Report of the 2022 Coastal States Working Group on the distribution of blue whiting in the Northeast Atlantic

September 2022

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1. Introduction

At the Coastal States meeting on 20 - 21 October 2020 between the European Union, the Faroe Islands, Iceland and Norway, the Norwegian delegation was encouraged to start a process to update the "Report from the NEAFC Working Group on Collating Information on the Distribution of All Life Stages of Blue Whiting in the North-East Atlantic and the Distribution of Catches from the Stock", in the same form as decided for the Norwegian spring spawning herring in 2019. Due to the Covid pandemic the work was postponed one year, and it was revisited at the CS meeting on 25 - 26 October 2021 in London. The delegations then agreed to establish a Working Group, which should be chaired by Norway in 2022, to update the report from NEAFC in 2013.

The first preparatory meeting took place on 7 December 2021 (Copenhagen/hybrid) to discuss the process of updating the report. For this purpose, the experts identified the need of additional catch data to continue the series provided in the 2013 report. The group was chaired by Åge Høines, Norway. Participants from all Parties attended the meeting.

Terms of Reference

The text below is copied from the agreed record from the Coastal States consultations in 2021 (item 8) and will be regarded as terms of reference for the present working group:

ToR from the Coastal States: The Coastal States delegations agreed to establish a Working Group, chaired by Norway in 2022, to update the "Report from the NEAFC Working Group on Collating Information on the Distribution of All Life Stages of Blue Whiting in the North-East Atlantic and the Distribution of Catches from the Stock, London, 26 - 28 November 2013".

Approach of the present group

The present report relies on standardised information in the form of output from internationally and nationally coordinated surveys. The international surveys are organized within the ICES Working Group of International Pelagic Surveys (WGIPS). This does not include national surveys. Surveys provide snapshots of biomass/abundance distribution of the different life stages at a specific point in time and space, but the integrated nature of their analysis will give distribution maps within the survey period. The present report contains updated survey information from 2010 - 2012 and added survey information from surveys in the period 2013 – 2020 presented as distribution maps and/or tables. All surveys provide information on juvenile and mature blue whiting and are conducted annually. The international surveys target blue whiting while most of the national surveys do not (Table 4.1). Further, the national surveys coverage is usually limited to only one (national) zone, therefore, international surveys are considered primary data sources and the national surveys secondary sources. Due to the lack of systematic information the working group chose to avoid interpolation between survey periods or combining surveys with different survey designs/ strategies. The maps and tables provide some guidance as to the within year rate of change in distribution among zones.

The working group issued a data call for catch data where it was kindly requested that the Parties provided information on their respective catches of blue whiting for the period 2010 - 2020 with a deadline of 1st April 2022. The data call on catch data was sent to the Coastal States and Fishing Parties on 15th December 2021.The full data call is given below and is followed by a detailed format document of the catch submissions needed. All nations responded in time and the period until the June meeting was used to quality check the received catch data.

Blue whiting data call sent to all Parties (see Appendix 4):

"As stated in the Agreed record on the management of blue whiting 2022, the delegations decided to establish a Working group, including scientific experts from all Parties, and chaired by Norway, to update the 2013 report "**Report from the NEAFC Working Group on Collating Information on the Distribution of All Life Stages of Blue Whiting in the North-East Atlantic and the Distribution of**

Catches from the Stock".

The first preparatory meeting took place on 7th December 2021 (Copenhagen/hybrid) to discuss the process of updating the report. For this purpose, the experts identified the need for additional catch data to continue the series provided in the 2013 report. Therefore, the working group kindly requests the Parties to provide information on their respective catches of blue whiting.

This data call requests catch data by month and ICES statistical rectangle for the period 2010 - 2020, and by exclusive economic zones (EEZs) and international waters. This information should be submitted in the format listed in the document attached to this letter (Appendix A5).

The Coastal States and the Fishing Parties of blue whiting are hereby asked to provide information on their respective catches of blue whiting by 1st April 2022. The data should be submitted to the Chair of the blue whiting Working Group (Åge Høines, aageh@hi.no), who will circulate it to all the members of the Working Group."

In this report the data are reported for the United Kingdom (UK) and the EU zones separately and to ensure there is no confusion with any previously published reports, the EU without the UK zone is referred to within this report as EU27 zone.

2. Background

Life cycle and distribution

Blue whiting (Micromesistius poutassou) is a small pelagic gadoid which is widely distributed in the Northeast Atlantic (Monstad, 1990) (Figure 2.1.1). The geographical range of blue whiting extends from the Gulf of Cadiz to Svalbard and into the Barents Sea, between southeast Greenland and the Kola Peninsula (Bailey, 1982; Zilanov, 1984; Monstad, 1990). The highest concentrations of the blue whiting are found along the continental shelf edge in areas west of the British Isles and on the Rockall Bank plateau, where it occurs in large schools in the spawning season. It is also present in most other management areas between the Barents Sea and the Strait of Gibraltar and westward into the Irminger Sea.

The main spawning area for blue whiting is along the shelf edge and the banks west of the British Isles and the spawning period ranges from January to June. Spawning takes place in the water column at depths between 300 m and 600 m. The spawning starts in the south of the species range and ending in the north, with the majority of spawning occurring in March and April. Spawning is also found to take place in several other areas, such as along the Norwegian coast, in Faroese and Icelandic waters, in the Bay of Biscay and further south along the Iberian shelf edge.

Following spawning, the eggs and larvae located in more southern areas, such as the Porcupine Bank area (west of Ireland) can drift both towards the south and north, depending on the spawning location, oceanographic conditions, and the effects of wind forcing. The eggs and larvae originating from the northern spawning area west of the Hebrides, on the other hand, most certainly drift northwards. The northward drift disperses most of the larval blue whiting into the Norwegian Sea and adjacent areas e.g., Icelandic waters, Faroese waters, North Sea, and the Barents Sea. The larvae settle in autumn in deeper shelf areas and stay mostly associated with the bottom during their first winter or longer. Over a period, covering two to three years, they become part of the mature stock. The southwards drifting larvae end up as juveniles in the Bay of Biscay and along the Iberian Peninsula.

Juveniles (age 0 - 2) are widely distributed, from the Iberian Peninsula in the south, to the Barents Sea and west to the Irminger Sea in the north. In times of high abundance, the Norwegian Sea is considered to be an important nursery area and they can also be found in large quantities in adjacent waters, such as the Barents Sea and in Icelandic and Faroes waters, and into the Norwegian Deep in the North Sea.

Mature blue whiting annually undertakes a seasonal migration between feeding and spawning areas. During the late autumn/early winter, mature blue whiting aggregate in the continental slope areas north and east of the Faroes. From here they commence their spawning migration southwards to the banks and shelf edge west of the British Isles. After spawning the feeding migrations start, either northwards into Norwegian Sea and adjacent areas or southwards along the continental shelf of mainland Europe.

Stock identity of the blue whiting stock is unclear as morphological, physiological, and genetic studies suggests the population consists of two stocks which occur in the spawning area west of the British Isles. However, for the purpose of the stock assessment, the blue whiting population is treated as a single stock. Due to the large population size, its considerable migratory capabilities and wide spatial distribution, the stock identity and population dynamics require more research effort to determine the stock structure. Blue whiting distribution in the north Atlantic is shown in Figure 2.1.1.

3. Methods

Internationally coordinated surveys (IBWSS, IESNS, IESSNS)

The method used to produce the estimates of the surveys age segregated blue whiting indices in the present report has changed since the 2013 report. A new estimation software StoX (Johnsen et al., 2019) is now available where biomass estimates are produced directly by EEZs. However, estimation of abundance from acoustic surveys with StoX is carried out according to the stratified transect design model developed by Jolly and Hampton (1990). This method requires pre-defined strata, and the survey area were therefore split into several strata with pre-defined acoustic transects based on biological or ecological knowledge. Within each stratum, parallel transects with equal distances or zigzag transects were used. The distance between transects is based on available survey time, and the starting point of the first transect in each stratum is randomized. This approach allows for robust statistical analyses of uncertainty of the acoustic estimates. Generally, and in accordance with most WGIPS coordinated surveys, all trawl stations within a given stratum with catches of the target species (blue whiting) were assigned to all transects within the stratum, and the length distributions were weighted equally within the stratum.

The StoX software is used as the estimation procedure in several of the ICES coordinated international surveys for the assessment of various stocks (e.g., the International ecosystem surveys in the Nordic Seas (IESNS), the International blue whiting spawning stock survey (IBWSS), and the International Ecosystem summer survey in the Nordic Seas (IESSNS)). This estimation procedure replaces the BEAM software which was based on acoustic values (instead of biomass) on 2 x 2 squares of 1-degree latitude and 2 degree's longitude (instead of exact location). This new method is considered to provide a more accurate estimation of abundance and biomass. A comparison between the two methods was made on the estimates for two years for all the international surveys in the updated report on NSSH and it showed minor differences in most cases (Anon. 2020). In 2021, age disaggregated indices from the three international surveys were re-estimated using the latest version of StoX (StoX 3.4), but in the current report only results for the period 2010-2020 are given.

However, recalculating the estimates using newer versions of the software (i.e., StoX 2.7 vs StoX 3.4) and post-stratification using EEZs as strata lead to changes in the estimates. All years for the different international surveys (2010 – 2020) were recalculated in 2021 by scientists at Institute of Marine Research, Bergen, using the latest StoX version (3.4) and to EEZs as strata. Table 3.1.1 summarises the differences between the original biomass estimates used in the assessment and the estimates used in this report. The difference between the older version of StoX (version 2.7) and the version 3.4 used now is very little, in most cases less than 2%. The reason for this difference is mainly due to a different procedure for calculating the area of each stratum. Version 3.4 uses an accurate procedure while the older one used a simpler approach, i.e., a more precise area is calculated now. The post-stratification increases the differences. Using the EEZ strata system violates the assumptions of the original survey design, e.g., sampling effort in the EEZ strata will not be uniform. This likely leads to oversampling or/and undersampling in parts of the EEZ strata. The differences between the original estimate and the "EEZ estimate" shown in Table 3.1.1 for IBWSS and IESSNS are most likely due to this problem. Looking at the results from the IESNS in the period 2010 – 2016 the main difference is because the area south of Iceland is included in the Icelandic EEZ but was not included in the original estimate since it is outside the defined survey area (Table 3.1.1, Figure 4.2.1-4.2.7). This area holds a substantial quantity of blue whiting in most of these years.

Catches

In the 2013 report (NEAFC 2013) the blue whiting catch data did not contain zonal information but only information on month and ICES statistical rectangle. In order to split the catches by ICES statistical rectangles into national zones (EEZ's) and international areas, a manual split had to be applied. This was originally done by using a Zonal Database (ZbyRect) that contained the surface proportions per zone and per rectangle. This database was originally developed by the 2013 NEAFC WG (see sec. 2.2 in the previous report, NEAFC 2013). However, in practice, the assignment of catches to EEZ's is unlikely to be proportional to surface area as catch locations in shared rectangles are often determined by nationality of vessel and the license used whilst fishing.

Due to the potential problem of assigning or assuming an assignment of catches to EEZ, the data call issued for the current report included a request that catch per rectangle data also contained information on catch zone (EEZ).

Since the new data call for the current report had different format compared to the 2013 report it was decided to include a temporal overlap of three years in the data series, 2010 - 2012, for quality checking. Differences in total catch between the time series range between 0 - 5% between countries (Figure 3.2.1). Some changes were seen especially for the EU27, 3% decrease, and UK zones, with 5% increase.

It should be noted that in the catch analyses presented in this report, the UK zone has been considered separately from the EU27 zone, even though the UK was a member of the EU during those years. The post-hoc separation was carried out to allow for analyses of trends in catches per zone for the new Coastal States arrangement that came into existence at the beginning of 2020. This could contribute to the observed difference in catch comparison for EU27 and UK when comparing data from the 2013 report to the current report.

Changes in the method to allocate catches to zones in the present report led to some zones containing significantly different catch proportions as compared to the old 2013 report. One such area is the Special Area between Faroes and UK (see sec. 2.5 in NEAFC 2013). The catches in the previous report from 2013 did not contain information on zonal attachment, therefore the catches were divided using the ZbyRect file (see above, NEAFC 2013). This method allocated a significant proportion of the blue whiting catches to the Special Area in the 2013 report (see Table 3.6.4 in NEAFC 2013). If the catches subsequently were to be allocated to national zones, a bias would be introduced if the catch proportions simply were split by half to each party. The reason being that the fishery in the Special Area is special insofar that most of the catches were fished on licences issued by the Faroes. It was only the formerly EU vessels and, in some instances, Norwegian vessels (which had licences from both Faroes and EU) that fished on the formerly EU licences there. The system was such that a bilateral agreement by Faroes and former EU allowed reciprocal access to the Special Area of a certain quota of blue whiting by both Parties. Therefore, a simple 50:50 rule would bias the real zonal distribution of the catches in the Special Area catches.

However, in the present report with zonal information of the catches in the Special Area, i.e., catches allocated to either Faroes or UK based on licensing authority, would effectively remove the bias problems in the Special Area as mentioned above in the old report allocation.

4. Results derived from Surveys

Twelve international and national research surveys conducted during the period 1981-2020 provide information on spatial and temporal variation in distribution and abundance of different life stages of blue whiting (Table 4.1). No singular survey covers the whole stock distribution range of all life history stages. The IBWSS is assumed to cover most of the spawning stock while IESNS and IESSNS cover large parts of the summer feeding distribution range of mature blue whiting and part of the immature stock. National surveys are limited to part of stocks overall range. Total stock biomass and proportion per zone from these three surveys are displayed in Tables 4.1.1 - 4.3.1.

Below is a short description 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.

National surveys which can potentially provide spatial information on blue whiting spatio-temporal distribution are listed in Table 4.1. However, due to limited spatial coverage of these surveys, the working group decided against quantifying distributions per zone, instead a qualitative description is provided (Annex A1).

Table 4.1. List of relevant surveys targeting blue whiting. 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 2010 (the former report includes surveys in the period 1995-2013).

Survey acronym	Survey name	Time of year	Life stage	Frequency	Area (ICES Sub-Areas and Divisions)	Year range	Survey type	Complete spatial coverage	Report Section	Comments
Surveys analysed in the report:										
IBWSS	International blue whiting spawning stock survey	March - April	Juveniles /adults	annual	4, 5, 6, 7, 12	2004-	acoustic	no	4.1	Survey results discarded in 2010. No survey in 2020 due to Covid-19 pandemic. Acoustic surveys have been carried out in March-April on the main spawning grounds west of the British Isles since the early 1980s independently by Norway and Russia. Beginning in 2004 the spawning stock survey effort was internationally coordinated and IBWSS was established.
IESNS	International Ecosystem Survey in Nordic Seas	May - June	Juveniles /adults	annual	1, 2, 4, 5, 6	1995-	acoustic	no	4.2	
IESSNS	International Ecosystem Summer Survey of the Nordic Sea	July - August	Juveniles /adults	annual	1, 2, 4, 5, 6, 12, 14	2016-	acoustic	no	4.3	The IESSNS started in 2010, however acoustic recordings of blue whiting were added to IESSNS in 2016.

Table 4.1. (cont.)

Additional surveys:									
FO-GFS-Q1	Faroese demersal spring survey	February-March	juveniles/ adults	annual	5b1	1996-	swept-area trawl survey	no	A1.1
FO-GFS-Q3	Faroese demersal autumn survey	August	juveniles/ adults	annual	5b1	1983-	swept-area trawl survey	no	A1.1
IS-GFS-Q1	Icelandic bottom trawl survey in spring (SMB)	March	juveniles/ adults	annual	Shelf areas within Icelandic EEZ (ICES 5a)	1985-	Bottom trawl	no	A1.2
IS-GFS-Q3	Icelandic bottom trawl survey in fall (SMH)	October	juveniles/ adults	annual	Shelf areas within Icelandic EEZ (ICES 5a)	1996-	Bottom trawl	no	A1.2
PT-PGFS-Q4	Portuguese groundfish bottom trawl survey	Q4 - Autumn	juveniles/ adults	annual	9a	1990-	Bottom trawl	no	A1.4
PT-Crust-BTS	Portuguese Nephrops bottom trawl survey	Q3 - Summer	juveniles/ adults	annual	9a (Portuguese southern and southwestern coast)	1997-	Bottom trawl	no	A1.4
BS-NoRu-Q1 (BTr)/Eco-NoRu-Q1(Aco)	Norwegian bottom trawl survey in the Barents Sea	Q1 - February	Juvenile/adults	annual	Barents Sea (1, 2a)	1981-	Bottom trawl/ Acoustic	no	A1.5

Table 4.1. (cont.)

NDSK	Norwegian shrimp survey in Skagerrak – Norwegian Deep	Q1 – January - February	Juvenile/adults	annual	North Sea and Skagerrak (4a, 3a)	1984-	Bottom trawl	no	A1.6	
SCO_DEEP	Scottish Deepwater Survey	Q3- September	juveniles/ adults	Biennial	Northwest of Ireland, along the shelf slope, to the north of Scotland (ICES 6a) below the shelf break (>500m)	1998 - 2021	Bottom trawl	no	A1.3	Formerly annual during 2000s. Biennial since 2013.

International Blue Whiting Spawning Stock survey (IBWSS)

The IBWSS survey was established in 2004 and is carried out annually, the exception being 2020 when no survey was carried out due to the Covid-19 pandemic. The estimate from the survey in 2010 was also discarded from the assessment due to bad coverage of the stock. The survey is run in March/April by vessels from Russia (2010 - 2015), Norway, Ireland, Faroes, and the Netherlands and is coordinated by ICES survey planning groups (PGNAPES and currently WGIPS). The survey aims to acoustically determine the distribution and abundance at age and length of the Northeast Atlantic blue whiting stock during the spawning season to the west of the British Isles. During the survey, biological sampling with a pelagic trawl, is used to verify the species and age composition of the acoustic backscatter values. Annual estimates (excluding 2010 and 2020) of abundance for ages 1 - 8 are used in the ICES assessment of the stock.

The resulting spatial biomass distributions in the period 2010 – 2020 are shown in Figures 4.1.1 - 4.1.9. Relative estimated blue whiting biomass and average proportions per EEZ are shown in Table 4.1.1. The blue whiting stock is mainly divided between EU (Irish) and UK waters in this survey and the average relative distribution by EEZ is EU 45.9%, UK 42.1, Faroes 7.1%, the Special Area zone between UK and Faroes 3.6%, and in the International west zone 1.3%. It should be pointed out, however, that these relative proportions are only valid for the area covered by the survey.

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) with the UK starting its own contribution from 2022. The survey covered a larger area in the period 2010 - 2016 than in the following years. The main difference was that the Icelandic part of the surveys included the shelf areas off west and south of Iceland until 2017. This area was not included in the original survey estimate but is taken into account in the current report. The eastern part of the Norwegian Sea is assumed to be an important nursery area for blue whiting and the samples are dominated by immature fish, especially in years when strong recruitment occurs.

The resulting spatial biomass distributions are shown in Figures 4.2.1 - 4.2.11. Percentage of estimated blue whiting biomass and average proportions per EEZ are shown in Table 4.2.1. The table shows that the average relative biomass is distributed inside the EEZ of Norway (49.7%), Faroes (19.8%) and Iceland (15.4%), and less in other EEZs.

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 vessels from Greenland and Denmark (EU27). The IESSNS survey is also coordinated by ICES survey planning groups (PGNAPES and currently WGIPS) similar to IESNS. The original main objective of the survey was to study abundance and distribution of Northeast Atlantic mackerel with swept-area methods in relation to oceanographic conditions, prey communities and marine mammals. From 2016 the main objective was expanded to also include investigations on blue whiting and NSS herring with acoustic methods thus this report contains data from the period 2016 – 2020.

The resulting spatial biomass distributions are shown in Figures 4.3.1 - 4.3.5. The percentage of estimated blue whiting biomass and average proportions per EEZ are shown in Table 4.3.1. The table outlines that the average relative biomass within the area surveyed is distributed inside the EEZ of Norway (28.5%), Faroes (28.7%), International area (Banana hole, 15.1%) and Iceland (13.1%), and less in other EEZs. This survey covers the main summer feeding area of the mature stock in the northeast Atlantic.

5. Results derived from catches

Overview of submitted data

To update the distribution maps of the catches for the period 2010 - 2020, a request was formulated on catch data by year, month and ICES statistical square (0.5° latitude, 1° longitude) and by exclusive economic zone (EEZ) and international waters to the nations fishing for blue whiting. The deadline for submission of the catch data was set to 1st April 2022. All countries 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, i.e., catches reported by year, month, zone, and ICES rectangle.

The total catch in the years 2010 - 2020 and the relative catch by zones are shown in Table 5.3.1 and Table 5.4.1. The catches reported to the Working Group were compared with the catches reported to WGWIDE and catches delivered by Coastal States for each year in 2010 - 2020 (ICES 2020). Catches reported to the Working Group as a percentage of catches reported to WGWIDE by year varies from 97.34 % to 100.70 %. Obviously, the difference can partly be explained by the fact that the catch data were raised in the WGWIDE report to account for changes in the percentages of water content of the fish. 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 subsidiary data.

Description of the Fishery

During the period from 2010 to 2020 covered in this report, 16 national fleets have been involved in the blue whiting fisheries. The bulk of the catch is caught with large pelagic trawlers, some with capacity to process or freeze on board while others pump the fish into refrigerated seawater (RSW) tanks. The fishery is mainly centred around the 1st and 2nd quarter of the year. During the first 1st quarter the catches are taken in the area west of the British Isles, on the Rockall and Hatton Banks and around the Faroe Islands. In these areas the fishing fleet is generally catching the spawning aggregations of blue whiting and the largest quantity is taken at these locations. In the following quarters, catches are taken further north in the Norwegian Sea, Icelandic waters, and the North Sea. Catches from the southern area off Spain and Portugal are usually more evenly distributed throughout the year. For details on the spatio-temporal pattern of the fishery see the annual report of ICES Working Group on Widely Distributed Stocks (ICES, 2020).

The spatial distribution of the commercial catch during a full seasonal cycle often do not necessarily reflect the annual changes in distribution of the stock. The location of the fishery can be complex and subject to numerous factors over and above where the stock is located e.g., targeting high concentrations at limited times of the year, market demand, profitability, availability of other pelagic stocks, access limitations to certain zones, etc.

Zonal patterns

Interannually, relative catches of blue whiting fluctuate by year for all zones (Figure 5.3.1, Figure 5.3.2, Table 5.3.1). The four zones that contribute the most to blue whiting catches are the Faroe Islands, EU27, UK and western international waters. More than 30% of the total catches are annually taken from Faroese waters (with the exception of 2011 with 28.1%) for the studied period (2010 - 2020), with an average proportion of 36% in the last three years. Catches from EU27 fluctuate throughout the period but have

increased from 15.5% in 2015 to 30.1% in to 2020. The proportion of catches taken in the UK EEZ in

the last three years is on average 16.7%. Catches from western international waters have also been fluctuating during the study period (range: 9.9% in 2018, 26.2% in 2011), and in the last three years around 14.2% of the catches came from this zone. On the other side, relative catches from the other EEZs have been considerably lower throughout the study period with a combined average of around 4.7% in the last three years.

Interannual and seasonal patterns

Over the period 2010 to 2020, which is primarily covered in this report, blue whiting catches varied interannually. Observed combined catches show an initial drop from 2010 to 2011 where the recorded catches are the lowest for all countries (Table 5.4.1). From this overall low in 2011 (104,000 tonnes) the combined catches show a general increase until 2018 (1.7 million tonnes), with a small dip in 2016 to 1.2 million tonnes. After the highest reported combined catches in 2018, a small decline is followed by a plateau in 2020 (Figure 5.4.1).

The changes observed in the seasonal pattern since the fishery began in the late 1970s is depicted in Figure 5.4.2 showing the percentage distribution of the fishery by month for each year since 1977 to 2020 and in Annex 3 where maps of the fishery per year and per month are shown. In the start of the period most of the catches were taken in April-May, but the “peak catch” time has gradually moved towards earlier in the year. In recent years the main fishery has been conducted in March-April. Another trend is a gradual decrease in the proportion taken in the latter half of the year; in the earlier years this proportion was much larger. However, the period 2000-2005 is an exception when a relative high proportion of the catch was taken in quarters 3 and 4.

Monthly trends

For the period 2010 to 2020, more than 50% of the annual blue whiting catches are caught during the peak of the fishery in March and April (Figure 5.4.3). During July to November catches are small but starts to pick up again in December/January.

The annual pattern has been stable during the period 2010 to 2020, with a steady build and decay of catches in the first six months of the year with peak catches between April and March, and very few relative catches in the second half of the year. Looking further back, peak catches have consistently been between March and April (Figure 5.4.4), however historically the second half of the year has been of some importance, e.g., 1975 - 1980 around 10% of catches per month June - October. Historical windows also show greater variation between years than the most recent window e.g., in April between 1995 and 2000 the percentage importance of this month varied ~ 20%. compared to being almost identical between 2015 and 2020. (Figure 5.4.2).

6. Discussion and conclusions

The ‘Terms of Reference’ required updating the "Report from the NEAFC Working Group on Collating Information on the Distribution of All Life Stages of Blue Whiting in the North-East Atlantic and the Distribution of Catches from the Stock, London, 26 - 28 November 2013" to include the period from 2013 to 2020. Updating of catch data was extended to include period 2010-2020 to provide three years of time series overlap quality checking as the data call requirements changed between the 2013 report and the current report. One survey was added to the list of international surveys, the IESSNS, which begun in 2016. For national surveys, most time series were updated, few were discontinued hence not updated, and few new ones were added.

The international surveys cover much of the stock over the spawning period and the summer feeding period. Unfortunately, as is to be expected of the surveys, they do not, and mostly probably never will, encompass the whole distributional area of a particular stage in the life history. The working group is of the opinion that each of the surveys provides a representative, overall, view of the stock distribution at the time of the survey. The principal caveat is that there will be an unknown proportion of the stock

which is elsewhere, and this must be considered when utilising the results presented in this report. The

national surveys provide a view of stock distribution for a part of the stock at particular time of year and should be viewed as such.

In this report catches in the years 2010-2020 have been compiled by years, months and EEZs. Spatial distribution maps have been made by using these data. It is clear that these maps cannot be directly used as evidence for blue whiting biomass distribution as catch data depend on a number of factors that influence fleets' behaviour such as agreements for quota allocation, access to national EEZs, market prices, availability of other pelagic stocks, etc.

The working group has compiled and systematized the available data from different surveys on the distribution of the blue whiting stock and the catch statistics from the fishery. Although much of the survey data is not designed to cover the total stock, and the catch data often are results of quota and access agreement, the working group is of the opinion that overall, the report gives a relevant general picture of the temporal and spatial (zonal) distribution of the blue whiting stock in the period 2010-2020, even though it can't be quantified in proportion of biomass per zone.

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8. Tables

Table 3.1.1. Comparison of biomass estimation using different versions of StoX, and when post-stratifying the survey into EEZ strata instead of using the scientific survey design in the original estimation procedure.

Year	Survey	StoX2.7(WGWIDE)	StoX3.4	EEZ (StoX3.4)	Difference StoX2.7-StoX3.4 (%)	Difference StoX3.4-EEZ (%)	Difference StoX2.7-EEZ (%)
2010	IBWSS	No valid survey					
2011	IBWSS	1 827	1 848	1 950	-1.1	-5.6	-6.8
2012	IBWSS	2 347	2 377	2 414	-1.3	-1.6	-2.9
2013	IBWSS	3 110	3 123	3 300	-0.4	-5.7	-6.1
2014	IBWSS	3 761	3 778	4 166	-0.5	-10.3	-10.8
2015	IBWSS	1 405	1 412	1 666	-0.5	-18.1	-18.6
2016	IBWSS	2 873	2 868	3 077	0.2	-7.3	-7.1
2017	IBWSS	3 135	3 155	3 143	-0.6	0.4	-0.3
2018	IBWSS	4 035	4 068	4 285	-0.8	-5.4	-6.2
2019	IBWSS	4 198	4 233	4 636	-0.8	-9.5	-10.4
2020	IBWSS	No survey					
2010	IESNS	129	129	120	0.1	6.6	6.7
2011	IESNS	296	298	431	-0.7	-44.7	-45.8
2012	IESNS	987	1 019	967	-3.3	5.1	2.0
2013	IESNS	1 001	1 017	1 161	-1.5	-14.2	-15.9
2014	IESNS	765	754	837	1.4	-11.1	-9.5
2015	IESNS	958	940	1 206	1.8	-28.3	-26.0
2016	IESNS	1 548	1 575	1 523	-1.8	3.3	1.6
2017	IESNS	928	937	916	-1.0	2.2	1.3
2018	IESNS	501	491	496	1.9	-0.9	1.0
2019	IESNS	535	547	497	-2.3	9.1	7.0
2020	IESNS	390	389	369	0.2	5.1	5.3
2016	IESSNS	2 283	2 306	2 473	-1.0	-7.2	-8.3
2017	IESSNS	2 704	2 702	2 995	0.1	-10.8	-10.8
2018	IESSNS	2 039	2 040	2 077	-0.1	-1.8	-1.9
2019	IESSNS	2 028	2 028	1 950	0.0	3.8	3.8
2020	IESSNS	1 806	1 799	1 791	0.4	0.4	0.8

Table 4.1.1. Total blue whiting stock biomass and biomass proportion (%) by EEZ during the International blue whiting Spawning Stock survey (IBWSS) west of the British Isles in Mach/April. No valid survey in 2010 and no survey conducted in 2020.

Year	Faroes	UK	UK/Faroes	EU/Ireland	International West	TSB (1000 t)
2010	No Valid Survey					
2011	4.3	68.6	13.9	13.3	0.0	1 950
2012	6.0	57.3	7.6	29.1	0.1	2 414
2013	8.9	47.1	2.7	40.5	0.8	3 300
2014	6.7	21.2	1.8	68.0	2.3	4 166
2015	15.8	33.0	2.1	46.6	2.4	1 666
2016	10.6	37.3	2.4	45.0	4.7	3 077
2017	4.5	42.2	0.9	52.2	0.3	3 143
2018	4.6	35.9	0.7	58.4	0.4	4 285
2019	3.0	36.3	0.4	60.0	0.4	4 636
2020	No Survey					
Average	**7.1**	**42.1**	**3.6**	**45.9**	**1.3**	

Table 4.2.1. Total blue whiting stock biomass and biomass proportion (%)by EEZ during the International ecosystem survey in the Nordic Seas (IESNS) in May/June.

Year	Faroes	Iceland	International	NorwSea	Jan Mayen	Norway	Svalbard	UK	TSB (1000 t)
2010	60.6	8.3		1.5	0.6	21.8	0.8	6.4	120
2011	25.0	33.3		4.5	0.0	29.6	1.1	6.4	431
2012	11.1	22.2		8.7	0.3	51.1	1.6	5.0	967
2013	10.7	24.8		10.3	0.3	52.4	0.8	0.7	1 161
2014	24.1	24.2		6.8	0.3	37.2	0.3	7.0	837
2015	13.0	24.0		8.7	1.0	47.3	0.5	5.5	1 206
2016	17.8	10.5		8.9	1.0	52.4	1.4	8.0	1 523
2017	21.6	8.6		9.2	1.5	53.6	0.9	4.6	916
2018	19.0	2.0		10.8	2.5	57.9	0.0	7.8	496
2019	10.3	8.0		7.6	0.0	65.2	0.7	8.1	497
2020	4.4	3.4		3.6	0.1	78.3	0.3	9.9	369
Average	**19.8**	**15.4**		**7.3**	**0.7**	**49.7**	**0.8**	**6.3**	

Table 4.3.1. Total blue whiting stock biomass and biomass proportion (%) by EEZ during the International ecosystem summer survey in the Nordic Seas (IESSNS) in July/August.

Year	Faroes	Greenland	Iceland	International NorwSea	International West	Jan Mayen	Norway	Svalbard	UK	UK /Faroes	TSB (1000 t)
2016	27.7	0.0	17.6	12.4	0.0	2.6	32.9	2.1	4.5	0.0	2 473
2017	40.0	0.7	11.4	14.8	0.1	4.4	22.2	3.0	3.5	0.0	2 995
2018	33.7	0.0	16.3	13.6	0.3	4.7	24.3	3.5	2.9	0.7	2 077
2019	19.2	0.0	14.2	18.6	1.0	4.6	33.0	1.4	6.5	1.5	1 950
2020	23.1	0.0	6.2	16.0	0.0	4.0	30.2	2.1	17.1	1.3	1 791
Average	**28.7**	**0.1**	**13.1**	**15.1**	**0.3**	**4.1**	**28.5**	**2.4**	**6.9**	**0.7**	

Table 5.3.1 Proportion (%) of catches of blue whiting by Exclusive Economic Zone (EEZ) from 2010 – 2020. Catch proportions of 0 were present for certain zones (NOR_EU27, RUS) across the full time series and were thus removed from the table.

Year	EU27	FRO	UK	GBR_FRO	GRL	INN	INW	ISL	NOR	SJM	SVA
2010	22.8	33.6	21.0	0.1	0.0	2.8	15.2	1.1	3.2	0.1	0.1
2011	13.3	28.0	8.1	0.1	0.0	12.2	26.2	4.1	7.8	0.0	0.0
2012	26.9	39.2	15.4	0.0	0.1	4.3	11.2	1.4	1.4	0.1	0.0
2013	30.3	39.4	9.4	0.0	0.0	3.0	14.9	1.0	1.5	0.2	0.1
2014	20.0	37.9	18.1	0.0	0.0	1.1	20.0	1.0	1.8	0.1	0.1
2015	15.5	38.4	11.6	4.2	0.0	3.7	20.6	1.4	4.7	0.0	0.0
2016	22.0	44.5	16.6	0.0	0.0	1.0	13.0	0.4	2.6	0.0	0.0
2017	25.8	39.3	16.8	0.0	0.0	1.4	13.0	1.4	2.0	0.0	0.0
2018	25.7	37.1	20.7	0.2	0.0	2.9	9.9	2.1	1.3	0.0	0.0
2019	28.2	34.5	14.6	0.2	0.0	1.6	19.2	0.4	1.4	0.0	0.0
2020	30.1	37.1	14.8	0.0	0.0	1.6	13.7	0.8	1.8	0.0	0.0
Average	**23.7**	**37.2**	**15.2**	**0.4**	**0.0**	**3.2**	**16.1**	**1.4**	**2.7**	**0.0**	**0.0**

Table 5.4.1. Summed catch of blue whiting by Coastal States and year. All information available by month.

Year	DEU	DNK	ESP	FRA	IRL	LTU	NLD	POL	PRT	SWE	FRO	UK	GRL	ISL	NOR	RUS	Total
2010	9 059	169	13 577	8 763	8 299	0	33 993	0	1 482	0	49 978	7 971	2 492	87 910	194 317	127 963	545 980
2011	266	164	2 406	4 880	1 192	0	4 573	0	603	0	16 404	1 440	88	5 881	20 539	45 798	104 243
2012	6 238	340	6 571	5 860	7 521	0	26 118	0	1 955	59	43 290	9 944	2 320	63 056	118 176	88 301	379 752
2013	11 418	2 170	14 593	16 636	13 205	0	50 285	0	2 055	201	85 767	13 498	2 135	104 917	196 245	120 812	633 944
2014	24 487	35 334	24 471	22 889	21 467	4 717	38 459	0	1 303	0	224 699	27 833	6 891	182 884	399 520	152 278	1 167 238
2015	24 106	46 208	23 880	19 320	24 762	0	56 241	0	1 430	58	282 501	34 345	5 620	214 870	489 439	185 758	1 408 544
2016	20 024	39 774	22 557	18 062	26 527	1 075	57 965	0	1 550	124	282 366	39 715	12 619	186 912	310 412	173 655	1 193 346
2017	45 522	63 611	26 022	18 409	43 222	5 299	81 093	15 889	1 625	124	356 501	72 466	20 212	228 927	399 363	188 449	1 566 740
2018	46 526	88 331	21 796	24 435	49 812	0	121 860	12 152	1 497	33	349 837	74 675	23 452	292 952	438 427	170 891	1 716 683
2019	37 711	69 352	21 603	21 548	38 561	0	67 355	27 184	2 659	44	336 568	62 177	20 042	268 351	350 974	188 006	1 512 142
2020	41 467	61 175	22 693	17 445	39 173	11 462	62 283	47 614	2 026	79	343 371	58 681	19 612	243 724	354 032	181 500	1 506 345

9. Figures

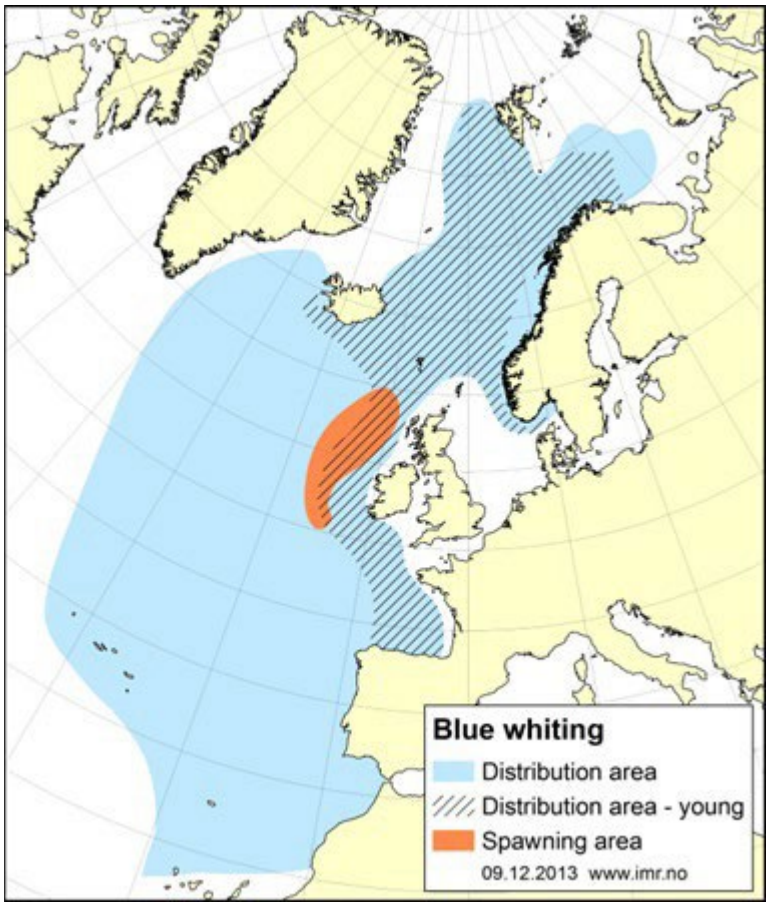

Figure 2.1.1. Distribution of blue whiting in the Northern Atlantic. (Source: www.imr.no)

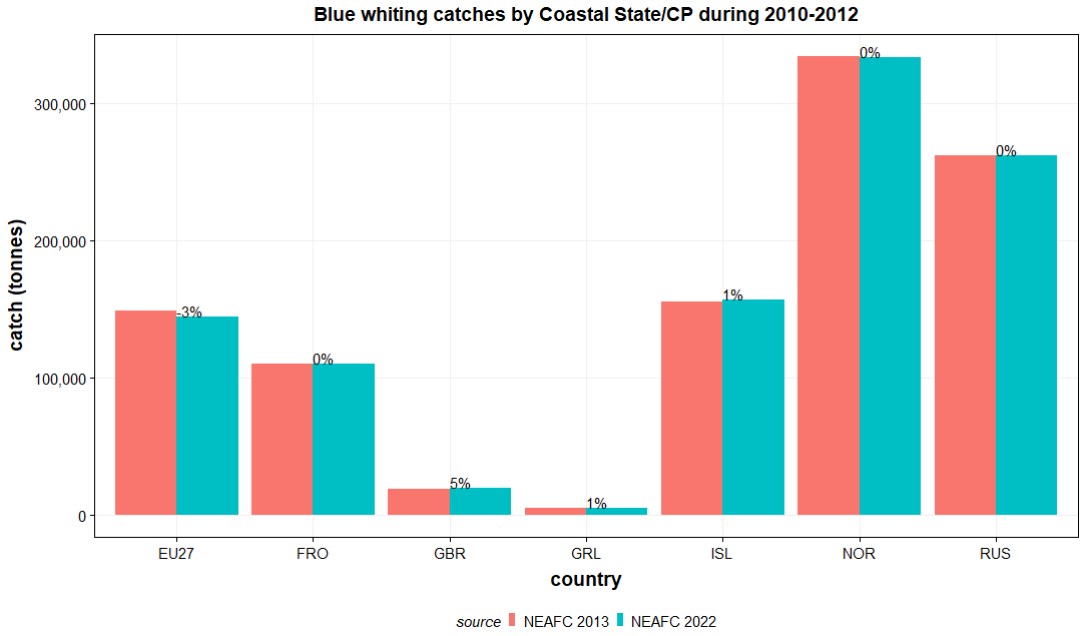

Figure 3.2.1. Comparison of the total reported catches for three overlapping years (2010-2012) between the 2022 and 2013 blue whiting data calls. The percentage refers to the relative difference from the 2022 data call compared to the 2013 data call.

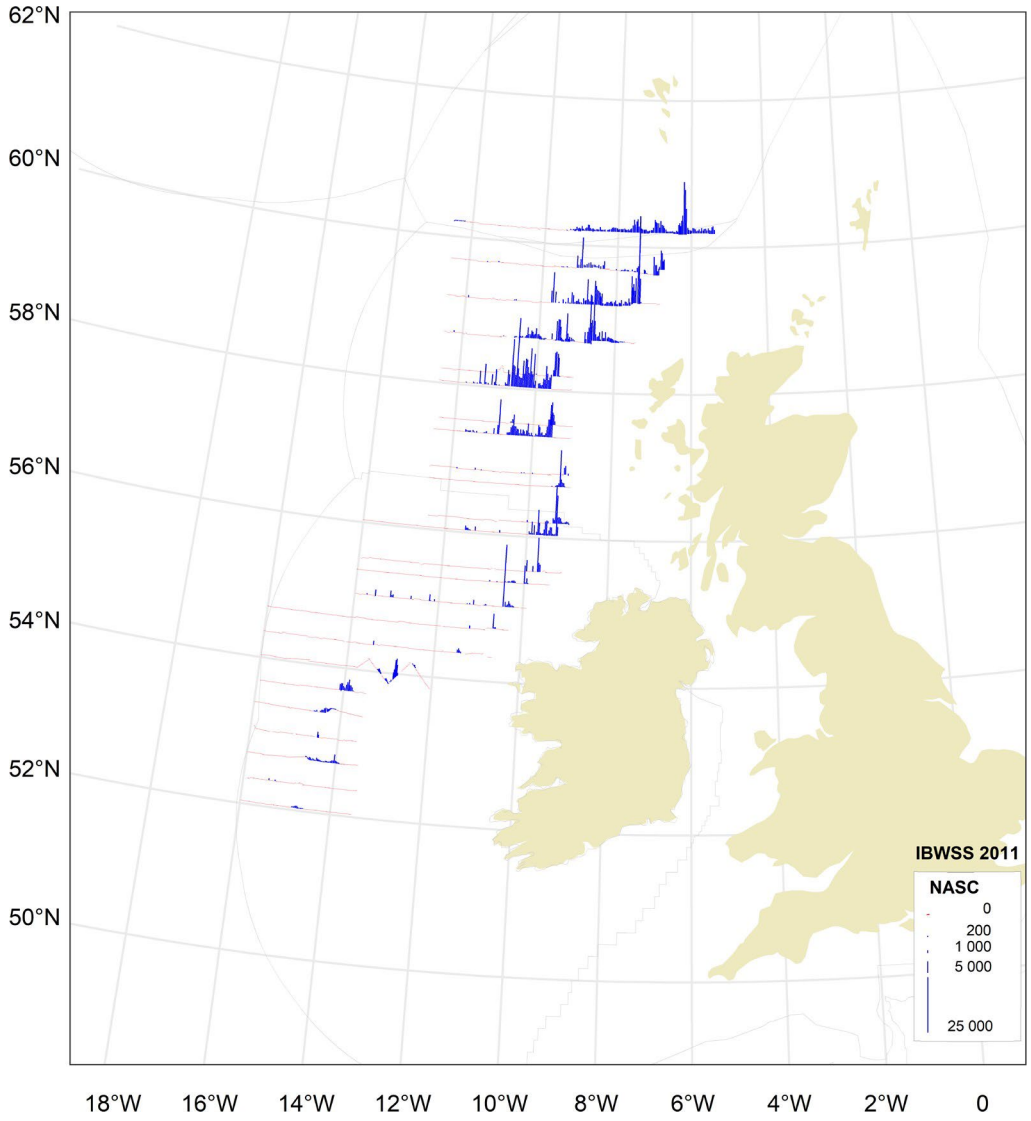

Figure 4.1.1. Distribution of blue witing on the spawning grounds west of the British Isles from the International spawning stock survey (IBWSS) in March/April 2011.

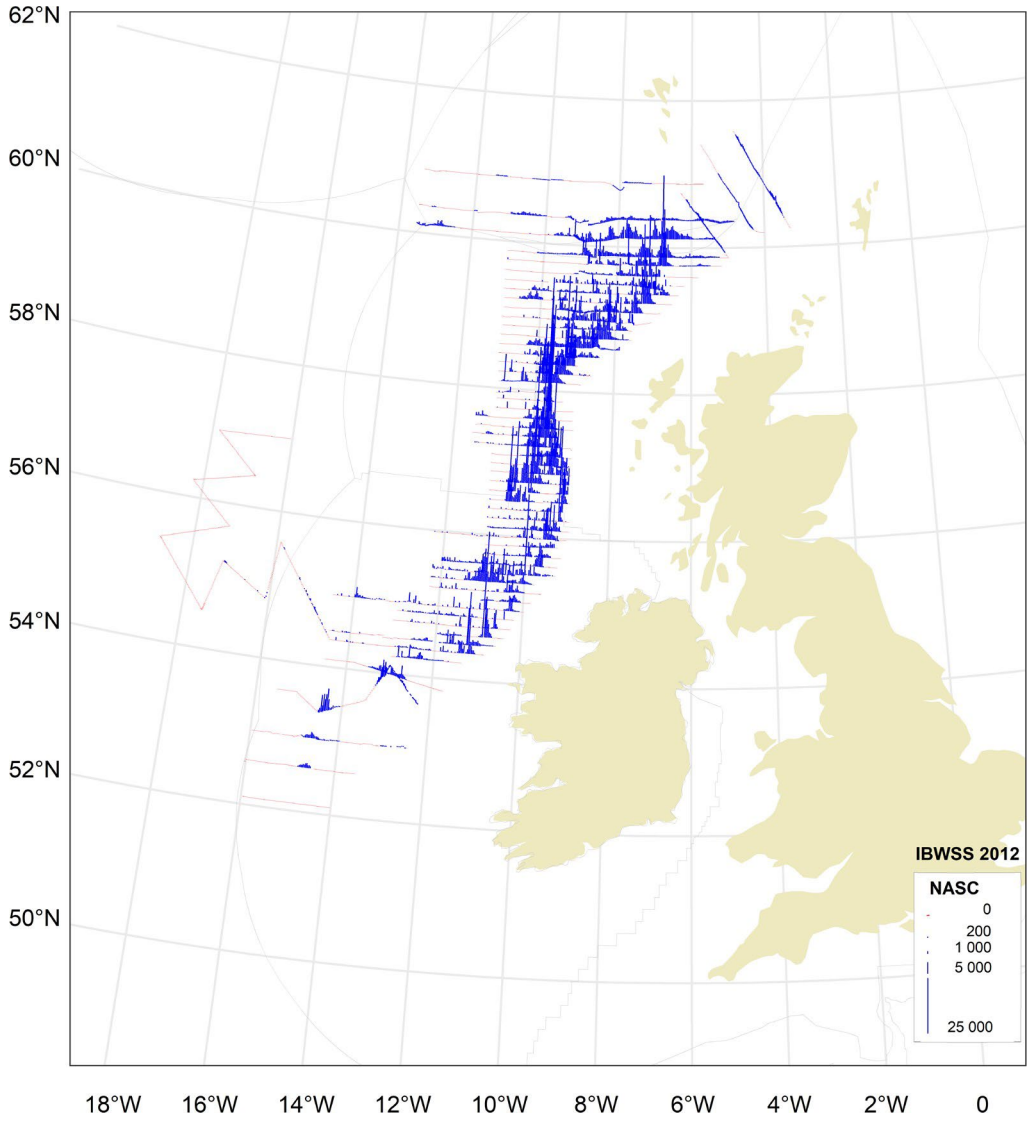

Figure 4.1.2. Distribution of blue witing on the spawning grounds west of the British Isles from the International spawning stock survey (IBWSS) in March/April 2012.

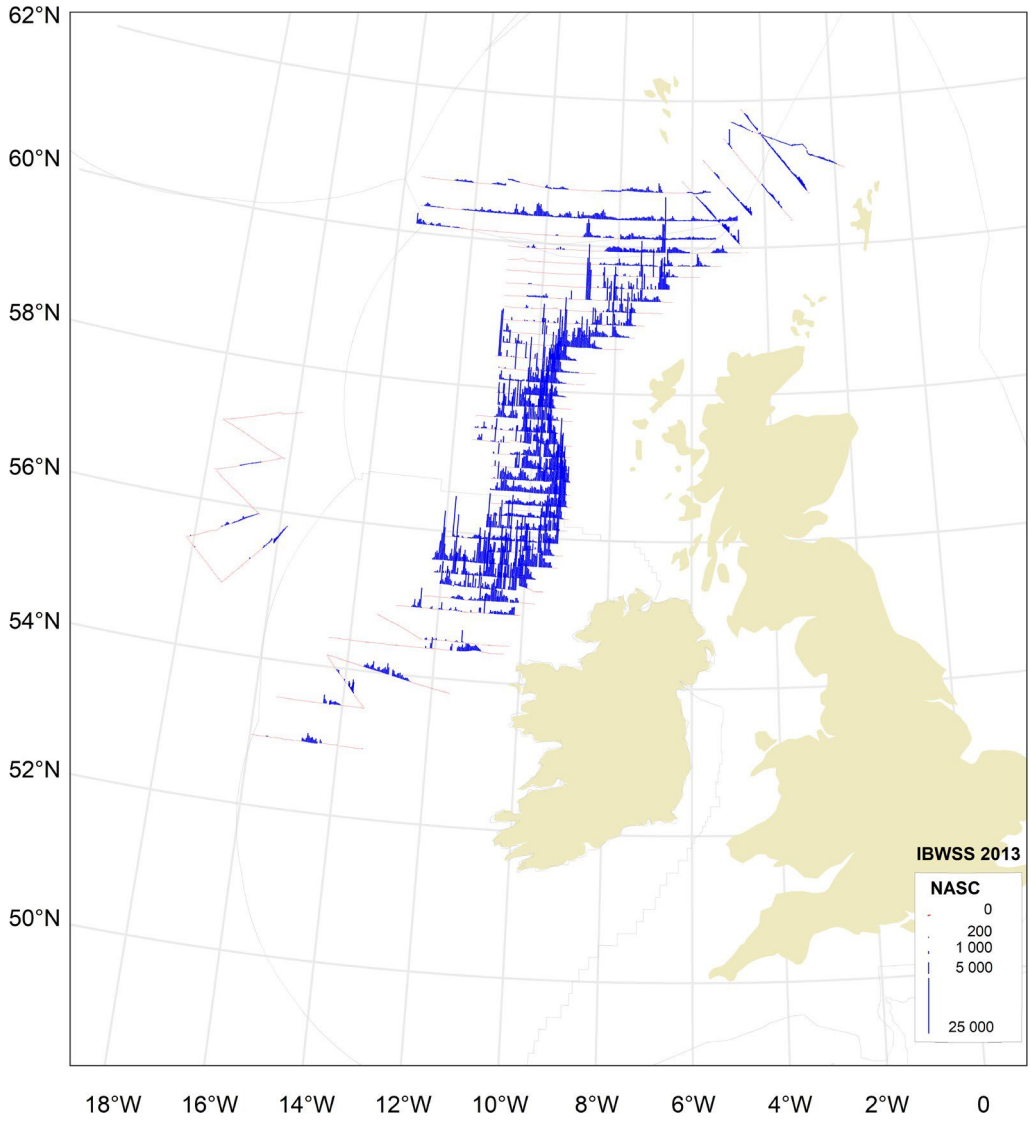

Figure 4.1.3. Distribution of blue witing on the spawning grounds west of the British Isles from the International spawning stock survey (IBWSS) in March/April 2013.

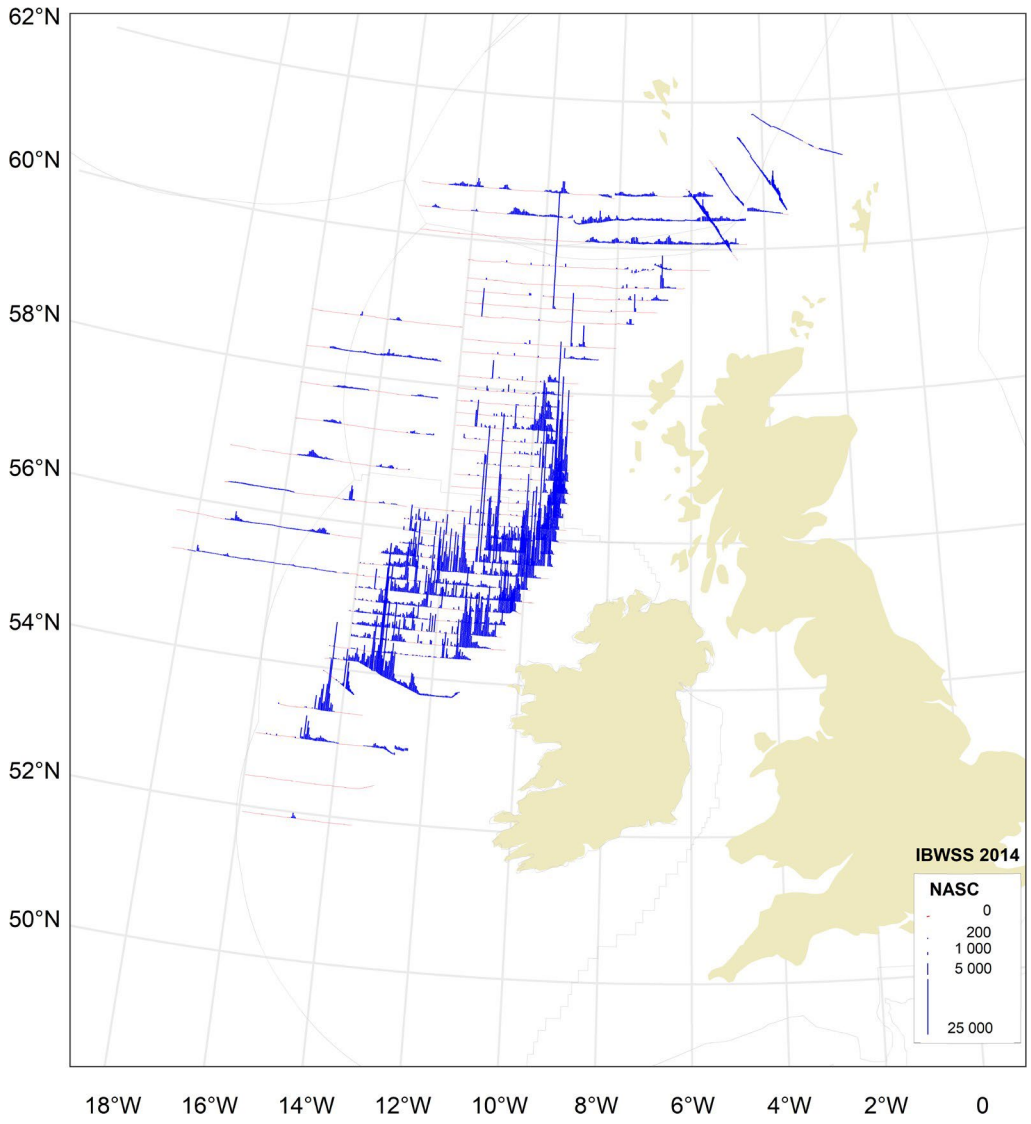

Figure 4.1.4. Distribution of blue witing on the spawning grounds west of the British Isles from the International spawning stock survey (IBWSS) in March/April 2014.

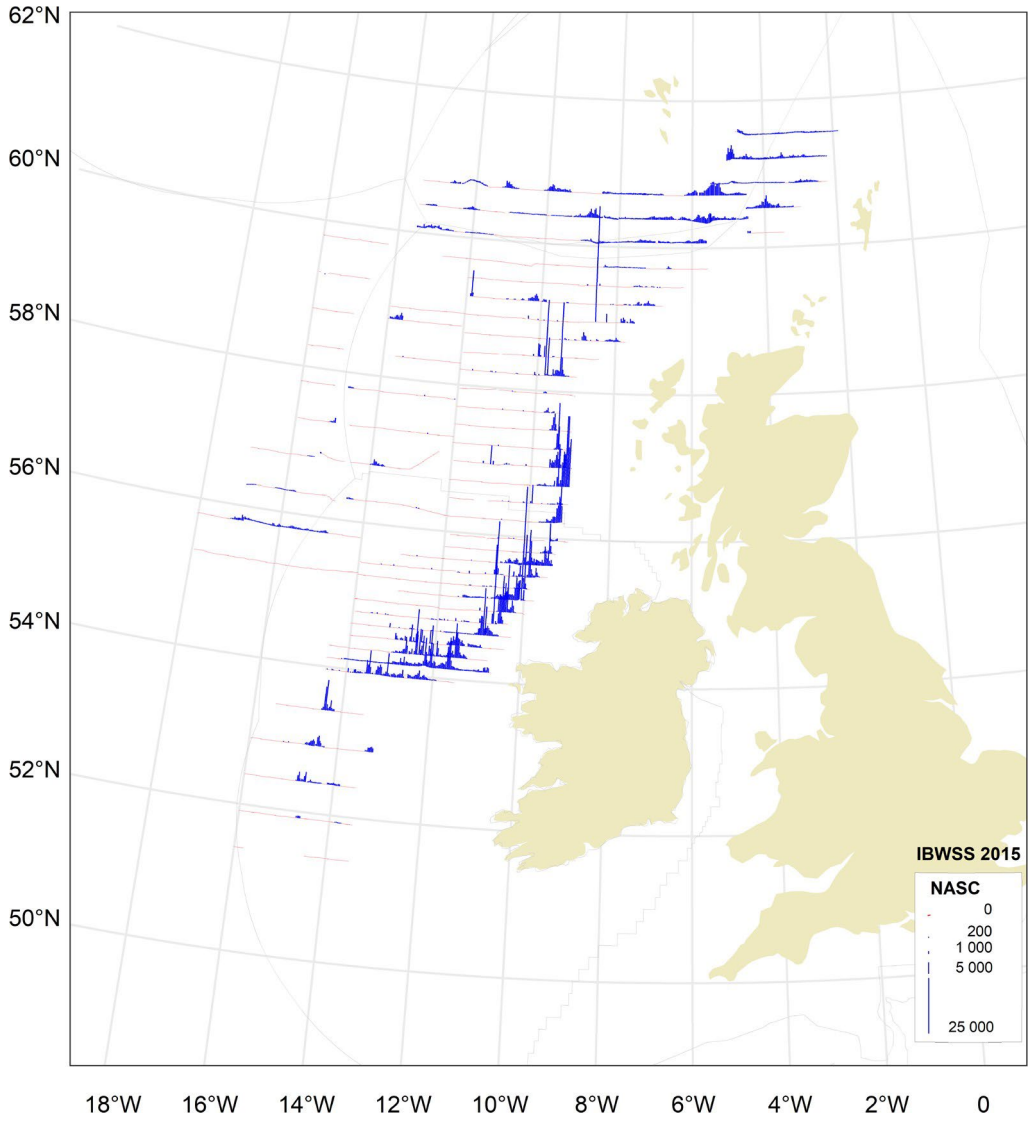

Figure 4.1.5. Distribution of blue witing on the spawning grounds west of the British Isles from the International spawning stock survey (IBWSS) in March/April 2015.

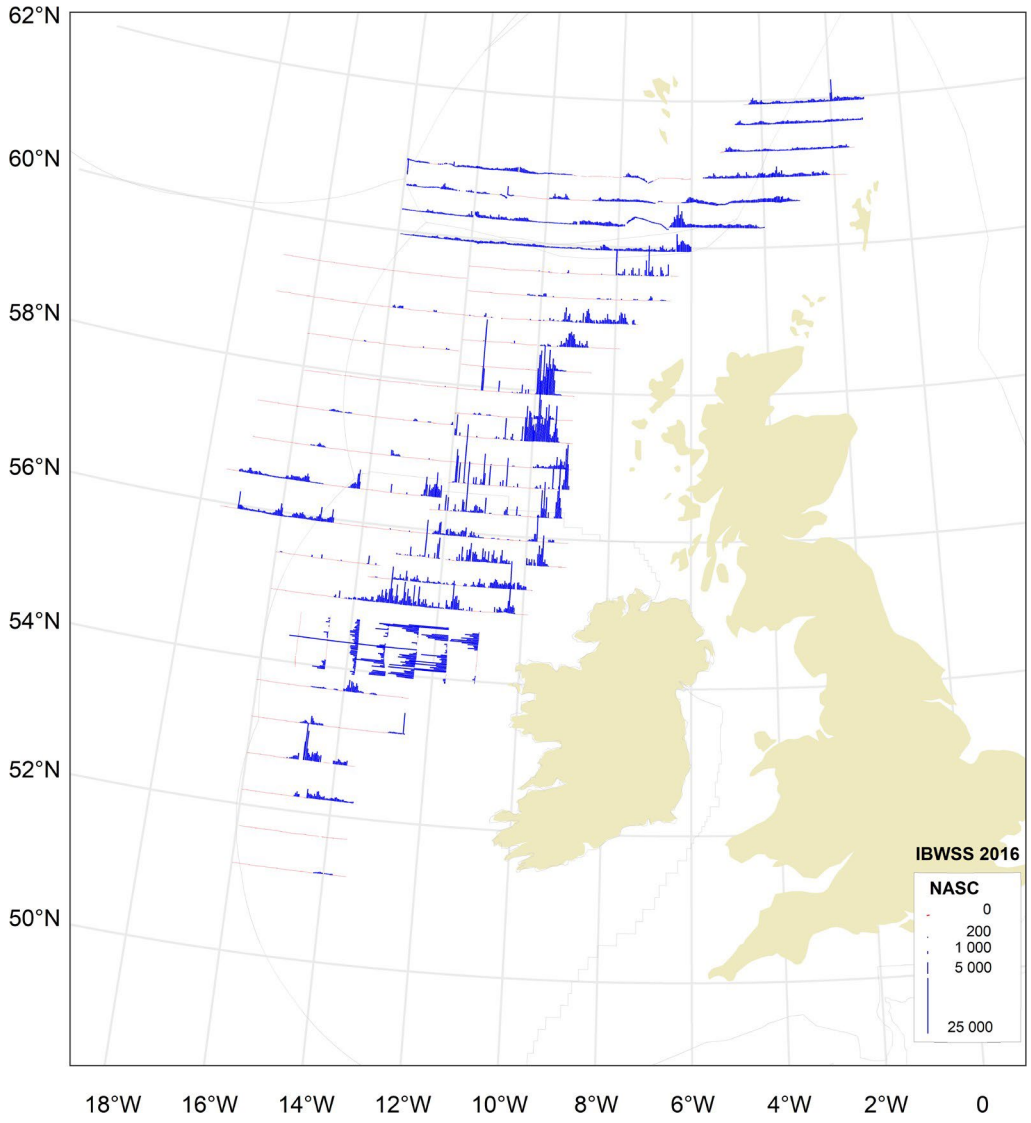

Figure 4.1.6. Distribution of blue witing on the spawning grounds west of the British Isles from the International spawning stock survey (IBWSS) in March/April 2016.

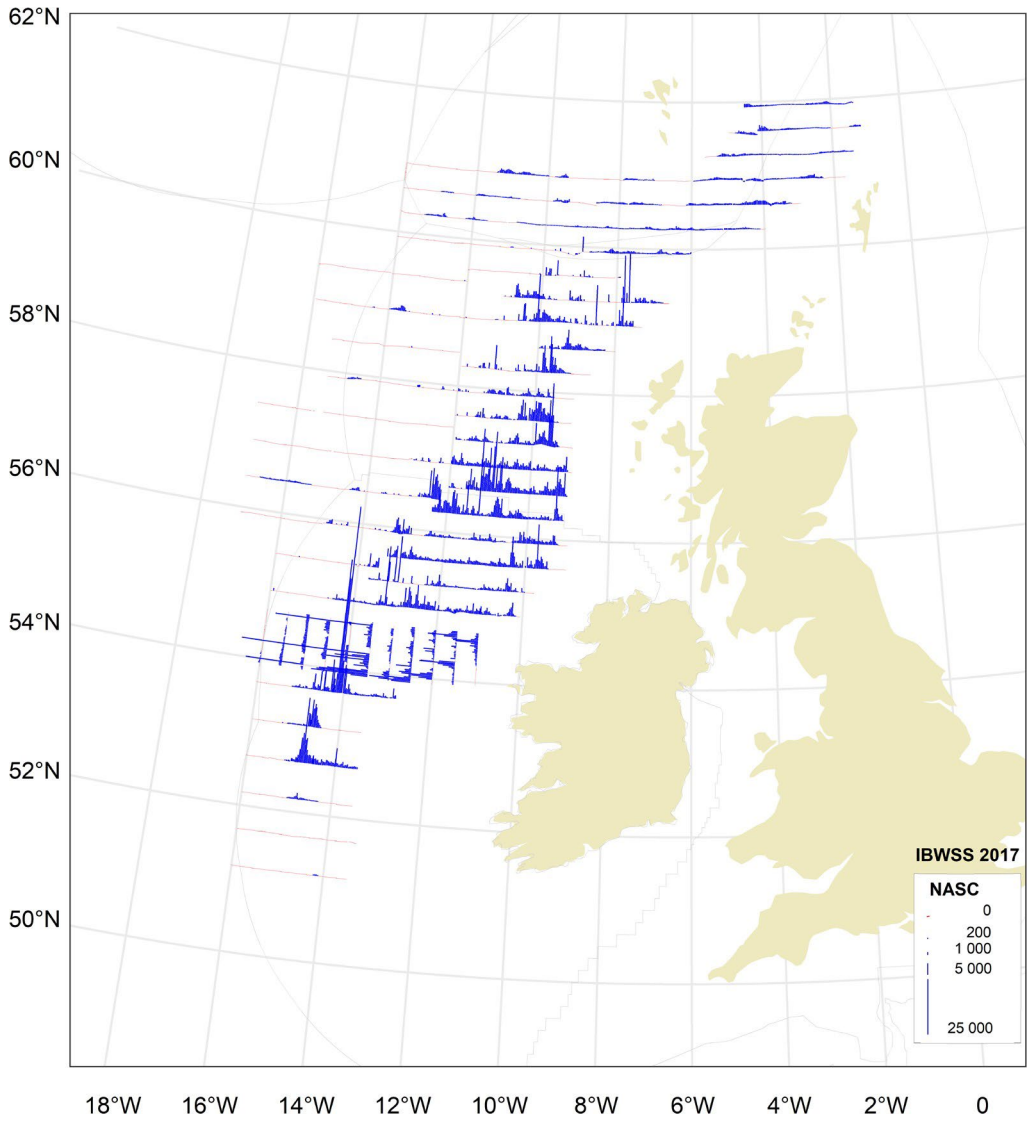

Figure 4.1.7. Distribution of blue witing on the spawning grounds west of the British Isles from the International spawning stock survey (IBWSS) in March/April 2017.

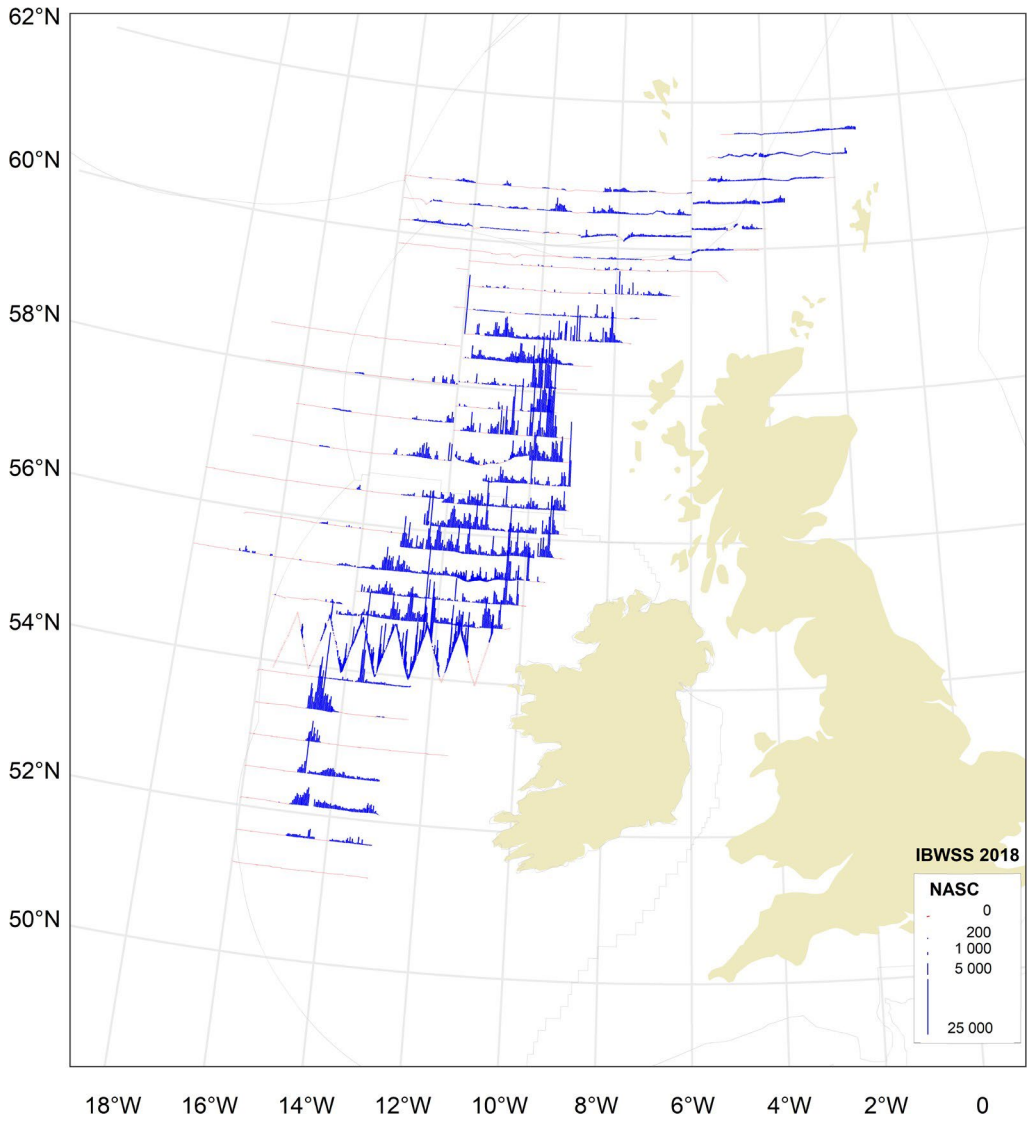

Figure 4.1.8. Distribution of blue witing on the spawning grounds west of the British Isles from the International spawning stock survey (IBWSS) in March/April 2018.

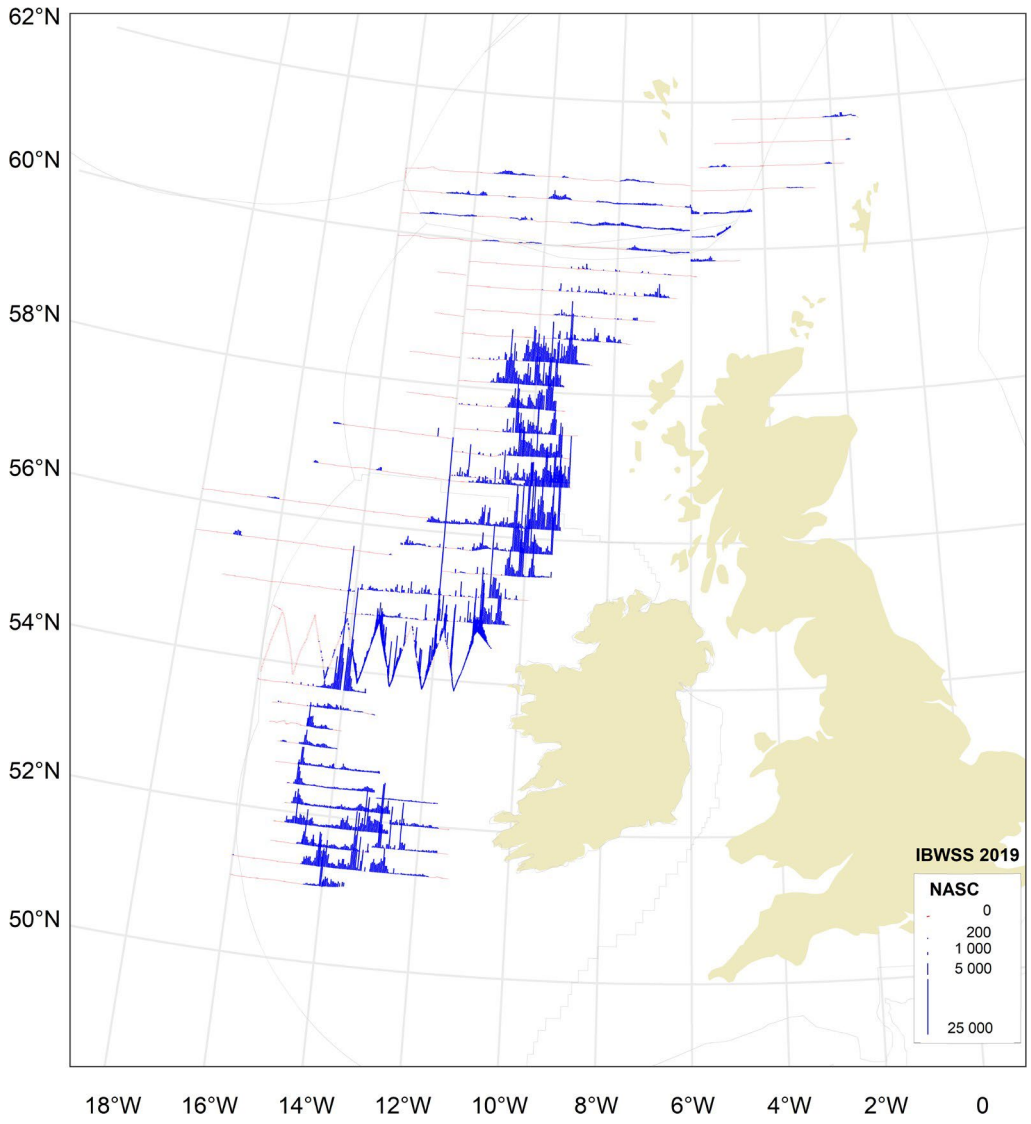

Figure 4.1.9. Distribution of blue witing on the spawning grounds west of the British Isles from the International spawning stock survey (IBWSS) in March/April 2019.

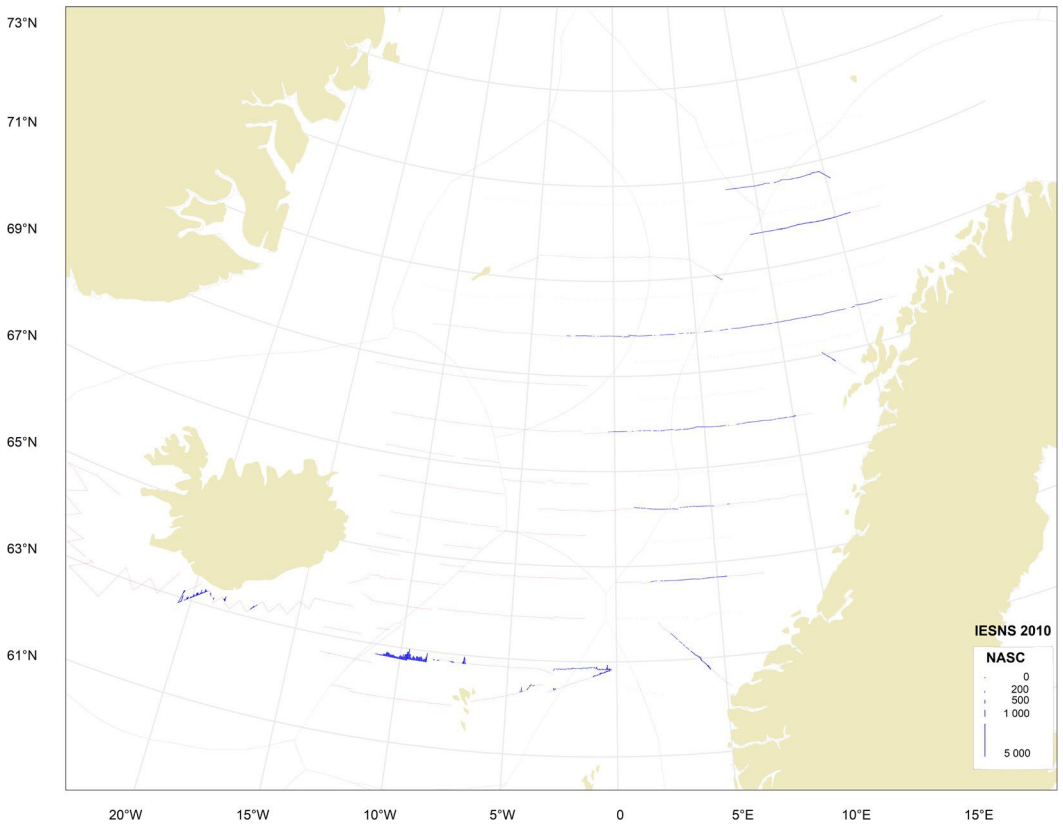

Figure 4.2.1. Distribution of blue witing in the Nordic Seas from the International ecosystem survey in the Nordic Seas (IESNS) in May/June 2010.

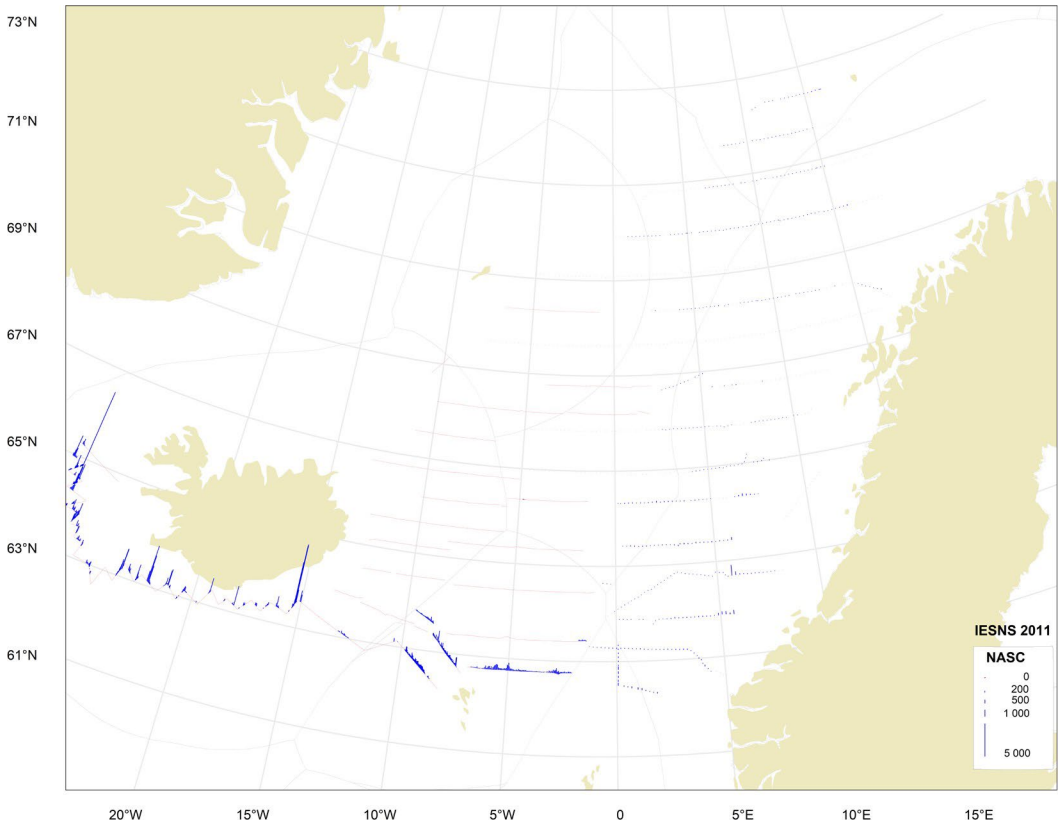

Figure 4.2.2. Distribution of blue witing in the Nordic Seas from the International ecosystem survey in the Nordic Seas (IESNS) in May/June 2011.

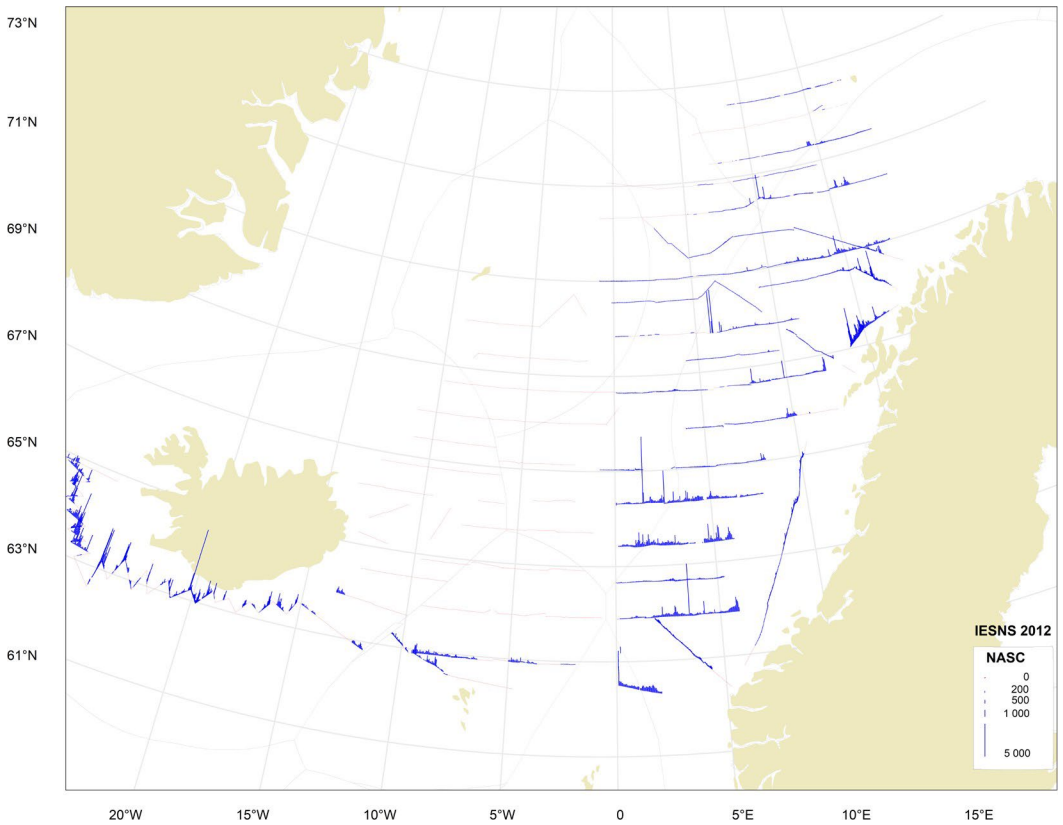

Figure 4.2.3. Distribution of blue whiting in the Nordic Seas from the International ecosystem survey in the Nordic Seas (IESNS) in May/June 2012.

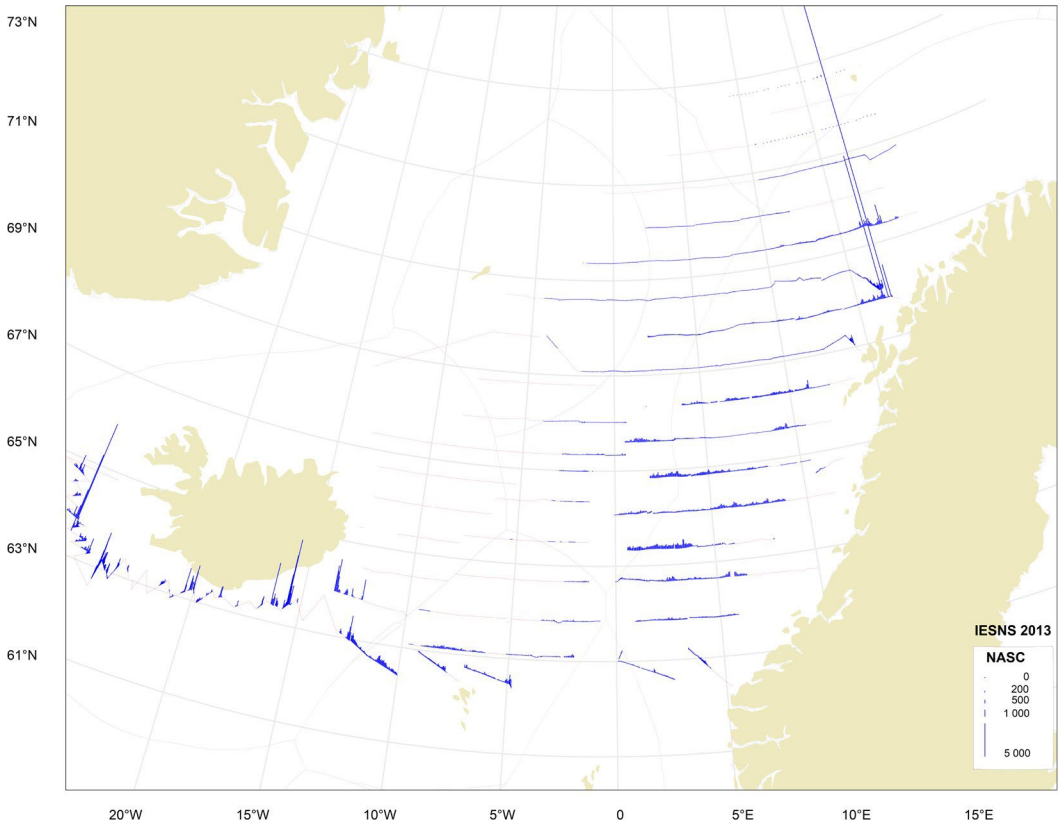

Figure 4.2.4. Distribution of blue whiting in the Nordic Seas from the International ecosystem survey in the Nordic Seas (IESNS) in May/June 2013.

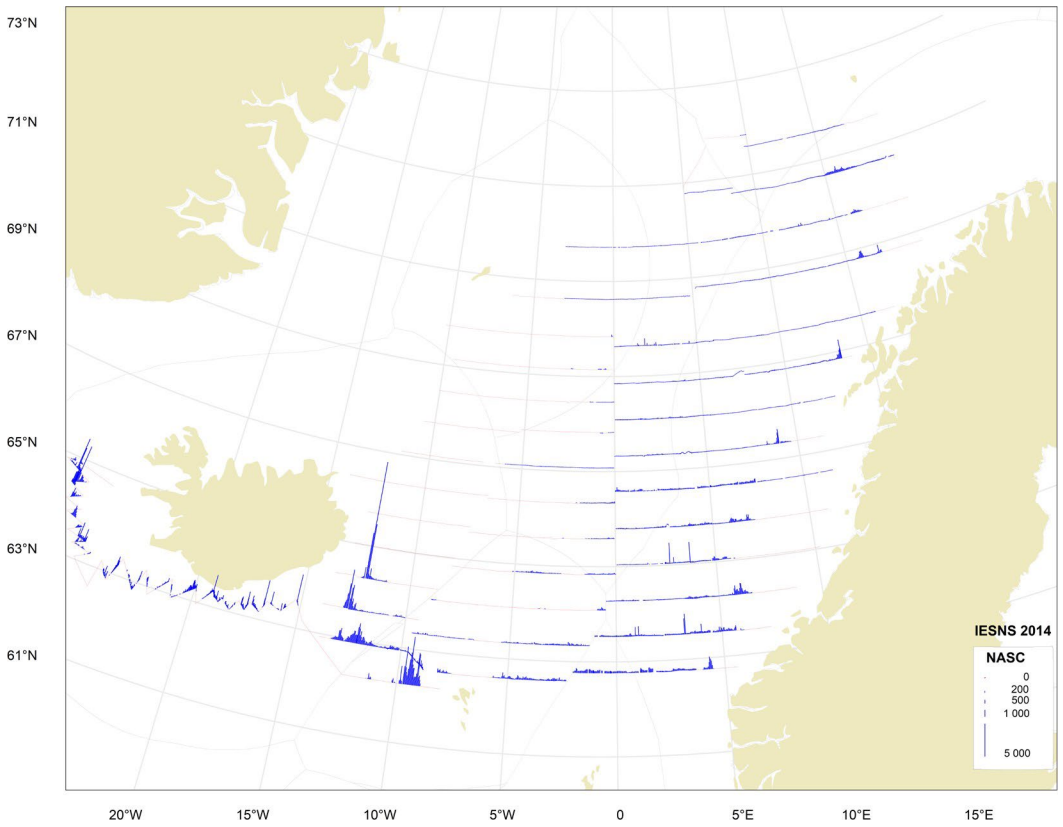

Figure 4.2.5. Distribution of blue whiting in the Nordic Seas from the International ecosystem survey in the Nordic Seas (IESNS) in May/June 2014.

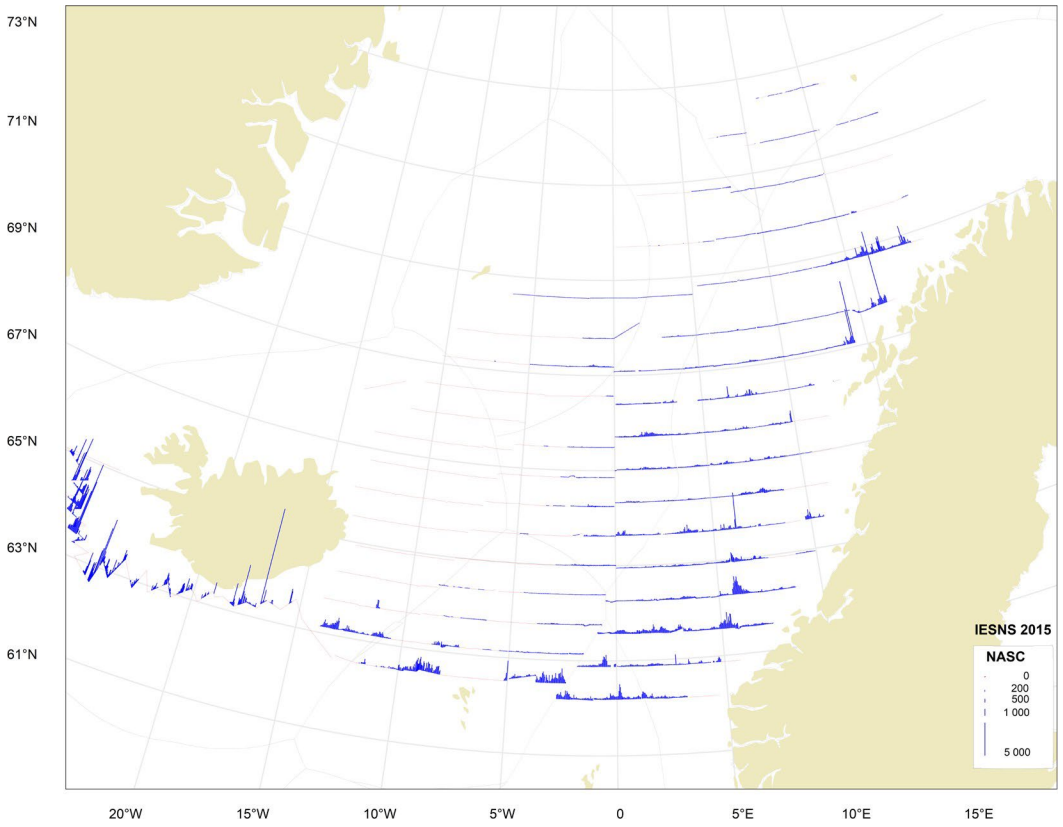

Figure 4.2.6. Distribution of blue whiting in the Nordic Seas from the International ecosystem survey in the Nordic Seas (IESNS) in May/June 2015.

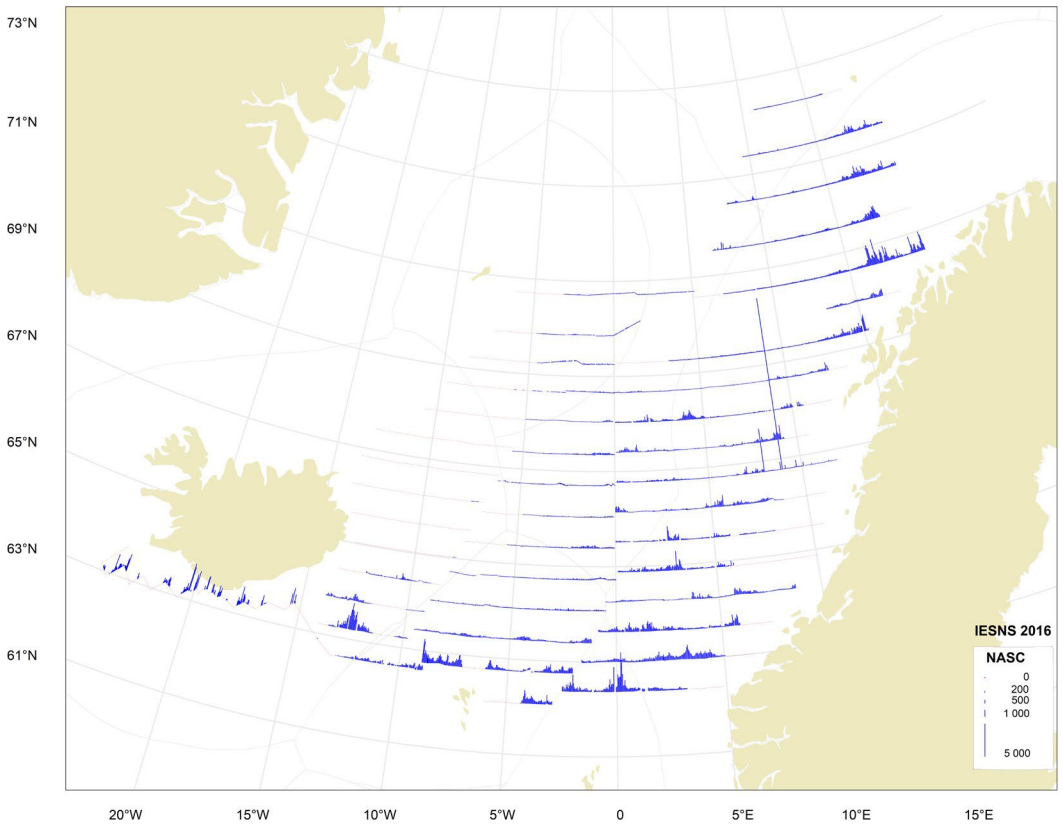

Figure 4.2.7. Distribution of blue whiting in the Nordic Seas from the International ecosystem survey in the Nordic Seas (IESNS) in May/June 2016.

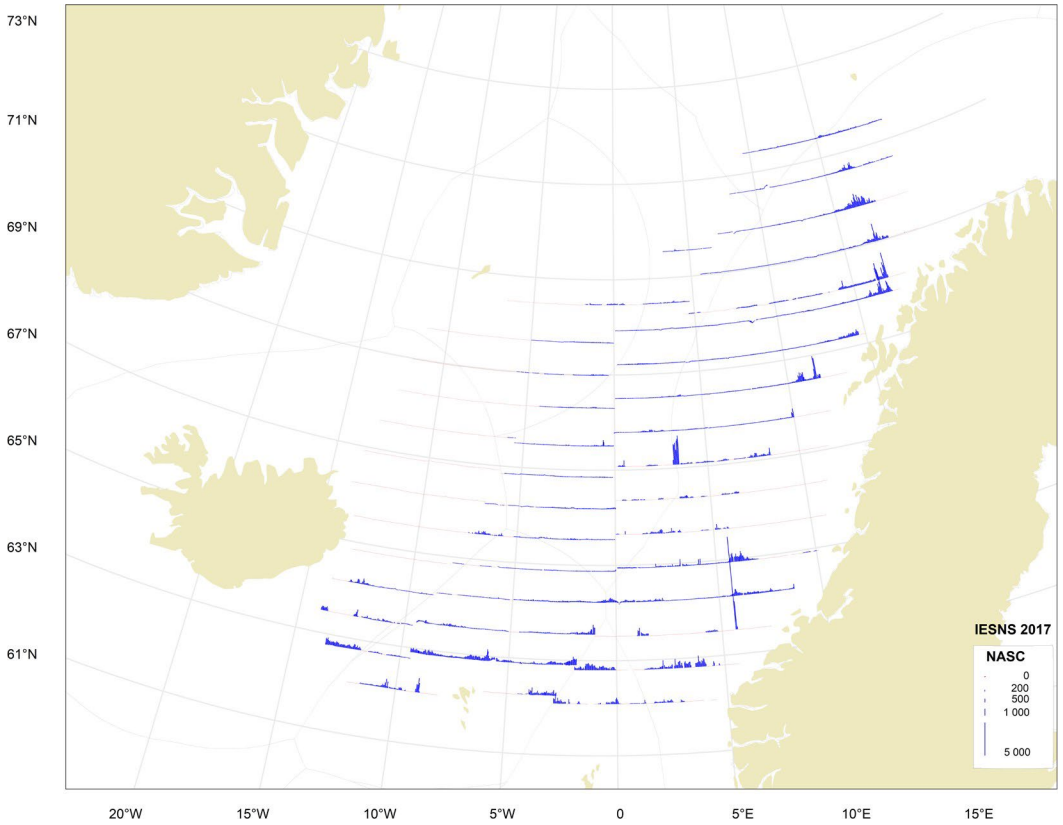

Figure 4.2.8. Distribution of blue witing in the Nordic Seas from the International ecosystem survey in the Nordic Seas (IESNS) in May/June 2017.

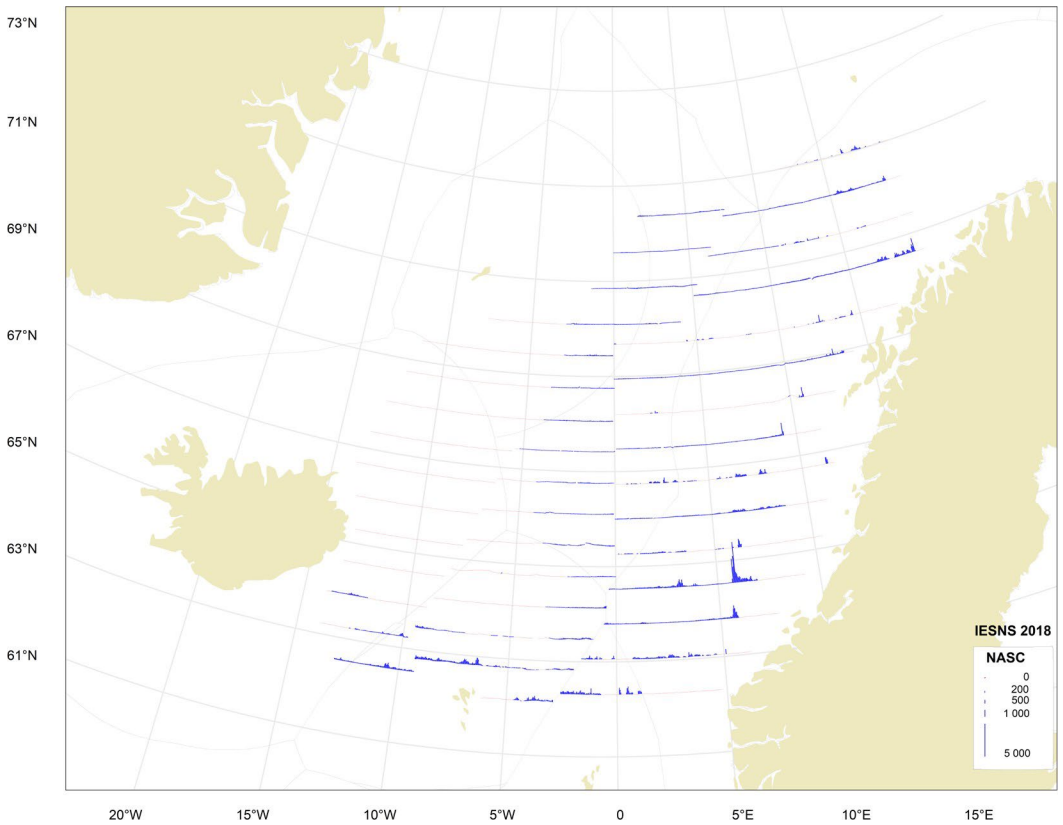

Figure 4.2.9. Distribution of blue witing in the Nordic Seas from the International ecosystem survey in the Nordic Seas (IESNS) in May/June 2018.

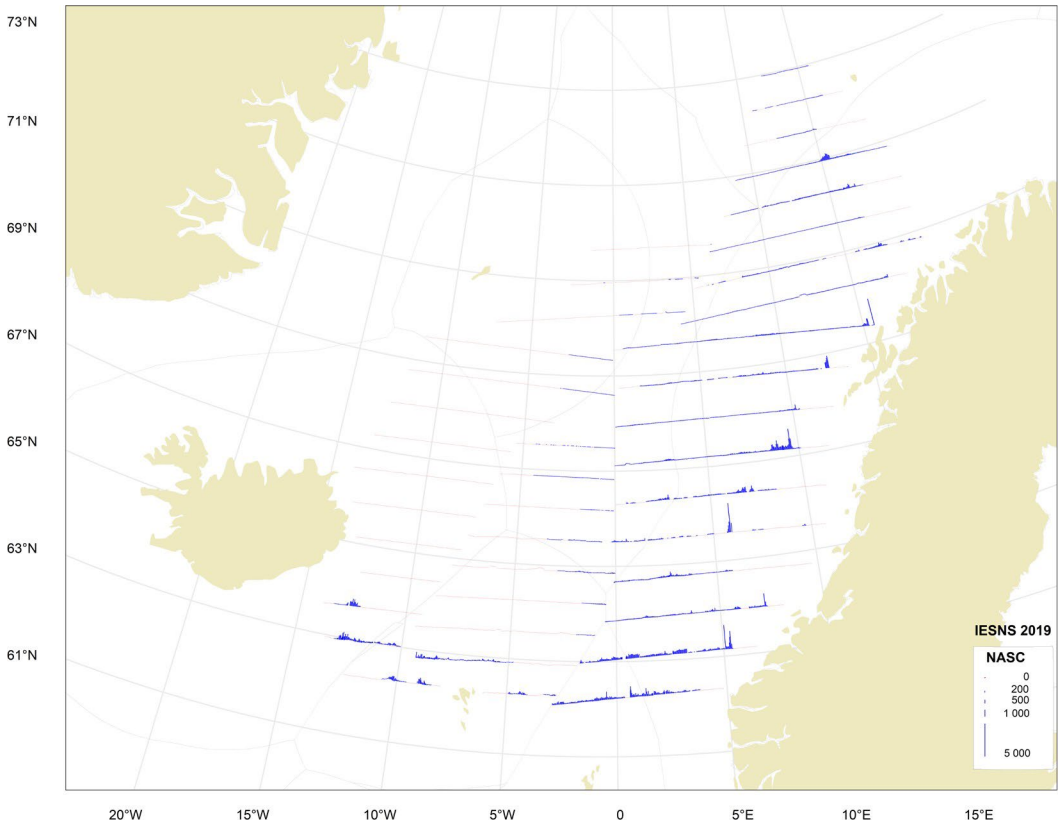

Figure 4.2.10. Distribution of blue witing in the Nordic Seas from the International ecosystem survey in the Nordic Seas (IESNS) in May/June 2019.

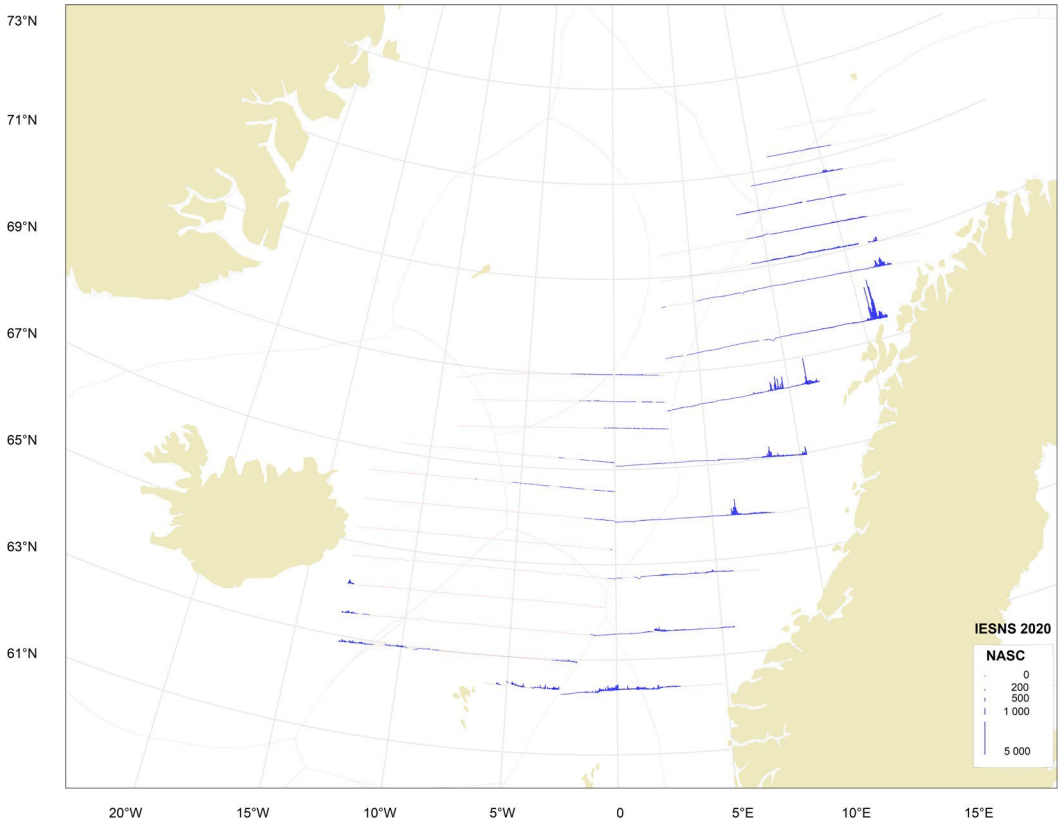

Figure 4.2.11. Distribution of blue witing in the Nordic Seas from the International ecosystem survey in the Nordic Seas (IESNS) in May/June 2020.

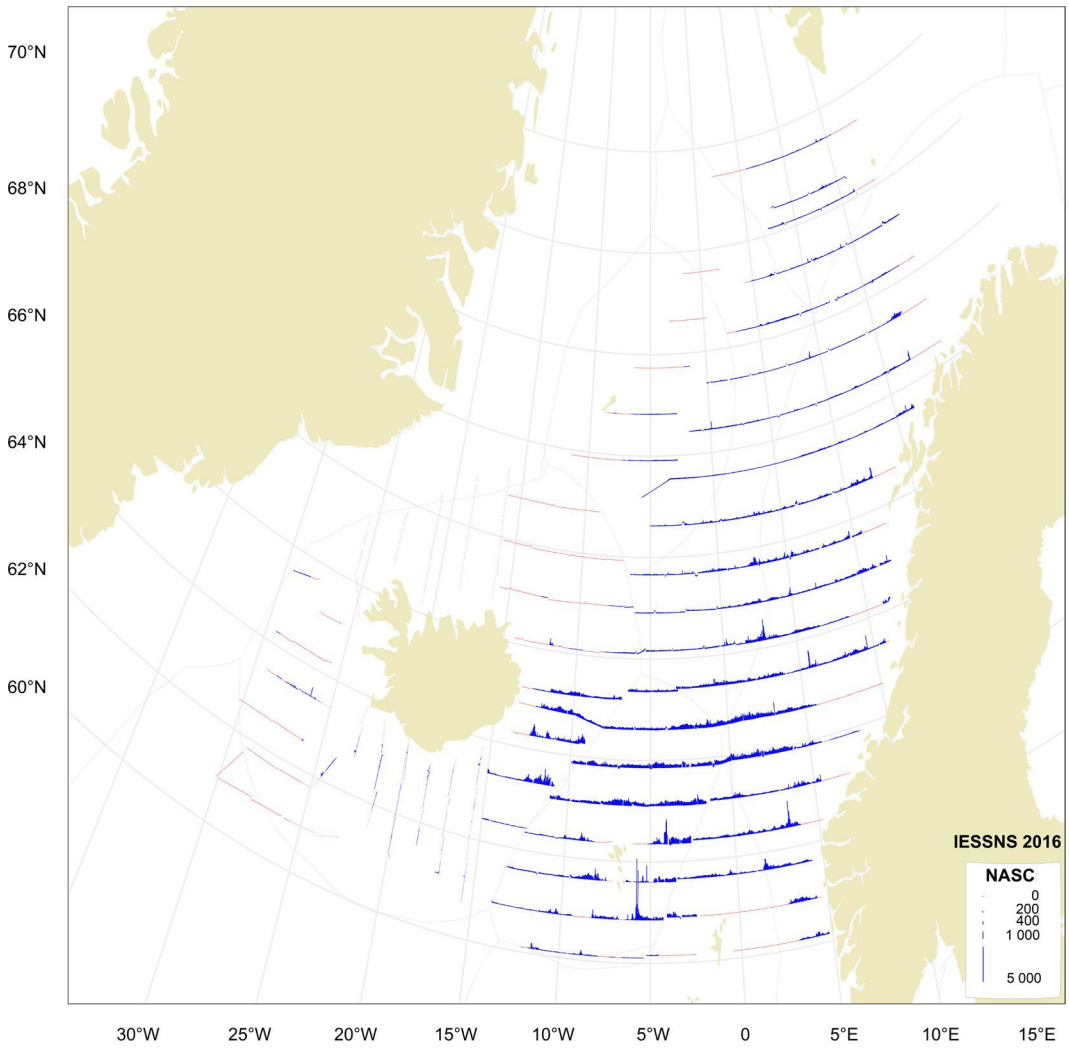

Figure 4.3.1. Distribution of blue whiting in the Nordic Seas from the International ecosystem summer survey in the Nordic Seas (IESSNS) in July 2016.

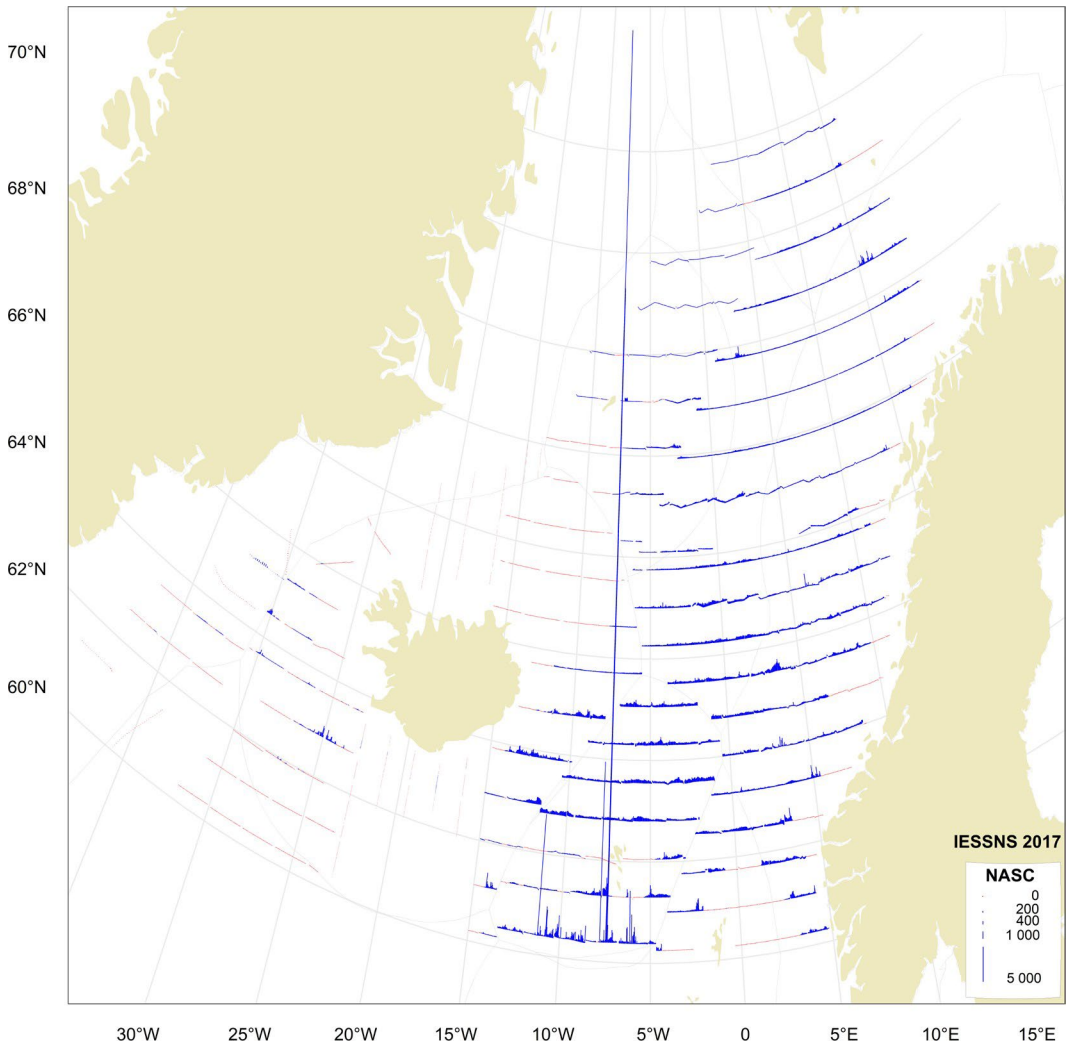

Figure 4.3.2. Distribution of blue whiting in the Nordic Seas from the International ecosystem summer survey in the Nordic Seas (IESSNS) in July 2017.

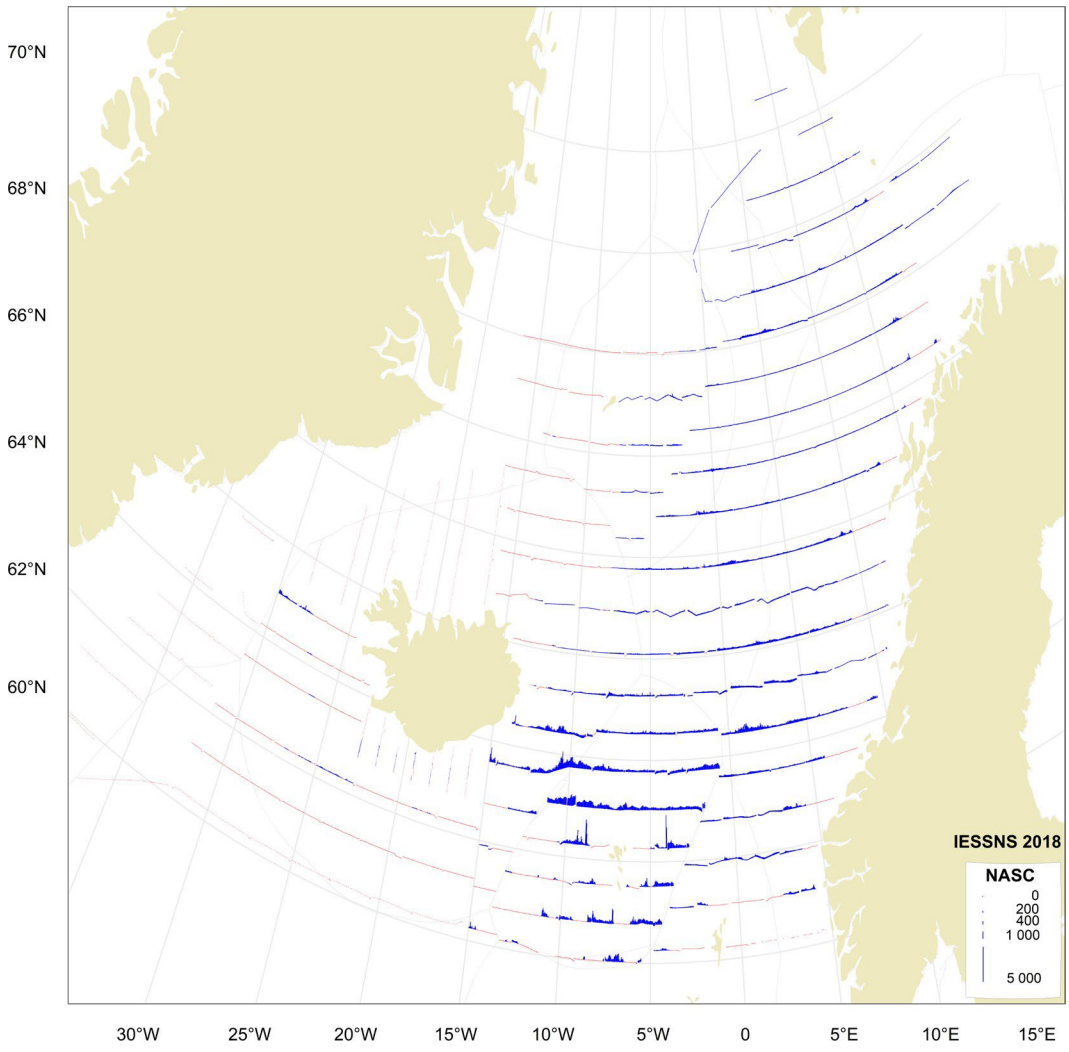

Figure 4.3.3. Distribution of blue whiting in the Nordic Seas from the International ecosystem summer survey in the Nordic Seas (IESSNS) in July 2018.

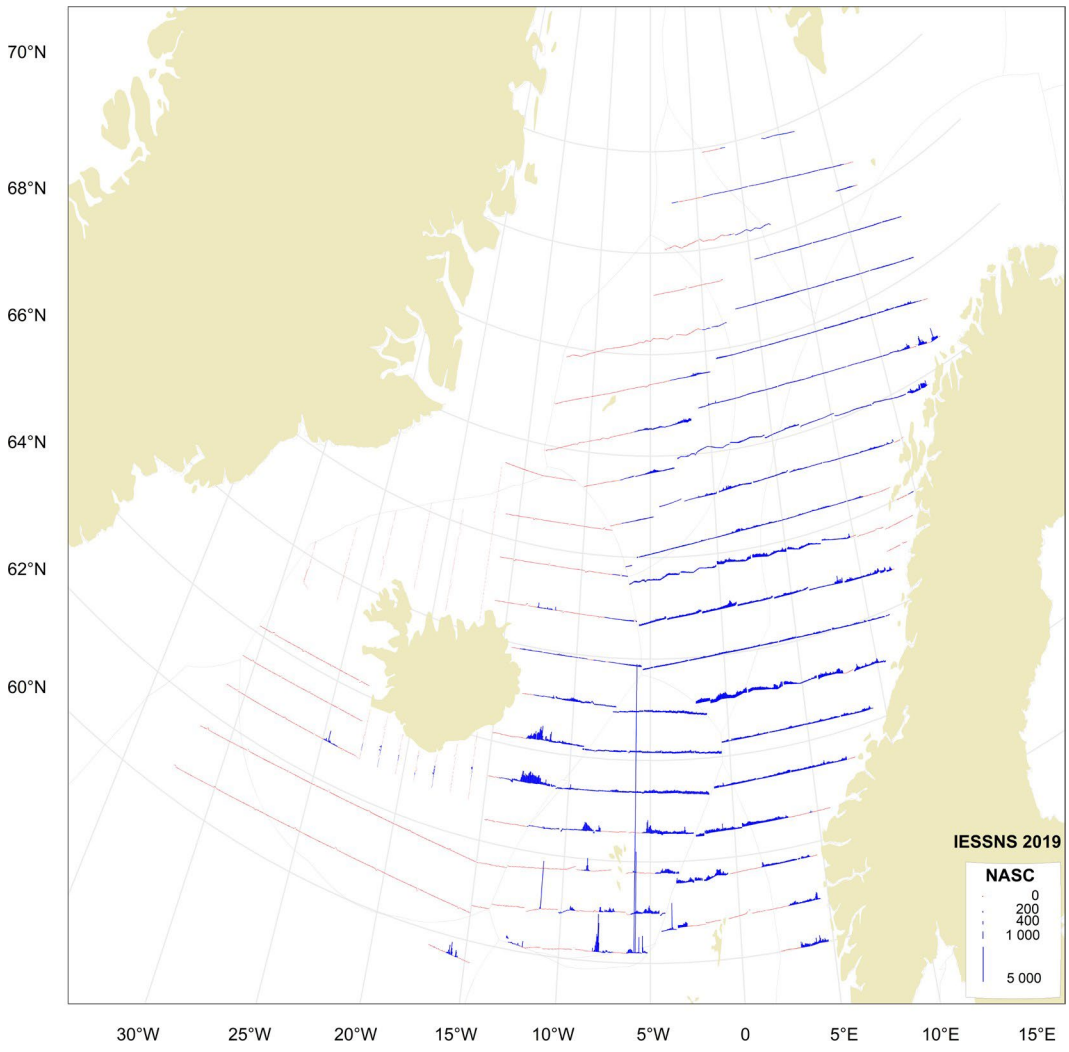

Figure 4.3.4. Distribution of blue whiting in the Nordic Seas from the International ecosystem summer survey in the Nordic Seas (IESSNS) in July 2019.

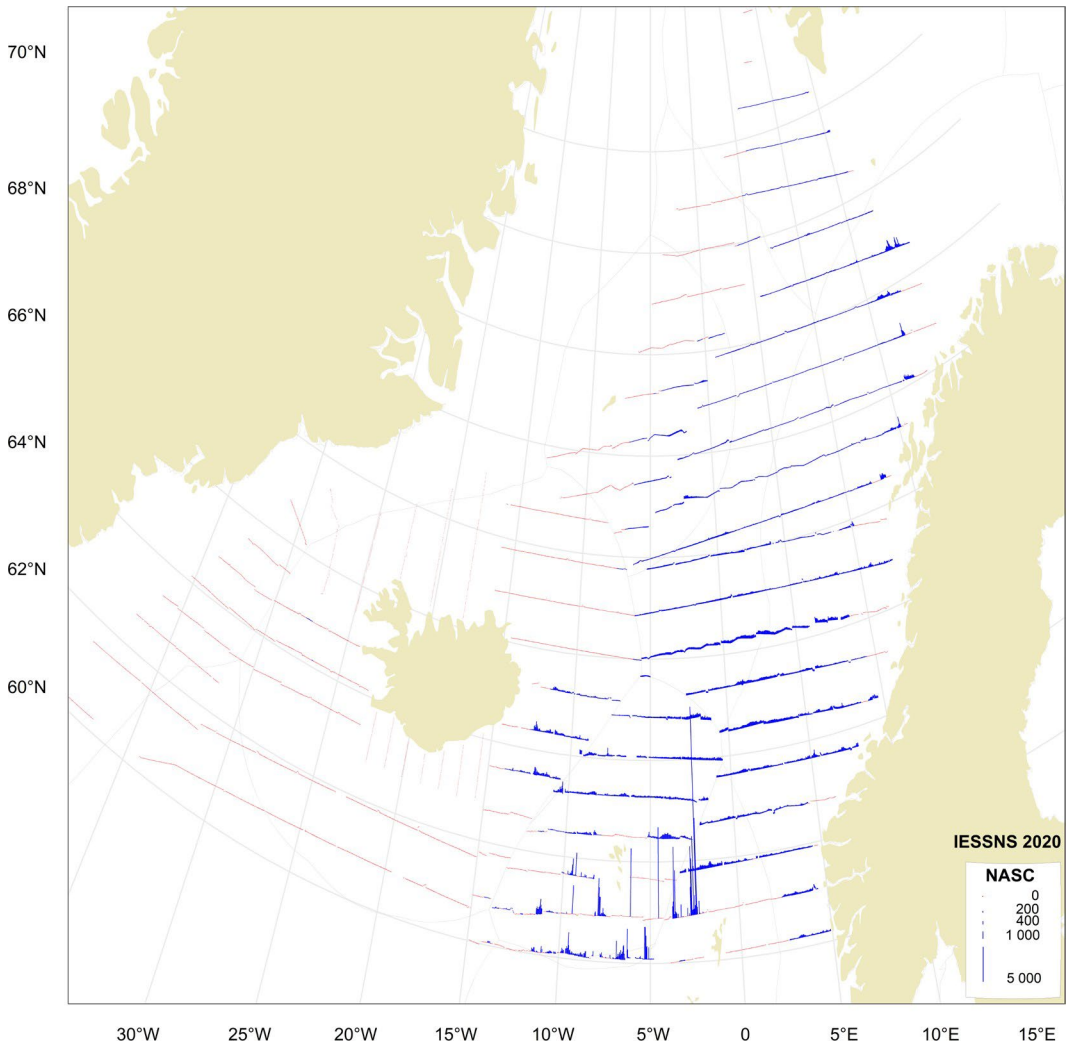

Figure 4.3.5. Distribution of blue whiting in the Nordic Seas from the International ecosystem summer survey in the Nordic Seas (IESSNS) in July 2020.

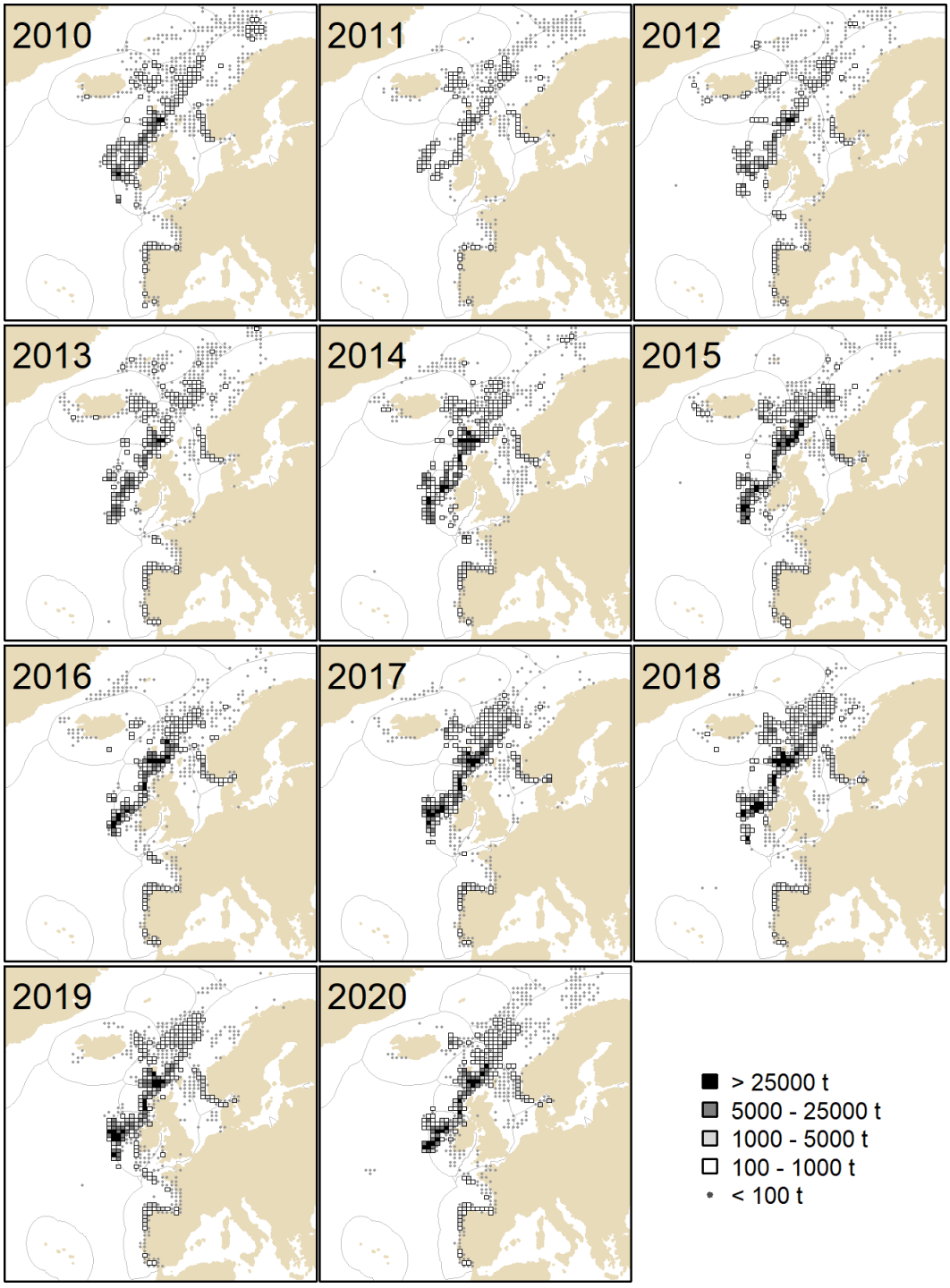

Figure 5.3.1. Annual aggregated catches of blue whiting by ICES-rectangles for individual years between 2010 – 2020.

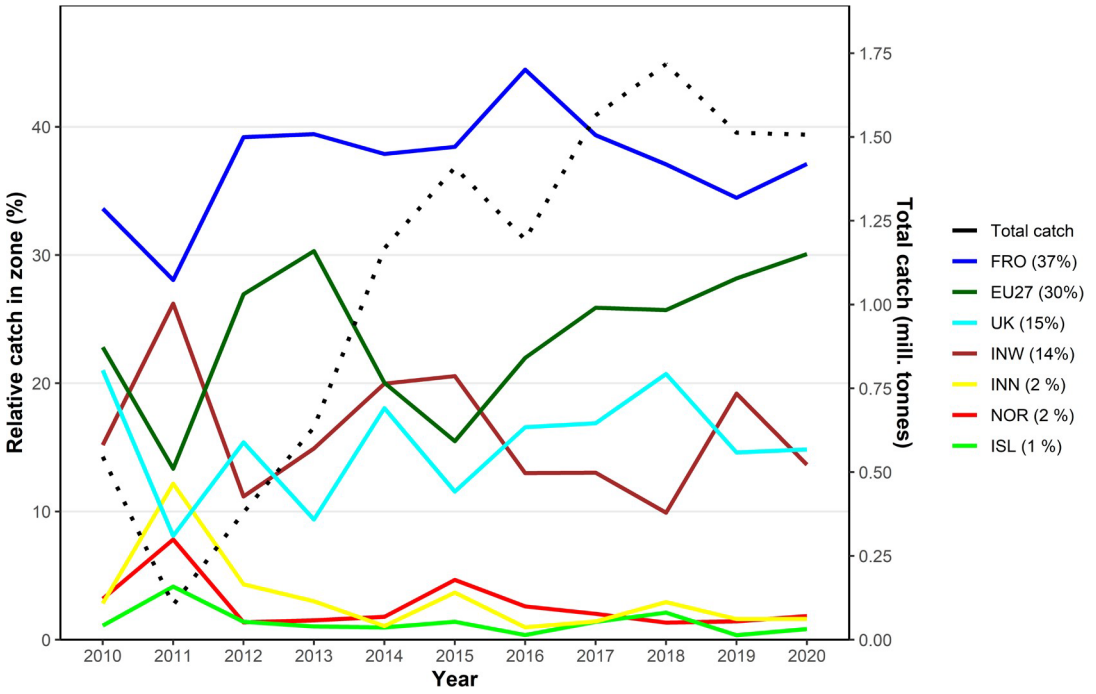

Figure 5.3.2. Total catch (mill. t) of blue whiting and relative catch (%) by Exclusive Economic Zone. Percentages in the legend refers to 2020. INW = International Waters West, INN = International Waters North ("Banana hole").

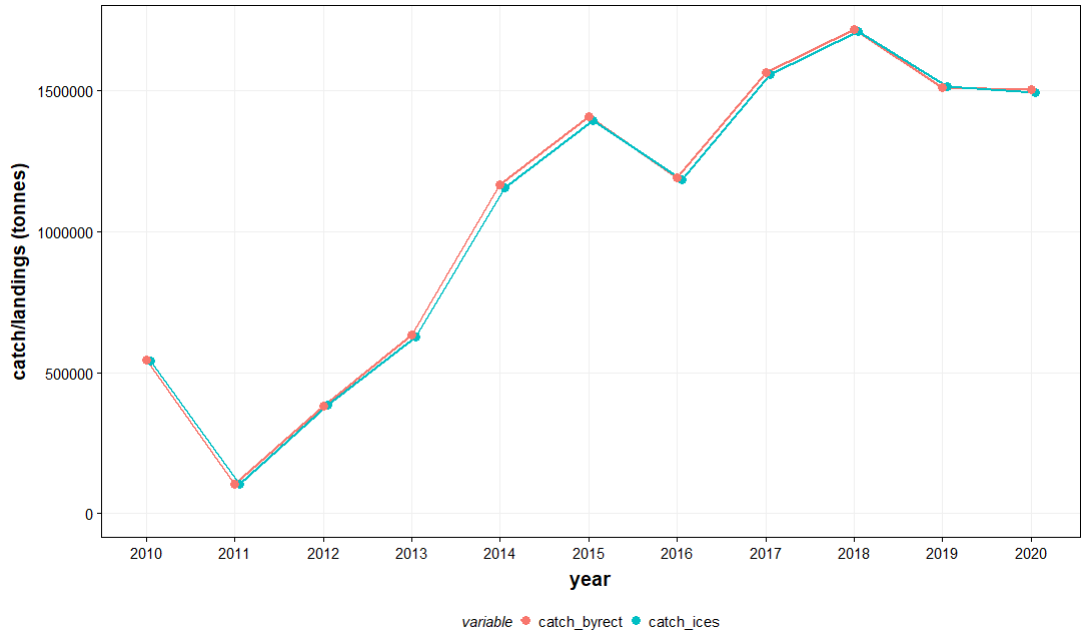

Figure 5.4.1. Comparison of summed catch by rectangle data (red), ICES catch estimates (green) and ICES landings estimates (blue, slightly shifted to avoid complete overlap).

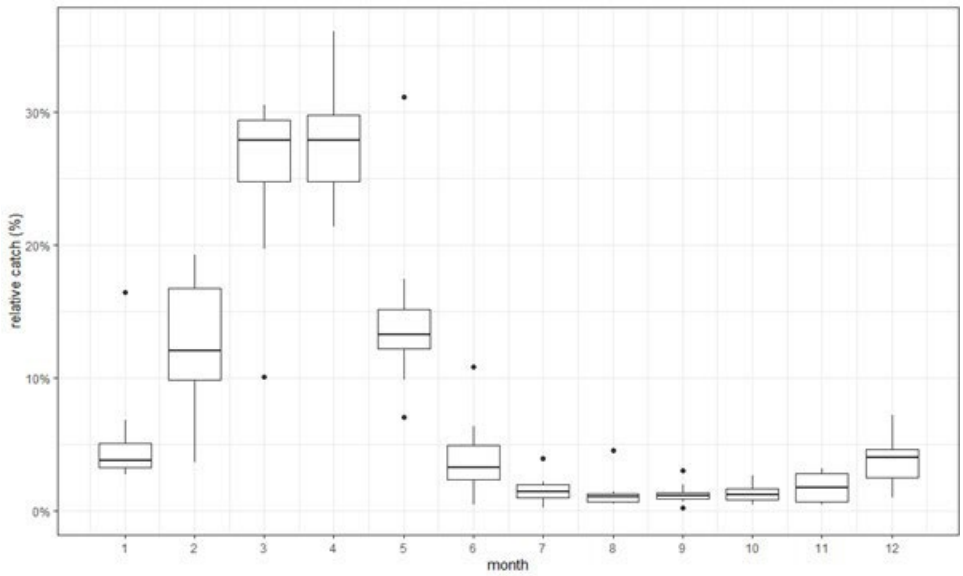

Figure 5.4.2. Boxplot of relative catches of blue whiting by month for the period 2010-2020.

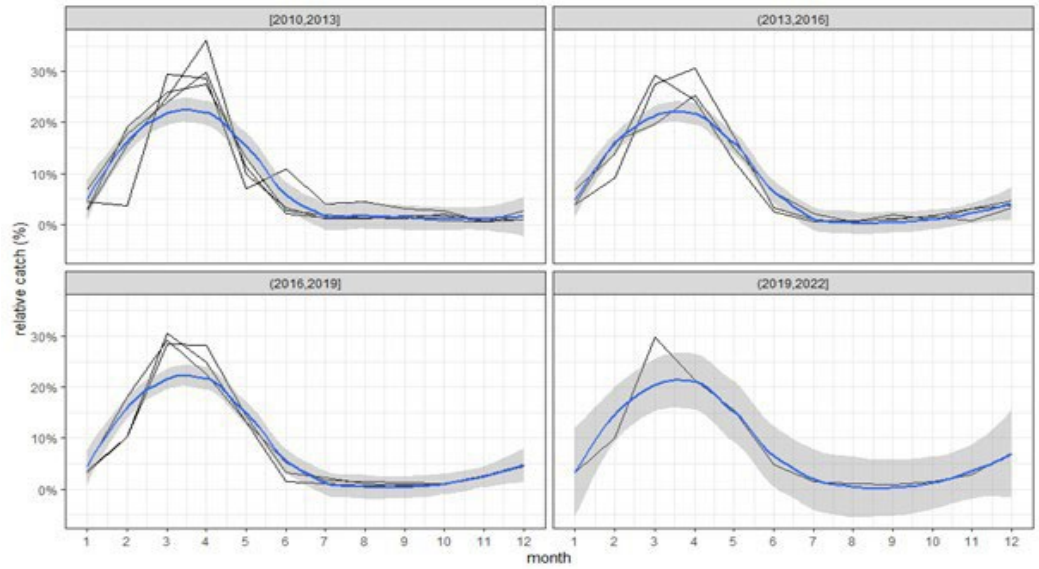

Figure 5.5.1. Relative catch of blue whiting per month for the years 2010-2020. The top left panel are the years 2010-2012, top right the years 2913-2015, bottom left the years 2016-2019 and bottom right the years 2019-2020. The grey area shows the confidence intervals of the average trend.

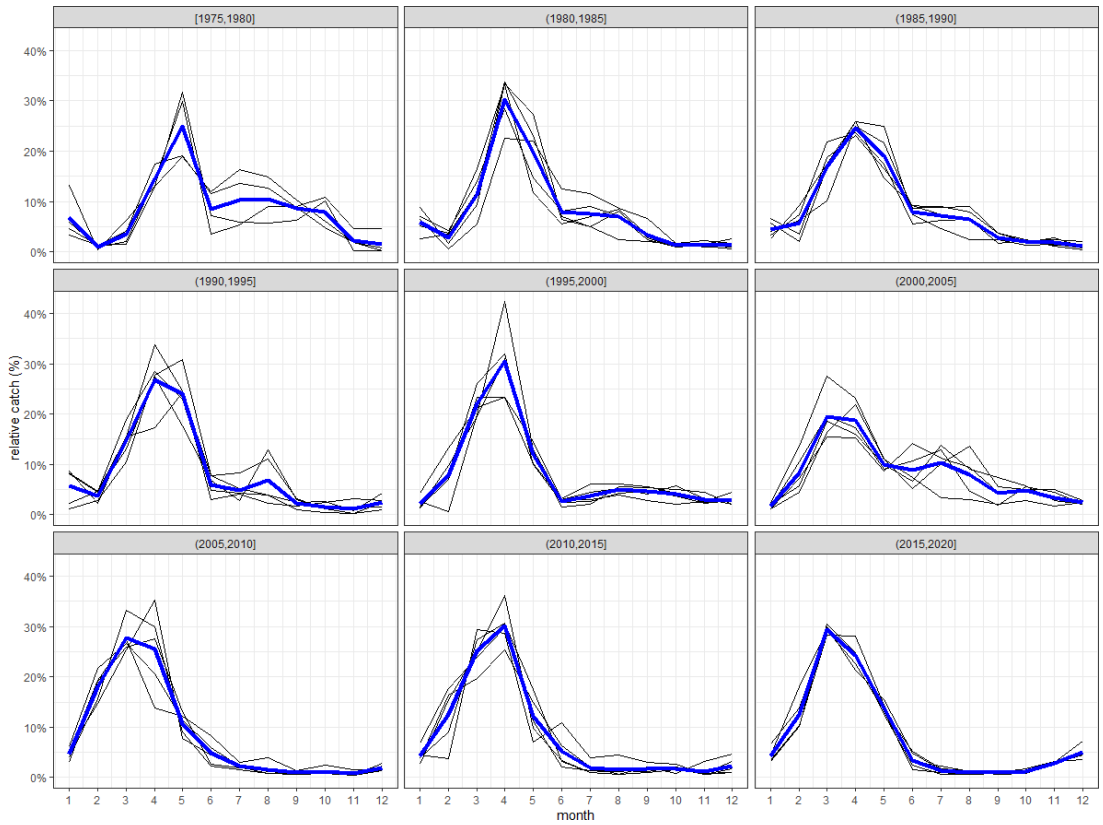

Figure 5.5.2. Relative catches by month, disaggregated in blocks of 6 (first panel) and 5 (the other panels) years. Black lines represent individual years, whereas the blue line is the average trend of catches for the block.

10. Annexes

Annex A1 – Additional surveys which provide incomplete spatial and temporal coverage

Annex A1.1 Faroe Plateau demersal surveys during Quarter 1 and 3

Two annual demersal bottom trawl surveys are carried out on the Faroe plateau by the Faroese Marine Research Institute (FAMRI), one during spring (FO-GFS-Q1) from March 1996 to present and one during late summer/early autumn (FO-GFS-Q3) from August 1994 to present. The surveys have not been used in the blue whiting assessments. The surveys are aimed at cod (Gadus morhua), haddock (Melanogrammus aeglefinus) and saithe (Pollachius virens), but varying amounts of blue whiting are caught as by-catch especially in the deeper regions of the shelf.

The size of the blue whiting ranges from 10 - 45 cm. After the spawning in early spring the larvae drift northwards with the currents and young of the year are found in the deeper regions of the shelf in the autumn. Also 1-group blue whiting are found on the shelf in the same regions and are caught in the spring ground fish survey. The average catches of blue whiting per unit effort (kg/hour) by ICES rectangle for the spring and summer bottom trawl surveys are available from 1998 and onwards.

Annex A1.2 Icelandic bottom trawl surveys in spring and autumn

Marine and Freshwater Research Institute (MFRI) has conducted an annual bottom trawl survey in March (SMB) (Sólmundssson et al., 2021) and October (SMH) (Jakobsdóttir et al., 2021) respectively since 1985 and 1995. Presentation of blue whiting data from both surveys in the current report is limited to the period 2010 to 2020. The surveys target demersal fish species on and in the vicinity of the continental shelf around Iceland within the national exclusive economic zone. The locations of trawl stations are fixed. Approximately 600 stations are sampled during SMB and approximately 360 during SMH. Trawling is carried out utilising a demersal trawl with approximately 17 m horizonal opening for both surveys, and approximate vertical opening of 2.5 m for SMB and 5 m for SMH.
Blue whiting is caught as by-catch during both surveys (Figure A1.2.1). Distribution varies between surveys and is wider ranging in SMH. In SMH, blue whiting is regularly caught along the shelf edge southeast, south, southwest, and west of Iceland. In SMB, blue whiting catch is limited to the shelf edge southeast and southwest of Iceland.

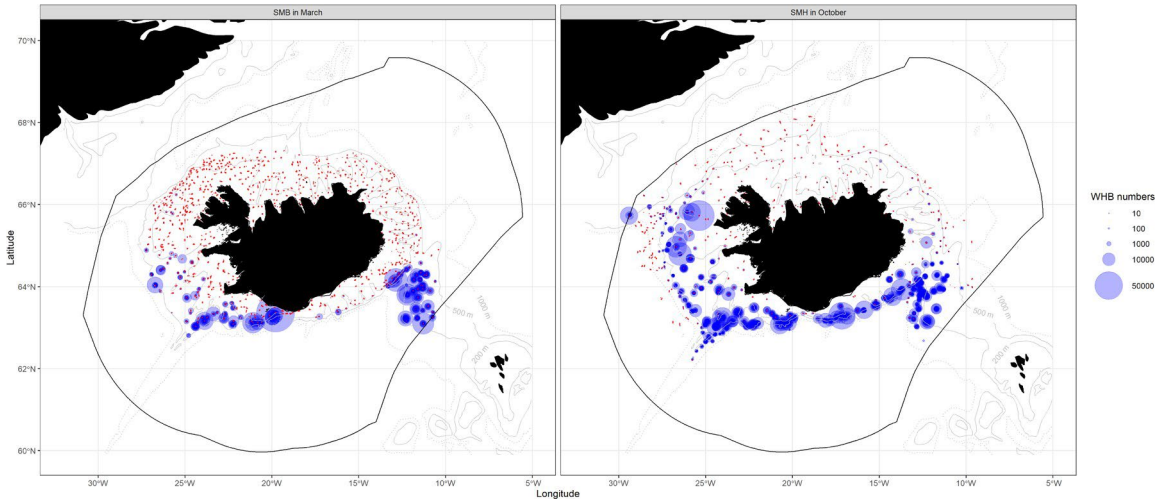

Figure A1.2.1. Blue whiting catch (filled blue circles) during SMB and SMH from 2010 to 2020. Number of blue whiting caught is presented by size of blue circle. Maximum catch per tow was 34, 645 specimens for SMB and 59, 697 specimens for SMH. Bottom trawl stations where no blue whiting were caught are also displayed (red dot) as is EEZ of Icelandic waters (black line) and depth contours for 200 m, 500 m, and 1000 m (grey lines).

Blue whiting was caught every year during both surveys (Figure A1.2.2). There was no SMH in 2011. Annual mean blue whiting abundance index ranged between 9 - 153 blue whiting per tow for SMB (Figure A1.2.2a) compared to 30 - 800 blue whiting per tow for SMH (Figure A1.2.2b). Furthermore, blue whiting were present at 4 – 20 % of trawl stations for SMB and for 30 - 47 % of stations for SMH. Variability in blue whiting annual mean abundance (shaded red ribbon) was high for both surveys as expected given the distribution of catch rates per tow station, i.e. few stations with high abundance, more with low and many zero catches.

Relevance of SMB and SMH time series for blue whiting

The surveys prove blue whiting presence in Icelandic EEZ during spring and fall. Blue whiting is considered a by-catch species in these surveys as the survey design does neither consider blue whiting spatial distribution nor vertical distribution in the water column. Annual mean density index value is sensitive to extreme catches and care should be taken with interpreting the data. Proportion of stations with blue whiting caught measures distribution range of blue whiting within the Iceland shelf per year.

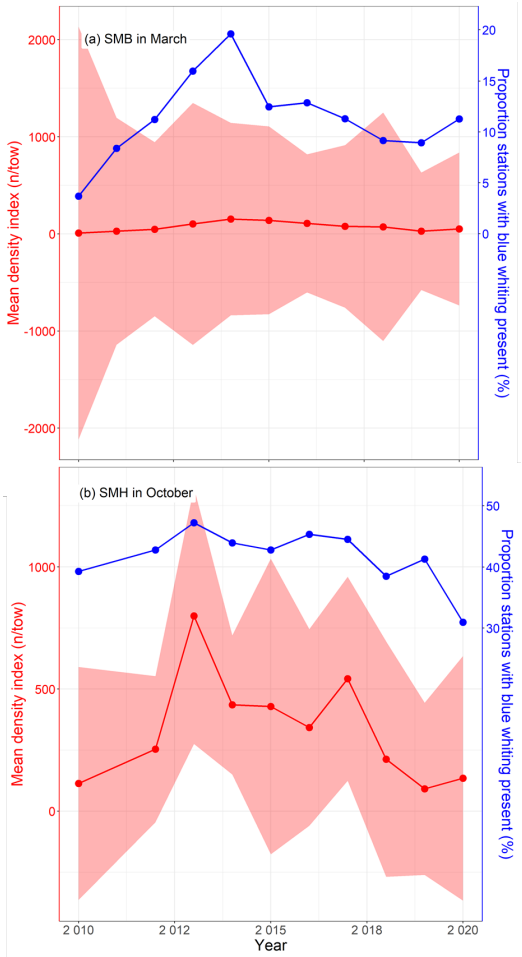

Figure A1.2.2. Blue whiting annual mean abundance for SMB (a) and SMH (b) from 2010 to 2020 (filled red circles) with coefficient of variation (shaded red ribbon). Proportion of stations with blue whiting present is also displayed (filled blue circles).

References

Jakobsdóttir, K. B., Björnsson, H., Sólmundsson, J., Kristinsson, K., Bogason, V. 2021. Stofnmæling botnfiska að haustlagi 2021. Framkvæmd og helstu niðurstöður. Haf- og vatnarannsóknir, HV 2021-60.

Sólmundsson, J., Haney, G., Karlsson, H., Pétursson, H., Björnsson, H., Jónsdóttir, I.G., Jakobsdóttir, K.B., Kristinsson, K., Bogason, V. 2021. Stofnmæling botnfiska á Íslandsmiðum 2021 - framkvæmd og helstu niðurstöður. HV- 2021-24.

Annex A1.3 A blue whiting biomass index for ICES Div. 6a derived from the Scottish Deepwater Survey data set

A regular trawl survey of the fish community in the deep waters to the northwest of Scotland has undertaken between 1998 and 2018, using the MRV Scotia. This survey routinely catches blue whiting in its shallower tows; therefore, we have explored its utility in assessing abundance of this species to the west of Scotland. Since 2015 the index has increased strongly, which does not align with general perceptions of the state of the stock and may represent some change in the migratory patterns.

The survey is conducted with a bottom trawl that was originally rigged with 21″ rock-hopper ground-gear, switching to lighter 16” bobbins in 2009, 1700 Kg doors (area 5.82 m^2); 100-m sweeps and 8″ titanium floats (rated to 2500 m). Warp-to-depth ratio ranges between 3:1 and 2:1, decreasing gradually with depth. Mesh size in the codend is 20 mm. Net geometry is monitored using SCANMAR sensors to

give headline height, depth, and distance of wings and doors to ensure the net is fishing correctly and in a consistent manner. Tows have been focussed on strata of 500m, 1000m, 1500m and 1800m, with hauls at intermediate depths being conducted as time and conditions allow. The survey covers ICES Division 6a from the northwest of Ireland, along the shelf slope, to the north of Scotland. Hauls at Rockall and at Rosemary Bank are conducted irregularly, and so have been excluded from this analysis.

Data for blue whiting in the deep-water survey are available from 1996 to 2021. Data were sub-setted to only include core stations located in shelf waters (therefore the index is only calculated from 1998 and data are not available for years where exploratory surveys take place). Biological data are only available for 2021, and so an age-based index of abundance cannot be calculated from this survey.

The lack of age data means that a calculated index of biomass using weight by haul data (calculated using Kristensen & Berg, 2018) is most appropriate. A delta lognormal model using the 'survey index' package (Berg, 2020) was fitted to the data assuming all fish are the same age, to give estimates of blue whiting biomass over time (Figure 1).

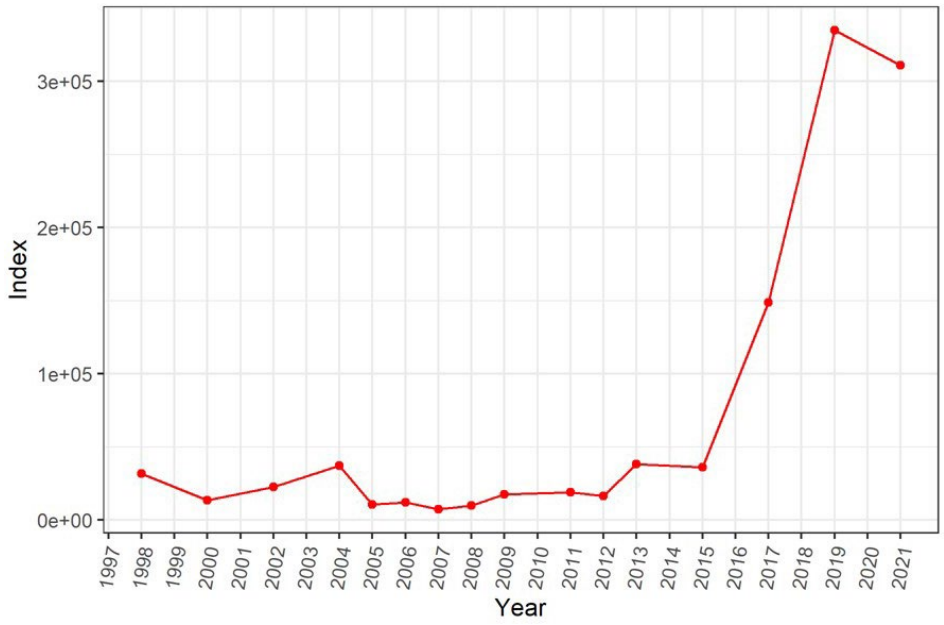

Figure 1. Index of Blue Whiting biomass derived from the Scottish deepwater survey.

The Scottish Deepwater Survey has conducted tows in both UK and Irish waters. Survey data were overlayed onto spatial information to assign each haul to the correct EEZ (Figure 2). Alternative survey grids were created for the Irish and UK EEZs and the survey index model was then re-projected across these grids (Berg, 2020) to give indices of blue whiting biomass for the two separate areas.

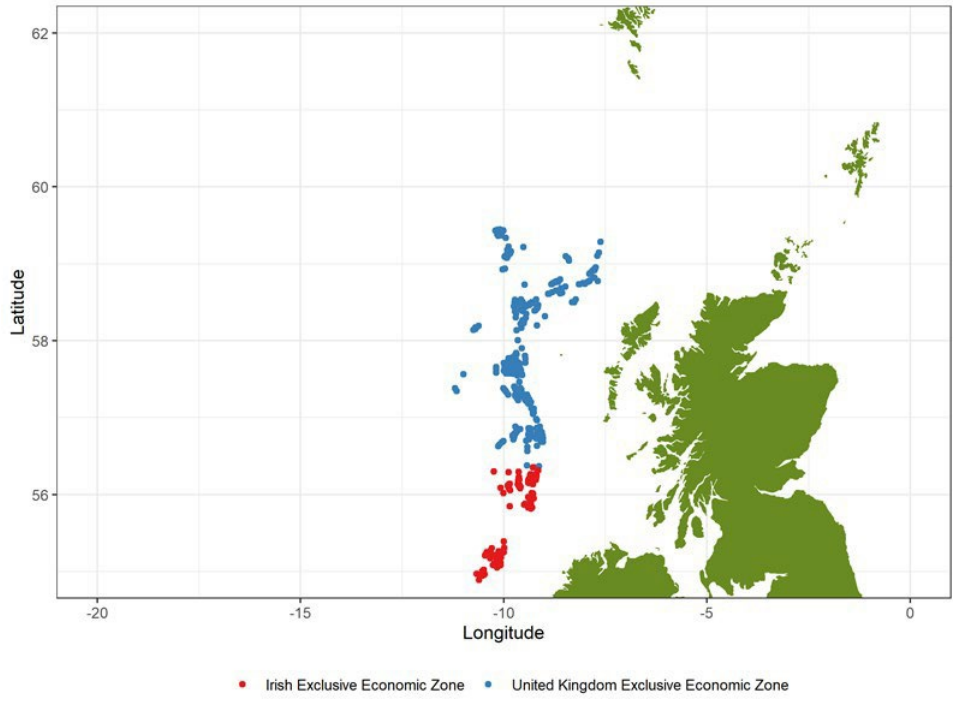

Figure 2. Hauls used in the calculation of the blue whiting index by EEZ.

The larger proportion of the survey hauls are conducted in UK waters (Figure 2), which is reflected in the roughly 80-20 split of the biomass index. This ratio has remained stable despite the recent increase in biomass (Figure 3, Table 1).

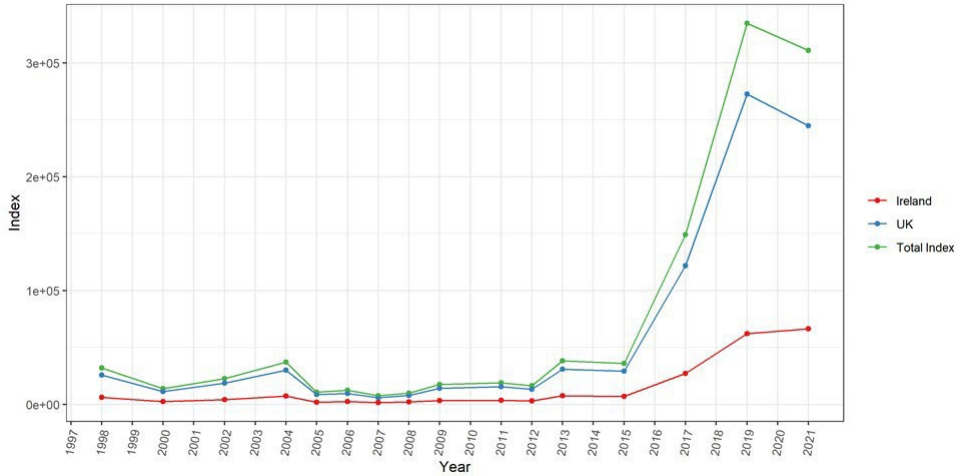

Figure 3. Index for blue whiting by country.

Year	UK	EU	Total	UK Proportion
1998	25767.96	6160.67	31928.64	**0.81**
2000	11256.89	2510.07	13766.96	**0.82**
2002	18615.22	4146.90	22762.12	**0.82**
2004	30070.86	7186.66	37257.52	**0.81**
2005	8740.06	1956.82	10696.89	**0.82**
2006	9692.02	2601.31	12293.34	**0.79**
2007	5914.68	1544.94	7459.62	**0.79**
2008	7830.81	2085.58	9916.39	**0.79**
2009	14210.73	3326.67	17537.39	**0.81**
2011	15427.65	3548.66	18976.31	**0.81**
2012	13357.51	3027.88	16385.39	**0.82**
2013	30783.22	7595.37	38378.59	**0.80**
2015	29165.03	6954.99	36120.02	**0.81**
2017	121751.28	27258.37	149009.65	**0.82**
2019	272735.32	62118.73	334854.05	**0.81**
2021	244808.05	66263.83	311071.88	**0.79**
Average of past 5 indices				**0.81**

References:

Berg, C.W. 2020. surveyIndex: Calculate survey indices of abundance from DATRAS exchange data.. R package version 1.09.

Kristensen, K., Berg, C. 2018. DATRAS: Read and convert raw data obtained from http://datras.ices.dk/Data_products/Download/Download_Data_public.aspx. R package version 1.01.

Annex A1.4 Portuguese surveys

The Portuguese Institute for Sea and Atmosphere have conducted the Portuguese groundfish surveys (PT-PGFS-Q4) along the whole Portuguese continental waters (ICES Division 9a) since June 1979, annually in autumn. The main objectives of these surveys are to monitor the abundance and distribution of blue whiting, hake and horse mackerel recruitment, monitor the abundance and distribution of hake in spawning season (winter) and, for all surveys to estimate: (i) abundance indices and biomass of the most important commercial species; (ii) biological parameters, e.g. maturity, ages, sex-ratio, weight, food habits; and (iii) biodiversity on the sampling area. The primary species were blue whiting, hake, horse mackerel, mackerel, chub mackerel, anglerfish, megrim and Norway lobster (ICES. 2017).

Portuguese Crustacean bottom trawl surveys or Nephrops surveys (PT-Crust-BTS) are conducted since 1997 and usually take place during the second quarter, generally late May - early July, covering the southwest and south coasts of Portugal, which correspond to the Functional Units (FU) 28 and 29 of ICES Division 9a, respectively. The main objectives of the Portuguese Crustacean Trawl Surveys are to:

(i) estimate the relative abundance of Nephrops, as well as of other crustacean species (deepwater rose shrimp. red shrimp) and accompanying species, like blue whiting; (ii) study their geographical distribution in space and time; and (iii) collect data for the determination of biological parameters (sex-ratio, length-weight relationships, maturity, growth).

The objective of this working document is to compile the abundance estimates and the distribution of blue whiting (Micromessistius poutassou), from those two surveys (PT-PGFS-Q4 and PT-Crust-BTS), conducted in Portuguese continental waters. This data compilation will correspond to the period from 2010 until 2021.

A.1.4.1 SURVEY DESIGN

Detailed information on changes on sampling design and estimation methods related with the Portuguese surveys' is available in ICES (2017), for the PT-PGFS-Q4 survey and on ICES (2018), for the PT-Crust-BTS Survey.

In 2012, 2019 and 2020 the surveys were not conducted.

A.1.4.1.1 Portuguese Autumn groundfish survey (PT-PGFS-Q4)

The Portuguese Autumn groundfish survey (PT-PGFS-Q4), or demersal survey, plan comprises 96 fishing stations, 66 at fixed (grid) positions and 30 at random, spread over 12 sectors, subdivided into 3 depth ranges 20 – 100m, 101 – 200m and 201 – 500m (Figure A.1.4.1.1). The tow duration is 30 min, with a trawl speed of 3.5 knots, during day light. The bottom trawl net used is the NCT (Norwegian Campbell Trawl) with rollers in the groundrope. The mean horizontal opening between the wings is 14.7 m, the mean vertical opening is 4.4 m and the codend mesh size is 20 mm. Before 2005, the survey design plan was based on 97 fixed stations, spread over the same 12 sectors but sub-divided into four depth ranges: 20 – 100m, 101 – 200m, 201 – 500m and 501 – 750 m, with a total of 48 strata (ICES. 2017).

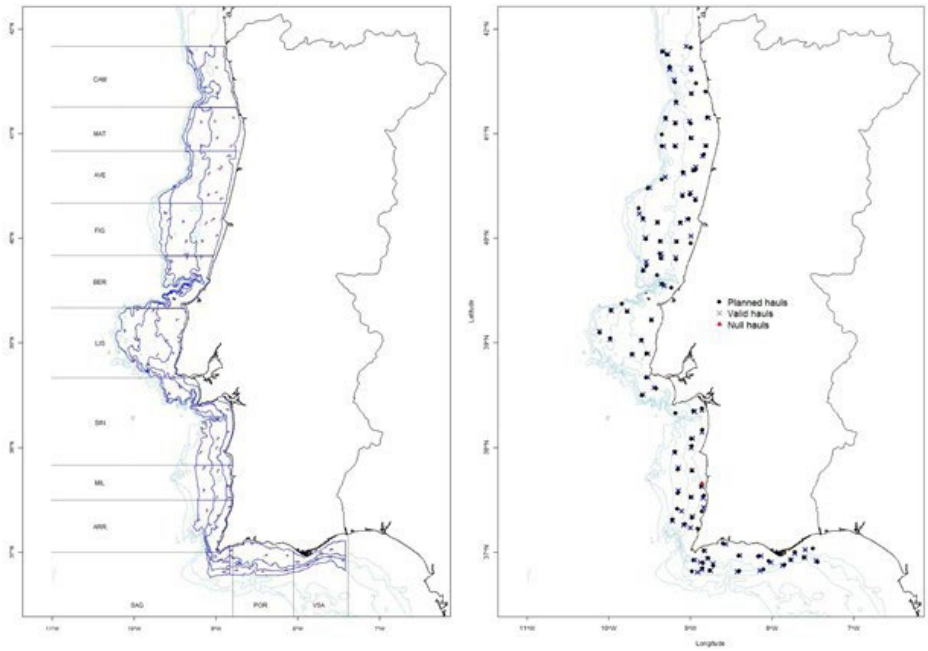

Figure A.1.4.1.1: Stratification (left plot) and hauls performed (right plot) during Portuguese Autumn groundfish survey conducted in 2017.

A.1.4.1.2 Portuguese Crustacean bottom trawl survey (PT-Crust-BTS)

The Portuguese Crustacean bottom trawl survey (PT-Crust-BTS) sampling design was adapted from the bottom trawl surveys (stratified random sampling) and formed the basis for data collection for the crustacean surveys in the period 1997 - 2004. The southwest and south coasts of Portugal were divided in sectors and each sector is split by depth strata. The number of trawling stations in each stratum was dependent on Nephrops and rose shrimp abundance variance, with a minimum of two stations per stratum. The average number of stations in the period considered here was 60. Due to the small number of samples in some strata and to the random selection of the positions, this sampling design does not allow the application of geostatistical methods for estimation. For this purpose, a regular grid composed by 77 rectangles is used since 2005 (Figure A.1.4.1.2), with one station within each rectangle. Each rectangle has 6.6 minutes of latitude x 5.5 minutes of longitude for the SW coast and vice-versa for the south coast, corresponding approx. to 33 nm^2. The abundance observed at a particular point within the rectangle will reflect the relative abundance of the resource at that geographical area and it is assigned to the centre of the rectangle. The stations may be grouped a posteriori in the strata used previously and the results compared with the former surveys.

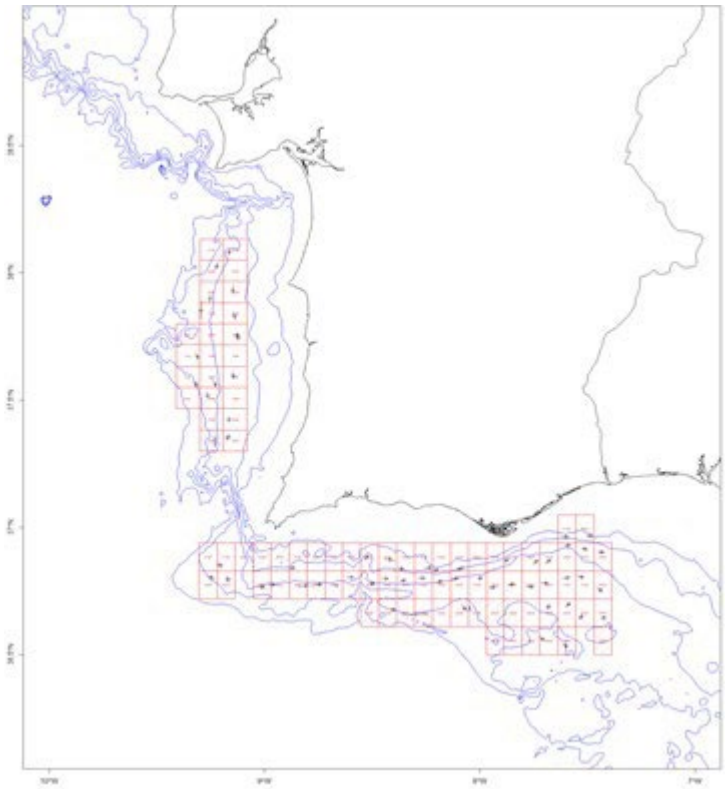

Figure A.1.4.1.2: Stratification (rectangles) and hauls performed during Portuguese Crustacean bottom trawl survey conducted in 2018.

A.1.4.2 METHODS

Portuguese Autumn groundfish survey (PT-PGFS-Q4)

The analysis will focus on years from 2010 onwards and limited to the PT-PGFS-Q4 Autumn surveys (2010 - 2021, except 2012, 2019 and 2020).

Abundance (number per hour) and biomass (kg per hour) estimation and their standard deviations were computed for the whole surveyed area and based on the methodology presented by Cochran (1977) for calculation of estimators for the stratified random sampling. Since blue whiting can form big shoals, in case the catches in a station were higher than 2000 kg, then the data were reviewed and reduced to the 95% quantile of the remaining observations in the same survey. The present data was reviewed with correction for maximum catches in 15 hauls in 2010, 2015, 2017, 2018 and 2021.

Portuguese Crustacean bottom trawl survey (PT-Crust-BTS)

The analysis will focus on years from 2010 onwards (2010-2021, except 2012, 2019 and 2020).

Abundance (number per hour) and biomass (kg per hour) estimation and their standard deviations were computed for the whole surveyed area and based on the methodology presented by Cochran (1977) for calculation of estimators for the stratified random sampling.

A.1.4.3 RESULTS

A.1.4.3.1 Portuguese Autumn groundfish survey (PT-PGFS-Q4)

A.1.4.3.1.1 Abundance indices

The blue whiting abundance in numbers and in weight per hour tow in the PT-PGFS-Q4 time series are shown in Table A.1.4.3.1.1. The highest values recorded in the series occurred in 2010 with 3238 ind/h and 101 kg/h and more recently in 2021 with 4466 ind/h and 154 kg/h.
A length limit of 20 cm is established as a proxy of recruitment. The recruitment index is usually highly related with the abundance index. The highest recruitment index was observed in 2010, in 2018 and also in 2021.

Table A.1.4.3.1.1: Blue whiting abundance in number and in weight estimated for the Portuguese Autumn groundfish surveys (PT-PGFS-Q4) from 2010 to 2021. No surveys have been conducted in 2012, 2019 and 2020.

Year	Number per hour tow Index(n/h)	Weight per hour tow Index (kg/h)	Number per hour tow <20 cm Recruitment Index (nrec/h)	Number per hour tow standard deviation	Weight per hour tow standard deviation
2010	3238.24	101.29	2683.94	505640.98	88728.95
2011	904.78	46.96	475.67	94596.22	35902.58
2012	-	-	-	-	-
2013	65.42	6.41	0.05	162.06	1067.76
2014	1087.78	34.97	1006.64	58375.19	12028.99
2015	1743.00	73.10	1102.77	186676.49	69400.63
2016	1028.19	53.04	430.56	139684.66	21623.31
2017	1233.40	68.53	705.12	86028.26	70545.69
2018	2183.52	97.54	1613.92	188112.64	96914.34
2019	-	-	-	-	-
2020	-	-	-	-	-
2021	4466.16	154.20	3568.43	373490.30	84691.11

Spatial distribution and Occurrences

The spatial distribution of blue whiting in the Portuguese Autumn groundfish surveys as number per hour tow is shown in Figure A.1.4.3.1.2. and Figure A.1.4.3.1.3 shows the distribution of the number of recruits (<20 cm) per hour tow in the Portuguese coast. During the autumn, blue whiting in the Northern region of Portugal occurs in higher abundance, although their presence in the southern areas has also been constant for time series period.

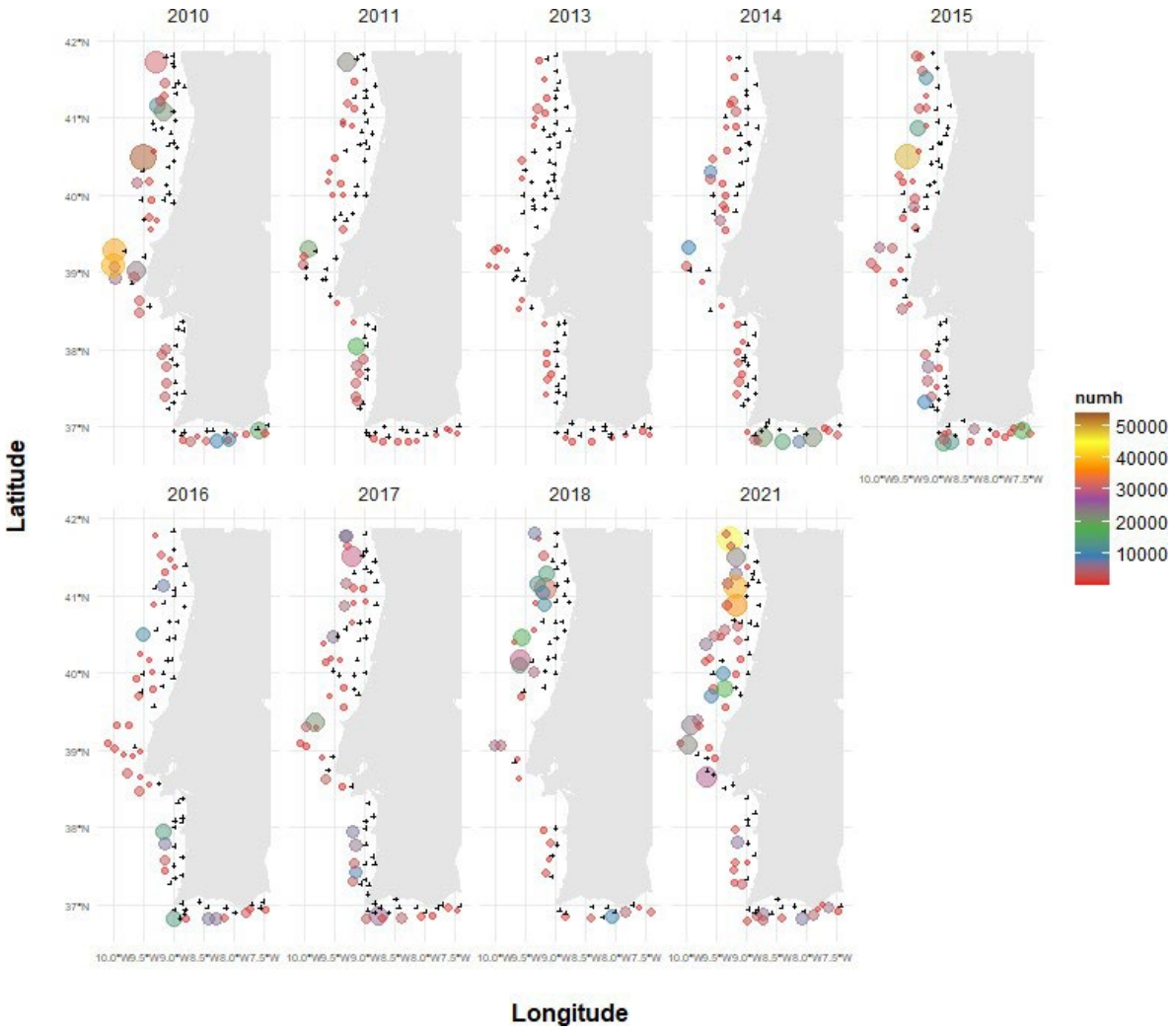

Figure A.1.4.3.1.2: Blue whiting abundance and spatial distribution as number per hour tow in the Portuguese Autumn groundfish surveys (PT-PGFS-Q4), from 2010 until 2021. No surveys have been conducted in 2012, 2019 and 2020. + station position without blue whiting catches.

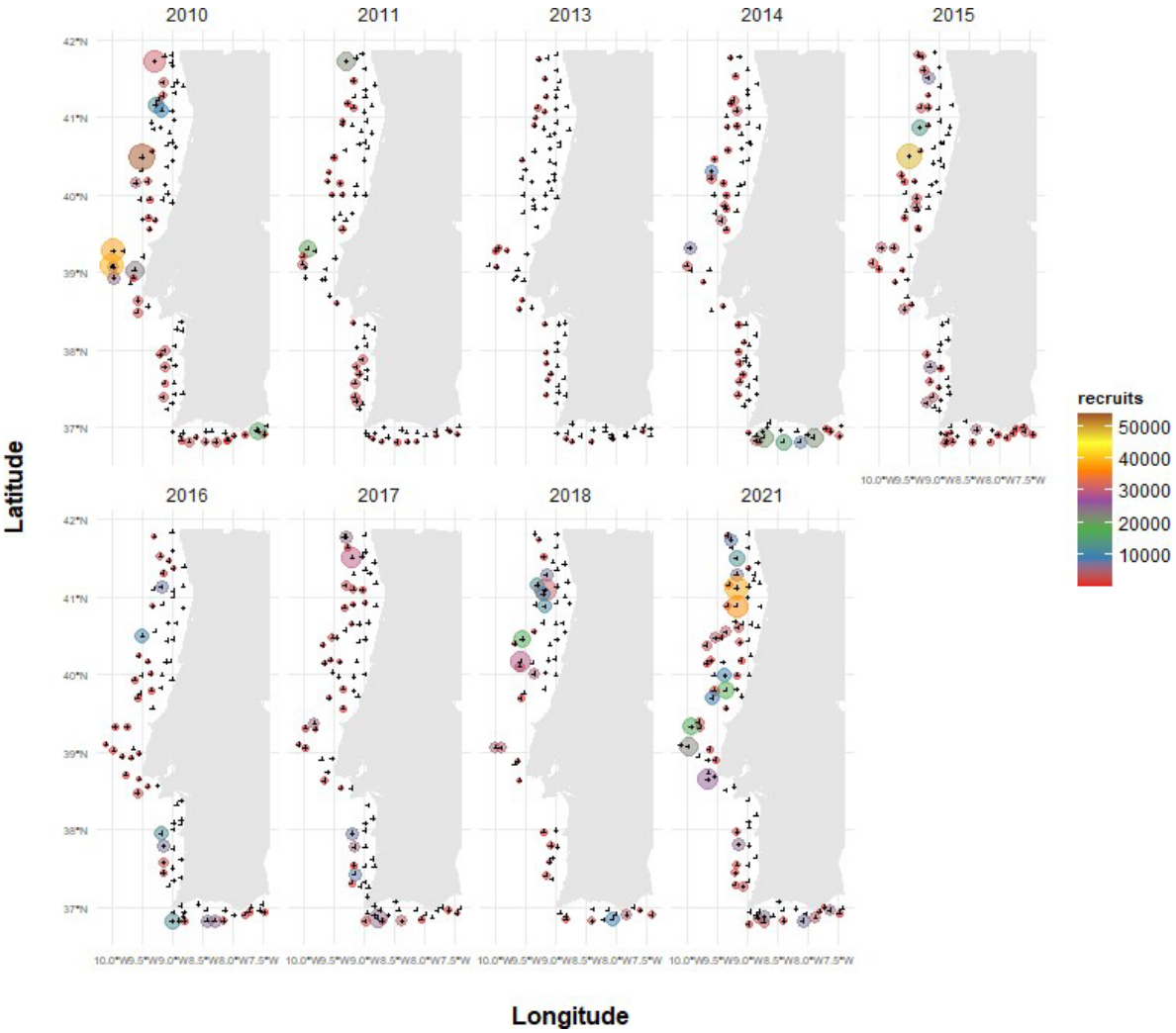

Figure A.1.4.3.1.3: Blue whiting recruits (<20cm) abundance and spatial distribution as number per hour tow in the Portuguese Autumn groundfish surveys (PT-PGFS-Q4), from 2010 until 2021. No surveys have been conducted in 2012, 2019 and 2020. + station position without blue whiting catches.

A.1.4.3.2 Portuguese Crustacean bottom trawl survey (PT-Crust-BTS)

A.1.4.3.2.1 Abundance indices

The blue whiting abundance in numbers and in weight per hour tow in the PT-Crust-BTS time series are shown in Table A.1.4.3.2.1. The highest values recorded in the series occurred in 2010 with 3861 ind/h and 51 kg/h and more recently in 2017 with 393 ind/h and 37 kg/h.

A length limit of 20 cm is established as a proxy of recruitment. The recruitment index is usually highly related with the abundance index. The highest recruitment index was observed in 2010, in 2017 and in 2021.

Table A.1.4.3.2.1: Blue whiting abundance in number and in weight estimated for the Portuguese Crustacean bottom trawl surveys (PT-Crust-BTS) from 2010 to 2021. No surveys have been conducted in 2012, 2019 and 2020.

Year	Number per hour tow Index(n/h)	Weight per hour tow Index (kg/h)	Number per hour tow <20 cm Recruitment Index (nrec/h)	Number per hour tow standard deviation	Weight per hour tow standard deviation
2010	360.55	51.15	42.00	6915.15	94.32
2011	59.88	10.50	2.21	78.77	3.76
2012	-	-	-	-	-
2013	85.92	11.15	0.14	59.36	1.59
2014	101.14	13.03	20.58	413.85	7.55
2015	76.81	6.28	6.68	-215.57	-0.67
2016	277.25	25.07	6.72	950.43	3.33
2017	393.37	39.69	30.65	2217.76	41.01
2018	214.25	28.26	10.49	907.32	12.22
2019	-	-	-	-	-
2020	-	-	-	-	-
2021	77.77	6.18	27.33	145.35	6.16

A.1.4.3.2.2 Spatial distribution and Occurrences

The spatial distribution of blue whiting in the PT-Crust-BTS surveys as number per hour tow is shown in Figure A.1.4.3.2.2. Figure A.1.4.3.2.3 shows the distribution of the number of recruits (<20 cm) per hour tow in the Portuguese coast. During the summer, blue whiting occurs in higher abundance in the south-western and southern coasts of Portugal.

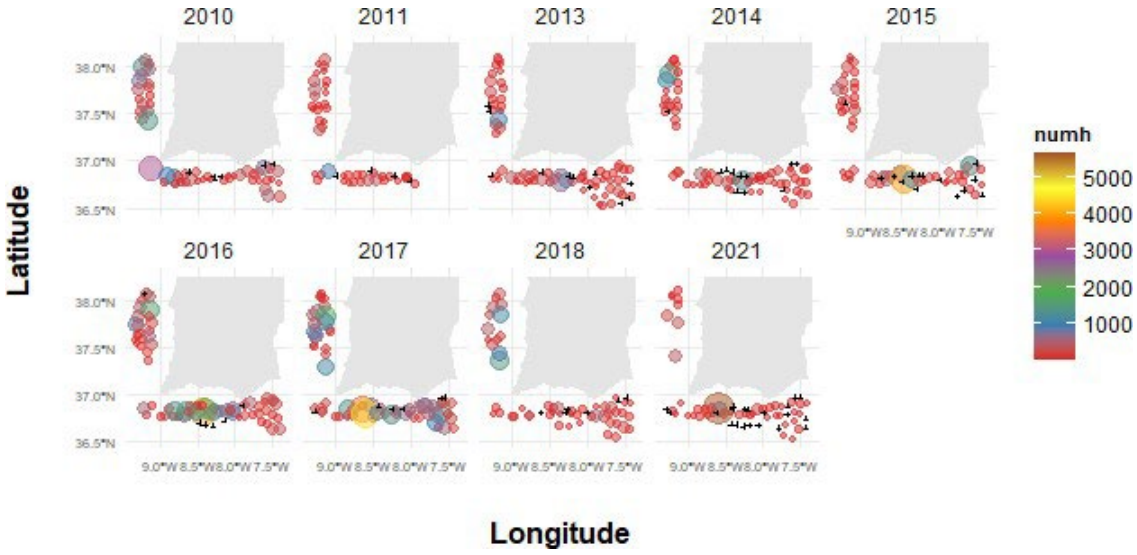

Figure A.1.4.3.2.2: Blue whiting abundance and spatial distribution as number per hour tow in the Portuguese Crustacean bottom trawl surveys (PT-Crust-BTS), from 2010 until 2021. No surveys have been conducted in 2012, 2019 and 2020. + station position without blue whiting catches.

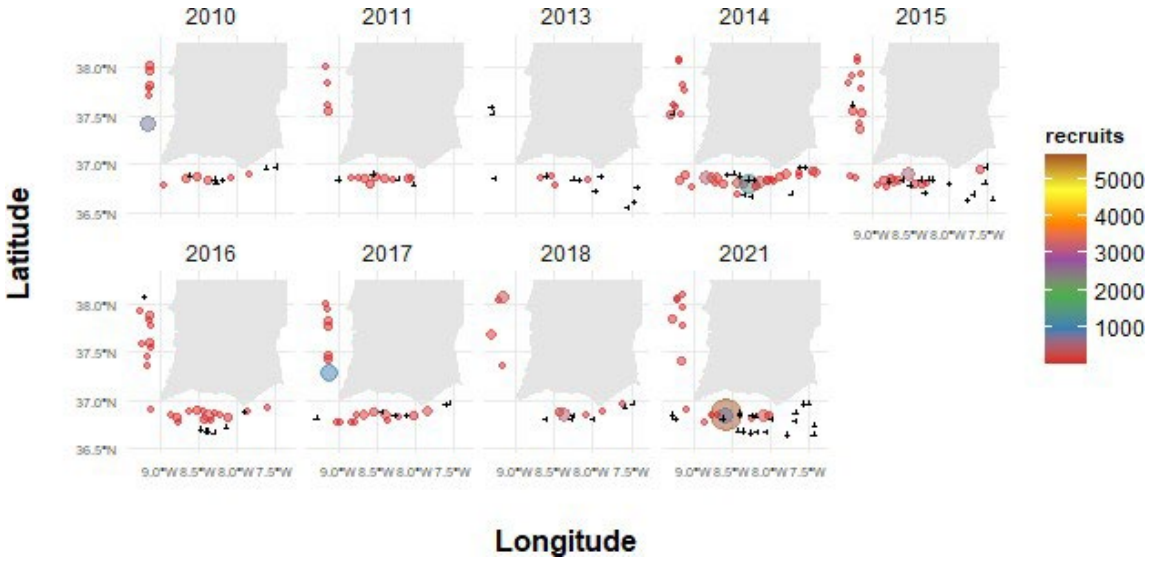

Figure A.1.4.3.2.3: Blue whiting recruits (<20cm) abundance and spatial distribution as number per hour tow in the Portuguese Crustacean bottom trawl surveys (PT-Crust-BTS), from 2010 until 2021. No surveys have been conducted in 2012, 2019 and 2020. + station position without blue whiting catches.

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Annex A1.5 Norwegian bottom trawl survey in the Barents Sea

Norway has conducted a bottom trawl survey in January - March targeting cod and other demersal fish in the Barents Sea since late 1970s. Blue whiting are regularly caught as a by-catch species in this survey. Estimates of blue whiting biomass and abundance are available from 1998 onwards. This index is used in the assessment for evaluation on incoming year-classes of blue whiting. The index is a qualitative measure indicating if the year-class might be strong.

Annex A1.6 Norwegian shrimp survey in Skagerrak - Norwegian Deep

Norway has carried out a bottom trawl survey targeting shrimp (Pandalus borealis) since 1984. Before 2005 the survey was conducted in October - November, during 2005-2006 it was carried out in May and from 2007 onwards it was conducted in January-February. Swept area estimates of blue whiting biomass are available from 1998 onwards. The blue whiting data is not used in the assessment.

Annex A2 – Survey and catch tables from the 2013 report

TableA2.1. Percentages of blue whiting biomass by zones (IBWSS) 1998-2013

Year	EU	Norway	Iceland*	Svalbard	Jan Mayen	Green-land	Faroes	Special area EU/FO	Inter. west	Inter. Bar. Sea	Inter. Norw. Sea	Russia	Special area Bar.Sea	Total
1998	89.45	-	-	-	-	-	7.22	2.64	0.68	-	-	-	-	100
1999	82.73	-	-	-	-	-	7.86	3.04	6.37	-	-	-	-	100
2000	84.39	-	-	-	-	-	9.25	4.42	1.94	-	-	-	-	100
2001	74.54	-	-	-	-	-	17.53	4.63	3.30	-	-	-	-	100
2002	76.14	-	-	-	-	-	19.13	3.72	1.00	-	-	-	-	100
2003	73.60	-	-	-	-	-	20.82	2.98	2.60	-	-	-	-	100
2004	70.70	-	-	-	-	-	19.09	3.36	6.85	-	-	-	-	100
2005	72.98	-	-	-	-	-	15.61	1.75	9.40	-	-	-	-	100
2006	69.68	-	-	-	-	-	7.71	1.64	20.64	-	-	-	-	100
2007	78.29	-	-	-	-	-	5.53	2.05	14.12	-	-	-	-	100
2008	77.91	-	-	-	-	-	6.24	2.56	13.26	-	-	-	-	100
2009	75.93	-	-	-	-	-	12.55	2.79	8.72	-	-	-	-	100
2010	85.18	-	-	-	-	-	8.27	6.55	0.00	-	-	-	-	100
2011	78.69	-	-	-	-	-	14.49	6.74	0.08	-	-	-	-	100
2012	83.27	-	-	-	-	-	13.29	3.13	0.30	-	-	-	-	100
2013	87.54	-	-	-	-	-	10.19	1.50	0.75	-	-	-	-	100

- Not covered

TableA2.2. Percentages of blue whiting biomass by zones (IBWSS) 1998-2013

	EU	Norway	Iceland	Svalbard	Jan Mayen	Green-land	Faroes	Special area EU/FO	Inter. west	Inter. Bar. Sea	Inter. Norw. Sea	Russia	Special area Bar.Sea
Average 2009-2013	82.1	-	0.0	-	-	-	11.8	4.1	2.0	-	-	-	-
Average 2004-2013	78.0	-	0.1	-	-	-	11.3	3.2	7.4	-	-	-	-
Average 1998-2013	78.8	-	0.0	-	-	-	12.2	3.3	5.6	-	-	-	-

TableA2.3. Percentages of blue whiting biomass by zones (IESNS) 2000-2013

Year	EU	Norway	Iceland	Svalbard	Jan Mayen	Green-land	Faroes	Special area EU/FO	Inter. west	Inter. Bar. Sea	Inter. Norw. Sea	Russia	Special area Bar.Sea	Total
2000	4.54	53.28	-	0.10	0.13	-	32.87	4.47	-	-	4.60	-	-	100
2001	0.74	44.72	-	0.34	0.80	-	45.87	2.53	-	-	5.00	-	-	100
2002	2.65	56.24	-	2.20	1.71	-	14.13	-	-	-	23.07	-	-	100
2003	3.88	32.22	12.29	0.45	4.12	-	35.98	1.67	0.13	-	9.26	-	-	100
2004	6.04	29.18	13.57	0.51	2.08	-	37.04	1.03	0.02	-	10.52	-	-	100
2005	6.20	52.28	10.06	1.56	7.38	-	10.13	-	-	-	12.37	-	-	100
2006	5.30	56.15	15.30	1.19	1.55	-	11.39	-	-	-	9.13	-	-	100
2007	0.03	40.55	25.43	1.40	1.58	-	22.76	-	-	-	8.12	-	-	100
2008	4.51	55.38	4.57	0.37	1.21	-	23.75	-	-	-	10.21	-	-	100
2009	1.15	45.93	10.37	1.84	1.04	-	35.10	-	-	-	4.57	-	-	100
2010	5.36	29.48	10.57	0.47	0.76	-	48.26	-	-	-	5.12	-	-	100
2011	6.62	52.63	16.85	2.05	0.01	-	17.89	-	-	-	3.95	-	-	100
2012	3.06	66.34	8.41	1.76	0.56	-	6.89	-	-	-	12.98	-	-	100
2013	0.56	58.90	13.45	1.25	0.69	-	11.23	-	-	-	13.93	-	-	100

- Not covered

TableA2.4. Percentages of blue whiting biomass by zones (IESNS) 2000-2013

	EU	Norway	Iceland	Svalbard	Jan Mayen	Green-land	Faroes	Special area EU/FO	Inter. west	Inter. Bar. Sea	Inter. Norw. Sea	Russia	Special area Bar.Sea
Average 2009-2013	3.3	50.7	11.9	1.5	0.6	-	23.9	-	-	-	8.1	-	-
Average 2004-2013	3.9	48.7	12.9	1.2	1.7	-	22.4	0.1	-	-	9.1	-	-
Average 2000-2013	3.6	48.1	10.1	1.1	1.7	-	25.2	0.7	-	-	9.5	-	-

TableA2.5. Catches (tonnes) of blue whiting by zones for each year 1977-2012

Year	EU	Norway	Iceland	Svalbard	Jan Mayen	Green-land	Faroes	Special area EU/FO	Inter. west	Inter. Bar. Sea	Inter. Norw. Sea	Russia	Special area Bar.Sea	Total
1977	56 637	3 273	7 334	4 271	1 216	327	77 052	6 104	3 182		40 328			199 723
1978	120 846	48 473	28 794	438	9 707	896	160 585	16 551	14		157 010			543 314
1979	173 621	90 511	24 155	15 456	26 329	204	187 531	16 924			558 156			1 092 888
1980	209 782	136 594	13 910	49 579	120 335	8 780	156 046	7 803	32		397 672			1 100 533
1981	222 802	140 295	14 994	68	88 341	17 385	191 215	27 151			185 950			888 201
1982	281 010	77 209	5 387	55	69	905	111 340	14 742	245		33 189			524 151
1983	321 537	54 185	7 080	0		329	105 431	9 058	16 488		13 205			527 313
1984	339 762	76 428	135	0		58	137 616	6 190	22 747		15 018			597 953
1985	326 522	72 172			29	202	172 387	26 427	25 560		27 146			650 444
1986	442 443	126 920	82		4		149 073	32 625	35 422		17 337			803 908
1987	347 894	71 577	126		2		154 243	12 241	84 126		22 438			692 647
1988	386 506	53 117	35	4	1		146 705	12 438	58 205		1 775			658 785
1989	367 088	65 316	2 747		0	50	79 675	13 679	120 357		5 459			654 370
1990	297 776	39 695	11				83 106	31 478	84 680		466			537 213
1991	235 244	51 708	211		8 084	0	98 243	30 794	27 021		6 613			457 919
1992	255 755	37 107	1				87 089	38 739	20 661		5 755			445 107
1993	299 378	64 444			0		81 394	27 548	50 381		7 105			530 250
1994	318 500	12 681	618		2		74 176	21 561	45 012		1 311			473 862
1995	326 673	24 260	402		1		73 282	17 056	44 352		1 071			487 097
1996	369 331	53 637	473				83 733	32 158	28 464		6 887			574 683
1997	384 206	66 985	10 495	1 396	7		88 266	28 891	32 499		13 620			626 366
1998	493 259	119 465	88 402	309	3 976		117 852	39 198	256 083		13 027			1 131 570
1999	465 862	132 385	107 713	949	899		212 579	40 415	268 406		20 703			1 249 911
2000	424 874	173 948	154 629	6 893	27		296 789	31 229	279 152		24 377			1 391 918
2001	428 550	216 345	268 256	36 036	78		411 801	60 643	237 205		81 730	22	2	1 740 669
2002	310 112	247 278	255 559	7 032	1 721		347 068	30 288	286 046	1	63 991	180	5	1 549 282
2003	330 522	285 470	355 137	28 131	481		603 769	35 423	485 053		241 302	46		2 365 334
2004	490 535	373 050	385 920	25 022	5 354		392 209	50 774	499 287		192 670			2 414 820
2005	566 600	140 781	120 713	32 291	150		465 853	39 120	611 632		67 350			2 044 492
2006	923 611	121 171	63 327	24 215	404	8 170	442 635	27 426	310 666		92 299			2 013 923
2007	830 346	67 905	61 212	4 955	610	5 192	311 556	59 329	296 794		27 125			1 665 024
2008	682 367	31 325	1 729	281	453	0	179 694	80 794	257 934		26 256			1 260 833
2009	310 912	21 556	965	764	115	4	91 096	55 368	135 697		19 850			636 327
2010	282 097	18 995	3 282	719	374	24	99 404	49 730	76 230		13 176			544 031
2011	29 253	8 056	3 405	68	5	15	15 039	7 424	27 232		12 657			103 154
2012	185 024	7 884	3 889	216	199	220	83 174	48 566	42 094		13 731			384 997

TableA2.6. Catches (percentages) of blue whiting by zones for each year 1977-2012

Year	EU	Norway	Iceland	Svalbard	Jan Mayen	Green-land	Faroes	Special area EU/FO	Inter. west	Inter. Bar. Sea	Inter. Norw. Sea	Russia	Special area Bar.Sea	Total
1977	28.4	1.6	3.7	2.1	0.6	0.2	38.6	3.1	1.6	0.0	20.2	0.0	0.0	100.0
1978	22.2	8.9	5.3	0.1	1.8	0.2	29.6	3.0	0.0	0.0	28.9	0.0	0.0	100.0
1979	15.9	8.3	2.2	1.4	2.4	0.0	17.2	1.5	0.0	0.0	51.1	0.0	0.0	100.0
1980	19.1	12.4	1.3	4.5	10.9	0.8	14.2	0.7	0.0	0.0	36.1	0.0	0.0	100.0
1981	25.1	15.8	1.7	0.0	9.9	2.0	21.5	3.1	0.0	0.0	20.9	0.0	0.0	100.0
1982	53.6	14.7	1.0	0.0	0.0	0.2	21.2	2.8	0.0	0.0	6.3	0.0	0.0	100.0
1983	61.0	10.3	1.3	0.0	0.0	0.1	20.0	1.7	3.1	0.0	2.5	0.0	0.0	100.0
1984	56.8	12.8	0.0	0.0	0.0	0.0	23.0	1.0	3.8	0.0	2.5	0.0	0.0	100.0
1985	50.2	11.1	0.0	0.0	0.0	0.0	26.5	4.1	3.9	0.0	4.2	0.0	0.0	100.0
1986	55.0	15.8	0.0	0.0	0.0	0.0	18.5	4.1	4.4	0.0	2.2	0.0	0.0	100.0
1987	50.2	10.3	0.0	0.0	0.0	0.0	22.3	1.8	12.1	0.0	3.2	0.0	0.0	100.0
1988	58.7	8.1	0.0	0.0	0.0	0.0	22.3	1.9	8.8	0.0	0.3	0.0	0.0	100.0
1989	56.1	10.0	0.4	0.0	0.0	0.0	12.2	2.1	18.4	0.0	0.8	0.0	0.0	100.0
1990	55.4	7.4	0.0	0.0	0.0	0.0	15.5	5.9	15.8	0.0	0.1	0.0	0.0	100.0
1991	51.4	11.3	0.0	0.0	1.8	0.0	21.5	6.7	5.9	0.0	1.4	0.0	0.0	100.0
1992	57.5	8.3	0.0	0.0	0.0	0.0	19.6	8.7	4.6	0.0	1.3	0.0	0.0	100.0
1993	56.5	12.2	0.0	0.0	0.0	0.0	15.4	5.2	9.5	0.0	1.3	0.0	0.0	100.0
1994	67.2	2.7	0.1	0.0	0.0	0.0	15.7	4.6	9.5	0.0	0.3	0.0	0.0	100.0
1995	67.1	5.0	0.1	0.0	0.0	0.0	15.0	3.5	9.1	0.0	0.2	0.0	0.0	100.0
1996	64.3	9.3	0.1	0.0	0.0	0.0	14.6	5.6	5.0	0.0	1.2	0.0	0.0	100.0
1997	61.3	10.7	1.7	0.2	0.0	0.0	14.1	4.6	5.2	0.0	2.2	0.0	0.0	100.0
1998	43.6	10.6	7.8	0.0	0.4	0.0	10.4	3.5	22.6	0.0	1.2	0.0	0.0	100.0
1999	37.3	10.6	8.6	0.1	0.1	0.0	17.0	3.2	21.5	0.0	1.7	0.0	0.0	100.0
2000	30.5	12.5	11.1	0.5	0.0	0.0	21.3	2.2	20.1	0.0	1.8	0.0	0.0	100.0
2001	24.6	12.4	15.4	2.1	0.0	0.0	23.7	3.5	13.6	0.0	4.7	0.0	0.0	100.0
2002	20.0	16.0	16.5	0.5	0.1	0.0	22.4	2.0	18.5	0.0	4.1	0.0	0.0	100.0
2003	14.0	12.1	15.0	1.2	0.0	0.0	25.5	1.5	20.5	0.0	10.2	0.0	0.0	100.0
2004	20.3	15.4	16.0	1.0	0.2	0.0	16.2	2.1	20.7	0.0	8.0	0.0	0.0	100.0
2005	27.7	6.9	5.9	1.6	0.0	0.0	22.8	1.9	29.9	0.0	3.3	0.0	0.0	100.0
2006	45.9	6.0	3.1	1.2	0.0	0.4	22.0	1.4	15.4	0.0	4.6	0.0	0.0	100.0
2007	49.9	4.1	3.7	0.3	0.0	0.3	18.7	3.6	17.8	0.0	1.6	0.0	0.0	100.0
2008	54.1	2.5	0.1	0.0	0.0	0.0	14.3	6.4	20.5	0.0	2.1	0.0	0.0	100.0
2009	48.9	3.4	0.2	0.1	0.0	0.0	14.3	8.7	21.3	0.0	3.1	0.0	0.0	100.0
2010	51.9	3.5	0.6	0.1	0.1	0.0	18.3	9.1	14.0	0.0	2.4	0.0	0.0	100.0
2011	28.4	7.8	3.3	0.1	0.0	0.0	14.6	7.2	26.4	0.0	12.3	0.0	0.0	100.0
2012	48.1	2.0	1.0	0.1	0.1	0.1	21.6	12.6	10.9	0.0	3.6	0.0	0.0	100.0

TableA2.7. Average percentage of catches by zone for the last 5, 10, 15, 20 and 30 years

	EU	Norway	Iceland	Svalbard	Jan Mayen	Green-land	Faroes	Special area EU/FO	Inter. west	Inter. Bar. Sea	Inter. Norw. Sea	Russia	Special area Bar.Sea
Average 2008-2012	46.3	3.8	1.0	0.1	0.0	0.0	16.6	8.8	18.6	0.0	4.7	0.0	0.0
Average 2003-2012	38.9	6.4	4.9	0.6	0.0	0.1	18.8	5.5	19.7	0.0	5.1	0.0	0.0
Average 1998-2012	36.3	8.4	7.2	0.6	0.1	0.1	18.9	4.6	19.6	0.0	4.3	0.0	0.0
Average 1993-2012	43.1	8.3	5.5	0.5	0.1	0.0	17.9	4.6	16.6	0.0	3.5	0.0	0.0
Average 1983-2012	47.1	9.0	3.7	0.3	0.1	0.0	18.6	4.3	13.8	0.0	2.9	0.0	0.0

TableA2.8. Average percentage of catches by zone for the last 5, 10, 15, 20 and 30 years

	EU	Norway	Iceland	Svalbard	Jan Mayen	Green-land	Faroes	Special area EU/FO	Inter. west	Inter. Bar. Sea	Inter. Norw. Sea	Russia	Special area Bar.Sea
Average 1977-2005	43.1	10.5	4.0	0.5	1.0	0.1	19.9	3.3	9.9	0.0	7.7	0.0	0.0
Average 2006-2012	46.7	4.2	1.7	0.3	0.0	0.1	17.7	7.0	18.1	0.0	4.2	0.0	0.0

[1]These two periods are before and after the coastal states came to a quota agreement

Annex A3 – Distribution of blue whiting fishing per month and year

Figure A3.1. Total catches 1977-2020 in January.

Figure A3.2. Total catches 1977-2020 in February.

Figure A3.3. Total catches 1977-2020 in March.

Figure A3.4. Total catches 1977-2020 in April.

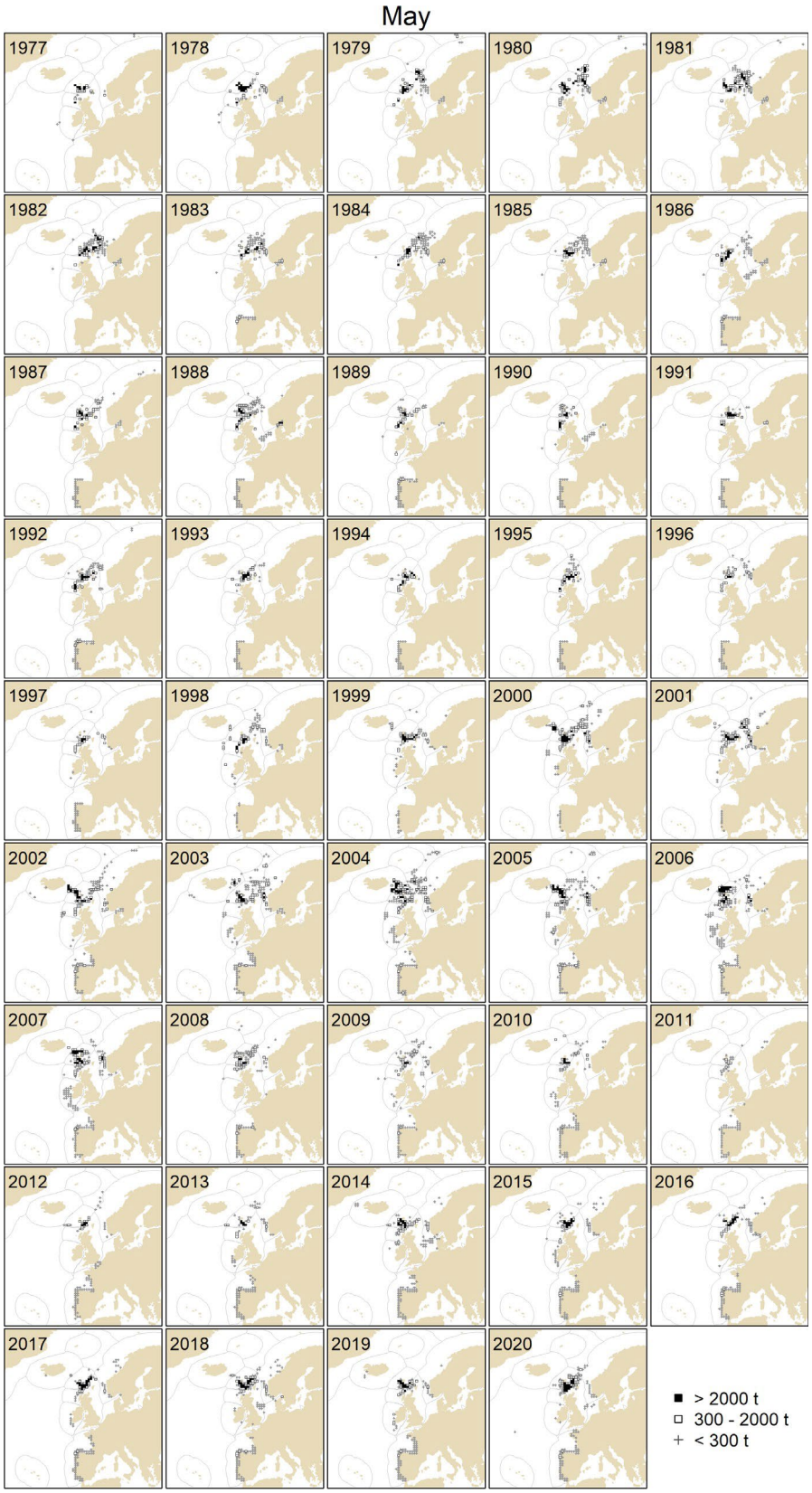


Figure A3.5. Total catches 1977-2020 in May.

Figure A3.6. Total catches 1977-2020 in June.

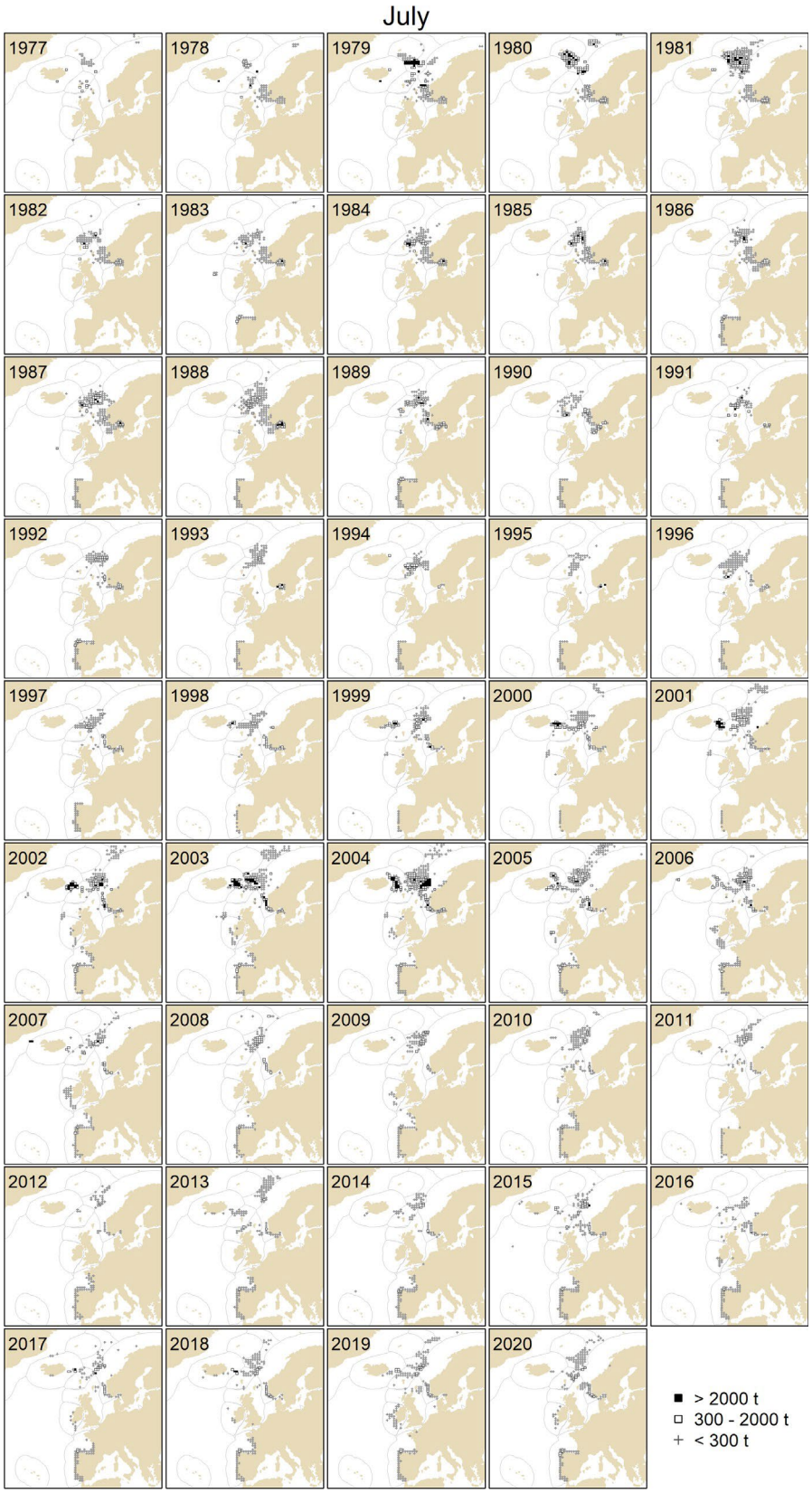


Figure A3.7. Total catches 1977-2020 in July.

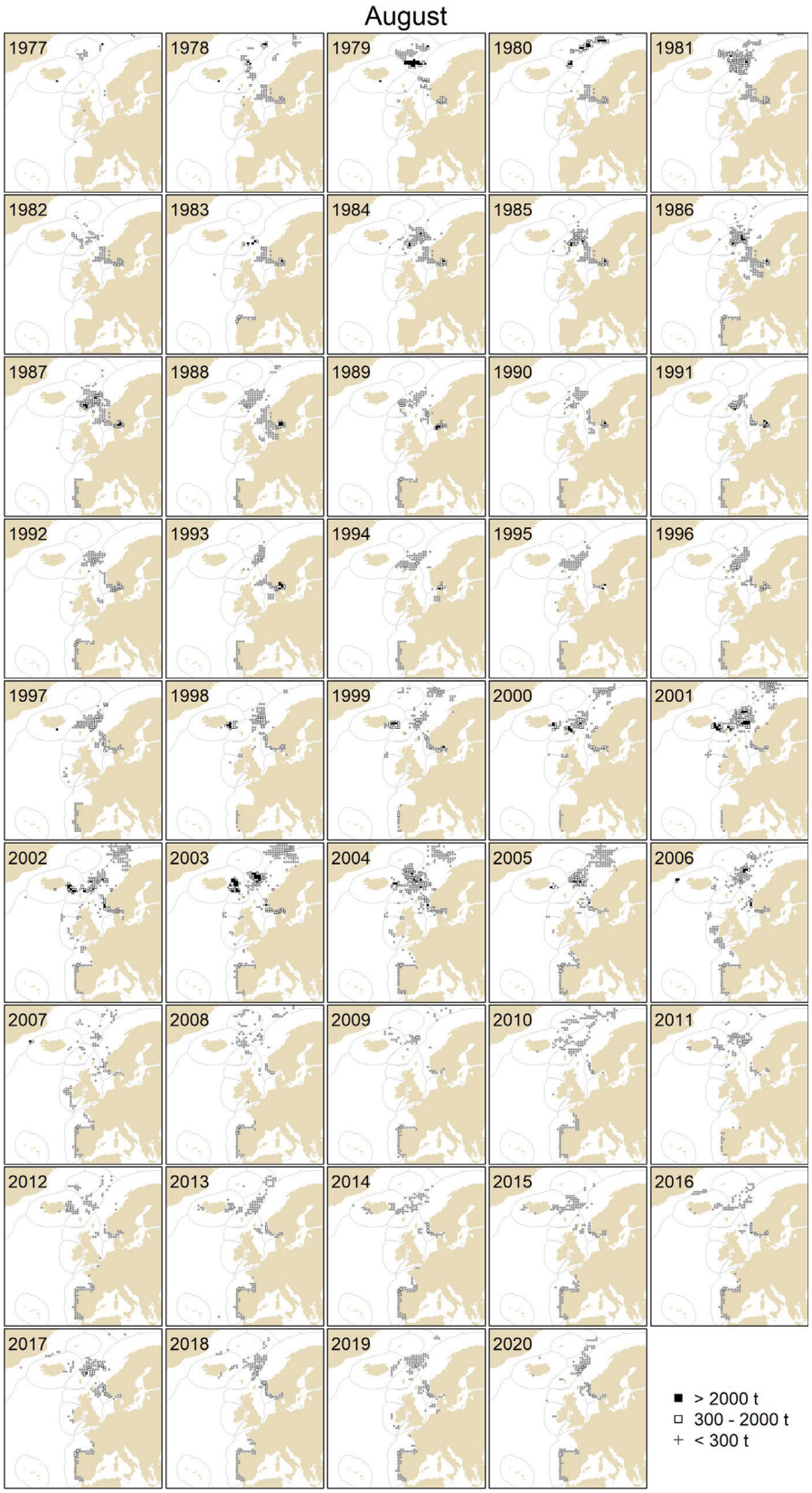


Figure A3.8. Total catches 1977-2020 in August.

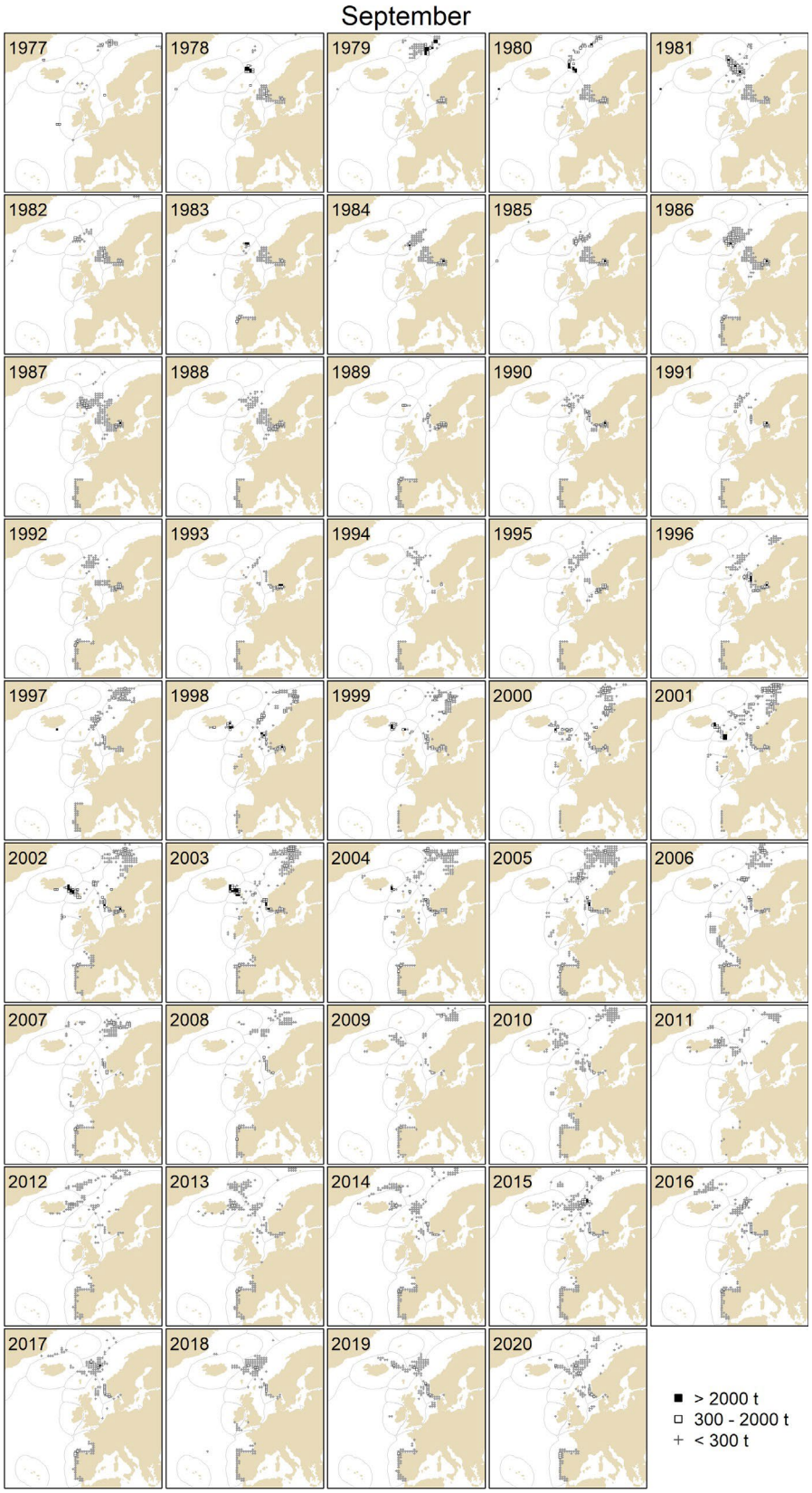


Figure A3.9. Total catches 1977-2020 in September.

Figure A3.10. Total catches 1977-2020 in October.

Figure A3.11. Total catches 1977-2020 in November.

Figure A3.12. Total catches 1977-2020 in December.

Annex A4 – Data call and formats

As agreed in the blue whiting agreed record for 2022, a Working group was established, including scientific experts from all Parties, to update the 2013 report **"Report from the NEAFC Working Group on Collating Information on the Distribution of All Life Stages of Blue Whiting in the North-East Atlantic and the Distribution of Catches from the Stock".**

The first preparatory meeting took place on 7 December 2021 (Copenhagen/hybrid) to discuss the process of updating the report. For this purpose, the experts identified the need of additional catch data to continue the series provided in the 2013 report. Therefore, the working group kindly requests the Parties to provide information on their respective catches of blue whiting.

This data call requests catch data by month and ICES statistical rectangle for the period 2010-2020, and by exclusive economic zones (EEZs) and international waters. This information should be submitted in the format listed in the document attached to this letter.

The Coastal States and the fishing parties of blue whiting are hereby asked to provide information on their respective catches of blue whiting by 1 April 2022. The data should be submitted to the Chair of the blue whiting Working Group (Åge Høines, aageh@hi.no), who will circulate it to all the members of the Working Group.

Catch data by ICES statistical rectangle submission:

Catch data should be submitted in a text file with 7 columns:
year, species, country, ices_rect, month, catch, zone

It is important that:

- The columns are comma-separated
- The parameters are put in the file without any "
- The file is saved as .txt or .csv
- Only upper case letters are used

  Countries are indicated with the three letterscode (alpha-3 code, https://www.nationsonline.org/oneworld/country_code_list.htm). **See separate designations for the United Kingdom at the bottom of the Table below.**
- Rectangle names are without spaces or hyphens
- Month is given in numbers: 1,2, ..., 12
- Landings/catches are given in tonnes (with three decimal places and use point as the decimal separator (not coma) e.g. 15000.123)
- Economic zones are given as three letter codes (see examples below)

Example of submission file. (The first line is the header line):

```
year,species,country,ices_rect,month,catch, zone
2015,WHB,DEU,55E8,3,99.000,IRL
2015,WHB,DEU,55E8,4,4.210,IRL
2015,WHB,DEU,55E9,4,54.321,IRL
```

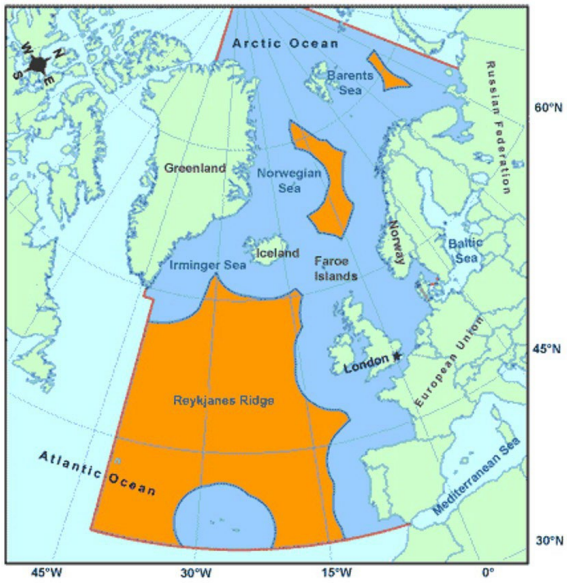
(catch numbers given in the example do not correspond to true values)

From EEZ / MarineRegions:

Territory1	ISO_Ter1
International Barents Sea	INB
International North	INN
International West	INW
Belgium	BEL
Germany	DEU
Denmark	DNK
Spain	ESP
Alhucemas Islands	ESP
Perejil Island	ESP
Ceuta	ESP
Peñón de Vélez de la Gomera	ESP
Chafarinas Islands	ESP
France	FRA
Faeroe	FRO
United Kingdom*	GBR
Guernsey	GGY
Gibraltar	GIB
Greenland	GRL
Ireland	IRL
Iceland	ISL
Jersey	JEY
Netherlands	NLD
Norway	NOR
Poland	POL
Azores	PRT
Madeira	PRT
Portugal	PRT
Russia	RUS
Svalbard	SVA
Jan Mayen	SJM
Sweden	SWE

*Separate regions in the United Kingdom

UK/Scotland	UKS
UK/England	UKE
UK/Wales	UKW
UK/Northern Ireland	UKN


Arctic Ocean
Barents Sea
Russian Federation
60°N
Greenland
Norwegian Sea
Norway
Baltic Sea
Iceland
Irminger Sea
Faroe Islands
London
European Union
45°N
Reykjanes Ridge
Atlantic Ocean
Mediterranean Sea
30°N
45°W
30°W
15°W
0°

Annex A5 – List of participants

Åge Høines, Norway (chair) Rune Mjørlund, Norway Anna H. Ólafsdóttir, Iceland

Jan Arge Jacobsen, Faroe Island Richard Nash, UK

Andrew Campbell, Ireland Campbell Pert, UK

Ana Leocadio, EU Commission Martin Pastoors, the Netherlands Alessandro Orio, Sweden

Claus Sparrevohn, Denmark Joseph Watson, UK

Patrícia Gonçalves, Portugal Corina Chaves, Portugal