# Updated Report of the Coastal States Working Group on the distribution of Norwegian spring spawning herring in the North-East Atlantic and the Barents Sea

September 2022

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# 1. Introduction

At the Coastal States meeting on 23-24 October 2019 between the European Union, the Faroe Islands, Iceland, Norway and the Russian Federation, the Norwegian delegation announced of its initiative where the Institute of Marine Research in Norway would lead a participatory process to update the "Report of the Coastal States Working Group on the distribution of Norwegian spring spawning herring in the North-East Atlantic and the Barents Sea" from 2014.

In the following Coastal states meeting in 2020 it was agreed that the report should be updated on a regular basis and the present report builds on the 2021 report but with added information from catches and surveys in 2022.

In the agreed record from the 2021 consultations, the work of updating the report was formalized by establishing a working group chaired by Norway in 2022 and subsequently by a scientist from the party chairing the Coastal State Consultations.

## 1.1. Terms of Reference

The text below is copied from the agreed record from the Coastal States consultations in 2020 (item 5) and will be regarded as terms of reference for the present working group:

"The delegations welcomed a presentation from The Norwegian Institute of Marine Research on the progress with the participatory process to update the "Report of the Coastal states Working Group on the distribution of Norwegian Spring Spawning Herring in the North East Atlantic and the Barents Sea, Copenhagen 4-7 March 2014" and the overview of methods for calculations of zonal attachment. Furthermore, methodologies to be used for calculations of zonal attachment for this stock were presented. In this regard, the delegations welcomed the fact that Norway intends to continue this work and to convene other scientific meetings with a view to keep the report up-to-date."

## 1.2. Approach of the present group

The present report relies on standardised information in the form of output from nationally and internationally coordinated surveys with common databases, most of them annually reported to ICES.

For temporal distribution among zones the present report followed a direct observation approach like the 2014 WG. However, for the survey data after 2013, StoX[1] (Johnsen et al., 2019) replaced the software BEAM that is no longer supported. The group was of the general opinion that the former analysis made using BEAM are comparable with StoX. The exercise to compare the few years of surveys data using both BEAM and StoX has only resulted in minor differences, therefore these can be considered as comparable.

Surveys provide snapshots of distribution of biomass/abundance of the different life stages. The former report used the following stages: early larvae, 0-group, juveniles (ages 0-3) and adults (age 4+), by producing maps and, when the data allowed, tables showing proportions by zones. The surveys provide information about biomass or abundance at specific points in time and space, but the integrated nature of their analysis will give distribution maps within the survey period. The present report contains added survey information from surveys in 2021-2022.

Catch distributions are based on a data call addressing each country with official recorded catches from the stock from logbooks and sales slips. This report contains added information from catches in 2021. For some countries catch information for the period 2013-2021 is added, which were missing in the 2021 report. The information from the landings statistics was compared to catches provided for ICES WGWIDE and Coastal States. Data were requested and reported by year, month, country and zone as tonnes and proportions.

[1] Version 2.7

# 2. Background

## 2.1. Main characteristics of the migration patterns of the stock

The Norwegian spring spawning herring (*Clupea harengus*) is one of the stocks composing the Atlanto-Scandian herring, together with two Icelandic herring stocks; the summer-spawners and spring-spawners (Johansen 1919; Dragesund et al., 1980). It is the largest herring stock in the world. It is widely distributed and highly migratory throughout large parts of the NE Atlantic during its lifespan. By far the majority of the adult stock occurs in Divisions 2a,b, 5a,b and 14a,b (Figure 2.1.1). Juveniles of the stock have their nurseries in Division 1a,b. In some years, Norwegian spring spawning herring can be found in adjacent areas mixing with other herring stocks.

The herring spawns along the Norwegian west coast in February-April. Large variations in the north-south distribution of the spawning areas have been observed through the centuries. The larvae drift north and northeast and distribute as 0–group in fjords along the Norwegian coast and in the Barents Sea. The Barents Sea is by far the most important juvenile area for the large year-classes, which form the basis for the large production-potential of the stock. Some year-classes are in addition distributed into the Norwegian Sea basin as 0–group. Most of the young herring leave the Barents Sea as 3 years old and feed in the north-eastern Norwegian Sea for 1–2 years before recruiting to the spawning stock. With maturation, the young herring start joining the adult feeding migration in the Norwegian Sea. The feeding migration starts just after spawning with the maximum feeding intensity and condition increase occurring from late May to July (Homrum et al., 2016). The feeding migration is in general length dependent; the largest and oldest fish perform longer and typically more western migrations than the younger ones. Young fish of productive year-classes emerging from the Barents Sea can migrate to the northeast of the Norwegian Sea for feeding. After the dispersed feeding migration, the herring aggregates through September-October in one or more wintering areas. These areas are unstable and since 1950 the stock has used at least 6 different wintering areas in different periods. During the 1950s and 1960s they were situated east of Iceland and after around 1970 in Norwegian fjords. In 2001–2002 a new wintering area was established off the Norwegian coast between 69º30'N and 72ºN in addition to the fjords. In 2007-2009, however, no herring was observed in the fjords in winter and a new wintering area was located in the ocean off northern Norway. After wintering, the spawning migration starts around mid-January. In the last decade, the herring has partially stayed in the south-western part of the Norwegian Sea for a prolonged time in autumn.

### 2.1.1. Early life stages

The Norwegian spring spawning herring spawns on the Norwegian coastal banks (Figure 2.1.1.1) during February-April (peak spawning in March). The eggs are deposited on the bottom. After hatching, larvae appear in the upper layers of the sea and drift with the current along the slope of the continental shelf. Larvae are gradually spread along the Norwegian coast and later appear in the Barents Sea along the Russian coast and sometimes the Bear Island-Spitsbergen area. While poor year-classes are mainly restricted to fjords in Norway, abundant ones are predominantly found in the Barents Sea. For instance, the portion brought to the Barents Sea of the abundant herring year-classes 1991, 1992 and 1998, comprised 84, 96 and 98 %, respectively, of the total number of these year-classes at the age of 1 year. Corresponding figures for the medium year-classes of 1990, 1993 and 1996 were 29-48 %, and of the poor year-classes 1995-1997 only 4-9 % (Krysov and Røttingen 2011). The young herring remain in the Barents Sea usually 3 years and then migrate westwards into the Norwegian Sea, but sometimes good year classes, as for example 2016, remain in the Barents Sea for 4-5 years.

Migration of the young herring in the Barents Sea varies seasonally. This has been described for the 1983 year-class (Røttingen 1990) (Figure 2.1.1.2).

### 2.1.2. Adults

A characteristic feature of this herring stock is an extensive and varying migration pattern. The migration may be relatively stable for periods while periods of large changes occur occasionally at varying time intervals. The changes may be observed on the spawning-, feeding- and/or overwintering grounds both in a single or an interrelated manner.

The usual annual clockwise migration route of adult herring feeding in the Norwegian Sea starting in the south after spawning and ending in the northeast at the wintering areas has remained through the whole period. However, some changes in the distribution and recently the timing of the migration have been observed through this period.

After the recovery of the NSS herring stock, and until about 2002 the bulk of the adult herring wintered in fjords in northern Norway. The 1998 and 1999 year-classes were expected to enter the fjords around 2002 but were instead observed wintering off the coast in the ocean off Vesterålen/Troms, between 69º30'N and 72ºN. This continued in the years to come and in 2005 also the 2002 year-class was observed wintering in the same area. During these years, the amount of older herring wintering in the fjords decreased rapidly and following the winter of 2007 no herring was observed in the fjords. In the last several years wintering herring have been observed in the oceanic areas and fjords in the Troms region.

After spawning, in March/April the herring migrate westwards into the Norwegian Sea to start feeding and main concentrations are found in the central part of this area. In July, the herring are spread out over a wide area feeding around the fringes of the Norwegian Sea. In the early period from 1995-1999 the main concentrations of feeding herring utilised the central and southern Norwegian Sea, mainly the southern part of the International and the Norwegian zone. From 1999 a north-eastward displacement of the adult stock took place, which lasted until 2005, with almost no herring observed in the central region. In 2006-2016 they were more pronounced in the southern and south-western area. After 2016, the main concentration again shifted to the central and southern Norwegian Sea and the eastern part also. Figure 2.1.2.2. shows distribution of the feeding herring in July-August 2022.

It is not clear what drives the changes in the migration, but the biomass, age structure and production of zooplankton are likely factors, as well as oceanographic features such as sea temperature. A further factor might be the large pelagic stocks of mackerel and blue whiting occupying the same feeding area. Young herring leaving the nursery areas in Barents Sea or coastal waters in Norway and joining the adult stock for feeding is not as capable of extensive feeding migration as older herring. Correspondingly, when rich year-classes have joined the adult stock from the nursery areas in the Barents Sea a more north–easterly distribution has been observed. The stock is currently dominated by the 2016 year-class. The 2022 summer distribution shows some old fish in the southwestern part of the Norwegian Sea, while the 2016 year-class was distributed in most of the Norwegian Sea.

## 2.2. Mixing with other herring stocks and populations

In the Norwegian Sea (2.a, 2.b), all monitored, sampled, and caught herring are assessed and managed as Norwegian spring-spawners. During the spawning season (1 February – 30 April), the distribution area is extended, and herring caught along the Norwegian coast (within the 12 NM) in area 4.a can be recorded as Norwegian spring-spawners clearly split out from other populations in the North Sea based on maturation, age, length and vertebrae counts, in addition to the very specific spatiotemporal use of historic spawning grounds for NSS herring and evidence from tag-recapture data. During feeding migration, the Norwegian spring-spawners have the potential to mix with herring stocks and populations that have been identified based on spawning time and area, or otolith characteristics. In the Norwegian Sea and adjacent waters, they can mix with the Norwegian autumn-spawners (Husebø et al 2005), the Icelandic summer-spawners, the Icelandic spring-spawners (small component, Óskarsson 2018), the Faroese autumn-spawners (Figure 2.2.1), North Sea herring and several local herring populations in Norway: in fjords along the coast (Aasen 1953; Lie et al 1978; Jørstad et al 1994; Libungan et al 2015), in semi-enclosed coastal ecosystems (Johannessen et al 2009; Langård et al 2014) and in the brackish Lake Landvik in the south (Eggers et al 2014; Libungan et al 2015). In Iceland, the Norwegian spring-spawners and Icelandic summer-spawners are separated based on maturity stage for management purposes.

# 3. Methods

## 3.1. Zonal database

In the analyses presented in this report, the same database with EEZ coordinates has been used as in the 2014 report (Anon. 2014). The countries provided their information on catches on NSS herring by EEZ, i.e. it was not necessary to use the database to split catches into EEZs. In the report from 2014 zonal

information from the database was applied to survey data (Anon. 2014). However, the method used to produce the estimates of the surveys in the present report has changed. A new estimation software StoX (Johnsen et al., 2019) is now available where biomass estimates are produced directly by EEZs. For the records, please note that the shapefile (MarineRegions.org) used in StoX for the EEZs does not include disputed areas where more than one party claim certain rights. With regards to NSS herring this applies to a disputed area along the boundary between the Icelandic and the Faroese EEZs.

The StoX software is used as the estimation procedure in several ICES-coordinated surveys for the assessment of various stocks (e.g. the International ecosystem surveys in the Nordic Seas – NSSH, the International blue whiting spawning stock survey – blue whiting, and the International Ecosystem summer survey in the Nordic Seas – NEA mackerel). This estimation procedure replaced the BEAM software, which produced biomass estimates on 2x2 squares of 1-degree latitude and 2 degree's longitude (instead of exact location). This new method is considered to provide more accurate estimation and thereby being more adequate than the former one. A comparison between the two methods was made on the estimates for two years for all the international surveys and it showed minor differences in most cases. Re-estimating the whole time series back to 1995 is not currently possible because some of the acoustic data are not available in survey database (PGNAPES) prior to 2009.

## 3.2. Surveys

### 3.2.1. Methods used when calculating abundance/biomass

#### Larval index

The herring larval abundance index is based on the number of caught larvae per square metre of surface at each station and is calculated with consideration to measured water volume, depth layers and total number of caught larvae. All larvae are included in the index and herring larvae abundance indices are produced. The surveyed area is delimited by a polygon, which is divided into a grid with cell sizes of 14.5 * 8 km. The herring larval density per grid is estimated and summed over the covered area (Stenevik *et al*. 2012).

#### 0-group index

The geographical distribution of 0-group fishes is estimated by the standard procedure which was first recommended in 1980 (Anon. 1980). All vessels use a small mesh mid-water trawl ("Harstadtrål"). The standard procedure consisted of tows at 3 depths, each of 0.5 nautical miles, with the headline of the trawl located at 0, 20 and 40 m. When the 0-group fish layer was recorded on the echo-sounder deeper than 60m or 80m additional tows at 60 and 80m, of 0.5 NM distance also, were carried out. The history of development of 0-group investigation and assessment method is described in detail for example in the survey report from 2007 (e.g. Anon. 2007). The abundance of 0-group herring is measured in numbers and the index (2013-2019) is calculated using the StoX software.

#### Juveniles

Juveniles are defined as immature herring age 1-3. All regions of the Barents Sea and adjacent areas of the Norwegian Sea are covered, with transects 35 nautical miles apart. Data from pelagic trawl hauls and bottom trawl hauls considered representative for the pelagic component of the stocks, which is measured acoustically, are included in the stock abundance calculations. The StoX software is used to make estimates of total biomass and numbers of individuals by age and length in the whole survey area and within different subareas.

#### Adults

The survey estimates of the adult part of the stock are based on scientific echosounders combined with trawl catches to identify species and size distribution. The StoX software is used to make estimates of total biomass and numbers of individuals by age and length in the whole survey area and within different subareas.

# 4. Results derived from Surveys

A number of national and international research surveys have been conducted over the period 2014-2022 that can provide information about spatial and temporal variation in distribution and quantity of different life stages of Norwegian spring-spawning herring (Table 4.1). Some of the surveys are constrained to only part of the distribution area, while others provide information for the whole stock and/or the whole period from 2014 to 2021/2022. All surveys are snap shots and representative for the distribution during the survey period. Seven survey series are updated since the 2014 WG and these surveys, taking place in the first to third quarters of the year, are considered to provide adequate quantitative information about the distribution of the stock, adult or juveniles. Relative estimates on biomass or number of fish for different EEZs were tabulated. No survey information is available for quarter 4. Below is a short description of each of the surveys, their main results with regards to inter-annual variation in the spatial distribution of the stock, and conclusions that can be derived from them as well as their limitations.

Table 4.1. List of relevant surveys targeting Norwegian spring spawning herring. Indication is given of whether and how the measured abundance/biomass is representative for the distribution of the life-stage. Some surveys may have started earlier, but the first year under consideration in this report is 2014 (the former report includes surveys in the period 1995-2013, see Annex 1).

| Survey | Month | Lifestage | Complete spatial coverage of life-stage | Year range | Representative for distribution of life-stage |
|---|---|---|---|---|---|
| **1st quarter** | | | | | |
| Acoustic survey on the spawning grounds | Feb/ Mar | Adults | Yes | 2015-2022 | Whole spawning stock covered |
| **2nd quarter** | | | | | |
| Larval survey in Norwegian coast | Mar/ Apr | Larvae | Yes | 2014-2016 | Whole distribution area of newly hatched larvae covered |
| International ecosystem survey in the Nordic Seas (IESNS) – Barents Sea | May | Juveniles ages 1-3 | Yes | 2014-2021 | Main distribution area of juveniles covered |
| International ecosystem survey in the Nordic Seas (IESNS) | May | Adults | Yes | 2014-2022 | Adult part of stock spatially covered |
| **3rd quarter** | | | | | |
| Ecosystem survey in Barents Sea | Aug | 0-group, | Yes | 2014-2019 | Main area of 0-group covered |
| | Aug | Juveniles age 1-3 | Yes | 2014-2021 | Main area of juveniles covered |
| International Ecosystem Summer Survey in the Nordic Seas (IESSNS) | Jul/ Aug | Adults | Yes | 2014-2022 | Northern boundary of distribution area not fully reached in all years<br>Main distribution area covered |
| **4th quarter** | | | | | **No surveys** |

# 1st quarter

## 4.1. Adults from acoustic survey on the spawning grounds

A Norwegian acoustic survey has been undertaken to estimate the abundance at age of herring in the spawning areas along the Norwegian coast in February and March. The survey has been carried out since 1988 but not in every year. This survey is conducted during a period when the entire spawning stock is

distributed along the Norwegian coast to spawn (Figure 4.1.1). No surveys were conducted during 2009 – 2014. In 2015 the survey was re-introduced, and results from 2015 – 2022 are included in this report.

# 2nd quarter

## 4.2. Larvae survey

A Norwegian herring larvae survey was carried out on the Norwegian shelf 1981 – 2016 during March-April. The objectives of the survey were to map the distribution of herring larvae and other fish larvae on the Norwegian shelf and to collect data on hydrography, nutrients, chlorophyll and zooplankton. In 2015 the distribution area was not fully covered due to bad weather conditions. The survey is considered to cover the entire distribution area of newly hatched larvae (Figure 4.2.1). There have been no surveys after 2016.

## 4.3. Juveniles in Barents Sea according to the International ecosystem survey in the Nordic Seas (IESNS)

A part of the international ecosystem survey in the Nordic Seas in May (section 4.6), is focusing on juvenile herring, zooplankton and hydrography in the Barents Sea. The survey is conducted by a Russian vessel and has been carried out in most years since 1995. There was no survey in 2022. Results from 2014 – 2021 are included in this report. The distribution maps are presented in Figure 4.3.1 and percentages by zone in Table 4.3.1. Average percentage distribution (2014 – 2021) is: Russia 52.4%, Norway 47.6%.

## 4.4. Adults from the International ecosystem survey in the Nordic Seas (IESNS)

The international ecosystem survey in the Nordic Seas is aimed at observing the pelagic ecosystem, focusing on herring, blue whiting, zooplankton and hydrography. The survey, carried out in late April and May since 1995, is coordinated by ICES survey planning groups (PGNAPES and currently WGIPS) and is a cooperative effort by Faroes, Iceland, Norway, Russia, and since 1998 the EU (Denmark, Germany, Ireland, The Netherlands, Sweden and UK). In 2022 the UK participated with ship-time. A good internal consistency among years for age groups 4+ and expert judgment on the whole time-series point out that the survey covers the adult part of the stock adequately each year. Biomass estimates based on the acoustic and catch samples for the years 2014-2022, shown in Figure 4.4.1 and Table 4.4.1, are therefore considered to be representative for the relative distribution of the adult part of the stock during that month of the year**.**

The average percentage distribution by zones for the whole period 2014 – 2022 give the following (Table 4.4.1): Norway 29.5%, International zone 17.2%, Faroes 24.4%, Iceland 23.7%, Jan Mayen 2.4%, and EU/UK 2.9%.

# 3rd quarter

## 4.5. 0-group and juveniles from ecosystem survey in Barents Sea

The survey consists of a trawl survey catching 0–group herring amongst other species and an acoustic survey estimating one and two-year-old herring. It is difficult to assess the abundance during autumn, for various reasons. The age groups 1 to 3 are found mixed with 0–group herring and are difficult to catch in the sampling trawl used in this survey. The stock size estimates of herring are therefore considered less reliable than those for capelin and polar cod. The survey, however, is assumed to cover the main

distribution area of 0-group herring even though it is known that they are found to a lesser extent in Norwegian fjords. There was no update of the 0-group index from this survey since 2020 due to a lack of complete survey coverage. Distribution maps of the 0-group are presented in Figure 4.5.1. The results from this survey, tabulated for the years 2014-2019 for 0-group, shows an average distribution of 49.4% in Norwegian EEZ and 3% in Russian EEZ, 34.9% in the Fishery protection zone around Svalbard, and 12.8% in international waters (Table 4.5.1).

For the juveniles, the survey coverage was considered adequate in 2022 and results are presented in Figure 4.5.2. According to Table 4.5.2 an average distribution of the juveniles is 62.2% in Norwegian EEZ, 37.6% in Russian EEZ.

## 4.6. Adults from the International ecosystem summer survey in Nordic Sea (IESSNS)

This ecosystem survey was initiated in 2004 by Norway and has since been gradually expanded in geographical coverage, especially from 2009 and onwards with participation of vessels from Iceland and the Faroes in addition to two vessels from Norway and in the most recent years Greenlandic and Danish vessels. The main objective of the survey is to study abundance and distribution of Northeast Atlantic mackerel, NSSH, blue whiting and other pelagic species with acoustic and swept-area methods in relation to oceanographic conditions, prey communities and marine mammals. Acoustic estimates of herring are available from the 2014 – 2022 surveys (Figure 4.6.1 and Table 4.6.1). According to Table 4.6.1 the biomass, on average, during July/August is distributed in the EEZ of Iceland 39.1%, Faroe Island 23.1%, Norway 18%, Jan Mayen 6.7%, the International waters in the Norwegian Sea 6.4%, Svalbard 4.3%, EU/UK 2.2% and Greenland 0.2%.

# 4th quarter

No new survey information is available for 4th quarter.

# 5. Results derived from catches

## 5.1. Overview of submitted data

To update the distribution maps of the catches for 2021, a request was formulated on catch data by year, month and ICES statistical square (0.5° latitude, 1° longitude) and by economic zone (EEZ) to the nations fishing for Norwegian spring-spawning herring. The deadline for submission of the catch data was set to 1st June 2022. All countries/parties delivered their catch data in time to be included in the report. The level of detail of the catch data was in line with the request.

The total catch in the years 1995-2021 and the relative catch by zones is shown in Figure 5.1.1. In Table 5.1.1 the catches reported to the Working Group are compared with the catches reported to WGWIDE and catches delivered by Coastal States for each year in 2013-2019 (ICES 2020). Catches reported to the Working Group as percentage of catches reported to WGWIDE by year varies from 97.34 % to 100.70 % (Table 5.1.1). Obviously, the difference can partly be explained with the fact that the catch data were raised in the WGWIDE report to account for changes in the percentages of water content. The proportion is 99.60 % for the whole period. There are however differences in catches reported by Coastal States with other data sources.

All catch data submitted had the requested quality, i.e. catches reported by year, month, zone and ICES rectangle.

## 5.2. Description of Fishery

The fishery today is carried out mainly in the beginning of the year and in the autumn, mainly by large purse seiners and pelagic trawlers, but also to a smaller degree as a coastal fishery. The catches are used for human consumption and reduction purposes to fish meal and fish oil.

The fishery is regulated and carried out by the Coastal States. The TAC is set by the Coastal States and derived from an agreed long-term management plan (ICES 2018). However, after 2013 no agreement on the sharing of the stock has been reached by the coastal states and thus the catches have been larger than recommended by ICES. The Coastal States have agreed on the TAC, but not the sharing arrangements.

In 2013-2021 the fishing pattern corresponds to the general seasonal distribution of the herring in the Norwegian Sea as the year progresses. The fishery focuses on wintering, pre-spawning, spawning and feeding fish. The fishing activity starts in January on the Norwegian shelf. The fishing effort then shifts south-west to Icelandic and Faroese waters in early autumn and expands north-east to International waters and Norwegian zone in late autumn.

In the earlier period until 2010, the traditional fishing activities followed the stock in a north-eastern direction in autumn to the eastern part of the Norwegian Sea. However, in the last decade the fishing activity have been significant also in the southern Norwegian Sea, in international (<68°N), Icelandic and Faroese EEZs in this time of the year. Fishing activities by zones in 2013-2021 is shown in Table 5.2.1 and Table 5.2.2.

The NSSH changed wintering areas from the fjords to more offshore waters off northern Norway during the years 2002-2006. The change in wintering pattern caused a large change in fishing pattern as well. More catches were taken during the spawning migration and at spawning time instead of during the wintering period. These changes applied mostly to the Norwegian fleet. In recent years, part of the herring has been wintering in the fjords of northern Norway again.

Typically, catches in the purse seine and pelagic trawl fishery consist of only herring with limited by-catches. However, due to the changes in the distribution of mackerel in the late 2000s, by-catches of mackerel did increasingly occur on the traditional herring fishing grounds but seem to have decreased again the last decade.

Due to limitations, which are inherent in catch data, e.g. regulation effects, national agreements on zonal access, distance from homeport, area misreporting, technical changes, changes in fishing methods etc., the fisheries do not necessarily depict the distribution of herring in the Norwegian Sea. However, fisheries do show presence of herring while no fishery cannot per se be concluded as absence of herring.

## 5.3. Seasonal and interannual patterns

Changes have been observed in the fishery through the years since the NSS herring reappeared in the feeding areas in the Norwegian Sea in the mid-1990s. The limitations mentioned in section 5.2 also apply to the seasonal changes in the herring fisheries and therefore the following description. The following description is therefore restricted to general remarks on distribution of the fisheries.

The changes observed in the seasonal pattern since the fishery began in the mid-1990s is depicted in Figure 5.3.1 showing the percentage distribution of the fishery by month for each year since 1995, and in Annex 2 where maps of the fishery per month and per year is shown. From this, four main periods stand out in the seasonal fishing patterns: an early period 1995-1997, a mid-period from 1998-2005, a late period (2006-2012) and a recent period (2013-2021, Figure 5.3.1).

In the early period, up to 1998, the main fisheries were in the spawning area (Norwegian EEZ) in January-March with a peak in February, then a fishery in the Norwegian Sea (ICES Divisions 5.a, 5.b and 2.a) developed with a peak in May, followed by a fishery in the north-eastern areas from September to November (Figure 5.3.1).

In the mid period 1998-2005 the spawning fishery was the same, but now the peak in the summer fishery changed from May to June while the autumn fishery continued as usual (Figure 5.3.1). However, the effort shifted with less effort in the summer period to an increase in the autumn fishery. A further change during this period was that the summer fishery had shifted further north into the Jan Mayen, International and Norwegian areas (Figure Annex 2). This northern movement of the feeding stock during the 1998-

2005 could be driven by a combination of increased temperature and reduced zooplankton abundance in the Atlantic water masses further south (Eliasen et al., pers. comm.).

In the period after 2005 the summer feeding areas again shifted southwest as was the case in the early period. The fishery, however, did not follow the previous pattern as the May and June fishery has almost disappeared, instead the late autumn and winter fishery dominated (Figure 5.3.1).

The recent fishing pattern is now concentrated in January targeting pre-spawning fish with practically no catches in March. The summer fishery has ceased and the only nations fishing in late summer are the Icelandic and Faroese fleets. In the total picture these quantities are small. The level of the autumn fishery has increased in recent years with a peak in October - November amounting to around 60% of the total annual catches (Figure 5.3.1). This fishery has for some years been mainly in the central Norwegian Sea, north of the Faroes and east of Iceland, whereas before 2015 it used to be stretched out towards the coast of Norway and north towards the Bear Island. Since 2019, however, there was also a fishery on the 2016 year-class off northern Norway during autumn. Changes in migration have also resulted in late arrival at the Norwegian coast for part of the stock (mostly older fish) during the winter in recent years.

There are several possible explanations for these observed changes in the summer fishery for Norwegian spring spawning herring. The distribution of herring has changed throughout the summer months over the years, and thus e.g. accessibility to the fleets may have also changed. The quality and fat content increases throughout the summer season, which may delay the fishery to increase profit. Stock size and consequently quota sizes may also affect where and when the catches are taken. Finally, the quota and fishing opportunities for other pelagic species (blue whiting and mackerel) are also likely to influence the focus put on the herring fishery.

The usual clockwise migration route of adult herring feeding in the Norwegian Sea, starting in the south after spawning, migrating westwards through the Faroese area and moving further north-westwards into Icelandic area in summer, and further north into the Jan Mayen area later in the summer, and ending in the northeast at the wintering areas seem to have stopped in the last decade. Now part of the adult herring seems to prolong their summer feeding period in the southern and southwestern areas, and the return migration to the wintering areas off northern Norway seems to start in the southern/central Norwegian Sea rather late in the season (October/November) or even later in the year. However, as a fishery was going on in the northern area during autumn at the same time as in the southern area, this indicates that it is not the entire stock that delays the northward migration. This pattern can be seen in the fishery by month from 1995-2021 (Figure Annex 2).

# 6. Discussion and conclusions

In this report data are presented from 2013-2022, which illustrate the distribution, and changes in distribution, of NSS herring. Annex 1 and Annex 2 includes tables from the previous report (1995-2013) for comparison. The main source of information is surveys. The surveys provide information about the general seasonal migration pattern and distribution of NSSH. Survey information is not available for all months, and some of the survey-series have been terminated. For example, there are no surveys covering the adult part of the population in the fourth quarter of the year during the period 2014-2022. The lack of systematic information throughout the year prevents a full assessment of the zonal distribution for all life stages, without making assumptions based on other data than survey data. For adults, survey information is available for February and the summer months (May and July-August), but no survey information was available to the working group for April, when the herring start the feeding migration, and September – December, when the herring is finishing the feeding season and returning to the wintering areas. For larvae and 0-group herring survey information is available in April and August/September, and for juveniles in May and August/September.

There are limitations in using catch-data to describe the seasonal distribution of herring. The most obvious one is that the catch data show presence of herring while absence needs to be based on judgement. Other limitations include fishery regulation effects, changes in fleet behaviour, national agreements on zonal access and area misreporting. One example of regulation effects is, that there has been no directed fishery in the Barents Sea since 1996 to protect juveniles. However, taking these limitations into account the catch data can be used to some extent to describe the distribution of NSS herring, as a supplement to survey data.

By combining the information from the surveys and the catches, some general conclusions can be made for the adult part of the stock and partly for juveniles, but a full assessment of a zonal distribution is not possible.

Information about the distribution of larvae, 0-group and juvenile stem from surveys only.

Larvae are distributed along the Norwegian coast in spring and drift mainly into the Barents Sea. That is, they are within the EEZ of Norway (larvae survey until 2016).

0-group herring were distributed in the Barents Sea in August in 2014-2019 (2020 was omitted from calculations because the spatial coverage was incomplete). There was some variability between years, but most being within the Norwegian zone. The rest is, in most years, distributed in the Russian zone, but also in the Fishery protection zone around Svalbard.

Juveniles were primarily distributed in the Barents Sea. In the years 2014-2021 information about the distribution in May comes from the IESNS surveys (however, the area was not surveyed in 2020 and 2022). According to these surveys most of the biomass was within the EEZs of Russia and Norway. Joint Russian and Norwegian surveys have taken place in August/September in the years 2014-2021 and also in these surveys most of the juveniles were within the EEZs of Russia and Norway.

For the adults in quarter 1, the main sources of information are from surveys on the spawning grounds in 2015-2022. According to this information the distribution of the adult part of the stock is limited to the eastern part of the Norwegian Sea and the Norwegian fjords, that is predominately within the Norwegian EEZ. It was only in 2018 that catches indicated some herring in the International waters in quarter 1 (in January). No survey was conducted in 2014.

In quarter 2, the adult stock migrates from the spawning grounds to the feeding grounds. The IESNS survey in the years 2014-2022 shows some inter-annual variability in the distribution but no apparent trend. The biomass has been mostly distributed in four zones, namely, EEZs of Norway, Iceland, Faroes and International waters in the Norwegian Sea.

Quarter 3 covers the latter half of the feeding season and the period when the stock starts to migrate back to the overwintering grounds. The results from the IESSNS survey in 2014-2022, are considered to be representative for the relative distribution of the adult part of the stock during July/August. The survey shows that herring is distributed mostly in the southwestern part of the Norwegian Sea in July/August, predominately in the EEZs of Iceland, Faroes and Norway, but in 2021 and 2022 a significant proportion was observed in the Jan Mayen area.

In quarter 4 there is no survey information for the period 2014-2022. However, data from the fishery indicate that the herring is widely distributed in several EEZs, at least during October and November. Moreover, the fisheries in the traditional feeding areas in the south-western part of the Norwegian Sea in quarters 3 and 4 have extended further into the autumn months, indicating that herring has been staying longer in this region compared to previous years. The reasons for the prolonged stay in the south-western regions of the feeding area in recent years are most likely linked to extended feeding opportunities into the autumn months in later years; since around 2005 herring put on a large proportion of the weight gain after July and the autumn body condition is generally good.

The working group has collated available data from surveys in the period 2014-2022 and analysed distribution of NSS herring based on these surveys. Catch data from 2013 to 2021 have been collated as well and they supplement the survey data. The working group believes that the current report gives a relevant picture of the distribution – and changes in distribution – of NSS herring in the Northeast Atlantic in the period considered.

Regarding methods for calculations of zonal attachment the group concluded in 2020 that the most relevant method is to follow the guidelines proposed by the scientific sub-group of the NEAFC Working Group on Allocation Criteria which met in London 21-23 February 2017. The NEAF Working Group recommended to use surveys to tabulate the distribution. For a given month (or quarter) and year, the biomass estimates in each zone should be expressed as percentages of the total stock biomass. Where possible, upper and lower bounds should be included to reflect the degree of confidence that the working

group places on its figures. For months in the year where no survey data are available, the guidelines propose to use expert knowledge of the biology and migration patterns of the stock to propose what is the most likely biomass present in each zone in each month, and provide upper and lower bounds for what are plausible deviations from the most likely values. These may reflect the range of the expert judgments within the working group. The working groups should complete all cells of both tables (juveniles and adults, respectively) in this way, even if the estimates are based only on expert judgement.

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# 8. Tables

Table 4.3.1. Percentages of NSSH by EEZ based on juveniles in Barents Sea during the International ecosystem survey in the Nordic Seas (IESNS) in May/June. No survey conducted in 2020.

| Year | Norway | Russia | Svalbard | Total |
|---|---|---|---|---|
| 2014 | 38.8 | 61.2 | 0.0 | 100.0 |
| 2015 | 51.1 | 48.9 | 0.0 | 100.0 |
| 2016 | 93.1 | 6.9 | 0.0 | 100.0 |
| 2017 | 26.3 | 73.7 | 0.0 | 100.0 |
| 2018 | 32.7 | 67.3 | 0.0 | 100.0 |
| 2019 | 30.8 | 69.2 | 0.0 | 100.0 |
| 2020 | | | | |
| 2021 | 60.5 | 39.5 | 0.0 | 100.0 |

Table 4.4.1. Percentages of NSSH by EEZ based on adults during the International ecosystem survey in the Nordic Seas (IESNS) in May/June. *Change from EU to UK EEZ from 2021.

| Year | EU/UK* | Norway | Iceland | Svalbard | JanMayen | Faroes | InterNorwSea | Total |
|---|---|---|---|---|---|---|---|---|
| 2014 | 2.9 | 21.8 | 14.0 | 0.0 | 0.8 | 31.0 | 29.6 | 100.0 |
| 2015 | 3.0 | 43.8 | 15.8 | 0.0 | 0.7 | 17.8 | 19.0 | 100.0 |
| 2016 | 9.5 | 23.7 | 16.7 | 0.0 | 3.6 | 27.3 | 19.2 | 100.0 |
| 2017 | 0.2 | 25.4 | 42.7 | 0.0 | 2.5 | 17.7 | 11.5 | 100.0 |
| 2018 | 2.3 | 14.3 | 30.3 | 0.0 | 5.8 | 28.5 | 18.8 | 100.0 |
| 2019 | 2.1 | 23.0 | 24.7 | 0.0 | 2.7 | 32.6 | 15.0 | 100.0 |
| 2020 | 1.5 | 43.9 | 21.4 | 0.0 | 0.1 | 27.8 | 5.2 | 100.0 |
| 2021 | 3.3 | 29.0 | 27.7 | 0.0 | 0.3 | 27.7 | 12.1 | 100.0 |
| 2022 | 1.0 | 40.2 | 20.4 | 0.0 | 5.1 | 9.4 | 23.9 | 100.0 |

Table 4.5.1. Percentages of NSSH by EEZ based on 0-group herring during the ecosystem survey in the Barents Sea in autumn. The 0-group coverage in 2020 was not complete and is therefore not included. Survey result from 2021 was not ready in time to be included in the report.

| Year | Norway | Russia | Svalbard | International | Total |
|---|---|---|---|---|---|
| 2014 | 72.0 | 0.4 | 20.6 | 7.0 | 100.0 |
| 2015 | 18.9 | 0.1 | 80.9 | 0.1 | 100.0 |
| 2016 | 18.5 | 5.9 | 33.8 | 41.8 | 100.0 |
| 2017 | 56.8 | 8.2 | 8.1 | 26.9 | 100.0 |
| 2018 | 38.9 | 0.0 | 60.3 | 0.8 | 100.0 |
| 2019 | 91.2 | 3.3 | 5.4 | 0.0 | 100.0 |

Table 4.5.2. Percentages of NSSH by EEZ based on juvenile herring during the ecosystem survey in the Barents Sea in autumn. Survey result from 2022 was not ready in time to be included in the report.

| Year | Norway | Svalbard | InterBarSea | InterNorwSea | Russia | SpecialAreaBar | Total |
|---|---|---|---|---|---|---|---|
| 2014 | 8.9 | 0.0 | 0.7 | 0.0 | 90.4 | 0.0 | 100.0 |
| 2015 | 67.5 | 0.0 | 0.0 | 0.0 | 32.5 | 0.0 | 100.0 |
| 2016 | 48.6 | 0.0 | 0.0 | 0.0 | 51.4 | 0.0 | 100.0 |
| 2017 | 44.6 | 0.0 | 0.7 | 0.0 | 54.7 | 0.0 | 100.0 |
| 2018 | 70.7 | 0.4 | 0.0 | 0.0 | 28.9 | 0.0 | 100.0 |
| 2019 | 73.2 | 0.0 | 0.0 | 0.0 | 26.8 | 0.0 | 100.0 |
| 2020 | 83.9 | 0.0 | 0.0 | 0.0 | 16.1 | 0.0 | 100.0 |
| 2021 | 100.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 100.0 |

Table 4.6.1. Percentages of NSSH by EEZ based on adults during the International ecosystem summer survey in the Nordic Seas (IESSNS) in July/August. *Change from EU to UK EEZ from 2021.

| Year | EU/UK* | Norway | Iceland | Svalbard | JanMayen | Greenland | Faeroes | InterNorwSea | Russia | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 2014 | 2.4 | 3.7 | 61.8 | 0.1 | 8.3 | 0.0 | 23.0 | 0.8 | 0.0 | 100.0 |
| 2015 | 0.6 | 13.4 | 29.7 | 0.0 | 4.7 | 0.0 | 47.8 | 3.7 | 0.0 | 100.0 |
| 2016 | 0.1 | 5.6 | 66.5 | 0.0 | 1.6 | 0.3 | 25.6 | 0.2 | 0.0 | 100.0 |
| 2017 | 0.4 | 24.3 | 43.7 | 0.0 | 0.5 | 1.1 | 29.8 | 0.3 | 0.0 | 100.0 |
| 2018 | 6.6 | 20.6 | 52.7 | 0.7 | 0.4 | 0.0 | 18.7 | 0.3 | 0.0 | 100.0 |
| 2019 | 5.3 | 18.4 | 39.9 | 6.2 | 0.3 | 0.0 | 24.8 | 5.2 | 0.0 | 100.0 |
| 2020 | 0.2 | 26.8 | 27.5 | 19.3 | 2.2 | 0.0 | 15.2 | 8.8 | 0.0 | 100.0 |
| 2021 | 3.0 | 34.3 | 15.4 | 3.5 | 23.4 | 0.1 | 2.7 | 17.7 | 0.0 | 100.0 |
| 2022 | 1.2 | 14.6 | 14.5 | 9.2 | 18.5 | 0.4 | 20.6 | 21.0 | 0.0 | 100.0 |

Table 5.1.1. Norwegian spring spawning herring. Catch reported to the Coastal States Working group (Data 2020) as percentage of catch reported to WGWIDE. Coastal States WG catches are official catches, whereas WGWIDE catches are provided by scientists. Note that EU catches are not included in this table and are therefore subtracted from the WGWIDE catches for the comparison.

| Year | Data 2021 | WGWIDE2020 | EU WGWIDE2020 | WGWIDE2020 (-EU) | Comparison | Coastal State Data |
|---|---|---|---|---|---|---|
| 2013 | 654 588 | 684 743 | 30 867 | 653 876 | 100.11 % | 687 732 |
| 2014 | 426 570 | 461 306 | 23 063 | 438 243 | 97.34 % | 445 404 |
| 2015 | 303 413 | 328 740 | 18 421 | 310 319 | 97.77 % | 324 995 |
| 2016 | 367 200 | 383 174 | 18 534 | 364 640 | 100.70 % | 384 492 |
| 2017 | 686 057 | 721 566 | 35 568 | 685 998 | 100.01 % | 719 104 |
| 2018 | 567 038 | 592 899 | 26 184 | 566 715 | 100.06 % | 591 401 |
| 2019 | 741 753 | 777 165 | 35 313 | 741 852 | 99.99 % | 774 491 |
| **Total** | **3 746 619** | **3 949 593** | **187 950** | **3 761 643** | **99.60 %** | **3 927 619** |

Table 5.2.1. Catches (tonnes) of Norwegian spring spawning herring by zones for each year 2013-2021. Change from EU to UK EEZ from 2021.

| year | Faroes | Greenland | Iceland | JanMayen | NEAFC | Norway | Russia | Svalbard | UK | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 2013 | 118 526 | 2 221 | 60 373 | 16 602 | 73 626 | 375 887 | 15 | 37 525 | 1 | 684775.9 |
| 2014 | 38 919 | 11 015 | 45 418 | 5 008 | 31 901 | 289 665 | 0 | 26 961 | 312 | 449199.2 |
| 2015 | 41 893 | 10 026 | 39 472 | 656 | 20 757 | 202 007 | 0 | 4 735 | 582 | 320128.4 |
| 2016 | 59 456 | 16 262 | 48 624 | 1 | 46 649 | 213 293 | 0 | 0 | 411 | 384697 |
| 2017 | 100 113 | 9 564 | 56 577 | 0 | 281 186 | 272 639 | 0 | 0 | 0 | 720081.3 |
| 2018 | 64 363 | 329 | 46 013 | 0 | 164 886 | 318 676 | 0 | 0 | 100 | 594367 |
| 2019 | 48 655 | 0 | 115 238 | 0 | 281 458 | 328 211 | 1 | 0 | 1 | 773564.9 |
| 2020 | 31 780 | 3 | 171 390 | 0 | 100 912 | 416 680 | 0 | 0 | 30 | 720795.9 |
| 2021 | 60 320 | 0 | 164 425 | 6 | 30 338 | 591 767 | 1 | 0 | 97 | 846954.7 |

Table 5.2.2. Catches (percentages) of Norwegian spring spawning herring by zones for each year 2013-2021. Change from EU to UK EEZ from 2021.

| Relative | Faroes | Greenland | Iceland | JanMayen | NEAFC | Norway | Russia | Svalbard | UK |
|---|---|---|---|---|---|---|---|---|---|
| 2013 | 17.3 | 0.3 | 8.8 | 2.4 | 10.8 | 54.9 | 0.0 | 5.5 | 0.0 |
| 2014 | 8.7 | 2.5 | 10.1 | 1.1 | 7.1 | 64.5 | 0.0 | 6.0 | 0.1 |
| 2015 | 13.1 | 3.1 | 12.3 | 0.2 | 6.5 | 63.1 | 0.0 | 1.5 | 0.2 |
| 2016 | 15.5 | 4.2 | 12.6 | 0.0 | 12.1 | 55.4 | 0.0 | 0.0 | 0.1 |
| 2017 | 13.9 | 1.3 | 7.9 | 0.0 | 39.0 | 37.9 | 0.0 | 0.0 | 0.0 |
| 2018 | 10.8 | 0.1 | 7.7 | 0.0 | 27.7 | 53.6 | 0.0 | 0.0 | 0.0 |
| 2019 | 6.3 | 0.0 | 14.9 | 0.0 | 36.4 | 42.4 | 0.0 | 0.0 | 0.0 |
| 2020 | 4.4 | 0.0 | 23.8 | 0.0 | 14.0 | 57.8 | 0.0 | 0.0 | 0.0 |
| 2021 | 7.1 | 0.0 | 19.4 | 0.0 | 3.6 | 69.9 | 0.0 | 0.0 | 0.0 |

Table 5.2.3. Catches (tonnes) of Norwegian spring spawning herring by zones in 2013. Change from EU to UK EEZ from 2021.

| EEZ / Country | Faroes | Greenland | Iceland | Jan Mayen | NEAFC | Norway | Russia | Svalbard | UK | Total_catch |
|---|---|---|---|---|---|---|---|---|---|---|
| DEU | 0 | 0 | 0 | 0 | 0 | 1 922 | 0 | 2 322 | 0 | 4 244 |
| DNK | 0 | 0 | 0 | 0 | 0 | 17 159 | 0 | 0 | 1 | 17 160 |
| FRO | 97 741 | 0 | 0 | 0 | 7 297 | 0 | 0 | 0 | 0 | 105 038 |
| GRL | 2 070 | 2 221 | 3 | 0 | 7 840 | 0 | 0 | 0 | 0 | 12 133 |
| IRL | 0 | 0 | 0 | 0 | 0 | 3 165 | 0 | 0 | 0 | 3 165 |
| ISL | 18 534 | 0 | 60 371 | 0 | 11 798 | 0 | 0 | 0 | 0 | 90 703 |
| NLD | 0 | 0 | 0 | 0 | 1 | 2 317 | 0 | 3 302 | 0 | 5 620 |
| NOR | 0 | 0 | 0 | 0 | 36 549 | 323 302 | 0 | 0 | 0 | 359 851 |
| RUS | 181 | 0 | 0 | 16 602 | 10 141 | 19 681 | 15 | 31 901 | 0 | 78 521 |
| UK | 0 | 0 | 0 | 0 | 0 | 8 342 | 0 | 0 | 0 | 8 342 |
| **Total** | **118 526** | **2 221** | **60 373** | **16 602** | **73 626** | **375 887** | **15** | **37 525** | **0.931** | **684 776** |

Table 5.2.3. Catches (tonnes) of Norwegian spring spawning herring by zones in 2014. Change from EU to UK EEZ from 2021.

| EEZ / Country | Faroes | Greenland | Iceland | Jan Mayen | NEAFC | Norway | Russia | Svalbard | UK | Total_catch |
|---|---|---|---|---|---|---|---|---|---|---|
| DEU | 0 | 0 | 0 | 0 | 0 | 384 | 0 | 284 | 0 | 669 |
| DNK | 0 | 0 | 0 | 0 | 8 893 | 2 916 | 0 | 0 | 0 | 11 810 |
| FRO | 24 093 | 0 | 0 | 0 | 2 806 | 0 | 0 | 0 | 0 | 26 899 |
| GRL | 2 022 | 11 001 | 165 | 0 | 0 | 0 | 0 | 0 | 0 | 13 188 |
| IRL | 0 | 0 | 0 | 0 | 706 | 0 | 0 | 0 | 0 | 706 |
| ISL | 6 978 | 14 | 45 253 | 0 | 6 583 | 0 | 0 | 0 | 0 | 58 827 |
| NLD | 0 | 0 | 0 | 0 | 72 | 2 607 | 0 | 6 453 | 312 | 9 445 |
| NOR | 0 | 0 | 0 | 28 | 7 255 | 255 847 | 0 | 0 | 0 | 263 131 |
| RUS | 5 826 | 0 | 0 | 4 980 | 5 586 | 23 676 | 0 | 20 224 | 0 | 60 292 |
| UK | 0 | 0 | 0 | 0 | 0 | 4 233 | 0 | 0 | 0 | 4 233 |
| **Total** | **38 919** | **11 015** | **45 418** | **5 008** | **31 901** | **289 665** | **0** | **26 961** | **312** | **449 199** |

Table 5.2.3. Catches (tonnes) of Norwegian spring spawning herring by zones in 2015. Change from EU to UK EEZ from 2021.

| EEZ / Country | Faroes | Greenland | Iceland | Jan Mayen | NEAFC | Norway | Russia | Svalbard | UK | Total_catch |
|---|---|---|---|---|---|---|---|---|---|---|
| DEU | 1 110 | 0 | 0 | 0 | 1 547 | 0 | 0 | 0 | 4 | 2 660 |
| DNK | 649 | 0 | 0 | 0 | 7 329 | 14 | 0 | 0 | 0 | 7 992 |
| FRO | 23 053 | 0 | 0 | 0 | 2 897 | 0 | 0 | 0 | 180 | 26 130 |
| GRL | 2 058 | 10 026 | 231 | 0 | 0 | 124 | 0 | 0 | 135 | 12 574 |
| IRL | 0 | 0 | 0 | 0 | 999 | 400 | 0 | 0 | 0 | 1 400 |
| ISL | 3 139 | 0 | 39 241 | 0 | 246 | 0 | 0 | 0 | 0 | 42 626 |
| NLD | 2 453 | 0 | 0 | 0 | 1 977 | 0 | 0 | 0 | 233 | 4 663 |
| NOR | 0 | 0 | 0 | 0 | 0 | 176 176 | 0 | 0 | 0 | 176 176 |
| RUS | 9 433 | 0 | 0 | 656 | 5 743 | 25 286 | 0 | 4 735 | 0 | 45 853 |
| UK | 0 | 0 | 0 | 0 | 19 | 6 | 0 | 0 | 30 | 55 |
| **Total** | **41 893** | **10 026** | **39 472** | **656** | **20 757** | **202 007** | **0** | **4 735** | **582** | **320 128** |

Table 5.2.3. Catches (tonnes) of Norwegian spring spawning herring by zones in 2016. Change from EU to UK EEZ from 2021.

| Country \ EEZ | Faroes | Greenland | Iceland | Jan Mayen | NEAFC | Norway | Russia | Svalbard | UK | Total_catch |
|---|---|---|---|---|---|---|---|---|---|---|
| DEU | 700 | 0 | 0 | 0 | 1 882 | 0 | 0 | 0 | 0 | 2 583 |
| DNK | 1 895 | 0 | 0 | 0 | 219 | 7 634 | 0 | 0 | 0 | 9 747 |
| FRO | 42 898 | 0 | 0 | 0 | 1 829 | 0 | 0 | 0 | 0 | 44 727 |
| GRL | 2 350 | 16 262 | 1 495 | 0 | 0 | 0 | 0 | 0 | 0 | 20 108 |
| IRL | 0 | 0 | 0 | 0 | 1 529 | 519 | 0 | 0 | 0 | 2 048 |
| ISL | 1 210 | 0 | 47 129 | 0 | 2 119 | 0 | 0 | 0 | 0 | 50 458 |
| NLD | 520 | 0 | 0 | 0 | 1 726 | 570 | 0 | 0 | 302 | 3 119 |
| NOR | 0 | 0 | 0 | 0 | 12 341 | 185 081 | 0 | 0 | 0 | 197 421 |
| RUS | 9 884 | 0 | 0 | 1 | 24 982 | 15 589 | 0 | 0 | 0 | 50 456 |
| UK | 0 | 0 | 0 | 0 | 22 | 3 900 | 0 | 0 | 109 | 4 031 |
| **Total** | **59 456** | **16 262** | **48 624** | **1** | **46 649** | **213 293** | **0** | **0** | **411** | **384 697** |

Table 5.2.3. Catches (tonnes) of Norwegian spring spawning herring by zones in 2017. Change from EU to UK EEZ from 2021.

| Country \ EEZ | Faroes | Greenland | Iceland | Jan Mayen | NEAFC | Norway | Russia | Svalbard | UK | Total_catch |
|---|---|---|---|---|---|---|---|---|---|---|
| DEU | 557 | 0 | 0 | 0 | 4 607 | 2 | 0 | 0 | 0 | 5 166 |
| DNK | 0 | 0 | 0 | 0 | 3 927 | 13 923 | 0 | 0 | 0 | 17 850 |
| FRO | 57 775 | 0 | 0 | 0 | 40 388 | 0 | 0 | 0 | 0 | 98 163 |
| GRL | 2 500 | 9 564 | 457 | 0 | 48 | 0 | 0 | 0 | 0 | 12 570 |
| IRL | 1 291 | 0 | 0 | 0 | 1 179 | 1 024 | 0 | 0 | 0 | 3 495 |
| ISL | 28 813 | 0 | 56 119 | 0 | 5 468 | 0 | 0 | 0 | 0 | 90 400 |
| NLD | 631 | 0 | 0 | 0 | 5 676 | 0 | 0 | 0 | 0 | 6 307 |
| NOR | 0 | 0 | 0 | 0 | 157 794 | 231 589 | 0 | 0 | 0 | 389 383 |
| POL | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| RUS | 8 514 | 0 | 0 | 0 | 61 301 | 21 303 | 0 | 0 | 0 | 91 118 |
| SWE | 0 | 0 | 0 | 0 | 766 | 439 | 0 | 0 | 0 | 1 205 |
| UK | 33 | 0 | 0 | 0 | 31 | 4 358 | 0 | 0 | 0 | 4 422 |
| **Total** | **100 113** | **9 564** | **56 577** | **0** | **281 186** | **272 639** | **0** | **0** | **0** | **720 081** |

Table 5.2.3. Catches (tonnes) of Norwegian spring spawning herring by zones in 2018. Change from EU to UK EEZ from 2021.

| Country \ EEZ | Faroes | Greenland | Iceland | Jan Mayen | NEAFC | Norway | Russia | Svalbard | UK | Total_catch |
|---|---|---|---|---|---|---|---|---|---|---|
| DEU | 0 | 0 | 0 | 0 | 1 919 | 0 | 0 | 0 | 2 | 1 922 |
| DNK | 0 | 0 | 0 | 0 | 2 094 | 14 958 | 0 | 0 | 0 | 17 052 |
| FRO | 32 377 | 0 | 4 920 | 0 | 44 155 | 510 | 0 | 0 | 0 | 81 962 |
| GRL | 2 460 | 329 | 10 | 0 | 91 | 0 | 0 | 0 | 0 | 2 890 |
| IRL | 0 | 0 | 297 | 0 | 122 | 2 009 | 0 | 0 | 0 | 2 428 |
| ISL | 19 149 | 0 | 40 786 | 0 | 23 457 | 0 | 0 | 0 | 0 | 83 392 |
| NLD | 1 557 | 0 | 0 | 0 | 2 846 | 0 | 0 | 0 | 32 | 4 435 |
| NOR | 0 | 0 | 0 | 0 | 34 849 | 297 177 | 0 | 0 | 0 | 332 027 |
| POL | 50 | 0 | 0 | 0 | 932 | 0 | 0 | 0 | 65 | 1 047 |
| RUS | 8 769 | 0 | 0 | 0 | 54 421 | 995 | 0 | 0 | 0 | 64 185 |
| SWE | 0 | 0 | 0 | 0 | 0 | 445 | 0 | 0 | 0 | 445 |
| UK | 0 | 0 | 0 | 0 | 0 | 2 582 | 0 | 0 | 0 | 2 582 |
| **Total** | **64 363** | **329** | **46 013** | **0** | **164 886** | **318 676** | **0** | **0** | **100** | **594 367** |

Table 5.2.3. Catches (tonnes) of Norwegian spring spawning herring by zones in 2019. Change from EU to UK EEZ from 2021.

| EEZ / Country | Faroes | Greenland | Iceland | Jan Mayen | NEAFC | Norway | Russia | Svalbard | UK | Total_catch |
|---|---|---|---|---|---|---|---|---|---|---|
| DEU | 0 | 0 | 0 | 0 | 4 142 | 0 | 0 | 0 | 0 | 4 142 |
| DNK | 227 | 0 | 0 | 0 | 11 049 | 6 413 | 0 | 0 | 0 | 17 688 |
| FRO | 26 664 | 0 | 37 685 | 0 | 49 591 | 0 | 0 | 0 | 0 | 113 940 |
| GRL | 1 747 | 0 | 0 | 0 | 1 677 | 0 | 0 | 0 | 0 | 3 424 |
| IRL | 0 | 0 | 0 | 0 | 1 098 | 1 677 | 0 | 0 | 0 | 2 775 |
| ISL | 11 152 | 0 | 77 553 | 0 | 19 341 | 0 | 0 | 0 | 0 | 108 046 |
| NLD | 512 | 0 | 0 | 0 | 4 647 | 0 | 0 | 0 | 1 | 5 160 |
| NOR | 0 | 0 | 0 | 0 | 113 309 | 317 195 | 0 | 0 | 0 | 430 504 |
| POL | 0 | 0 | 0 | 0 | 1 327 | 0 | 0 | 0 | 0 | 1 327 |
| RUS | 8 353 | 0 | 0 | 0 | 75 278 | 406 | 1 | 0 | 0 | 84 039 |
| SWE | 0 | 0 | 0 | 0 | 0 | 720 | 0 | 0 | 0 | 720 |
| UK | 0 | 0 | 0 | 0 | 0 | 1 801 | 0 | 0 | 0 | 1 801 |
| **Total** | **48 655** | **0** | **115 238** | **0** | **281 458** | **328 211** | **1** | **0** | **1** | **773 565** |

Table 5.2.3. Catches (tonnes) of Norwegian spring spawning herring by zones in 2020. Change from EU to UK EEZ from 2021.

| EEZ / Country | Faroes | Greenland | Iceland | Jan Mayen | NEAFC | Norway | Russia | Svalbard | UK | Total_catch |
|---|---|---|---|---|---|---|---|---|---|---|
| DEU | 27 | 0 | 0 | | 2 747 | 0 | | | 28 | 2 801 |
| DNK | 0 | 0 | 0 | | 2 974 | 9 885 | | | 0 | 12 860 |
| FRO | 21 720 | 0 | 77 363 | | 3 947 | 0 | | | 0 | 103 029 |
| GRL | 1 127 | 3 | 1 | | 2 419 | 0 | | | 0 | 3 550 |
| IRL | 0 | 0 | 0 | | 1 102 | 1 601 | | | 0 | 2 704 |
| ISL | 204 | 0 | 94 027 | | 3 655 | 287 | | | 0 | 98 173 |
| NLD | 501 | 0 | 0 | | 3 275 | 3 039 | | | 0 | 6 815 |
| NOR | 0 | 0 | 0 | | 29 043 | 380 394 | | | 0 | 409 436 |
| POL | 0 | 0 | 0 | | 263 | 1 089 | | | 0 | 1 352 |
| RUS | 8 201 | 0 | 0 | | 51 121 | 15 603 | | | 0 | 74 925 |
| SWE | 0 | 0 | 0 | | 223 | 2 947 | | | 0 | 3 170 |
| UK | 0 | 0 | 0 | | 143 | 1 836 | | | 2 | 1 981 |
| **Total** | **31 780** | **3** | **171 390** | | **100 912** | **416 680** | | | **30** | **720 796** |

Table 5.2.3. Catches (tonnes) of Norwegian spring spawning herring by zones in 2021. Change from EU to UK EEZ from 2021.

| EEZ / Country | Faroes | Greenland | Iceland | Jan Mayen | NEAFC | Norway | Russia | Svalbard | UK | Total_catch |
|---|---|---|---|---|---|---|---|---|---|---|
| DEU | 0 | 0 | 0 | 0 | 0 | 3 185 | 0 | 0 | 0 | 3 186 |
| DNK | 0 | 0 | 0 | 0 | 0 | 15 854 | 0 | 0 | 0 | 15 854 |
| FRO | 44 821 | 0 | 55 779 | 0 | 13 682 | 9 | 0 | 0 | 0 | 114 290 |
| GRL | 6 244 | 0 | 1 | 0 | 211 | 0 | 0 | 0 | 0 | 6 456 |
| IRL | 0 | 0 | 0 | 0 | 0 | 1 793 | 0 | 0 | 0 | 1 793 |
| ISL | 16 | 0 | 108 646 | 4 | 5 611 | 22 | 0 | 0 | 0 | 114 299 |
| NLD | 0 | 0 | 0 | 0 | 0 | 7 389 | 0 | 0 | 0 | 7 389 |
| NOR | 0 | 0 | 0 | 0 | 843 | 488 790 | 0 | 0 | 0 | 489 633 |
| POL | 0 | 0 | 0 | 0 | 0 | . | 0 | 0 | 97 | 97 |
| RUS | 9 240 | 0 | 0 | 1 | 9 991 | 73 609 | 1 | 0 | 0 | 92 842 |
| SWE | 0 | 0 | 0 | 0 | 0 | 1 116 | 0 | 0 | 0 | 1 116 |
| **Total** | **60 320** | **0** | **164 425** | **6** | **30 338** | **591 767** | **1** | **0** | **97** | **846 955** |

# 9. Figures

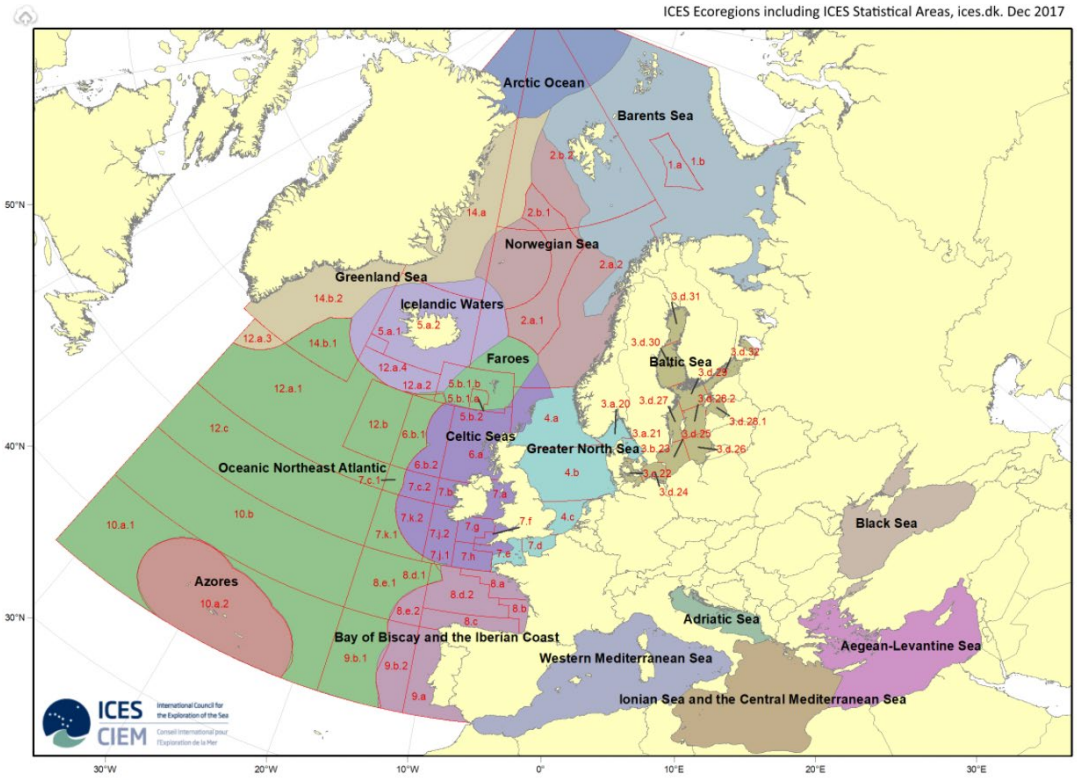



Figure 2.1.1. ICES ecoregions and statistical areas (Divisions), where Norwegian spring spawning herring is distributed. Also, adjacent Divisions are shown.

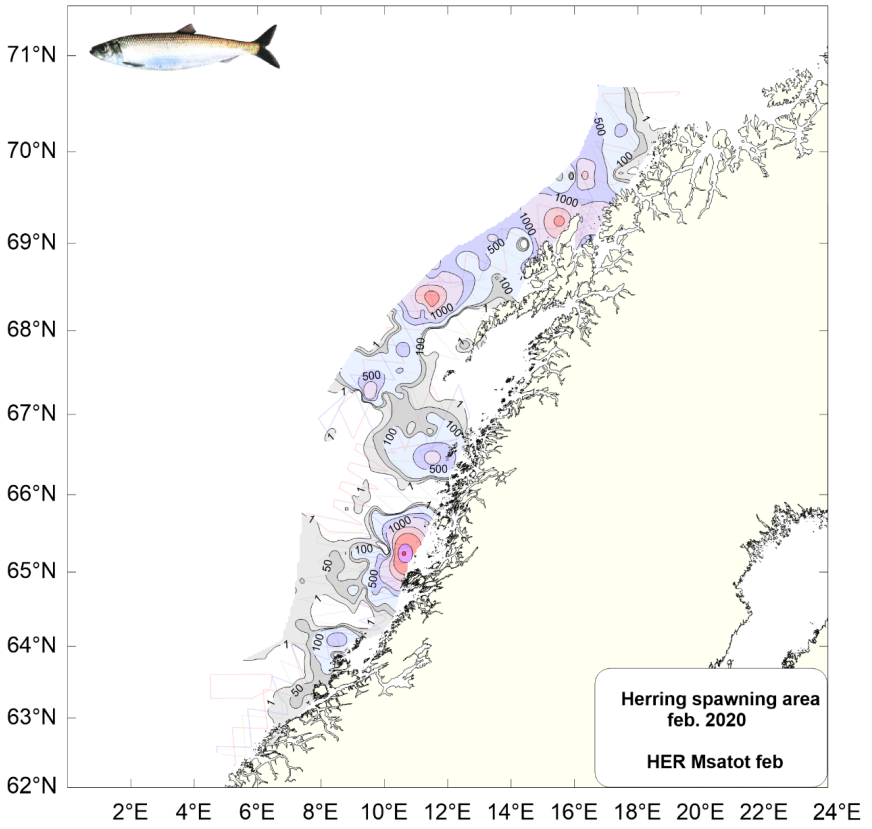



Figure 2.1.1.1. Spawning area of Norwegian Spring Spawning Herring in February 2020. Data from Norwegian Acoustic survey on the spawning grounds.

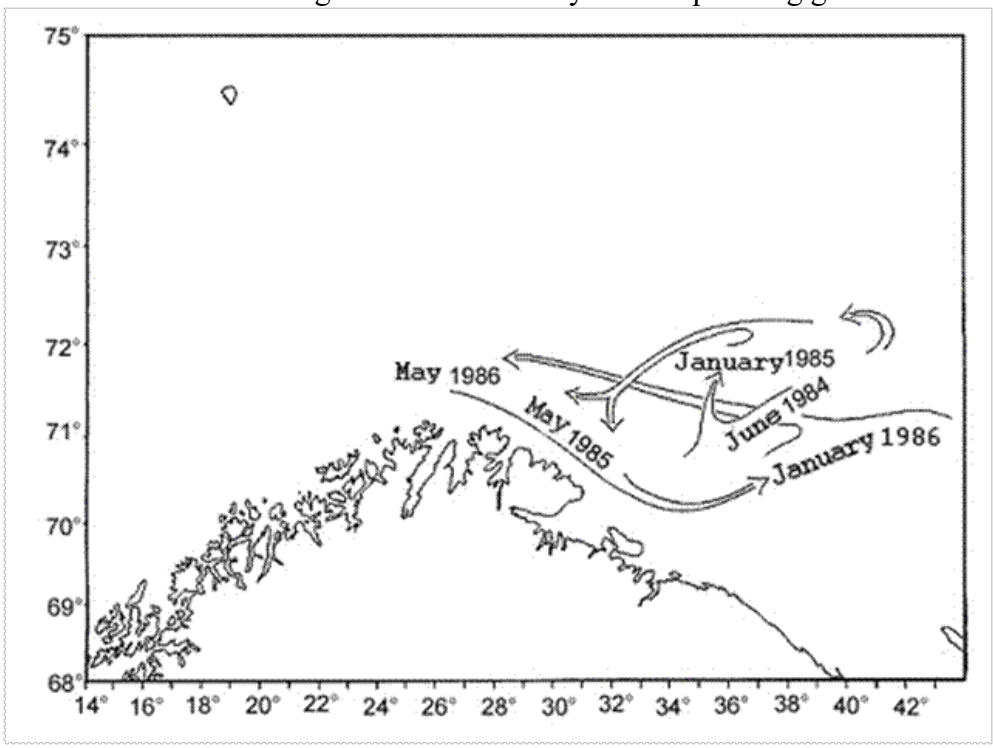



Figure 2.1.1.2. Migration scheme of the 1983 year-class as juveniles in the Barents Sea (from Røttingen 1990).

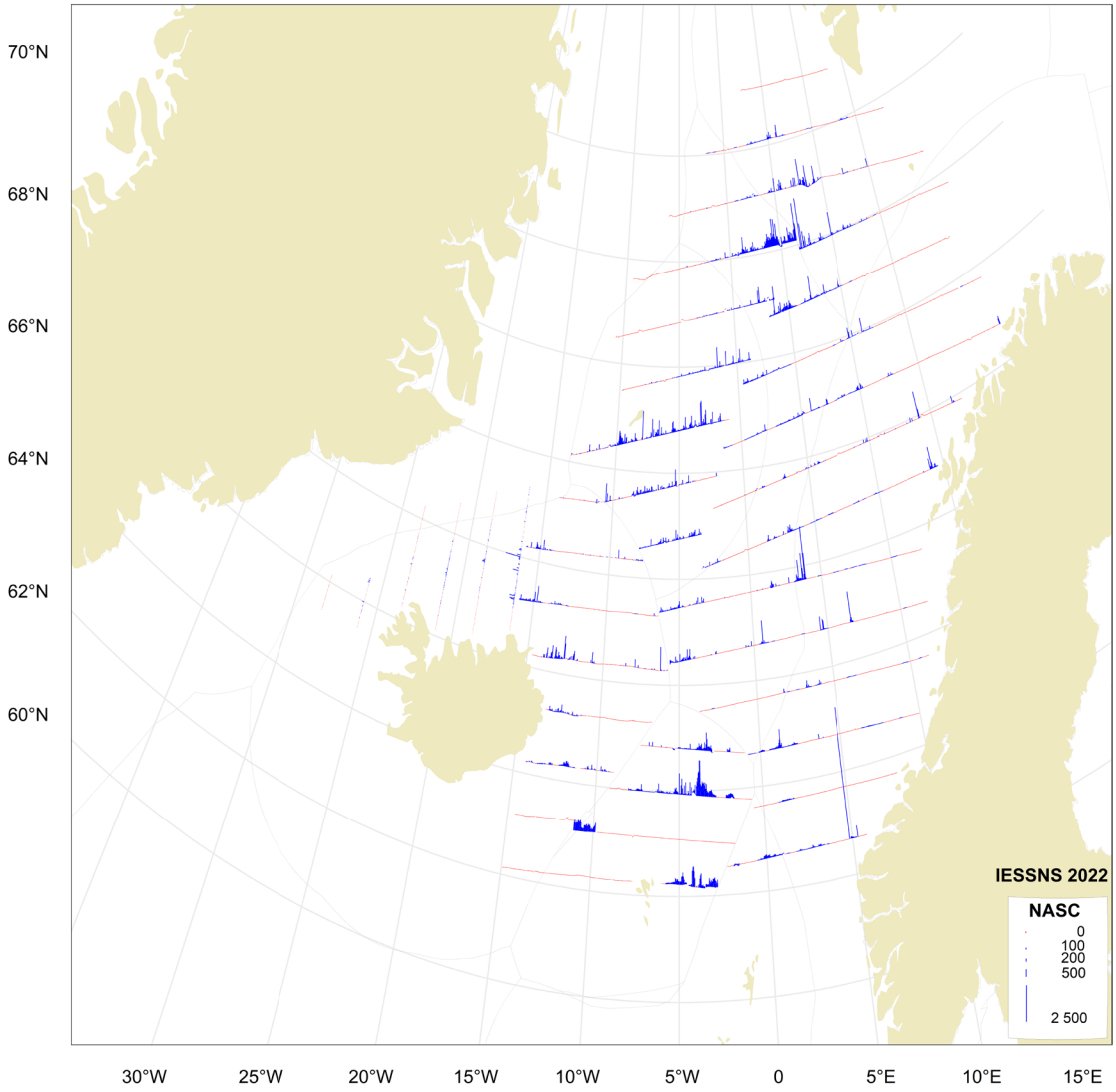



Figure 2.1.2.2. Distribution of Norwegian Spring Spawning Herring during the feeding period in July-August 2022 (IESSNS survey).

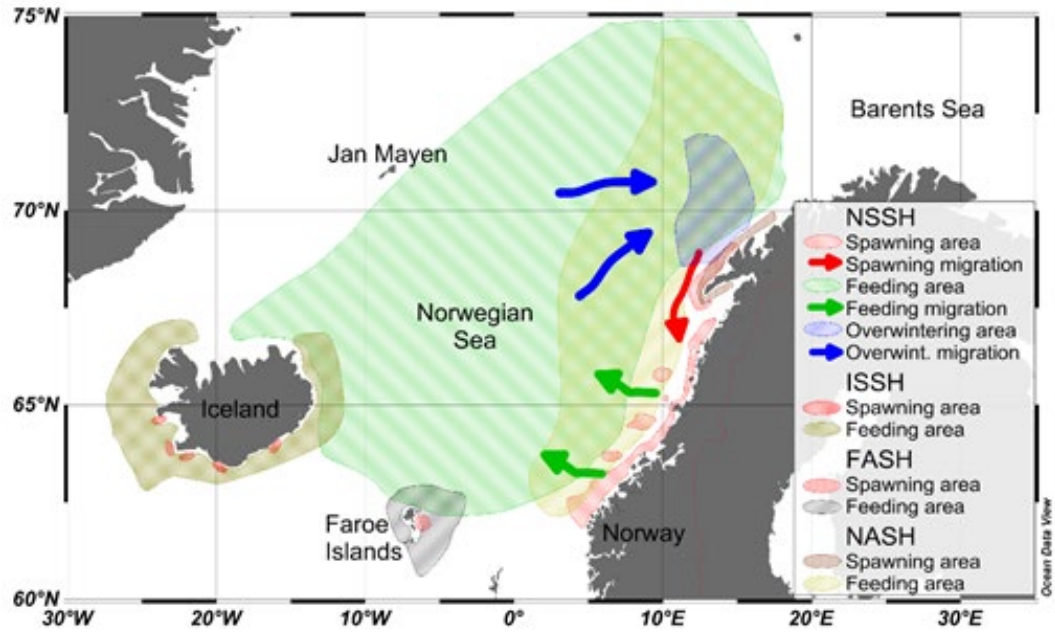
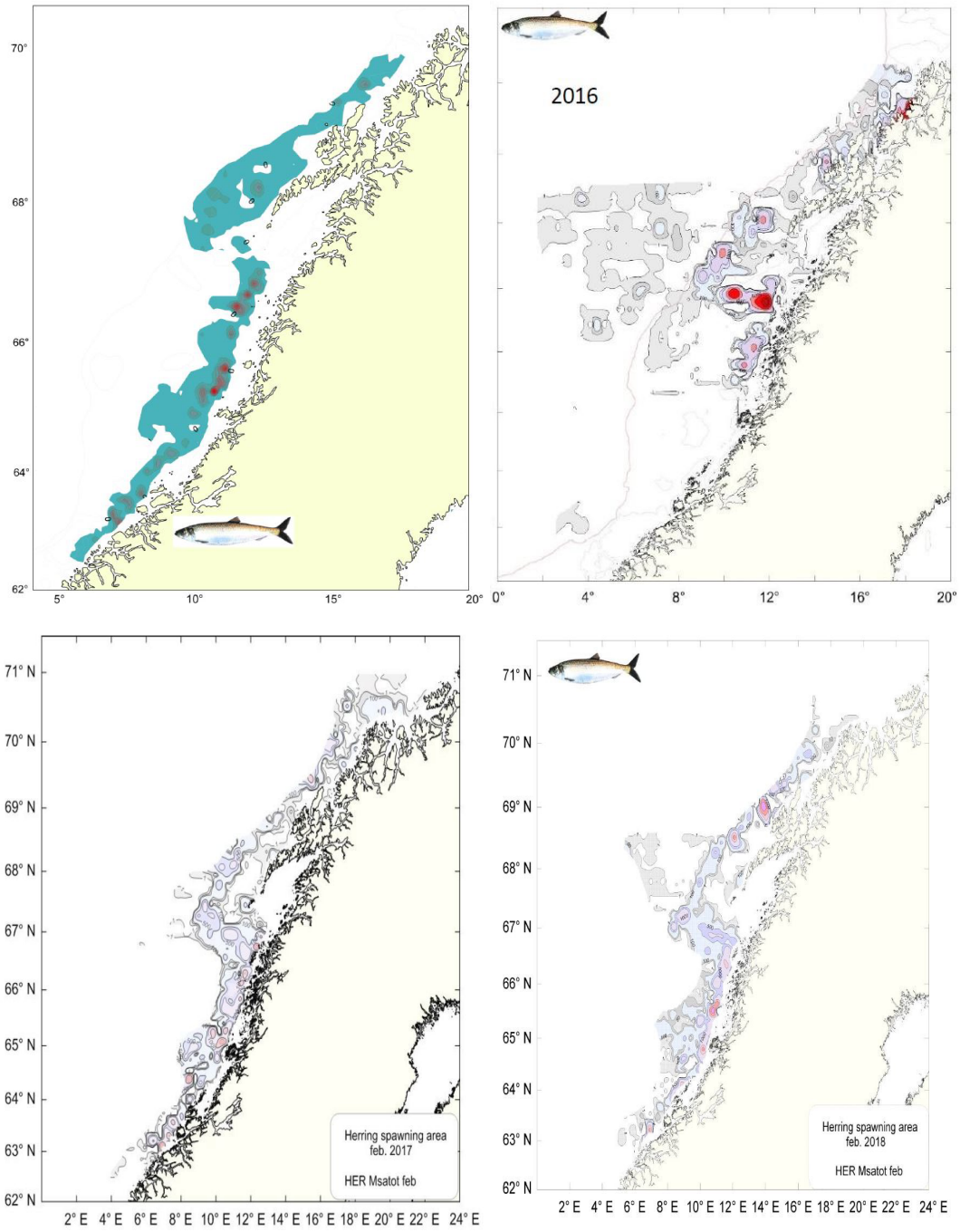



Figure 2.2.1. Current migration pattern of the adult part of Norwegian spring-spawning herring (NSSH) and interactions with other surrounding stocks, i.e. Icelandic summer-spawning herring (ISSH), Faroese autumn-spawning herring (FASH), and Norwegian autumn-spawning herring (NASH) (from Pampoulie et al. 2015).


2016
Herring spawning area
feb. 2017
HER Msatot feb
Herring spawning area
feb. 2018
HER Msatot feb

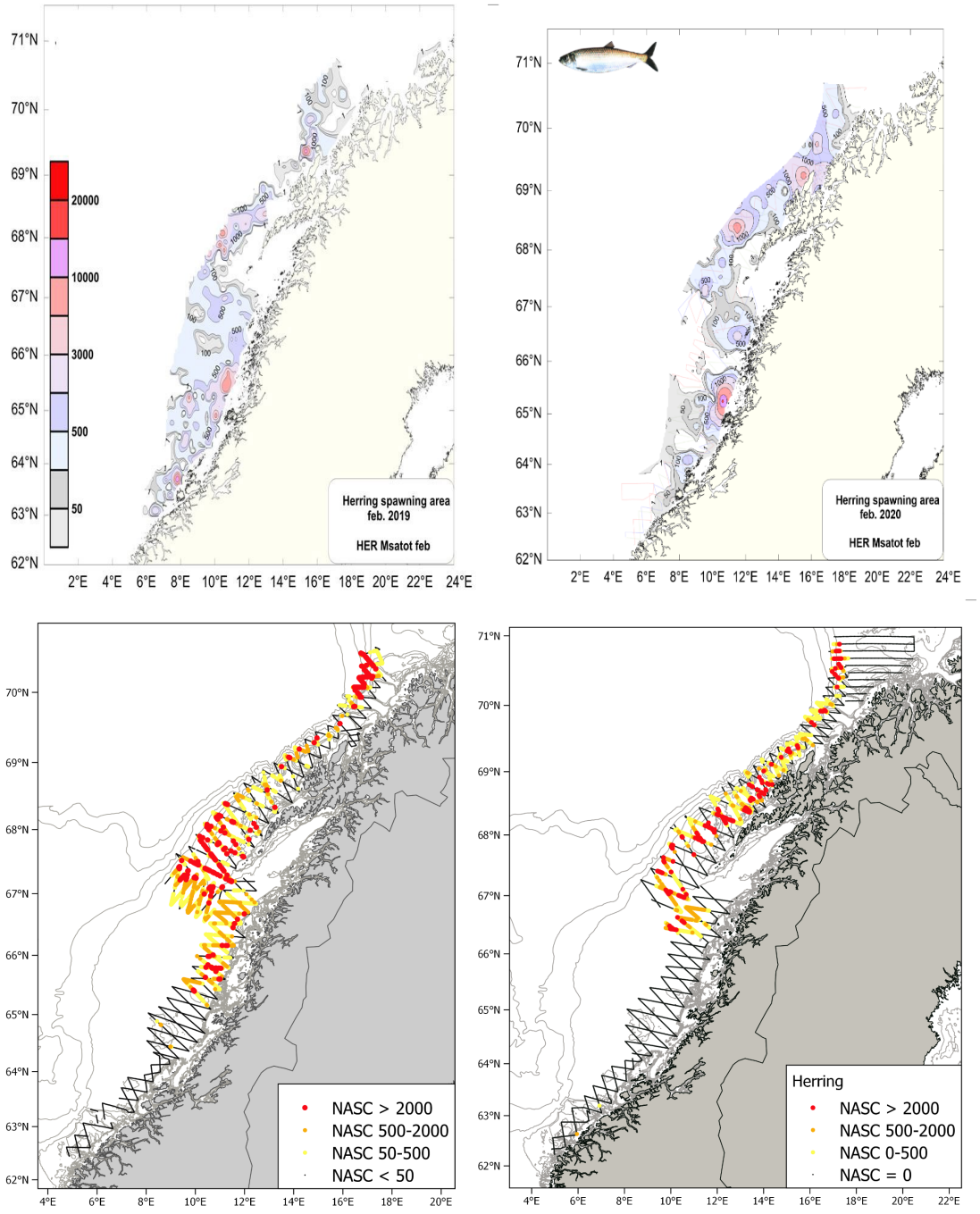



Figure 4.1.1. Distribution of herring from the acoustic survey on the spawning grounds in February 2015-2022.

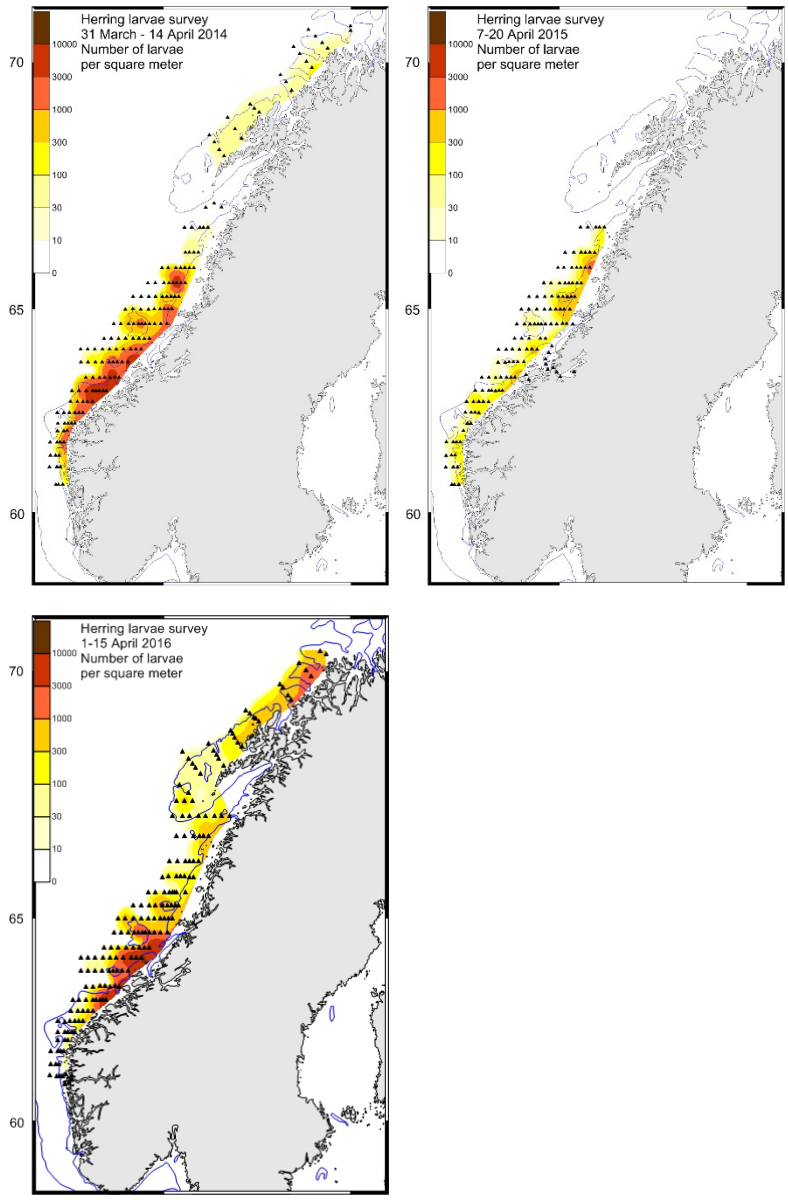



Figure 4.2.1. Distribution of herring larvae in April 2014-2016.

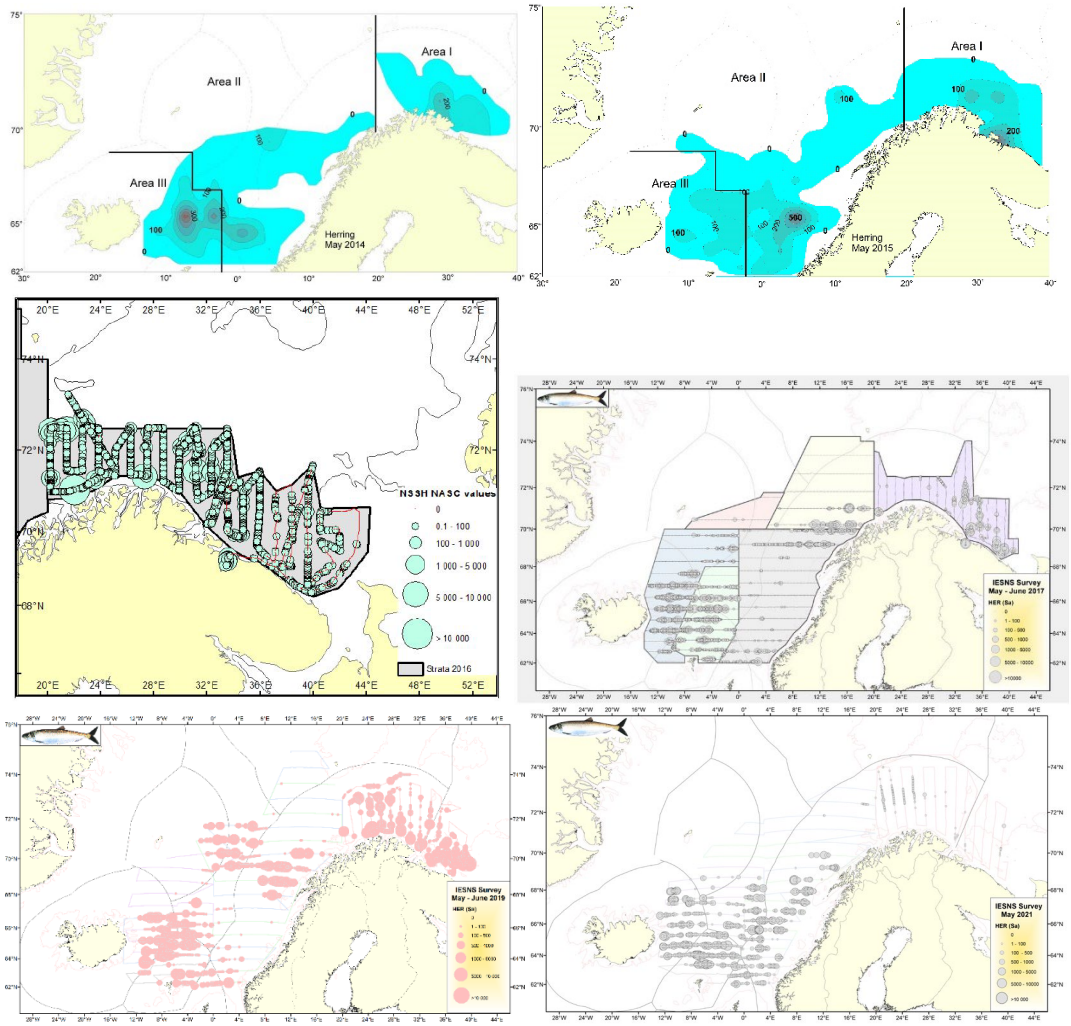



Figure 4.3.1. Distribution of juvenile NSSH in Barents Sea from the International ecosystem survey in the Nordic Seas (IESNS) in May/June 2014-2021. Note that for all years except 2017, the map covers also the distribution of adult fish in the Nordic Seas. There was no coverage in the Barents Sea in 2020 and 2022.

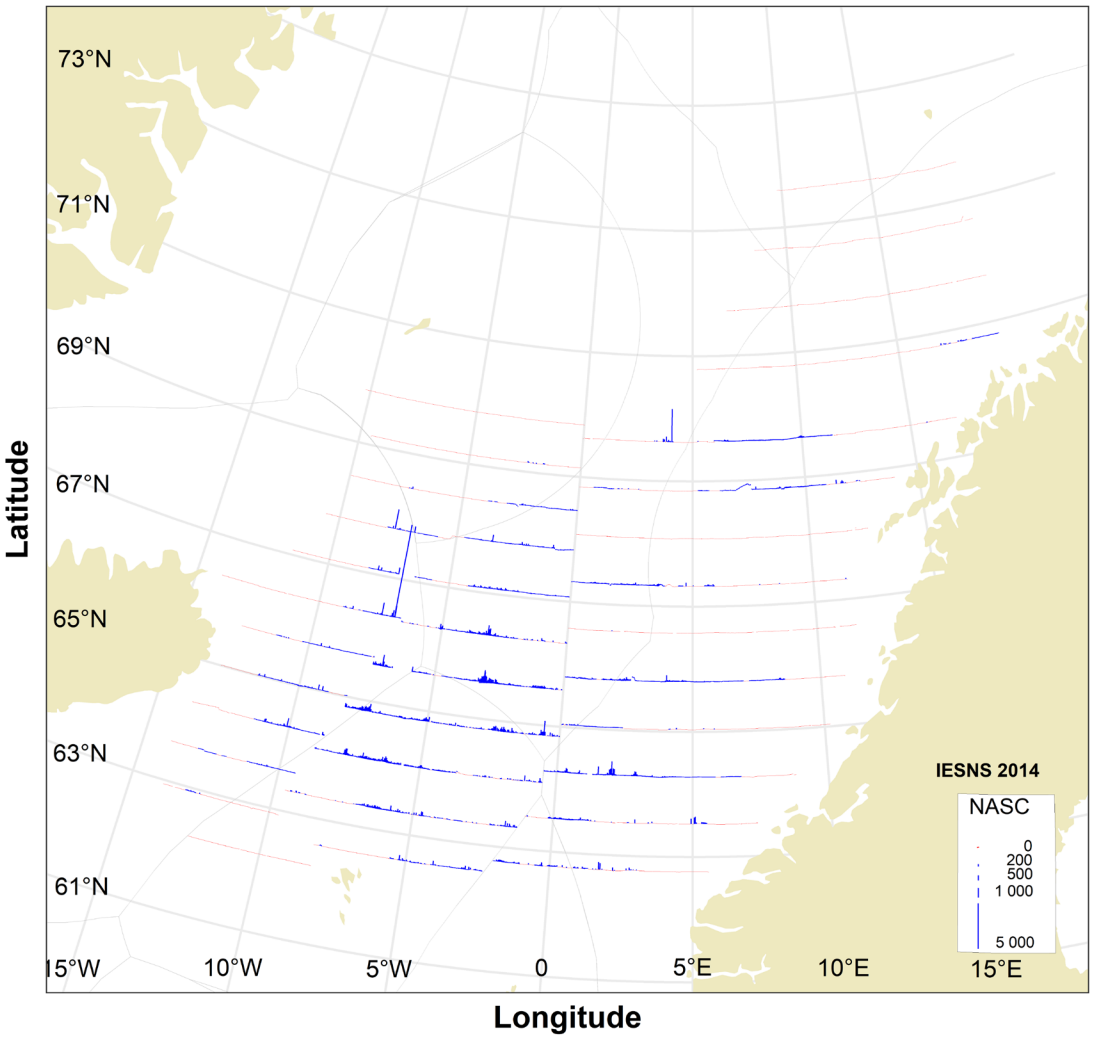



Figure 4.4.1. Distribution of adult NSSH in the Nordic Seas from the International ecosystem survey in the Nordic Seas (IESNS) in May/June 2014.

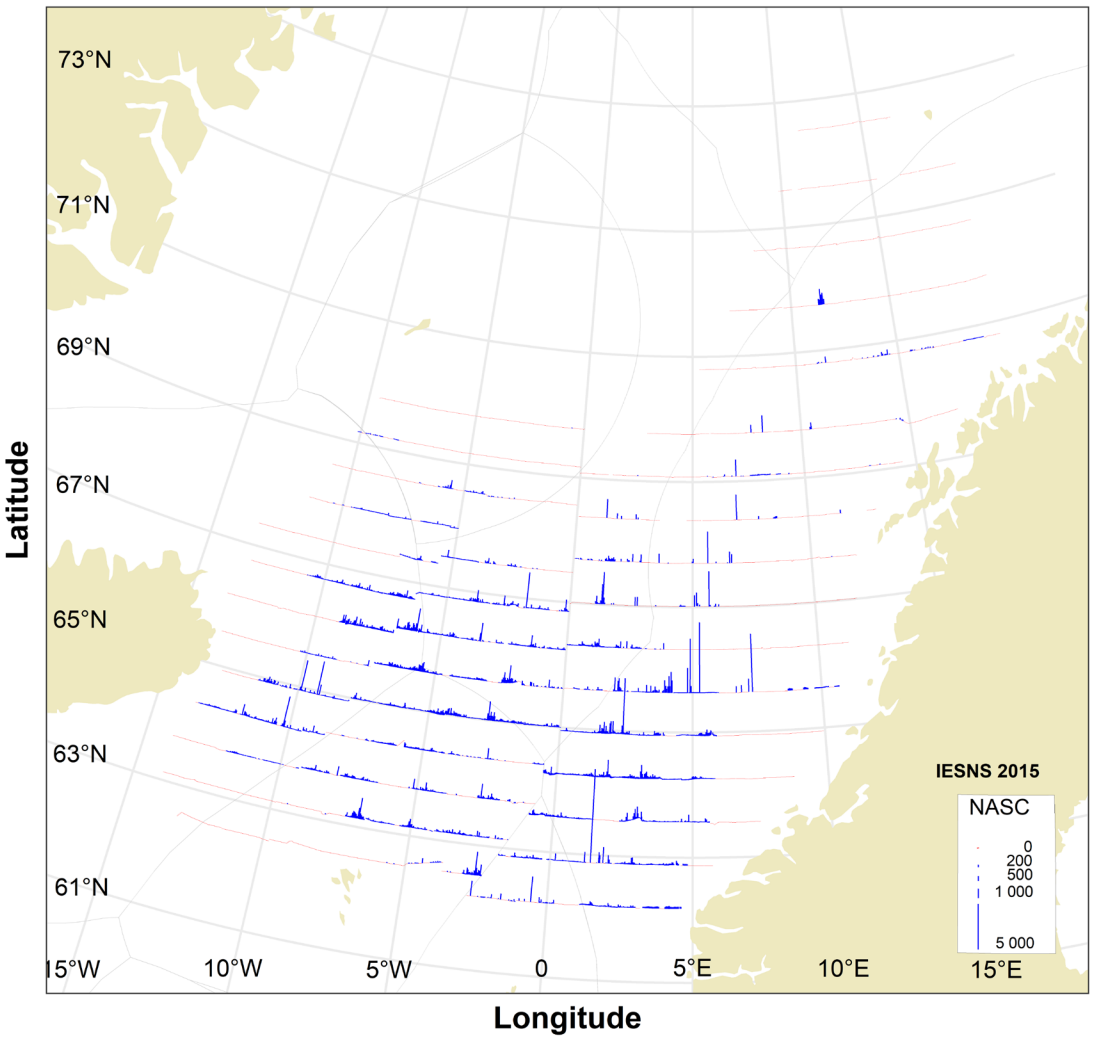



Figure 4.4.1. Distribution of adult NSSH in the Nordic Seas from the International ecosystem survey in the Nordic Seas (IESNS) in May/June 2015.

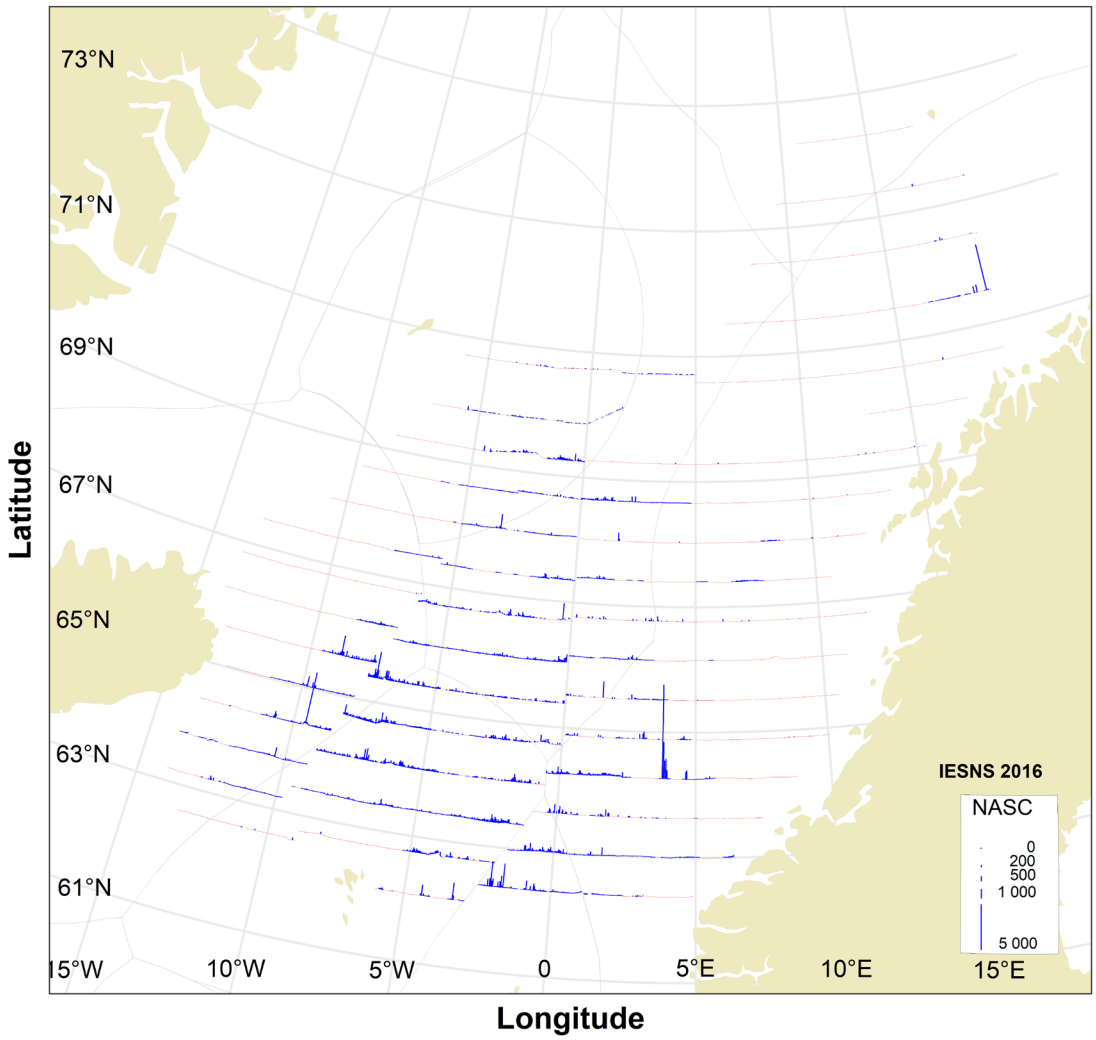



Figure 4.4.1. Distribution of adult NSSH in the Nordic Seas from the International ecosystem survey in the Nordic Seas (IESNS) in May/June 2016.

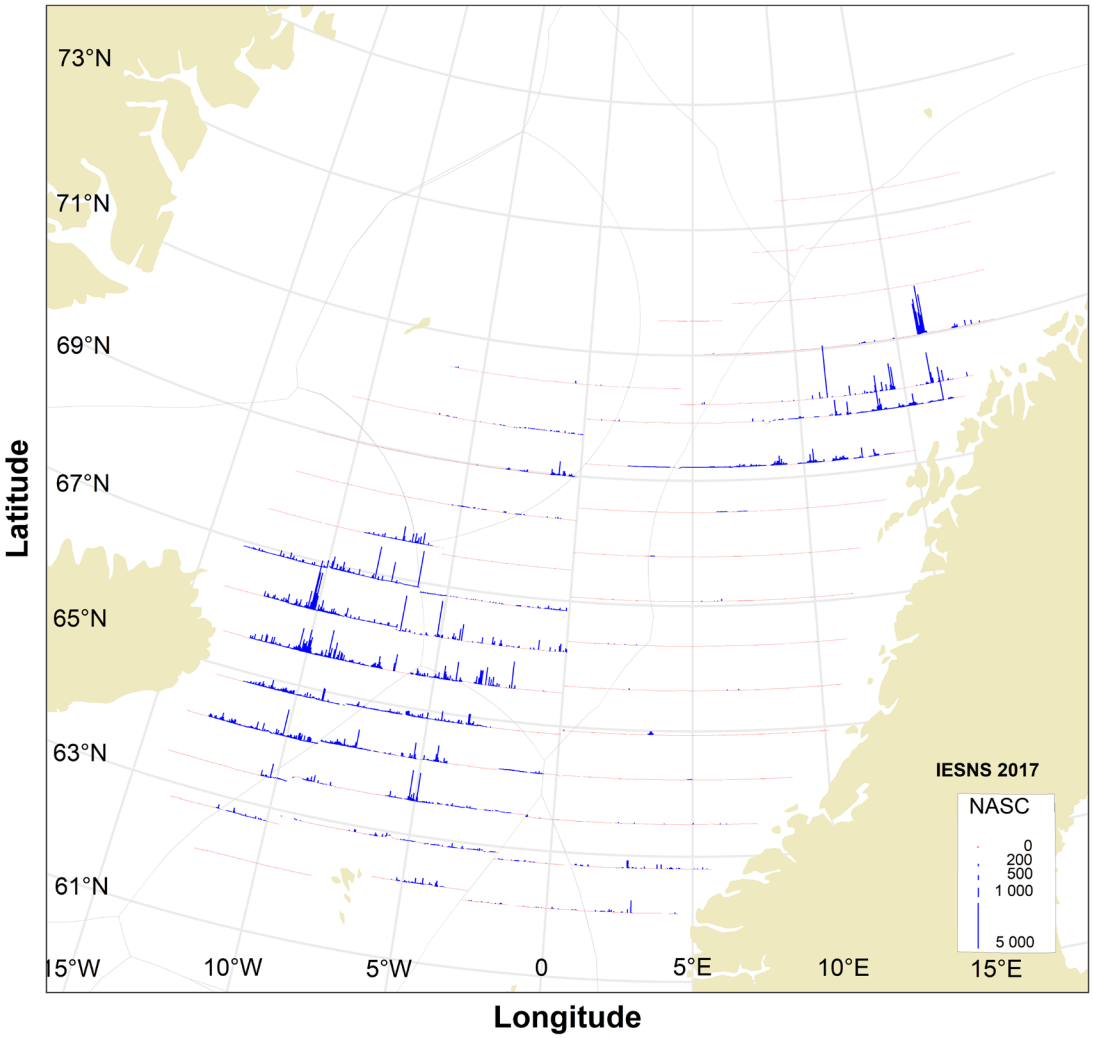



Figure 4.4.1. Distribution of adult NSSH in the Nordic Seas from the International ecosystem survey in the Nordic Seas (IESNS) in May/June 2017.

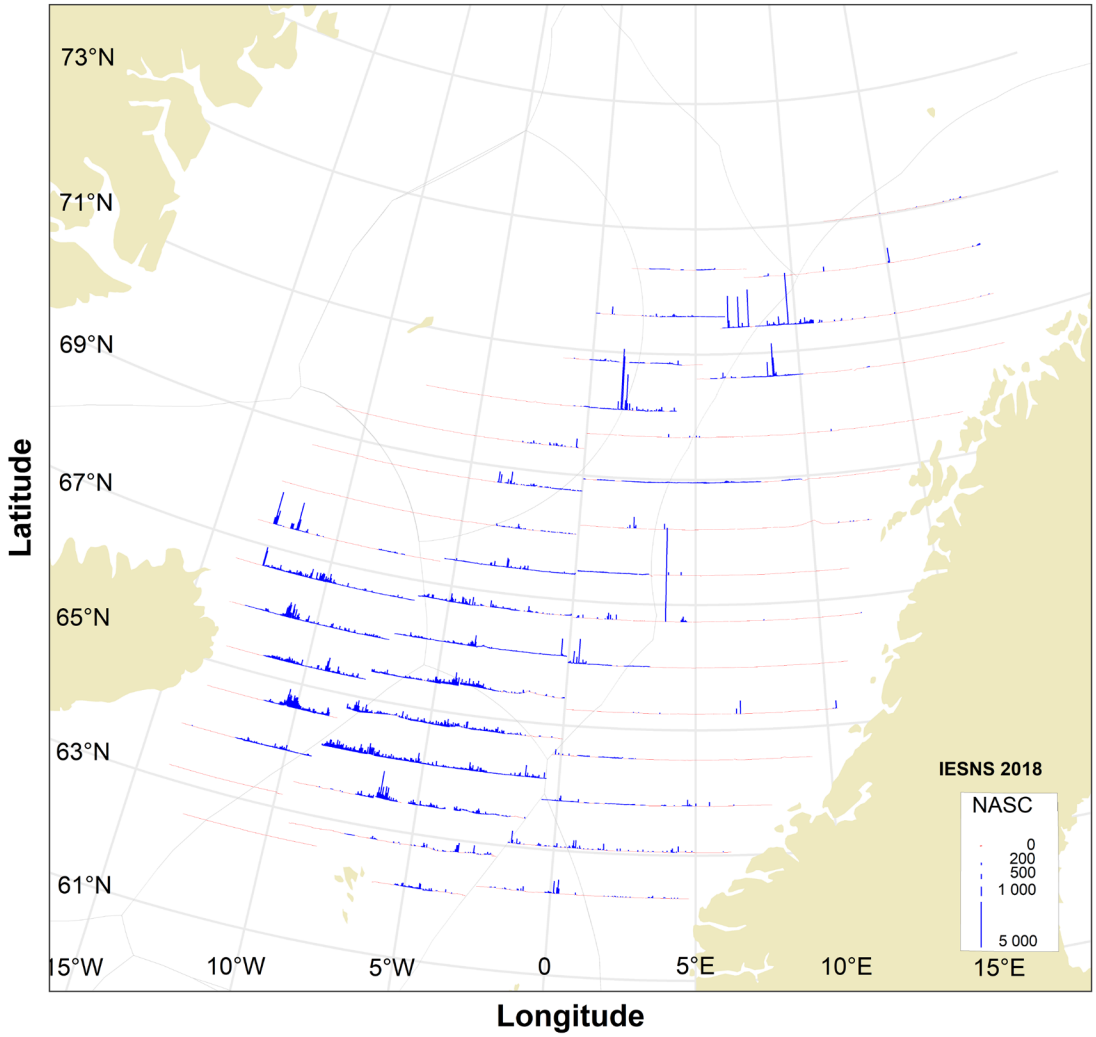



Figure 4.4.1. Distribution of adult NSSH in the Nordic Seas from the International ecosystem survey in the Nordic Seas (IESNS) in May/June 2018.

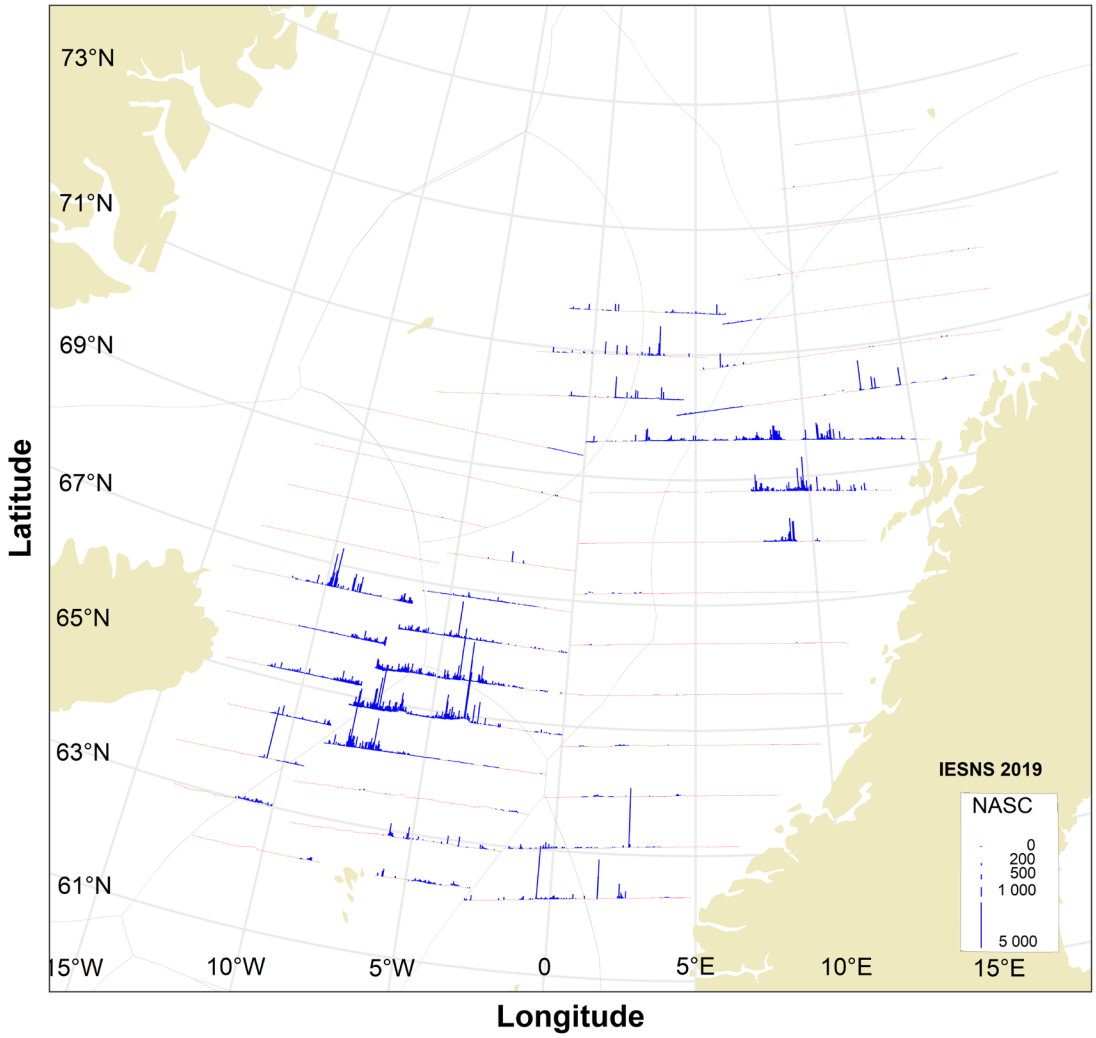



Figure 4.4.1. Distribution of adult NSSH in the Nordic Seas from the International ecosystem survey in the Nordic Seas (IESNS) in May/June 2019.

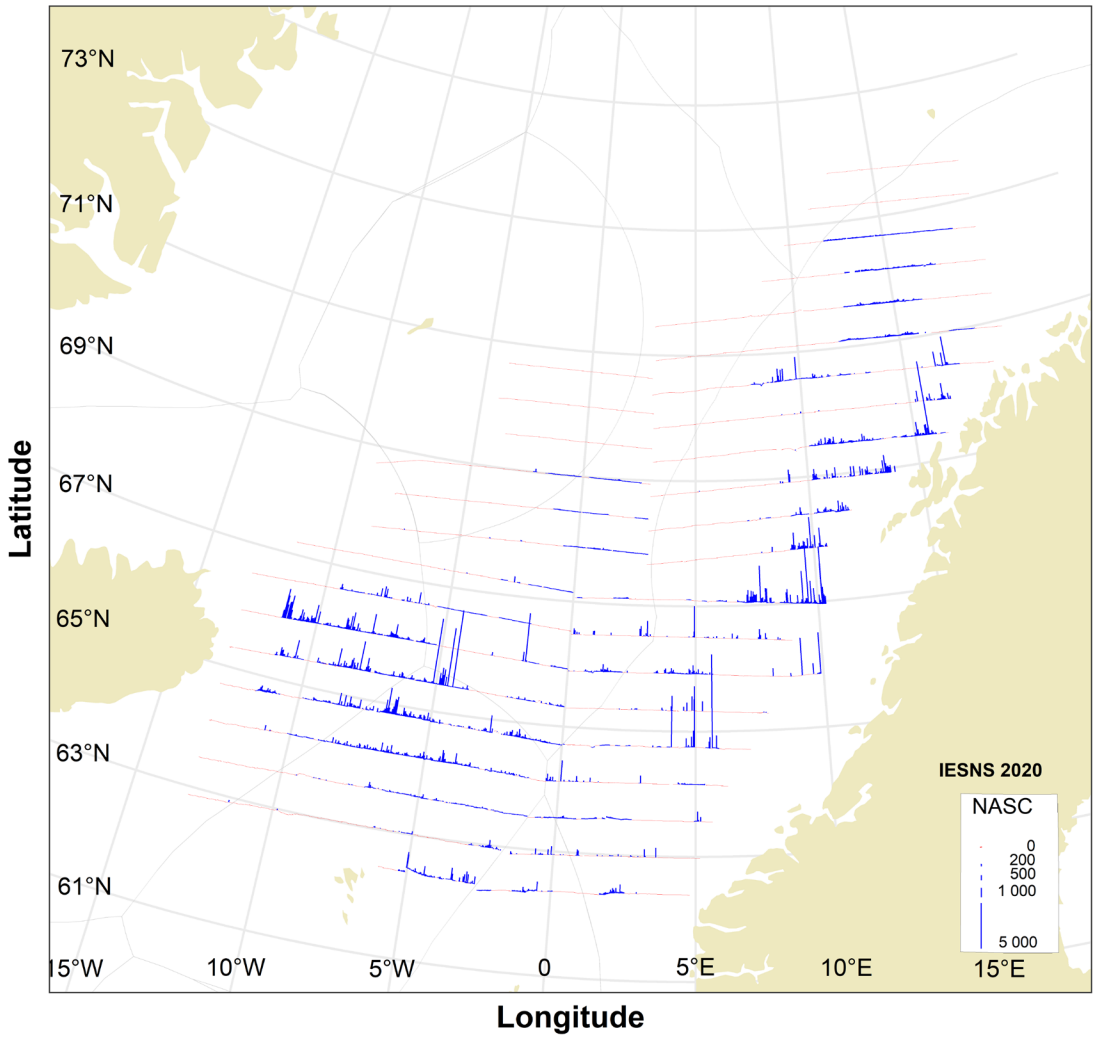



Figure 4.4.1. Distribution of adult NSSH in the Nordic Seas from the International ecosystem survey in the Nordic Seas (IESNS) in May/June 2020.

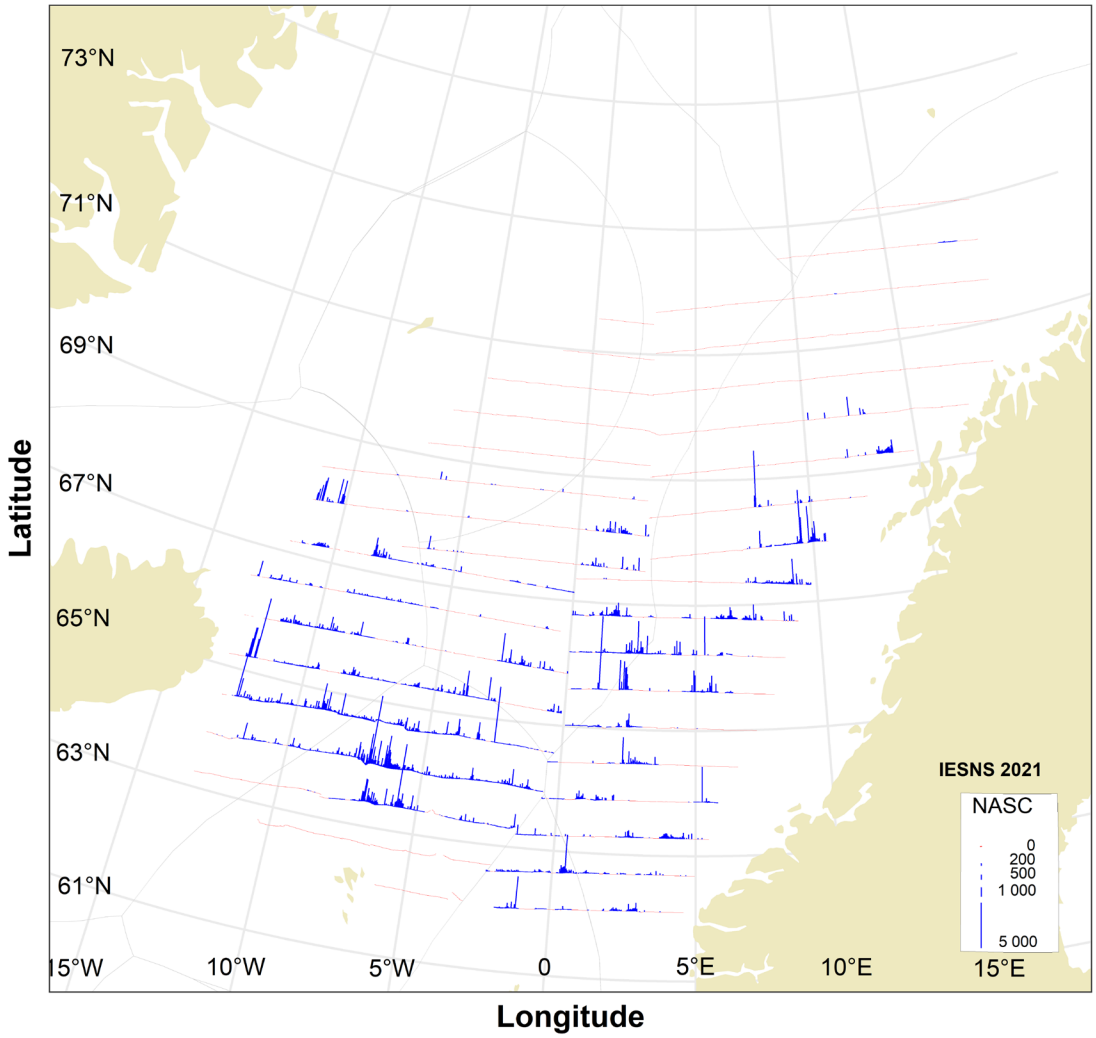



Figure 4.4.1. Distribution of adult NSSH in the Nordic Seas from the International ecosystem survey in the Nordic Seas (IESNS) in May/June 2021.

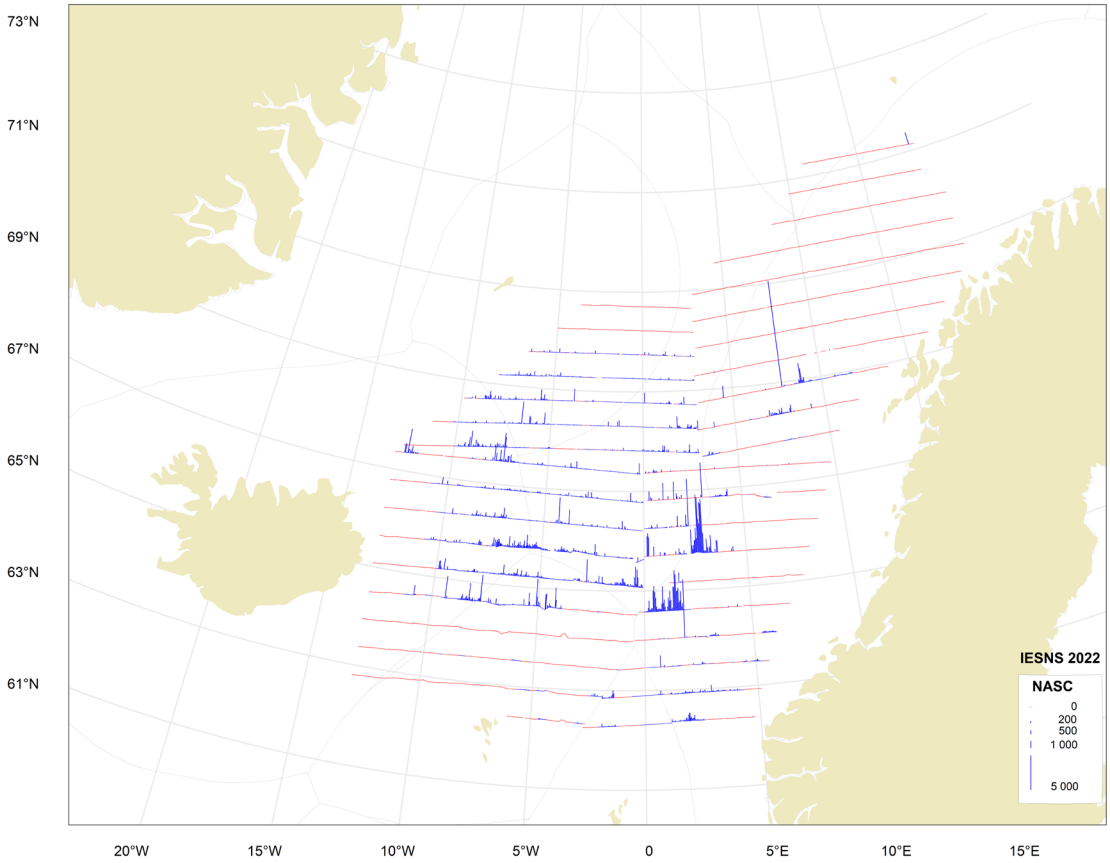



Figure 4.4.1. Distribution of adult NSSH in the Nordic Seas from the International ecosystem survey in the Nordic Seas (IESNS) in May/June 2022.

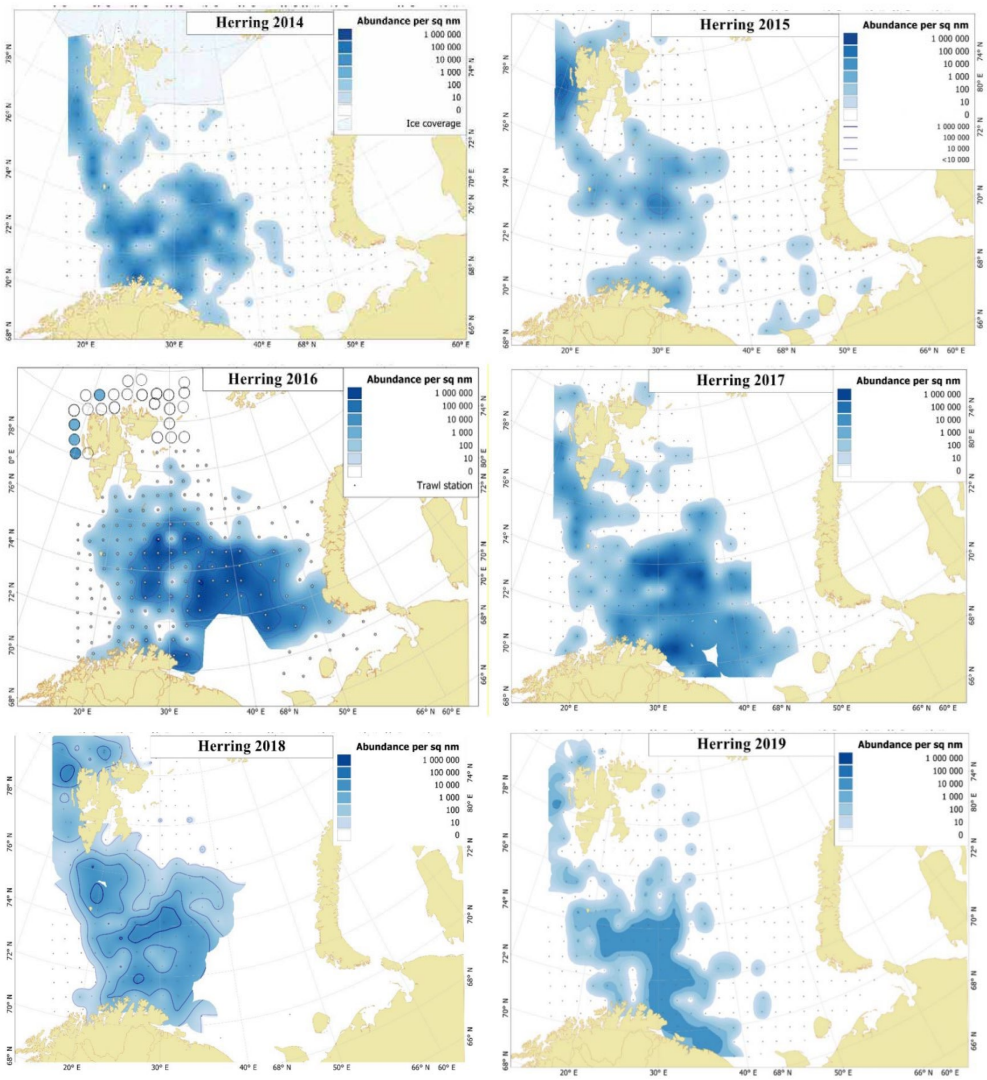



Figure 4.5.1. Distribution of 0-group NSSH from the ecosystem survey in the Barents Sea in autumn 2014-2019.

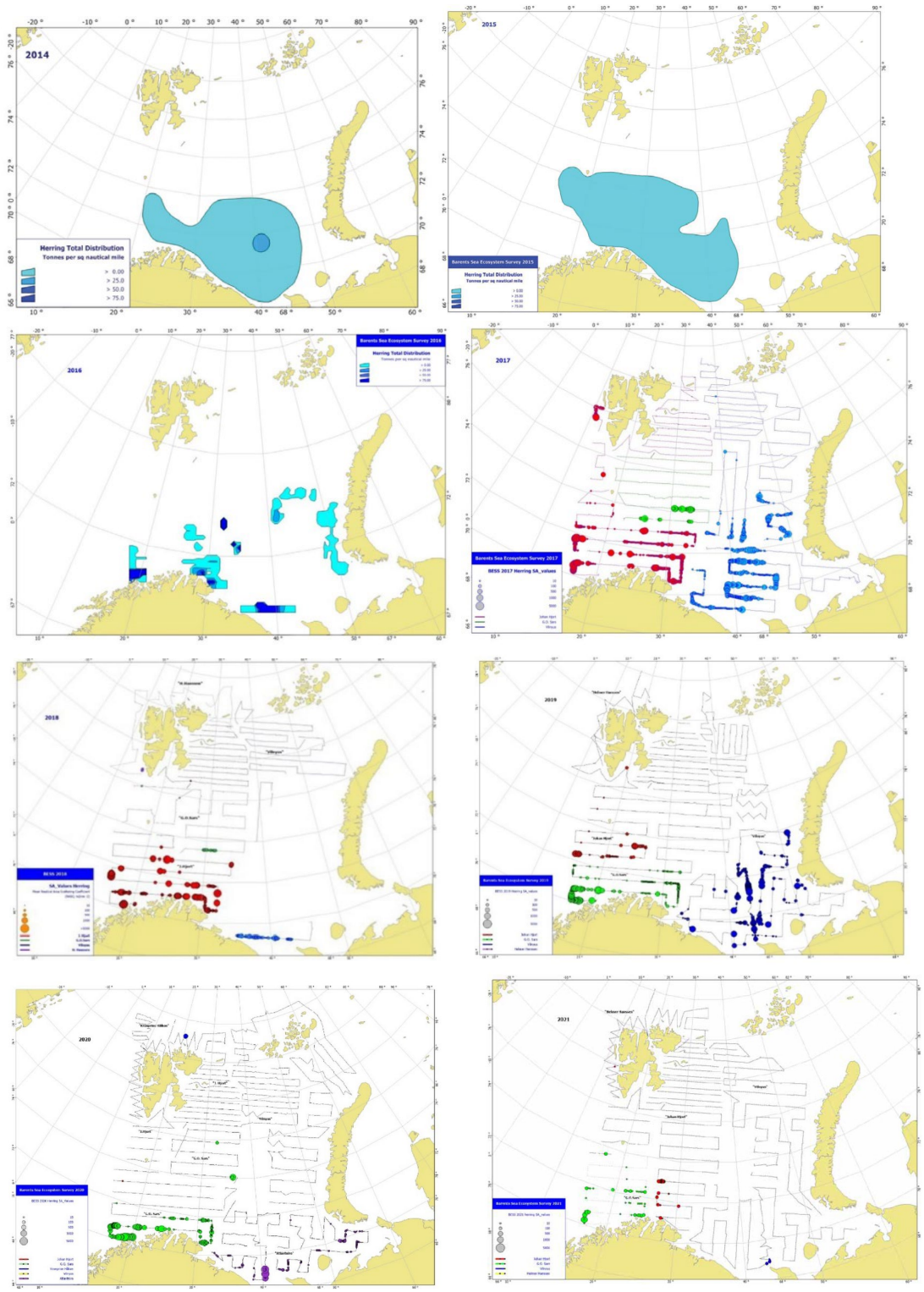



Figure 4.5.2. Distribution of juvenile NSSH from the ecosystem survey in the Barents Sea in autumn 2014-2021.

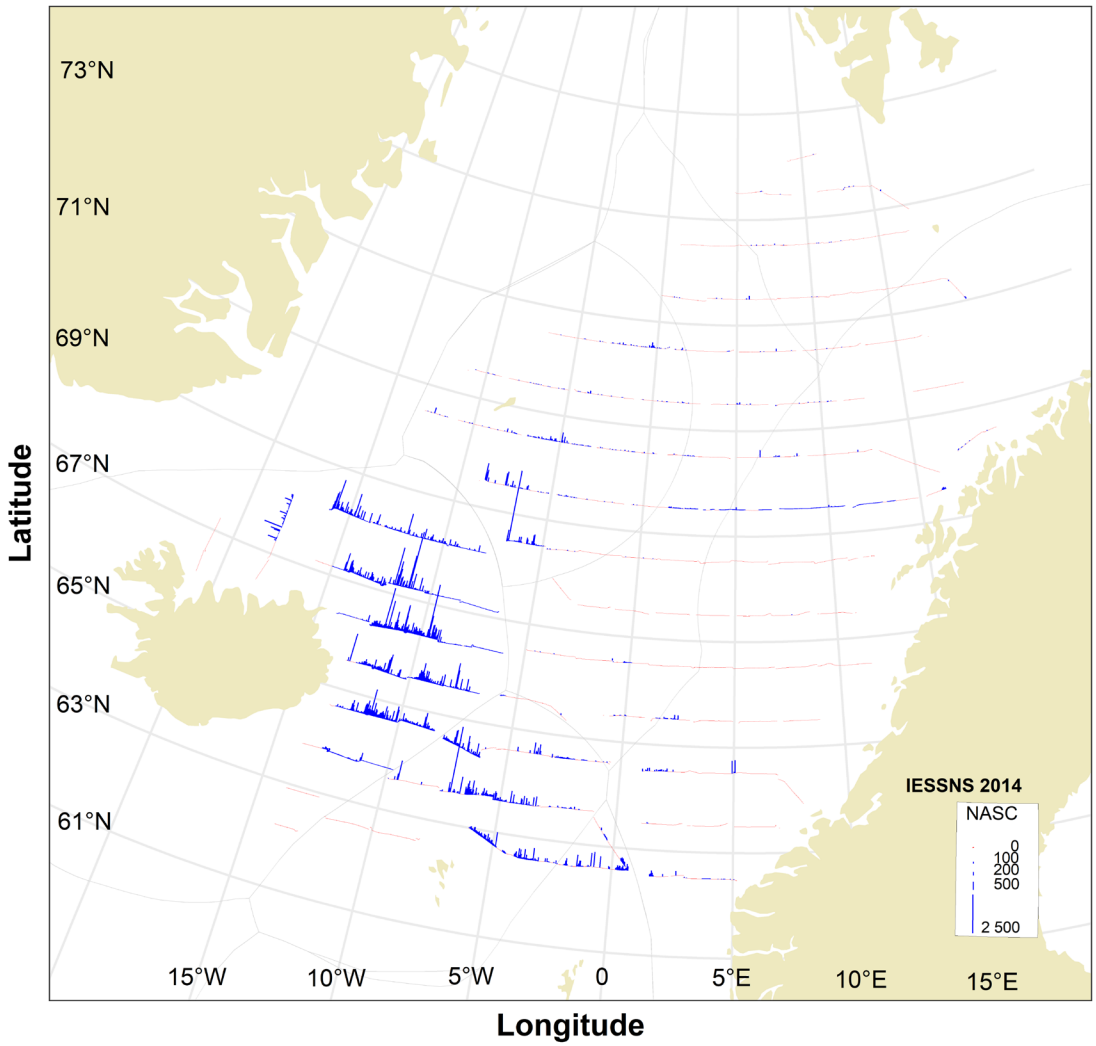



Figure 4.6.1. Distribution of adult NSSH in the Nordic Seas from the International ecosystem summer survey in the Nordic Seas (IESSNS) in July 2014.

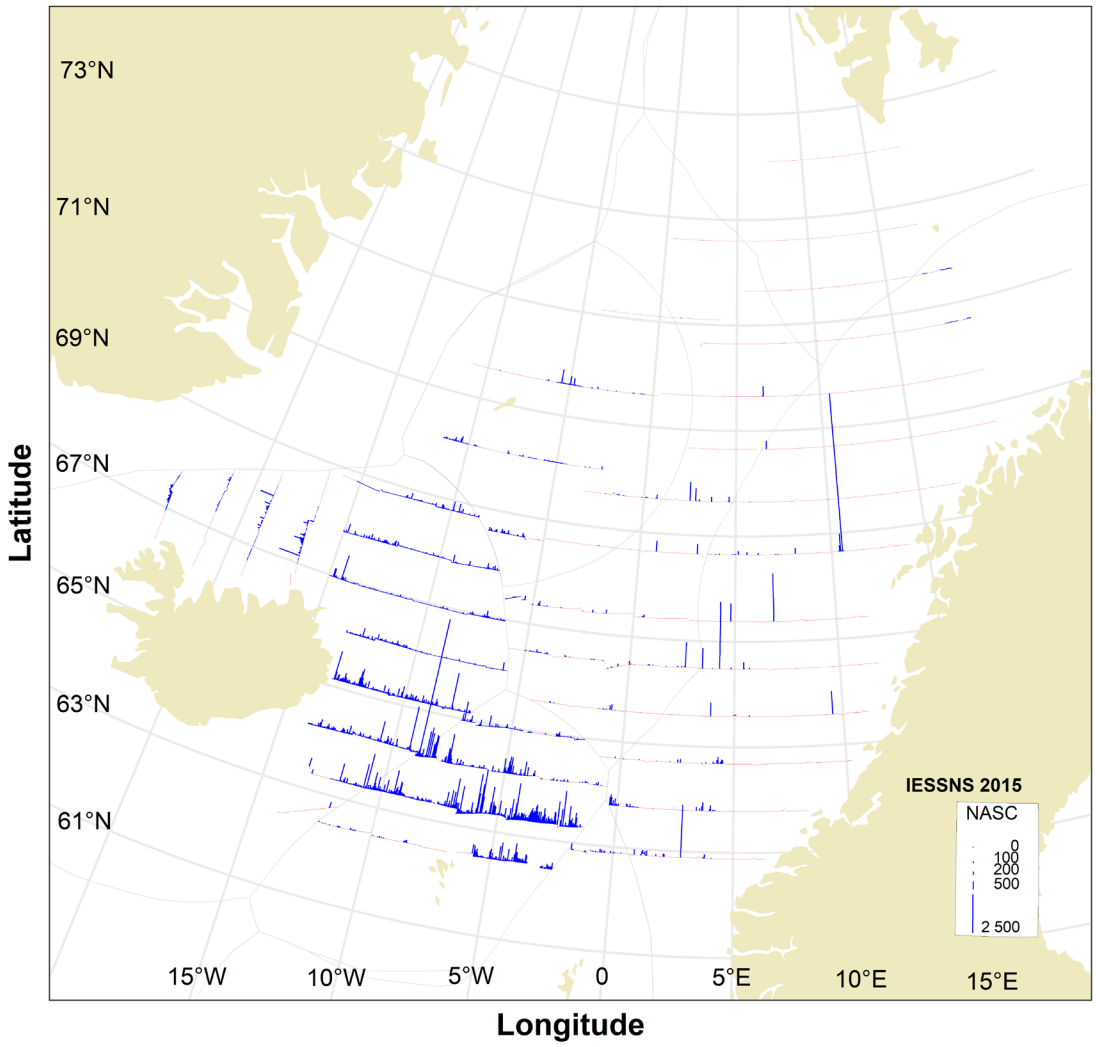



Figure 4.6.1. Distribution of adult NSSH in the Nordic Seas from the International ecosystem summer survey in the Nordic Seas (IESSNS) in July 2015.

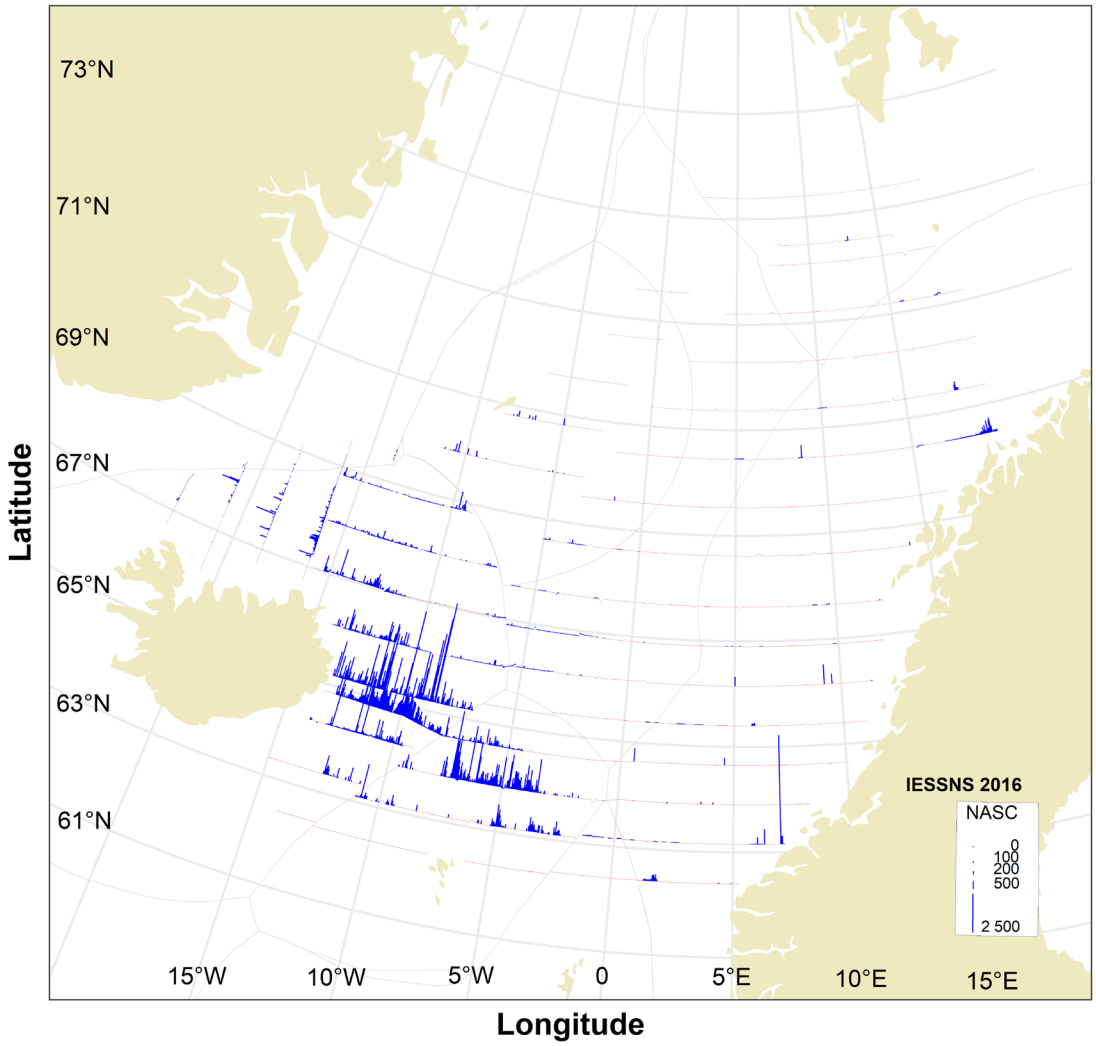



Figure 4.6.1. Distribution of adult NSSH in the Nordic Seas from the International ecosystem summer survey in the Nordic Seas (IESSNS) in July 2016.

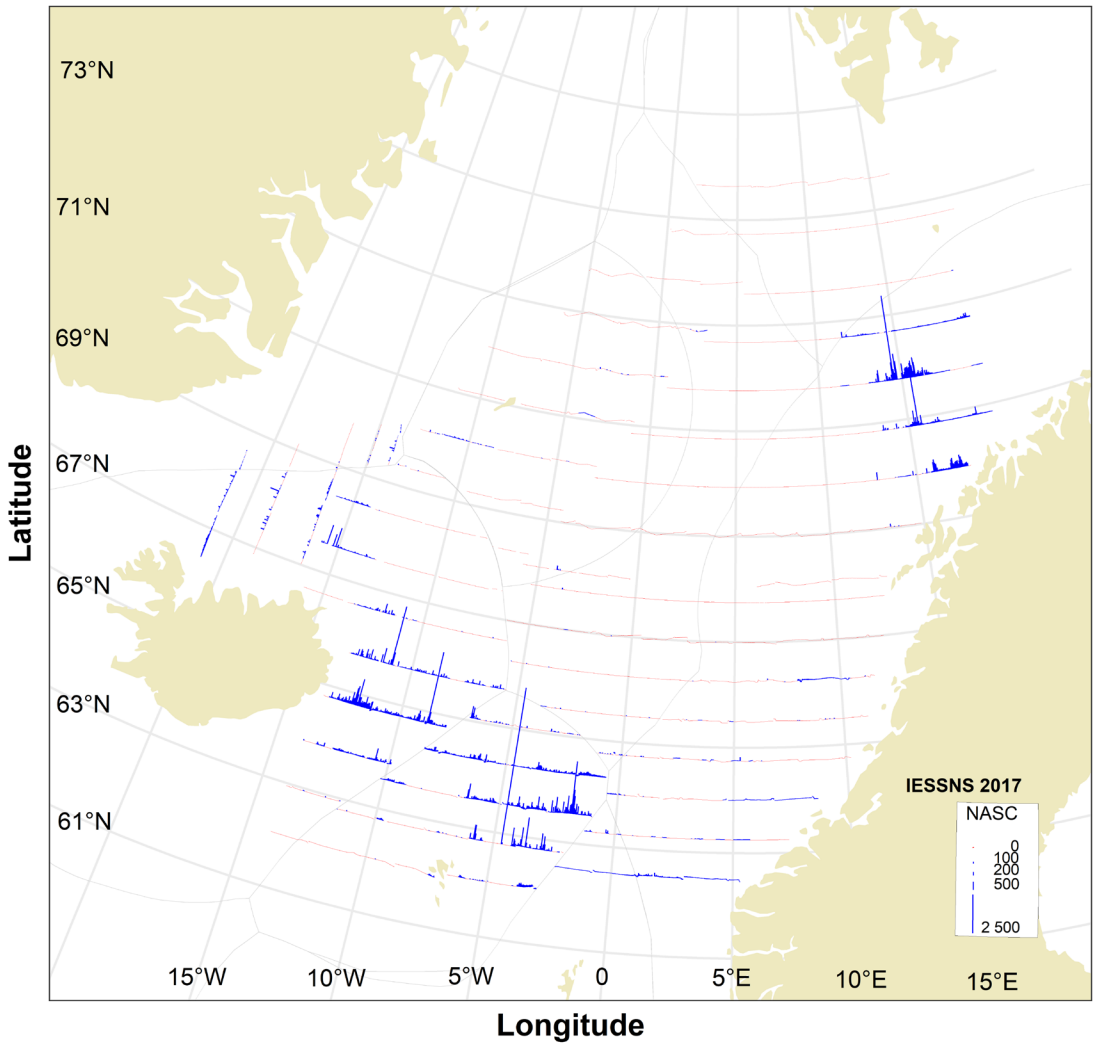



Figure 4.6.1. Distribution of adult NSSH in the Nordic Seas from the International ecosystem summer survey in the Nordic Seas (IESSNS) in July 2017.

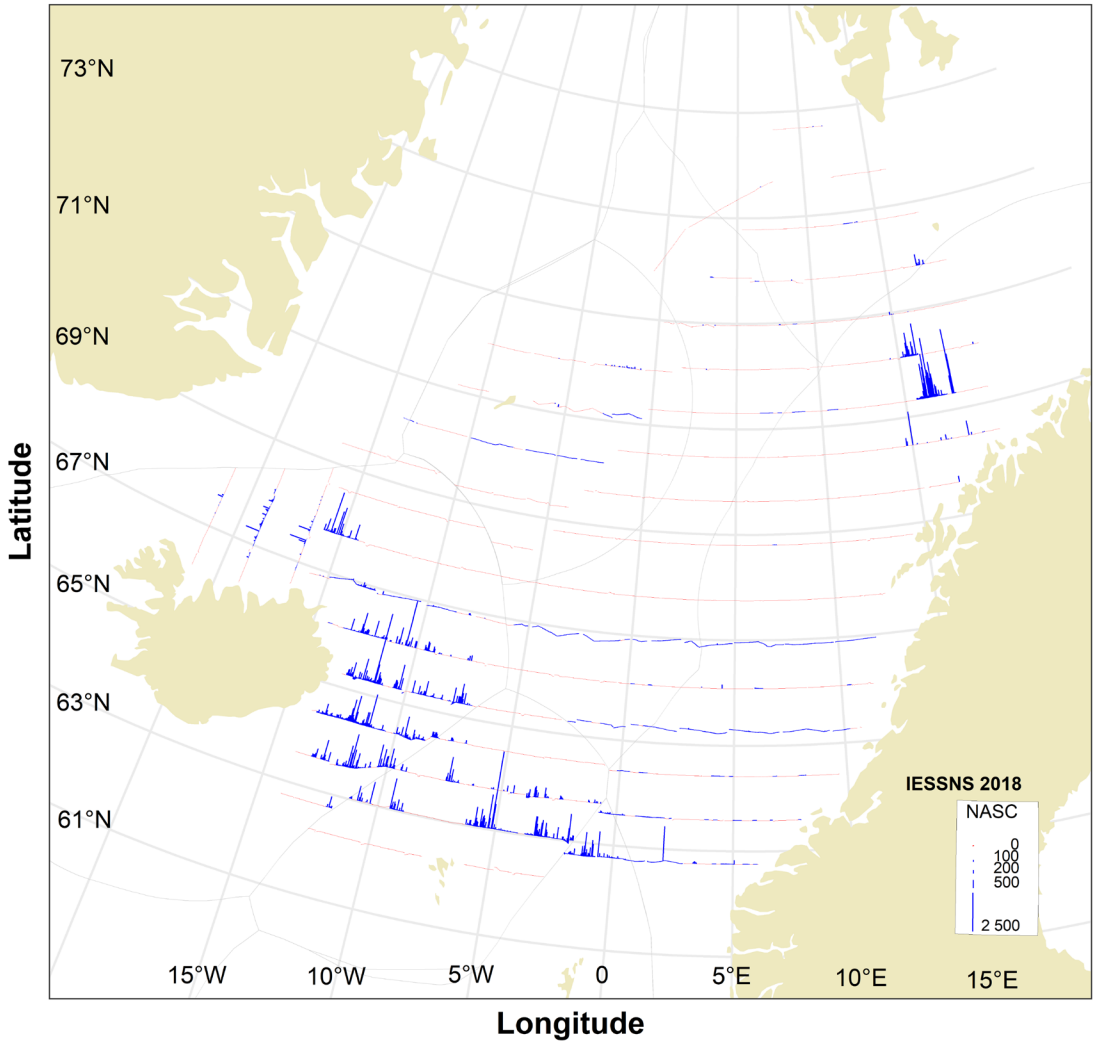



Figure 4.6.1. Distribution of adult NSSH in the Nordic Seas from the International ecosystem summer survey in the Nordic Seas (IESSNS) in July 2018.

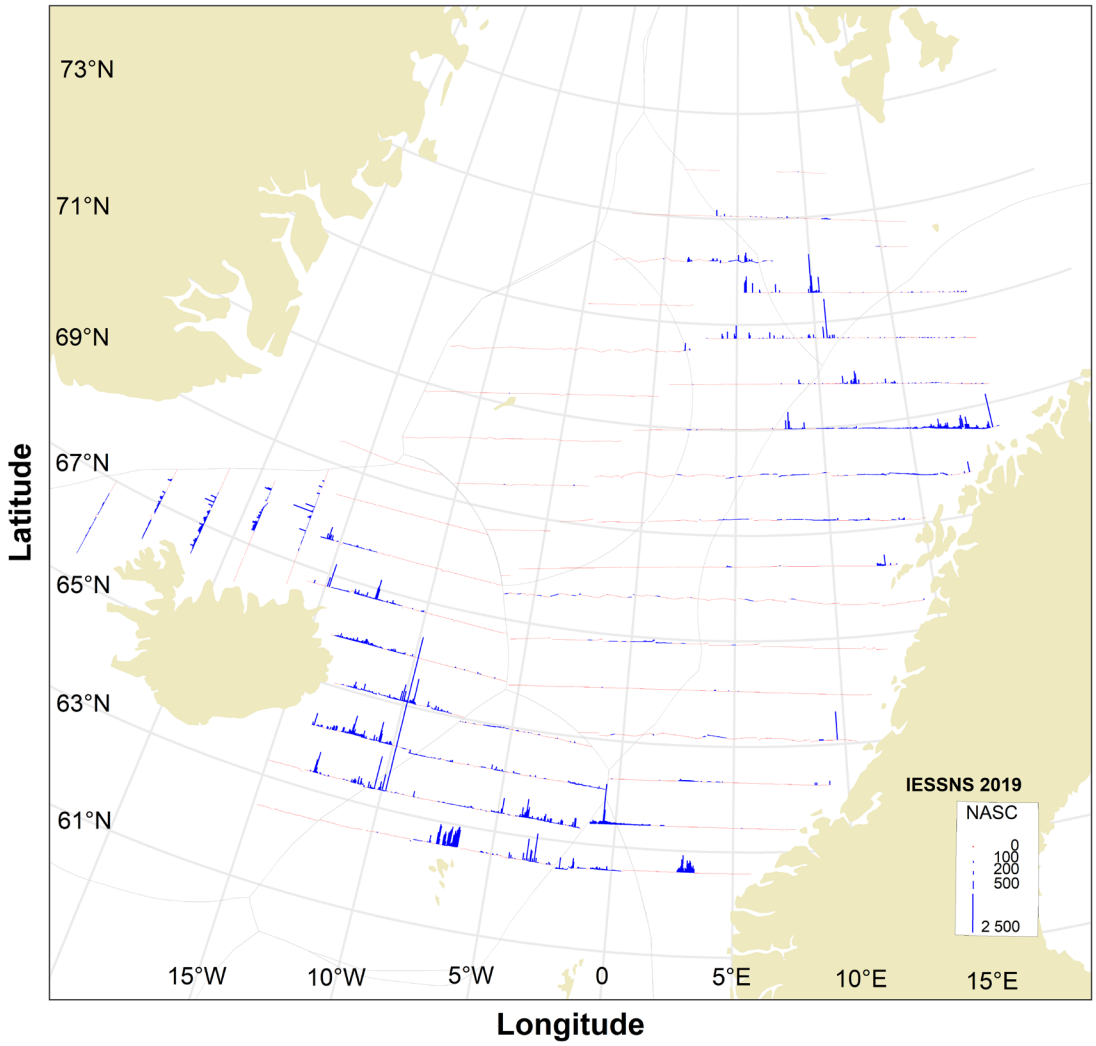



Figure 4.6.1. Distribution of adult NSSH in the Nordic Seas from the International ecosystem summer survey in the Nordic Seas (IESSNS) in July 2019.

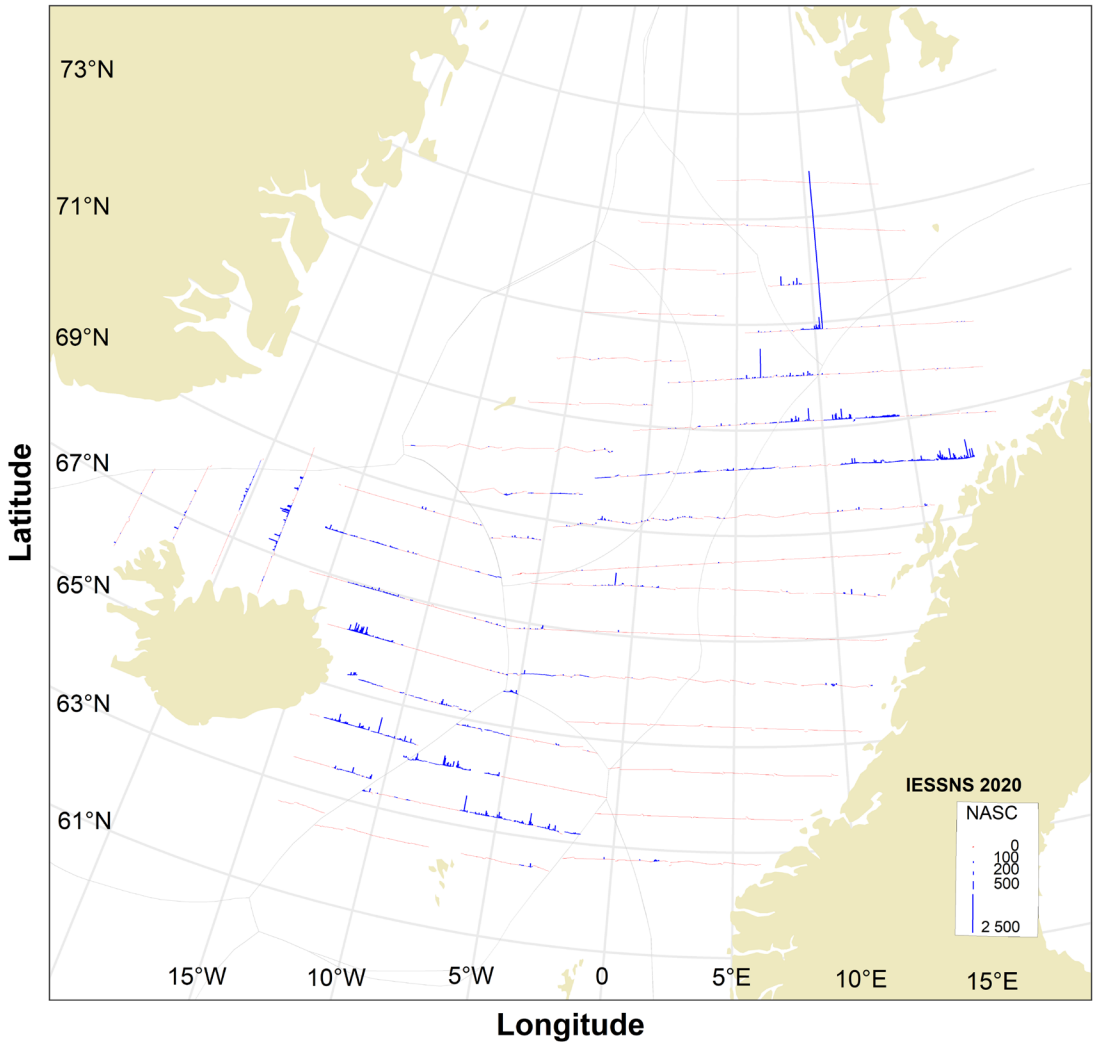



Figure 4.6.1. Distribution of adult NSSH in the Nordic Seas from the International ecosystem summer survey in the Nordic Seas (IESSNS) in July 2020.

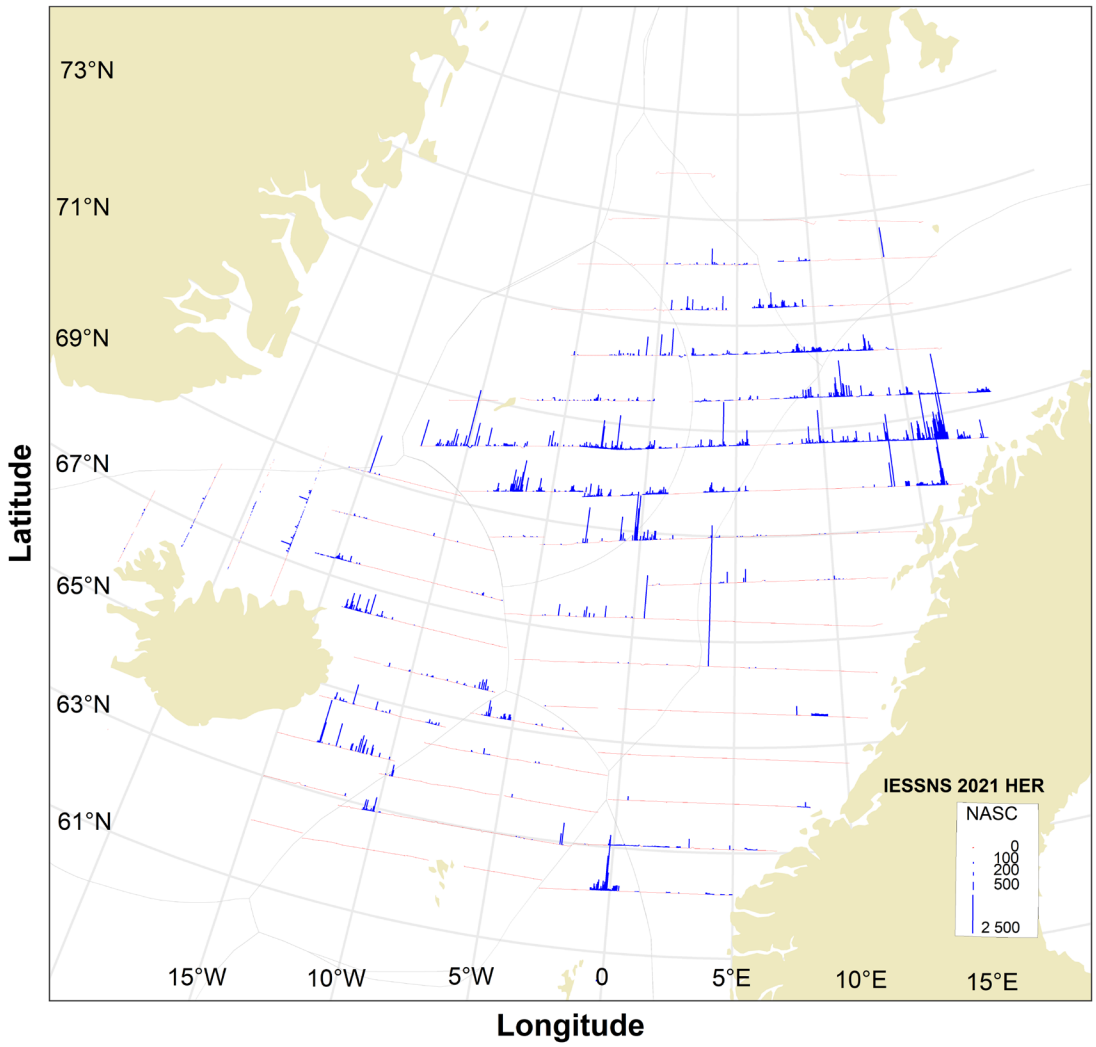



Figure 4.6.1. Distribution of adult NSSH in the Nordic Seas from the International ecosystem summer survey in the Nordic Seas (IESSNS) in July 2021.

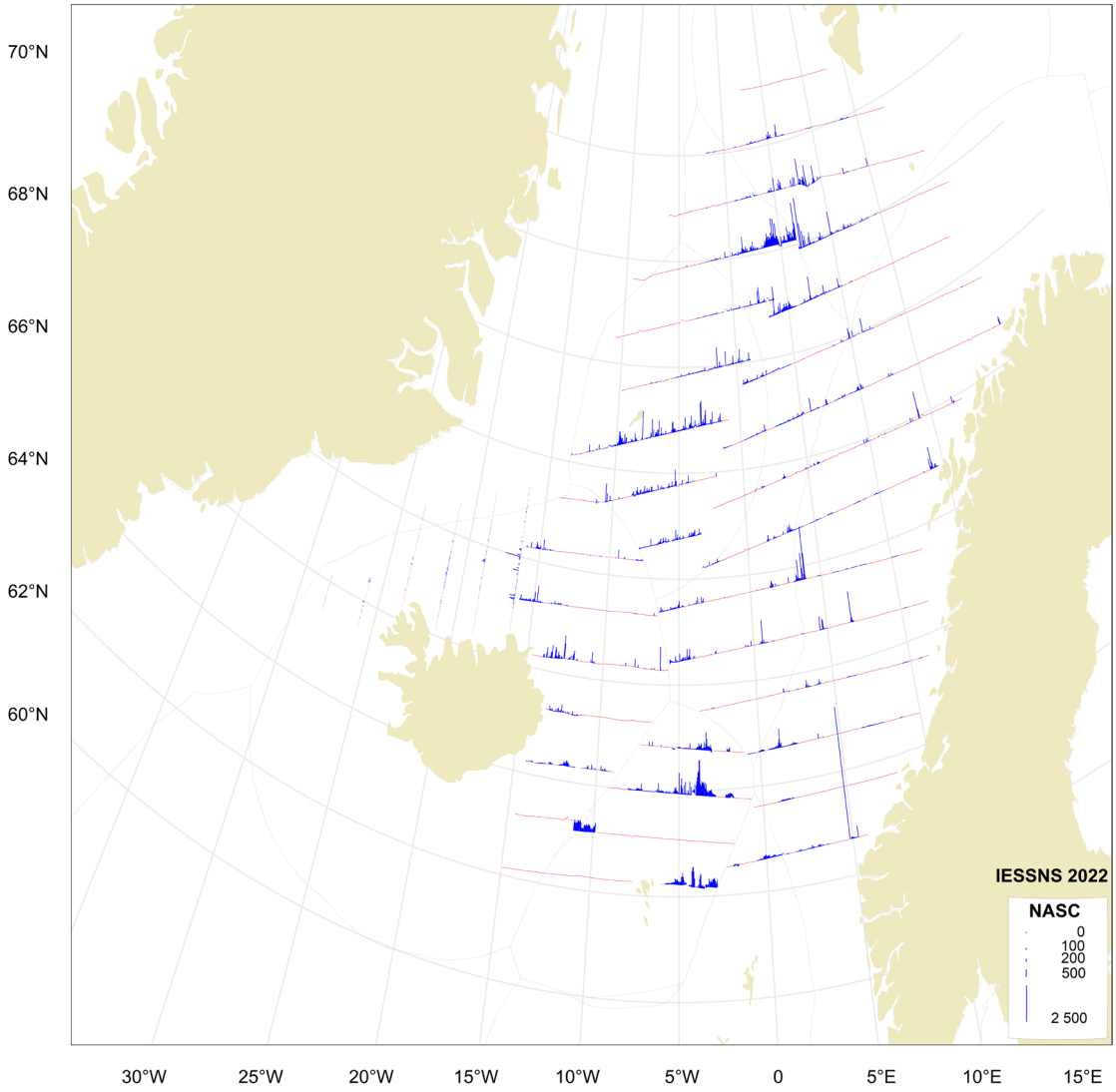



Figure 4.6.1. Distribution of adult NSSH in the Nordic Seas from the International ecosystem summer survey in the Nordic Seas (IESSNS) in July 2022.

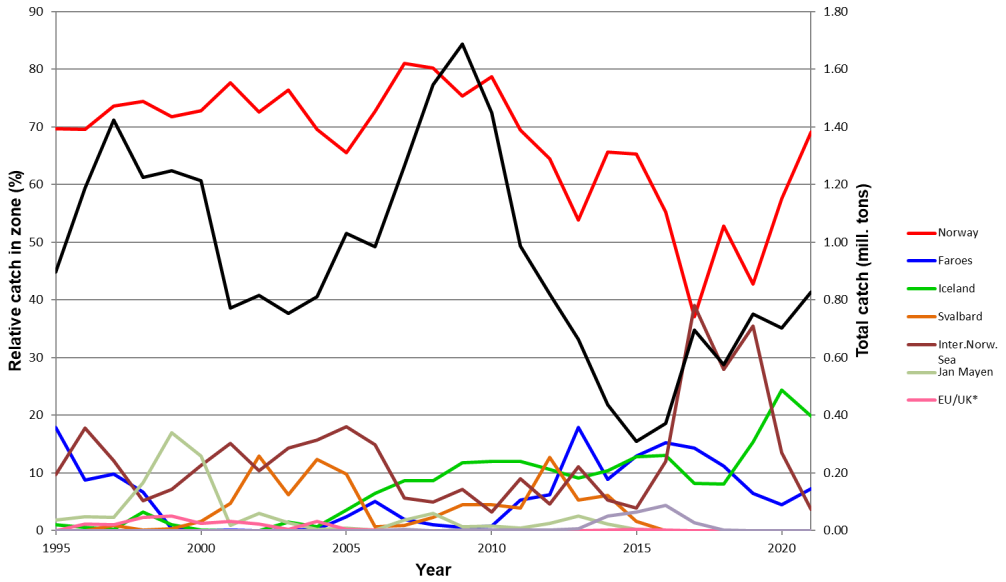



Figure 5.1.1. Relative catch by EEZs in the period 1995-2021.*Change from EU to UK EEZ from 2021.

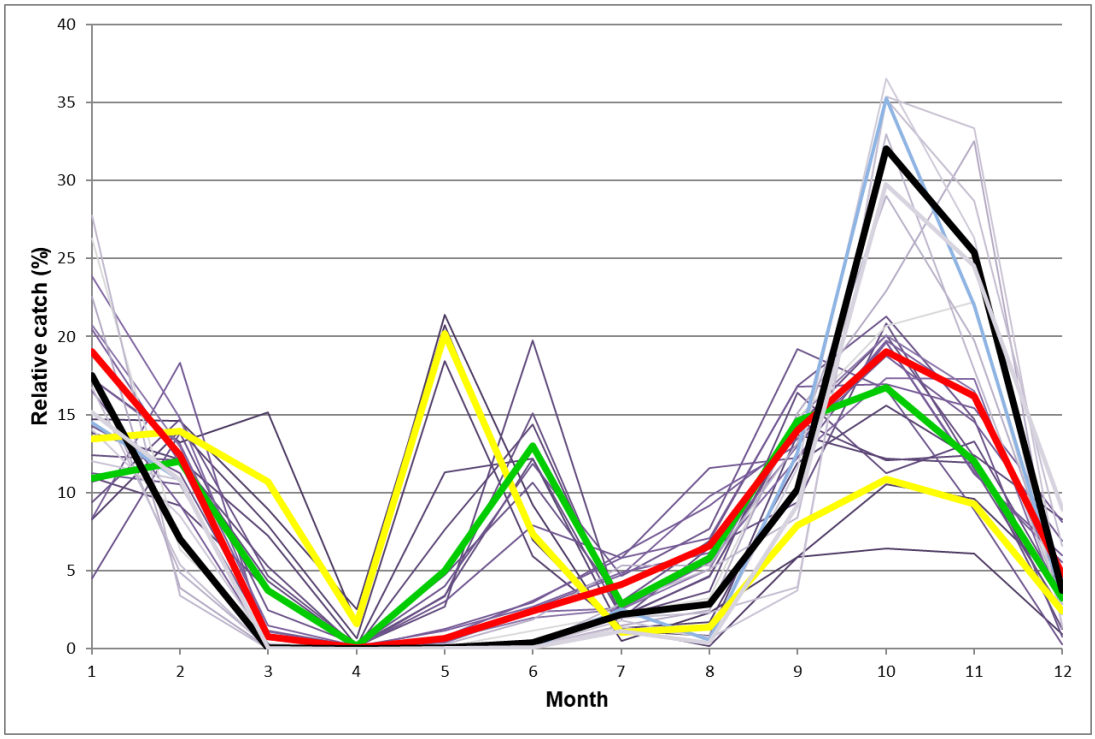



Figure 5.3.1. Relative catch per month for the years 1995-2021. The coloured bold lines are averages over different periods (yellow 1995-1997, green 1998-2005, red 2006-2012, and black 2013-2021).

# Annexes

## Annex 1 – Survey and catch tables from the 2014 report

Table A.1. Percentages of Norwegian spring spawning herring by zone from spawning ground survey in February/March (chapter 4.2). *= incomplete coverage. - = region not covered.

| Year | Norway | Iceland | Russia | EU | Faroe Islands |
|---|---|---|---|---|---|
| **1995** | 100 | - | - | - | - |
| **1996** | 100 | - | - | - | - |
| **1997** | - | - | - | - | - |
| **1998** | 100 | - | - | - | - |
| **1999** | 100 | - | - | - | - |
| **2000** | 100 | - | - | - | - |
| **2001** | - | - | - | - | - |
| **2002** | - | - | - | - | - |
| **2003** | - | - | - | - | - |
| **2004** | - | - | - | - | - |
| **2005** | 100 | - | - | - | - |
| **2006** | 100* | - | - | - | - |
| **2007** | 100* | - | - | - | - |
| **2008** | 100* | - | - | - | - |
| **2009** | - | - | - | - | - |
| **2010** | - | - | - | - | - |
| **2011** | - | - | - | - | - |
| **2012** | - | - | - | - | - |
| **2013** | - | - | - | - | - |

Table A.2. Percentages of Norwegian spring spawning herring by zone from wintering survey in January (chapter 4.3). - = region not covered.

| Year | Norway | Iceland | Russia | EU | Faroe Islands |
|---|---|---|---|---|---|
| **1995** | 100 | - | - | - | - |
| **1996** | 100 | - | - | - | - |
| **1997** | 100 | - | - | - | - |
| **1998** | 100 | - | - | - | - |
| **1999** | 100 | - | - | - | - |
| **2000** | - | - | - | - | - |
| **2001** | - | - | - | - | - |
| **2002** | - | - | - | - | - |
| **2003** | - | - | - | - | - |
| **2004** | - | - | - | - | - |
| **2005** | - | - | - | - | - |
| **2006** | - | - | - | - | - |
| **2007** | - | - | - | - | - |
| **2008** | - | - | - | - | - |
| **2009** | - | - | - | - | - |
| **2010** | - | - | - | - | - |
| **2011** | - | - | - | - | - |
| **2012** | - | - | - | - | - |
| **2013** | - | - | - | - | - |

Table A.3. Percentages of Norwegian spring spawning herring larvae by zone from larval survey in March/April (chapter 4.4). *= incomplete coverage. - = region not covered.

| Year | Norway | Iceland | Russia | EU | Faroe Islands |
|---|---|---|---|---|---|
| **1995** | 100 | - | - | - | - |
| **1996** | 100 | - | - | - | - |
| **1997** | 100 | - | - | - | - |
| **1998** | 100 | - | - | - | - |
| **1999** | 100 | - | - | - | - |
| **2000** | 100 | - | - | - | - |
| **2001** | 100 | - | - | - | - |
| **2002** | 100 | - | - | - | - |
| **2003** | 100* | - | - | - | - |
| **2004** | 100 | - | - | - | - |
| **2005** | 100 | - | - | - | - |
| **2006** | 100 | - | - | - | - |
| **2007** | 100* | - | - | - | - |
| **2008** | 100 | - | - | - | - |
| **2009** | 100* | - | - | - | - |
| **2010** | 100 | - | - | - | - |
| **2011** | 100 | - | - | - | - |
| **2012** | 100 | - | - | - | - |
| **2013** | 100 | - | - | - | - |

Table A.4. Percentages of Norwegian spring spawning herring juveniles by zone from International Ecosystem Survey in the Norwegian Sea (IESNS) in the Barents Sea in May (chapter 4.5). - = region not covered.

| Year | Norway | Russia |
|---|---|---|
| 1998 | 9.6 | 90.4 |
| 1999 | - | - |
| 2000 | 90.2 | 9.8 |
| 2001 | 97.8 | 2.2 |
| 2002 | 84.9 | 15.1 |
| 2003 | - | - |
| 2004 | - | - |
| 2005 | 83.4 | 16.6 |
| 2006 | 87.8 | 12.2 |
| 2007 | 98.8 | 1.2 |
| 2008 | - | - |
| 2009 | 99.6 | 0.4 |
| 2010 | 67.4 | 32.6 |
| 2011 | 66.3 | 33.7 |
| 2012 | 100.0 | 0.0 |
| 2013 | 95.8 | 4.2 |

Table A.5. Percentages of Norwegian spring spawning herring adults by zone from the International Ecosystem Survey in the Norwegian Sea (IESNS) in May (chapter 4.6).

| Year | EU | Norway | Iceland | Svalbard | JanMayen | Faroes | InterNorwSea |
|---|---|---|---|---|---|---|---|
| 1996 | 0.8 | 33.8 | 1.9 | 0.0 | 8.3 | 3.0 | 52.3 |
| 1997 | 0.8 | 42.8 | 0.0 | 0.0 | 0.3 | 3.4 | 52.6 |
| 1998 | 0.4 | 80.6 | 0.0 | 0.0 | 0.2 | 0.3 | 18.6 |
| 1999 | 0.0 | 44.9 | 0.0 | 0.0 | 7.7 | 0.0 | 47.3 |
| 2000 | 0.3 | 65.4 | 0.0 | 1.3 | 3.7 | 0.0 | 29.3 |
| 2001 | 0.0 | 56.5 | 0.0 | 2.8 | 5.3 | 0.2 | 35.2 |
| 2002 | 0.0 | 62.2 | 0.0 | 6.1 | 7.5 | 0.0 | 24.2 |
| 2003 | 0.0 | 49.9 | 1.2 | 10.8 | 11.8 | 5.1 | 21.3 |
| 2004 | 0.0 | 49.0 | 2.3 | 0.6 | 15.1 | 5.0 | 28.0 |
| 2005 | 0.0 | 49.1 | 7.5 | 2.2 | 2.6 | 15.0 | 23.6 |
| 2006 | 0.0 | 24.7 | 20.8 | 3.2 | 4.8 | 24.9 | 21.6 |
| 2007 | 0.4 | 31.1 | 20.5 | 0.8 | 2.0 | 16.2 | 29.0 |
| 2008 | 1.3 | 19.9 | 15.0 | 0.1 | 3.0 | 18.4 | 42.3 |
| 2009 | 2.3 | 26.6 | 15.7 | 0.0 | 6.8 | 10.9 | 37.8 |
| 2010 | 2.8 | 34.5 | 14.8 | 0.8 | 1.4 | 21.0 | 24.7 |
| 2011 | 3.0 | 31.2 | 8.9 | 0.2 | 2.4 | 19.6 | 34.7 |
| 2012 | 2.7 | 36.5 | 10.0 | 0.0 | 0.8 | 21.4 | 28.6 |
| 2013 | 1.2 | 30.5 | 9.8 | 0.0 | 3.1 | 23.5 | 31.9 |

Table A.6. Percentages of 0-group Norwegian spring spawning herring by zone from the Ecosystem Survey in the Barents Sea (chapter 4.8).

| Year | Norway | Svalbard | InterBarSea | Russia | SpecialAreaBar |
|---|---|---|---|---|---|
| 1995 | 72.1 | 18.5 | 3.4 | 6.0 | 0.0 |
| 1996 | 93.7 | 0.6 | 0.0 | 5.7 | 0.0 |
| 1998 | 68.2 | 4.3 | 0.4 | 26.8 | 0.4 |
| 1999 | 83.1 | 2.0 | 0.0 | 14.9 | 0.0 |
| 2000 | 99.6 | 0.1 | 0.0 | 0.3 | 0.0 |
| 2001 | 24.2 | 32.8 | 29.7 | 13.3 | 0.0 |
| 2002 | 42.9 | 17.6 | 0.2 | 39.3 | 0.0 |
| 2003 | 97.9 | 0.4 | 0.2 | 1.5 | 0.0 |
| 2004 | 78.1 | 7.3 | 1.0 | 12.8 | 0.9 |
| 2005 | 88.2 | 0.6 | 3.7 | 7.5 | 0.0 |
| 2006 | 74.4 | 1.4 | 0.3 | 23.8 | 0.2 |
| 2007 | 99.5 | 0.2 | 0.0 | 0.2 | 0.0 |
| 2008 | 78.0 | 5.1 | 3.9 | 13.1 | 0.0 |
| 2009 | 79.5 | 8.0 | 0.0 | 12.4 | 0.1 |
| 2010 | 80.3 | 1.4 | 4.3 | 14.0 | 0.0 |
| 2011 | 68.4 | 19.0 | 6.1 | 6.4 | 0.1 |
| 2012 | 96.8 | 1.5 | 0.0 | 1.7 | 0.0 |
| 2013 | 71.7 | 21.2 | 5.1 | 2.0 | 0.0 |

Table A.7. Percentages of Norwegian spring spawning herring juveniles by zone from the Ecosystem Survey in the Barents Sea in August/September (chapter 4.8). *= incomplete coverage.

| Year | Norway | Svalbard | InterBarSea | InterNorwSea | Russia | SpecialAreaBar |
|---|---|---|---|---|---|---|
| 1998* | 0.0 | 0.0 | 0.0 | 0.0 | 100.0 | 0.0 |
| 1999* | 3.3 | 0.0 | 0.5 | 0.0 | 96.2 | 0.0 |
| 2000* | 0.0 | 0.0 | 1.1 | 0.0 | 98.9 | 0.0 |
| 2001* | 0.0 | 0.0 | 0.4 | 0.0 | 99.6 | 0.0 |
| 2002* | 0.0 | 52.7 | 0.0 | 0.0 | 47.3 | 0.0 |
| 2003* | 62.2 | 0.0 | 0.2 | 0.0 | 37.5 | 0.0 |
| 2004 | 63.4 | 5.1 | 0.7 | 0.0 | 30.5 | 0.3 |
| 2005 | 37.2 | 11.7 | 2.7 | 20.7 | 27.7 | 0.1 |
| 2006 | 50.9 | 0.1 | 0.4 | 0.0 | 48.0 | 0.6 |
| 2007 | 3.0 | 0.0 | 0.0 | 0.0 | 97.0 | 0.0 |
| 2008 | 10.0 | 29.3 | 0.0 | 0.0 | 60.7 | 0.0 |
| 2009 | 54.3 | 43.7 | 0.0 | 0.0 | 2.0 | 0.0 |
| 2010 | 63.7 | 36.3 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2011 | 71.3 | 0.0 | 0.0 | 0.0 | 28.7 | 0.0 |
| 2012 | 79.5 | 2.6 | 0.0 | 0.0 | 17.9 | 0.0 |
| 2013 | 21.4 | 0.0 | 0.9 | 0.0 | 77.7 | 0.0 |

Table A.8. Percentages of Norwegian spring spawning herring adults by zone from the International Ecosystem Summer Survey in the Norwegian Sea (IESSNS) in July (chapter 4.10). *= incomplete coverage.

| Year | EU | Norway | Iceland | Svalbard | JanMayen | Greenland | Faroes | InterNorwSea |
|---|---|---|---|---|---|---|---|---|
| 2009 | 0.2 | 25.9 | 23.5 | 4.1 | 21.7 | 0.2 | 9.7 | 14.8 |
| 2010 | 1.3 | 22.1 | 20.8 | 12.5 | 16.7 | 0.7 | 16.5 | 9.4 |
| 2011* | 2.9 | 2.9 | 24.5 | 0.0 | 2.9 | 0.0 | 60.6 | 6.2 |
| 2012 | 3.8 | 7.0 | 35.3 | 0.1 | 10.5 | 0.0 | 36.6 | 6.6 |
| 2013 | 2.7 | 5.5 | 43.8 | 0.6 | 8.8 | 0.1 | 32.2 | 6.3 |

Table A.9. Percentages of Norwegian spring spawning herring adults by zone from spawning ground survey in November/December (chapter 4.12). *= incomplete coverage. - = region not covered.

| Year | Norway | Iceland | Russia | EU | Faroe Islands |
|---|---|---|---|---|---|
| **1995** | 100 | - | - | - | - |
| **1996** | 100 | - | - | - | - |
| **1997** | 100 | - | - | - | - |
| **1998** | 100 | - | - | - | - |
| **1999** | 100 | - | - | - | - |
| **2000** | 100 | - | - | - | - |
| **2001** | 100 | - | - | - | - |
| **2002** | 100* | - | - | - | - |
| **2003** | 100* | - | - | - | - |
| **2004** | 100* | - | - | - | - |
| **2005** | 100* | - | - | - | - |
| **2006** | 100* | - | - | - | - |
| **2007** | 100* | - | - | - | - |
| **2008** | - | - | - | - | - |
| **2009** | - | - | - | - | - |
| **2010** | - | - | - | - | - |
| **2011** | - | - | - | - | - |
| **2012** | - | - | - | - | - |
| **2013** | - | - | - | - | - |

Table A.10. Norwegian spring spawning herring catches - data availability and quality as used in the Coastal States Working Group report and in the database file.

| Year | Denmark | Faroe Islands | France | Germany | Greenland | Iceland | Netherlands | Norway | Poland | Russia | Sweden | UK |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1995 | | | | | | | | 3 | | 2 | | 1 |
| 1996 | 1 | 1 | | | | 1 | 2 | 3 | | 2 | 1 | 1 |
| 1997 | 1 | 1 | NA | 2 | | 1 | 2 | 3 | | 2 | 1 | 1 |
| 1998 | 1 | 1 | NA | 2 | | 1 | 2 | 3 | | 2 | 1 | 1 |
| 1999 | 1 | 1 | | 2 | | 1 | 2 | 3 | | 2 | 1 | 1 |
| 2000 | 1 | 1 | | 2 | | 1 | 2 | 3 | | 2 | 1 | 1 |
| 2001 | 1 | 1 | | 2 | | 1 | 2 | 3 | | 2 | 1 | 1 |
| 2002 | 1 | 1 | | 2 | | 1 | 2 | 3 | 4 | 2 | 1 | 1 |
| 2003 | 1 | 1 | | 2 | | 1 | 2 | 3 | | 2 | 1 | 1 |
| 2004 | 1 | 1 | NA | 2 | | 1 | 2 | 3 | 2 | 2 | 1 | 1 |
| 2005 | 1 | 1 | | 2 | | 1 | 2 | 3 | 2 | 2 | 1 | |
| 2006 | 1 | 1 | NA | 2 | | 1 | 2 | 3 | 2 | 2 | 1 | 1 |
| 2007 | 1 | 1 | | 2 | 4 | 1 | 2 | 3 | 2 | 2 | | 1 |
| 2008 | 1 | 1 | | 2 | 4 | 1 | 2 | 3 | | 2 | | 1 |
| 2009 | 1 | 1 | | 2 | 4 | 1 | 2 | 3 | | 2 | | 1 |
| 2010 | 1 | 1 | | 2 | 4 | 1 | 2 | 3 | | 2 | | 1 |
| 2011 | 1 | 1 | | 2 | 4 | 1 | 2 | 3 | | 2 | | 1 |
| 2012 | 1 | 1 | | 2 | 4 | 1 | 2 | 3 | | 2 | | 1 |

1= spatially disaggregated data (rectangles) on a monthly basis and derived from logbooks with zonal information
2= spatially disaggregated data (rectangles) on a monthly basis and derived from logbooks without zonal information
3= spatially disaggregated data (rectangles) on a monthly basis with zonal information and derived from sources other than logbooks
4= catch data, usually on an annual basis, assigned to arbitrary ICES rectangles
NA= no data available, but fishery

Table A.11. Norwegian spring spawning herring. Catch reported to the Coastal States Working Group as percentage of catch reported to WGWIDE. Coastal States WG catches are official catches, whereas WGWIDE catches are provided by scientists.

| Year | CS WG 2014 | WGWIDE | Comparison |
|---|---|---|---|
| 1993 | 229,066 | 232,457 | 98.5 % |
| 1994 | 498,420 | 479,228 | 104.0 % |
| 1995 | 896,882 | 905,501 | 99.0 % |
| 1996 | 1,187,992 | 1,220,283 | 97.4 % |
| 1997 | 1,423,968 | 1,426,507 | 99.8 % |
| 1998 | 1,225,097 | 1,223,131 | 100.2 % |
| 1999 | 1,247,181 | 1,235,433 | 101.0 % |
| 2000 | 1,212,631 | 1,207,201 | 100.4 % |
| 2001 | 771,632 | 766,136 | 100.7 % |
| 2002 | 813,544 | 807,795 | 100.7 % |
| 2003 | 749,187 | 789,510 | 94.9 % |
| 2004 | 805,594 | 794,066 | 101.5 % |
| 2005 | 1,026,314 | 1,003,243 | 102.3 % |
| 2006 | 968,223 | 968,958 | 99.9 % |
| 2007 | 1,264,053 | 1,266,993 | 99.8 % |
| 2008 | 1,546,513 | 1,545,656 | 100.1 % |
| 2009 | 1,686,912 | 1,687,371 | 100.0 % |
| 2010 | 1,447,340 | 1,457,015 | 99.3 % |
| 2011 | 987,717 | 992,997 | 99.5 % |
| 2012 | 818,960 | 826,000 | 99.1 % |
| **Total** | **20,807,226** | **20,835,481** | **99.9 %** |

Table A.12. Catches (tonnes) of Norwegian spring spawning herring by zones for each year 1995-2012

| EEZ / Year | EU | Faroes | Greenland | Iceland | Inter.Norw. Sea | Inter. West | Jan Mayen | Norway | Russia | Special area EU/FO | Svalbard | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1995 | 613 | 164,083 | | 12,979 | 92,856 | | 7,035 | 619,164 | 152 | | | 896,882 |
| 1996 | 10,495 | 101,757 | | 1,759 | 221,691 | | 29,381 | 822,893 | | 16 | | 1,187,992 |
| 1997 | 14,828 | 145,501 | | 3,407 | 169,208 | | 32,111 | 1,046,687 | 51 | 0 | 12,174 | 1,423,968 |
| 1998 | 29,463 | 85,235 | | 42,157 | 68,986 | | 96,021 | 903,216 | 0 | | 19 | 1,225,097 |
| 1999 | 32,860 | 3,874 | 150 | 12,310 | 96,792 | | 206,633 | 892,606 | 8 | 198 | 1,751 | 1,247,181 |
| 2000 | 15,369 | 14 | | 400 | 145,793 | 1 | 150,566 | 881,187 | 181 | | 19,121 | 1,212,631 |
| 2001 | 13,882 | 275 | | | 123,812 | 0 | 6,996 | 594,733 | 165 | | 31,768 | 771,631 |
| 2002 | 10,029 | 130 | | | 86,459 | | 24,558 | 595,213 | | | 97,155 | 813,544 |
| 2003 | 1,577 | 902 | | 11,821 | 109,682 | 0 | 6,464 | 571,686 | 0 | | 47,053 | 749,187 |
| 2004 | 12,226 | 1,078 | | 5,425 | 134,529 | 0 | 653 | 556,846 | 0 | | 94,836 | 805,594 |
| 2005 | 4,408 | 22,069 | | 38,506 | 197,145 | | 2,970 | 668,006 | 2 | 0 | 93,208 | 1,026,314 |
| 2006 | 1,134 | 51,295 | | 62,999 | 138,474 | | 163 | 707,448 | | 10 | 6,700 | 968,223 |
| 2007 | 585 | 20,585 | 1,552 | 113,737 | 77,283 | 3 | 22,176 | 1,017,243 | 0 | | 10,890 | 1,264,053 |
| 2008 | 20 | 10,932 | | 139,289 | 82,216 | | 45,557 | 1,235,768 | 25 | | 32,705 | 1,546,513 |
| 2009 | 74 | 6,479 | | 203,576 | 118,501 | | 9,151 | 1,270,568 | | | 78,564 | 1,686,912 |
| 2010 | 257 | 12,914 | 155 | 173,194 | 46,106 | | 10,657 | 1,141,051 | 1 | | 63,004 | 1,447,340 |
| 2011 | 4 | 52,168 | | 117,112 | 91,630 | | 4,097 | 686,425 | 0 | | 36,282 | 987,717 |
| 2012 | 2 | 53,734 | 162 | 85,800 | 36,541 | | 10,161 | 527,358 | 0 | | 105,200 | 818,960 |
| **Total** | **147,825** | **733,024** | **2,019** | **1,024,473** | **2,037,704** | **5** | **665,351** | **14,738,099** | **587** | **224** | **730,429** | **20,079,739** |

Table A.13. Catches (percentages) of Norwegian spring spawning herring by zones for each year 1995-2012

| EEZ / Year | EU | Faroes | Greenland | Iceland | Inter.Norw. Sea | Inter. West | Jan Mayen | Norway | Russia | Special area EU/FO | Svalbard | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1995 | 0.07 % | 18.29 % | 0.00 % | 1.45 % | 10.35 % | 0.00 % | 0.78 % | 69.04 % | 0.02 % | 0.00 % | 0.00 % | **100.00 %** |
| 1996 | 0.88 % | 8.57 % | 0.00 % | 0.15 % | 18.66 % | 0.00 % | 2.47 % | 69.27 % | 0.00 % | 0.00 % | 0.00 % | **100.00 %** |
| 1997 | 1.04 % | 10.22 % | 0.00 % | 0.24 % | 11.88 % | 0.00 % | 2.26 % | 73.50 % | 0.00 % | 0.00 % | 0.85 % | **100.00 %** |
| 1998 | 2.40 % | 6.96 % | 0.00 % | 3.44 % | 5.63 % | 0.00 % | 7.84 % | 73.73 % | 0.00 % | 0.00 % | 0.00 % | **100.00 %** |
| 1999 | 2.63 % | 0.31 % | 0.01 % | 0.99 % | 7.76 % | 0.00 % | 16.57 % | 71.57 % | 0.00 % | 0.02 % | 0.14 % | **100.00 %** |
| 2000 | 1.27 % | 0.00 % | 0.00 % | 0.03 % | 12.02 % | 0.00 % | 12.42 % | 72.67 % | 0.01 % | 0.00 % | 1.58 % | **100.00 %** |
| 2001 | 1.80 % | 0.04 % | 0.00 % | 0.00 % | 16.05 % | 0.00 % | 0.91 % | 77.07 % | 0.02 % | 0.00 % | 4.12 % | **100.00 %** |
| 2002 | 1.23 % | 0.02 % | 0.00 % | 0.00 % | 10.63 % | 0.00 % | 3.02 % | 73.16 % | 0.00 % | 0.00 % | 11.94 % | **100.00 %** |
| 2003 | 0.21 % | 0.12 % | 0.00 % | 1.58 % | 14.64 % | 0.00 % | 0.86 % | 76.31 % | 0.00 % | 0.00 % | 6.28 % | **100.00 %** |
| 2004 | 1.52 % | 0.13 % | 0.00 % | 0.67 % | 16.70 % | 0.00 % | 0.08 % | 69.12 % | 0.00 % | 0.00 % | 11.77 % | **100.00 %** |
| 2005 | 0.43 % | 2.15 % | 0.00 % | 3.75 % | 19.21 % | 0.00 % | 0.29 % | 65.09 % | 0.00 % | 0.00 % | 9.08 % | **100.00 %** |
| 2006 | 0.12 % | 5.30 % | 0.00 % | 6.51 % | 14.30 % | 0.00 % | 0.02 % | 73.07 % | 0.00 % | 0.00 % | 0.69 % | **100.00 %** |
| 2007 | 0.05 % | 1.63 % | 0.12 % | 9.00 % | 6.11 % | 0.00 % | 1.75 % | 80.47 % | 0.00 % | 0.00 % | 0.86 % | **100.00 %** |
| 2008 | 0.00 % | 0.71 % | 0.00 % | 9.01 % | 5.32 % | 0.00 % | 2.95 % | 79.91 % | 0.00 % | 0.00 % | 2.11 % | **100.00 %** |
| 2009 | 0.00 % | 0.38 % | 0.00 % | 12.07 % | 7.02 % | 0.00 % | 0.54 % | 75.32 % | 0.00 % | 0.00 % | 4.66 % | **100.00 %** |
| 2010 | 0.02 % | 0.89 % | 0.01 % | 11.97 % | 3.19 % | 0.00 % | 0.74 % | 78.84 % | 0.00 % | 0.00 % | 4.35 % | **100.00 %** |
| 2011 | 0.00 % | 5.28 % | 0.00 % | 11.86 % | 9.28 % | 0.00 % | 0.41 % | 69.50 % | 0.00 % | 0.00 % | 3.67 % | **100.00 %** |
| 2012 | 0.00 % | 6.56 % | 0.02 % | 10.48 % | 4.46 % | 0.00 % | 1.24 % | 64.39 % | 0.00 % | 0.00 % | 12.85 % | **100.00 %** |
| **Total** | **0.76 %** | **3.75 %** | **0.01 %** | **4.62 %** | **10.73 %** | **0.00 %** | **3.06 %** | **72.89 %** | **0.00 %** | **0.00 %** | **4.16 %** | **100.00 %** |

Table A.14. Total catches (tonnes) of Norwegian spring spawning herring by country in each zone for the years 1995-2012

| EEZ Country | EU | Faroes | Greenland | Iceland | Inter.Norw. Sea | Inter. West | Jan Mayen | Norway | Russia | Special area EU/FO | Svalbard | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Denmark | 30,188 | 5,939 | | | 263,442 | | | 254,301 | | | | 553,870 |
| Faroe Island | | 228,513 | | 72,965 | 228,554 | | 54,731 | 353,100 | | | 67,887 | 1,005,751 |
| Germany | 27,390 | 2,065 | | | 34,988 | | 1,820 | 43,289 | | | 38,531 | 148,083 |
| Greenland | | 1,514 | 1,552 | | 6,496 | | | 10,755 | | | 489 | 20,805 |
| Iceland | | 395,480 | | 945,735 | 826,795 | | 497,959 | 192,685 | | | 172,863 | 3,031,517 |
| Netherland | 40,460 | 2,845 | 155 | 113 | 95,951 | | 13,170 | 77,080 | | | 41,091 | 270,866 |
| Norway | 6 | 3,144 | | 3,207 | 171,041 | | 39,696 | 11,819,197 | | | 20,775 | 12,057,065 |
| Poland | 1,514 | 1 | | | 1,937 | | | 3,680 | | 0 | 47 | 7,178 |
| Russia | 1,483 | 19,343 | 312 | 2,452 | 316,230 | 5 | 53,565 | 1,800,349 | 587 | 224 | 382,881 | 2,577,431 |
| Sweden | | 1,095 | | | 86,399 | | 2,108 | 28,756 | | | 5,865 | 124,223 |
| UK | 46,784 | 73,085 | | | 5,870 | | 2,302 | 154,908 | | | | 282,949 |
| **Total** | **147,825** | **733,024** | **2,019** | **1,024,473** | **2,037,704** | **5** | **665,351** | **14,738,099** | **587** | **224** | **730,429** | **20,079,739** |

# Annex 2. Distribution of NSSH fishing per month and year

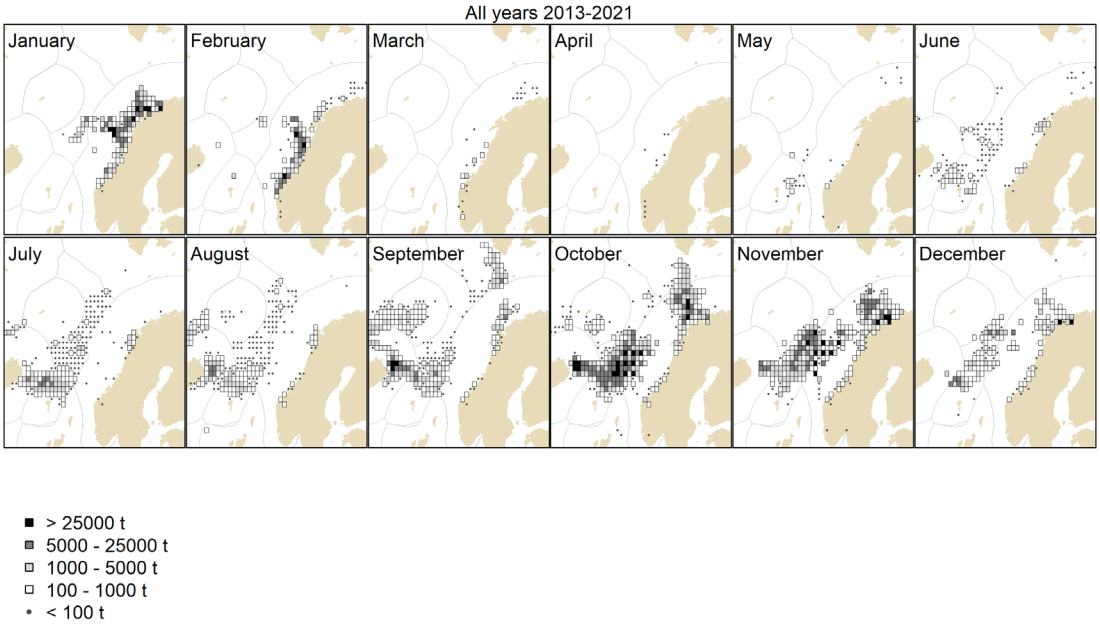



Figure A2.1. Total catches combined for years 2013-2021 by month.

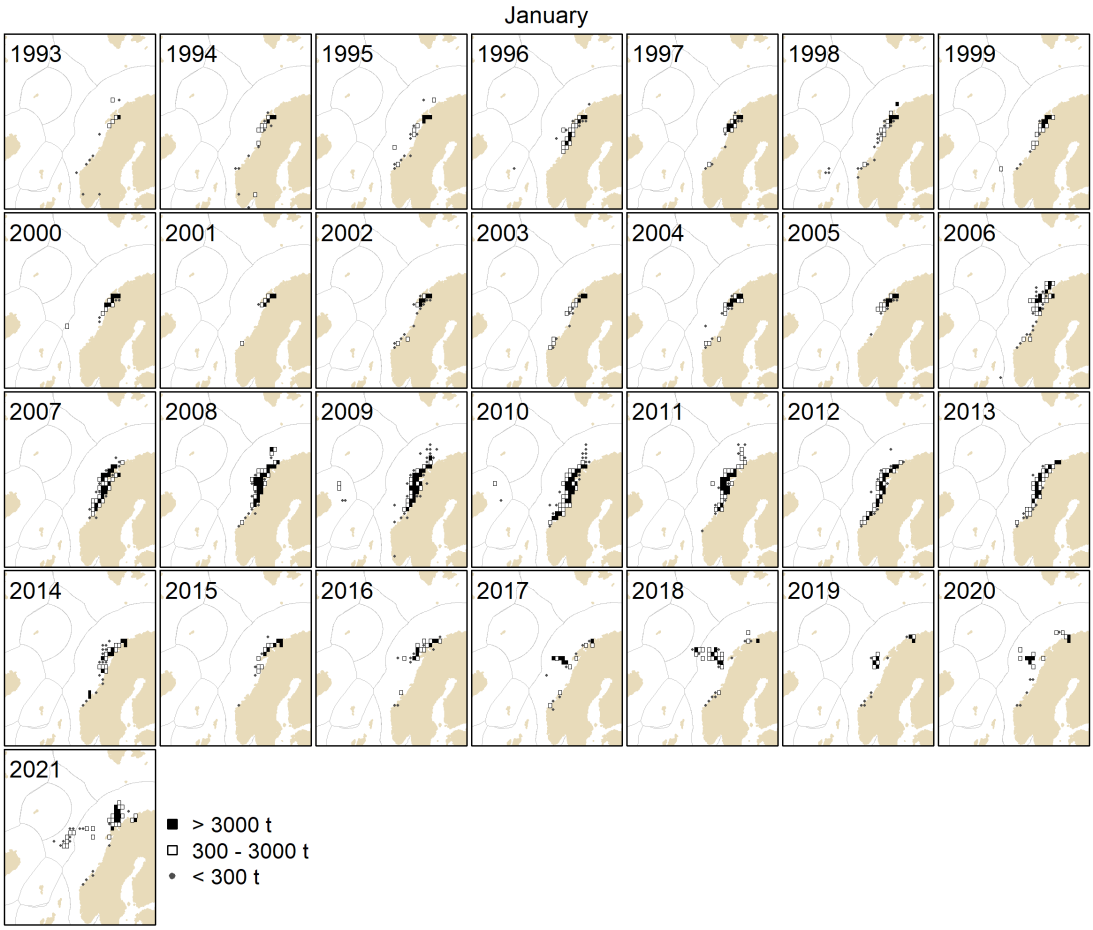



Figure A2.2. Total catches 1993-2021 in January.

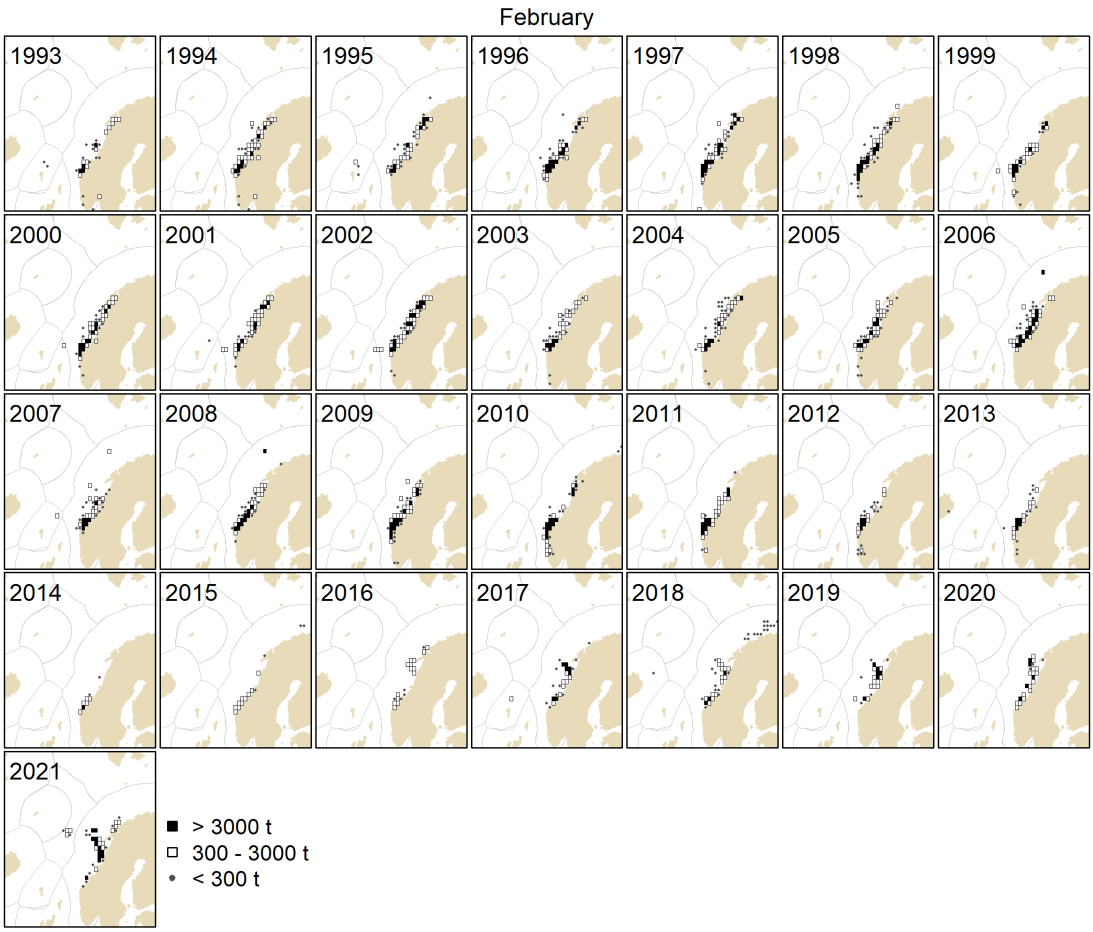



Figure A2.2. Total catches 1993-2021 in February.

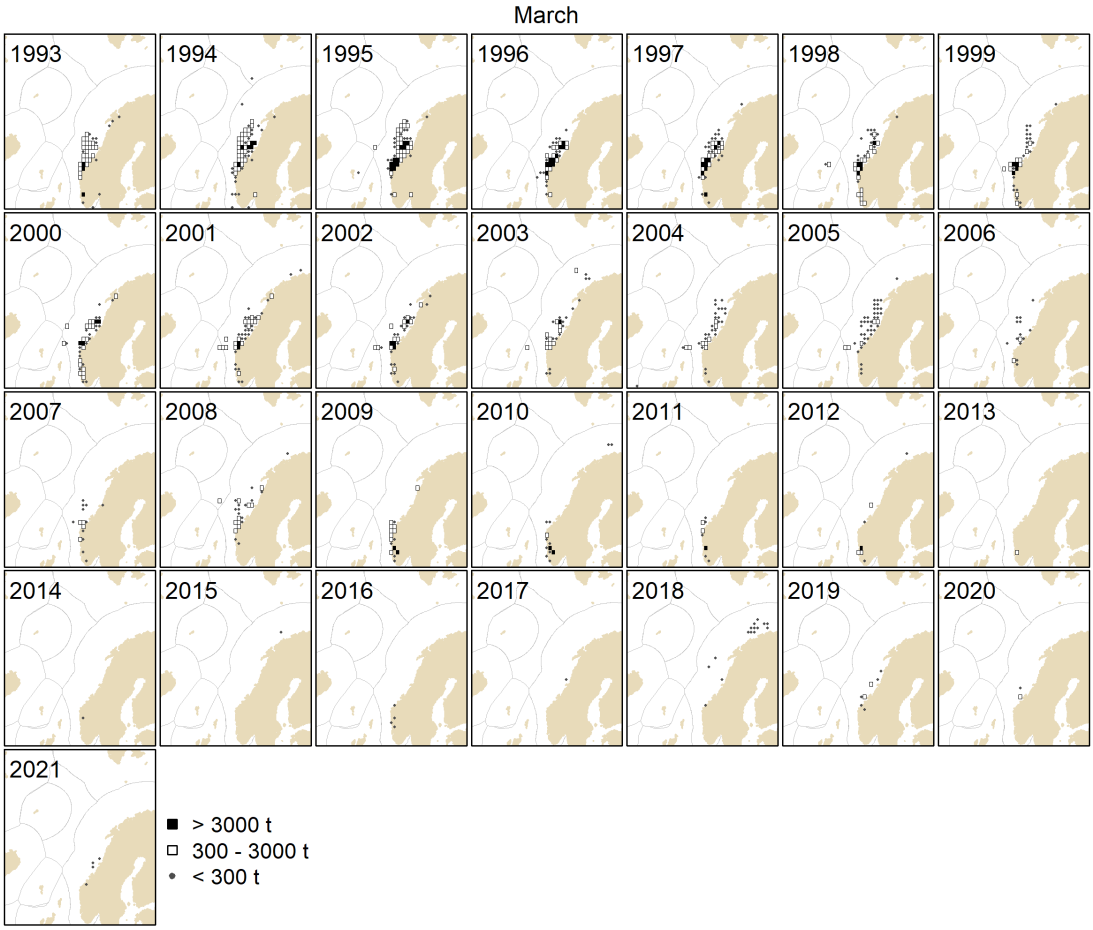



Figure A2.2. Total catches 1993-2021 in March.

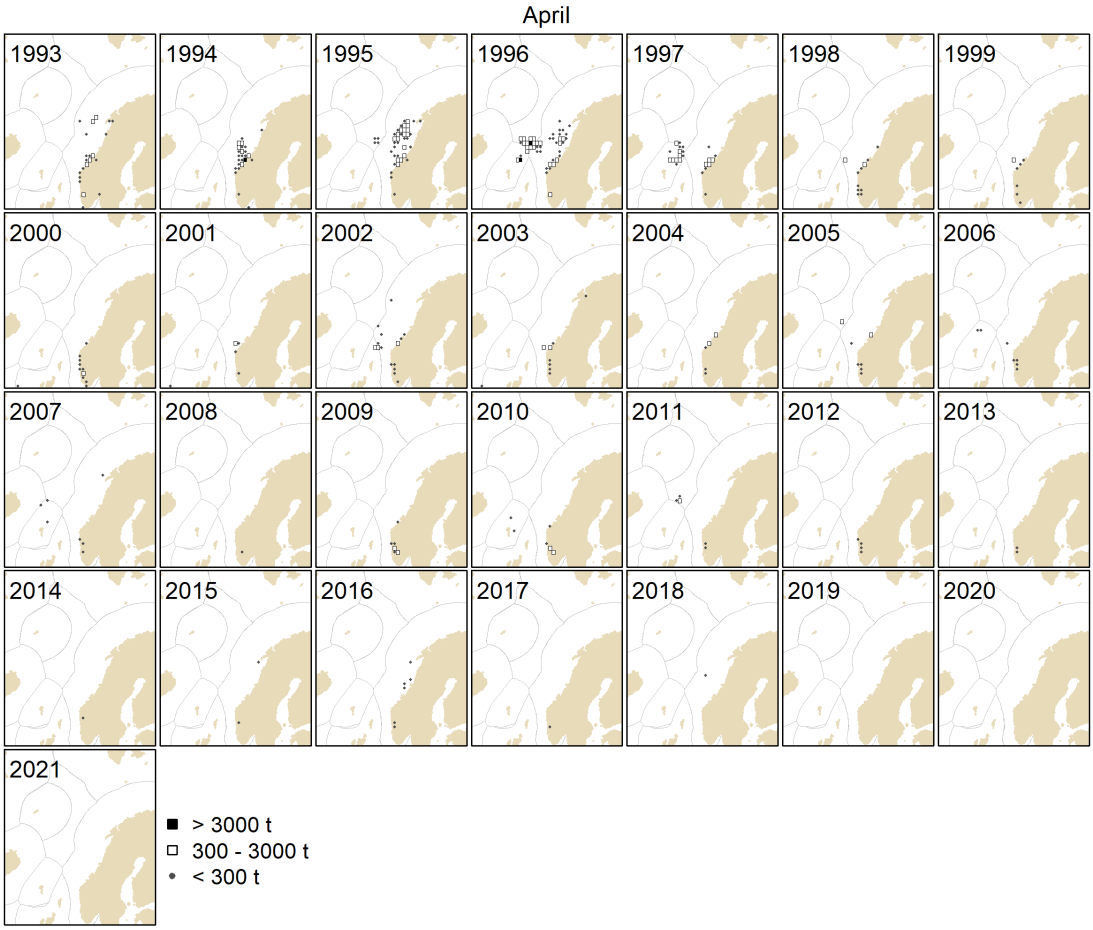



Figure A2.2. Total catches 1993-2021 in April.

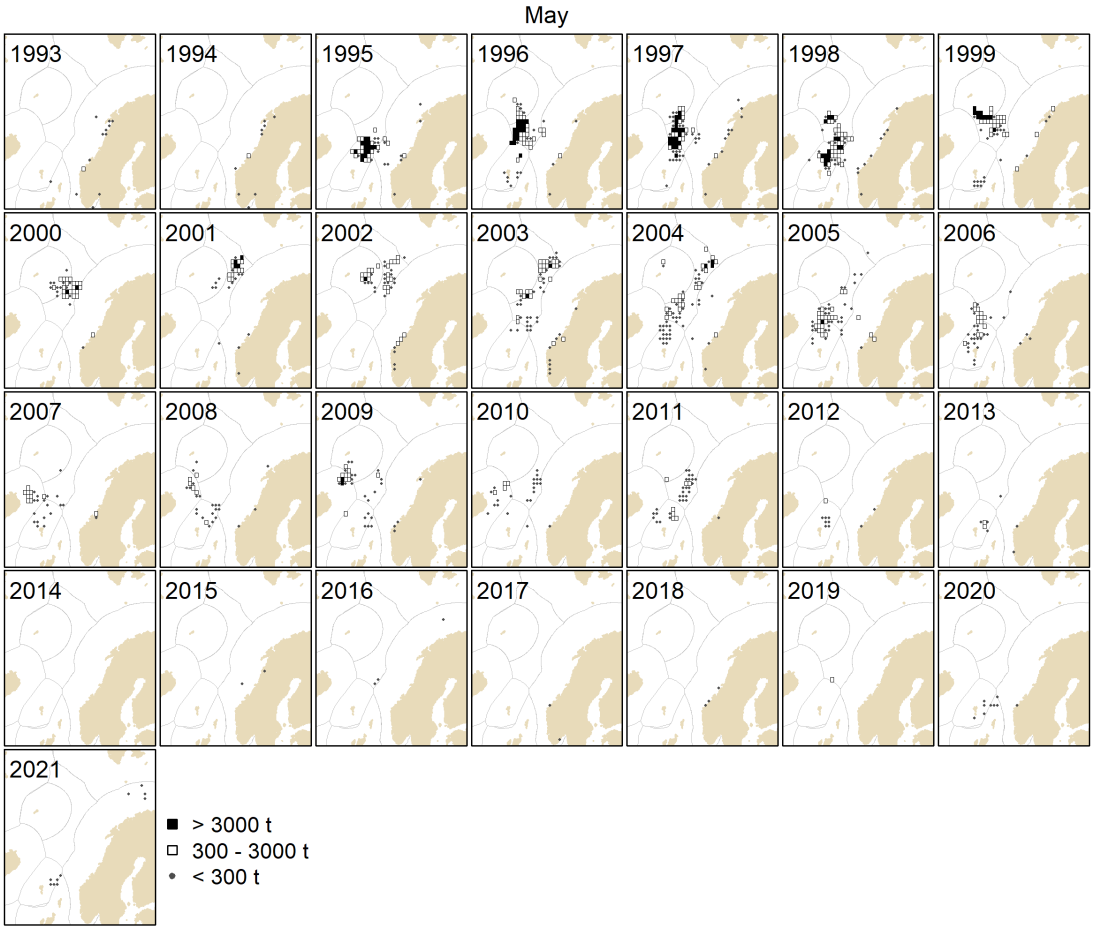



Figure A2.2. Total catches 1993-2021 in May.

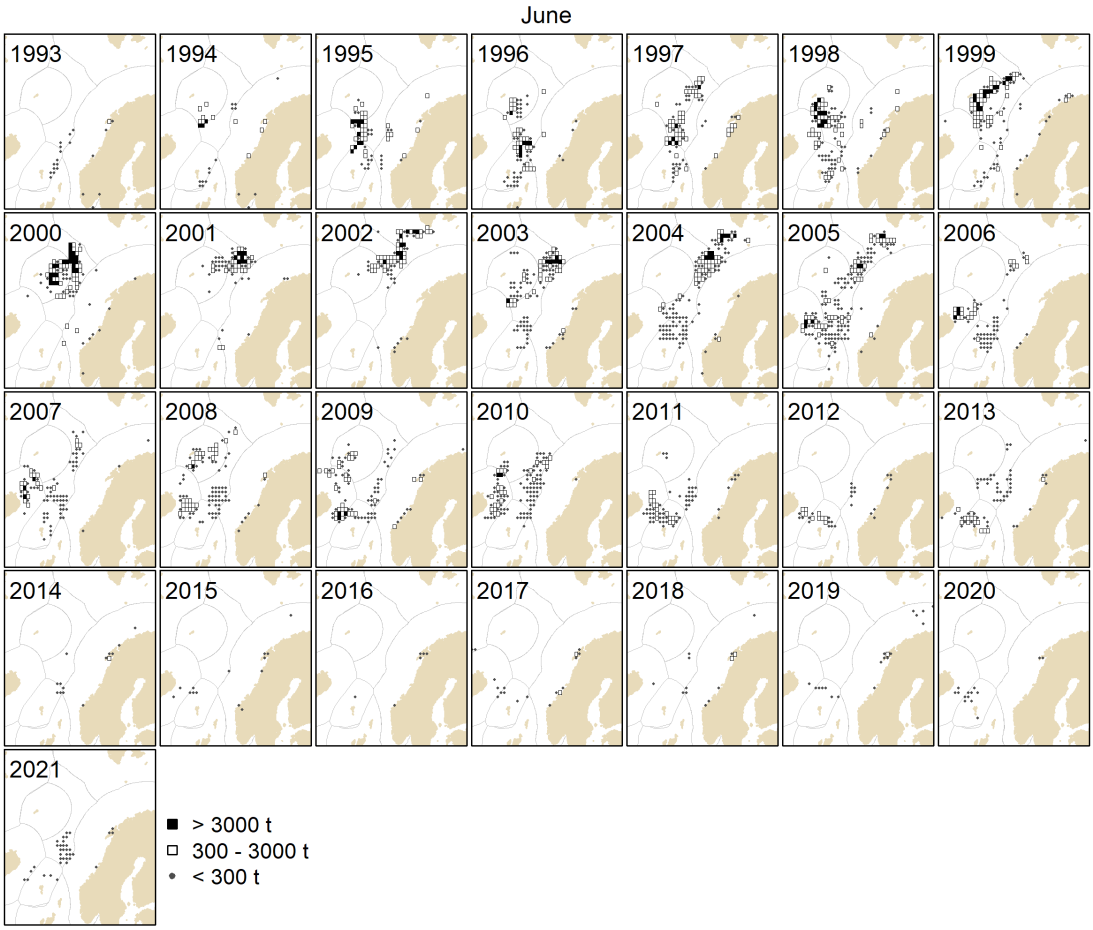



Figure A2.2. Total catches 1993-2021 in June.

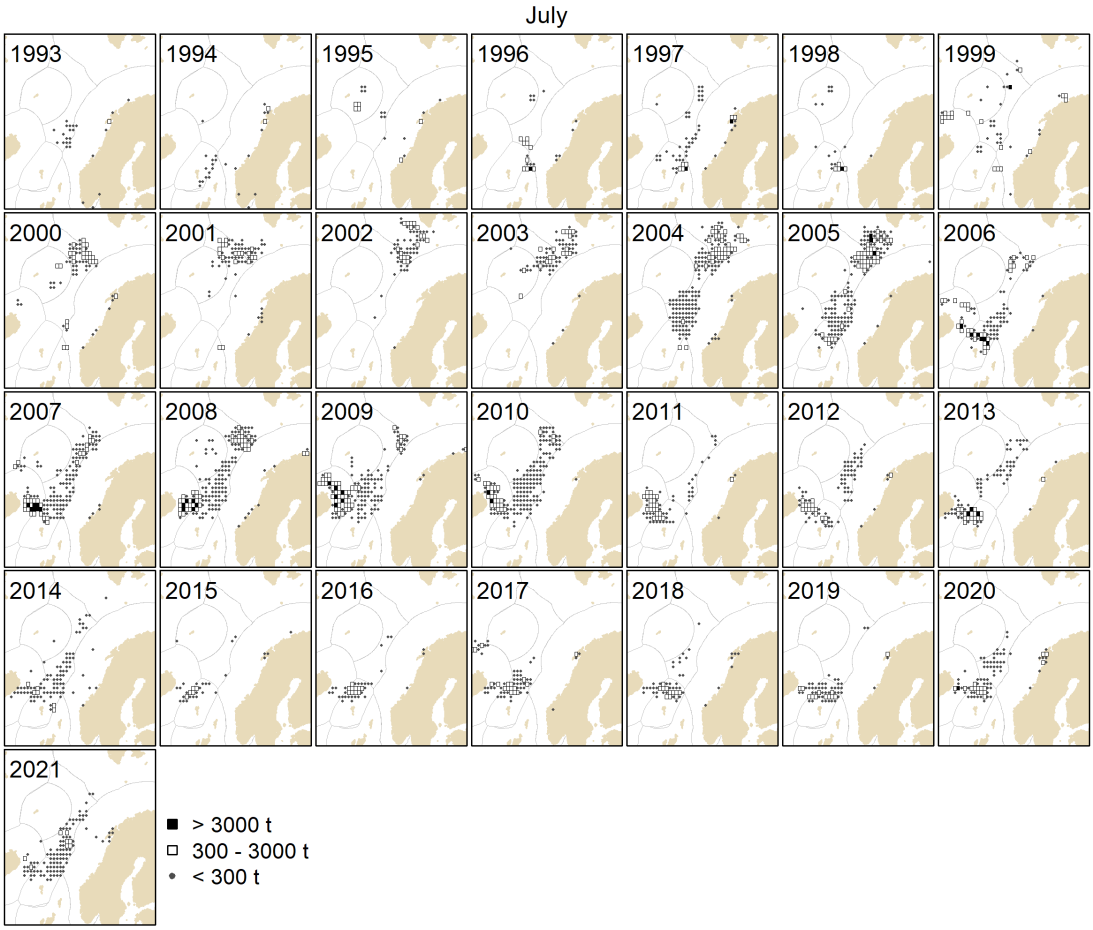



Figure A2.2. Total catches 1993-2021 in July.

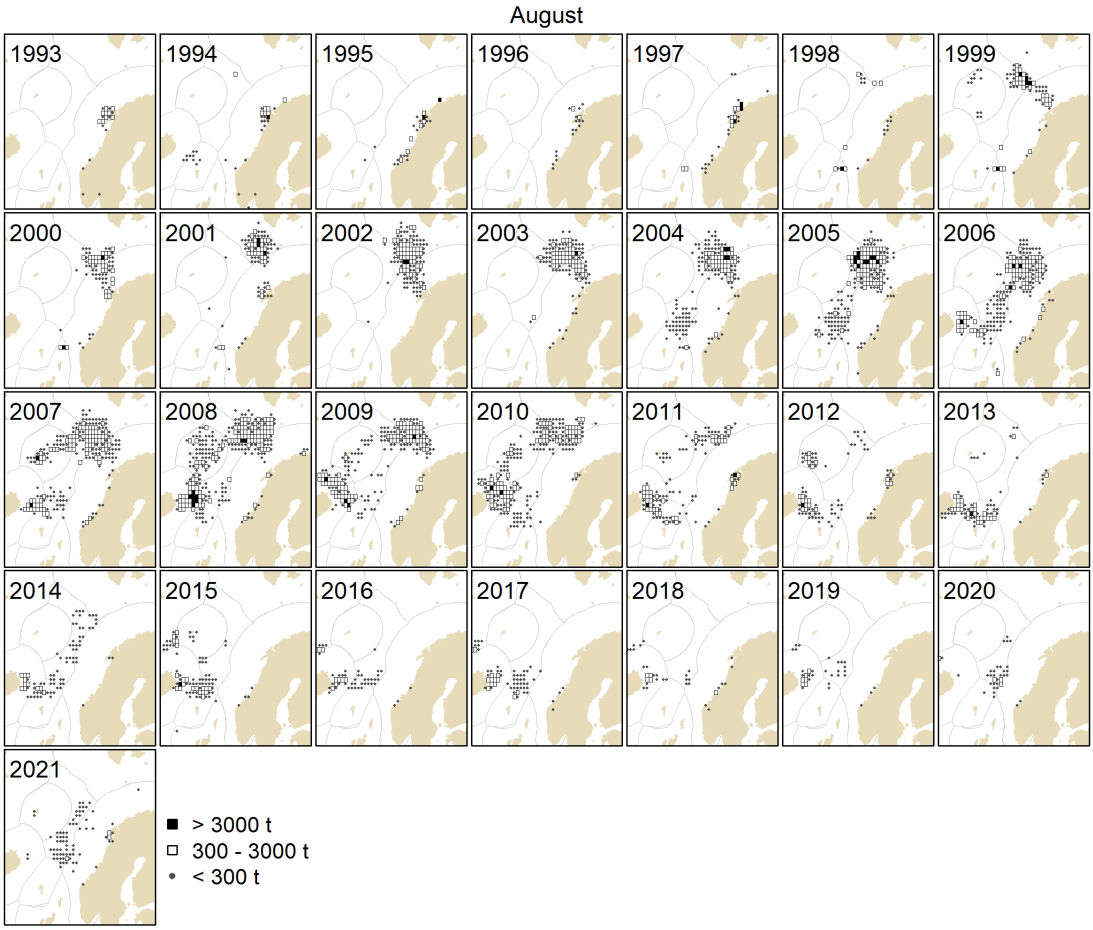



Figure A2.2. Total catches 1993-2021 in August.

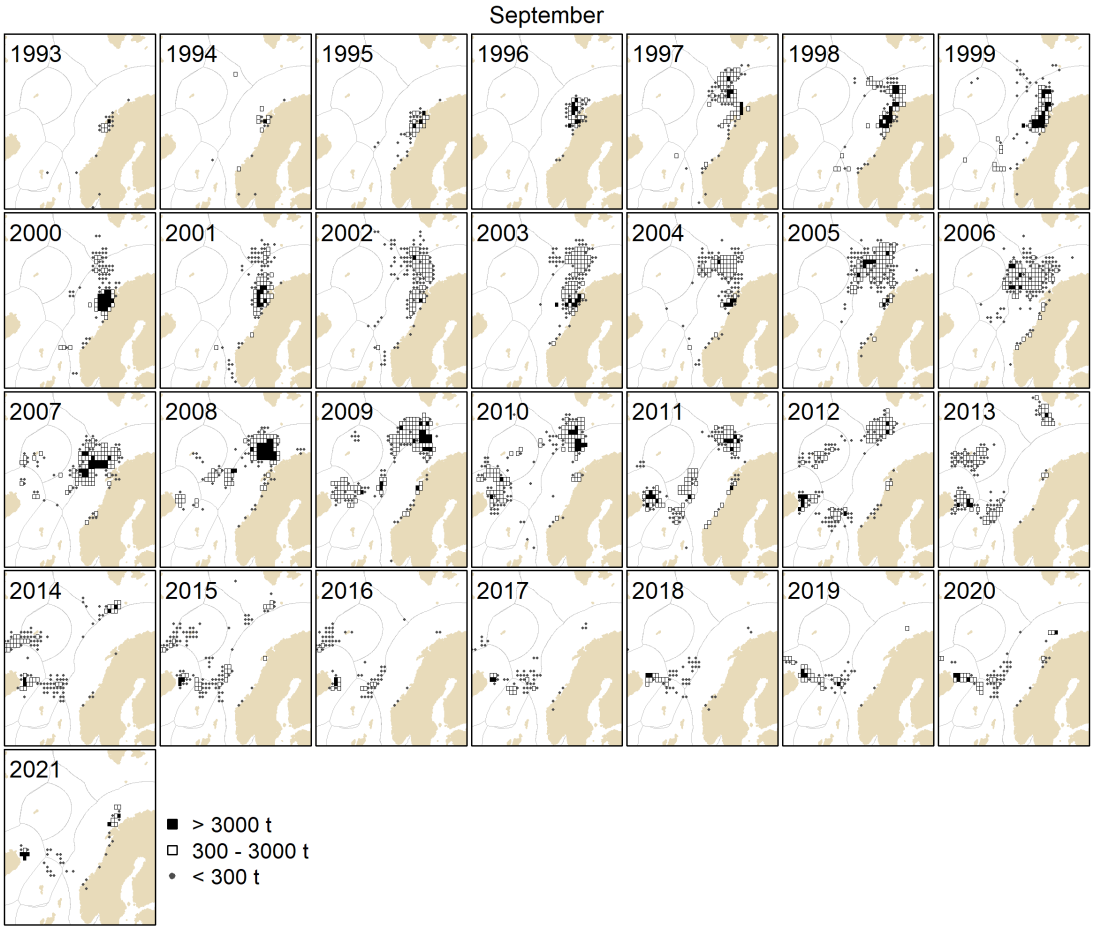



Figure A2.2. Total catches 1993-2021 in September.

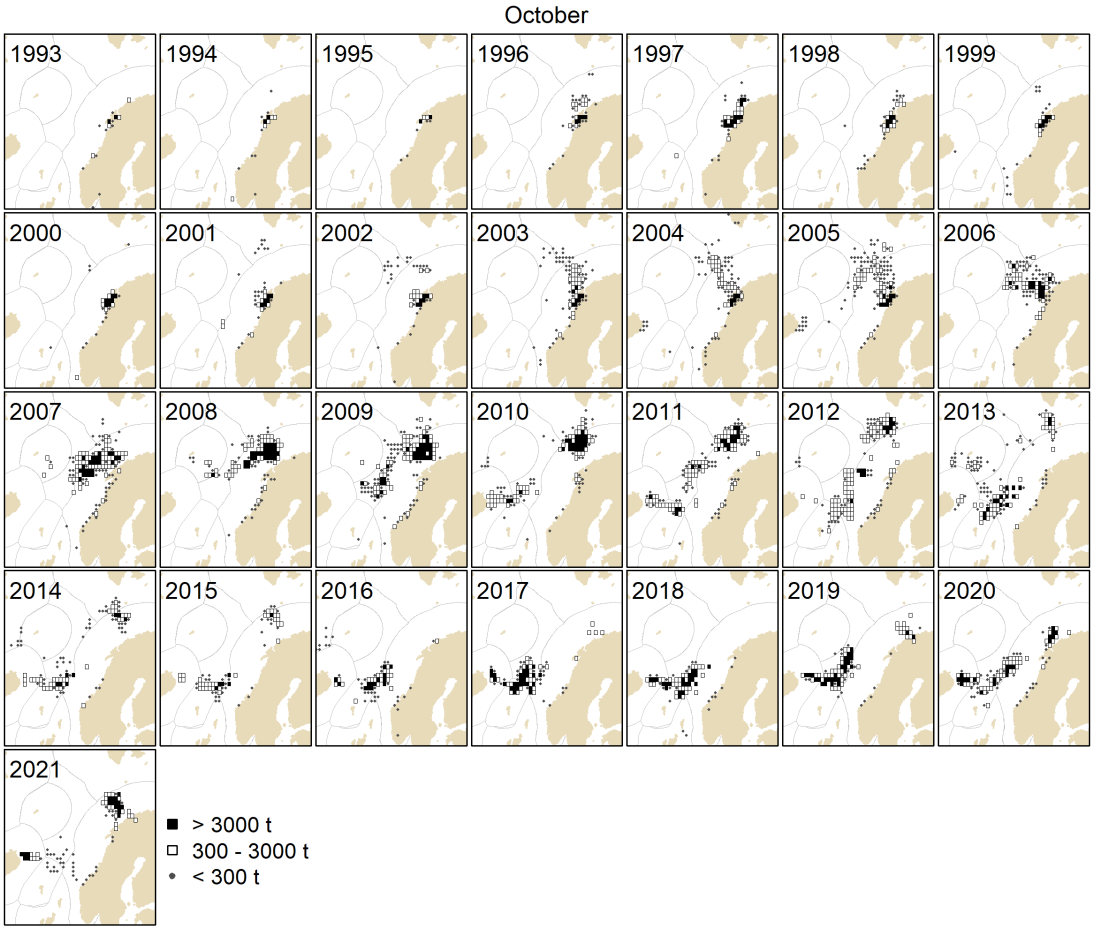



Figure A2.2. Total catches 1993-2021 in October.

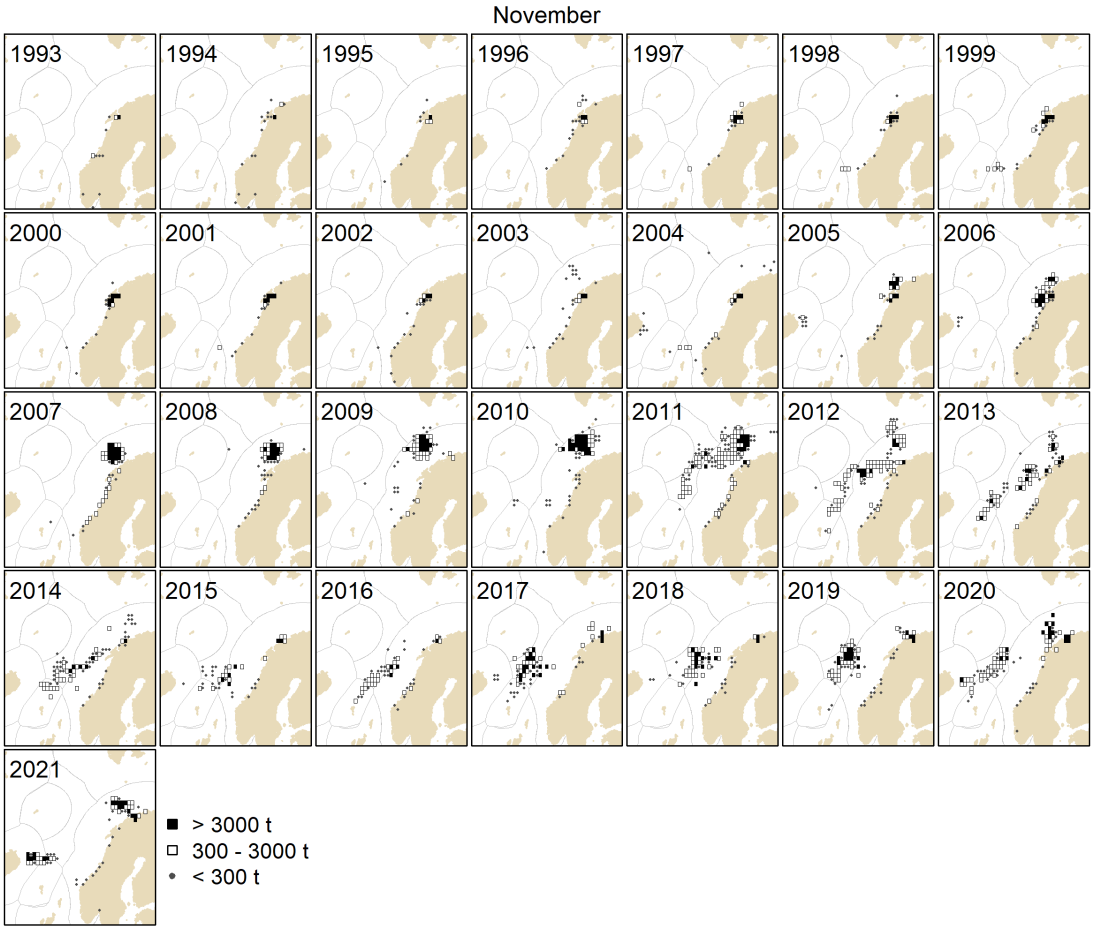



Figure A2.2. Total catches 1993-2021 in November.


Figure A2.2. Total catches 1993-2021 in December.

# Annex 3. List of participants

Åge Høines, Norway
Erling Kåre Stenevik, Norway (chair)
Guðmundur J. Óskarsson, Iceland
Lisa Libungan, Iceland
Jan Arge Jacobsen, Faroe Island
Eydna í Homrum, Faroe Island
Søren Post, Greenland
Richard Nash, UK
Neil Campbell, UK
Ana Leocadio, EU Commission