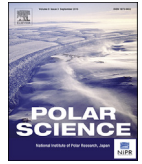




Contents lists available at ScienceDirect

Polar Science

journal homepage: <http://ees.elsevier.com/polar/>

Norwegian fisheries in the Svalbard zone since 1980. Regulations, profitability and warming waters affect landings

Ole Arve Misund^{a, b, c, *}, Kristin Heggland^a, Ragnheid Skogseth^a, Eva Falck^a, Harald Gjørseter^b, Jan Sundet^b, Jens Watne^d, Ole Jørgen Lønne^a

^a University Centre in Svalbard, P.O. Box 156, N-9171 Longyearbyen, Norway

^b Institute of Marine Research, P.O. Box 1870, N-5817 Bergen, Norway

^c National Institute of Nutrition and Seafood Research, P.O. Box 2029, N-5817 Bergen, Norway

^d Directorate of Fisheries, P.O. Box 185, N-5804 Bergen, Norway

ARTICLE INFO

Article history:

Received 8 September 2015

Received in revised form

4 January 2016

Accepted 1 February 2016

Available online xxx

Keywords:

Arctic fisheries

Svalbard

Climate change

ABSTRACT

The Svalbard archipelago in the High Arctic is influenced by cold Arctic water masses from the north-east and the warm West Spitsbergen Current flowing northwards along its western coast. The eastern waters and the fjords are normally frozen during the winter months, while the coastal waters west of the archipelago remain open. Norwegian fishers have been harvesting from Svalbard waters for decades and detailed records of catches exists from 1980 onwards. We analyze the catch records from the Svalbard zone (approximately ICES area IIb). The large fishery for capelin in summer yielding annual catches up to 737 000 tons was closed by a Norwegian fishery regulation in the mid nineteen nineties. Demersal fisheries have been continuous, and the results clearly indicate a northward trend in landings of Northeast Arctic cod, haddock, ling and Atlantic halibut. Fisheries of Northern shrimp have been more variable and shown no clear geographic trends. A “gold rush” fishery for scallops north of Svalbard lasted for about 10 years (1986–1995) only, and ended due to low profitability. These results are discussed in relation to the possibility of further northward extension of fisheries subjected to climate change.

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1. Introduction

The area around Svalbard is the world's northernmost waters with regular fisheries and a strict fisheries regulation system. The Svalbard Treaty, signed 1920 in Versailles, France, gave Norway sovereignty over the Svalbard archipelago, and a fisheries protection zone around Svalbard (here termed the Svalbard zone, Fig. 1) was introduced in 1977 when Norway extended its Exclusive Economic Zone to 200 nautical miles. The Svalbard zone was adjusted slightly as a result of the border agreement with Russia in 2010, and is now 715 000 km².

Regular commercial fishing is carried out annually from the southern border of the Svalbard zone at 74° North latitude, south of Bjørnøya (Bear Island), and around the Svalbard archipelago all the way up to about 81° 30' North. This is much farther North than in other circumpolar waters. Around Greenland, Canada, Alaska and

East Russia most fishing occurs south of 65° North. In the Russian part of the Barents Sea, fishing mainly takes place south of 78° North (Jakobsen and Ozhigin, 2011).

Fishing vessels operating in the fisheries protection zone around Svalbard must follow a suite of technical regulations set to protect juvenile gadoids and redfish. Minimum mesh sizes are regulated for whitefish trawls, and sorting grids are mandatory in both whitefish and shrimp trawls. Moreover, a regulatory system is enforced to open and close areas with high by catch of juvenile cod and redfish (Gullestad et al., 2014). Discarding of unwanted or undersized catch is banned. The Norwegian Coast Guard patrols the area frequently to ensure that these regulations are followed.

Based on historical activity, fishers from Norway and Russia are the main stakeholders to the fish resources in the area, but fishers from “third countries” (the EU and the Faroe Islands) have been allocated quotas of Northeast Arctic cod (*Gadus morhua*) and other demersal species in the Svalbard zone. For Northern shrimp (*Pandalus borealis*), fishers from Iceland and Greenland have access to the area too. The fishing quotas for different species are based on scientific advice from the International Council for the Exploration

* Corresponding author. University Centre in Svalbard, P.O. Box 156, N-9171 Longyearbyen, Norway.

E-mail address: ole.arve.misund@unis.no (O.A. Misund).

<http://dx.doi.org/10.1016/j.polar.2016.02.001>

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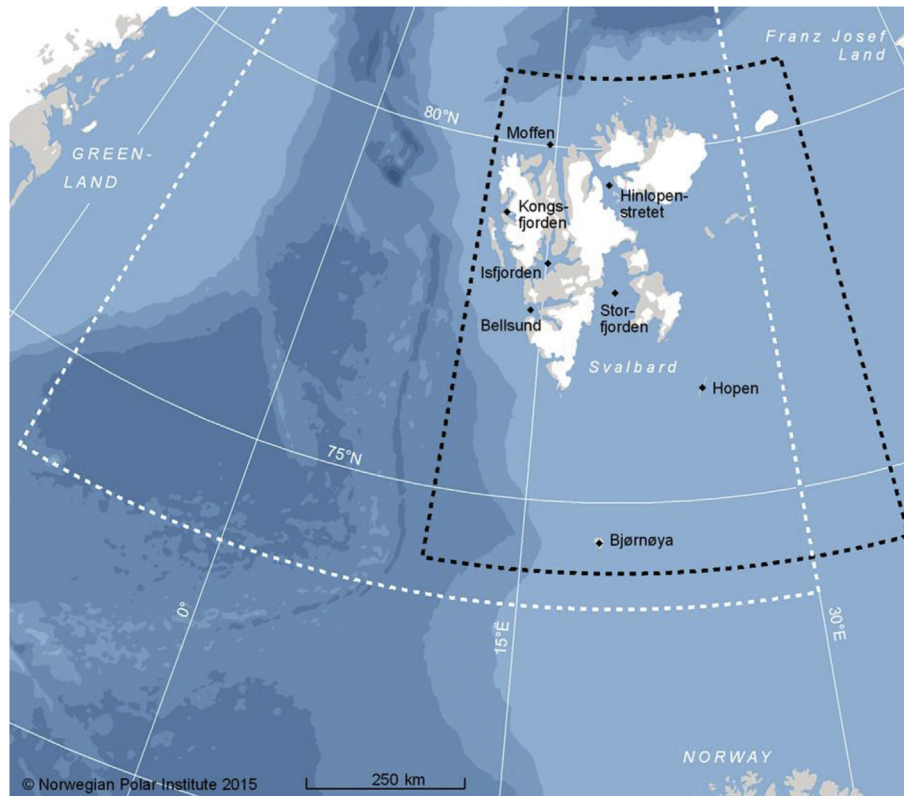


Fig. 1. The Svalbard zone (stippled black line) and ICES area IIb (stippled white line).

of the Sea (ICES), and are negotiated and decided upon by the joint Norwegian–Russian Fishery Commission, which has been active since 1976 (Hammer and Hoel, 2012). These fishing quotas are set for each individual species, and are normally valid for ICES areas I, IIb (approximately the Svalbard zone), and IIa. Specific regulations can apply for the Svalbard zone, however, for instance regarding the redfish fishery by third countries (the EU and the Faroe Islands).

Norwegian fishers have been harvesting the Svalbard waters for about 140 years. On the northernmost leg of the famous Norwegian North Sea Expedition in 1878, a vessel with fishers jigging Northeast Arctic cod from dories was encountered west of the northernmost islands along the west coast of the Svalbard archipelago (Sars, 1878). The first catch records for Northeast Arctic cod from Svalbard waters date back to 1874 (Iversen, 1934). Norwegian vessels caught 37 000 cod in 1874 and the fishing continued up to 1882 when 249 400 cod were caught in the Svalbard waters. In 1883 altogether 18 Norwegian fishing vessels went to Svalbard waters, but the cod was no longer present (Iversen, 1934).

Since 1980, the Directorate of Fisheries in Norway (www.fiskeridir.no) has collected detailed information on landings from Norwegian fishers, including data about the Svalbard zone. Weight and monetary value, broken down by species, is available from the database of statistics at the Directorate of Fisheries. Data for the years from 2000 to the present are available on line. To combat illegal fishing, a regulation was introduced in 2003 requiring Norwegian fishing vessels larger than 15 m to carry a satellite transmitter sending information about vessel position and speed on an hourly basis to the Fisheries Monitoring Centre at the Norwegian Directorate of Fisheries.

In a circumpolar context, the waters along the western and northern coast of Svalbard (about 76° 30′ – 81° North, see Fig. 1), are the northernmost waters that are usually ice free. This is

because the Svalbard archipelago is warmed by the West Spitsbergen Current (Fig. 2), the northernmost branch of the North Atlantic Current, which flows along the western coast and turns northeastwards into the Polar Basin north of the archipelago. The eastern coast of the Svalbard archipelago is chilled by a cold Arctic current flowing from northeast. This cold current rounds the southern tip of Svalbard and flows as a cold, coastal current northwards along the western coast of Svalbard (see Fig. 2). The Svalbard fjords are therefore normally frozen during winter, but during the past decade this has not been the case on the western coast of Svalbard.

In recent decades, global warming has become more evident. For example, sea ice extent in the Arctic at its minimum in September has been reduced by 13% per decade in the period 1979–2012 (NSIDC, 2013). Likewise, the volume of the Arctic sea ice has been reduced by 3100 km³ per decade since 1979 (psc.apl.washington.edu). This indicates quite dramatic changes in the sea ice volume and extent over the last three decades. Winter ice extent in the waters north of Svalbard has declined by about 10% per decade, and the Atlantic Water entering the Arctic Ocean has warmed by about 0.3 °C per decade (Onarheim et al., 2014). The maximum temperatures of Isfjorden and Grønfjorden on the west coast of Svalbard have increased by about 2 °C during the last hundred years (Pavlov et al., 2013).

Warming of the Svalbard waters in the last decades has enabled northward expansion of boreal marine species. In 2005 blue mussels (*Mytilus edulis*) were back in the fjords of Western Svalbard for the first time in 1000 years (Berge et al., 2005). Species like Northeast Arctic cod, Northeast Arctic haddock (*Melanogrammus aeglefinus*), and herring (*Clupea harengus*) have become successively more common in the fjords of Western Svalbard (Berge et al., 2015). In 2013, Atlantic mackerel (*Scomber scombrus*) were caught

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