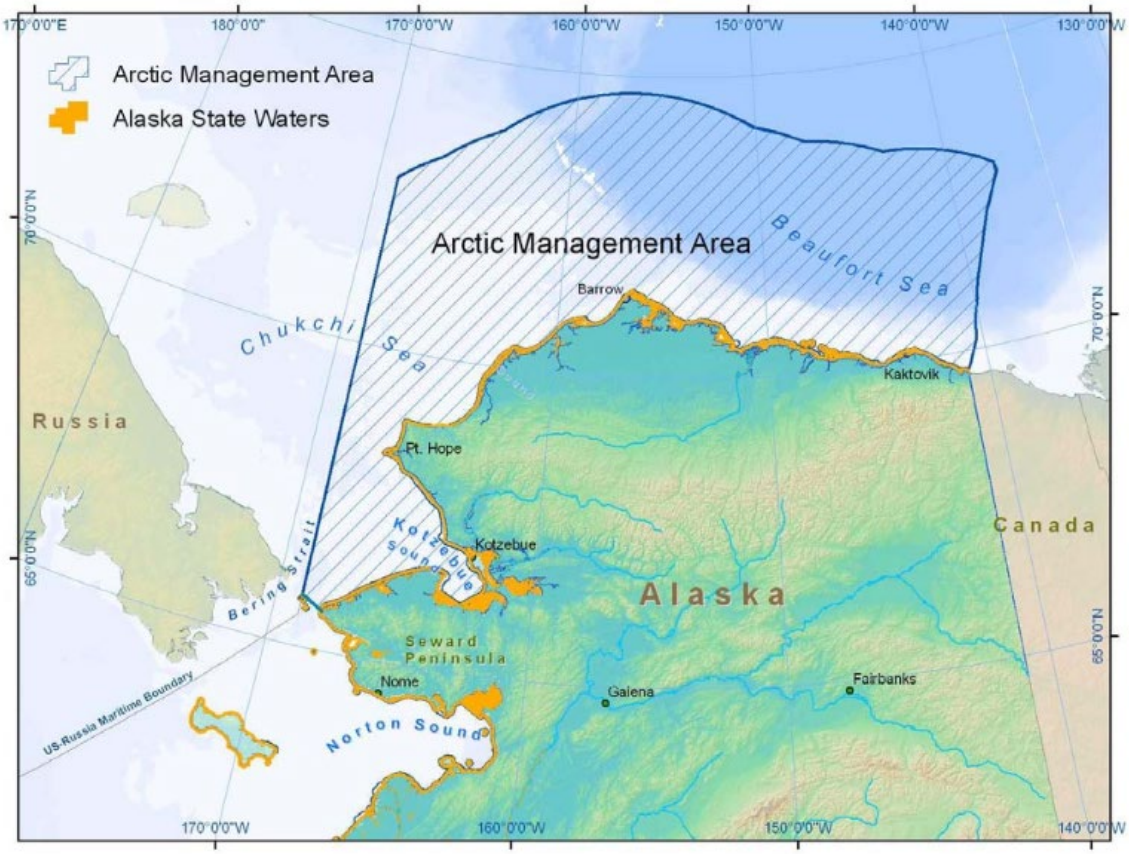


Figure 3: Arctic Management Area (NPFMC 2009).

To allow for a broader overview on the Alaskan marine environments (including sub-Arctic waters) and to put the available data on the sectors of the blue economy into context, we also include information on the other marine areas. The Alaskan Arctic waters are largely covered by sea ice for some portion of the year, and the seasonal presence and dynamics of sea ice has a strong influence on ecosystem structure and function (NOAA 2015; Figure 2). While the southern part of the northern Bering Sea is only covered by sea ice for a few weeks – or not at all in years of low ice coverage – the Chukchi and Beaufort seas are covered by sea ice for about 6 to 8 months of the year (NOAA 2015). Portions of the northern Chukchi and Beaufort seas can be covered by ice year-round. However, the Arctic sea ice cover has declined over recent decades, and some of the most pronounced declines of September sea ice extent have been observed in the Chukchi and Beaufort seas (Meier et al. 2007). Additionally, the maximum sea ice extent in the Bering Sea has been at record lows in 2018 and 2019, with less than half of the long-term mean (1980-2010) (NOAA 2019).

2.2 State of Alaska's Arctic Marine Environment

The eastern shelf of the Bering Sea has an exceptionally productive ecosystem, supporting large numbers of seabirds and marine mammals. It also provides subsistence harvests for Indigenous communities across Alaska, and, additionally, more than 40% of the annual U.S. commercial catch of fish and shellfish, exceeding $3 billion annually (NOAA 2015). However, rising sea temperatures and a growing interest in oil and gas exploration and development are likely to impact the fish, marine mammal and seabird diversity of the

Alaskan Arctic, as well as the traditional lifestyles and livelihoods connected to these species and their surrounding ecosystems (NOAA 2014).

2.2.1 Fish

Table 1: Comparative data and information on fish in the Alaskan marine waters. Sources in footnotes

Species richness	Abundance as indicated by primary productivity	Threatened species according to IUCN Red List	Main areas
48 species (ADFG 2022a)	341.62 mgCm-2day-1 (Sea Around Us 2016)	**9 species** 7 Least Concern 2 Data Deficient (IUCN 2021)	Bering, Beaufort and Chukchi Seas

Fish resources of the Alaskan Arctic have not been as thoroughly sampled as in other large marine ecosystems in Alaska (e.g. eastern Bering Sea, Gulf of Alaska, Aleutian Islands). However, the available data shows that, of the entirety of 66 groundfish stocks or stock complexes managed under federal fishery management plans off Alaska, none have been subjected to overfishing (NOAA 2015). Survey catches in the Alaskan Arctic show that fish sizes are generally small, and demersal fish biomass is low. Species composition is dominated by cod, flatfish, sculpin, and eelpout species (NOAA 2015). Indigenous Peoples reported die-offs of blue cod and tomcod, as well as salmon — likely due to lack of food — which were also reported to travel further north to spawn in colder water (NOAA 2015). Reports similar to these encounters of Indigenous Peoples have been made in Bering and Barents Sea fisheries, which have experienced a northerly shift in the distribution of Arctic fish species (NOAA 2019). Shifts are associated with changes in bottom water temperature and loss of sea ice (Thorson et al. 2019). Arctic cod has been consistently identified as the most abundant fish species of the Chukchi and Beaufort seas, occurring in benthic and pelagic habitats in ice-free waters (NOAA 2015). In terms of shellfish, only the Pribilof Islands blue king crab stock is overfished in the Alaskan Arctic at a biomass of less than 80% of BMSY (NOAA 2015).[1] The two biggest threats to the fish of the Alaskan Arctic are climate change and oil and gas development in the Beaufort Sea, which can affect the species' habitat and thus their entire lifecycle (Alaska Department of Fish and Game n.d.).

2.2.2 Marine mammals

Table 2: Comparative data and information on marine mammals of the Alaskan Arctic

Species richness	Threatened species according to IUCN Red List	Main areas
24 species (ADFG 2022a)	**6 species** 2 Vulnerable 4 Least Concern (IUCN 2021)	Coast and ice edge

Alaskan waters are home to fourteen whale species, one dolphin species, six seal species, the walrus, the sea lion, as well as the polar bear. The arctic fox does range on pack ice

[1] There is no directed fishing for the blue king crab of Pribilof Islands and the majority of blue king crab habitat is closed to bottom trawling. Since 2015, a new rebuilding plan for the blue king crab has been implemented, that also entails prohibition on directed cod pot fishing in the Pribilof Islands Habitat Conservation Zone.

but is not included here in the count of marine mammals. The six threatened mammal species that inhabit the Alaskan Arctic are: the beluga whale, the humpback whale, bowhead whale, polar bear, walrus, and arctic fox (IUCN 2020). The distribution of these mammals is subject to the annual dynamics of sea ice (NOAA 2015).

Walrus

The Walrus population of Alaska was estimated at 129,000 animals in 2004 by the U.S. Fish and Wildlife Services (species profile under ADFG 2022a). The species use the sea ice in the Bering Sea during winter to haul out, breed and whelp, and the decline in sea ice may alter its habitat and feeding opportunities (NOAA 2015). The future trend is, however, unknown (species profile under ADFG 2022a).

Polar bears

In 2015, the Southern Beaufort Sea population was estimated to be ~900 bears (Bromaghin et al. 2015) with the Alaska portion estimated at 565 animals (Bromaghin et al. 2021), while the size of the Bering/Chukchi seas population was recently estimated at almost 3000 polar bears, making this the largest subpopulation in the Arctic (Regehr et al. 2018). Polar bears use the ice as hunting grounds throughout the year (NOAA 2015). They also build maternity dens in the ice after giving birth to cubs, for example in the “Coastal Plain” of the Arctic National Wildlife Refuge (NOAA 2015). The species is listed as threatened under the Endangered Species Act, as the sea ice they depend on for food and shelter is declining, leading to reductions in length of hunting seasons. The southern Beaufort Sea subpopulation of polar bears is declining, while the status of the Bering/Chukchi sub-population is unknown (species profile under ADFG 2022a). The adoption of new legislation in 2016 opened parts of the habitat to oil and gas development, which can cause polar bears to be displaced from high-quality denning areas, while oil spills can reduce the insulation capacity of animals (NOAA 2015; species profile under ADFG 2022a). The future of oil and gas development is, however, still evolving (see section 3.1.3 below).

Whales

Whales of the Alaskan Arctic, such as the threatened belugas and bowhead whales, spend the winter along the ice edge in the northern Bering Sea. In the spring, they follow regularly recurring leads and fractures in the ice that roughly follow the Alaska coast during migration toward their summering grounds in the Beaufort Sea (NOAA 2015). The Bristol Bay and eastern Beaufort Sea populations of the beluga whale are stable or increasing, while too little data exists on the Chukchi Sea and Bering Sea populations to make a trend analysis (species profile under ADFG 2022a). Threats to the species include hunting, interaction with fisheries, stranding, entrapment in sea ice, predation (by orcas and polar bears), underwater noise pollution, contaminants, and climate change (species profile under ADFG 2022a). The low reproductive rate of the beluga can cause instant negative effects on the population when disturbed (species profile under ADFG 2022a). The bowhead whales are an important subsistence species for Alaskan northern coastal villages, as they spend their entire lives near the sea ice of the Bering, Chukchi and Beaufort Seas (Quakenbush 2008). Bowhead whale stocks are listed as ‘endangered’ under the Endangered Species Act and as ‘depleted’ under the Marine Mammal Protection Act, but the Bering Sea stock is recovering and has been increasing at about 3% per year (Quakenbush 2008), with a current population estimate of about 17,000 whales (Givens et al. 2015). The Alaska Eskimo Whaling Commission (AEWC) and the National Marine Fisheries Service have

managed the species cooperatively since 1981, and, together with International Whaling Commission, have established a harvest quota that allows for limited aboriginal subsistence whaling (Quakenbush 2008).

2.2.3 Seabirds

Table 3: Comparative data and information on seabirds in Alaska

Species richness	Threatened seabird species according to IUCN Red List Status	Key sites (monitored colonies) for seabird
41 (FWS n.d.)	**1 vulnerable** (IUCN 2021)	Along the coastline and ice-edge

Of about 470 species of birds found in Alaska, most are migratory birds (see Fish and Wildlife Service FWS n.d.). Seabirds arrive to Alaska's extensive coastline (about 74,000 km, including about 16,000 km along National Wildlife Refuges) in numbers of tens of millions each summer (FWS n.d.). A total of 41 breeding seabird species have been counted in Alaska (CAFF 2015). In addition to the coastline made up of protected habitats of cliffs and islands, seabirds also concentrate near the ice-edge to prey on ice-associated invertebrates and Arctic cod (FWS n.d.; NOAA 2015). Threats to the bird species include oil pollution, predation, fishing (bycatch) and plastic trash. The occurrence of seabird bycatch in Alaska is considered relatively low given the level of commercial fishing effort off Alaska each year, with an annual average of 0.019 birds per 1,000 hooks from 2002 through 2015 (Melvin et al. 2019), and compared to other oceans, but is still high enough to be concerning (Melvin et al. 2019; Krieger et al. 2019). Seabird bycatch is associated with similar fisheries operations in Southern waters. The albatross is the focal seabird species group for conservation efforts in terms of bycatch, as the short-tailed albatross is listed as endangered under the U.S. Endangered Species Act and the laysan and black-footed albatross are listed as birds of conservation concern by the USFWS (Krieger et al. 2019).

A status update on the State of the Arctic Marine Biodiversity Report by the Arctic Council's circumpolar seabird expert group (CBird) included data from 2016-2019 on eight key circumpolar species (CAFF 2021): In the "Pacific Arctic" marine area, for instance, which covers the greater part of Alaska's coastline on the Arctic Ocean, the update showed deteriorating trends for two species (now "stable" instead of "increasing"). For three species, data availability decreased for parts of the region; for two species, it improved.

The "2020 Alaska Seabird Die-off Update", published by the FWS, reports that in May 2020, dead and dying seabirds from the Bering Strait Region, including the species puffins, murres, shearwaters, kittiwakes and auklets, were found (FWS 2020). While the number of deaths was not substantial (320 carcasses reported in 2020), this was still concerning, especially to local communities (FWS 2020). The cause of death was associated with a non-petroleum oil (vegetable, fish, or cooking oil) which was found in the birds' esophagus and lungs, as well as on their feathers (FWS 2020). Die-off events have occurred every year since 2017 in the northern Bering and southern Chukchi Seas and are unusual due to the number and variety of dead birds, the broad geographic area affected, and the duration of the series of events over a summer (FWS 2020). The reason is still unknown, but the carcasses are analysed for harmful algal bloom toxins (FWS 2020). An Indigenous perspective contributing to the NOAA Arctic Report Card of 2019 (NOAA 2019) found: "We

have regularly observed die-offs during at least the last five summers" (Druckenmiller et al. 2019).

3 Drivers and pressures

3.1 Introduction and overview

The above overview already shows examples of how certain species are substantially affected by both climate change impacts and human activities. Human activities (such as shipping and fishing) are key *drivers* of change in Arctic environments, impacting Arctic ecosystems by placing *pressures* on flora and fauna (for example, through noise pollution from boats or damage to the seafloor from dredging). In this section, we evaluate the status and trends of key existing and emerging economic sectors driving marine biodiversity loss in Alaskan waters, and identify the pressures that they exert on Alaskan Arctic ecosystems. We list the sectors in accordance with their contribution to the US GDP, but also focus our description of the sectors on the Alaskan Arctic, using quantitative and qualitative data at the Alaskan Arctic scale to complement national data. In this section, we also identify sector-specific regulations that aim to limit sectoral impacts on the Alaskan Arctic environment.

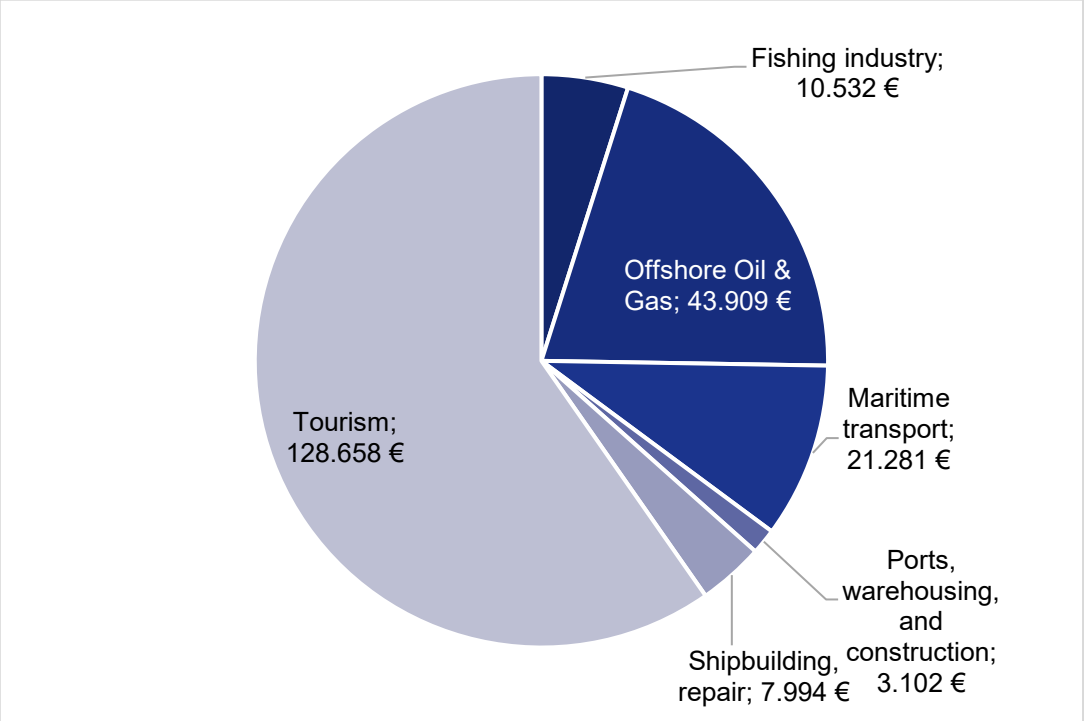


Figure 4: USA Blue Economy Sectors, Gross Value Added 2018 (€ million)

The US Blue Economy is dominated by tourism income, which brought in 128 billion Euros in gross value added (GVA) in 2018. Second in importance is the offshore oil and gas sector (numbers presented here also include other minerals and aggregates, such as gravel); this sector is approximately a third as important as the tourism sector. While not as considerable, maritime transport and the fishing industry are also significant contributors to the American economy. These data are not available at the state level. Below, we draw on

available state data to characterise the different key sectors for the state of Alaska, and – as available – in its Arctic waters.

3.1.1 Fishing (Extraction of species and associated industry)

Overview of the activity, socioeconomic importance and trends

The fishing sector affects Arctic ecosystems through its extraction of fish, as well as through secondary impacts such as habitat damage from dredging, bycatch, and noise pollution. Alaska is central to the American fishing industry, as it is responsible for more than half of the total US catch.

In 2018, the Alaska fishing and fish processing sector employed the equivalent of 37,700 full-time jobs and generated 5.6 billion dollar in direct income for the sector (McDowell Group 2020a). Employment and GVA fluctuate from year to year, with, for instance, 2016 value added and employment being 9% lower than five years prior. Fish farming is illegal in Alaskan waters but farming of shellfish and aquatic plants is an expanding activity (AlaskaNor 2020).

Table 4: Quick facts on fishing and aquaculture activities in the USA (and – where data available – Alaska)

% of GVA	Capture in tonnes (2018)	Main areas
USA: 0.06%	**USA** catch: 4 744 418 Aquaculture: 466 122 (FAO 2021) **Alaska** catch (2016): 2,700,000t AlaskaNor (2020)	**Alaska**: Majority of fishing occurs in Bering Sea/Aleutian Islands region, and further south, south-east. **Arctic**: West coast of region.

Alaska's fishing industry predominantly focuses on two species: Alaskan salmon and Alaskan pollock. Together, these account for about 68% of catch value generated by the Alaskan fishing industry (in 2017-2018). These are supplemented by high-value species such as halibut, black cod, and crab, which, despite accounting for only 2% of catch by weight, contribute almost 21% of catch value (McDowell Group 2020a).

The share of Alaskan fishing industry activity that takes place in the "Arctic-Yukon-Kuskokwim" region covering the Eastern Bering, Chukchi and Beaufort Sea is relatively small: 0.7% of fishing catch value and 0.5% of harvesting value occurs in this region, generating 1000 full-time equivalent jobs – 800 of which are processing and secondary jobs – and 32 million dollar of labour income in the region (McDowell Group 2020a). Salmon are the most important catch, predominantly caught with set nets or fish wheels. King crab are another valuable catch; they are caught with crab pots. As shown by Figure 5, most of the fishing activity happens south of the Arctic Circle, though coastal and near coastal fishing is present throughout the Alaskan Arctic region.

Indigenous communities play an important role in Arctic fishing. There are three non-profit Indigenous Community Development Quota groups in the Arctic region, each of which are allocated 10% of catch quotas. These community development groups also own seafood processing plants (McDowell Group 2020a).

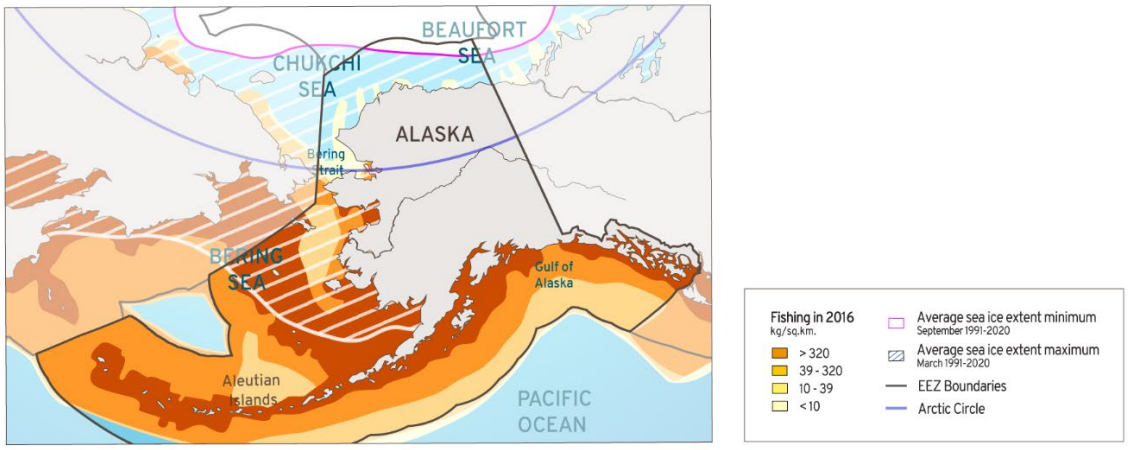


Figure 5: Fishing effort in the US Arctic waters. IASS visualisation based on CopernicUSA Climate Change Service/ECMWF (2021a, 2021b), Flanders Marine Institute (2019), GRID-Arendal (2019), Pauly et al. (2020).

Sector growth (Alaska): Alaskan fish catches and corresponding values fluctuate from year to year in line with fish stocks and external macro-economic trends. Figure 6 shows recent trends in catch volume and value. Lower fish prices in recent years (especially for salmon) mean that despite robust catches, value was low until 2016. This matches data at the US scale: fish capture across the whole of the USA has fluctuated but remained at a similar level since 2011 (FAO 2019). In 2018 and 2019, catches were stable, but declined substantially in 2020 due to the COVID-19 pandemic and its main impacts: lower participation of fishermen, declining revenues and rising costs for businesses (McKinley Research 2022).

Related pressures

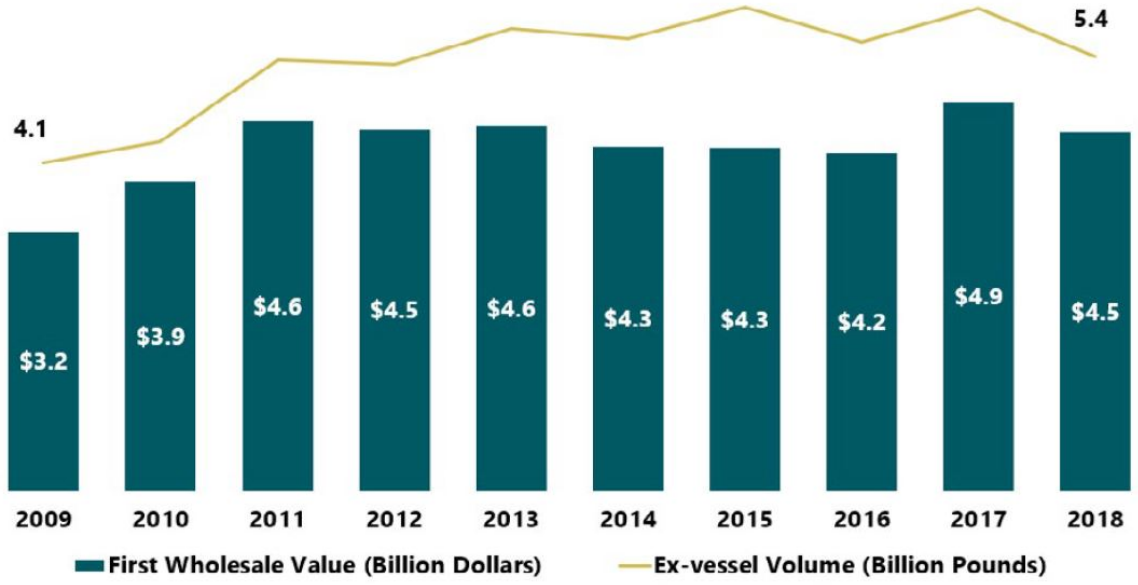


Figure 6: Fish catch and value of Alaskan fishing sector, 2009-2018 (McDowell Group 2020a)

- **Extraction of species:** While extraction of species is significant, no stocks were found to be overfished or approaching overfished status in the Bering Sea, Aleutian Islands, and the North Alaska region in 2019 (Siddon and Zador 2019).
- **Bycatch**: Seabird bycatch is a problem, but has decreased since 2017 (Siddon and Zador 2019). Bycatch of non-target fish and marine mammals is an additional pressure.

The regional case study of the ArkMPA project provides additional perspective on the impacts of these pressures in the Arctic (Wienrich & Lukyanova 2022).

Regulations – Fisheries

In the US, the "Magnuson-Stevens Fishery Conservation and Management Act" (MSA), adopted in 1976, encompasses the main legal provisions applicable to fishing in federal waters. The Act has been revised several times over the years, most recently in 2007 (NOAA, MSA). The Act fosters, in addition to food security and social and economic development, the prevention of overfishing and rebuilding of overfished stocks (NOAA n.d.). Eight regional fishery management councils were established under the Act to manage fisheries and conservation measures in their region in waters within the 200-mile Exclusive Economic Zone (EEZ). The objectives defined in the Act are implemented through fishery management plans (FMPs) (NOAA MSA).

Two important amendments to the act were enacted through the Sustainable Fisheries Act (1996) and the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act (2006) (NOAA, MSA):

- The objectives of the Sustainable Fisheries Act added the (consideration of) habitat as a key component for fisheries management, set standards for fishery management plans and measurable criteria to evaluate the stock status and standards to address fishing vessel safety, fishing communities and bycatch (NOAA, MSA).
- The MSA Reauthorization Act sets annual catch limits and accountability measures, promotes market-based management strategies, and aims to strengthen the role of science, (e.g. by peer-reviewing by the scientific and statistical committees, and the Marine Recreational Information Program) as well as the international cooperation in regard to addressing illegal, unregulated, and unreported fishing and bycatch (NOAA, MSA).

Fisheries in the USA are generally moving towards an ecosystem approach to sustainable fisheries (Lauren et al. 2013). The mandate lies with various authorities, councils, bodies, and international organisations that are responsible for and collaborate in the management of fishery resources, depending on whether the fishery is conducted in federal or state waters:

- NOAA holds the authority to manage fisheries in federal waters, cooperating with the regional fisheries management councils that were established under the MSA (Wenzel et al. 2013) and which develop the FMPs. In Alaska, the North Pacific Fishery Management Council (NPFMC) is the responsible body, whereas the Regional Office of NOAAs Fisheries approves and implements those measures (NOAA n.d.). The management plans must comply with the federal legal framework and National Standard Guidelines, which are mandated under the MSA (NOAA, MSA).

- Fisheries in coastal waters are regulated by Alaska Statutes. The authority to develop and conserve fishery resources and state waters lies with the Alaska Board of Fisheries (AS 16.05.221): *"This involves setting seasons, bag limits, methods and means for the state's subsistence, commercial, sport, guided sport, and personal use fisheries, and it also involves setting policy and direction for the management of the state's fishery resources."* (ADFG n.d.). The Alaska Department of Fish and Game is responsible for issuing fishing licenses in state waters (ADFG n.d.). The enforcement of Alaska's fishery and wildlife legislation lies with the Department of Public Safety, through its Division of Alaska Wildlife Troopers (Alaska Department of Public Safety Alaska Wildlife Troopers n.d.). For the delimitation of the Arctic Management Area, see also Figure 3 in the introduction to the study area above (section 2.1).

Alaska's fisheries management has had some success, with most stocks in Alaskan waters considered to be managed sustainably and in a good state (World Ocean Review 2013). The FAO identifies that there are only two overfished stocks in the Alaska Region, Bering Sea snow crab and Pribilof Islands Blue king crab (FAO 2019). In many cases, "Total Allowable Catches" (TACs) and "Individual Transferable Quotas" (ITQs) have been set in accordance with the maximum sustainable yield (MSY) principle, which aims to ensure that harvest does not exceed the replenishing rate of the fish stock (World Ocean Review 2013). Management practices also involve delineating areas closed to fishing (FAO 2019). Another management practice is limiting the time for fishing activities. It employed, is for instance, in Sitka Sound in the Gulf of Alaska where the herring fishery was regulated by limiting fishing activity to a few hours a year (Word Ocean Review 2013). In 2019 and 2020, no annual herring fishery occurred, but it opened for 15 days in 2022 (ADFG 2022b).

An example for a fishery closure can be found in the Arctic Management Area (see Figure 3 above): Following an ecosystem-based management (policy) approach, the responsible fisheries management council, NPFMC, approved the Arctic Management Plan for Fish Resources of the Arctic Management Area (Arctic FMP) regulating commercial fisheries in 2009 (NPFMC 2009), which has since been amended twice. The plan includes the management of all commercially used fish stocks (e.g. finfish and shellfish) except Pacific salmon and Pacific halibut, which are governed through other authorities. The Arctic FMP provides for a closure of the U.S. federal fisheries within the Arctic Management Area for any species of finfish, molluscs, crustaceans, and all other forms of marine animal and plant life (NPFMC 2021). The decision of the council was based on the developments in the rapidly changing Arctic environment, a lack of scientific data on (governance of) fisheries in this region and potential risks of the impact of fishing for the subsistence way of life for Indigenous Peoples and coastal communities in the far North (Hull et al. 2015). The process followed the drastic loss of sea ice in the Chukchi Sea and Arctic Ocean (Hull et al. 2015). However, the commercial harvest of birds and marine mammals is still legal in this area as it is not regulated by the Arctic FMP (NPFMC 2021). Another fishery closure took place in 2019 when the NPFMC closed a portion of federal waters in Cook Inlet to commercial salmon fishing (Pacer 2019).

3.1.2 Aquaculture

Overview of the activity, socioeconomic importance, and trends

Aquaculture is currently at a low level in Alaska. In part, this is due to a ban on fish farming in Alaskan waters. However, mariculture (i.e. the cultivation of marine plants) is predicted to have a bright future, with ambitions to grow it from its current revenue of less than $1

million to a 1000-fold increase within 30 years (AlaskaNor 2020). There is also already aquaculture production of oysters, production of which doubled between 2012-2018 up to $1.4 million of value (Pring-Ham 2020). Aquatic farms are mainly located along the vast coastline of the southeast and south-central regions of Alaska and increase economic opportunities for coastal communities (ADFG 2021a). Main aquatic farm products include pacific oysters, littleneck clams, mussels, and aquatic plants such as kelp (ADFG 2021a).

A Mariculture Task Force, formed in 2016, laid out a comprehensive *Mariculture Development Plan* to accelerate the development of aquaculture to grow towards a $100 million industry over the next 20 years (Alaska Mariculture Task Force 2018).

Regulations - Aquaculture

Alaska has a relatively young aquatic farming industry (ADFG, 2021a). Currently, all projects concerning aquaculture are located in state waters (NOAA, n.d.). Therefore, the authority lies with (the commissioner of) the Alaska Department of Fish and Game (ADFG), mandated by the Aquatic Farm Act (AFA). Permits are issued by the ADFG; the Alaska Aquaculture Permitting Portal provides additional information on the permitting process (Alaska Aquaculture Interagency Working Group, 2021). Finfish farming has been prohibited in Alaska by the 16.40.210 Alaskan Statute.

Due to the support of the Alaska Regional Office and Pacific States Marine Fisheries Commission, a first NOAA Fisheries Alaska Mariculture Workshop took place in January 2020. Various stakeholders were brought together to discuss emerging issues. During the workshop, they identified three main needs, which were to increase research (inter alia with a Mariculture Research Center), improve and adjust policy/permitting, and improve access to capital (NOAA n.d.). A follow-up three-day conference organised by the University of Alaska discussing these topics took place in April 2022 (University of Alaska 2022).

3.1.3 Offshore Oil & Gas

Overview of the activity, socioeconomic importance, and trends

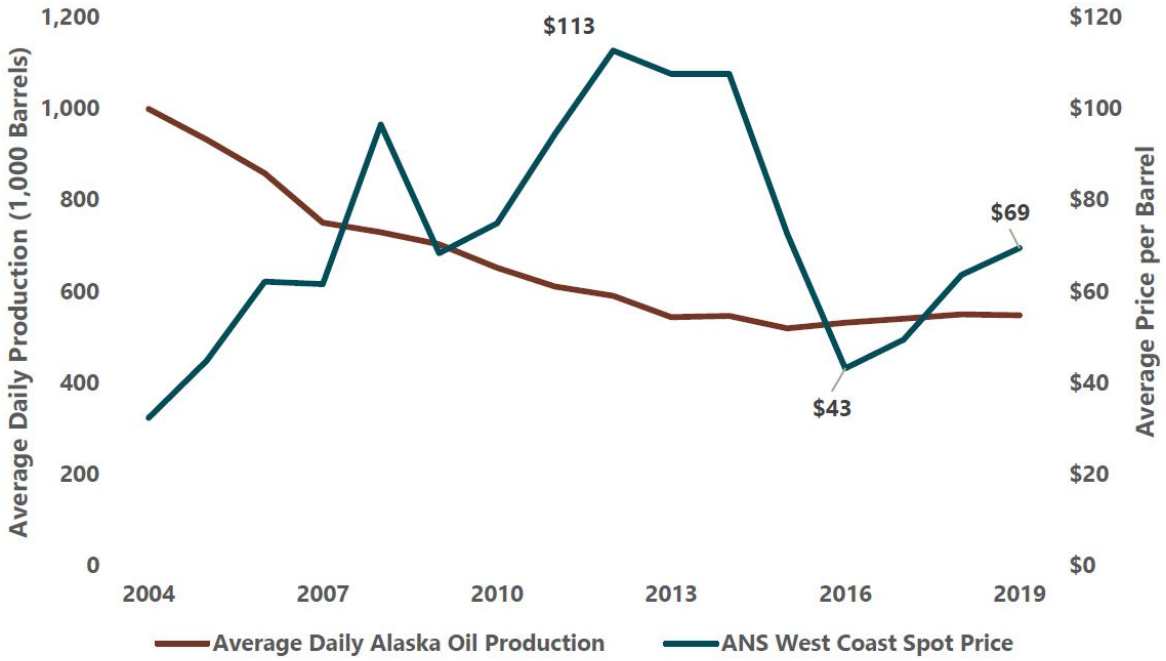
Oil and gas exploration and extraction affects the marine environment by creating the risk of massive oil leaks, as well as through noise, light and hydrocarbon pollution from drilling, and habitat disturbance. The oil and gas industry is the largest single-sector employer in Alaska. Direct and indirect employment in this sector, including on- and offshore, amounted to 9,930 workers in 2018 (McDowell Group 2020b). However, most of the oil production in Alaska occurs onshore (particularly on the North Slope), with limited offshore production in the Cook Inlet (South of Anchorage) and two small offshore oil sites in the Beaufort Sea (Northeast of Prudhoe Bay) (AlaskaNor 2020).

Table 5: Quick facts about oil and gas activities in Alaska

% of GDP	% of total employment	Oil production volume	Oil wells for development (D) and exploration	Main areas for production (P) and exploration (E)
USA, Offshore: 0.24% of GVA (Bureau of Economic Accounts, 2020)	**Alaska: On- and Offshore**: 2,16% (9,330 direct and indirect jobs out of 459,178 total in 2018) (McDowell Group 2020)	**Alaska Crude Oil (total):** About 173,5 million barrels/year (1/2021 to 1/2022) (averaging about 475,500 barrels a day) (Alaska Oil and Gas Conservation Commission Data Miner 2022)	**Alaska offshore**: 1342 in total (incl. service wells, abandoned wells) Development/Completion: 472 Exploratory/Completion: 2 (Alaska Oil and Gas Conservation Commission Data Miner 2022)	E: Exploration offshore of North Slope. P: Cook Inlet (16 platforms); P: Beaufort Sea (two islands: a main production island, MPI, and a satellite drilling island, SDI) (Bureau of Ocean Energy Management 2021)

Alaska: Production of the oil and gas industry in Alaska has decreased considerably since peaks in the 1980s. As shown by Figure 7, this fall in production has continued since 2000 (McDowell Group 2020b). The contribution of Alaska to the overall US oil production has gone down substantially from its peak (24.8%) in 1988 to only 4.4% in 2018 (McDowell Group 2020b).

Figure 14. Alaska Crude Oil Production* and Alaska North Slope Oil Price, SFY2004-SFY2019



* Include Cook Inlet and North Slope production, SFY2019 production is forecasted.
Source: Alaska Department of Revenue.

Figure 7: Alaskan crude oil production and prices 2004-2019 (Data source for the production: Alaska Department of Revenue, graphics: McDowell Group 2020b)

Arctic region: The North Slope region, which is the northernmost borough of Alaska and entirely situated in the Arctic, is also an oil-rich region. Oil is predominantly drilled on land and then transported across the Trans-Alaska Pipeline System. The two oil basins in the

Alaskan Arctic, the Beaufort Sea and Chukchi Sea have been estimated to hold a total of more than 23 billion barrels of oil (notwithstanding actual sampling and very difficult production conditions); this would be an enormous amount of oil, with the Beaufort Sea's estimated 15 billion barrels second only to the Gulf of Mexico within the USA in terms of expected deposits (Brigham 2015). The Alaskan government has auctioned off exploration leases to a number of oil majors. In 2020, Shell announced plans for seismic testing and exploratory drilling in West Harrison, just off the Alaskan coast in the Beaufort Sea (High North News 2020). This followed efforts by Shell to drill in the Chukchi Sea between 2012 and 2015, which were unsuccessful due to local conditions as well as regulatory and legal challenges (High North News 2020). Generally, challenging conditions for offshore drilling and associated high costs, as well as environmental concerns, mean that growth is likely to be limited in the coming decade (AlaskaNor 2020).

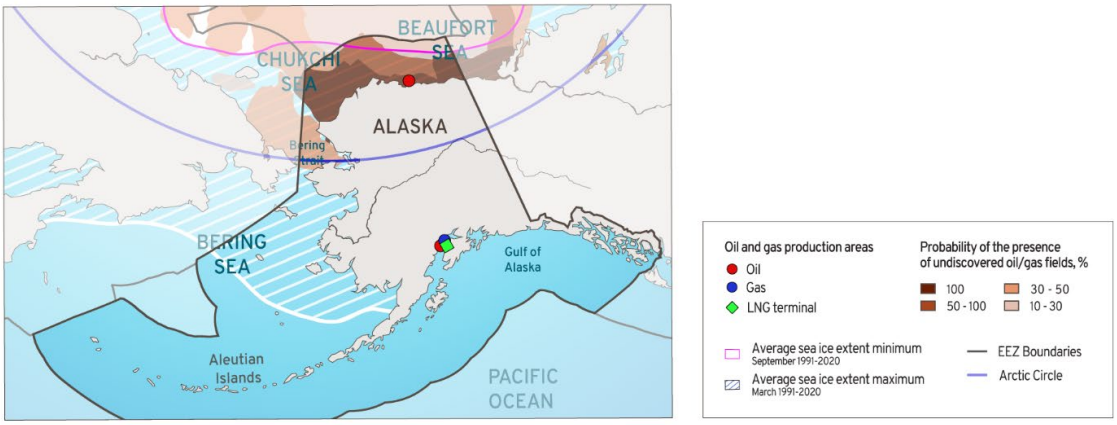


Figure 8: Current oil production areas in the US Arctic waters and probability of the presence of at least one undiscovered oil and/or gas field with recoverable resources greater than 50 million barrels of oil equivalent according to USGS 2009 survey results. IASS visualisation based on Copernicus Climate Change Service/ECMWF (2021a, 2021b), Flanders Marine Institute (2019), GRID-Arendal (2019), Department of Natural Resources, Division of Oil and Gas (2013).

Policy changes on Arctic oil production due to changing US administrations

Offshore drilling in Alaskan waters has become an area of contradicting approaches by different US administrations. In particular, the opening of the "Coastal Plain" has been subject to controversial discussions. In 2020, the Trump administration announced to open up the Arctic National Wildlife Refuge (ANWR) to oil exploration (Reuters 2020). The initiative was based on the Coastal Plain Oil and Gas Leasing Program and the first auctions were held in the beginning of January 2021 (CRS 2021).

The new administration under President Biden halted activities in the Refuge by putting in place a temporary moratorium with an executive order when he entered office (Melody and Rosen 2021). The executive order stated that due to the alleged legal deficiencies of the Coastal Plain Oil and Gas Leasing Program, in particular an inadequate environmental review, the Ministry of the Interior would be obliged to initiate a new comprehensive review. In June 2020, the Biden Administration suspended oil and gas leases (Federman 2021). A new environmental analysis could potentially impose further restrictions on the leasing programme or cancel the leasing program altogether (Federman 2021).

However, a federal judge in Louisiana preliminary blocked the halt of the leasing programme, claiming the Biden administration overstepped its competencies. Accordingly, the authority would instead lie with congress (Davenport 2021). In July 2022, the Interior Department proposed a new offshore leasing program with new sales between 2023 and 2028, including one in Alaska's Cook Inlet (Department of the Interior 2022) that had been cancelled under the previous programme in May 2022.

Pressures

The most significant risk that drilling poses is an uncontrolled oil leak, which would have significant impacts on sea life, including marine mammals and birds. Drilling and exploration also generate (impulsive) noise pollution, and physically disturb the seabed. The associated need to transport goods and fuel to and from drilling and production sites also impacts marine environments in a similar way, as described in the maritime transport section below. Moreover, the regional case study of the ArkMPA project provides additional perspective on these pressures (Wienrich & Lukyanova 2022).

Regulation – Offshore Oil and Gas

The authority for overseeing oil and gas activities lies with different institutions and depends on the location of the extraction site. For offshore developments in federal waters, the competence lies with the Bureau of Ocean Energy Management (BOEM under the US Department of the Interior). The development of the programme includes preparation of an environmental impact statement (EIS). The BOEM also applies legislation regarding the protection of endangered species and marine mammals, as well as regarding water pollution caused by oil (BOEM n.d.).

The specific responsibilities for preparedness, prevention and response to oil spills are split between several agencies and governance levels (see BOEM 2019, for a detailed overview):

- *Prevention:* The Outer Continental Shelf Lands Act (OCSLA) provides a foundation for regulations on offshore oil development and operations in federal waters, which are implemented by BOEM and the Bureau of Safety and Environmental Enforcement (BSEE) – both under the US Department of the Interior (BOEM 2019). The BOEM focuses inter alia on leasing, exploration, development plan administration, geological and geophysical permitting, economic analysis, and environmental studies. The BSEE focuses on field operations including permitting, research, inspections, offshore regulatory programmes, oil spill response, training, safety, and environmental compliance. An *Ocean Energy Safety Advisory Committee* assessed existing regulations for oil and gas operations in the Arctic and found inter alia that BSEE "regulations as written do not address all the unique Arctic operating conditions" (OESAC 2013, p.20). Subsequently, in 2016, a new rule on Exploratory Drilling on the Arctic Outer Continental Shelf was passed to ensure higher standards, but is focused on mobile offshore drilling units, not the use of other drilling technologies (BSEE 2017).
- *Response*: The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) provides guidelines on reporting, spill containment and cleanup. Emergency response takes place through a national framework, including response headquarters, a national response team and regional response teams (EPA 2021a). The overarching authority to respond to oil spills lies with the US Coast Guard (EPA 2021b). The Coast Guard is pre-designated as "federal on scene coordinator" (FOSC) in the cases of oil discharges in offshore or coastal zones. The Federal Environmental Protection Agency (EPA) is the pre-designated FOSC in the case of inland spills. The FOSC may at any time remove or arrange for the removal of a discharge and mitigate or prevent a substantial threat of a discharge. In emergency situations, this position has farther-reaching competences. In case of a pollution violation, the Captain of the Port (COTP) is authorized to use several enforcement actions, including a letter of warning, a notice of violation or civil and criminal penalties. The *Alaska Regional Contingency Plan* of 2018 and its four sub-area contingency plans specify additional requirements (see Figure 9).

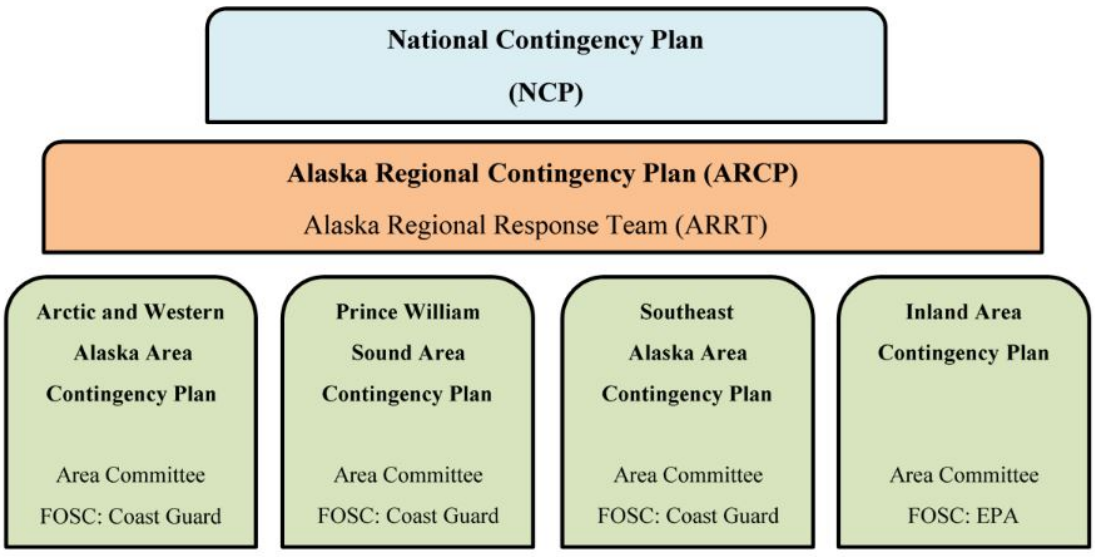


Figure 9: Alaska's Oil Spill Planning Framework (BOEM 2019).

The U.S. *Oil Pollution Prevention Regulation* applies the precautionary approach and includes the polluter pays principle. However, MPAs and conservation areas are not entirely protected, as some extraction activities are allowed in these areas (see section 4 below).

3.1.4 Maritime transport

Maritime transport provides a supporting role for the whole of the Arctic region, in addition to the jobs and income it generates. It enables other economic activities and supports communities throughout the Alaskan Arctic. Maritime transport has grown quickly in recent years, with the number of vessels operating in the region more than doubling between 2008 and 2018 (U.S. Committee on the Marine Transportation System 2019). This is in part due to decreasing ice cover, as well as strong economic activity in the region (U.S. Committee on the Marine Transportation System 2019).

Table 6: Quick facts on maritime transport activities in Alaska, USA.[2]

% of GVA	% of total employment	Main areas
Alaska: 0,11% (of total USA) (Bureau of Economic Accounts, 2020, own calculations)	**Alaska:** 0.027% (of total USA) (Bureau of Economic Accounts, 2020, own calculations)	**Alaska**: Most of the shipping occurs below the Arctic circle. **Arctic:** Along the coast, especially near Deadhorse and Utqiagvik

Overview of the activity, socioeconomic importance, and trends

In terms of total vessel traffic in the Alaskan Arctic by vessel type, over 50% of these vessels are tug, towing, and cargo vessels; other vessels include fishing vessels (10%), tourism (9%), tankers (7%), government/law enforcement/search and rescue (6%), research (5%) and other vessels (5%) (U.S. Committee on the Marine Transportation System 2019). Growth in maritime transportation is driven by natural resource development and trade, which are affected by global commodity prices (Brigham 2015). Figure 10 shows the swift growth in maritime transportation traffic between 2008 and 2018, which is forecasted to continue. Maritime transportation is highly seasonal, with no traffic over the winter months in areas with substantial sea ice coverage. As climate change results in a longer ice-free season, traffic is expected to increase. Even the second-most moderate growth scenario (named “most plausible” by the authors of the graph), would lead to an increase of more than a third of 2018 numbers by 2030.

Figure 11 shows the transportation density in Alaskan waters, which is largely along the coastline, reaching also north to Chukchi and Beaufort Seas, but has its biggest density from the southern Alaskan coastline (below the Arctic Circle) to the Aleutian Islands and further to the west.

[2] Note: GVA and total employment are % of total USA (not just Alaska). Slight differences in definitions of categories, due to data availability. GVA figures refer to the ocean economy activities passenger and freight transportation; employment refers to the ocean economy industry of water transportation.

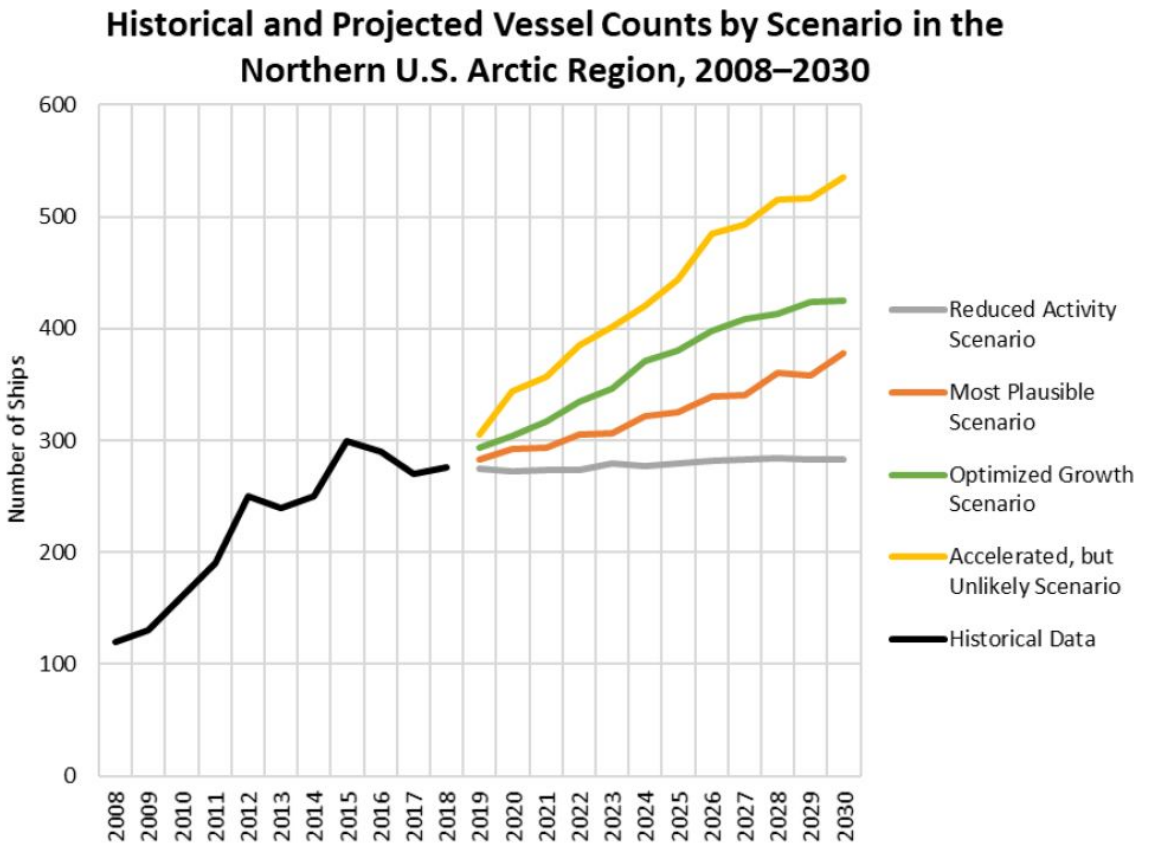


Figure 10 Historic and projected number of vessels in the Northern U.S. Arctic Region, 2008 – 2030 (U.S. Committee on the Marine Transportation System 2019).

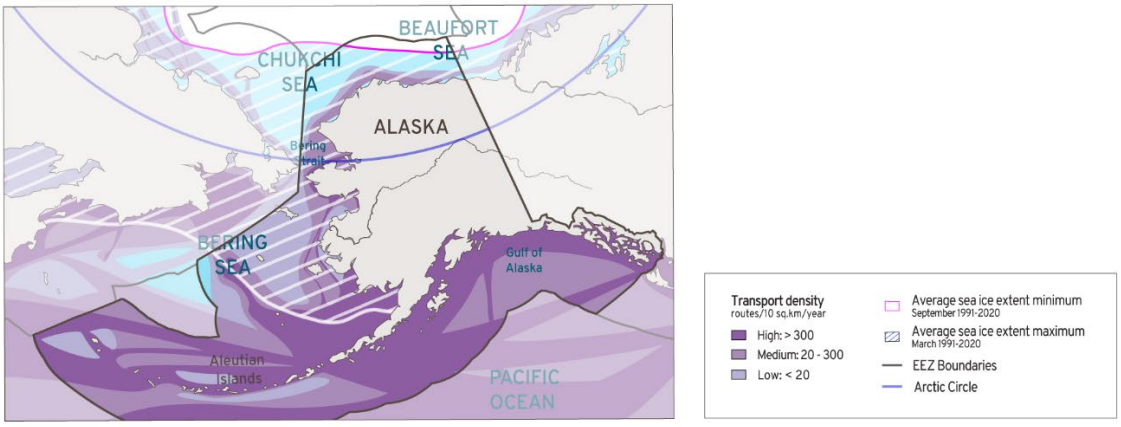


Figure 11 Transport density in Alaskan waters. IASS visualisation based on Copernicus Climate Change Service/ECMWF (2021a, 2021b), Flanders Marine Institute (2019), GRID-Arendal (2019), MarineTraffic (2021).

Related pressures

Maritime transport produces multiple environmental pressures that include local air and water pollution (e.g. sulphur from heavy oil), underwater noise, and introduction of invasive species. Port infrastructure creates noise and seabed disturbances, as well as

litter and other pollution and contaminants. The regional case study of the ArkMPA project provides additional perspective on these pressures (Wienrich & Lukyanova 2022).

Regulations

Several legal acts cover the protection of the maritime environment and are implemented by the US Coast Guard, the EPA, or both (for the competences on offshore oil spills, see section 3.1.3 above):

- The Oil Pollution Prevention Act of 1990 was amended in 2018 to also regulate the responsibilities for oil spills of oil tanker shipping, which lies within the competence of the US Coast Guard. This Act enforces the requirements of the MARPOL Convention and its Annexes I, II and V (on oil pollution, pollution by noxious liquid substances in bulk, and pollution by garbage from ships).
- The EPA and the US Coast Guard jointly and cooperatively enforce (EPA & US Coast Guard 2011) the Maritime Pollution Act of 2008 and the Act to Prevent Pollution from Ships, which were introduced to implement the Annex VI of the MARPOL Convention (on the prevention of air pollution from ships) (NOAA 2018).
- The Clean Water Act (CWA) regulates the discharge of wastewater in US waters. The main objective is "*to restore and maintain the chemical, physical, and biological integrity of the Nation's waters"* (33 U.S. Code § 1251 (a)). The CWA has made it illegal to discharge pollutants from a point source into navigable waters unless a permit has been obtained (EPA 2020). Its implementation is under the competence of the EPA, supported by regional inspectors.

3.1.5 Tourism

Tourism affects ecosystems through heightened boat traffic and construction of infrastructure, as well as direct impacts when tourists visit Arctic habitats. Coastal tourism is a large employer and significant contributor to the Alaskan economy. In 2017, tourism was responsible for 43,300 full- and part-time jobs in Alaska, principally in the food/drink and accommodation sectors, but also supporting retail jobs, tourism/activities sector, transport and other sectors (McDowell Group 2018; McDowell Group 2020).

Table 7 Quick facts on tourism in Alaska, USA.

% of GVA	% of total employ-ment	Number of cruise passengers (2015)	Main areas
USA: 0,69 %	**Alaska**: approx. 10% (McDowell Group 2020)	198,000 (with 1.1 million embarkations) (Business Research and Economic Advisors, 2019)	Juneau, Ketchikan, Skagway

Overview of the activity, socioeconomic importance, and trend

Alaska: The overall number of visitors was steadily increasing since the last financial crisis in 2008 and 2009, as shown in Figure 12. This is reflected in increased employment numbers, with total employment in Alaska due to tourism increasing by 20% between 2008-2017. Cruise tourism plays a central role in Alaskan tourism: 49% of visitors either arrive or leave (or both) on cruise ships (McDowell Group 2018). The number of

passengers on cruise ships in Alaska has grown steadily for more than two decades, with the exception of 2008 and 2009 after the financial crisis, with Alaska cruise ship passenger numbers 1.4 million in 2020, from less than 700,000 in 2000 (Cruise Lines International Association Alaska, 2020).

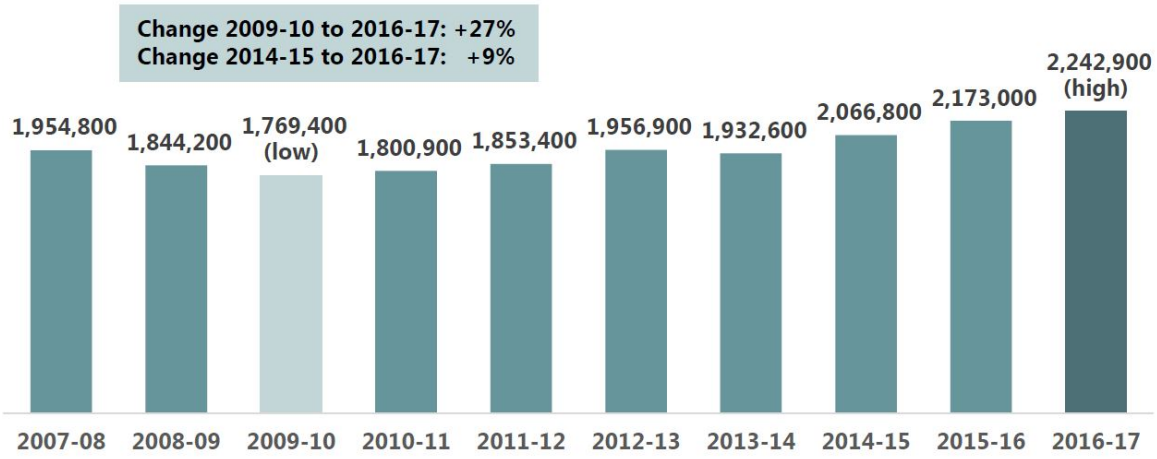


Figure 12 Alaska Visitor Volume, 2007-08 to 2016-17 (October-September) (McDowell Group, 2018)

Arctic: While tourism is important to the Alaskan economy (see above: approximately 10% of total employment in the state), over 75% of those jobs are in the southeast and central south of the state. The statistical area “far north” only contributes 375 full-time jobs and 2% of employment in Alaska (McDowell 2018). Coastal tourism traffic in the Arctic includes passenger boats (e.g. cruise ships) and private craft, such as personal yachts and boats. As shown by Figure 14, most of the traffic is relatively near the coast.

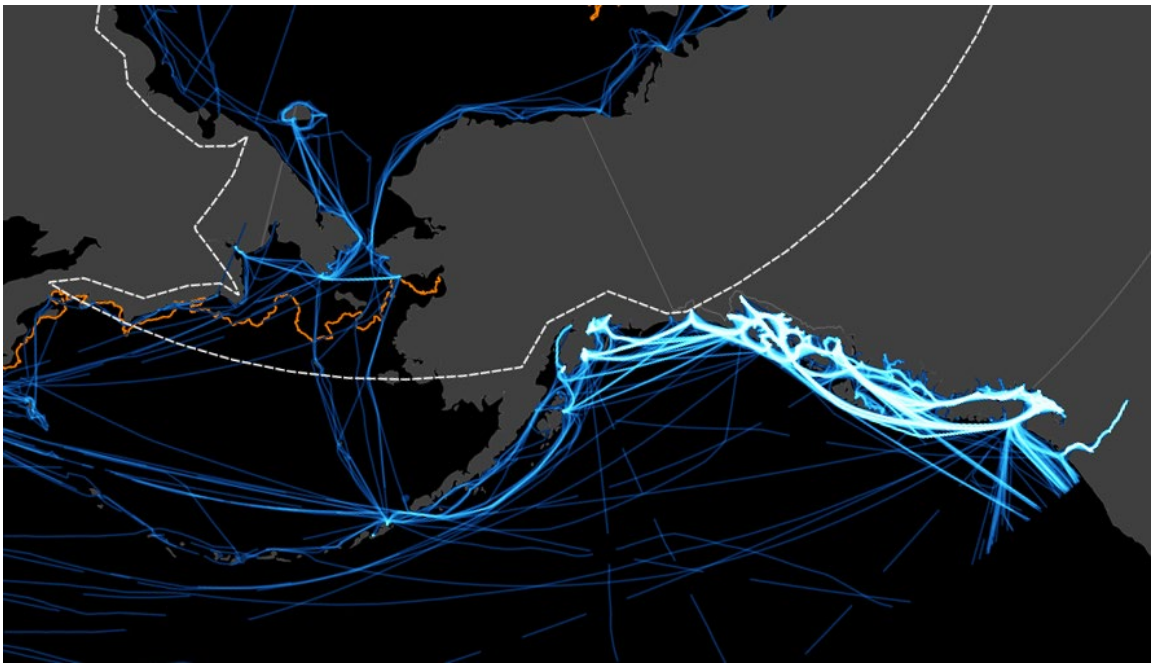


Figure 13: Tracks of all tourism vessels in the US Arctic waters in 2019. Source: PAME (2021).

Pressures

- **Shipping-related pressures:** Cruise vessels present many of the same environmental pressures as shipping, including local pollution, greenhouse gas emissions and noise pollution to sea and air (EEA 2019).
- **Infrastructure-related pressures**: Increased pleasure and cruise ships may require increased tourism infrastructure, such as ports and moorings, which disturb habitats, and act as sources of pollution and contaminants (EEA 2019).

The regional case study of the ArkMPA project provides additional perspective on these pressures (Wienrich & Lukyanova 2022).

Regulation – Tourism

Cruise ship regulations: In July 2001, an Alaska Statute (46.03.460) established the Commercial Passenger Vessel Environmental Compliance (Cruise Ship) Program (CPVEC). The Alaska Department of Environmental Conservation (ADEC) worked with a facilitator and a Negotiated Regulations Committee to draft regulations to accompany this law (Alaska Department of Environmental Conservation 2021a). The CPVEC program aims to provide terms and conditions of vessel discharges, independent verification of environmental compliance and allows the department to monitor and supervise discharges from commercial passenger vessels through a registration system.

- **Large vessels:** Large vessels (more than 250 beds) must apply for a permit to discharge wastewater in state waters. The Alaska Department of Environmental Conservation issues the permits (Alaska Department of Environmental Conservation 2014). The permit obligates operators to refrain from discharging *"untreated sewage, treated sewage, graywater, or other wastewaters in a manner that violates any applicable state or federal law governing the disposal or discharge of solid or liquid waste material" (*AS 46.03.462 b, 1) and makes use of advanced wastewater treatment systems *(*AS 46.03.462 e). Moreover, large vessels are required to take Ocean Rangers on board who act as independent observers monitoring environmental and discharge requirements (Alaska Department of Environmental Conservation 2021b).
- **Small vessels:** In 2013, Best Management Practices (BMP) were established as an alternative for wastewater discharge permits. Under the regulations, with some exceptions, operators of the small vessels CPVEC Program, may not discharge treated sewage, greywater and other wastewater in state waters unless the vessel obtains a discharge permit, and meets the legal requirements, or when the department approves alternative terms and conditions to operate under the BMPs (Alaska Department of Environmental Conservation 2021).

4 Conservation through marine protected areas in Alaska and the USA

Numerous regulatory and policy approaches aim to conserve biodiversity within Alaska and the wider USA. These conservation activities aim to minimise or mitigate the harmful impacts of human activities on Arctic maritime ecosystems described in previous sections.

In this section, we focus on one key marine conservation tool, Marine Protected Areas (MPAs), and how they are used in the USA and Alaska.

Table 8: Quick facts on Marine Protected Areas in the USA (Marine Conservation Institute, 2022)

Percentage of Marine Area designated as MPAs	Protected area in km²	Number of Marine Protected Areas	Proposed MPAs
19%	1,627,936	888	4

To properly contextualise the data in this table, the following should be noted:

1) These national level figures in the first two columns are dominated by one marine protected area, Papahānaumokuākea Marine National Monument, which is found in the North Pacific Ocean and which covers approximately 17% of the US territorial waters (Marine Conservation Institute 2022). MPA coverage in Alaska is the lowest of all USmarine regions, with only 0.6% of Alaskan marine area covered by an MPA (National Marine Protected Areas Center 2020).
2) The amount of square kilometers of protected area in the second column includes any status of protection, including 18% of fully/highly protected areas and 1.1% of less protected/unknown status areas. Fully protected MPAs ban any extractive or destructive activity. All impacts must be minimised. In highly protected MPAs light extractive activities with minimised impacts and are allowed to a limited extent (Marine Conservation Institute 2022).

In the US, an ecosystem-based fishery management approach is applied (National Marine Protection Centre 2015). A key tool under this approach are MPAs, which are implemented and managed at both federal and state level. A US National System of Marine Protected Areas has been established (Executive Order 13158) in consultation with the states, as well as with the Regional Fisheries Management Councils (FMCs), tribes and other entities, including the Marine Protected Area Federal Advisory Committee (MPA FAC) (National Marine Protected Areas Center 2015, p. 3). Under the executive order, both a framework for a National System of MPAs and a National MPA Center have been established to coordinate its implementation (National Marine Protected Areas Center 2015).

In federal waters, regional fishery management councils, established under the Magnuson-Stevenson-Fishery Conversation and Management Act, hold the authority over the designation of MPAs (Witherwell and Woodby 2005). These plans must be authorised by the federal National Oceanic and Atmospheric Administration (NOAA). However, MPAs have also been established in state waters by state and regional authorities (Wenzel et al. 2013).

The USA designates a wide variety of different MPAs, including national marine sanctuaries, national parks and wildlife refuges, many state parks and conservation areas, and a variety of fishery management closures (National Marine Protected Areas Center 2020). In the USA, an MPA is defined as "*any area of the marine environment (including the Great Lakes) that has been reserved by federal, state, territorial, tribal, or local laws or regulations to provide lasting protection for part or all of the natural and cultural resources therein* (Executive Order 13158, 2000)." While there is some overlap, this definition is not as stringent as the IUCN definition, "*A clearly defined geographical space, recognised,*

dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values." (IUCN, 2012, p. 12). This is reflected in Figure 14, which shows that little of the Alaskan area designated as an MPA achieves high levels of protection.

In the USA, roughly 1.000 MPAs have been established (NOAA 2021). In June 2020, 26% of US waters (including the Great Lakes) were MPAs, exceeding the aim of Aichi Target 11 to protect 10% of coastal and marine areas (NOAAs 2020).[3] However, nearly all highly protected areas are located within two large MPAs (the Papahānaumokuākea Marine National Monument and the Pacific Remote Islands Marine National Monument) in the far-off Pacific Ocean. In addition, only 3% of MPAs were declared as "no-take MPAs" in which extractive uses are prohibited (NOAA 2020).

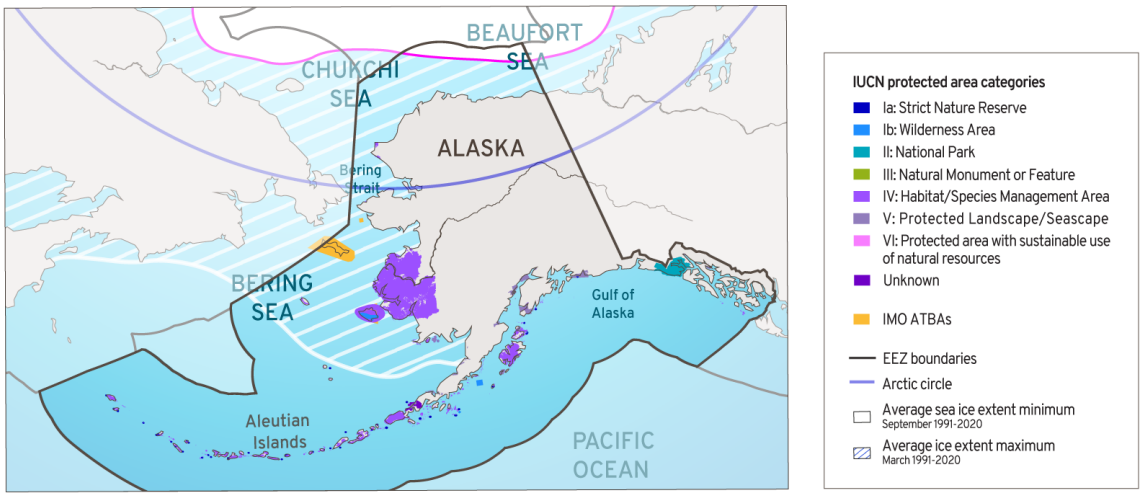


Figure 14: Map of marine protected areas in Alaska. IASS visualisation based on Copernicus Climate Change Service/ECMWF (2021a, 2021b), Flanders Marine Institute (2019), GRID-Arendal (2019), UNEP-WCMC and IUCN (2022), Ocean Conservancy (2021).

MPA coverage in Alaska is very low relative to the rest of the USA. According to NOAA, the Arctic has the lowest percentage of MPAS of the regional waters in the USA (0.6 %) (NOAA 2020). According to a presentation of the NOAA MPA Center, 45 MPAs have been designated in Alaskan waters, with a total amount of 1.6 million km² (NOAA MPA Center n.d.). 14 MPAs are Natural Heritage MPAs, one is a Cultural Heritage MPA (total amount 430,000 km²) and 30 are Sustainable Production MPAs (1.6 million km²) (NOAA MPA Center n.d.). Accordingly, no "no-take MPAs" exist within the Arctic[4] (NOAA MPA Center n.d.).

Access to MPA information is provided through NOAA's Marine Protected Areas Inventory (MPA Inventory) which describes all MPAs in US waters, what they are and which purpose

[3] This information contradicts the results in Table 3, where only 778 MPAs and a proportion of 19 per cent were counted. The basis of NOAA 2020 data is not presented. However, it can be assumed that less protected areas were also included in the calculation which explains the large difference between both sources.

[4] The closest to a no-take MPA is the Walrus Island Game Sanctuary, which only allows access with permits.

they serve. It is a comprehensive geospatial database and combines publicly available data with information from state and federal MPA programmes (NOAA n.d.).

5 The Role of Indigenous Peoples

Compared to other Arctic, states the participation framework for Indigenous Peoples is less unified (O`Donnell et al. 2018). However, it offers opportunities for interaction and involvement of Indigenous Peoples in the resource extraction industry “as well as consultation with governmental departments and agencies” (Newman et al. 2014 p. 108).

Three substantial legislations have set the framework for the co-management system in Alaska. The Alaska Native Claims Settlement Act (ANCSA) settled territorial claims in Alaska, dividing the land between native corporations, the state and the federal government (Inuit Circumpolar Council Alaska 2020). It also eliminated fishing and hunting rights by introducing a fee-based land ownership system (Inuit Circumpolar Council Alaska 2020). This way, communal land claims were transformed into private property claims, which are represented by 13 Native regional and 210 village corporations. (Newman et al. 2014 p. 108). The Act’s impacts have to be considered with regard to multiple aspects: “*While this approach brought economic benefits to Indigenous communities, it also resulted in the weakening of Indigenous cultural practices*.” (O`Donnell et al. 2018 p. 12-13). Until today, different management rules apply on federal land, state land and land held by native cooperation governments (Inuit Circumpolar Council Alaska 2020).

Roughly 60% of the lands are Federal territories, which are governed under the Alaska National Interest Lands Conservation Act (ANILCA), passed by Congress in 1980, and the Outer Continental Shelf Lands Act (OCSLA), adopted in 1953 (O`Donnell et al. 2018). Both agreements obligate the consultation of Indigenous communities before any decision is taken which may affect their traditional territories or lifestyles (O`Donnell et al. 2018). Under ANILCA, several protected areas were established for Alaska’s native tribes to use (Trustees for Alaska 2015). However in the event of a resource development project, the opposing views of Indigenous and non-Indigenous Peoples can be expressed, but do not necessarily stop a project (O`Donnell et al. 2018).

“*A federal agency can conclude that a resource activity is necessary despite concerns voiced by the public, and there is no duty to obtain consent prior to allowing activities to take place on federally owned lands*.” (O`Donnell et al. 2018 p. 13).

Under ANILCA title VIII, “subsistence use priority“ was allocated to „rural Alaskans“, which evoked political conflicts between state and federal level, as well as by opposition to the Act. In 1982, the Alaska Supreme Court ruled that a subsistence use approach violated the state’s constitution. The allocation of fishing and hunting rights is not based on a native status but on the residency in “rural areas” (Inuit Circumpolar Council Alaska 2020).

On federal lands, hunting and fishing is governed under the Federal Subsistence Board (FSB). Under title VIII ANILCA governance is supported through two advisory bodies which secure stakeholder participation, in particular with regard to "rural residency" (Inuit Circumpolar Council Alaska 2020). However, there is no fixed number of seats given to Indigenous Peoples representatives. Based on the ruling of the Supreme Court of Alaska,

no distinction is made between Alaskans and rural area residents on land that is governed by state administration (Inuit Circumpolar Council Alaska 2020).

However, under ANILCA, several conservation laws were enacted. Some give preferential rights to Indigenous Peoples. The Marine Mammal Protection Act (MMPA) frees “Alaska Native subsistence users” from the moratorium on the “take” of mammals if the usage results in the creation of handcrafts and clothing in a “non-wasteful manner” (Inuit Circumpolar Council Alaska 2020).

Some progress was also made with the establishment of the Alaska Migratory Bird Co-management Council in 2003, which aims to manage the hunts of birds cooperatively with the agencies (Seattle Times 2018). In the past, bird hunting was managed through the Migratory Bird Treaty Act, enacted in 1917, which prohibited harvests in spring and summer of migratory birds and their eggs during its implementation in the 1960s and 1970s (Seattle Times 2018).

In 2018, Alaskan state and wildlife officials formally apologised for the failing to consider the impact of the Act on food sovereignty to Native Alaskans: “*We recognize that the regulations were wrong, that they prohibited hunting of migratory birds when you needed it most during the springtime*,” and continued “*We got it wrong, we regret that we caused harm. We realize now that it was a wrong regulation to have in place, so we apologize for that*.” (Seattle Times 2018).

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