ABANDONED LOST OR OTHERWISE DISCARDED FISHING GEAR (ALDFG) IN THE ARCTIC

FISHING PRACTICE & GEAR INVENTORY

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ARCTIC COUNCIL

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Protection of the Arctic Marine Environment

Abandoned Lost or otherwise Discarded Fishing Gear (ALDFG) in the Arctic – Fishing Practice & Gear Inventory

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Wouter Jan Strietman

Project leads
Norway and United States of America (USA)

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Norwegian Ministry of Climate and Environment

GRID ARENDAL
A UNEP Partner

The Nordic Institute in Greenland

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EXECUTIVE SUMMARY

The issue of Abandoned, Lost, or otherwise Discarded Fishing Gear (ALDFG) in the Arctic is a growing concern, impacting both marine ecosystems and fisheries sustainability. ALDFG contributes significantly to marine litter, affecting fish stocks, marine biodiversity, and coastal communities. The Arctic region presents unique challenges due to harsh environmental conditions, extensive coastlines, and the transboundary nature of its waters.

Efforts to address ALDFG in the Arctic involve a combination of regulatory measures, industry practices, and scientific research. Arctic states implement different approaches to mitigate ALDFG, including gear marking requirements, reporting and retrieval programs, and innovations in gear technology. International organizations, such as the International Maritime Organization (IMO) and the Food and Agriculture Organization (FAO), also play a key role in supporting sustainable fishing practices and reducing gear loss.

This report aims to provide an understanding of fishing efforts and gear types used in the Arctic. It explores data on fisheries, fishing gear, and national and international efforts to prevent and mitigate ALDFG. The insights presented contribute to ongoing discussions on improving gear management, enhancing reporting mechanisms, and strengthening cooperation among Arctic States. By increasing awareness and implementing targeted interventions, stakeholders can work toward reducing the long-term environmental impacts of ALDFG in Arctic waters.

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1. BACKGROUND

Marine litter, particularly plastic waste, is a growing environmental concern that poses serious threats to marine ecosystems worldwide, including the Arctic. The 2019 Desktop Study on Marine Litter including Microplastics in the Arctic evaluated the scope of marine litter in the Arctic, analyzed both sea and land-based sources of litter and identified all types of fishing activities as significant sources of marine litter.

Every year, it is estimated that nearly 2% of all fishing gear used in commercial fisheries worldwide becomes ALDFG.[1] ALDFG is understood to have significant environmental impacts, but the quantity of litter generated during fishing remains poorly understood.[2] Studies mapping seafloor litter in the Barents Sea and Norwegian Sea have also highlighted fishing gear as the predominant type of litter found there.[3]

ALDFG encompasses various items such as netting, mono/multifilament lines, hooks, ropes, floats, buoys, sinkers, anchors, metallic materials, and fish aggregating devices (FADs) made of non-biodegradable materials such as concrete, metal, and polymers. Largely composed of synthetic materials like nylon and polyethylene (PE), these durable plastics persist in the environment and contribute to ghost fishing. Several factors influence the potential for fishing gear to become ALDFG. These include environmental conditions, such as seafloor topography and underwater obstructions, which can cause gear to become snagged and difficult to recover. Tidal patterns, currents, waves, and heavy winds can also lead to gear loss by sweeping gear off position or making it difficult to locate. Wildlife interactions with fishing gear, such as entanglements with large whales or other marine life, may cause loss of gear. Operational losses and errors by fishing operators

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can contribute to ALDFG, even during regular fishing activities.

The International Maritime Organization (IMO) and the Food and Agriculture Organization (FAO) are key players in addressing the issue of ALDFG. The IMO, through the International Convention for the Prevention of Pollution from Ships (MARPOL), has established regulations to minimize marine pollution, including the intentional discarding of fishing gear. Currently, Regulation 10.6 of MARPOL Annex V requires reporting of the accidental loss or discharge of fishing gear which poses a significant threat to the marine environment or navigation to the flag State and coastal State, but there is no reporting requirement to IMO on the discharge or loss of fishing gear. However, there is now ongoing work by the IMO's Sub-Committee on Pollution Prevention and Response (PPR) on how to amend MARPOL Annex V, and the 2017 Guidelines for the Implementation of MARPOL Annex V, to facilitate and enhance reporting of lost or discarded fishing gear. This is a measure included in the IMO Action Plan to Address Marine Plastic Litter from Ships. PPR 12 approved a draft revised Action plan (draft 2025 Action plan), with anticipated adoption by the Marine Environment Protection Committee (MEPC) 83 in April 2025. Other measures relating directly to fishing gear in the draft 2025 Action plan, are the development of mandatory goal-based measures under MARPOL Annex V for the marking of fishing gear, and consideration of development of measures for a ship-specific management plan for the gear and equipment deployed in fishing activities, including the logging of fishing gear on board a fishing vessel.

The FAO plays a critical role by promoting responsible fisheries management and developing best practices to mitigate ALDFG. Through its Voluntary Guidelines on the Marking of Fishing Gear,[4] the FAO encourages member states to mark fishing gear for easier identification and retrieval, reducing the likelihood of loss. The FAO also works with Regional Fisheries Management Organizations (RFMOs) to strengthen regulatory frameworks for gear management and recovery. Furthermore, FAO promotes research into biodegradable alternatives to synthetic fishing gear, aiming to reduce the long-term environmental impacts of ALDFG.

Strengthening regulations through international instruments like IMO's MARPOL Annex V has been crucial in prohibiting the disposal of plastic gear at sea. Other efforts include gear recovery programs, and promoting the development of biodegradable materials. Awareness campaigns and training for fishers on responsible gear management also help minimize the accidental loss of gear.

ALDFG is recognized as a major source of marine litter in Arctic waters.[5] This report represents an implementation activity under the strategic actions identified within the theme Reducing Marine Litter Inputs from Fisheries and Aquaculture in the Arctic Council's Regional Action Plan on Marine Litter in the Arctic (ML-RAP).[6] The aim is to provide baseline information on fishing efforts and the gear types used within the Arctic and near-Arctic to help inform and improve gear identification as part of monitoring or removal, which ultimately improves ALDFG prevention and intervention efforts by improving understanding of the types of gear being used in the region, which can eventually lead to better identification of the sources of ALDFG that are observed on shore or in the marine environment.

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2. OVERVIEW OF FISHERIES IN THE ARCTIC AND MAIN GEAR TYPES

2.1 FISHERIES IN THE ARCTIC

The major sectors of maritime activity in the Arctic region are fisheries (including commercial, subsistence, and recreational), aquaculture, offshore energy development, mining, shipping, and cruise tourism.

Under the United Nations Convention on the Law of the Sea (UNCLOS), Arctic states have rights to resources in their respective offshore Exclusive Economic Zones, or EEZs. As a result, Arctic states – specifically Canada, Iceland, Norway, Russia, and the USA, along with the Faroe Islands and Greenland (autonomous territories of the Kingdom of Denmark), have the greatest fishery allocations in the region. Large-scale commercial fisheries occur in the high seas' areas of the North Atlantic and North Pacific Oceans and in the Barents and Bering Seas. Smaller subsistence fisheries occur within the territorial waters of the Arctic States.

Commercial fisheries mainly take place in the Subarctic shelf areas bordering the Arctic Ocean. Targeted species include cod, halibut, capelin, pollock, salmon, herring, crabs and other crustaceans. In the Canadian Eastern Arctic and West Greenland, specific attention is given to the northern prawn fisheries due to their significant economic and ecological importance. The most productive fishing grounds occur in the Barents Sea and the Bering Sea. They are sustained by notable fish stocks, making the Arctic fisheries among the most significant on a global scale. Other productive fishing areas include the Norwegian Sea, the waters between Iceland and Greenland, and the Northwest Atlantic. Bilateral maritime boundaries have been established, although some agreements, such as the one between Russia and the USA, have not been ratified. There are also high-seas areas in the Arctic and sub-Arctic that are managed by RFMOs like the Northeast Atlantic Fisheries Commission (NEAFC) and the Northwest Atlantic Fisheries Organization (NAFO). The most economically valuable fisheries in the region include pollock in the Bering Sea and Atlantic cod in the Barents Sea, along with haddock, herring, blue whiting, and redfish.[7] Small-scale fisheries play a role as a source of income and food for coastal residents across all Arctic coastal states.

Photo: iStock

The main commercial fishing methods used in the Arctic are primarily trawling, with both pelagic and bottom trawling playing significant roles. Pelagic trawling, targeting species like Alaska pollock, dominates in areas like the Bering Sea and is commonly used for catching fish that swim in mid-water, such as herring and mackerel. Bottom trawling, more prevalent in the Atlantic Arctic, is used to target species that live close to the seabed, such as cod, haddock, halibut and prawns. In addition to trawling, other fishing methods include longlines, which target demersal species like cod, and purse seines, used for catching pelagic species like mackerel and herring. Fixed gear, such as gillnets and pots, are also used, though these methods are less widespread within commercial fisheries in the Arctic region compared to trawling.[8]

The focus is on main fishing areas within the Arctic States' EEZs but also includes fishing activities in the high seas areas of the North-East Atlantic. This is because the main fish stocks in this region are transboundary and straddle or migrate between the EEZs and the high seas.

2.2 FISHING IN THE HIGH SEAS OF THE CENTRAL ARCTIC OCEANARCTIC

The Central Arctic Ocean presents a unique case with respect to fishing. Parts of the Central Arctic Ocean fall under the national jurisdiction of the following five Arctic States: Canada, the Kingdom of Denmark (in respect of the Faroe Islands and Greenland), Norway, the Russian Federation, and the United States. The high seas, however, are not under the jurisdiction of any nation. Historically accessible only by icebreakers, climate change leads to decreased sea ice, creating the potential for migrating fish stocks in the coming years. However, due to the limited understanding of this ecosystem, an international agreement was signed to allow time to gather better scientific information which can then be used to regulate any future fisheries in these areas. In 2021, the International Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean entered into force. Signatories to the agreement - Canada, the People's Republic of China, the Kingdom of Denmark (in respect of the Faroe Islands and Greenland), Iceland, Japan, the Republic of Korea, Norway, the Russian Federation, the United States of America, and the European Union - committed to prevent unregulated commercial fishing within this region for 16 years, until 2037, with a provision for automatic extension for an additional five years.

Figure 1: EEZs in the Arctic.

2.3 MAPPING FISHING VESSELS IN THE ARCTIC

To map main fishing areas in the Arctic, GRID-Arendal produced maps based on PAME's Arctic Ship Traffic Data (ASTD). The ASTD contains tracks of fishing vessels (the larger ones using Automatic Identification Systems or AIS-Class A), showing their sailing routes but not indicating when they were fishing. Norwegian studies have identified that vessels typically fish at speeds of 1-5 knots.[9] Based on this information, GRID-Arendal produced the following maps using the ASTD for the years 2013 and 2021, respectively. The year 2013 data represent the first year of the operation of the ASTD and is used here for comparison with year 2021 data which is the year of the data gathering for the purpose of this report. These maps show where all ships operated in the Arctic in 2013 and 2021, and where all fishing vessels operated in the Arctic for 2013 and 2021, indicating the main fishing areas.

As Arctic ice cover diminishes due to climate change, fishing activities have expanded further north into previously ice-covered areas. The Barents Sea and northern Bering Sea have already seen increased trawling activity due to the loss of sea ice. However, most fishing remains concentrated in the Subarctic, as the High Arctic is still largely protected by sea ice and less accessible waters.[10]

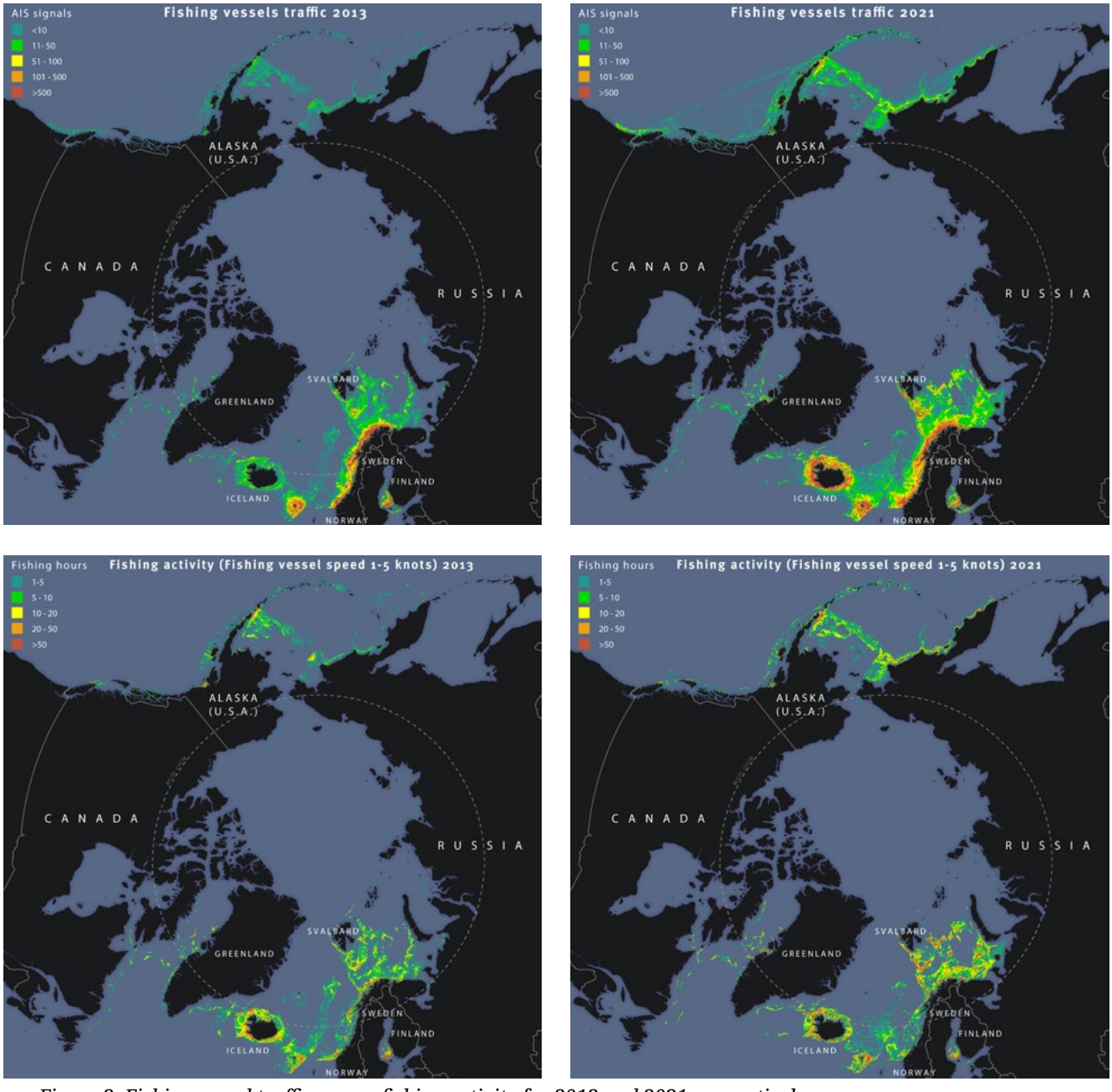


Figure 2: Fishing vessel traffic versus fishing activity for 2013 and 2021, respectively.

2.4 OVERVIEW OF MAIN FISHING ACTIVITIES BY ARCTIC STATE

Table 1 provides an overview of main fishing activities in Arctic States EEZs. Additional information on number of fishing vessels in each states' EEZ, fishing gear types used, location and target-species for fishing was gathered as part of the project through a survey. Methodology and results are presented in chapter 3.

Table 1: Overview of fishing activities in several Arctic States EEZs.

Arctic state	Fishing activities in Arctic waters
Canada	Commercial fishing in Canada's Arctic is relatively small in comparison to its Atlantic and Pacific fisheries, and to those in other Arctic nations. In the north, commercial fishing is limited to the Eastern Arctic, including Hudson Bay, Hudson Strait, Baffin Bay, and Davis Strait.[11] Subsistence fisheries continue to be of great importance to local communities across the Canadian Arctic. New fisheries may open up in the future as climate change makes more areas accessible for exploitation.
Faroe Islands	Most fishing activities are carried out by Faroese vessels within their EEZ. The Faroe Islands government oversees the management of most stocks in this region, with shared stocks subject to management through the North-East Atlantic Fisheries Commission (NEAFC) or coastal state agreements involving the EU, Iceland, Greenland, the Faroe Islands, Norway, Russian Federation, and the United Kingdom.[12] In a special area west of the Faroe Islands, only Faroese and Icelandic vessels are permitted to fish. Similarly, in a special area south of the Faroe Islands, only vessels licensed by the Faroes or the United Kingdom are allowed to fish.
Greenland	The Government of Greenland (Naalakkersuisut) manage the fishery and overseas marine areas within three nautical miles of the coastline, including inland seas like fjords and bays, while the Danish Navy is patrolling the marine environment from three nautical miles to 200 nautical miles from the baseline (the EEZ).[13] The prawn and halibut fisheries account for over 80% of the country's export income. Greenland's fisheries are divided into inshore and offshore sectors with distinct management approaches and socio-economic contexts. The majority of the inshore fishery is found along the west coast, while the offshore fishery is located in both the west and east coast of Greenland.[14] Bilateral agreements allow vessels from Norway, Russia, Faroe Islands, and some EU member states to operate in Greenland's EEZ offshore.[15]
Iceland	The fishing industry in Iceland holds a significant position as one of the nation's foremost sectors. Fish products contribute to approximately 40% of the country's commodity exports. Iceland has a 200 nautical mile exclusive fishing zone, more than seven times the size of the country (758,000 km2).[16] The five most important target species in Icelandic fisheries in 2021 were cod, haddock, saithe capelin, and mackerel. These species dominate both demersal and pelagic fisheries, with cod being the most valuable species in terms of economic importance.[17]
Norway	In terms of value, cod is the most significant species in Norway, contributing approximately 44% of the total export value from marine fisheries in 2018. By volume, mackerel, herring, and cod are the primary species. Another significant sector is shellfish, comprising shrimp and crabs.[18] The fishing fleet in 2023 consisted of 5607 powered vessels, 84% of which were small-scale vessels less than 11 meters in length.[19] A large proportion of the vessels fish for different species using different types of gear during the year. Most of the commercially important species are transboundary and are managed in cooperation with the other coastal states. Management regimes may include technical measures related to fishing gear design like mesh sizes and the use of sorting grids. Foreign vessels make up a significant proportion of the total number of large fishing vessels operating in waters under Norwegian fisheries jurisdiction as zonal access is an integrated element in some of the agreements with other states. The main gear used by these vessels are bottom trawls.

Table 1 (continued)

Arctic state	Fishing activities in Arctic waters
USA	Alaska's climate ranges from arctic and subarctic to temperate. Alaska has five large marine ecosystems, including the Gulf of Alaska, the Aleutian Islands, the eastern Bering Sea, the northern Bering Sea and Chukchi Sea, and the Beaufort Sea.[20] The US Arctic Research and Policy Act of 1984 defines Arctic waters off Alaska to include U.S. waters of 1) Aleutian Islands, 2) Bering Sea, 3) Chukchi Sea, and 4) Beaufort Sea. Commercial fisheries occur primarily in the Aleutian Islands and Bering Sea portions of the Arctic. Areas further north fall under the Arctic Management Area which governs commercial fisheries in U.S. waters of the North Bering, Chukchi and Beaufort Sea and Bering Seas. Under the Arctic Fishery Management Plan for Fish Resources of the Arctic Management Area, all commercial fishing is prohibited in this area "until such time in the future that sufficient information is available with which to initiate a planning process for commercial fishery development".[21] The only exception is for targeted commercial fishing of Pacific salmon and Pacific halibut. The Bering Sea ecosystem serves as a vital source of fish and other seafood products that are consumed globally. The interactions with this ecosystem extend beyond the Bering Sea communities, encompassing various communities along the West coast and throughout the United States, particularly through federal and state commercial fisheries. The management of Alaska's federal fisheries, including the Bering Sea, is overseen by the North Pacific Fishery Management Council, the State of Alaska, and the NOAA National Marine Fisheries Service (NMFS).

Detailed information on fishing activities for the following ecoregions: Barents Sea, Faroes, Greenland Sea, Icelandic waters and the Norwegian Sea, can be accessed in the International Council for the Exploration of the Sea (ICES) fisheries overview reports. The ICES fisheries overviews summarize the services derived from fishing activities and the effects of fishing on the ecosystem in each ICES ecoregion and includes which countries are catching what species, quantifying discards and bycatch, describing the various fishing methods being used, and how stocks are managed.[22] Additional detail on fisheries activities in Alaska can be found within the National Oceanic and Atmospheric Administration (NOAA) NMFS Fisheries of the United States annual report.

Photo: WJ Strietman

2.5 MAIN TYPES OF FISHING GEAR

The definition of fishing gear used in this report aligns with Annex V of the International Convention for the Prevention of Pollution from Ships (MARPOL). According to this definition, *fishing gear means any physical device, part thereof, or combination of items that may be placed on or in the water or on the sea-bed with the intended purpose of capturing, or controlling for subsequent capture or harvesting, marine or fresh water organisms*.

Fishing gear materials include textile and non-textile components. Textile materials comprise netting, twine, and rope, while non-textile materials refer to floats, sinkers, and hooks. Traditionally, natural fibers such as cotton, manila, sisal, jute, and coir were used in fishing gear. Over the latter part of the 20th century, synthetic fibers, such as polyamide (PA), polyester (PES), polyethylene (PE), and polypropylene (PP), have replaced natural fibers due to properties like high breaking strength, weather resistance, low maintenance, and long service life. Additional synthetic fibers like polyvinyl alcohol (PVA), polyvinyl chloride (PVC), and polyvinylidene chloride (PVD) are also used but are less common.[23]

FAO[24] provides classifications and detailed descriptions of various gear types and operational practices used globally to catch aquatic animals and identifies 10 broad categories along with “gear not known”, followed by a more detailed list of sub-categories.

The Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) 2021 Report[25] categorizes fishing gear components that contribute to the global ocean burden of plastic marine litter as follows (gear types, structure and materials composition is presented in Figure 3):

- Netting, largely comprising monofilament or multifilament fibre polymers woven into knotted and knotless meshes. The main types of netting polymers include PE, PA and PES which are non-biodegradable.
- Ropes and lines, comprising a variety of non-biodegradable polymer materials, including PP, PE, ultra-high molecular weight polyethylene (UHMWPE) and PA.
- Floats and buoys, commonly comprising PE, acrylonitrile butadiene styrene (ABS), expanded polystyrene (EPS), ethylene vinyl acetate (EVA) and polyurethane (PUR).
- Sinkers and anchors composed of lead blocks and iron chain.
- Metallic materials also constitute the frames, beam and otter boards for net spreads, and also constitute the core material for pots, along with accessories such as thimbles, shackles, swivels, purse rings and anchors.

Photo: Shutterstock

Figure 3:

Major gear types, sub-gear types, characteristics and composition

Based on FAO[26] and GESAMP 2021

Falling gear

Types
Cast nets, Lantern nets

Structure
Nets or basket-like structures that are cast, pushed down, or allowed to fall to catch fish below. They are typically used in shallow waters but can also be employed in deep waters from a boat, often utilizing lights to attract and concentrate fish.

Materials composition
Netting: PA/PE fibres
Sinking lines: PVC/ABS with lead blocks

Lift nets

Types
Portable, Stationary, Boat-operated, Shore-operated

Structure
Netting mounted on a frame that is lowered into the water to allow fish to enter, then lifted to collect the accumulated fish. The net can be a series of horizontal sheets or a bag-shaped panel. It can be operated by hand or with mechanical assistance, from shore or a boat.

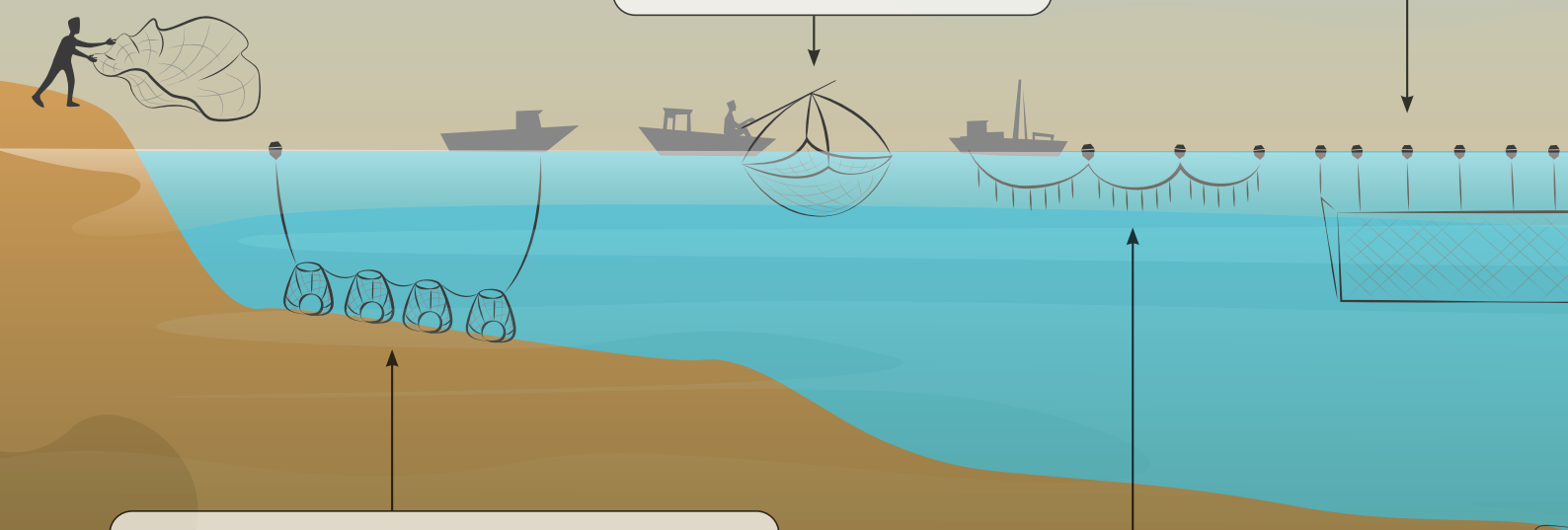
Materials composition
Netting: PE/PA fibre
Lift lines: PA/PP fibre
Sinking lines: same as lift lines with lead blocks
Poles: natural, PVC/ABS, or metal

Gillnets

Types
Set (anchored), Fixed (staked), Drift, Encircling, Trammel

Structure
Single or three-walled netting with floating (head) lines, sinking (footrope) lines, and buoys, with or without anchors (for set gillnets). Fish are caught through gilling, wedging, snagging, or entangling.

Materials composition
Netting: monofilament nylon or woven fibres comprised of PES, nylon or PE
Float Lines: PP/PE with PVC/EVA/ABS floats
Sinking Lines: PP or PES with lead blocks or lead core
Buoys: vinyl/PVC/PUR



Traps

Types
Pots, Barriers, Fences, Weirs, Stationary uncovered pound nets (e.g. large fish traps, Japanese set nets, etc.), Fyke nets, Stow nets, Aerial traps.

Structure
Stationary structures made of netting or pots with metal or wooden frames and synthetic or wire mesh. They include floating (head) and sinking (ground) lines, beams or T-frames for spreading, and are anchored with buoys. Traps guide fish through currents or attractants into a holding chamber or codend-like bag, often using funnels or non-return devices to prevent escape.

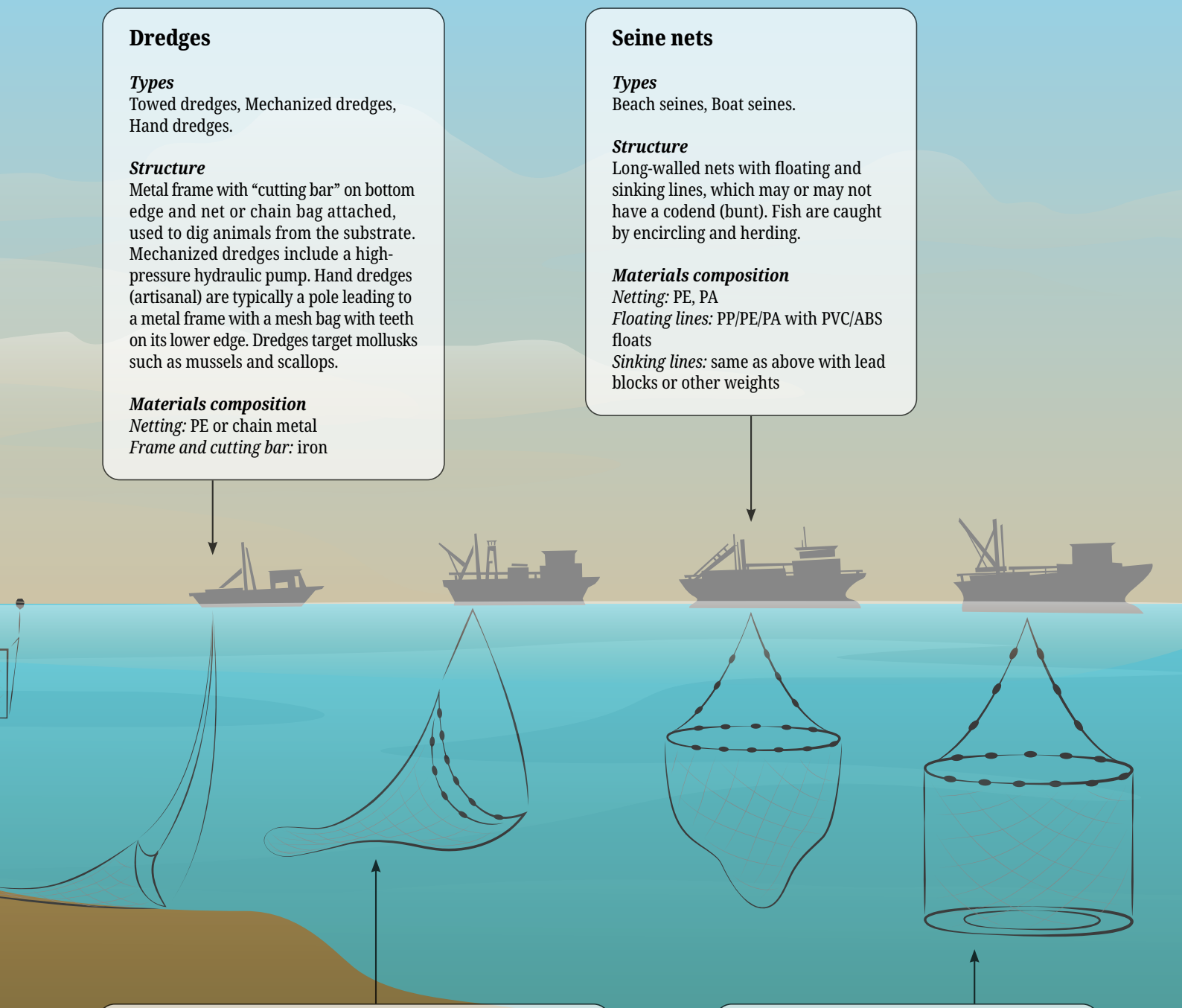
Materials composition
Netting: woven polymer fibres, typically PE.
Float and sink lines: PP/PA with PVC/EVA floats and lead sinkers
T-frames or beams: "plastic" or steel pipes, or natural materials (e.g. wood, bamboo)
Buoys: PVC/PUR/vinyl
Anchor: iron
Pot: PVC coated wire, wood, PE netting
Rope: PP

Hooks and lines

Types
Hand-operated pole and line, Mechanized pole and line, Longlines (set and drift), Trolling lines, Vertical lines.

Structure
Baited or unbaited hooks that can include a main line, branch lines, hooks, lures, floats and sinkers. The design of the hook is tailored to the fish's mouth, behaviour, and fishing technique, and may be barbed or barbless.

Materials composition
Main lines and branch line: PP/PA multifilament, PA monofilament
Hooks: steel
Lures: metal, PVC, rubber
Floats: PVC
Sinkers: lead



Dredges

Types
Towed dredges, Mechanized dredges, Hand dredges.

Structure
Metal frame with "cutting bar" on bottom edge and net or chain bag attached, used to dig animals from the substrate. Mechanized dredges include a high-pressure hydraulic pump. Hand dredges (artisanal) are typically a pole leading to a metal frame with a mesh bag with teeth on its lower edge. Dredges target mollusks such as mussels and scallops.

Materials composition
Netting: PE or chain metal
Frame and cutting bar: iron

Seine nets

Types
Beach seines, Boat seines.

Structure
Long-walled nets with floating and sinking lines, which may or may not have a codend (bunt). Fish are caught by encircling and herding.

Materials composition
Netting: PE, PA
Floating lines: PP/PE/PA with PVC/ABS floats
Sinking lines: same as above with lead blocks or other weights

Trawls

Types
Beam trawls, Bottom trawls, Mid-water trawls

Structure
Cone-shaped nets with a codend (bunt), float (head) line, sinking (footrope) line, bridle/sweep lines, and warp for towing, with or without otter boards. Trawls can be towed by one or two boats, and their versatility allows for the capture of various species.

Materials composition
Netting: woven polymer fibres of PA/nylon, PE, (occasionally UHMWPE)
Lines: PP/PA/UHMWPE
Sinking lines: same as above with rubber, ABS or metal blocks
Otter boards: steel, wood
Beam: metal, wood, bamboo

Surrounding nets

Types
Purse seines, Surrounding nets

Structure
A bag or "purse"-shaped net with a codend, bunt or "harvest" section that encircles a school of fish. The edges are defined by a purse line with a purse string, a float line with floats, a sinker line, and a pulling line.

Materials composition
Netting: woven polymer fibres, e.g. PA/nylon, PES
Lines: polymer fibres, e.g. PP, PE, UHMWPE, PA
Floats: PVC, EVA
Sinkers: lead
Purse rings: iron or brass

3. SURVEY ON FISHING GEAR TYPES IN THE ARCTIC

3.1 METHODOLOGY AND DATA GATHERING

To understand the gear types used by fishing vessels in the Arctic, a template with specific questions was sent to representatives of six of the eight Arctic States (Canada, Russia, USA, Iceland, Norway and Kingdom of Denmark with information requested from the Greenlandic and Faroese EEZ), and five of them submitted responses. The Baltic Sea is considered out of scope for this project. The aim of the template was to understand the gear types used by fishing vessels in the Arctic in 2021.

The Arctic States were asked to answer the following five questions in addition to filling in the table below on the types of gear that fishing vessels used in their respective EEZ in 2021.

1. How many unique vessels operated in your country's Arctic EEZ in 2021?

2. What vessels are included in the above number?

3. How many were fishing vessels?

4. How many fishing vessels were from your country?

5. Location of fishing and species permitted

Furthermore, each Arctic State was asked to submit information on the number of vessels using particular types of fishing gear based on the FAO gear type classification noting that some submissions provided number of landings instead. Arctic States were also asked to fill in as multiple entries if a vessel used more than one type of gear. For example, if one vessel used both dredges and lift nets, it would count twice. The table below summarizes these submissions which represents a combination of number of vessels and landings with further details on each Arctic State's submission provided in Chapter 3.3.

Table 2: Number of vessels using particular fishing gear in Arctic State's EEZ in 2021.

Type of fishing gear	Canada	Faroe Islands	Greenland	Iceland	Norway	USA
Dredges	–	–	1	2	1	–
Falling Gear	–	–	–	–	–	–
Gillnets and Entangling Nets	15	3	206	107	2383	–
Hooks and Lines	–	336	224	335	2425	198
Lift Nets	–	–		–	–	–
Seine nets	–	–		37	352	–
Surrounding nets (e.g. purse seines)	–	–	2	19	464	–
Traps (e.g. pots)	–	4	99	–	2375	285
Trawls	13	105	46	98	613	647
Other	–	–	8	–	66	–
Total	**28**	**449**	**585**	**618**	**8679**	**1130**

Table 3: Data gathering review.

Arctic state	Response by
Canada	Fisheries and Oceans Canada (DFO)
Greenland	Greenland Fisheries and Hunting Control Authority
Faroe Islands	The Faroe Islands Fisheries Inspection
Iceland	Marine and Freshwater Institute
Norway	The Norwegian Directorate of Fisheries
USA	NOAA Fisheries: NMFS Alaska Regional Office, Sustainable Fisheries Division

3.2 DATA ANALYSIS

Although every effort was made to collect similar information on vessel movements and the management of ALDFG in each Arctic State, differences in national reporting requirements and the level of details, mean that the information submitted is not consistent across jurisdictions and lack a common or consistent data on fishing efforts, gear, and practices. Below is a summary of each Arctic States' response. Recognizing the differences in reporting, no attempt is being made here to analyse and compare data across Arctic States.

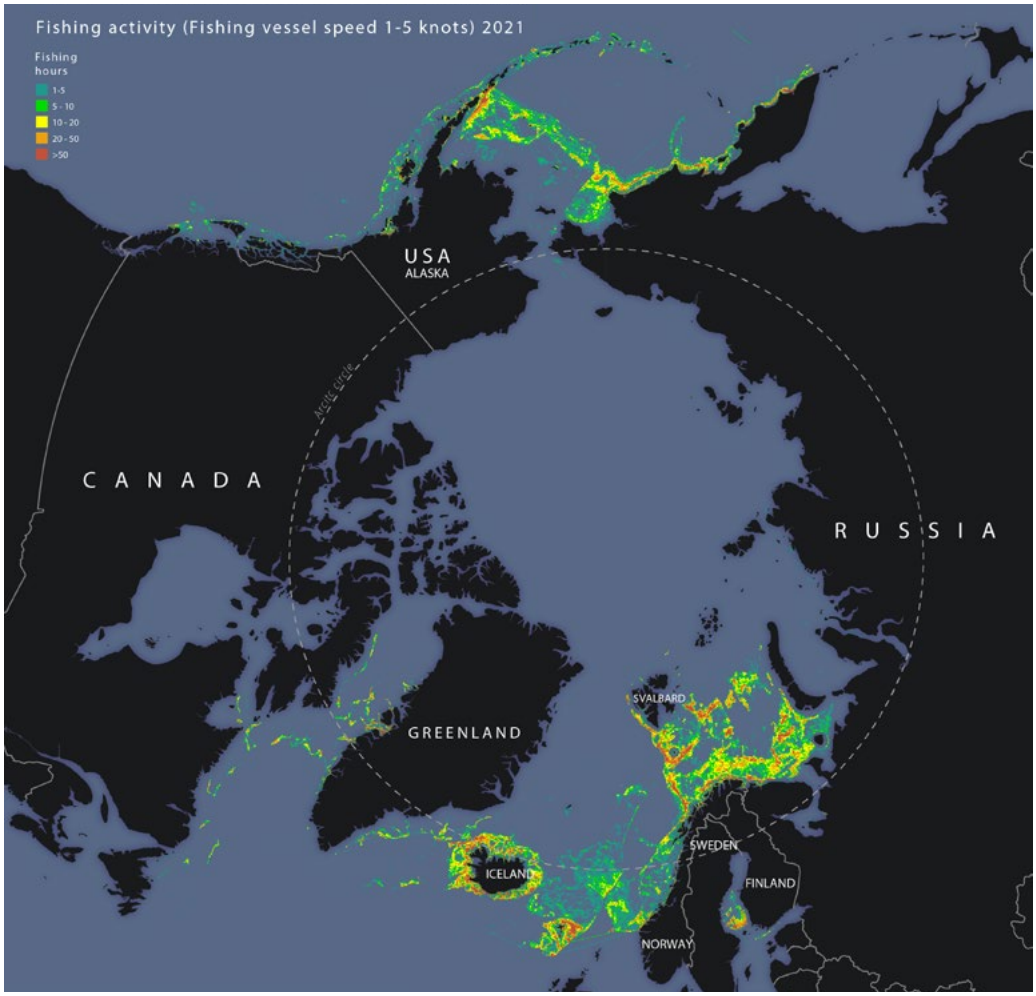


Figure 4: Overall fishing activity in 2021.

3.2.1 CANADA

There were 215 unique vessels that operated in Canada Arctic EEZ (north of 60 degrees north) in 2021. Forty (18.6%) were fishing vessels, with 28 being Canadian-flagged and 12 being foreign-flagged. Of the 12 foreign vessels, six were identified as "trawlers", five as "fishing vessels", and one as a "fishery research vessel". Only gill- and entangling nets, and trawls were used by the fishing vessels.

According to the ASTD data, fishing vessels mostly operated in the Labrador Sea, alongside Davis Strait and towards Baffin Bay. Limited fishing vessel traffic is in Hudson Bay and none in the Northwestern Territories, the Arctic Ocean, or the Beaufort Sea.

According to Fisheries and Oceans Canada, the dates of the season for Greenland Halibut in NAFO Subarea 0 (Divisions 0A and 0B) area is from January 1 to December 31 (decision pertaining to 2023 fishing season); but the dates are subject to change. For the 2023 fishing season, the Minister has decided to decrease the TACs by 9.25% in NAFO Divisions 0A and 0B at 8,704.99 tonnes and 7,797.51 tonnes respectively.[27]

Canada submitted the following map with locations of fishing and species permitted (Figures 5): one for the Northwest Atlantic Fisheries Organization (NAFO) Divisions 0A and 0B (Greenland halibut fishery and one for Shrimp Fishing Areas (shrimp fishery).

Table 4: Number of ships in Canadian Arctic EEZ (north of 60 degrees north) in 2021.

Ship Types	Number of unique ships	% of total	Km travelled	% of total
Cargo	18	8,4%	191,855	17.5%
Container	1	0,5 %	10,353	0.9%
Dry bulk	40	18,6%	146,437	13.4%
Fishing	40	18,6%	325,667	29.7%
Government/research	30	14%	137,150	12.5%
Other/special ships	11	5,1%	15,376	1.4%
Passenger (cruise)	1	0,5%	1,563	0.1%
Pleasure vessels	19	8,8%	2,439	0.2%
Tanker	13	6%	137,170	12.5%
Tugs	42	19,5%	127,347	11.6%
Total	**215**	**100%**	**1,095,357**	**100%**

Table 5: Fishing vessels in Canadian Arctic EEZ in 2021.

Flag	Number of unique ships	% of total	Km travelled	% of total
Canada	28	70%	325,375	99.9%
Foreign	12	30%	293	0.1%
Total	**40**	**100%**	**325,667**	**100%**

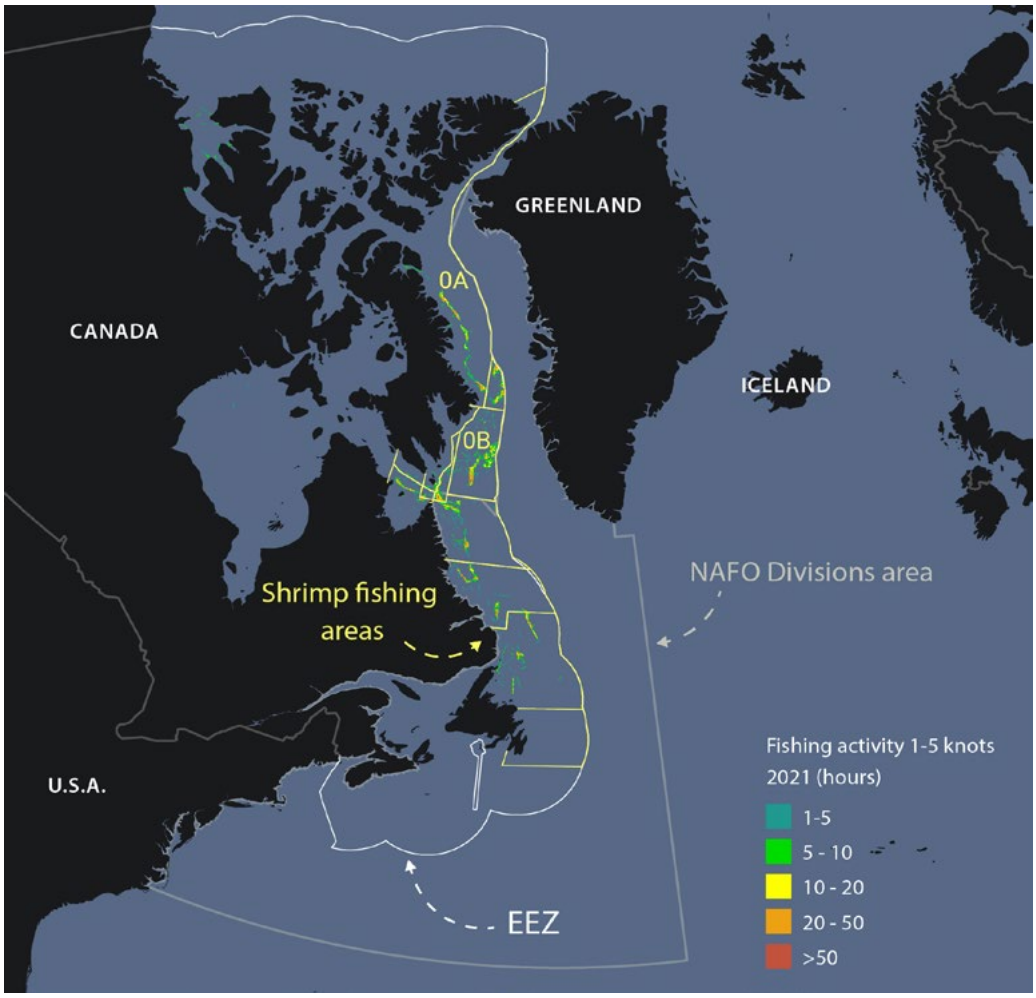


Figure 5: Overall fishing activity in Canada's EEZ in 2021.

Table 6: Gear types in Canadian Arctic EEZ in 2021.

Type of Gear	**Number of ships**
Dredges	–
Falling Gear	–
Gillnets and Entangling Nets	15
Hooks and Lines	–
Lift Nets	–
Seine nets	–
Surrounding nets (e.g. purse seines)	–
Traps (e.g. pots)	–
Trawls	13
Other	–
Total	**28**

3.2.2 FAROE ISLANDS

There were 449 unique vessels that operated in the Faroese EEZ in 2021. This includes 314 smaller vessels, below 15GT and not required to send VMS position messages to the Faroese Fisheries inspection, and several fishing vessels not engaged in fishing, but rather fishing operations, such as fish carrying etc.

Included in the 449 unique vessels are all Faroese fishing vessels above 15 GRT (Gross Register Tonnage), all licensed boats below 15 GRT licensed to fish in Faroese EEZ and all foreign fishing vessel that sent a VMS position message to the Faroese Fisheries inspection.

Here "fishing vessel" means any vessel equipped for, intended for, or engaged in fishing activities, including fish processing, transshipment or any other activity in preparation for or related to fishing activities, including experimental or exploratory fishing activities.

In the Faroe Islands EEZ there are four species controlled by quota: Atlantic mackerel, Atlantic herring, Blue whiting and Silver smelt (Argentina silus). The rest of the fishing effort is regulated by fishing days.

The special area south of the Faroe Islands (Figure 6, marked in green) are only open to vessels licensed by the Faroe Islands or United Kingdom. Faroe Islands also has a special agreement with Iceland for fishing in the area marked in green to the east (Figure 6).

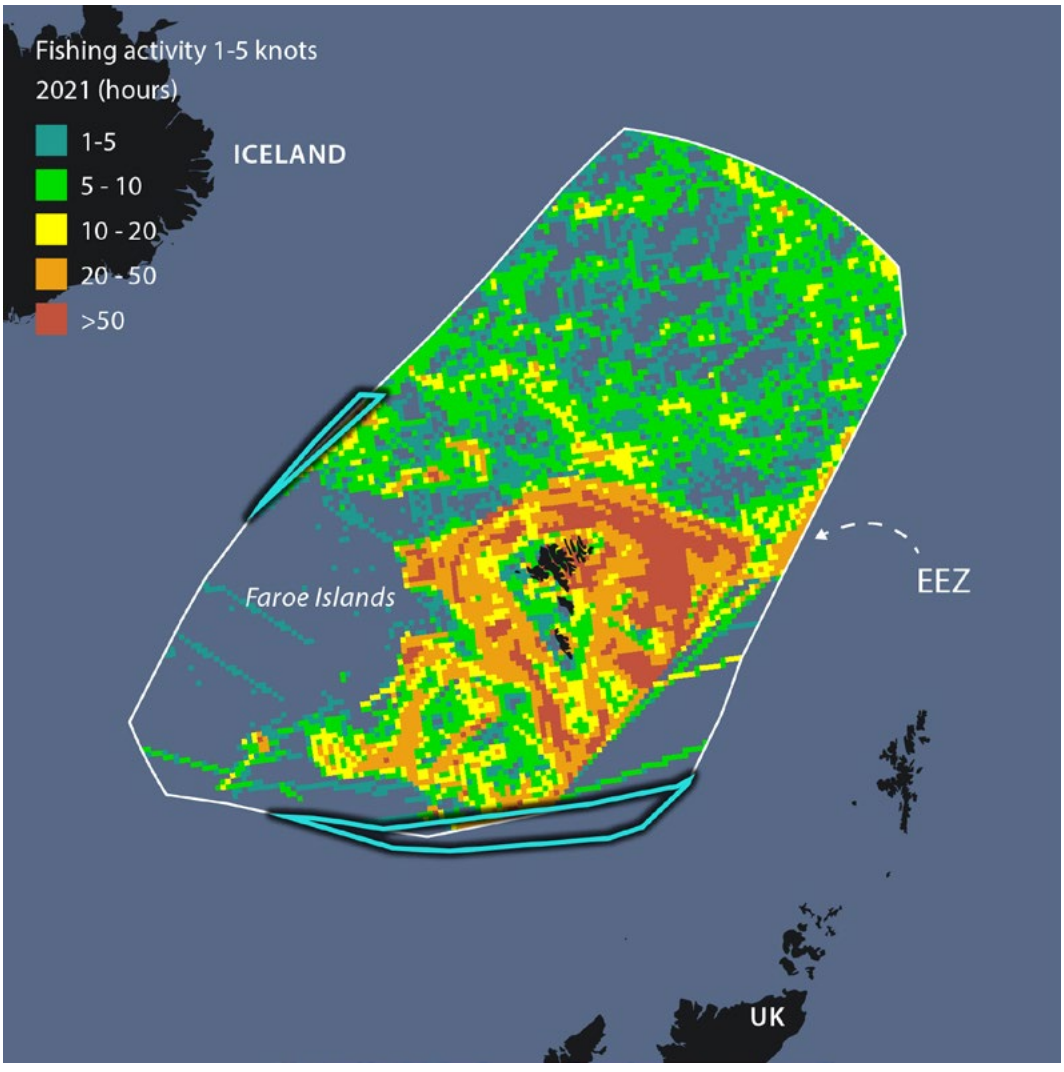


Figure 6: Overall fishing activity in the EEZ around the Faroe Islands in 2021.

Table 7: Fishing vessels in Faroe Islands EEZ in 2021.

Fishing vessel type	Number of ships
Shellfisher	1
Prawn vessel	1
Netting vessel	3
Factory trawler	4
Lobster boat	4
15-110 BRT	15
Long liner	17
Purse seiner/Trawl	18
Pair trawler	26
Fish carriers	265
Below 15 BRT	314
Total	**449**

Included are all Faroese fishing vessels above 15 GRT, all licensed boats below 15 GRT licensed to fish in Faroese EEZ and all foreign fishing vessel that sent a VMS position message to the Faroese Fisheries inspection. This data excludes several fishing vessels not engaged in fishing, rather fishing operations, such as fish carrying etc.

Table 8: Gear types in Faroe Islands EEZ in 2021.

Type of gear	Number of ships
Falling Gear	0
Lift Nets	0
Seines (e.g. Danish seines)	0
Surrounding nets (e.g. purse seines)	0
Gillnets and Entangling Nets	3
Traps (e.g. pots)	4
Trawls	105
Hooks and Lines	336
Total	**449**

This table only reviews the Faroese flagged vessels.

3.2.3 GREENLAND

ASTD data show that for 2021, there were 241 unique ships in the EEZ, 108 being fishing vessels (45%). These numbers exclude smaller fishing vessels operating mainly inshore, who do not require AIS Class A transponders, only Class B.

For areas where fishing is allowed, Greenland submitted a table, listing where certain gear types are allowed to catch which species. For example, fishing with purse seines is allowed in East Greenland for Capelin. Fishing for Greenland halibut, shrimps and cod in the offshore fisheries is mainly with bottom trawl.

Greenland also submitted the following map showing major fishing areas and main species per area.

Greenland submitted a list of 186 vessels as an overview of which ships are allowed to fish in Greenlandic waters. The list excludes almost 2000 smaller vessels and open boats, around 6 meters in length and under, who only engage in inshore fisheries. Greenland estimates that the fleet of small open boats will often alternate between gillnets and longlines during the fishing season.

In addition to providing a list of vessels, Greenland also submitted a list of gear types used in 2021. As many of the vessels are capable of using more than one gear type, the total number of gear types used does not match the number of vessels.

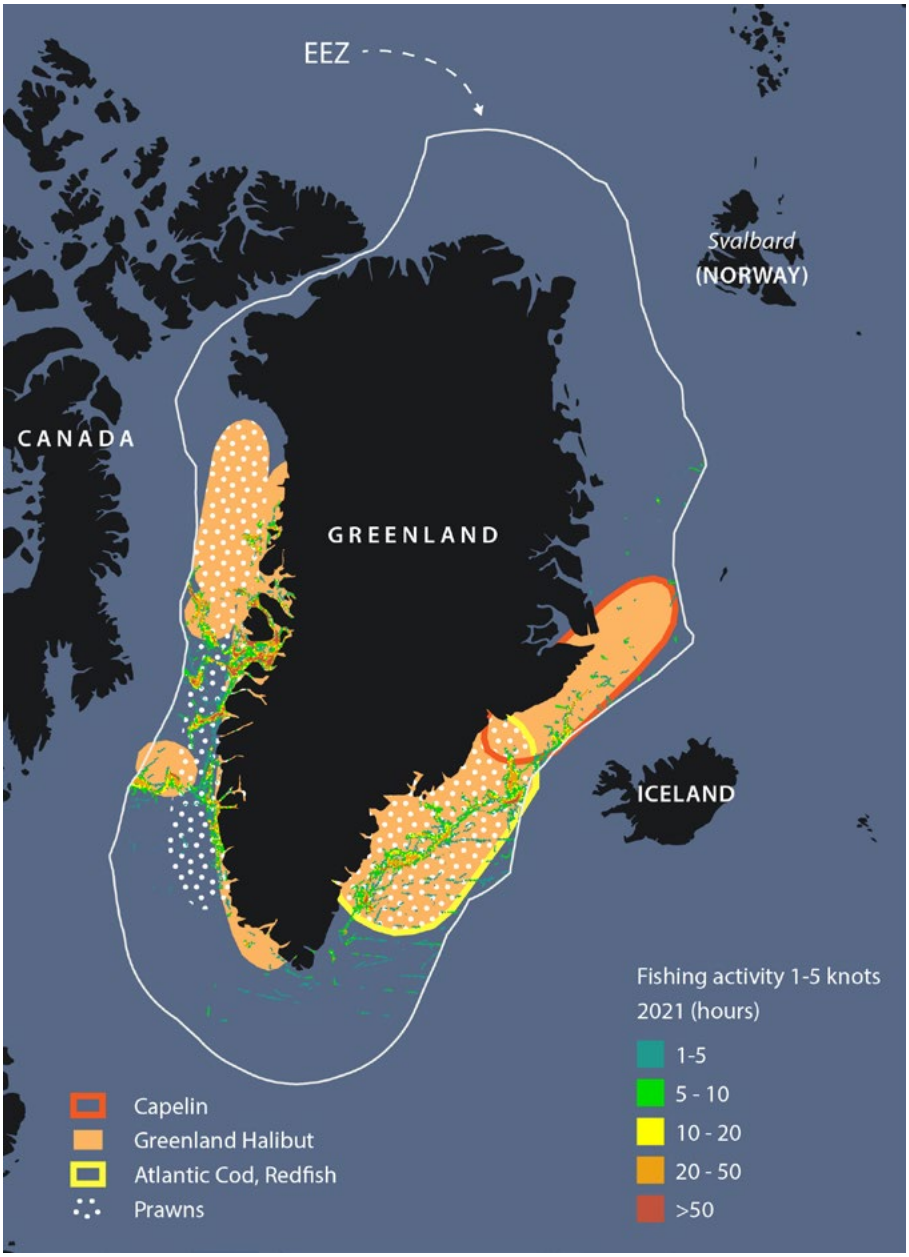


Figure 7: Overall fishing activity in Greenland's EEZ in 2021.

Table 9: Gear types allowed in Greenland to the species on the map above.

Gear type	Area	Species
Bottom otter trawls	Dohrn Bank	Atlantic cod
	East Greenland	Greenland halibut
	Greenland, RED-demersal management area	Redfish
	Iceland	Capelin
	North West Greenland	Greenland halibut
	South West Greenland	Greenland halibut
	Southwest and Southeast Greenland	Atlantic cod
	Upernavik, Uummannaq, Diskobay	Greenland halibut
	West and East Greenland	Atlantic cod
	West Greenland	Capelin
	West Greenland	Prawn
	West and East Greenland	Atlantic cod
Covered pots	Greenland outside Upernavik, Uummannaq, Diskobay	Greenland halibut
Drift gillnets	Greenland outside Upernavik, Uummannaq, Diskobay	Greenland halibut
Gill nets	Upernavik, Uummannaq, Diskobay	Greenland halibut
	West and East Greenland	Atlantic cod
	West Greenland	Redfish
	West Greenland	Capelin
Handlines and polelines	Greenland outside Upernavik, Uummannaq, Diskobay	Greenland halibut
	Upernavik, Uummannaq, Diskobay	Greenland halibut
	West and East Greenland	Atlantic cod
	West Greenland	Redfish
Longlines (not specified)	Greenland outside Upernavik, Uummannaq, Diskobay	Greenland halibut
	Upernavik, Uummannaq, Diskobay	Greenland halibut
	West and East Greenland	Atlantic cod
	West Greenland	Redfish
	West Greenland	Capelin

Table 9 (continued)

Gear type	Area	Species
Midwater otter trawls	East Greenland	Capelin
	Iceland	Capelin
	West and East Greenland	Atlantic cod
	West Greenland	Capelin
Miscellaneous gears/Hand brailer	Greenland outside Upernavik, Uummannaq, Diskobay	Greenland halibut
	Upernavik, Uummannaq, Diskobay	Greenland halibut
	West and East Greenland	Atlantic cod
	West Greenland	Redfish
	West Greenland	Capelin
Pound Net	West and East Greenland	Atlantic cod
	West Greenland	Capelin
Set gillnets	Greenland outside Upernavik, Uummannaq, Diskobay	Greenland halibut
	Upernavik, Uummannaq, Diskobay	Greenland halibut
	West and East Greenland	Atlantic cod
	West Greenland	Capelin
	West Greenland	Redfish
With purse lines seines	West Greenland	Capelin

Table 10: Gear types in Greenland in EEZ 2021.

Gear type	Number of gear types
Bottom otter trawls	37
Covered pots	31
Drift gillnets	1
Gill nets	162
Handlines and polelines	31
Longlines (not specified)	193
Midwater otter trawls	9
Miscellaneous gears/Hand brailer	8
Pound Net	68
Set gillnets	43
With purse lines	2
Total	**585**

3.2.4 ICELAND

A vast majority of fishing in the Icelandic EEZ is conducted by Icelandic companies and vessels. Bilateral agreements with Greenland, Faroe Island and Norway are also in place with around 50 foreign vessels fishing each year. Iceland reports around 1650 ships fishing in the EEZ in 2021, over half of them are <10m in length and operate close to shore.

Use of fishing gear is dependent on the season and the area in question.

Iceland reported 618 >10 m fishing vessels for 2021, noting that many of them used more than one type of gear, sometimes as many as three types. The numbers are based on ships that landed in Iceland, excluded are therefore vessels in the EEZ that did not land in an Icelandic port. The number does not represent the number of ships, rather each type of gear when it landed. Certain areas in the Icelandic EEZ are subject to bans depending on the fishing gear, and the season. Some areas are closed due to spawning seasons. These areas are shown on the map below.

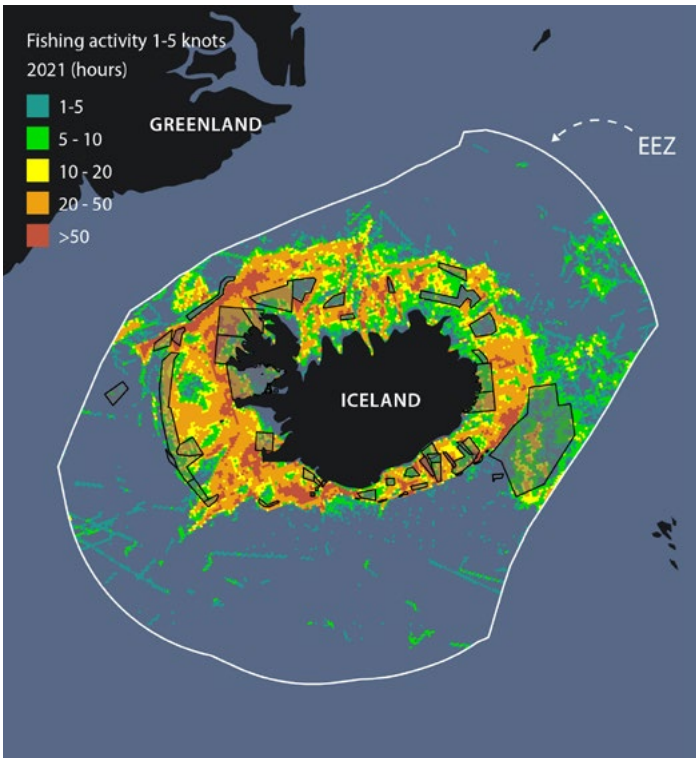


Figure 8: Overall fishing activity in Iceland's EEZ in 2021.

Table 11: Number of fishing vessels using assigned gear types.

Gear type	Number of ships (based on landings)
Dredges	2
Falling Gear	0
Gillnets and Entangling Nets	107
Hooks and Lines	355
Lift Nets	0
Seines (e.g. Danish seines)	37
Surrounding nets (e.g. purse seines)	19
Traps (e.g. pots)	0
Trawls	98
Total	**618**

This table reviews ships landing in Icelandic ports.

3.2.5 NORWAY

Norway's data comes from three zones; the Exclusive Economic zone (NOR), the Fisheries Zone around Jan Mayen (XJM) and the Fisheries Protection Zone around Svalbard (XSV).

Norwegian vessels are normally licensed to fish in all waters under Norwegian fisheries jurisdiction. Regulations introduce some separate licenses in areas north and south of 62° N. All vessels have to comply with specific regulations established to protect vulnerable marine ecosystems (VMEs), juvenile fish, or in areas close to the coast reserved for smaller vessels and different gears. Vessels also have to comply with safety regulations established by the maritime authorities as to where they are certified to operate, meaning that their size steers how far from the coast they can operate.

The consequence of the Norwegian regulatory system is that the vessels may within the limitations described above choose where to fish and which gear to use. The presence of the allowed species thus guides where fishing takes place.

The numbers in the table to the right are from different data sources. Data on Norwegian vessels come from Norway's sales notes database. Norwegian (and third country) fishing vessels that land catch in Norway, and Norwegian vessels fishing in Norway's EEZ are covered in the sales notes database. In this database each landing is recorded and the gear used during the fishing trip is included. Many vessels use different gear during the different fishing seasons, and they may thus appear more than once in the database and in the table.

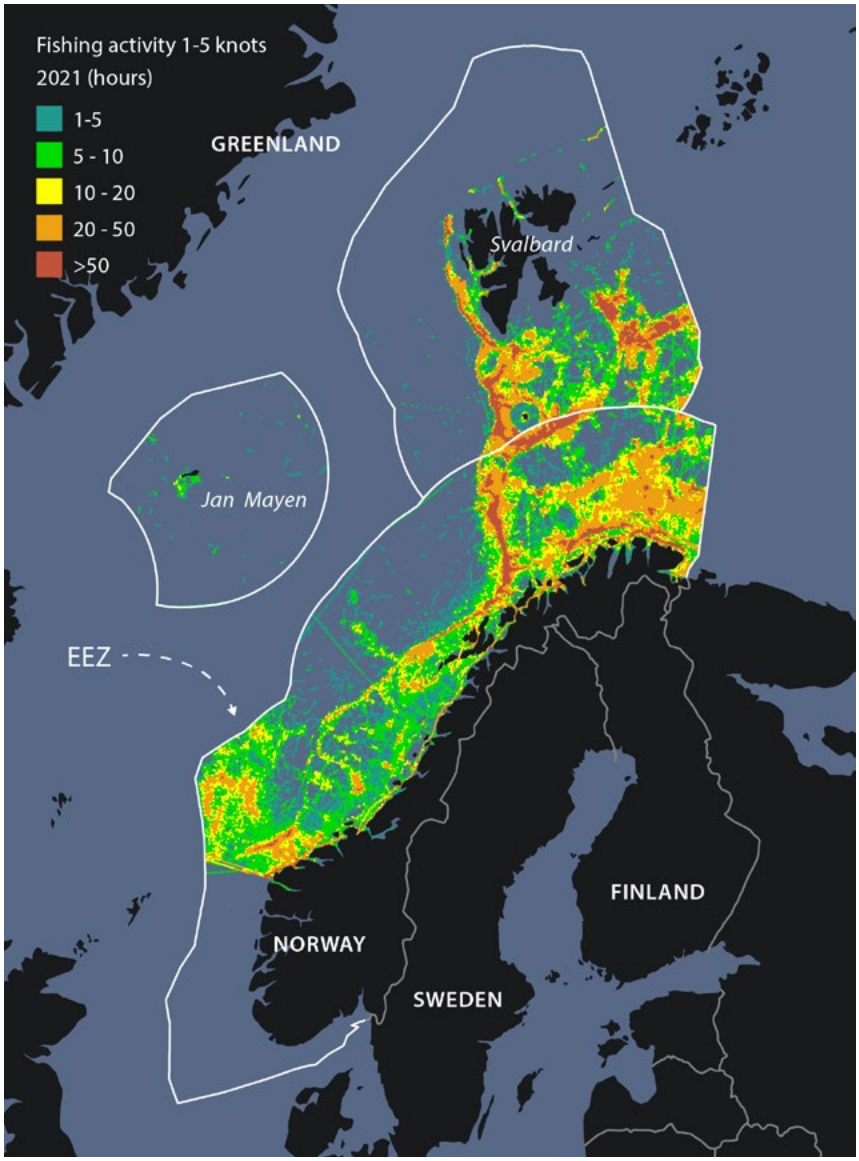


Figure 9: Overall fishing activity in Norway's EEZ in 2021.

Third country fishing vessels fishing in Norway's EEZ may land their catches outside Norway and the sales notes database therefore do not provide a full overview of these. Instead, Norway used Electronic Reporting Systems (ERS) for data on these vessels. Russian and Greenlandic fishing vessels do not report in ERS and these were added to the overview manually. The different sources give the following total number of fishing vessels in the three zones (Table 12 below). Most Norwegian fishing vessels are counted as multipurpose vessels, meaning one fishing vessel use several different fishing gears throughout one year.

Table 12: Type and number of vessels in Norway.

Vessel type	NOR	XJM	XSV	Total
Fishing vessels*	4969	4	83	5056
Rental/Replacement vessels	138		7	145
Co-fishing vessels	305			305
Pair trawl-vessels	1			1
Education vessels	3			3
Algae-trawlers	14			14
Recreational vessels	293		1	294
Total	**5723**	**4**	**91**	**5818**

*Many Norwegian fishing vessels are counted as multipurpose vessels, meaning one fishing vessel use several different fishing gears throughout one year.

Table 13: Number of fishing vessels using assigned gear types.

Vessel type	Norwegian vessels*	Foreign vessels**	Total
Dredges	1	–	1
Falling Gear	–	–	0
Gillnets and Entangling Nets	2372	11	2383
Hooks and Lines	2424	1	2425
Lift Nets	–	–	0
Seines (e.g. Danish seines)	333	19	352
Surrounding nets (e.g. purse seines)	462	2	464
Traps (e.g. pots)	2375	–	2375
Trawls	371	242	613
Harpoon/canon (whaling)	13	–	13
Others	53	–	53
Total	**8404**	**275**	**8679**

*Source: Norwegian sales notes data
**ERS-data from international fishing vessels. Russian and Greenlandic fishing vessels are not included in this table.

3.2.6 UNITED STATES

The United States reported numbers for the definition of the "Arctic" as established by the US Arctic Research and Policy Act of 1984 where Arctic waters off Alaska include US waters of: 1) Aleutian Islands, 2) Bering Sea, 3) Chukchi Sea, and 4) Beaufort Sea.

In 2021, there were 6,913 unique vessels, as identified by AIS tracking, that operated in the US Arctic as defined in the map (Figure 10). Of these, 2,764 were US vessels and 4,149 were non-US vessels. In 2021, there were 303 fishing vessels that participated in fishing activity in the EEZ of the Bering Sea and Aleutian Islands.[28]

These numbers exclude commercial fishing vessels participating in fisheries in state waters, 0-3 nm from shore.

There are 3 fishery management plans (FMPs) that govern commercial fishing in these waters:

- The Fishery Management Plan for Fish Resources of the Arctic Management Area (Arctic FMP) governs commercial fisheries of fish resources in US waters of the Chukchi Sea and Beaufort Sea. The Arctic FMP currently prohibits all commercial fishing.
- The Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands Management Area (BSAI FMP) governs groundfish fisheries of the Bering Sea and Aleutian Islands Management Area (BSAI). The FMP management area is the US EEZ of the Bering Sea and that portion of the North Pacific Ocean adjacent to the Aleutian Islands which is between 170E W. longitude and the U.S.-Russian

Table 14: BSAI Area in 2021.

Area	Hook and line	Pot	Trawl	Total
508	1	0	0	1
509	2	25	124	151
512	0	18	0	18
513	15	6	50	71
514	8	5	28	41
516	0	6	75	81
517	17	40	114	171
518	22	12	4	38
519	12	17	64	93
521	27	66	97	190
523	12	10	30	52
524	34	56	19	109
541	26	16	19	61
542	15	5	13	33
543	7	3	10	20
Total	**198**	**285**	**647**	**1130**

Convention Line of 1867. These areas are defined in Federal Regulations at: Figure 1 to Part 679. Targeted species include Pacific Halibut and those groundfish listed in Table 2a to Part 679. Pacific halibut may be harvested by hook and line or pot gear. Groundfish may be harvested by hook and line, pot, and trawl gear.

- The Fishery Management Plan for Bering Sea/Aleutian Islands King and Tanner Crabs establishes a State/Federal cooperative management regime that defers crab management to the State of Alaska with Federal oversight. The commercial fisheries for crab species are identified in Federal Regulations Table 1 to Part 680. Crab may only be harvested with pot gear.

The Chukchi Sea and Beaufort Sea are in the Arctic Fishery Management Area (the Arctic FMP). The Arctic FMP governs commercial fisheries of fish resources in US waters of the Chukchi Sea and Beaufort Sea and currently prohibits all commercial fishing.

The Fishery Management Area for the Aleutian Islands and Bering Sea (commonly referred to as the "BSAI") is the US EEZ of the Bering Sea and that portion of the North Pacific Ocean adjacent to the Aleutian Islands which is between 170E W. longitude and the U.S.-Russian Convention Line of 1867. These areas are defined in Federal Regulations at: Figure 1 to Part 679.

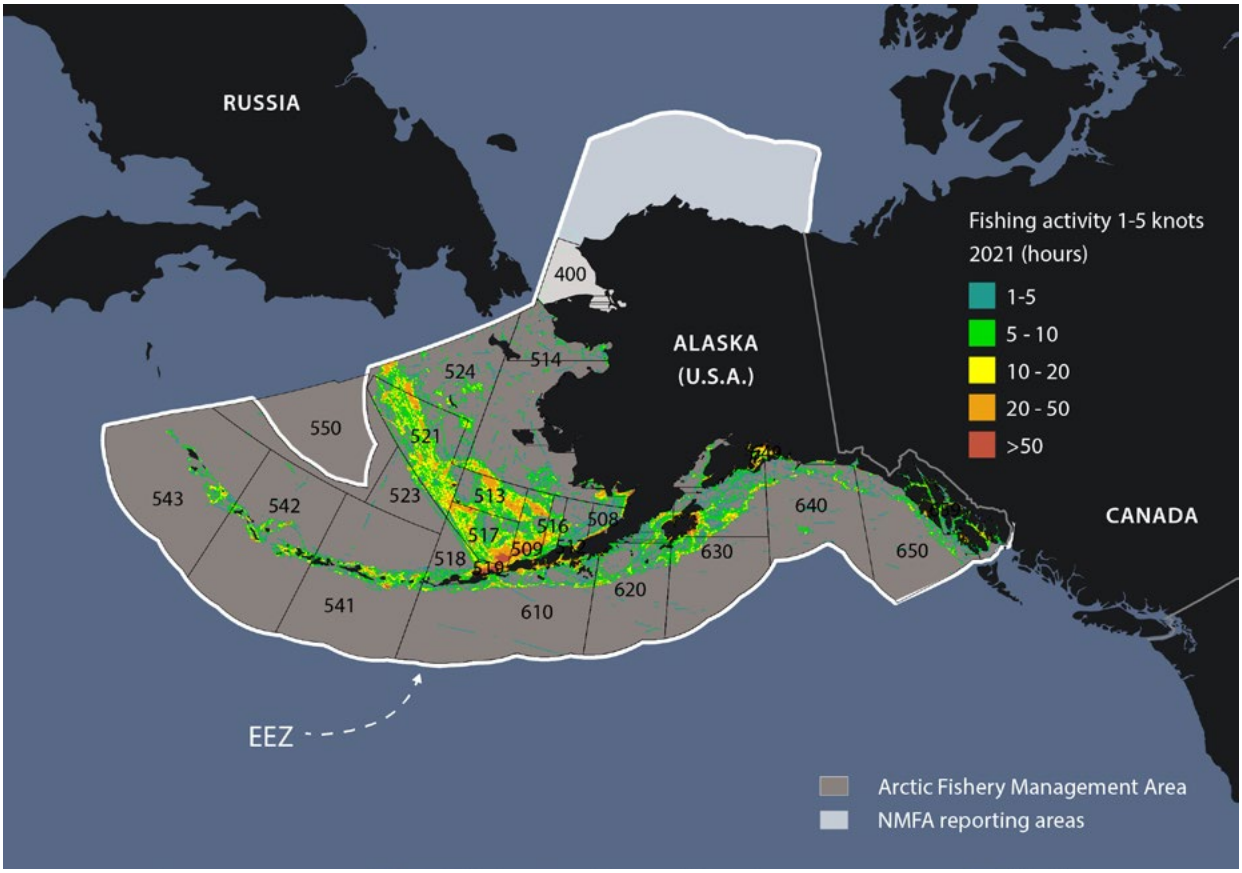


Figure 10: Overall fishing activity in US Arctic.

3.3 SUMMARY OF ANALYSIS ON FISHERIES AND GEAR TYPES DATA

As mentioned, there is a lack of consistent data on fisheries in the different Arctic States. The differences in national reporting requirements, level of detail in reports and jurisdiction/practice in terms of data sharing hindered the possibility for direct comparison across the Arctic. Figure 11 shows a summary of the reported use of different fishing gear types in the Arctic, with hooks and lines, gillnets and entangling nets, and traps/pots being the predominant, followed by trawls.

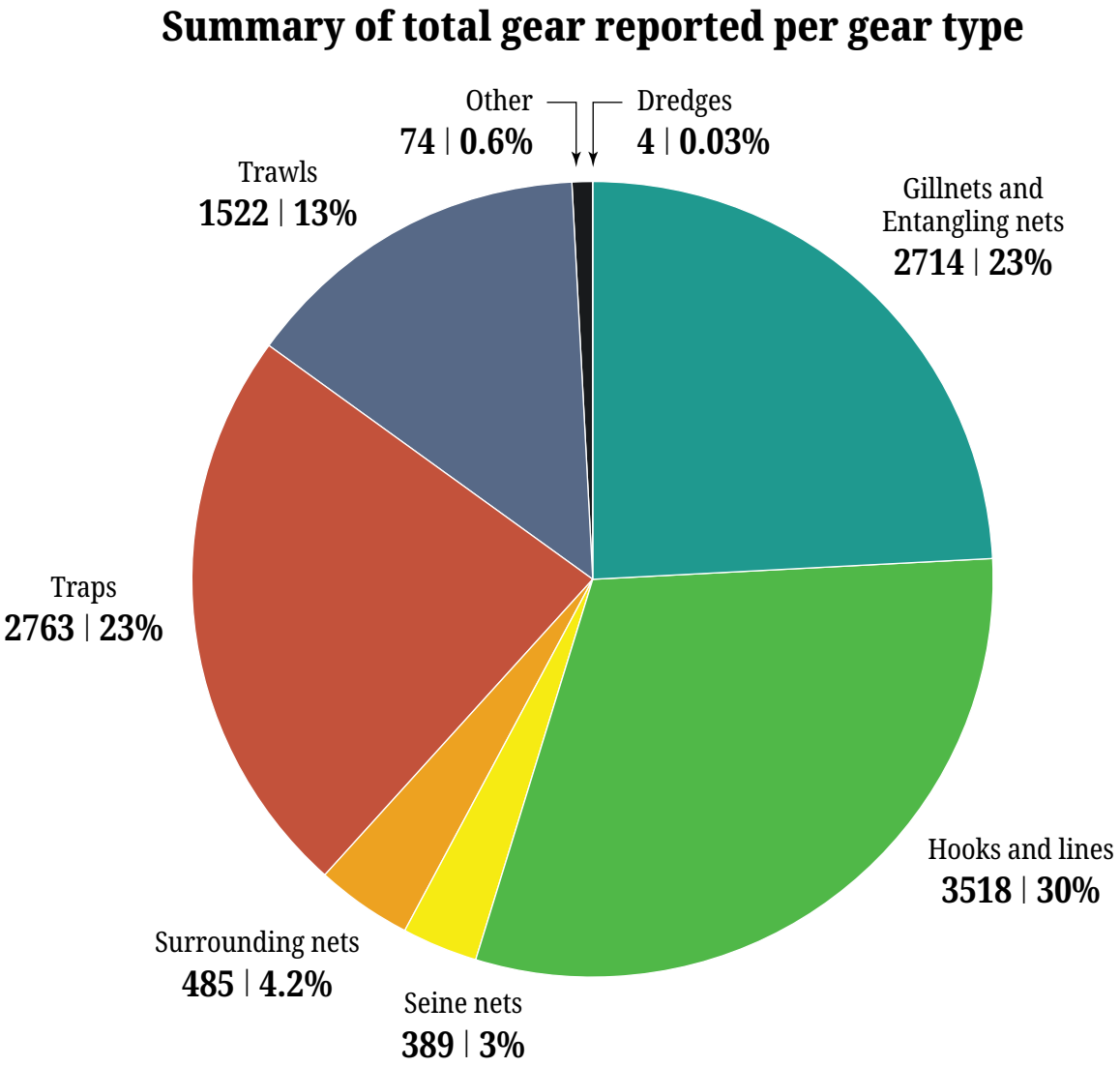


Figure 11: Summary of total gear reported per gear type.

4. ARCTIC STATES APPROACHES IN MITIGATING ALDFGS

Arctic States management, monitoring, and response efforts for ALDFG involve a combination of prevention, retrieval, and regulation. Management efforts include mandatory gear marking, reporting lost gear, and promoting the use of biodegradable materials to reduce long-term environmental impacts. Monitoring focuses on tracking fishing activities and the areas most affected by ALDFG, with some nations conducting gear retrieval surveys. Response effort involve public awareness campaigns, clean-up programs, and international collaboration under frameworks like the Arctic Council's Regional Action Plan on Marine Litter in the Arctic (ML-RAP) and FAO guidelines, aiming to reduce ALDFG and its impact on marine ecosystems.

Below are examples of Arctic States' approaches in managing ALDFG's in their waters.

4.1 CANADA

In 2019, the Department of Fisheries and Oceans Canada (DFO) launched the Ghost Gear Program (GGP) to address the growing issue of ghost gear in our oceans. The program follows the Government of Canada's commitments to support National and International efforts to address ghost fishing and to support the global fight to reduce marine litter from fishing activities by taking measurable actions and becoming a global leader in the management of this issue.

Domestic commitments include the Government of Canada's Zero Plastic Waste Agenda, which was initiated in 2019 under the Federal Leadership Toward Zero Plastic Waste initiative and renewed in 2022 under the Funding for Advancing a Circular Plastics Economy for Canada initiative. On the international stage, Canada has committed to the G7 Ocean Plastics Charter and the Global Ghost Gear Initiative, both of which were signed in 2018. Canada continues to demonstrate international leadership on ghost gear through engagement with the RFMOs. Currently, as part of the ongoing Intergovernmental Negotiating Committee's process to develop an international legally binding instrument on plastic pollution, Canada is strongly advocating for the inclusion of ghost gear as well as proper management, marking and responsible disposal of fishing gear.

In 2020, Canada implemented mandatory lost gear reporting for all commercial fisheries. Harvesters are required to report details of lost gear (such as gear type, amount of gear, location of gear loss, date, etc.) to the Department of Fisheries and Oceans Canada (DFO). This reporting is critical to understanding the amount of gear lost in Canada and the subsequent impacts on marine ecosystems and the environment. This reporting is an integral component of the sustainable management of Canadian fisheries, and as such, it is an enforceable requirement of commercial license conditions. Failure to report lost gear is subject to charges under Canada's Fisheries Act. To support these requirements, the DFO developed the Fishing Gear Reporting System (FGRS), a user-friendly application for harvesters to report lost and retrieved fishing gear. The FGRS has yielded data that can be used to create hotspot maps, which in turn inform retrieval operations and inform future fisheries management decisions, such as areas to avoid due to high levels of gear loss, or potential modifications to the gear to be made in the future with a view to reducing loss. Since January 2020, over 20,000 lost gear reports have been submitted reporting: 77,902 units of gear, 916 km of rope, 38 km of nets, 42 km of longline and 3 km of trawl.

In 2022, Canada became the first country to share its lost gear reporting data with the Global Ghost Gear Initiative's global data portal. This portal is the world's largest freely available repository of ghost gear data. The Global Ghost Gear Initiative incorporates this data into its research, removal projects, and strategic recommendations for how to address ghost gear.

Finding Solutions: Ghost Gear Fund (Canada)

In 2020, as part of the Ghost Gear Program, the Ghost Gear Fund (GGF) was launched to assist harvesters, environmental groups, Indigenous communities, the aquaculture industry, and coastal communities take concrete action in the fight against ghost gear. The GGF supports third-party led projects under four pillars:[29]

Ghost gear retrieval, targeting areas with high levels of reported lost gear, areas with known habitats for species at risk, and areas with higher impact lost gear (gillnets, pots, traps)

Acquisition and piloting of new technologies aimed at the prevention, reduction, and retrieval of ghost gear

Responsible disposal, including recycling of retrieved ghost gear and end-of-life fishing gear

International leadership, focusing on helping developing and small island state to mitigate the impacts of ghost gear

Between 2020 and 2024, the Ghost Gear Fund (GGF) has provided more than $58.3 M (CAD) to 143 projects with 134 in Canada and 9 internationally. Since 2020, the fund has supported the retrieval of 40,767 units of gear and 925 km of rope accounting for the removal of more than 2,400 tonnes of ghost gear from Canada's waters. The GGF has facilitated in excess of 3,470 dedicated gear retrieval trips.

The greatest number of projects funded by the GGF are in Atlantic Canada, with a smaller number on the Pacific coast.[30] While there has been a limited number of funded projects in the Canadian Arctic, DFO has identified ghost gear as a major source of marine litter in the region and is working to identify lost gear hotspots for future projects.[31]

4.2 FAROE ISLANDS

In the Faroe Islands, efforts to address marine litter involve both "Fishing for Litter" and systematic recording during scientific surveys. "Fishing for Litter," which restarted in 2017 after a pilot project in 2008, is conducted on a voluntary basis, with participation from certain ships and the ports of Leirvík and Runavík.[32] Additionally, marine litter is recorded during an ongoing groundfish survey using bottom trawls. Since 2015, dedicated seafloor mapping using video has also been conducted in various localities, noting observed litter items. In 2017, this effort expanded under the NOVASARC project, which filmed 60 localities. During this survey, only 13 litter items, all fishing lines, were recorded.[33] Three NGOs are working to combat marine litter in the Faroe Islands: Ringrás, Rudda Føroyar/Clean the Faroes (beach cleanups), and Føroya Náttúru- og Umhvørvisfelag (advocacy and campaigning).

4.3 GREENLAND

The Ministry of Nature and Environment is developing an action plan to decrease plastic use and clean up lost or abandoned fishing gear. In 2018, the Parliament of Greenland (Inatsisartut) established an Environmental Fund (Miljøfonden). The purpose of the environmental fund is to help the strengthening of a sustainable development in society with respect for human living conditions and conservation of animal and plant life. In 2022, 2 million Danish kroner were reserved for handling lost fishing nets and other marine waste, as well as maintaining fishing areas.[34]

All vessels fishing in Greenlandic waters are obliged to report lost and recovered fishing gear to Greenland Fisheries and the Hunting Control Authority. All reports are entered into a database in order to identify hot spots for annual retrieval and clean-up campaigns, especially in shore waters where it is assumed that many fishing gears are lost due to drifting ice and ice floes.

4.4 ICELAND

Since 2018, the Environment Agency of Iceland has conducted Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) beach litter monitoring on several beaches. Data from the OSPAR beach litter pollution status (2018–2020)[35] for Arctic Waters, which included only beaches from Iceland, revealed significant litter pollution on surveyed sites. The median total count of litter was 252 items/100 m, with plastic materials dominating the composition. Plastic accounted for 97% of the recorded litter, with a median of 172 items/100 m. Notably, single-use plastics (SUP) and maritime-related plastic items (SEA) contributed significantly to the pollution, with medians of 30 items/100 m (13%) and 30 items/100 m (12%), respectively.

Concurrently, the Marine and Freshwater Research Institute has been documenting visible waste brought up by bottom trawling gear during research expeditions since 2015. In the context of the Benthic Habitat Mapping project, the distribution and composition of seafloor waste were examined based on collected imagery, with discussions on potential consequences and impacts of this waste. Among the 325 transects surveyed, litter was found in 72 of them, predominantly comprised of fishing gear (94.1%), with fishing lines constituting the largest portion at 80.5%.

The distribution of fishing gear litter extended across the southern region of Iceland, with some items discovered beyond the 65° latitude, including a fishing rod, wire, and fishing line in Víkuráll. Notably, coastal areas in South Iceland, particularly Reykjaneshryggur, exhibited a high prevalence of fishing lines, with 151 items entangled among rocks and corals. These lines were colonized by sessile organisms such as ascidians, hydrozoans, bryozoans, sponges, sea anemones, and polychaete worms. Gillnets were also encountered in various locations, with Skeiðarárdjúp in 2004 having the highest concentration. These nets were frequently entangled with corals and rocks, exhibiting signs of long-term presence with attached organisms like bryozoans, hydrozoans, sea pens, and even fish. The nets caused detrimental effects to the surrounding coral areas. Notably, a net found in Skaftárdjúp harbored a diverse array of organisms, including scallops, ascidians, bryozoans, brachiopods, starfish, and feather stars.[36]

Finding Solutions: Icelandic Recycling Fund

In 2003, the Icelandic government established the Icelandic Recycling Fund which plays a significant role in promoting the circular economy, sustainable resource utilization, in reducing the generation of waste, and increasing its recycling. Through the use of economic incentives, the fund aims to reduce waste and increase reuse and recovery of a range of materials.[37] Recycling fees are collected on range of products, but fishing gear made of synthetic materials is exempted from recycling fees in accordance with an agreement between the Recycling Fund and the Fisheries of Iceland (based on an exemption clause in the Act on Recycling Fees). Further information available e.g. in the 2024 environmental report of the Fisheries of Iceland (p. 29): https://sfs-web.cdn.prismic.io/sfs-web/Z08bSZbqstJ97_fg_SFS-Environmental_Report-2024.pdf

4.5 NORWAY

The Norwegian Directorate of Fisheries has developed a national action plan to reduce marine litter from commercial and recreational fisheries and aquaculture.[38] The plan includes measures to increase awareness of marine litter, contributing to the development of new technology, supporting research into biodegradable materials for use in fisheries, and implementing regulations to reduce ghost fishing. For example, most pots and traps are now required to have biodegradable cotton thread that opens the gear after a period of time underwater, allowing trapped fish and shellfish to escape.

Fishers are also required to report lost gear to the Coast Guard. Reports must include information on the vessel, the type of gear, the time that the gear was lost, and the vessel position when gear was lost.[39] The Directorate for Fisheries uses these reports to conduct annual gear retrieval surveys. Although the survey focuses on gillnets, traps, and pots, it has also collected large amounts of lines, seines, ropes, wires and anchors.

The EU directive on plastic products, which includes extended producer responsibility for numerous plastics in fisheries, came into force in 2019. This directive makes plastics producers responsible for the costs of collecting, transporting, and treating discarded fishing equipment. In response, the Norwegian government is developing a similar regulatory requirement, aiming to implement it by December 2024.[40]

Finding Solutions: Fishing for Litter

The Fishing for Litter program, initiated in 2015 and coordinated by the research organization SALT, aims to mitigate litter in the ocean by raising awareness within the fishery sector, monitoring regional beaches for marine litter, and exploring recycling opportunities for marine debris. The program encompasses the majority of the Norwegian coast, including Svalbard, serving as a catchment area for litter collection efforts. In 2020, the participating fishing vessels predominantly utilized trawling gear, accounting for 57% of the total vessels, while autoline gear represented 16% of the gear types employed.

Analysis of the collected waste revealed that plastic rope constituted the predominant material, comprising 85.1% of the total. This category encompasses various items such as nets, trawls, traps and cuttings. Metal, particularly steel wires from trawl, constituted the second major category. The 2020 report indicated that fishery activities were the primary source of the collected marine debris, accounting for 85% of the waste. Within the fishing-related waste category, nets represented 21%, snow crab pots accounted for 19%, unidentified trawls constituted 18%, and bottom trawls made up 14%. Additionally, a significant portion of the fishery waste collected included rope and cuttings, amounting to 19%. It should be noted that certain materials collected may not be directly attributed to fishery activities and could potentially originate from aquaculture sources.[41]

Finding Solutions: Clean Nordic Oceans

The Nordic Council of Ministers established the Clean Nordic Oceans project and knowledge network in 2017 as a Norwegian Presidency project. Norway has served as the organization's leader, and Sweden and Denmark are also members of the management group. To reduce the risk of ghost fishing and marine litter from fishing gear and to encourage more recycling and reuse, the project set out to create a Nordic network for exchanging knowledge and experience. Some of the key findings in its 2020 report, and which apply to all Nordic countries, include:

- Low overview of the quantity and location of lost fishing gear in each country as few have functioning reporting systems.
- Little or no effort into removing lost fishing gear, weakening efforts for clean-up operations.
- Passive fishing gear (e.g., traps, gillnets) at significantly higher risk of being lost than active gear (e.g., trawls).
- Awareness initiatives appear to be insufficient in all countries.
- Some locations lacking reception facilities for recovered and scrapped fishing gear.
- Operational costs a barrier towards reusing and recycling recovered fishing gear.[42]

Based on the findings in the report, a number of recommendations were made to help reduce ghost fishing.[43] General measures to be taken include increasing awareness of the issues surrounding ALDFG and reviewing national legislation to determine whether additional regulations are required. Measures that can be taken on fishing vessels include improving the visibility of the position of fishing gear, marking fishing gear on the seabed, improving procedures toward residual waste from gear, simplified system to report the position of lost gear, and retrieving lost fishing gear.

In October 2023, Norway introduced new regulations that support international efforts, including those outlined in the FAO's Voluntary Guidelines for the Marking of Fishing Gear, requiring ports to establish dedicated facilities for collecting and sorting waste from ships, which now explicitly includes lost and discarded fishing equipment. This initiative is part of a broader effort by Norway to tackle marine litter and minimize ALDFG.

The digital tool Rent Hav includes all registered clean-up data from Norway. Clean ups are carried out by volunteers and those who work with marine litter (funded). For more information, see https://ny.renthav.no/renthav?mode=map, showing top findings since 2020. Most of the collective data is based on citizen science, however fisheries and aquaculture related litter is clearly a main category of findings in the Northern part of Norway.

Beach litter has been monitored in Norway through OSPAR since 2011. From 2024 the amount of OSPAR monitored beaches have increased from 7 to 15 beaches. Eleven of these are located in the Arctic area. With this expansion of OSPAR monitored beaches, as well as increased numbers of annual registrations, the quality of data from Norway regarding beach litter (and proportion of fisheries related litter/fishing gear) will improve in coming years: https://beachlitter.ospar.org/map.

4.6 UNITED STATES

The U.S. National Oceanic and Atmospheric Administration (NOAA) has administered a Marine Debris Program since 2006 under the Marine Debris Research, Prevention, and Reduction Act Marine Debris Act and successive reauthorizing Acts.[44] The focus of the program is to "identify, determine sources of, assess, prevent, reduce, and remove marine debris and address the adverse impacts of marine debris on the economy of the United States, marine environment, and navigation safety".[45] This includes the reduction and prevention of gear loss. There is no mandatory program for reporting ALDFG, however the Marine Debris Program supports extensive outreach and education activities, and has developed a number of technical guides, including those on the detection and removal of derelict fishing gear, the removal of abandoned and derelict vessels, and the impacts of marine debris on marine species and habitats.[46] Under the Act to Prevent Pollution from Ships, which implements MARPOL (including MARPOL Annex V for the United States), U.S. and foreign flag vessels are generally prohibited from intentionally discharging fishing gear into the U.S. EEZ, the U.S. territorial sea, or U.S. internal waters. MARPOL Annex V contains an exception to the prohibition for accidental loss of fishing gear and discharge of fishing gear necessary for protecting the safety of the ship or the marine environment.

NOAA has also facilitated the creation of Regional Action Plans for marine debris in many states, and is finalizing an Alaska Marine Debris Action Plan. This plan gathers inputs from across the groups working on, or concerned about, the marine debris issue to capture existing actions, identified challenges or needs, and future priorities. Within the Alaska plan, work to better understand and both prevent and address the impacts of ALDFG is a key focus area.

Finding Solutions: Community shoreline cleanups

The rugged and remote nature of much of the Arctic coasts present a particular challenge for removing marine litter, including that associated with ALDFG. In Alaska, NOAA works with community partners to conduct research, removal, and prevention activities.[47] Data collected from shoreline cleanups can help detect patterns and change signals in debris quantity and composition, the amounts and types of items arriving (including ALDFG) and help understand how quickly litter reaccumulates in different locations over time.

There is an active and innovative community of organizations working on the issue of marine litter in Alaska, including state and federal agencies, local communities, native and tribal organizations, and non-governmental organizations. Ocean Conservancy (OC) is working across Alaska through its Arctic Coastal Cleanup program.[48] Working with local organizations and communities, they provide resources to track and remove marine litter. At the end of the cleanup period, OC compiles and disseminates a summary of the data to its partners.

5. ONGOING EFFORTS ON MARKING FISHING GEAR

The FAO plays a critical role by promoting responsible fisheries management and developing best practices to mitigate ALDFG through its Voluntary Guidelines on the Marking of Fishing Gear.[49]

Below are examples of ongoing efforts on marking of fishing gear and what is being done by whom in managing ALDFG's in their waters.

Canada:

In Canada, it is prohibited for any person to set, operate, or leave in the water any unattended fishing gear other than mobile gear or handlines unless the gear is marked.

The general purpose of gear marking is to identify ownership of unattended fishing gear to ensure that the type, size and quantity of fishing gear and equipment is being used in the manner in which the license prescribes.

The vessel registration number, if it is set out in the licence authorizing the use of that gear, or in any other case the name of the person who owns the gear, shall be painted on or otherwise securely affixed to a tag, float or buoy attached to the gear.

In addition to the general purpose of gear marking, sequentially numbered gear tags are also used in various fisheries as a tool for compliance and conservation. The requirement to use tags is described in conditions of licence where harvesters are required to assume the responsibility and cost of obtaining sequentially numbered gear tags from an approved tag supplier. The tags enable the monitoring of limitations on the amount of gear used in a particular fishery as well as an enforcement tool to monitor area restrictions and ensure closed-times are being respected. Under Canada's Fisheries Act, closed-time is defined as a specified period during which certain specified fishing is not allowed.

Canadian Fishery Officers carry out dockside inspections throughout fishing seasons to ensure harvesters are using the correct tags as listed in their conditions of licence. During at-sea patrols, officers also verify tagged gear onboard ships and carry out hauling operations to ensure set gear is legal. Numbered tags affixed to fishing gear and traps helps to easily identify the harvester and the amount of gear in use.

Gear tags also assist with identifying owners of lost fishing gear that has been retrieved and can confirm whether gear has been reported missing, as is required for all commercial fisheries in Canada.

Kingdom of Denmark (in respect of Faroe Islands and Greenland):

Gear marking is implemented for passive gear due to risk for loss of gear and navigational and operational reasons, and for active gear (trawl) due to risk of gear loss. For dredges, another active gear type, marking is implemented for operational and navigational reasons while surrounding nets, purse seines and seine nets are unregulated. Trawls and gillnets are very commonly used in Danish fisheries, while nets, traps, dredges and seine nets are commonly used. Surrounding nets or purse seines are rarely used. For all gear types regulated for marking, the marking provides details of ownership. For dredges the vessel is equipped with electronic positioning equipment and the resulting location data is saved, showing the operating areas of the vessel. Passive gear will be visible for navigational safety, but not traceable through marking and unmarked gear will be removed.

Greenland has regulations on marking of active and passive fishing gear in accordance with the Conventions on Conduct of Fishing operation in the North Atlantic. Active gears such as trawls are marked mainly in order to identify the owner of the gear when it is recovered.

Iceland:

Gear marking by Iceland is implemented in the form of physical tags for both passive and active gear types. Passive gear must have all anchors and buoys marked and must have flags. Marking must be in sequence, numbered for each net for inspection reasons. Flags must have reflectors. Hooks, lines and gillnets (passive gear) also require AIS transponders when used at depths greater than 400 meters.

The marking of both active and passive gear is regulated due to the risk of losing the gear as well as for navigational and operational reasons, although traps, hooks and lines (passive gears) are marked mainly because of the risk of loss. Active gear such as surrounding nets, purse seine and trawls are very commonly used in Iceland, while dredges are less commonly used. Passive gear such as hooks and lines and gillnets are still very commonly used, though the gillnet fleet has been declining. Traps are commonly used. For all marked gear types, the marking details ownership. The presence of gear in the water column is indicated to other fishers or authorities through marking on buoys. If gillnets are set in areas with trawling they must also be marked with a blinking light, though these fisheries are not don't commonly occur in the same area. Reporting of lost gear, including parts of gear, to both the Coast Guard and the Directorate of Fisheries (DoF) is required. The report must include location, and the information must also be noted in the vessel's logbook. Marking types and designs are approved by the competent authority and follow regulations by the DoF.

Because the gear is expensive, every effort is made to retrieve lost fishing gear whenever recovery is feasible. If the DoF is notified of a lost gillnet—or if, during monitoring, lost gear is identified that was not reported, the DoF collaborates closely with the Coast Guard and other fishermen to attempt recovery. However, when the lost gear involves components such as codends or parts of trawl or part of longline, retrieval becomes practically impossible.

Norway:

Norway has marking regulations that are implemented for passive gear only for both navigational and operational reasons and for the risk of loss of gear. There is no requirement to mark active gear, as they are not lost in the same way as passive gear. Passive gear such as hooks and lines, gillnets and traps are all very commonly used. For gillnet and lines, gear identification by fishers for operational reasons and control authorities is an important driver for marking regulations. Gear is to be marked with floats tagged with the ship's Port Letters Number (PLN), while additional marking through Automatic Identification Systems (AIS) is voluntary. Traps are marked for the risk of gear loss. Individual marking of each trap used in the snow crab fishery is required from 01.01.24 in order to identify the fishing vessels when pots are retrieved by other vessels or in the government funded retrieval missions. In recreational fishing, vessels without license number should mark each trap with owner's name and address. All incidents where gear are lost by commercial fishing vessels are to be reported to the Coast Guard. The data are used by the Directorate of Fisheries to plan and execute annual gear retrieval missions. Reporting of gear loss in recreational fishing is voluntary and can be done via an app installed on mobile phones. All data is publicly available and are used by e.g. divers when arranging retrieval missions in areas along the coast. This mainly occurs in the southern parts of the country.

US-Arctic:

In the U.S. Arctic, three fishery management plans (FMPs) govern commercial fishing in these waters: 1) Aleutian Islands, 2) Bering Sea, 3) Chukchi Sea, and 4) Beaufort Sea.

The main regulatory body overseeing gear marking measures in the U.S Arctic is the National Oceanic and Atmospheric Administration (NOAA), particularly through the North Pacific Fishery Management Council (NPFMC), which sets standards for fisheries operating in U.S. federal waters of the Arctic.

- Gear marking regulations in the Bering Sea require all hook-and-line, longline pot, and pot-and-line commercial fishing gear to be marked with the vessel identification number and additional markers as specified for different gear types.

- The Chukchi Sea region, where subsistence fishing is common among Indigenous communities, has less stringent gear marking requirements for small-scale and subsistence gear, though visible markers are still encouraged to identify ownership and prevent gear conflicts. NOAA promotes voluntary best practices for marking fishing gear, including visible buoys and tags for subsistence fishers. These practices are aimed at reducing marine litter and preserving marine ecosystems.

- Gear marking requirements in the Beaufort Sea are particularly focused on identifying the gear involved in interactions with marine mammals, such as polar bears, seals, and whales. NOAA collaborates with the U.S. Fish and Wildlife Service (USFWS) to monitor gear usage and implement conservation-oriented best practices.

North-East Atlantic Fisheries Commission (NEAFC):

Denmark (in respect of the Faroe Islands & Greenland), the European Union, Iceland, Norway, the Russian Federation and the United Kingdom are Contracting Parties of the Convention on Future Multilateral Cooperation in North-East Atlantic Fisheries that established the NEAFC. In 1998, NEAFC adopt-

ed a recommendation on a Scheme of Control and Enforcement in Respect of Fishing Vessels Fishing in Areas Beyond the Limits of National Fisheries Jurisdiction in the Convention Area which has been subsequently amended to the most recent version in force from 15 January 2024.

The Scheme of Control and Enforcement Scheme (Scheme) of the NEAFC[50] applies to all fishing vessels used or intended for use for the purposes of fishing activities conducted on fisheries resources in the NEAFC Regulatory Area. Article 7 on Marking of Gear states:

- Each Contracting Party shall ensure that gear used by its fishing vessels in the Regulatory Area is marked consistent with the Convention on Conduct of Fishing operations in the North Atlantic signed in London on 1 June 1967.
- Marker buoys or similar objects floating on the surface and intended to indicate the location of fixed fishing gear shall display the registration number of the fishing vessel to which they belong.
- Article 7b on Garbage at sea and Retrieval of lost gear states that vessels shall have on board equipment to retrieve lost gear. Lost gear shall if possible be retrieved. If retrieval is unsuccessful, the loss shall be reported to the flag state.

Northwest Atlantic Fisheries Organization (NAFO):

NAFO has similar rules to NEAFC regarding marking of gear, retrieval and reporting to flag state. These rules are found in article 10, 11, 12, 13 and 14 of the 2024 version of NAFO Conservation and Enforcement Measures.

Photo: WJ Strietman

6. FINDINGS AND NEXT STEPS

The issue of ALDFG in the Arctic is a multifaceted problem that requires a comprehensive approach. The Arctic States have made significant strides in addressing this issue, but there is still much work to be done. The following findings and next steps are based on the information gathered in this report.

6.1 FINDINGS

- Arctic States and stakeholders across the Arctic have implemented various strategies to address ALDFG, including gear marking initiatives, ghost gear retrieval programs, biodegradable fishing gear development, and international cooperation.
- The primary fishing methods in the Arctic include trawling (pelagic and bottom), longlining, gillnets, and traps/pots, with each method carrying different risks of gear loss and environmental impact.
- Despite growing efforts to mitigate the impacts of ALDFG by Arctic States, there are significant variations in gear types, fishing practices, and reporting methods among Arctic States, complicating data collection and comparative analysis of ALDFG's impact.
- International bodies like the IMO and FAO are actively working to develop guidelines and best practices to mitigate ALDFG, emphasizing sustainable fishing practices.
- Enhanced data collection, standardized reporting systems, and improved international cooperation are critical to effectively managing and reducing ALDFG in Arctic waters.
- Parts of fishing gear, ropes and net cuttings, are prominent among marine litter found on beaches in the Arctic. This suggests that activities on board fishing vessels are a main source. Regulations relating to marking of gear, retrieval and reporting will not effectively target the causes behind such losses.

6.2 NEXT STEPS

- Develop measures addressing the causes of the most prominent marine litter from fisheries, such as ropes and net cuttings and investigate best practices for handling, maintaining, and managing fishing gear and its waste on Arctic fishing vessels, by developing a suggestion for a Fishing Gear Management Plans (FGMP) for different Arctic fisheries.
  - Using the data presented on fishing activities in the Arctic, investigate best practices for handling, maintenance and waste management of fishing gear and parts thereof onboard Arctic fishing vessels. The concept of a ship specific Fishing Gear Management Plan (FGMP) will be a measure to prevent parts of fishing gear, including rope- and net-cuttings from becoming marine litter.
  - Convene a workshop with fisheries representatives, policymakers, researchers, NGOs and other experts from the Arctic region, to provide an overview of current knowledge and identifying knowledge gaps related to handling, maintenance and waste management of fishing hear and parts thereof onboard fishing vessels operating in the Arctic.
- Promote the Voluntary Guidelines for the Marking of Fishing Gear | Responsible Fishing Practices for Sustainable Fisheries | Food and Agriculture Organization of the United Nations.
- Examine implementation measures and actions on net cuttings based on data from beach monitoring and other sources, mapping of sources and causes.
- Strengthen international cooperation and information sharing on ALDFG through existing forums such as the Arctic Council and RFMOs.

LIST OF ACRONYMS

ABS acrylonitrile butadiene styrene
ALDFG Abandoned, Lost, or otherwise Discarded Fishing Gear
AIS Automatic Identification Systems
ASTD Arctic Ship Traffic Data
GRT Gross Register Tonnage
EEZ Exclusive Economic Zones
EVA ethylene vinyl acetate
FAO Food and Agriculture Organization
FMP Fishery Management Plans
IMO International Maritime Organization
MARPOL International Convention for the Prevention of Pollution from Ships
NAFO Northwest Atlantic Fisheries Organization
NMFS National Marine Fisheries Service
NOAA National Oceanic and Atmospheric Administration
OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic
PAME Protection of the Arctic Marine Environment
PA polyamide
PE polyethylene
PES polyester
PP polypropylene
PUR polyurethane
PVC polyvinyl chloride
RFMO Regional Fisheries Management Organization
UHMWPE ultra-high molecular weight polyethylene

NOTES

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PAME

Protection of the Arctic Marine Environment

PAME SECRETARIAT
Borgir, v. Nordurslod
Akureyri - Iceland
Tel: +354 461 1355
pame@pame.is
pame.is