



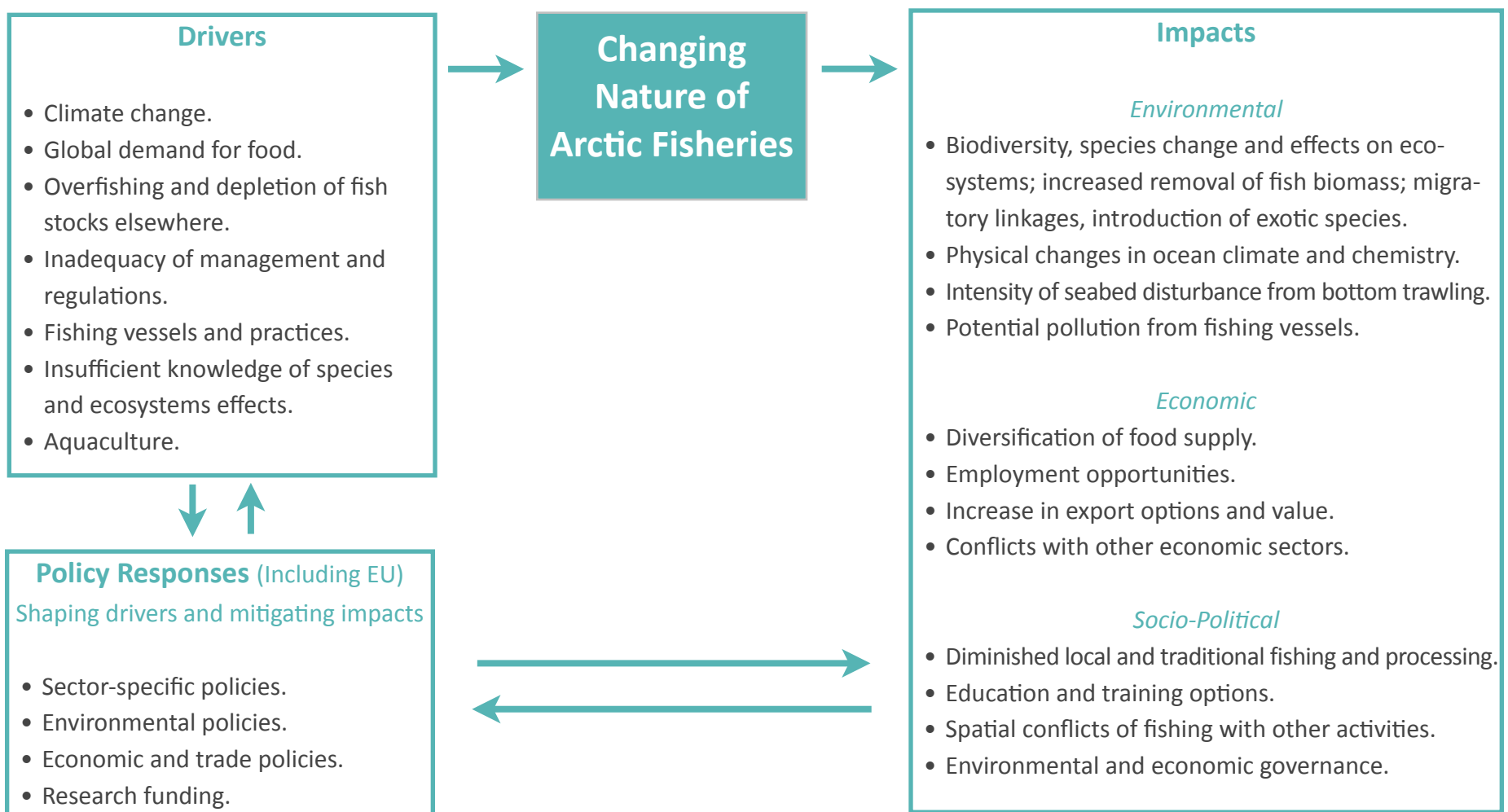
FACTSHEET

## Changing Nature of Arctic Fisheries?

### Overview

Fisheries and aquaculture make crucial contributions to the world's well-being and prosperity. In addition to an important food source, the fisheries sector provides livelihoods and income, both directly and indirectly. According to the UN Food and Agriculture Organization (FAO), fish and fishery products are among the most traded food commodities worldwide. While capture fisheries production remains stable, aquaculture production keeps on expanding. Aquaculture is set to remain one of the fastest-growing animal food-producing sectors. This factsheet highlights some of the issues in relation to sub-Arctic capture fisheries, aquaculture and their relevance to the European Union.

Figure 1: Drivers and Impacts



Website: [www.arcticinfo.eu](http://www.arcticinfo.eu)

### Strategic Environmental Impact Assessment of Development of the Arctic

This factsheet is to stimulate dialogue between stakeholders, Arctic experts and EU policymakers. Stakeholder input informs the analysis of trends and the role of the European Union in shaping Arctic developments. It will lead to recommendations to EU policymakers and be published as the Strategic Assessment of Development of the Arctic Report in spring 2014. The European Commission-funded project is implemented by a network of 19 institutions lead by the Arctic Centre in Rovaniemi and is linked to the EU Arctic Information Centre initiative.

Sub-Arctic fisheries represent about 5% of the overall global catch. Historically fisheries are a key industry and employer across the Arctic, with some communities almost wholly reliant on fisheries and fish processing for their economic survival. Fisheries have been and still are of importance for many northern communities. For instance, fisheries and related activities are the single most important component of the economy in Iceland, representing 27% of GDP in 2011.

In Norway fish and fish farming accounted for 0.7% of GDP in 2010 with production of about 3.5 million tonnes of seafood, of which 25% was from the aquaculture industry. On a regional basis, the fisheries sector around the Barents Sea is estimated to contribute about 8% of GDP in the Murmansk area.

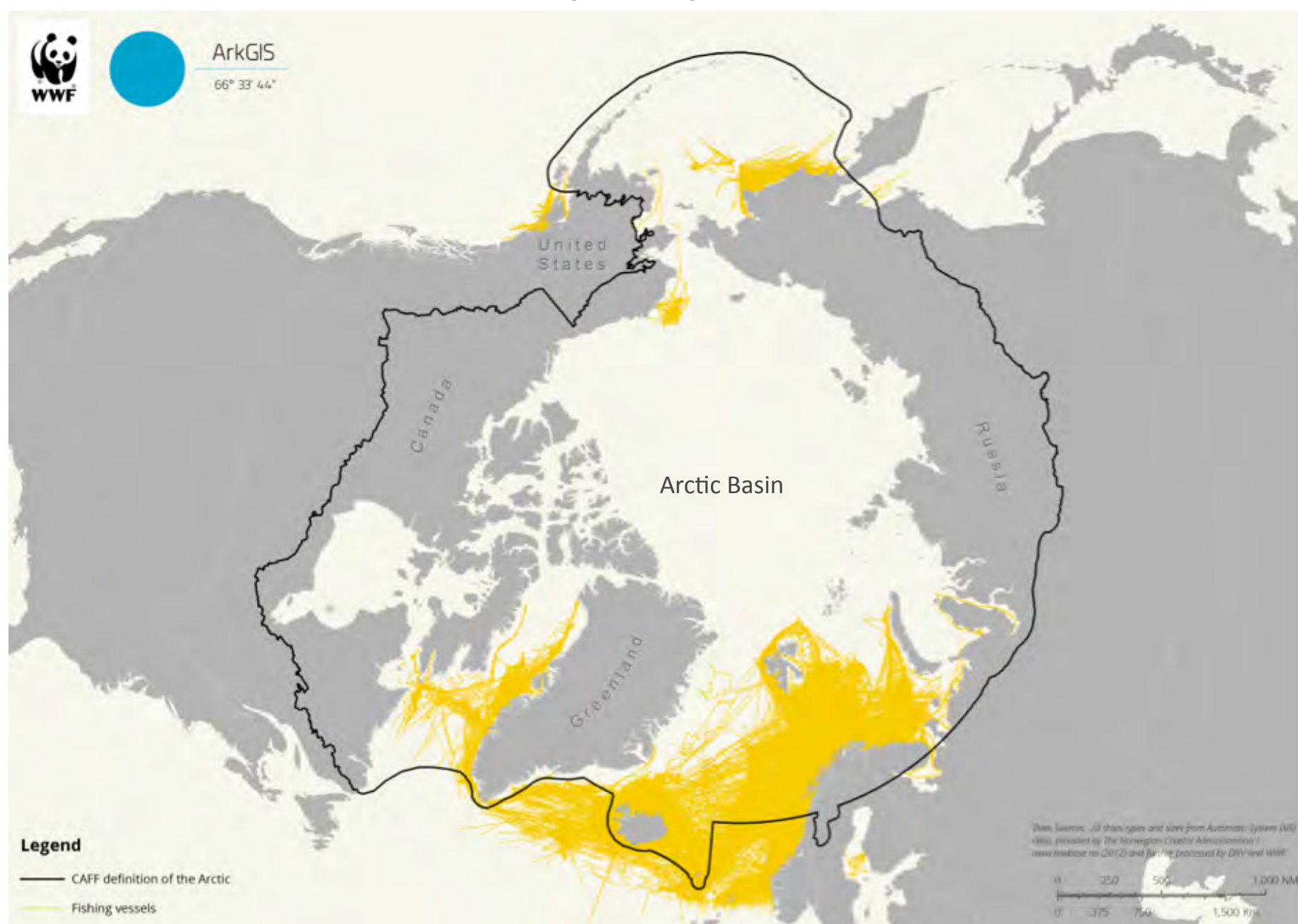
Fisheries represent about 90% of the export earnings of Greenland, 33% in Iceland and about 6% in Norway in 2010, whereas in the large Arctic states of Russia and the United States, which have more diversified and larger economies, fish were less than 1% of export earnings.

## Where Are the Fish?

Marine ecosystems and the shelf areas off the coasts of Labrador, Newfoundland, Greenland and Iceland, and the Bering and Barents Seas, are often referred to as sub-Arctic systems (and are socially, economically and politically part of the Arctic region as defined by the AHDR). In terms of environmental conditions, these ecosystems are characterised by large annual and seasonal fluctuations.

The northern region includes the Arctic Basin, *i.e.* Central Arctic Ocean, with adjacent land areas (on an ecosystem basis, the true Arctic region) and the sub-Arctic region immediately south of the Arctic. While the biological production in the Arctic Basin is quite low (particularly beyond shallow seas above continental shelves), the sub-Arctic includes rich marine ecosystems. Arctic Basin includes areas beyond coastal states' exclusive economic ones, which may become important in the (considered fairly unlikely) case some fish stocks move northwards.

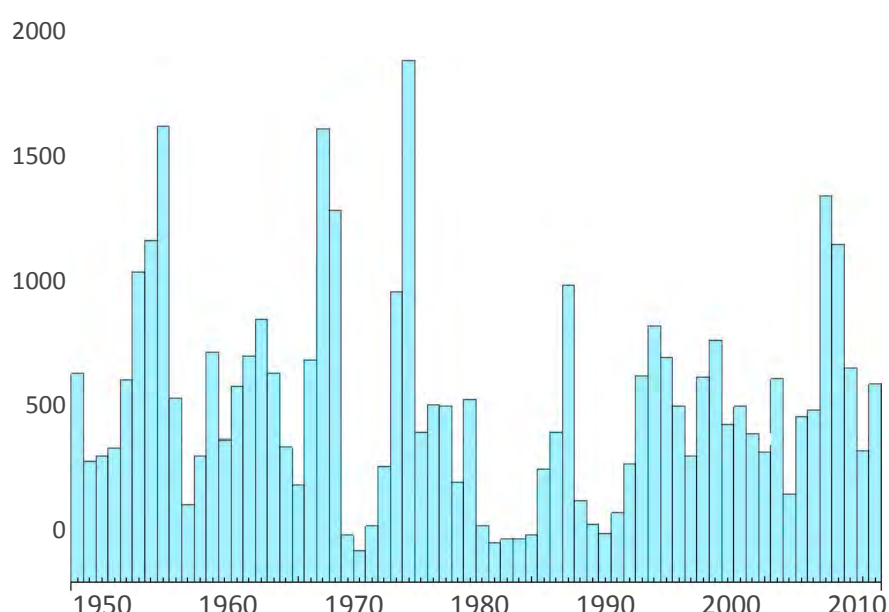
Figure 2: Fishing Vessels



Source: Arctic Geographical Information System (ArkGIS), [www.arkgis.org/fishing\\_vessels.aspx/map.aspx?node=2091](http://www.arkgis.org/fishing_vessels.aspx/map.aspx?node=2091). Data source: Automatic System (AIS) data, provided by the Norwegian Coastal Administration/[www.havbase.no](http://www.havbase.no) (2012) and further processed by DNV and WWF.



Figure 3 **Variability of Cod Recruitment in the Last Decades in North-East Atlantic (three year old cod). Numbers in millions.**



Source: Centre of Marine Resource Management. Norwegian Collage of Fisheries Science, University of Tromsø, Norway.

Some of the world's most productive fisheries are in the sub-Arctic region in the shallow waters of each side of the Arctic Basin. The areas are dominated by few and large fish stocks characterised by distinct seasonal migration patterns, large recruitment (number of new young fish entering the population in a given year) variability and relatively low individual growth rates. In the Bering Sea fisheries, pollock is the dominant species, while the Barents Sea is dominated by a cod-capelin system occasionally disturbed by inflow of herring from the Norwegian Sea.

The large fisheries utilise the great productivity of the shallow water areas, governed by variations in temperatures and nutrients. Ocean currents determined by sea floor topography, transport large zooplankton biomasses from the slopes into the more shallow areas where they are used by higher trophic level species (position in a food chain). While the distribution areas of benthic (bottom dwelling) species such as cod and pollock are limited to the shelf areas, pelagic (dwelling above the benthos) species, in principle, are not limited. Yet the pelagic species are constrained by food availability, which is richer in the shelf areas.

The marine species in the sub-Arctic are highly specialised to cope with long- and short-term environmental variations. Recruitment and growth variations are natural responses by which the species are able to adapt to such changes. Annual migration patterns and slight changes in spatial distributions are natural responses to a changing environment.

Aquaculture production is in a different situation since location, population density and food availability are controlled. Variations in the physical environment, however, are essentially not controlled, although the production may be moved to alternative locations. Permanent shifts in the environmental conditions may

therefore lead to significant changes in the spatial distribution of aquaculture activities.

### Changing Conditions

Climate change is a reality and the impacts are experienced in the sub-Arctic and Arctic regions. How on-going climate change will affect the marine ecosystems and hence the fisheries is not easy to predict, with some predictions being made for greater abundance towards the North of sub-Arctic fish stocks (*e.g.* in the Arctic Climate Impact Assessment).

Perhaps climate driven changes in other parts of the world, causing shifts in global fish markets, could turn out to be the most important climate change effect for the sub-Arctic fisheries. The challenge for fisheries management remains the same: to use the natural resources in a sustainable manner according to expressed man-

### Fisheries Management in Iceland

Iceland has built a modern and competitive seafood industry of a high standard, based on sustainable harvesting and protection of the marine environment. Its fisheries management system is based on principles of sustainable use.

The fishing industry is one of the main pillars of the Icelandic economy. It directly employs around 9 000 people, more than 5% of the total workforce. In 2012, the seafood industry contributed 11% to Iceland's GDP directly and export production of marine products amounted to ISK 269 billion (€1.7 billion). Europe is the largest market for Icelandic seafood products, accounting for about 70-80% in recent years. Cod is the most valuable fish stock, representing about 31% of total seafood industry exports. The United Kingdom has been the single most important market for Icelandic seafood products for many years.

Iceland has 772 km<sup>2</sup> of exclusive economic zone (up to 200 nautical miles) that includes some of the richest fishing grounds in the world. It has structured a fisheries management system to ensure responsible fisheries. Management is primarily based on extensive research on the fish stocks and the marine ecosystem; decisions made on the conduct of fisheries and allowable catches on the basis of scientific advice; and effective monitoring and enforcement of the fisheries and the total catch.

Iceland has one of the most extensive enforcement regimes in the world, in particular regarding port control and weighing of all catches. Discards are prohibited by law. All catches by Icelandic vessels must be weighed and recorded at the port of landing by authorities. The ports of landing are then required to send information on a daily basis directly to the Directorate of Fisheries database. This means that the Directorate always has up-to-date figures on catches and can conduct its management and surveillance of fisheries promptly and effectively. The information is accessible to all to ensure transparency at:

[www.en.fiskistofa.is/heildastodur.php](http://www.en.fiskistofa.is/heildastodur.php).

Source: [www.responsiblefisheries.is](http://www.responsiblefisheries.is)

agement objectives and due consideration of the uncertainty, which is an inherent component in natural resource management.

### Drivers

Commercial fisheries in sub-Arctic regions are based on the use of relatively few fish species. The dynamics of many of the ecosystems they belong to are not well understood. The unknown effect climate change may have on these systems adds to the already significant uncertainty related to our understanding of the systems.

Physical changes are perhaps easier to predict, but here too there are large uncertainties. Evidently climate change causes warmer Atlantic water to enter into the Arctic region. But at the same time the influx of Atlantic water may be reduced, moderating the overall warming effect. The picture is different in the Bering Sea area which may experience slightly more warming than the Barents Sea. With sea-ice cover also expected to decline, marginal fishing grounds will become more accessible. Invasive species may increase.

There is increasing global demand for fish and fish products that provide important food supply for the global population. Over the last fifty years, world fish food supply has outpaced global population growth. The sector also provides livelihoods and income. Fish and fishery products are among the most traded food commodities worldwide, with trade volumes and values reaching new highs in 2011 and they are expected to carry on rising. While capture fisheries production has remained stable over the last decades, aqua-

culture production is expanding. It is not possible to predict how climate change may affect supply and demand of fish products, given all the dynamic factors at play.

### Multiple impacts of possible changes in fisheries

Fishing has cumulative effects on whole ecosystems and provides income, food security and livelihoods for people and communities. Climate change will have unknown impacts on both ecosystems and their dependent communities. In the sub-Arctic region, ecosystems and communities are highly specialised in dealing with environmental changes, which is the competence by which they have survived. In addition to depending on unpredictable natural systems, the fishing communities also depend on unpredictable global fish markets.

### Aquaculture

Aquaculture has grown rapidly in recent decades and is the fastest growing animal-sourced food producing sector in the world, with an average annual growth rate of almost 9% over the last decade. Aquaculture is an economic activity that uses and transforms natural aquatic resources into commodities valued by society and in so doing may generate environmental impacts. Aquaculture provides important employment opportunities as they are often in remote areas with few other livelihood options.

The vast majority of aquaculture is made up of salmon culture in Norway. This represents 93% of the total value of aquaculture in the Arc-

**Aquaculture Site for Salmon in Troms County, Norway**



Photo: Frank Gregersen / Nofima ©.



### Aquaculture seems to be more resilient to climate change than capture fisheries.

This finding is based on recent analysis from the Arctic Climate Change, Economy and Society (ACCESS) project that is examining how climate change may impact Arctic fisheries, aquaculture and the livelihood of communities and economic sectors dealing with marine living resources.

Arctic region. Norway is also home to the second- and third-largest species, trout and cod, bringing the Norwegian share of Arctic (in AHDR definition) aquaculture to 98%. Iceland produces Arctic char and cod, and smaller volumes of salmon. Aquaculture in Finland and Sweden produces small volumes of freshwater species.

A key challenge for aquaculture from climate change involves changes in water temperature; this will impact the overall aquatic environment that supports aquaculture production, as well as performance of the farming operations. The overall impact from climate change will depend on the structure of the aquaculture industry, i.e. its capacity to adapt to new circumstances, accessibility to new water and land suitable for production, existing regulations and markets. Environmental changes may lead to spatial displacement of aquaculture production that also may pose other challenges and opportunities.

The direct effects from a temperature change on the aquaculture industry to some extent can be modelled with fairly good accuracy, including both the effects on fish growth as well as how a whole industry may be affected. These models indicate that aquaculture in the Arctic will be enhanced by warming water temperatures. Other direct effects such as loss due to increase in storm frequency and intensity can be relatively well anticipated, but the uncertainty regarding how these parameters will change is high. Indirect effects such as caused by diseases, pest species and increased freshwater runoff are very hard to predict. What is certain is that as a conse-

quence of climate change the environmental conditions will change and that the industry will have to adapt.

### Governance

Governance of fisheries has local, national, regional and international dimensions. It is complex, covering long-term, strategic planning as well as short-term operational management and with a scope ranging from local fisheries to whole ecosystems. Good governance and monitoring is vital for the optimal and sustained use of marine fisheries resources. In the case of aquaculture, its effective governance - the sector's use of natural resources to ensure long-term sustainability and employ best husbandry practices - is essential for its continued growth.

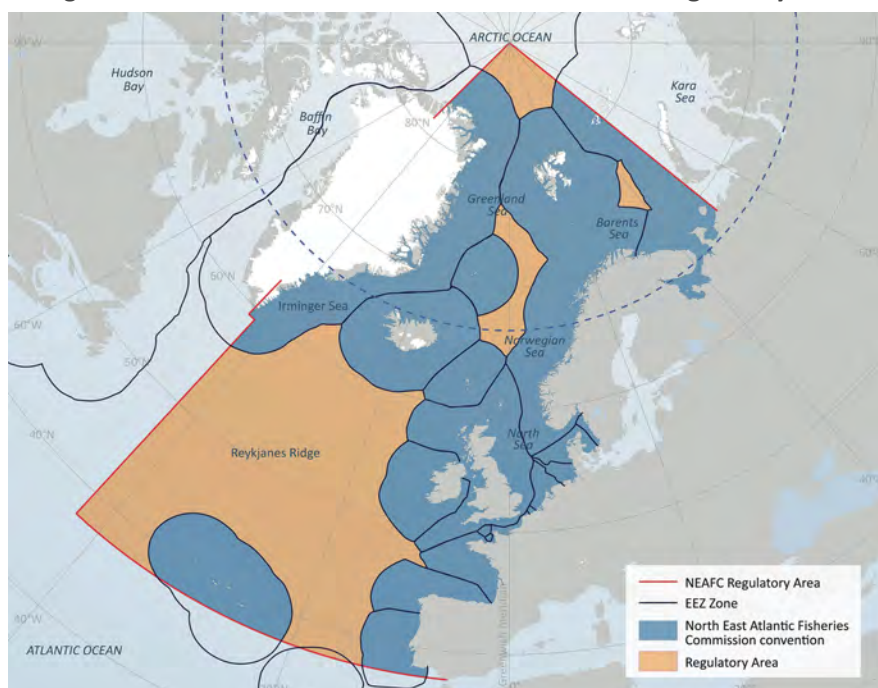
### UN Fish Stocks Agreement

The Fish Stocks Agreement, which came into force in 2001, aims to improve international and domestic management of straddling and highly migratory fish stocks. That is done through regional fisheries management organisations and also includes conservation obligations for the waters within the EEZs for those stocks. Canada, Denmark, United States, Finland, Iceland, Norway, Russia, Sweden are among the 166 countries that have become parties to this Agreement.

Various international framework for managing fisheries have been adopted. The most significant ones are the United Nations Convention on the Law of the Sea (UNCLOS), the Fish Stocks Agreement, the United Nations Food and Agriculture Organization (FAO) Compliance Agreement, the FAO Code of Conduct for Responsible Fisheries and some UN General Assembly resolutions, such as on drift-nets and destructive fishing practices. UNCLOS enshrines the right of nations to extend their exclusive economic zone (EEZ) up to 200 nautical miles from the baselines and made the freedom to fish in the high seas conditional on each state's willingness to co-operate with other states to ensure the conservation and good management of the fish stocks concerned. All the global instruments, both legally binding and indicative measures, related to fisheries conservation and management are applicable to the sub-Arctic and possible Arctic fisheries.

The United States already has enacted national proactive regulation with regards to Arctic fisheries. The North Pacific Fishery Management Council (NPFMC) plays a crucial role in federal regulation with regard to the maritime zones of the United States in the north Pacific. In 2009, the Council approved a new Fishery Management Plan for Fish Resources of the Arctic Management Area (Arctic FMP), which closes commercial fishing from federal waters of the US Arctic coast.

Figure 3: North East Atlantic Fisheries Commission Regulatory Area



Source: [www.neafc.org](http://www.neafc.org), Arctic Portal.

North East Atlantic Fisheries Commission (NEAFC) is the regional fisheries management organisation for the northeast Atlantic, one of the most abundant fishing areas in the world. It is the only fisheries convention that extends to the North Pole (Figure 3). Its aim is to ensure the long-term conservation and optimum use of the regional fishery resources to provide sustainable economic, environmental and social benefits. It adopts management measures for various fish stocks and control measures to ensure that they are properly implemented and other measures to protect the marine ecosystem from potential negative impacts of fisheries.

The International Council for the Exploration of the Sea (ICES), the world's oldest inter-governmental science organisation, is the leading forum for exchange of scientific information, stock assessment and management advice for the north Atlantic fisheries. ICES provides member states (including NEAFC) with advice based on an ecosystem approach to management.

This implies a higher focus on uncertainty than in the former single species management scheme. Harvest control rules have been developed for the fish stocks assessed by ICES, incorporating an ecosystem perspective albeit lacking full knowledge of the dynamics of these systems.

**Gap at the Top**

That the centre of the Arctic Ocean was unregulated was hardly a concern when it was an ice-bound backwater. This is changing. In summer 2012, 40% of the central Arctic Ocean ice cover melted. Roughly 8% of the Central Arctic Ocean is within the area under fisheries regulation overseen by the North East Atlantic Fisheries Commission.

Five national governments with Arctic coastline think that with the now regular melting of the polar ice the future establishment of a regional fisheries management organisation for the Central Arctic Ocean could be considered.

Talks among officials from Norway, Denmark, Canada, United States and Russia in mid-2013 acknowledged the desirability of improving scientific understanding of the Arctic marine environment in part to determine whether fish stocks of commercial interest may occur in the future in the central Arctic Ocean and potential impacts on the ecosystem.

Based on available scientific information, it was generally understood that commercial fishing in the high seas area of the central Arctic Ocean is unlikely to occur in the near future. Nevertheless, there was recognition of the desirability of addressing the possibility that commercial fishing could take place in the future in the Central Arctic Ocean.

**How the European Union May Be Affected?**

Both fish consumption and dependence on imports is growing in the European Union: it is one of the world's top three importers of fish and aquaculture products. Its three biggest suppliers are Norway (22%), China (9%) and Iceland (6%). Across the EU, average annual fish consumption is more than 23 kg per person compared with a global average of about 17 kg per person.

One-third of fish caught in the sub-Arctic waters are sold on the European market, so the safety of continuous and long term availability of this food source is of major interest for the EU. The EU is keen to ensure good co-operation with Arctic states in the sustainable management of marine biological resources. Fisheries conservation is a priority, in addition to access and supply.

Agreements based on exchange of fishing opportunities dominate the EU's relations with its neighbours to the north, particularly Norway, Iceland and Greenland. The EU has a long history of mutually overlapping fisheries with these nations. Since the creation of the Common Fisheries Policy, the EU has negotiated the annual exchange of quotas on behalf of its Member States, between which the quotas are shared on the basis of relative stability. These agreements play a vital role in preserving the continuity of traditional fisheries following the declaration of 200-mile EEZs. They enable each fleet to continue to fish in the other parties' waters. Indeed, one of the main purposes of these negotiations is to enable mutual access to stocks which straddle territorial boundaries, and which shift back and forth between EU waters and those of northern partners according to the time of the year. These agreements are extremely important to a large section of the EU fleet, especially the agreement with Norway, which covers quotas worth more than €2 billion.

**Racks with drying stockfish**



Source: GettyImages



The small island of Uummannaq lies on the west coast of Greenland, where more than 80% of the land is covered by an ice cap that is in places, up to 4km thick. Local Inuit residents hunt and fish from the sea ice, or travel over it in order to reach fertile hunting grounds.



Photo: Lawrence Hislop, GRID-Arendal.

### How Does the European Union Influence sub-Arctic Fisheries?

The European Union has extensive experience in setting regulatory standards for fishing with both environmental and socio-economic criteria at a supra-national level through its Common Fisheries Policy (CFP), launched in 1970. Notably, however, no current EU members are coastal states to the sub-Arctic oceans and the European Economic Area Agreement does not cover CFP, although it includes trade in fisheries products and regulates state aid and competition in the sector - a constraint for EU policy in this area. EU Member States can still act in a wide range of other capacities, *e.g.* as flag states, port states, market states, or with respect to their natural and legal persons.

In a flag state capacity, the EU and its Member States are able to exercise their rights and discharge their obligations with respect to the Arctic Ocean and adjacent areas, most notably freedom of the high seas, such as marine scientific research, laying of cables and pipelines; navigational rights and freedoms in the maritime zones of Arctic Ocean coastal states; and obligations relating to the marine environment and living resources connected to these rights and freedoms.

The European Union influences the development of sub-Arctic fisheries directly and indirectly through a wide variety of policies, practices, market mechanisms, collaborative engagements and research. For example, marine pollution originating in the EU and EU-flagged vessels fishing in Arctic waters can affect fish stocks. The EU may influence Arctic fisheries by way of its participation in regional fisheries management organisations and international developments such as the FAO.

Its support for scientific research in the Arctic and in areas to underpin improved fisheries management may have implications for Arctic fisheries. The EU has significant influence through its role in resource management, the heft of its market size, and its trade and regulations – highlighted briefly here.

#### Resource Management

Fish move across borders and seas, and fishing fleets have done the same for centuries. Since the activities of each fishing fleet affect the opportunities of other fleets, the EU countries chose to manage their fisheries collaboratively through the CFP. This policy brings together a range of measures designed to achieve a thriving and sustainable European fishing industry. The CFP may impact on the health of some of the fish stocks that extend into the Arctic.

The EU is revamping the CFP to make it more efficient in ensuring the economic viability of European fleets, conserving fish stocks and providing good quality food to consumers. Substantial efforts are being made to integrate the objectives of its Marine Strategy Framework Directive within the new CFP, as part of an ecosystem-based management approach. Fisheries ecosystem plans have been developed for three major European marine regions (North Sea, North-western waters and South-western waters).

In its Arctic communication in 2008, the EU proposed to put in place a regulatory framework for the part of the Arctic high seas not yet covered by an international conservation and management regime before new fishing opportunities arise. This is to prevent

fisheries developing in a regulatory vacuum and to ensure fair and transparent management in accordance with the Code of Conduct for Responsible Fishing. The EU position is that in principle extending the mandate of the existing management organisations such as NEAFC is preferable to creating new ones: until such a regime is in place, no new fisheries should commence. The EU is a contracting party to the NEAFC along with Denmark, Iceland, Norway and Russia.

### *Market Size and Proximity*

The European Union accounts for about 26% of global fish imports, making it the largest market in the world, with a value of about €36 billion (US\$50 billion) in 2011. Its dependence on imports for fish consumption is growing. This is a result of the rising trend in consumption, but also illustrates the constraints within the EU on further expansion of supply. In this respect, the current reform of its Common Fisheries Policy aims to rebuild its fish stocks, as well as boost aquaculture production. The results of the reform and the effects on supply and trade will only be felt in the medium-to-long term.

### *Trading Fish in a Globalised World*

In the early days of the CFP, EU trade policy on fish was decided by the EU alone. However, since the launch of the World Trade Organization process, trade policy and tariffs in all economic sectors are now dealt with multilaterally at international level.

The common organisation of the EU market includes measures to try and ensure a stable and predictable supply of fish as a vital raw material. A relevant tool is the Autonomous Tariff Quotas (ATQs). The aim of ATQs is to enhance access for EU processors to fish from third countries by granting reduced tariff rates on the import of specific products for which domestic production is in deficit.

These tariff rates are intended to provide balanced incentives, which give priority to EU production where it exists, while ensuring that the European processing industry is not unfairly penalised when it has to compete on the world market for inputs.

### *Combating Illegal Fishing*

EU rules to deter illegal, unreported and unregulated (IUU) fishing came into force in 2010 and include:

- Only marine products validated as legal by the relevant flag state or exporting state can be imported or exported from the EU.
- A black list has been established covering both IUU vessels and states that turn a blind eye to illegal fishing activities.
- EU operators who fish illegally anywhere in the world, under any flag, face substantial penalties proportionate to the economic value of their catch.

There is increasing need for international co-operation among fishing and seafood-importing countries to improve global fisheries management of shared marine resources and to preserve the associated employment and other economic benefits of sustainable fisheries. In line with a commitment to stem IUU fishing, the European Union and the United States, as leaders in global fish trade, agreed to bilateral co-operation in September 2011 to work together to adopt effective tools to combat IUU fishing. Another example is an agreement between Norway and the EU wherein Norway will issue a catch certificate for all Norwegian landings and exports to the EU.

### *Food Safety Standards*

EU legislation harmonises food safety control across the member countries. A key aspect is that all food and feed business operators, from farmers and processors to retailers and caterers, have principal responsibility for ensuring that food placed on the EU market meets the required food safety standards. The regulations apply at every stage in the food chain, including primary production, *i.e.* fishing, aquaculture and farming, in line with a “farm to fork” approach to food safety.

### **What is the Role of the European Union in the Arctic?**

The European Union is a complex international actor. It has acquired a number of decision-making powers from its Member States and hence influences the content of their national legislation. Based on the European Economic Area Agreement, the EU also influences relevant legislation in Iceland and Norway. The EU also influences outcomes of international negotiations – including those of importance for the Arctic.

Only a small part of the territory of EU Member States - in northern Sweden and Finland – is located in the Arctic and the EU has no Arctic coastline. Nevertheless, EU regulations and actions, including research funding and regional policies, influence Arctic developments. Moreover, the EU is a major environmental and economic actor in the Arctic and has established a special relationship with Greenland.

Since 2008, relevant EU activities have been brought under a common umbrella of “Arctic policy”. A communication in 2012 stresses three key aspects: knowledge – support for scientific research; responsibility – promoting the sustainable use of natural resources; and engagement – enhancing co-operation with Arctic partners.



## Key Questions to Stakeholders Regarding Arctic Fisheries

- 1 What are your concerns about the environmental, economic and social impacts of fishing activities and aquaculture?
- 2 What changes do you see and experience in fishing activities, both commercial and traditional, and their impacts on people, communities and the environment?
- 3 What is the most important message regarding the changing nature of Arctic fisheries that you would like to be sure is heard?
- 4 How can the EU influence the development of environmental policy on sustainable use of fish stocks in the Arctic?
- 5 How can the EU play a role in harmonisation of international regulations on commercial fishing in international waters of the Central Arctic Ocean?

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*The chapter “Changing Nature of Arctic Fisheries” in the final assessment report (see [www.arcticinfo.eu](http://www.arcticinfo.eu)) builds on this factsheet and on the stakeholder consultations conducted between October 2013 and February 2014.*

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