INTERNATIONAL BOTTOM TRAWL SURVEY WORKING GROUP (IBTSWG; outputs from 2024 meeting)

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Contents

i Executive summary

The International Bottom Trawl Survey Working Group (IBTSWG) coordinates long-term, fishery-independent bottom trawl surveys in the Northeast Atlantic and North Sea, providing data for stock assessments and analyses of the distributions and relative abundance of fish. IBTSWG also promotes the standardization of fishing gears and methods. The surveys are important platforms for additional data collection (e.g. fish larvae, stomach contents, fish tagging, and fish parasites). This report summarizes national contributions in 2023–2024 and plans for the 2024–2025 surveys.

In the North Sea, the surveys are performed in Q1 and Q3. The 2024-Q1 North Sea IBTS was impacted by storms and an enforced vessel change. Other factors (e.g. offshore infrastructure and static fishing gear) increasingly impact on access to some fishing areas and increases steaming times. Some surveys had to fish at stations relatively close to each other in order to ensure sampling in all rectangles.

The 2022-Q3 North Sea IBTS was broadly completed. The number of valid hauls and average tow duration were comparable to previous years. The abundances of 0-group cod and haddock were lower than the previous year.

The Northeast Atlantic surveys are conducted in Q1, Q3-4, with 14 national surveys operating over the continental from northern Scotland to the Gulf of Cádiz. Most surveys were completed successfully. The Portuguese survey was impacted by mechanical issues, and the Northern Irish survey was unable to operate in Irish waters. Further otter-trawl coverage of the western English Channel was completed by France, with these survey data now in DATRAS.

Further adjustments to the proposed new survey trawl were agreed, with intersessional work undertaken over 2024. The gears plans in the current report are likely to be subject to further, minor modifications, and should be finalised in the coming year.

The increase in the numbers of offshore infrastructure projects (e.g. windfarms) and number and extent of protected areas is impacting on the sites that can be sampled effectively by trawl surveys operating in many areas.

IBTSWG also met online with various data users, including relevant stock assessment groups, to present summaries of relevant surveys.

ii Expert group information

Expert group name	International Bottom Trawl Survey Working Group (IBTSWG)
Expert group cycle	Multiannual fixed term
Year cycle started	2022
Reporting year in cycle	3/3
Chair(s)	Pia Schuchert, United Kingdom
	Jim Ellis, United Kingdom
Meeting venue(s) and dates	4-8 April 2022, online meeting
	27-31 March 2023, Lysekil, Sweden
	8-12 April 2024, online meeting

1 Introduction

1.1 Background

ICES' International Bottom Trawl Survey Working Group (IBTSWG) has its origins in the North Sea (Subarea 4), and the Skagerrak and Kattegat (Division 3.a), where coordinated surveys have occurred since 1965. Whilst there have been surveys in various quarters, the coordinated surveys in the North Sea are currently conducted in Q1 (NS-IBTS-Q1) and Q3 (NS-IBTS-Q3), and these provide the best time-series data. The Q1 survey also extends into the eastern parts of the eastern Channel (Division 7.d; roundfish area 10). For more details of the history of the survey, see Heessen *et al.* (1997) and ICES (2020).

The IBTSWG assumed responsibility for coordinating trawl surveys in North-eastern Atlantic European seas (ICES Subareas 6–9) in 1994. The different ground types sampled in these areas has resulted in survey-specific trawl gears.

In addition to survey coordination and the annual meetings of IBTSWG, the group also edits the relevant survey manuals, which provide further information on the surveys, sampling protocols and history of the surveys. These manuals cover the North Sea IBTS (ICES, 2020) and the North-eastern Atlantic (ICES, 2017).

1.2 Terms of Reference (ToRs)

The ToRs for IBTSWG for the period 2022–2024 were:

a) Coordination and reporting of North Sea and North-eastern Atlantic bottom trawl surveys, including appropriate field sampling in accordance with the EU Data Collection Framework. Review and update (where necessary) IBTS survey manuals in order to achieve additional updates and improvements in survey design and standardization. (ACOM).

b) Address DATRAS-related topics in cooperation with DGG: data quality checks and the progress in re-uploading corrected datasets, quality checks of indices calculated, and prioritizing further developments in DATRAS. (ACOM).

c) Develop a new survey trawl gear package to replace the existing standard survey trawl GOV. (SCICOM)

d) Evaluate the current survey design and explore modifications or alternative survey designs, identifying any potential benefits and drawbacks with respect to spatial distribution and frequency of sampling. Consider the effects of enforced changes in the distribution of survey stations (e.g. in relation to MPAs and offshore industries). Explore potential additional data collection, e.g. stomach sampling and tagging (SCICOM) and engage with the Workshop on Pilot North Sea Fisheries Independent Regional Observation (WKPilot NS-FIRMOG).

e) Making data from IBTS available to be used by different ICES end-users, such as assessment groups, OSPAR and others. Establish a communication with end user groups as to the needs of the users and the data available within DATRAS. Collate a user document that outlines the important caveats in the data with regards to non-target species (e.g. when a non-target species was first recorded as a species, the confidence in sampling). Establish a continued working relationship between user groups and survey group.

During 2024, IBTSWG met online (Figure 1.1), with the participants list provided in Annex 1. Full details of the resolutions are provided in Annex 2. ICES have recently developed alphanumeric codes for the various surveys used in ICES assessments and advice, and the relevant codes for those surveys conducted under the auspices of IBTSWG are provided in Annex 3.

This is the third report produced during the current triennium, following the information provided in ICES (2022b) and ICES (2023).

Figure 1.1. IBTSWG meeting online during the 2024 meeting.

1.3 Format of the report

The survey summaries and planning coordination (ToR a) are provided in Section 2, with more details on the surveys also provided for the North Sea IBTS Q1 (Annex 4), North Sea IBTS Q3 (Annex 5) and North-eastern Atlantic surveys (Annex 6).

DATRAS-related topics, including data quality (ToR b), are addressed in Section 3. Following on from the previous Workshop on the Further Development of the New IBTS Gear (WKFDNG), which was held in November 2021 (see ICES, 2022a), additional discussions on the new trawl (including online meetings held inter-sessionally, and recent sea-going trials, the descriptions of the proposed new survey trawl are associated rigging are provided in Section 4 (Tor c).

Relevant aspects of survey design, including additional data collection (ToR d), are addressed in Section 5, with the communication with user groups (ToR e) summarised in Section 6.

1.4 Work conducted in the current triennium (2022–2024)

IBTSWG has produced annual reports in each of the reporting years of the triennium (ICES, 2022b, 2023). A summary of the work undertaken by the IBSTWG, and the main outputs are summarised here:

- Coordination of bottom trawl surveys in European seas of ICES Division 3.a and Subareas 4 and 6–9, including the collection of data used my multiple stock assessment groups.
- Substantial progress towards introducing a new survey trawl for the IBTS in the North Sea.
- Discussion of additional biological data collection to contribute to wider understanding of the ecosystem, including parasites of cod and haddock, stomach contents, and scientific work conducted using data collected on the surveys coordinated by IBTSWG.
- Improved communication and exchange with other ICES Expert Groups, including assessment working groups.

1.5 Survey manuals

The current survey manuals for the IBTS in the North Sea (ICES, 2020) and North Eastern Atlantic (ICES, 2017) have not been updated in the most recent triennium. Given that the new survey trawl being developed for use in the North Sea (which would also likely be used in some North-East Atlantic survey areas), is close to being agreed, IBTSWG decided that it would be appropriate to update the manuals once the new trawl has been introduced. With regard to the North-East Atlantic surveys, it was decided to wait as there are currently a number of new survey vessels being introduced.

1.6 Forward look

The proposed ToRs for the next triennium of IBTSWG were drafted during the meeting and these will be available for the Ecosystem Observation Steering Group (EOSG) when finalising Expert Group Resolutions.

In the next triennium, IBTSWG agreed to hold physical meetings in 2025 and 2027, and to meet online in 2026. IBTSWG supports the incoming chairs being Patrik Börjesson (SLU Aqua, Sweden) and David Stokes (Marine Institute, Ireland). IBTSWG agreed that the next meeting should be 4-days, held from 1–4 April 2025 in Northern Ireland.

1.7 Acknowledgements to IBTSWG members

IBTSWG would like to extend their grateful thanks to Barbara Bland (Sweden) for her valuable contributions to IBTSWG over the years and wish her a very happy retirement.

During the editing of this report, IBTSWG was informed that Yves Vérin, who had been the survey leader on IFREMER's Q1 North Sea IBTS and member of IBTSWG for many years, had sadly passed away. IBTSWG take this opportunity to express their condolences to Yves' family and friends, and to remember his friendship and sustained input to IBTSWG over the years.

2 Coordination of North Sea and North-eastern Atlantic surveys

2.1 Introduction

This section of the report, which addresses ToR (a), provides short summaries on the most recent surveys undertaken under the auspices and coordination of IBTSWG. More detailed information is provided in the Annexes for the North Sea IBTS-Q1 (Annex 4), North Sea IBTS-Q3 (Annex 5) and North-eastern Atlantic (Annex 6), with the distribution plots of key stocks shown in Annex 8.

2.2 Summary report of the North Sea IBTS Q1

2.2.1 General overview

The North Sea IBTS Q1 survey aims to collect data on the distribution, relative abundance and biological information on a range of fish species in ICES Subarea 4 and Divisions 3.a and 7.d. During daytime, the GOV (Grand Ouverture Verticale) bottom trawl with standard groundgear A for normal bottom conditions, or groundgear B for rough ground (Scotland in Division 4.a only), was used to sample fish, with age data collected for the target species (cod, haddock, whiting, saithe, Norway pout, herring, mackerel, and sprat) and a number of additional species (see Annex 4). A CTD was deployed at most trawl stations to collect temperature and salinity profiles. Herring larvae were sampled with a MIK-net (Methot Isaac Kitt) during the night.

In 2024, there were six participating vessels in the Q1 survey, namely “Dana” (26D4, Denmark), “GO Sars” (58G2, Norway), “Scotia” (748S, Scotland), “Thalassa” (35HT, France), “Tridens II” (64T2, Netherlands) and “Svea” (77SE, Sweden). Germany used the Danish vessel “Dana”, due to mechanical issues with their own vessel.

The survey covered the period 12 January to 22 February 2024. Denmark started earlier with their survey then in previous years, to allow Germany to use the “Dana” as well.

A total of 351 GOV hauls (341 valid and 10 invalid) were uploaded to DATRAS and 585 MIK hauls (two of which were invalid) were deployed and uploaded to the eggs and larvae database. Most rectangles were fished at least once this year, the majority being fished with two hauls as planned. One rectangle, 50E7, was not covered at all.

Germany informed the coordinator and Q1 participants in advance of the survey that they were unable to use their own research vessel and were going to use the “Dana”, but that would result in a reduced number of days at sea. In anticipation of that, some of the German stations were allocated to other countries to cover in case time would allow. Some of these stations have been covered.

For more detailed information for the Q1 surveys conducted in 2024, see Annex 4.

2.2.2 Highlights from the 2024 Q1 surveys

- For the target species of which age-1 indices used to be reported (herring, sprat, cod, whiting, haddock, Norway pout, mackerel), very low numbers of age-1 fish were caught. Sprat had an average (1980–2023) preliminary age-1 index, while the other species all had one of the lowest preliminary indices in the time-series since 1980.
- Two named storms passed over the North Sea in the period vessels were or were planned to be at sea. This was followed by two weeks with, at least in the southern North Sea, very rough weather that resulting in fishing on the edge of what would be deemed operable conditions.
- The rough weather conditions hampered speed of steaming between stations creating the dilemma 1) do we fish the maximum number of stations putting stations at ~10 nm apart, 2) reduce the number of stations but sample stations randomly in the rectangles. Both options were used by individual cruise leaders.
- The German vessel "Walther Herwig III" (06NI) wasn't available due to technical issue. Therefore, the Germans used the Danish vessel "Dana". This resulted in a shift in survey timing of the Danish survey and reduced the days at sea for the German survey. This was the reason for the reasonably large number of rectangles only covered once.
- Wind farms, specifically the large UK windfarms on the Dogger Bank, cause serious parts of previously sampled areas to be no longer available for trawl survey coverage. A similar issue was raised about the increased fishing with static gears along the English coast making areas unavailable for trawling activities. Currently, the surveys were still allowed in some of the areas closed for fishing activities (MPA, SAC, SPA etc.), but concerns were raised about the recently implemented German areas for which it is being considered to close them also for research trawling.
- France encountered challenges performing hauls in two ICES rectangles (35F0 and 36F0) due to the presence of static gears on the sea bottom (lobster traps, etc.). It seems these kinds of gear will be used more routinely in the coming years. Consequently, France had to trawl closer to the ICES borders, which is not optimal.
- Diet data (stomachs) were collected following the updated-five-year rolling scheme that was initiated as part of the EU-MAP obligations by the EU. These were also collected by the non-EU countries Norway and Scotland.
- The Netherlands was not able to use the Seabird CTD for downcast on each GOV, although a Valeport CTD, with a lower detail, was used instead.

2.2.3 Issues arising from the 2024 Q1 surveys

During NS-IBTS Q1 2024, France encountered challenges performing hauls in two ICES rectangles (35F0 and 36F0) due to the presence of static gears on the sea bottom (lobster traps, etc.). It seems this kind of gear will be used routinely in the coming years by fishermen. For technical reasons, the captain may disagree to trawl in these areas, also because static gears cannot be detected with echosounders. As a consequence, France had to trawl closer to the ICES borders, which is not optimal. To address this issue in the future, France will try to get spatial polygons where these gears are located, in order to find alternative sampling stations in these ICES rectangles. In the general context where the different countries have difficulties to find alternative sampling stations, France will ask for a supplementary sea day to allow prospections in order to create new haul stations (in 2025 and 2026 in the southern North Sea).

In certain areas, sets of stations were undertaken in groups relatively close together (specifically by the Scottish) due to poor weather combined with restricted available survey time in that area, slow vessel transect speeds, and a requirement to use only known trawl sites due to fishing gear limitations. Though suboptimal this avoided dropping rectangles from the survey in sectors where full coverage of assigned rectangles was essential. IBTSWG participants will always try to avoid making such squares during surveys, but until we can move away from having to use more-or-less ‘tried and tested’ stations only (requiring a more suitable gear than the current GOV), it may be difficult to always completely circumvent this.

2.2.4 Planning and coordination

For 2025, all participants indicated to be part of the survey again and as the situation currently is they all plan to use their own national vessel. The start dates of the national surveys are therefore likely to be very similar as in previous years. The spatial distribution of the stations is changed in 43F3 and 38F7. Due to an installed German area closed for fisheries, only positions on the most southern part of rectangle 38F3 are left for fishing. These are too far off the track of Denmark. Therefore, Denmark proposed a swap with Germany. Germany will do both stations in 38F7, and Denmark will cover the station originally assigned to Germany in 43F3 (Figure 2.1).

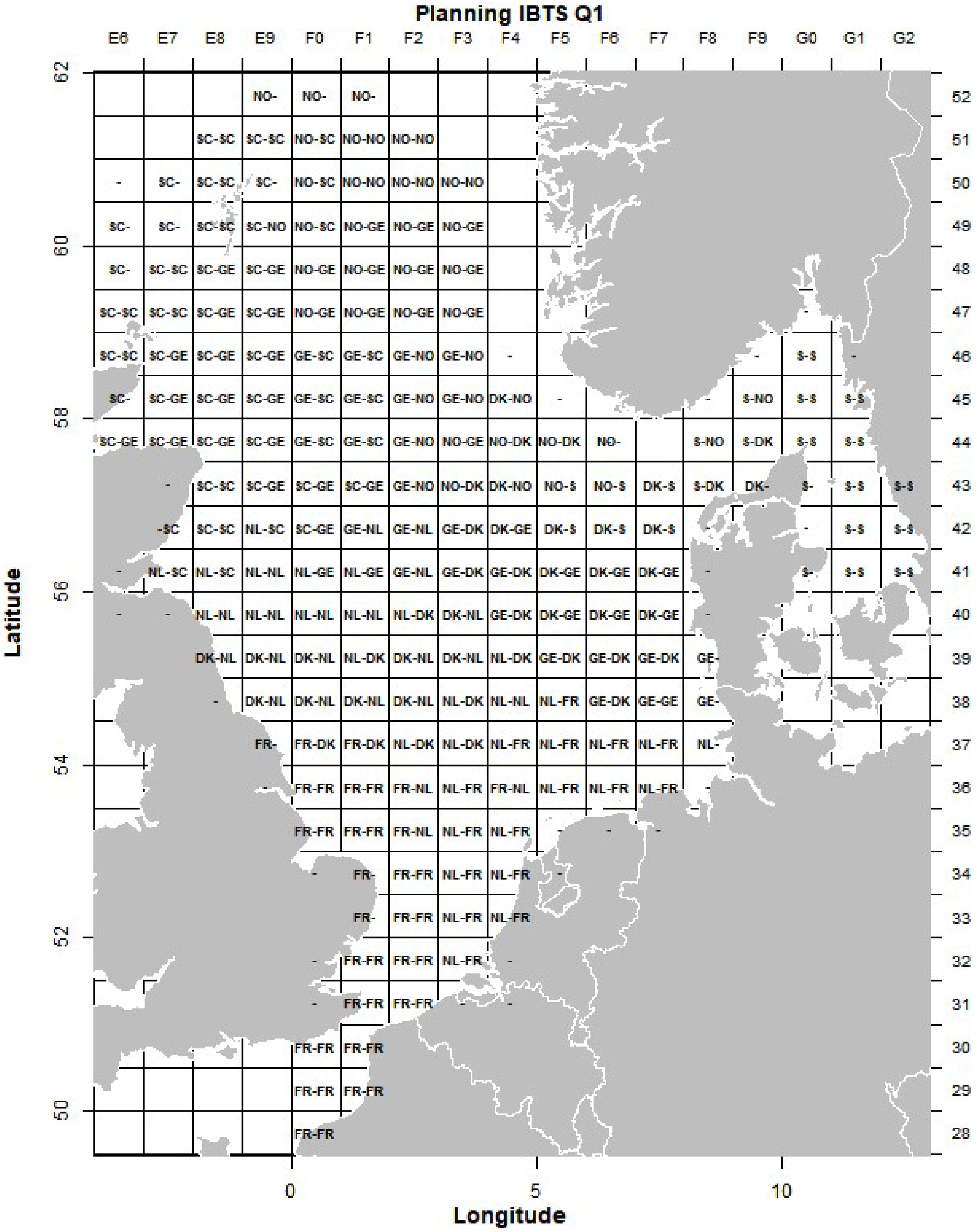


Figure 2.1. Allocation map for Q1 2025.

2.3 Summary report of the North Sea Q3 IBTS

2.3.1 General overview

The North Sea IBTS Q3 survey aims to collect data on the distribution, relative abundance, and biological information on a range of fish species in ICES Division 3.a and Subarea 4. The bottom trawl, GOV (Grand Ouverture Verticale) with standard ground gear A for normal bottom conditions or ground gear B for rough ground (Scotland in Division 4.a only) is used during daytime. A CTD was deployed at most trawl stations to collect temperature and salinity profiles. Age and individual fish data were collected for the standard species (herring, sprat, cod, haddock, whiting, saithe, Norway pout, mackerel and plaice) and for a number of additional species.

Six nations participated in the Quarter 3 survey in 2023. The overall survey period extended from 18 July to 4 September. In this period, 339 valid GOV hauls were conducted. All rectangles except one allocated to the survey area were covered by at least one GOV haul. The total number of tows was still among the highest achieved in the past six years and average tow duration did not further decrease (Figure 2.2). A detailed report for the survey in 3Q 2023 is be found in Annex 5.

Figure 2.2. Mean tow duration and total number of valid tows in the 3rd quarter NS-IBTS (1991-1997: standard tow duration of 30 min adopted by all countries first in 1998; 2009: no participation of Norway, 2015-2016: 50 % of the tows in area 4 planned as 15 min tows).

2.3.2 Highlights from the 2023 Q3 surveys

- Due to technical issues, one rectangle was not covered by a valid tow. Other rectangles with only one haul were rectangles that are largely covered by land, or other obstructions made it impossible to find tracks which are fishable with the GOV;
- 25 tows (8.6 %) reported as valid to DATRAS were shorter than 25 minutes. Minimum tow duration was 14 min, and most of these tows had a duration between 15 and 20 min. In most cases, the reduced tow duration was due to limited space due to safety distance rules from an increasing number of obstructions (e.g. cables and pipelines) or rough bottom conditions and a lack of alternative tracks;
- In contrast to the past two years, no mass occurrence of bryozoans (*Electra* cf. *pilosa*) was observed;
- Compared to the other countries, Sweden and in particular Norway reported relative low values for vertical net opening below the lower theoretical limits. Considering the differences between countries and changes over timer it appears advisable that a vessel/country effect is included in modelling abundance indices for pelagic species such as mackerel;
- Stomach content data and samples were collected according to five-year rolling scheme initiated under the EU DCF. Both, EU and non-EU countries participated in the sampling;
- Southern species such as anchovy, sardine and striped red mullet were observed again but in lower quantities than in the last year. The occurrence of 0-group fish of these species indicates that spawning areas have been established or re-established in the southern North Sea. However, a quantitative analysis on this considering a potential impact of relative high bottom temperatures is so far missing;
- Abundance of 0-group cod and haddock was considerably lower than in the previous year.

2.3.3 Issues arising from the 2023 Q3 surveys

No issues reported.

2.3.4 Planning and coordination

All regularly contributing countries intend to participate in the 2024-Q3 North Sea IBTS survey program. Below is a table showing the expected survey dates for each country for this year.

Denmark	"Dana"	22 August to 9 September
England	"Cefas Endeavour"	2 August to 31 August
Germany	"Walther Herwig III"	15 July to 12 August (combined with national survey)
Norway	"G.O. Sars"	24 July to 14 August
Scotland	"Scotia"	16 August to 6 September
Sweden	"Svea"	20 August to 1 September

The actual rectangle allocation to the countries is show in Figure 2.3. Country-specific maps (and allocation to rectangle base files) as well as information on additional sampling requests will be distributed to the participants in the international survey program by the coordinator at latest in early June.

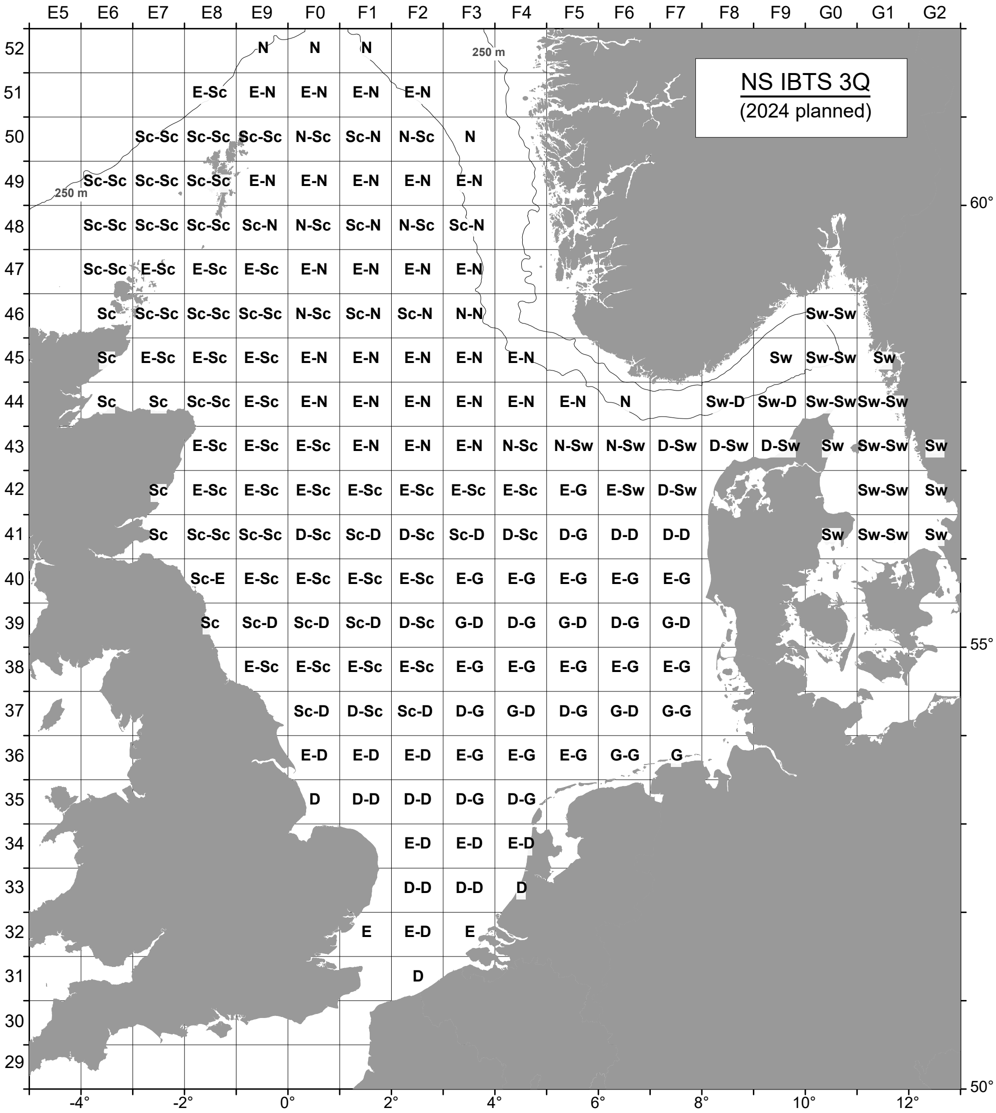


Figure 2.3. Rectangle allocation by country for the North Sea IBTS in 3Q 2024 (D: Denmark, E: England, G: Germany, N: Norway, Sc: Scotland, Sw: Sweden).

Deadlines for data submission to DATRAS are set to 10 October 2024 for preliminary data and 1 March 2025 for the final complete submission.

2.4 Summary report of the North-eastern Atlantic IBTS

2.4.1 General overview

In 2023, seven vessels from six nations performed 15 surveys in the North-eastern Atlantic (NEA) IBTS area. A total of 1170 valid hauls, out of the 1270 hauls planned, were accomplished over 347 days, and these were distributed across all quarters of 2023 (see Annex 6).

The Portuguese research vessel was once again impacted by vessel and contractual issues that resulted in the PT-PGFS-Q4 commencing over a month later than was planned and, once underway, was only able to successfully complete 54 of the planned 96 stations before having to return to port.

The NIGFS-Q4 also experienced serious disruption due to a failure to install a new ballast water treatment system aboard "Corystes" that resulted in the vessel being refused access to those survey stations located within the Irish EEZ. This accounted for around 40% of all the surveyed stations for this survey, including a high proportion of those considered important for both haddock and whiting. This issue has still not been addressed and the Q1 2024 survey has consequently suffered the same issues. This is a real concern for the relevant end user for the data provided by this survey which is WGCSE.

All other surveys were completed without serious or significant incident.

Four surveys (Scotland, Spain, Northern Ireland and Ireland) were undertaken during Q1 in February and March, with the Irish anglerfish survey once again extending into April. Scotland, France and Spain were active during Q3, with the Rockall haddock survey taking place alongside the Western Channel, Porcupine Bank and the Northern Spanish Coast shelf surveys. Portugal, France, Northern Ireland, Ireland, Scotland and Spain were all active during Q4.

Survey programme highlights as well as the planned survey dates for the NEA survey programme in 2024 are summarised below, with a more comprehensive account of the 2023 survey activities and the individual survey reports provided in Annex 6.

2.4.2 Highlights and issues

- The aforementioned issues experienced by the Portuguese vessel during the Q4 survey are extremely unfortunate and are on the back of those encountered during the same survey in 2022 and resulting in a very similar outcome, this time with less than 60% of the planned trawl stations completed during the 2023 survey. The southwestern region again bore the brunt regarding loss of areal coverage. In addition, it has been announced that from 2024 Portugal plans to merge the PT-PGFS-Q4 survey with the Q4 Nephrops TV survey. This will extend the survey duration by approximately two weeks (to approx. 45 days) as well as adding approximately 24 trawl deployments to the current survey plan. Intersessional work to continue on delivery of a new abundance indices although this will almost certainly be further hampered by the significant disruption encountered during the last 2 years since the arrival of the "Mario Ruivo".
- The ballast water tank issue encountered during the NIGFS-Q4 is of particular concern due to the relatively high importance of the stations that are affected and the likely impact on the assessment process for haddock and whiting in Division 7.a. Only 61% of the trawl stations were completed whilst the survey duration was consequently reduced by almost 50%. WGCSE are aware and IBTSWG has also been informed that this issue was also encountered during the NIGFS-Q1 2024 which is very concerning.
- From 2024-Q1, Northern Ireland has reduced the remaining 1-hour (3 nm) Q1 trawl stations down to 20 mins (1 nm), thereby standardising distance/duration with the other Q1 trawl stations as well as with those undertaken during the Q4 survey where all stations

are 20 minutes. Preliminary comparative abundance plots were presented to IBTSWG and, at first glance, there appeared to be little or no impact on the number of species encountered. IBTSWG, however, would encourage further work being undertaken to investigate potential impacts on catchability of target species.

- The Western part of the French Channel Groundfish Survey (FR-WCGFS) can now be formally welcomed into the NEA survey list within IBTSWG and with the survey data now being available to upload to DATRAS. The complete survey time series (2018–2023) is expected to be uploaded before the end of the year.
- The EVHOE survey in Q4 once again experienced exceptionally challenging weather that impacted the first half of the survey and particularly around the Bay of Biscay strata and together with trawl damage resulted in a loss of four survey days. The greatest impact was felt within the deeper strata and especially in the southern part of the Bay of Biscay. Eight stations were either cancelled or rendered invalid due to various factors, including obstacles encountered on the bottom, large catches of unwanted species such as boarfish. Several stations remained unfished due to longliners that prevented access to several stations. Because the deeper strata were disproportionately affected it was noted that this may impact the overall size distribution for certain species as the larger individuals are often encountered at greater depth and therefore the dataset resulting from this survey may not be representative for some of the deeper water species.
- Generally negative trends reported across the board within Subareas 6 and 7 for most if not all of the target gadoid species and pretty much all are also well below their long term average estimates. In 2023, for the first time in the survey the IE-IGFS-Q4 caught no cod in Division 6.a.
- Similar issues common to several surveys were raised regarding the additional time required in planning surveys and specifically around re-allocating trawl stations in order to avoid marine cables, MPA's and SAC's etc and this is in addition to disruption encountered whilst on survey due to wind farms and also static gear. In addition, processing times for Diplomatic Clearance applications within the post-Brexit era is also proving to be an especially onerous and protracted process. These issues are not in any way unique to the NEA surveys, however their impact is being felt far more acutely now within several NEA surveys and this of course also feeds into the broader discussions taking place within IBTSWG around the shrinking areas now available for trawl surveys and the influence, if any, that groups such as IBTSWG have in pushing back against some of these restrictions.

2.4.3 Planning and Coordination

The expected dates for the NEA IBTS surveys taking place in 2024 are shown in Table 2.1.

Table 2.1. Provisional/realised dates for 2024 NEA surveys and any planned intercalibration.

Survey	Code	Starting	Ending	Expected hauls	Planned Inter-cal.
UK-Scotland West (spring)	UK-SCOWCGFS-Q1	15/02/2024	08/03/2024	62	-
UK-Scotland Rockall	UK-SCOROC-Q3	10/09/2024	23/09/2024	40	-
UK-Scotland West (au-tumn)	UK-SCOWCGFS-Q4	03/11/2024	26/11/2024	60	-
UK-North Ireland (spring)	UK-NIGFS-Q1	29/02/2024	22/03/2024	60	-
UK-North Ireland (autumn)	UK-NIGFS-Q4	07/10/2024	24/10/2024	60	-
Ireland - Anglerfish Survey 7.bcjk	IE-IAMS-Q1	08/02/2024	03/03/2024	45	-
Ireland - Anglerfish Survey 6.a	IE-IAMS-Q2	12/04/2024	21/04/2024	40	-
Ireland - Groundfish Sur-vey	IE-IGFS-Q4	01/11/2024	17/12/2024	170	-
France – EVHOE	FR-EVHOE-Q4	22/10/2024	05/12/2024	155	-
France - Eastern Channel	FR-CGFS-Q4	01/10/2024	16/10/2024	74	-
France - Western Channel	FR-WCGFS-Q3	16/09/2024	29/09/2024	48	-
Spain – Porcupine	SP-PORC-Q3	08/09/2024	14/10/2024	80	-
Spain - North Coast	SP-NSGFS-Q4	20/09/2024	24/10/2024	116	-
Spain - Gulf of Cádiz (spring)	SP-GCGFS-Q1	26/02/2024	10/03/2024	45	-
Spain - Gulf of Cádiz (au-tumn)	SP-GCGFS-Q4	29/10/2024	11/11/2024	45	-
Portugal (autumn)	PT-PGFS-Q4	24/09/2024	02/11/2024	96+24	-

3 DATRAS and related topics on data quality

3.1 Introduction

This section of the report provides information on updates to DATRAS and any issues relating to data quality. This report section addresses ToR (b).

3.2 Data comparison tool updates

The DATRAS team introduced the data version comparison release to the group. The primary objective of this release is to enhance the user experience for data submitters, stock coordinators, and stock assessors by providing timely notifications and easy access to changes made to submitted data.

It emphasized the importance of notifying Working Group/Expert Group members about any alterations in data, ensuring transparency and accuracy in the assessment process. To receive notifications, users need to register at the notification page (Figure 3.1) and provide the criteria on which they want email alerts.

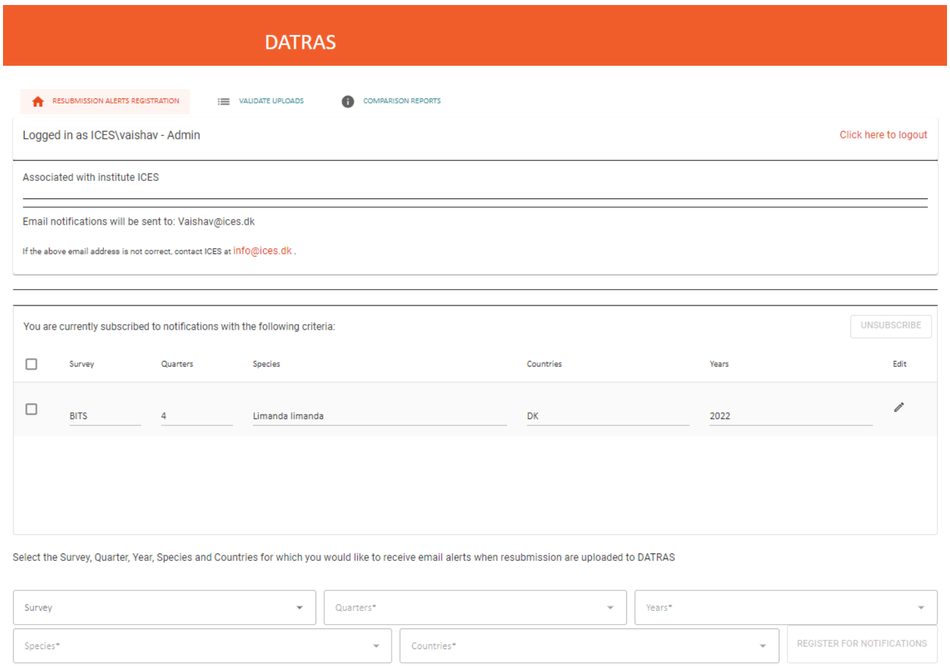


Figure 3.1. Screen shot of the notifications page

The process flow shown in Figure 3.2 indicates the steps through which notifications are sent out to different data user groups.

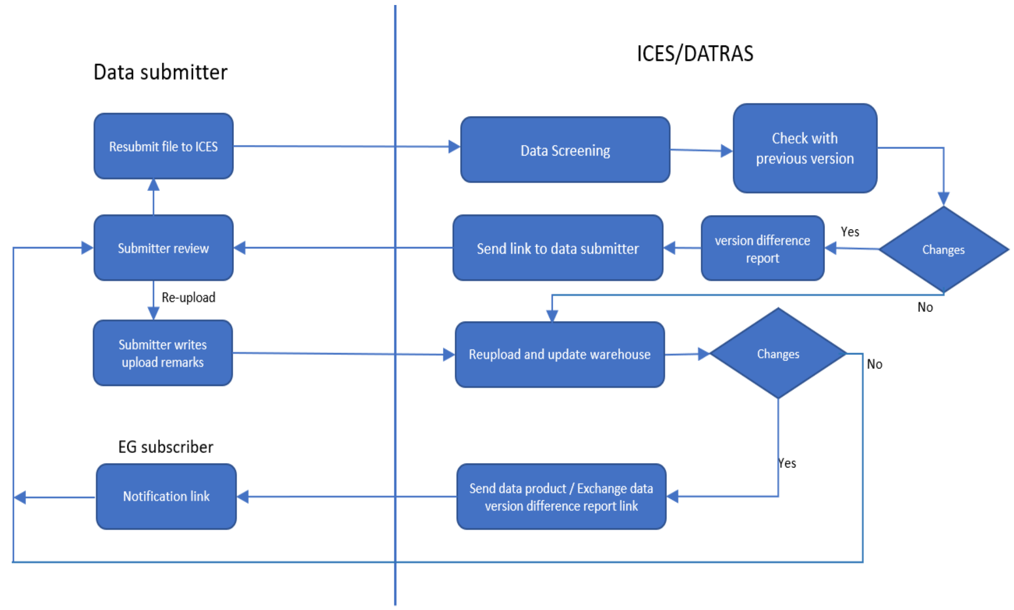
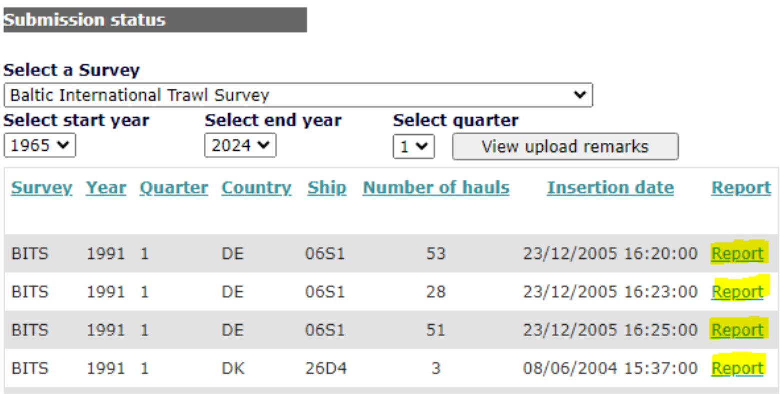


Figure 3.2. Flow diagram showing how the notification process works for when data are amended.

The data comparison tool has been operational since the first quarter of 2024 and is accessible via the link https://datras.ices.dk/DATRASApp. Additionally, there is a direct link from the submission status page of DATRAS (Figure 3.3).



Submission status

Select a Survey
Baltic International Trawl Survey

Select start year 1965 **Select end year** 2024 **Select quarter** 1 View upload remarks

Survey	Year	Quarter	Country	Ship	Number of hauls	Insertion date	Report
BITS	1991	1	DE	06S1	53	23/12/2005 16:20:00	Report
BITS	1991	1	DE	06S1	28	23/12/2005 16:23:00	Report
BITS	1991	1	DE	06S1	51	23/12/2005 16:25:00	Report
BITS	1991	1	DK	26D4	3	08/06/2004 15:37:00	Report

Figure 3.3. Screen shot of the submission status page.

The data compare tool (see also Figure 3.4) provides data submitters with immediate email/web notifications after data uploads, to stay informed about changes in their file. Additionally, users can access detailed reports comparing the most recent five versions or more over a one-year period, facilitating comprehensive analysis. The tool also offers PDF download options. Subscribed users receive a report when the data warehouse is updated in the nightly routine. Email notifications are only received if any changes are found in their selection criteria.

By incorporating selected fields such as HH, HL, and CA, and fields which included are crucial in the CPUE and Indices products, DATRAS aim to streamline the checking process. Moreover, the drill-down option provides users with a more detailed view for specific checks, enhancing data. The inclusion of chart functionalities further simplifies the visualization of changes, and the plan is to improve further.

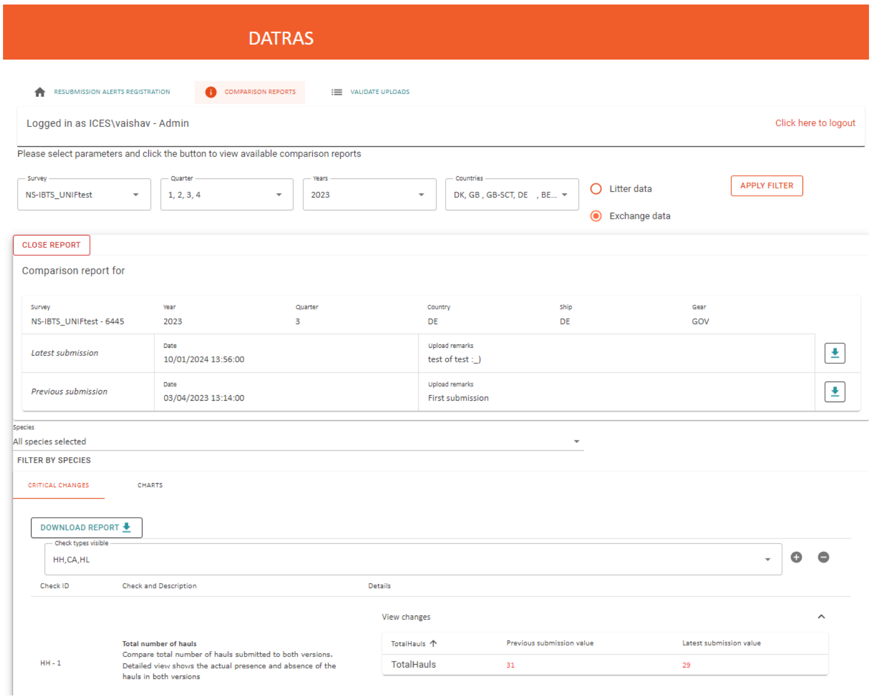


Figure 3.4. Screen shot of the comparison reports page.

In the DATRAS subgroup during the meeting, the data comparison tool was evaluated and feedback sought on different checks and its usability. Test files were provided to individual submitters for testing the system. Full list of checks is available in the presentation IBTSWG2024_DATRAS.pptx.

Unified format Header Harmonization (DATRAS-Acoustic) Update

The DATRAS team provided an update on the ongoing task of header harmonization, as outlined in Issue #21 on our GitHub repository. Implementation Timeline of header harmonization effort is currently in progress and is scheduled for completion in Q3 of 2024. We anticipate opening submissions for review and feedback in 2024 Q4.

Implications for Screening Procedure and Format:

As part of this harmonization process, there are significant implications for the screening procedure and data format, information about Unified Checks, Mandatory Fields and Range Standardization for unified format will be the next step towards header harmonisation task.

3.3 Outcome of the intersessional group on CatCatchWgt reporting issues in DATRAS

The intersessional group (IG) met on the 15th of September 2023 to:

1) review the field specifications of the DATRAS format, of which the ambiguity had likely led to some of the documented issues (see relevant WD provided in ICES, 2023), and,

2) draft recommendations for bringing the existing issues to the attention of potential users.

Following first contact with the working group on DATRAS governance (WGDG), these were formalized and summarized in a validation and clarification request addressed to WGDG.

Regarding the first objective, particular attention was paid to the clarification and harmonisation of specifications for the ambiguous fields listed in the WD presented to IBTSWG 2023 (ICES, 2023): CatCatchWgt, TotalNo, NoMeas and HlNoAtLngt, in particular the description of their aggregation levels. Recommendations were also drafted for clarification of whether some fields indicated intended of realized characteristics of the station (e.g. quarter, statRec), and to document missing dataType "P", among others.

The IG further drafted a generic warning that should be displayed on data download, and discussed ways this should be brought to the users' attention. For the web frontend, it should at least be shipped with the data (in the disclaimer or elsewhere), while for the icesDatras package, warnings should be implemented at package loading and/or data download. It was further suggested that access to the faulty fields could be made temporarily unavailable by default (and optionally requested), until full corrections were made. It was further mentioned during the meeting that the original CatCatchWgt values should be kept in a way or another (with possibly corrected values in a new field), so that later improvements of (or customed) correction methods can be re-applied.

These recommendations were reviewed by WGDG. The unified format descriptions (https://www.ices.dk/data/data-portals/Pages/DATRAS_format_description.aspx) were updated based on their feedback. Generic warnings, pointing to the "DATRAS news and update page" – where known outstanding data issues are listed and documented, were added to the disclaimer (frontend) and are being implemented on loading of the icesDatras R-package.

As of April 2024, the issues with reported CatCatchWgt in DATRAS were yet to be fully addressed.

4 Gear-related topics and the new survey trawl

4.1 Introduction

There have been longer-term discussions regarding trawl design for many of the surveys undertaken under the auspices of IBTSWG. For example, from 2000 there was an IBTS TOR to address the acknowledged ongoing difficulty in expanding IBTS co-ordination into the Atlantic area. This was due to the fragility and selection characteristics of the recommended trawl (the GOV 36/47) for the target area and species. Consequently, in the early 2000s, the Study Group on Survey Trawl Gear for the IBTS Western and Southern Areas (SGSTG; ICES, 2003, 2004) and the subsequent Study Group on Survey Trawl Standardisation (SGSTS; ICES, 2005, 2006, 2007, 2008, 2009) highlighted the need for a survey trawl that was more robust than the GOV trawl as used in the North Sea. In addition, a number of significant inconsistencies in the GOV trawl plan and its interpretation were identified.

Whilst initial work on this topic was established as a TOR for the North-eastern Atlantic surveys, the NS-IBTS has subsequently seen a need to extend survey coverage to the north-western parts of the Subarea 4, in areas where the standard GOV is prone to damage, and there is increased interest in sampling other coarse ground areas which may be important habitats for some target species. Furthermore, many participants in the NS-IBTS are finding it increasingly difficult to source spare materials for the GOV trawl, necessitating some nations to change netting materials etc.

The IBTSWG has recognised the need to correct and modernize the design to produce a more robust trawl for survey work, and this led to two recent ICES workshops, namely the Workshop on Impacts of planned changes in the North Sea IBTS (WKNSIMP; ICES, 2019) and the Workshop on the Further Development of the New IBTS Gear (WKFDNG; ICES, 2022).

The IBTSWG made progress in agreeing many elements of the new survey trawl during the 2022 and 2023 meetings, with additional intersessional work. Following successful sea trials, meetings were undertaken in the subsequent months, primarily to refine the plans and account for several of the design features that had been developed by the Marine Institute and experts for the trawl they had been developing.

There were various gear trials using the revised new trawl over the last 12 months, and the observations from these studies are provided below.

It should also be noted that there were also some online meetings of the IBTSWG gear subgroup in the months following the meeting, and the outcomes of these meetings are included here.

Given that the gears are being trialled, and modifications still being made, members of IBTSWG plan to update the gear drawings that are shown in the current chapter in time for the 2025 meeting. The most up-to-date drawings will be stored on SharePoint as and when they become available.

4.2 Latest gear plans for the survey trawl being developed (full-scale version)

Since the last IBTSWG (2023) a number of virtual meetings were held to refine the new trawl specification (see Figure 4.1 to Figure 4.6 for the most current gear plans (Version 5), noting that minor modifications may be made for the final plans), mostly focusing on the trawl net plan.

During meetings (2023–2024) of the IBTS new survey gear sub-group, further discussions were held on strengthening, such as guard meshes and tearing strips. It was suggested the current design given in Figure 4.1 should be considered the maximum required to construct a robust trawl. However, it was agreed the incorporation of strengthening would be left to national preference, depending on the grounds fished and risk of damage (as well as reducing costs when strengthening is not required). The group agreed incorporating 3 to 6 meshes deep of double twine of the same mesh size would not compromise catchability or selectivity.

The group further reiterated the mesh sizes of all netting panels must be checked when supplied and monitored to assess netting panel shrinkage using the Omega gauge. This will ensure the netting is not suffering significant dimensional change, such as shrinkage, which is common in braided twines used in demersal trawls due to sand ingress into the twine braid. It will be particularly important for the proposed net, as the different panels and twines to be used means that there is the potential for different shrinkage rates. Regular measuring of the length of both the upper and lower panels, especially the first belly panel and corresponding upper panel, is recommended.

During the meetings held in 2024 it was agreed twine runnage in the original net design was too fixed and an appropriate range of materials should be allowed. The consensus was there is a clear boundary (Figure 4.1) where a stronger twine is required for the front part of the trawl and a lighter twine to the rear of this line. The group have put out a call for suggested materials from IBTS participants' local net makers to help define what the runnage ranges should be for the two areas of the trawl, and are looking for returns in the summer of 2024. Deviation from the twines would need to minimise difference in the runnage, and will be specified in the final gear drawings, along with guidance on the scale of deviation that would be acceptable.

The group agreed the flotation package needed further investigation to assess if further reductions from 138 x 200 mm floats is possible without compromising the required headline height (ca. 4.5–5 m).

It should be noted the trawl door, backstrop extension and wire pennants shown in Figure 4.6 are specific to the UK Scotland survey vessel "Scotia" and may/will differ for other national survey vessels.

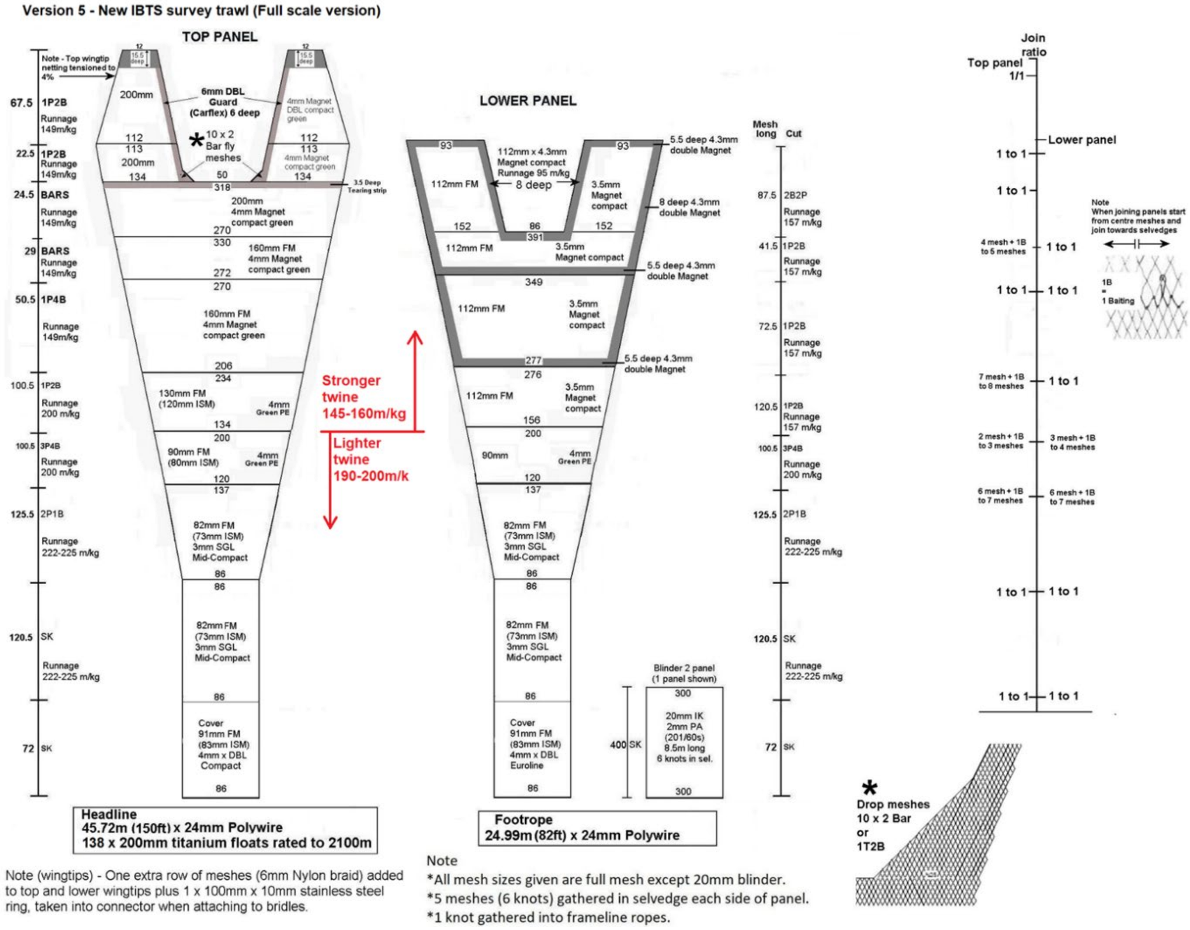


Figure 4.1. Net plan for the developed survey trawl (full-scale version). Version 5 of 17 May 2024.

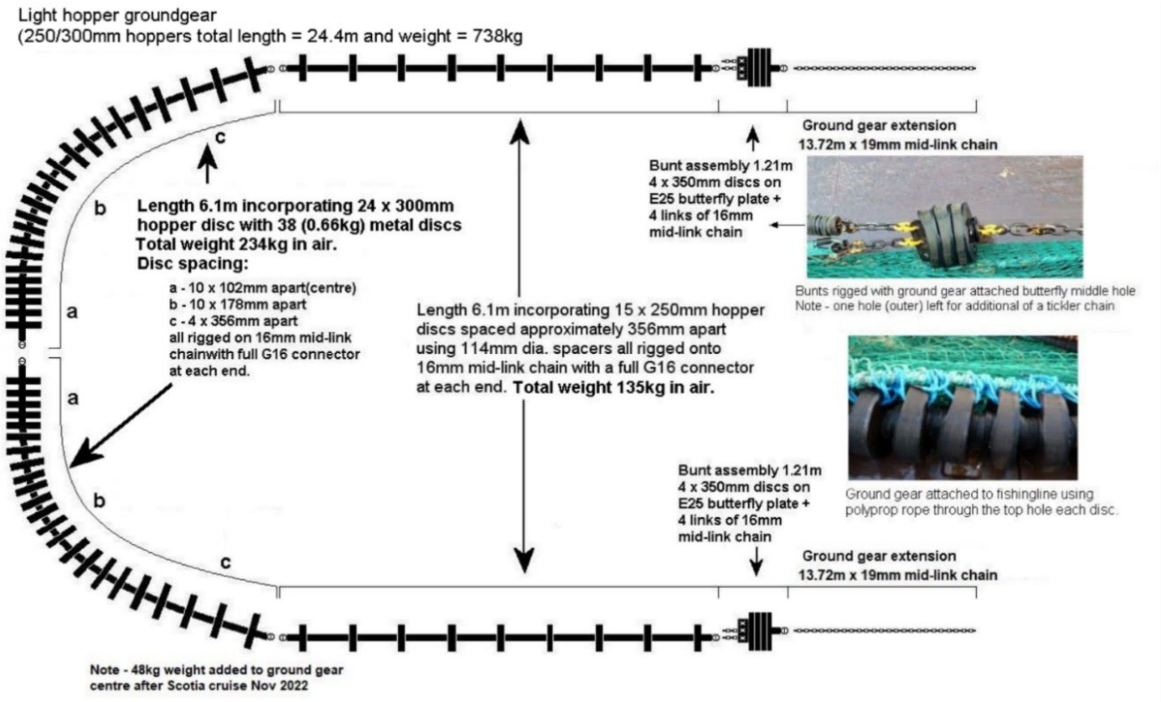


Figure 4.2. Light rockhopper groundgear specification for the developed survey trawl (full-scale version). Version 5 of 17 May 2024.

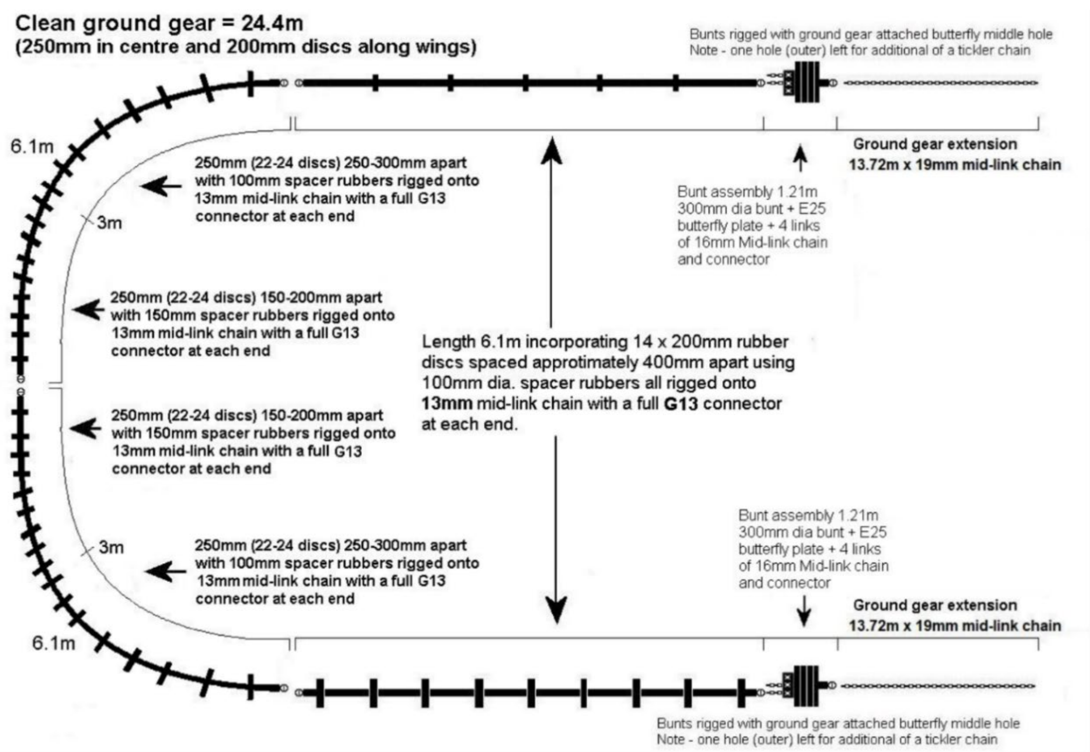


Figure 4.3. Clean groundgear specification for the developed survey trawl (full-scale version). Version 5 of 17 May 2024.

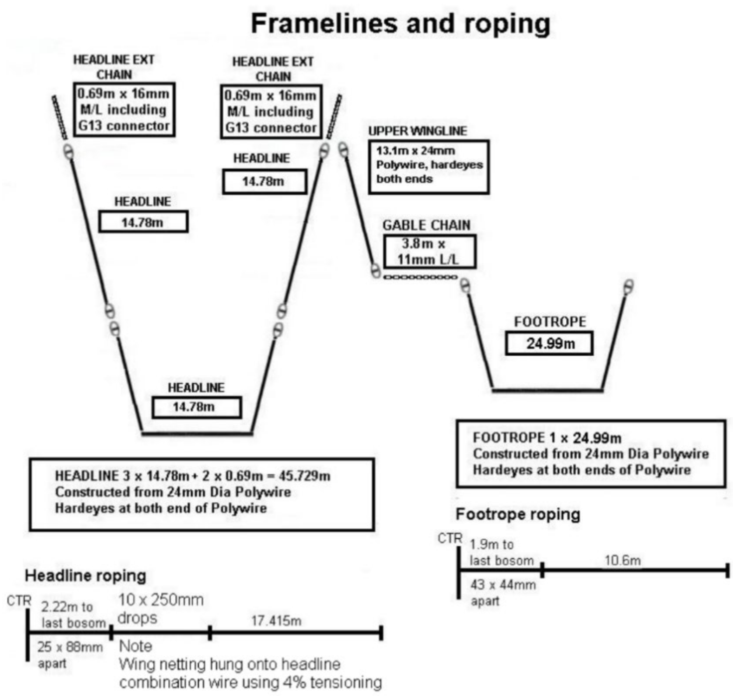


Figure 4.4. Framelines, headline and footrope roping for developed survey trawl (full-scale version). Version 5 of 17 May 2024.

Figure 4.5. Current floatation specification, including positioning around the headline, for the developed survey trawl (full-scale version). Version 5 of 17 May 2024.

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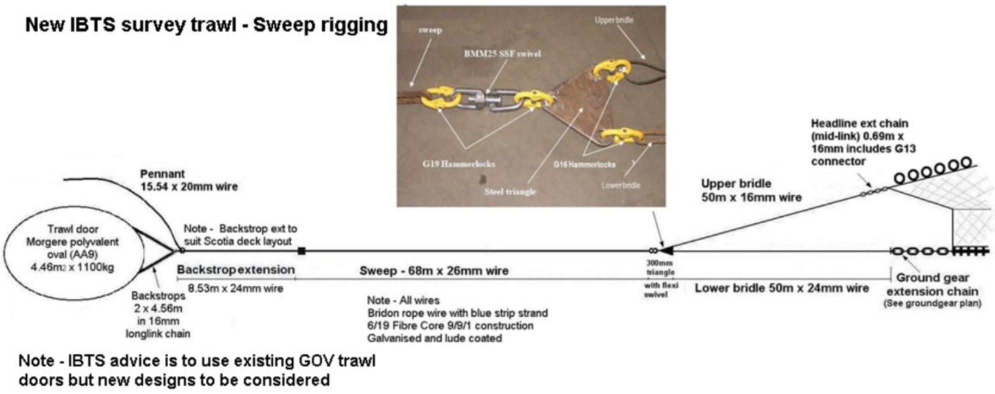


Figure 4.6. Wire rig specification for the developed survey trawl (full-scale version). Version 5 of 17 May 2024.

4.3 Updated gear diagrams for the survey trawl (scaled-down version)

Whilst the broader specifications for the survey trawl were encouraged by members of IBTSWG, several institutes retained some concerns over the size of the trawl and the headline, noting that gear trials on some vessels had indicated that the headline height could be greater than seen for the current GOV. Such a high headline height could in some areas, such as in the Skagerrak and in some shallower-water areas of the southern and central North Sea, result in excessively large catches of small pelagic fish for example. Catches with a lot of fish surplus to sampling requirements can compromise catch sampling, as well as raising ethical questions. Consequently, there was interest by multiple nations for developing a version of the net that had a reduced fishing cycle, with this due to appropriate sampling needs (e.g. pelagic fish) and vessel capacity (e.g. size of the net drum) across the survey fleet. Fishing skippers on various research vessels had indicated that a reduction in the fishing circle would also help reduce the headline height.

David Warwick (SeaFish, UK) updated net plans for the scaled-down version of the trawl. This trawl has an overall reduction to the fishing circle of 13.5% (compared to your original trawl). Other modifications made were:

- The section of 130 mm in the top sheet was replaced with 112 mm.
- Drop/fly meshes into the lower wings.
- An additional ½ a mesh added to the length of the first section of the top wing and 1½ meshes to the wing tip section. This was to help to reduce the amount of tension applied to the netting when rigging.
- One mesh added to the lower wing to keep the lower wing end in line with the first section of wing.
- Two meshes added to the bottom of the belly section that ends in 225 meshes. This was to allow for a degree of shrinkage in the belly netting, thus helping the net maintain a better shape after the netting shrinks.

There was some discussion on the use of drop (fly) meshes, with some institutes concerned over whether all the deck crew would be sufficiently familiar with drop meshes as and when mending trawls. It was suggested that the version with drop (fly) meshes (Figure 4.7) should be used as standard, although if a damaged trawl could not be mended at sea to that specification, then the version without drop meshes (Figure 4.8) would be acceptable for the remainder of the survey. If this occurred, then the trawl should revert to the specification with drop meshes when overhauled after the survey.

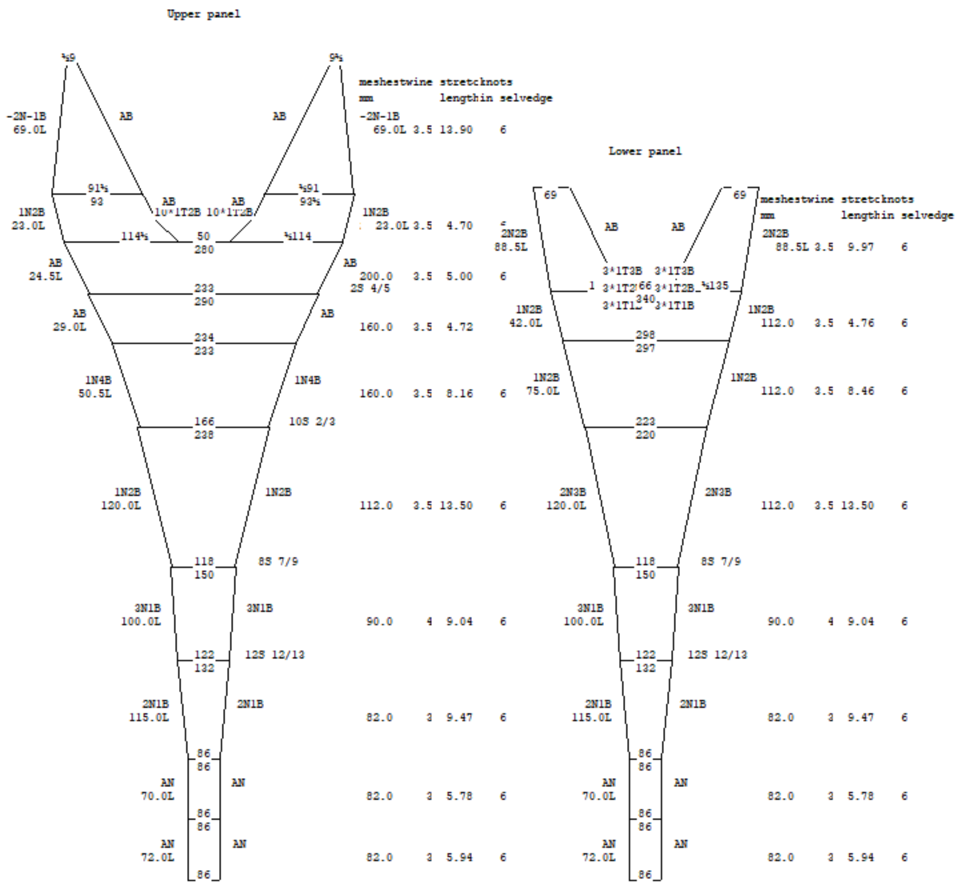


Figure 4.7. Initial net plans developed by SeaFish for a scaled down version of the trawl, with drop (fly) meshes included. It is expected that these net plans will be updated in 2025.

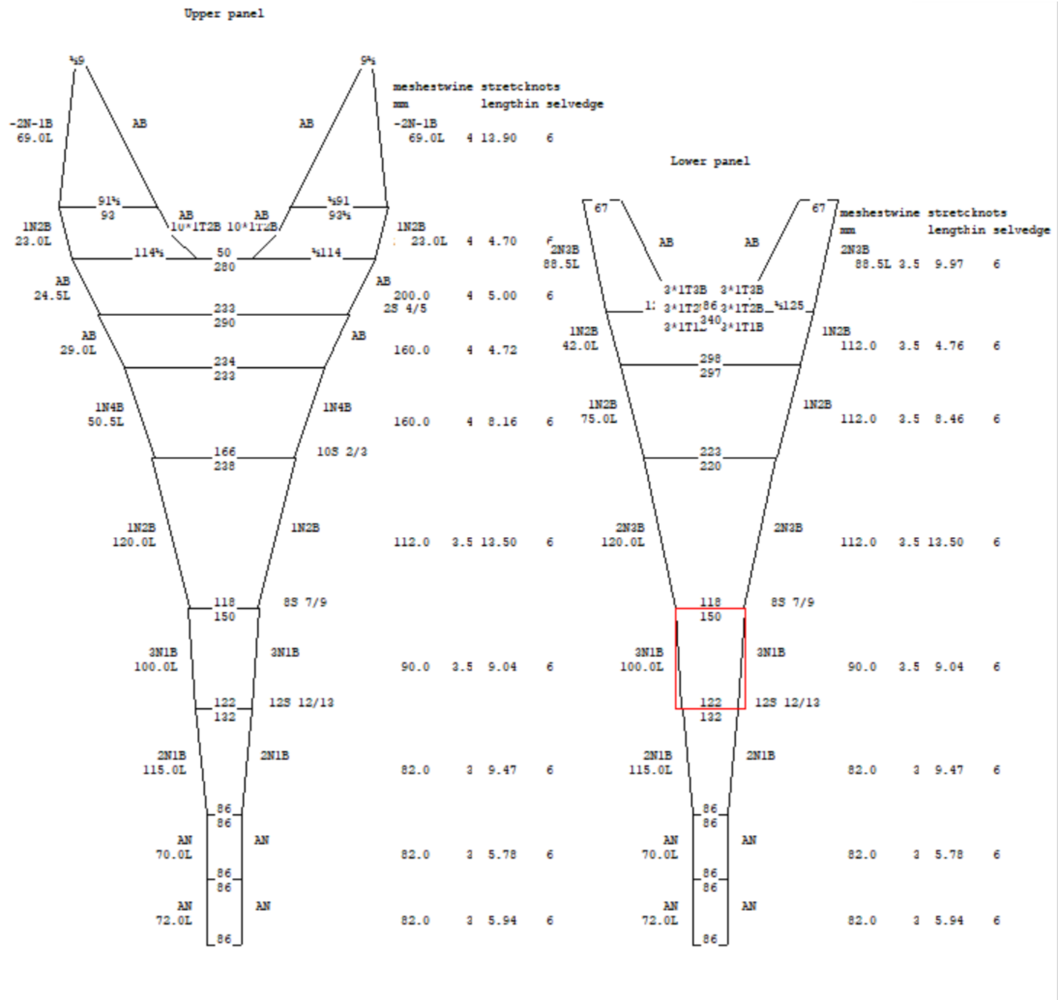


Figure 4.8. Initial net plans developed by SeaFish for a scaled down version of the trawl, with no drop meshes. It is expected that these net plans will be updated in 2025.

4.4 Recent sea-going trials

4.4.1 France

Scientists from IFREMER gave a presentation on their gear trials work using the JTS610 trawl that was conducted on "Thalassa" from 8–13 September 2023.

Concerns raised were the headline with 6% tension before net mounting, which was considered to be difficult at sea (noting that a reduction to 4% tension has now been deemed more practical).

The meshes mounted on the side were also under high tension, and it was questioned whether it was necessary to have such tension so close the meshes when they are 82 mm.

During the gear trials work, 17 experimental hauls were undertaken, at depths of ca. 50–120 m on both muddy and coarse sand habitats. The towing speed ranged from ca. 3–4 knots, with a median speed of about 3.5 knots. Three hauls had varying speeds of 3-4 knots every 10 minutes, with the remaining 14 hauls having a more constant speed of 3.2–3.5 knots). Modifications trialled included extra weight (chains) to the ground gear and changing the number of floats.

In terms of net geometry, door Spread ranged from 68–82 m (depending on depth) and wing spread (22–23 m) and headline height (ca. 6 m) were relatively stable.

There were concerns regarding the behaviour of the ground gear and the trawl in the water column, as it was considered that there was no constant contact with the bottom and that the ground gear and doors may take off at speeds of about 4 knots. There appeared to be variable ground contact near the wings and in the middle part, with the triangle also noted to lift off at times. There also seemed to be lower tension in the lower bridle.

The following advantages of the trawl were noted:

- Robust design and construction.
- Good overall geometry for the fishing conditions considered (speed, depth, etc.)
- Stable net geometry and good vertical opening (but see below).
- Ground gear directly attached to the net, with no adjustments required.

However, issues that were raised by this study were:

- The complex construction with several types of materials and mounting methods which can complicate potential repairs at sea.
- Some elements of the rigging were not explained in the documents/plans.
- The headline with 6% tension before net mounting would be difficult to manage at sea.
- It is a long net which could be difficult for smaller vessels to manage.
- The size of the net could catch higher quantities of schooling fish (e.g. anchovy, boarfish, herring, horse mackerel, sardine, mackerel), which is already a concern in some surveys.
- Ground gear not always stable on the bottom.
- Unbalanced tension (upper bridle greater than the lower bridle (potentially a buoyancy effect).
- Insufficient chain length to properly fill the space between the rubber discs.
- Too high a vertical opening (cf. the GOV).

Given the above, the following measures were suggested for consideration:

- Reduce the trawl size to be more comparable to the current GOV 36/47.
- Use high-density netting (and either common to all countries or with equivalent runnage) in the upper part of the trawl, and use PE in the end of the trawl (these materials are easier to find and common to all).
- Simplify the net panel assembly and standardized them to simplify the mounting.
- Potentially no need for reinforcement along the selvedges (for some surveys).
- Consider the implications of too small a mesh in the extension, noting that there is a cod-end of 20 mm.
- Check the weights of the sections of the ground gear.
- Potentially re-appraise how the net is mounted on the groundgear, to give it a little more freedom and increase bottom contact.
- Adjust the tension between the upper and lower bridles.

4.4.2 UK (Scotland)

4.4.2.1 Introduction

A further gear development cruise to trial the new survey gear (designated BT238) was undertaken by Marine Scotland Science from 27 November to 6 December 2023 on the Scottish research vessel “Scotia”. The main aims of the cruise were to:

1. Fine tune the flotation package of BT238 with reference to previous gear performance trials undertaken by France (see above).
2. Assess ground gear contact of the BT238 light hopper rig using bottom contact sensors and underwater observations with a self-recording mini TV system.
3. Compare the fishing catchability/performance of the BT238 against the current Scottish standard survey trawl (GOV + Ground gear B) on IBTS survey stations around the Shetland Islands.
4. Collect feedback from vessel Fishing Master and crew on the new survey gear rigging, deployment and fishing behaviour.

4.4.2.2 Net geometry

A total of 21 trawl geometry/TV observation hauls (15–30 minutes) were made with BT238 and eight paired catch comparison hauls completed against the GOV trawl. The parameters measured (at every haul) were speed over the ground, headline height, trawl sounder (bottom) contact, door tilt (roll/pitch), wing end spread, and door spread. Self-recording angle sensors recorded touch down/lift off, and bottom contact at ground gear centre and quarters during each haul. Other parameters such as warp deployed, water depth and tide/wind conditions were recorded manually from the vessels bridge systems.

The recommendation from the IBTS Gear Sub-group (2023) was for the new survey trawl to have a headline height between 5.0 to 5.5 m. The original version of BT238 (MK 1) was rigged with 156 x 200 mm floats and found to have an average headline height of ~6.0 m. To achieve the required height and improve ground gear contact the flotation was gradually reduced to 138 floats, similar to the trials conducted by IFREMER on "Thalassa" (Aug 2023).

Once the flotation was reduced, the mean headline height ranged from 4.9 m to 5.85 m and was broadly comparable to the GOV trawl (Figure 4.9). A benefit of the reduced flotation was improved ground gear contact at higher towing speeds (of 4.0–4.4 kts) with no lifting detected by the trawl sounder or bottom contact sensors.

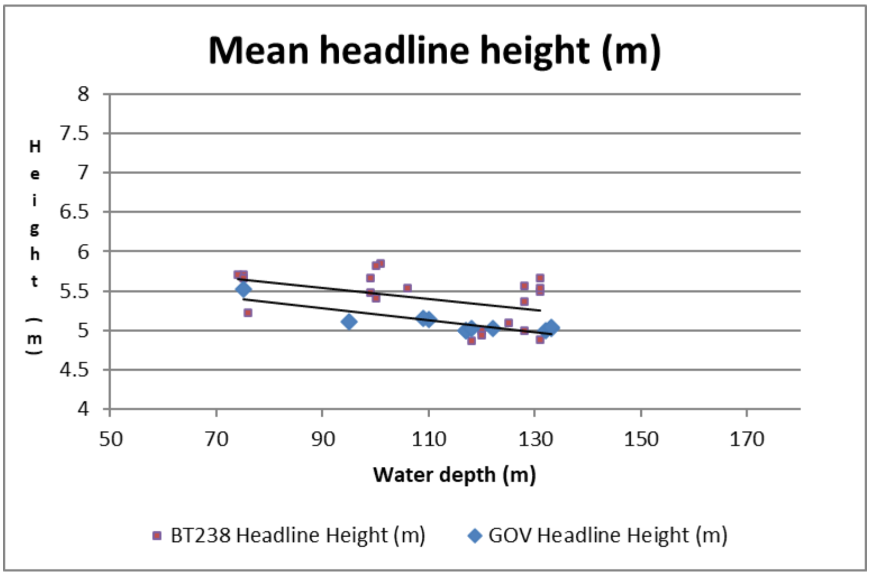


Figure 4.9. Mean headline heights for BT238 and GOV as observed onboard "Scotia".

The wing end spread for BT238 ranged from 20–22 m, consistent with mean values recorded during previous cruises. The general rule for optimum wing end spread for whitefish trawls is around half the headline length (BT238 = 45.7m). The wing end spread for the GOV trawl was found to be around 21.5m, slightly less than BT238, but higher than the IBTS recommended 18 m. However, it should be noted that the IBTS survey manual noted that (in Q1) that longer sweeps (97 m; noting that the sweeps including back-strops and connectors would have a total length of 110 m) when in water depths deeper than 70 m, but historically this has not been the case for all Q1 North Sea surveys. Door spread was comparable between the two trawls (Figure 4.10), but BT238 was slightly lower, due in part to greater drag of the light hopper ground gear and indicating better ground contact.

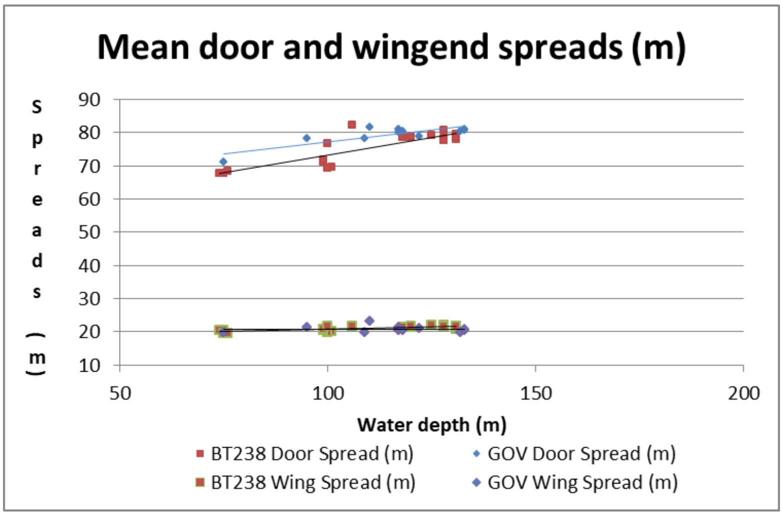


Figure 4.10. Mean door spread and wing end spreads for the BT238 and GOV, as observed onboard "Scotia".

4.4.2.3 Ground gear contact

As recommended by IBTSWG (2023), and prior to the cruise, the light hopper ground gear centre sections (2 x 6.1 m) were altered to incorporate steel discs, increasing overall weight by 25 kg per side. All observations with the mini-TV system suggested consistent ground contact across the full length of the ground gear (Figure 4.11). No issues with lift off were detected and therefore no other adjustments were made during the cruise.

Consistent ground contact was further backed up by the bottom contact data (Figure 4.12) with neither ground gear centre nor port quarter showing signs of lift off, areas of concern raised during previous discussion of the IBTSWG gear sub-group.

Figure 4.11. Light hopper ground gear, showing centre round to the starboard wing (top) and the quarter/belly guard meshes (bottom).

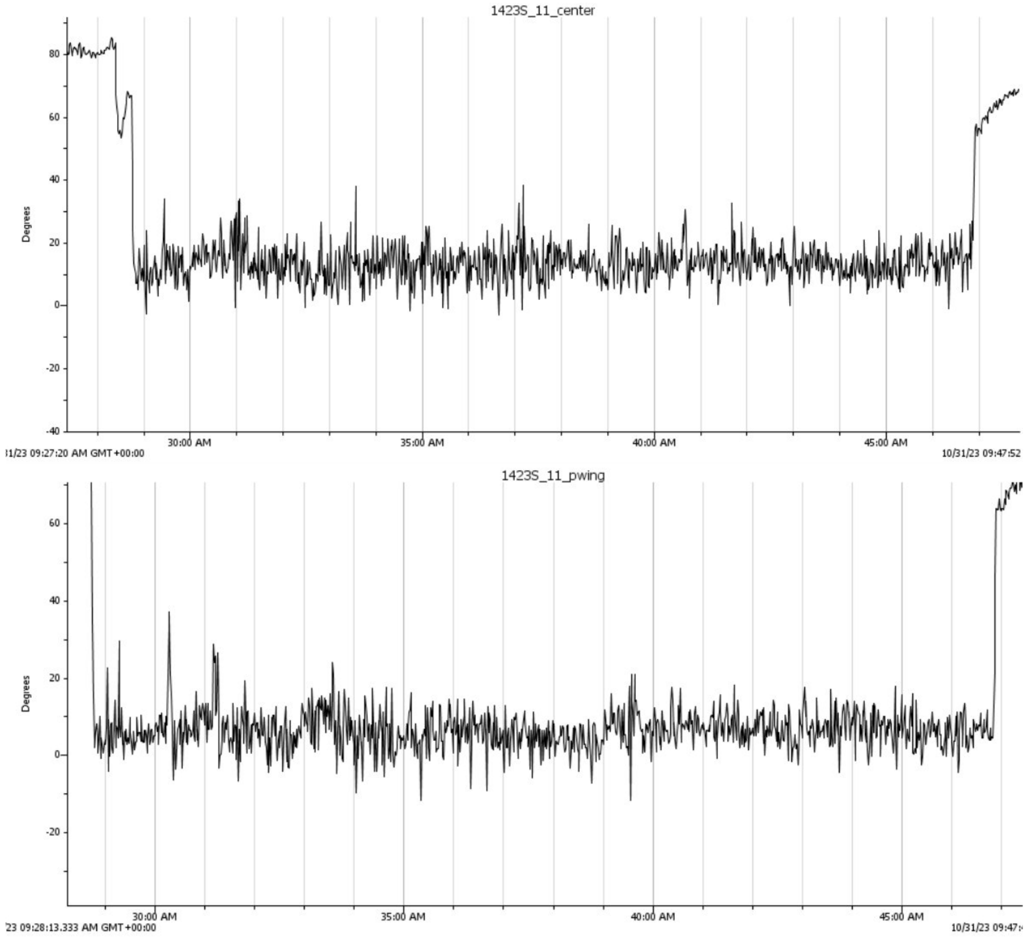


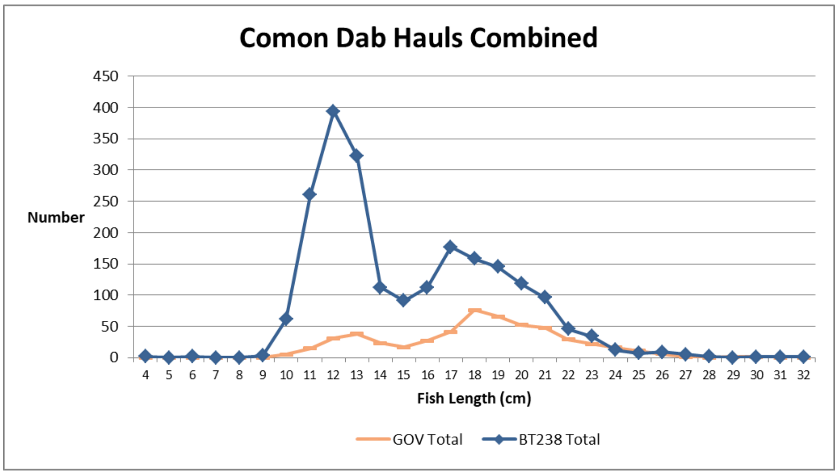
Figure 4.12. Example data from bottom contact units for centre (top) and port quarter/wing (bottom) as recorded onboard "Scotia" (Haul 11).

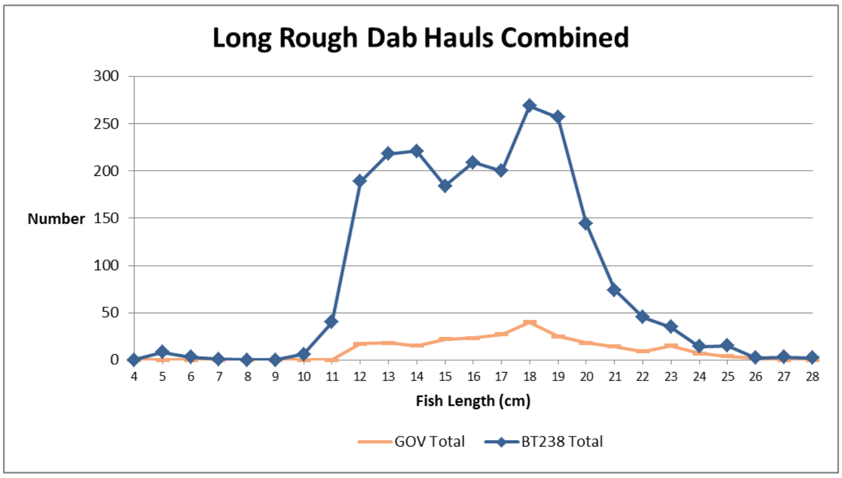
4.4.2.4 Comparative fishing

A total of eight paired tows were made on three different fishing grounds, with slightly different species compositions encountered in each area. All species were separated and measured as per IBTS catch sampling recommendations.

Both the BT238 and GOV trawls caught a similar species mix and size ranges irrespective of the areas targeted. Species encountered varied from skates, dogfish, small pelagic fish (herring and mackerel), Norway pout, cod, plaice and haddock. Whiting, common dab and long rough dab were caught in higher numbers, and the length frequency distributions of these species are shown in Figure 4.13.

Of particular interest were the flatfish species, as they were caught in smaller numbers by BT238 (MK1) compared to the Marine Institute (MI) trawl during previous catch comparison trials (IBTSWG, 2019). The improved flatfish catches may be due to the revised belly sheet mesh size (112 mm FM) now used in BT238 (MK3), which is similar to the mesh size used in the MI trawl. Furthermore, this improvement could also be enhanced due to the added weight (50kg) to the centre of the light hopper ground gear and reduction in flotation (156 floats reduced to 138 floats) compared to the MK1 version. For whiting BT238 caught significant amounts of fish in the 26–32 cm length range compared to the GOV. However, the data was heavily influenced by one morning haul and the limited number of comparative hauls completed. Whilst based on a limited number of paired hauls, these initial catch data demonstrates that both gears caught similar size ranges of all three species and were not missing a particular length component.





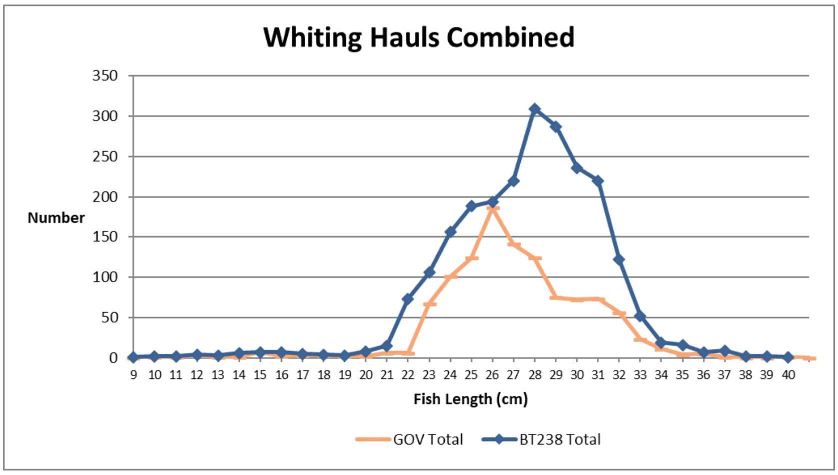


Figure 4.13. Numbers at length of common dab (top), long-rough dab (centre) and whiting, combined across hauls, for the GOV (groundgear B) and BTS238.

4.4.2.5 Feedback on the handling and operation of the new trawl gear

When rigging, and during fishing operations, the Fishing Master and crew of "Scotia" found the new trawl gear package less complicated and far easier to deploy/retrieve compared to the GOV. They regarded the guard meshes and tearing strips inserted at key potential damage points around the trawls front-end as essential, and viewed as a minimum for Scotland's North Sea survey areas.

It was suggested the 112 mm netting used in the construction of the belly sheet would take slightly longer to mend, but by having spare panel sections precut with a 1:1 joining ratio would simplify the process.

The Fishing Master felt the twines used throughout construction was acceptable and the cut (tapering) of the trawl was a big improvement compared to the GOV trawl design.

When towing, the Fishing Master found the new trawl settled quickly and then once up to towing speed (3.7 kts) was very stable and required limited adjustments to the REVs, suggesting gear drag was tuned to the vessel. This is not the case for the GOV gear and during the paired hauls required constant monitoring and adjustment with speed increasing/decreasing (+/-0.3kts) throughout each deployment.

4.4.2.6 Future development trials

Two further cruises on "Scotia" are planned for June and October 2024 with the main objectives being:

June 2024

- Increase weight along light hopper wing sections (+25 kg per side) and disc size (250 mm to 300 mm).
- Assess reductions in headline height by further reductions of flotation.
- Assess reducing top wing tensioning from 6% to 4%.
- Measure trawl drag using self-recording tension cells located at headline and ground gear.

- Trial new clean ground gear and collect gear geometry, drag and bottom contact data using sensors and mini-TV system.
- Undertake comparative (paired) hauls between the new trawl with clean ground gear compared against Scottish GOV with ground gear A.

October 2024

- Collect gear geometry/drag and bottom contact data for new scaled down (13.5%) version of the new trawl.
- Undertake comparison (paired) hauls between the full and reduce scale versions of the new trawl gear.

4.4.3 UK (England)

A Working Document by Hatton and Ellis (2024) was submitted to IBTSWG and an edited version included here.

Abstract: 18 successful deployments of the Jackson JTS610 otter trawl with fine/clean ground gear were made at eight selected sites in the North Sea during a gear trials survey in December 2023. While poor weather curtailed sampling over much of the planned survey area, catches were compared with that seen at those sites as sampled during the UK (English) IBTSQ3 survey with the GOV (Grande Overture Verticalé) trawl four months prior. Concerns over ground contact of the net were addressed, with evidence of contact seen up to lower bridle/sweep join. Catch comparisons showed a near identical number of fish species caught by both the JTS610 and the GOV, although the JTS610 recorded larger catches overall. It was noted that time of year would have an impact on species distribution, with only very small catches of pelagic fish seen in December. There was also a notable decrease in epibenthic fauna bycatch. Headline height parameters were also investigated but results proved inconclusive.

4.4.3.1 Introduction

Cefas first trialled the JTS610 v.3 net during a south-west otter trawl survey in February 2023, utilising the light hopper ground gear. Testing of the design with clean/fine ground gear was conducted by France/Ireland in September 2023, which highlighted some concerns at the following IBTSWG subgroup for new trawl gear later that month. Cefas approved a ten-day gear trials survey (CEnd 19/23) to test the JTS610 v.3 with clean/fine ground gear in December 2023. The aims of this trials survey were to investigate the concerns raised at the subgroup, and compare catches with the JTS610 to those seen by the GOV during the English IBTSQ3 survey (CEnd 12/23) in August 2023. Whilst comparisons of these catches include both gear-related factors and seasonal factors, paired tows of the two gears in the same gear trials trip would have resulted in too low a number of comparable tows (given the limited sea-time available, and the time that would have been required to switch between trawls).

The concerns highlighted during the sub-group were the ground contact at the quarters and bunt-ends of the ground gear, as well as at the triangle bridle split. The headline of the net was also very high, which would result in large pelagic catches for countries fishing in the Skagerrak, and areas of shallow water. There was also higher tension noted on the upper bridles, compared to the lower bridles, as well as with the ability to mend net damage, with crew noting the net's complexity and mesh construction.

4.4.3.2 Methods

Initially, 27 locations completed successfully during CEnd 12/23 were identified for repeat tows on CEnd 19/23. These were selected to cover a range of water depths and substrates to maximise the range of testing of the JTS610, and subsequent catch comparisons. Fishing was conducted aboard RV "Cefas Endeavour", as was used for CEnd 12/23, and the JTS610 v.3 net with clean/fine ground net was the primary net used. As recommended by the sub-group, a 50 kg, 16 mm traveller chain was added along the bosom section of the ground gear to provide additional weight to the trawl and improve ground contact. Also, six floats were removed, three from each wing, next to the headline.

Each tow replicated the 2 nm tow line completed by the GOV four months earlier, as close as practicably possible, although standard tow speed was reduced to the recommended 3.4—3.5 kts Speed Over Ground (SOG). Scanmar Ground Explorer units were attached to the ground gear to assess ground contact, while net geometry sensors were used to record door spread, wing end spread and headline height. During the course of the trials, the net was modified in order to test particular parameters to investigate four areas; ground contact, headline height, ease of use, and catch comparison. More details of these changes can be seen in the Working Document.

Fish catches were sorted into species, weighed and measured into Cefas' Electronic Data Capture (EDC) system. Sub-sampling was conducted where appropriate, similar to the protocols used during CEnd 12/23. For the purposes of this preliminary study, data were analysed in terms of the raised weight per hour (in kg), and the weights averaged for the JTS610 v.3 net, as multiple tows were conducted at some locations (cf. the single tow sampled by GOV trawl during the IBTS-Q3). Similarly, tow times were standardised to be able to compare catches as accurately as possible.

4.4.3.3 Results

In total, 24 deployments of the JTS610 were completed over eight different sampling stations (see Working Document). Six of these hauls were invalid; five due to loss of net geometry sensor readings and the sixth due to the port wing becoming twisted on deployment and not allowing the net to adopt its correct shape, resulting in a very low headline reading. Only eight of the 27 planned fishing stations across the survey grid could be completed due to the westerly gales throughout the survey period, limiting the scope of the work to the most westerly sites that had some protection from the UK mainland.

Ground contact: The concern raised during the sub-group from previous testing of the JTS610 with clean/fine ground gear was whether there was sufficient ground contact at the quarters and further up towards the triangle bridle split. The impact of loss of ground contact could result in the trawl missing smaller flatfish species and epibenthos, biasing collecting a representative data set. Investigating this and potential changes to the net to improve ground contact was considered a key aim of CEnd 19/23.

Marport Bottom Explorer sensors were attached to the end of each ground gear bunt section, behind the chain to the bunt extension piece. These were used for eight tows, with the position of the sensors changed, first to the other side of the ground gear inside the net after no readings were found in the position pictured. This worked intermittently but provided data showing between 0.1–0.3 m distance from the ground, with no change when speed over the ground was increased from the standard 3.4 kts to 4.5 kts, although this was only into 0.3 kts of tide. When one sensor was moved to the bosom of the net it was found to be covered in muddy substrate, indicating that the sensor had been in direct contact with the sea floor and this is perhaps why the sensor data were only coming back intermittently.

With the sensors showing minimal lift from different positions and the evidence of the mud, it was decided that they could not provide any more information and were replaced with dangle chains (these being of lower mass than the sensor when protected by the metal housing). The abrasion of contact with the ground would give another type of indication that good ground contact was being achieved. Abrasion was evident on the dangle chain at the bunt/bunt-extension and then up the wirework, along the ground gear extension chains to the hammerlock connecting the chains to the lower bridle and up to swivel joints and triangle where the bridles meet the sweeps. With anecdotal, visual evidence of this abrasion up to the sweeps, and with minimal lift shown by the Bottom Explorer Sensors, after nine tows it was concluded that the net provided good ground contact, and with catch comparison supporting this (see below).

Headline height: The JTS610 net had shown a headline height of 6–7 m on its first use during the 2023 Q1SWOTTER survey (CEnd 3a/23), compared to the ~5 m seen with the currently used GOV trawl (see Figure 4.14). The expected impact of a higher headline would see more pelagic fish caught, especially in areas surveyed by IBTS members operating in areas with abundant pelagic fish, including various coastal areas and the Skagerrak. CEnd 19/23 investigated whether minor changes in the JTS610 could reduce the headline height enough to be more comparable to the headline height seen by the GOV trawl.

With the reduced floatation recommended from the sub-group, the first eight tows that produced usable headline height sensor data showed an average of 6.7 m (6.3–7.39 m), although the lower values were in deeper water, as expected. After this, an additional six floats were removed from the start of the wing, next to the headline for a total of 132 floats, this then only saw a reduction in headline height to 6.5 m. A further 18 floats were then removed, three sets of three on each side, down the wing, leaving a total of 114 floats. This reduced headline height to ~6 m in 60–80 m water depth. Other net geometric sensors did not provide consistent data through these changes to see their impact on the net shape, unfortunately.

It was concluded that a simple reduction in flotation did not definitively show that it would reduce headline height without impacting the shape of the net. Further investigations should be conducted, but the current thoughts following this survey, based on comments from the crew as mentioned below, would be that a reduction in the fishing circle by shortening the headline would be the best option to reduce headline height.

Ease of use: The handling of the net is very much driven by the experience of the crew of RV "Cefas Endeavour". Due to the lack of gear damage on CEnd 19/23, this investigation was dealt exclusively by qualitative comment, following concerns that the net is difficult to mend from previous testing.

It was assumed that mending gear damage would be more difficult due to the use of compound twine in the net's construction, however, it was also understood that this harder wearing twine would also likely reduce the amount of mending required. The crew also indicated that increased experience using the new twine may ease this concern. The layout of the net also did not appear to be difficult to mend. The crew also acknowledged that the lack of middle bridle and kite (that provides dynamic lift for the GOV) made the net much easier to deploy and recover compared to the GOV.

In terms of suggested improvements, it was indicated that the cod-end sleeve could be reduced in length, by removing a mesh panel, and the fishing circle should be reduced in size (for example, to 90% of the current configuration) in order to most effectively reduce headline height to the desired values.

Catch comparisons: When comparing catches, it is important to highlight that many species (especially pelagic fish such as herring Clupea harengus) will see their distribution affected by the difference in time of year (Knijn et al., 1993). For this preliminary report, catches were related to the survey, given that there were confounding factors of gear type and time of year. Eight different IBTSQ3 locations were sampled on the survey, some of which were fished more times than on CEnd 12/23, and have been averaged and labelled by ICES rectangle. Length distributions for the species discussed are shown in Figure 4.15 to Figure 4.17.

Gadiformes: Gadoid catches have been summarised by the four most common, commercially important species to the IBTS; cod *Gadus morhua*, haddock *Melanogrammus aeglefinus*, whiting *Merlangius merlangus* and Norway pout *Trisopterus esmarkii*.

Few cod were caught in the surveys, and only on three stations were they recorded on each, so comparisons between the nets was limited for this species. A similar number of cod were caught on both surveys (11 on CEnd 12/23; 10 on CEnd 19/23), mostly 25–46 cm in length (Figure 4.15), and with one 68 cm fish caught during CEnd 19/23, which would account for the difference in catch weight between the nets (Table 4.1).

CEnd 19/23 saw a much larger catch weight of haddock to that seen during CEnd 12/23 four months previously, with over three times that of CEnd 12/23. Much of this was seen at three of the eight stations sampled; 40F0, 43E9 and 45E7. The combined average catches at 43E9 and 45E7 were 1754 kg higher during CEnd 19/23 than observed during CEnd 12/23, with the largest catch being at 40F0 for both surveys. The length distribution seen across both surveys was quite similar, however, with the abundance of fish recorded between 21 cm and 40 cm but raised numbers were much higher across this distribution during CEnd 19/23, contributing to the higher catch weights.

Similar to cod, average catch weights for Norway pout were small which limited comparisons, but both surveys showed catches at 40F0 made up ~90% of total catch across these sites. As the length distribution of Norway pout was small, it is to be expected that this is very similar across both surveys (CEnd 12/24: 5–20 cm, CEnd 19/23: 9–21 cm) but the CEnd 12/23 recorded over five times more fish at these lengths compared to CEnd 19/23, which explained the higher catch weights.

Catch weights for whiting were found to be nearly twice as high during CEnd 12/23, than seen later in the year (CEnd 19/23). As with the haddock, the most abundant catches for both surveys were at 40F0, with more whiting observed at all stations (except 42E8 and 43E9) during CEnd 12/23. The length distribution showed more smaller fish (15–20 cm) caught during CEnd 12/23, although by later in the year these classes would have grown to be covering the lower part of the distribution recorded during CEnd 19/23. Much larger numbers were caught during CEnd 12/23, however, with over four times caught in the 20–24 cm range.

Flatfish (Pleuronectiformes): Due to the concerns before the survey about ground contact, comparisons on flatfish species were extended beyond the commercially important plaice *Pleuronectes platessa* and lemon sole *Microstomus kitt* to include two of the more abundant species: dab *Limanda limanda* and long-rough dab *Hippoglossoides platessoides*.

Plaice catch weights (Table 4.2) were relatively similar across most of the stations sampled but total catch weight during CEnd 19/23 was found to be twice that of CEnd 12/23, due to a larger catch of plaice on 45E7, yielding over six times that seen in August. The length distributions (Figure 4.16) of plaice in both surveys were similar, with most specimens 16–32 cm, although the catches in CEnd 12/23 did see a broader overall length range (15–41 cm), while CEnd 19/23 saw larger numbers at length between these.

Lemon sole catch weights were the lowest of the four flatfish species compared, but in total were very similar (CEnd 12/23: 42.6 kg, CEnd 19/23: 49.17 kg). The largest differences was at prime stations 42E8 and 43E9, where over three times more was caught during CEnd 19/23, but weights by station were generally similar. The length distribution was seen to be comparable for both surveys, ranging from 14–24 cm, although CEnd 12/23 did see a small number of larger fish (up to 33 cm, compared to 28 cm during CEnd 19/23).

Catches of dab were found to be larger during CEnd 19/23 than observed during CEnd 12/23, especially at stations further north (42E8, 42E9, 43E9 and 45E7). In total, over twice as much dab was recorded on CEnd 19/23, compared to that seen earlier in the year. Despite this, the length distributions were similar, with most fish being 11–23 cm. The largest numbers were seen at 15 cm (CEnd 12/23) and 16–17 cm (CEnd 19/23), which will also contribute to the differences in catch weights.

Similar to lemon sole, catch weights of long-rough dab were small, although were found to be generally larger during CEnd 19/23, in particular 42E8, 42E9 and 43E9. In total, this resulted in the nearly twice as much long-rough dab being observed during CEnd 19/23 than on CEnd 12/23. Comparing the length distributions, the fish sampled during CEnd 12/23 contained more smaller fish (10–15 cm), where CEnd 19/23 recorded more fish towards the larger end of the length range (20–23 cm).

Pelagic fish: As can been seen in Table 4.3, catch weights for pelagic species could not be compared due to the minimal catches seen during CEnd 19/23. These species may move grounds over the year, with populations being in the UK coastal areas to spawn in August, but by December they may have moved elsewhere, resulting in limited sampling. In terms of numbers, only 124 herring were caught during CEnd 19/23, compared to a raised 4598 on the same prime stations during CEnd 12/23. Four mackerel *Scomber scombrus* and 28 sprat *Sprattus sprattus* were the other commercial pelagic species caught during CEnd 12/23.

Elasmobranchs: Only small numbers of elasmobranchs were caught during both CEnd 12/23 and CEnd 19/23 at the selected prime stations, resulting in small catch weights (Table 4.4). More cuckoo ray *Leucoraja naevus* and starry smooth-hound *Mustelus asterias* were caught during CEnd 19/23, compared to that seen during CEnd 12/23, with similar amounts of lesser-spotted dogfish *Scyliorhinus canicula* and spurdog.

Length distribution data (Figure 4.17) were less accurate to compare to other species due to the lower numbers of individuals caught, but similar length ranges were observed for cuckoo ray (CEnd 12/23: 29–62 cm; CEnd 19/23: 25–53 cm) and lesser-spotted dogfish (CEnd 12/23: 13–68 cm; CEnd 19/23: 18–71 cm). However, for spurdog CEnd 19/23 caught larger individuals (80–98 cm) that were not observed in the late summer (potentially also due to seasonal migrations), and there were also differences in the length range of starry smooth-hound (CEnd 12/23: 81–104 cm; CEnd 19/23: 42–86 cm).

Other species: Also of note was the presence of smaller, non-commercial species during CEnd 19/23, including pogge *Agonus cataphractus*, lumpsucker *Cyclopterus lumpus*, scaldfish *Arnoglossus laterna*, dragonets *Callionymus* spp., lesser weever *Echiichthys vipera*, and hagfish *Myxine glutinosa*.

A concern was noted with the representation of epibenthic fauna. While the number of species recorded on both surveys for these stations was similar (CEnd 12/23 = 61, CEnd 19/23 = 59), the catch weight was much higher during CEnd 12/23: (133 kg) than during CEnd 19/23 (27 kg). Such a pronounced decrease in this catch component is probably more associated with gear than seasonal effects. Unfortunately, as epibenthic catch was only weighed (total biomass) and the individual species observed on CEnd 12/23, it isn't known which species this additional weight may be attributed to.

4.4.3.4 Discussion

While fishing location was limited by weather to only eight stations, this provided evidence for two key questions for the JTS610; how suitable it as a replacement for the GOV as the standard net is to be used for IBTS surveys, and are there concerns over the design in respect to ground contact.

A higher overall catch weight was recorded during CEnd 19/23 (7372 kg) than for CEnd 12/23 (5736 kg), although the number of fish, cephalopod and commercial shellfish species sampled was nearly identical (58 to 57, respectively). This could be attributed to the modern design of the JTS610; utilising new technology and materials used in the commercial industry will likely give the net an advantage over the GOV, which has not been used in the fishing industry for decades now.

It was encouraging to see that in the top 15 species ranked by catch weight (Table 4.5), only three species that were caught by CEnd 12/23 in abundance were not seen in high biomass by CEnd 19/23: mackerel, sprat and horse mackerel *Trachurus trachurus*. As noted above, these species may have seasonal changes in behaviour and distribution, and were possibly not in the areas sampled at the time of year when this survey was operating.

The flatfish species analysed here were found to have consistently larger catch weights in the JTS610, compared to the GOV. Gadoids, however, showed a stark contrast between the more common species, haddock and whiting. The JTS610 caught over three times as much haddock as the GOV, but less than half that of whiting. With these a key species for the IBTS, more testing in these areas would give a better understanding to the differences seen during these gear trials. The lack of epibenthic fauna seen in the JTS610 catches should also merit further investigation; as the time of year would not expect to be as much of a factor, in contrast to that supposed for the pelagic fish catches.

The ground contact of the gear was shown to be appropriate. While the Scanmar Bottom Explorer units did not consistently provide data, when they did it showed minimal loss of contact (<0.3 m). The mud found on the sensors indicates direct contact with the substrate and wear on the lower bridle chains and bridles up to the triangle split indicate bottom contact of the fishing gear to this point.

The potential reduction of flatfish catches with the JTS610, due to bottom contact concerns, was not apparent from preliminary analyses, with overall catches being approximately twice as much caught for dab, long-rough dab and plaice than in the GOV. Evidence of smaller demersal species, such as scaldfish and hagfish, also indicate that smaller-bodied demersal species are also retained.

Whilst the initial trials were encouraging, more testing of the gear is recommended, to allow for collecting further data from other areas of the North Sea in order to see changes in net geometry due to water depth (and substrate). Cefas hopes to conduct more trials with the JTS610 v.3 with clean/fine ground gear in the near future, possibly as early as the 2024 English IBTSQ3 survey.

Additionally, more detailed analyses of the data collected are required, including more detailed statistical analyses comparing data between the two surveys considered here, and also with data collected during the 2024 Q1 IBTS.

Table 4.1. Average catch weights (kg) for commercial gadoid species caught during CEnd 12/23 (August, IBTSQ3, GOV trawl) and CEnd 19/23 (December, gear trials, JTS610 trawl).

ICES Rectan-gle	Cod		Haddock		Norway Pout		Whiting	
	CEnd 12/23	CEnd 19/23	CEnd 12/23	CEnd 19/23	CEnd 12/23	CEnd 19/23	CEnd 12/23	CEnd 19/23
36F0	-	-	0.57	62.18	-	0.25	500.98	112.79
36F1	-	0.34	0.80	9.89	-	-	201.02	17.97
40E9	0.53	-	358.20	234.95	6.06	1.67	289.17	26.65
40F0	1.16	2.27	508.33	1620.75	56.14	17.21	821.17	400.11
42E8	-	1.16	63.00	645.90	0.25	0.224	7.54	106.32
42E9	2.44	9.72	260.54	661.16	0.07	-	64.45	100.95
43E9	0.48	1.01	140.07	1109.97	0.09	0.14	33.82	179.35
45E7	-	0.72	305.74	1090.79	-	0.03	5.84	46.01
Total	4.60	14.59	1637.24	5435.57	62.62	19.52	1923.97	990.146

Table 4.2. Average catch weights (kg) for selected flatfish species caught during CEnd 12/23 (August, IBTSQ3, GOV trawl) and CEnd 19/23 (December, gear trials, JTS610 trawl).

ICES Rectan-gle	Dab		Lemon sole		Long rough dab		Plaice	
	CEnd 12/23	CEnd 19/23	CEnd 12/23	CEnd 19/23	CEnd 12/23	CEnd 19/23	CEnd 12/23	CEnd 19/23
36F0	38.37	19.12	0.54	0.70	-	1.53	2.97	0.22
36F1	12.86	24.01	0.36	-	-	-	4.19	0.848
40E9	0.31	0.25	2.06	0.21	1.74	6.28	-	0.28
40F0	2.05	0.84	5.10	2.12	29.14	24.41	-	0.76
42E8	17.51	33.44	3.29	6.98	4.53	7.87	26.92	7.78
42E9	14.52	52.76	1.04	4.62	2.86	36.33	18.08	43.11
43E9	11.52	76.78	3.67	11.74	9.61	29.86	23.40	29.71
45E7	18.62	87.65	26.55	21.87	0.25	1.65	25.36	157.86
Total	115.75	294.84	42.60	48.24	48.13	107.92	100.92	240.56

Table 4.3. Average catch weights (kg) for commercial pelagic species caught during CEnd 12/23 (August, IBTSQ3, GOV trawl) and CEnd 19/23 (December, gear trials, JTS610 trawl).

ICES Rectangle	Herring		Mackerel		Sprat	
	CEnd 12/23	CEnd 19/23	CEnd 12/23	CEnd 19/23	CEnd 12/23	CEnd 19/23
36F0	-	3.79	8.11	-	-	0.04
36F1	4.18	0.871	1.88	-	269.21	0.14
40E9	200.44	10.2	119.90	-	-	0.10
40F0	237.58	7.72	19.42	0.16	-	-
42E8	53.72	-	3.84	-	0.57	-
42E9	24.17	0.36	136.42	-	0.08	-
43E9	2.27	0.38	1.31	0.36	-	-
45E7	-	0.09	250.96	-	-	-
Total	522.36	23.42	541.84	0.51	269.86	0.26

Table 4.4. Average catch weights (kg) of selected elasmobranch species caught during CEnd 12/23 (August, IBTSQ3, GOV trawl) and CEnd 19/23 (December, gear trials, JTS610 trawl)

ICES Rectan-gle	Cuckoo ray		Lesser-spotted dogfish		Spurdog		Starry smooth-hound	
	CEnd 12/23	CEnd 19/23	CEnd 12/23	CEnd 19/23	CEnd 12/23	CEnd 19/23	CEnd 12/23	CEnd 19/23
36F0	-	-	9.26	-	-	-	-	2.02
36F1	-	-	4.32	-	-	-	6.38	-
40E9	-	0.64	0.03	0.03	1.33	-	-	5.91
40F0	-	-	0.03	0.70	-	16.49	-	0.86
42E8	2.28	3.92	1.96	4.1	-	0.02	-	1.54
42E9	0.68	6.24	1.25	6.97	0.45	4.73	-	0.84
43E9	5.21	8.53	1.16	4.40	0.42	57.70	-	11.83
45E7	1.67	4.14	8.44	10.06	-	-	-	1.92
Total	9.82	23.47	26.44	23.53	2.20	78.94	6.38	24.91

5 Survey design and additional data collection

5.1 Introduction

This section considers a range of topics related to the surveys, including any aspects relevant to survey design, any additional data collection conducted during the surveys, or analyses of data collected by IBTSWG-coordinated surveys.

5.2 Trawl times

5.2.1 Northern Irish groundfish survey

The NIGFS had a reduction in trawl time in 2017, where the tow lengths were reduced from 3 nm to 1 nm tow (i.e. from 1 h to 20 min) following a few years of experimental tows. However, some tows in the Q1 survey remained at 1 h to further monitor issues relating to trawl time reduction (Figure 5.1).

In 2023, Northern Ireland suggested to IBTSWG that all hauls for the Q1 survey should be standardized to 1 nm, largely due on considerations of improving animal welfare (by reducing the number of individuals caught) and to increase the efficiency of the survey.

In 2017 analyses were conducted with generalized linear mixed models on a set of additional samples of 20 minute tows added to the survey and repeat sampling of the same stations. The analysis included the following factors:

- Mean length
- Weigh (log normal)
- And the Variables of:
- Duration (factor)
- Order (factor)
- Station (random factor)
- Strata
- Year

Full results can be seen in ICES (2015, 2016).

Initial results indicated that tow duration had no significant effect, including no effect on species diversity. Further analyses were conducted in 2023, between the stations that remained at the 1 h tow and those that had a reduced tow time, including the following responses:

- Species richness and diversity
- Abundance of small and large haddock
- Abundance of small and large whiting
- Abundance of small and large plaice

The variables included distance over ground (DOG), strata (random factor) and year. The variables of order and station were obsolete, as no duplicate stations were conducted. Stations in Strata 9 and 10 were excluded from the analysis due to no one hour tows having been conducted in recent years.

There was no significant effect of tow duration on either species richness (species number in tow) or on species diversity (Shannon-weaver diversity index/log(species richness) (Table 5.1).

Table 5.1. Results for species diversity and species richness. The DOG refers to "Distance over ground" for all valid hauls. While the DOG is supposed to be 1 or 3 nm, it can in this analysis take values between 0.8 and 3.2 nm.

Species diversity					
	Value	Std.Error	DF	t-value	p-value
(Intercept)	0.500	0.017	406	29.047	0.000
DOG	–0.002	0.008	406	–0.283	0.778
Species richness					
	Value	Std.Error	DF	t-value	p-value
(Intercept)	23.162	0.713	406	32.506	0.0000
DOG	0.249	0.321	406	0.776	0.438

For individual species, there was no effect of tow duration on the abundance of small, medium and large cod, small haddock, small whiting, and small and large plaice. There were, however, some minor effects on the abundance of larger haddock and whiting, which may relate to larger fish having the ability to outswim the trawl over shorter tow durations.

Table 5.2 and Figure 5.2 illustrate the impact of the tow duration on the mean length of commercial species in the hauls. Figure 5.2 plots the mean lengths of haddock, whiting and place in 1 nm hauls compared to 3 nm hauls, while Table 5.2 uses a GLME to estimate the impact of tow duration on the mean length of fish.

While there were differences between the mean length for haddock and whiting, this might be due to several factors, particularly since the longer and shorter tows have not been randomly allocated across the area and have been kept constant over the years, which makes a comparison more difficult, and differences could be originate in spatial variation rather than explainable by the tow duration. Figure 5.1 shows that many of the 1 h tows are clustered, as are many of the 20 min. tows, additionally the tows are not evenly distributed by numbers within the different strata. Hence, a direct comparison is not possible.

In combination with previous results, the Northern Irish survey will change the tow duration from 3 nm to 1 nm for all stations.

Table 5.2. Results for GLME for haddock, whiting, plaice and cod mean length, random effect is strata.

Species	**Value (DOG)**	**Std. Error**	**t-value**	**p-value**
Haddock	1.598	0.775	2.069	0.0403
Whiting	0.837	0.299	2.798	0.0055
Plaice	-0.045	0.274	-0.163	0.871
Cod	-0.304	1.94	-157	0.876

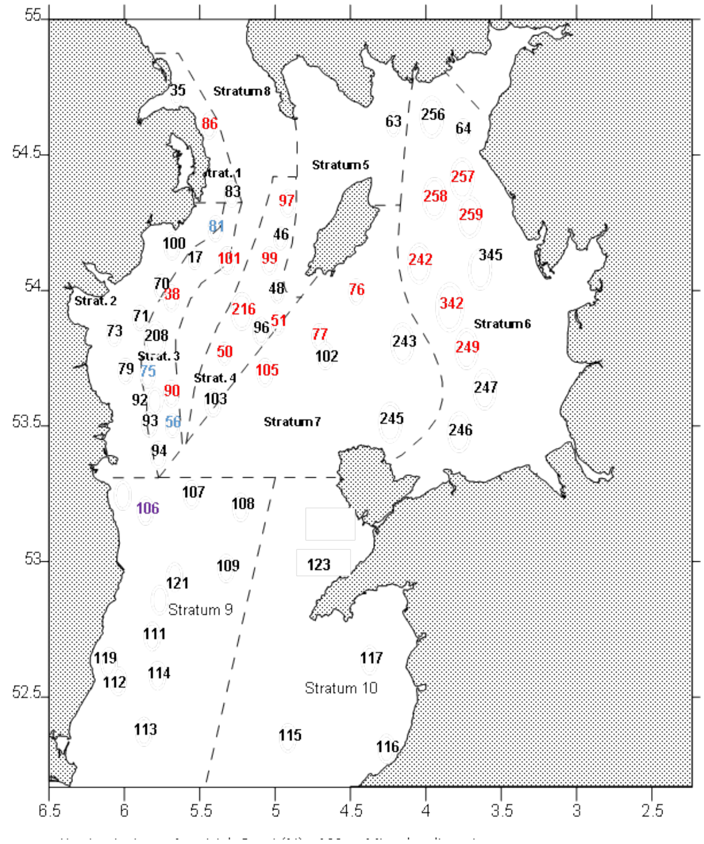


Figure 5.1. Map of the stations for the Q1 groundfish survey from 2023, with black numbers representing the 20 min. tows and red numbers representing the 1 h tows. Purple and blue stations indicate those not sampled in the particular year due to issues such as static gear, or rocky ground.

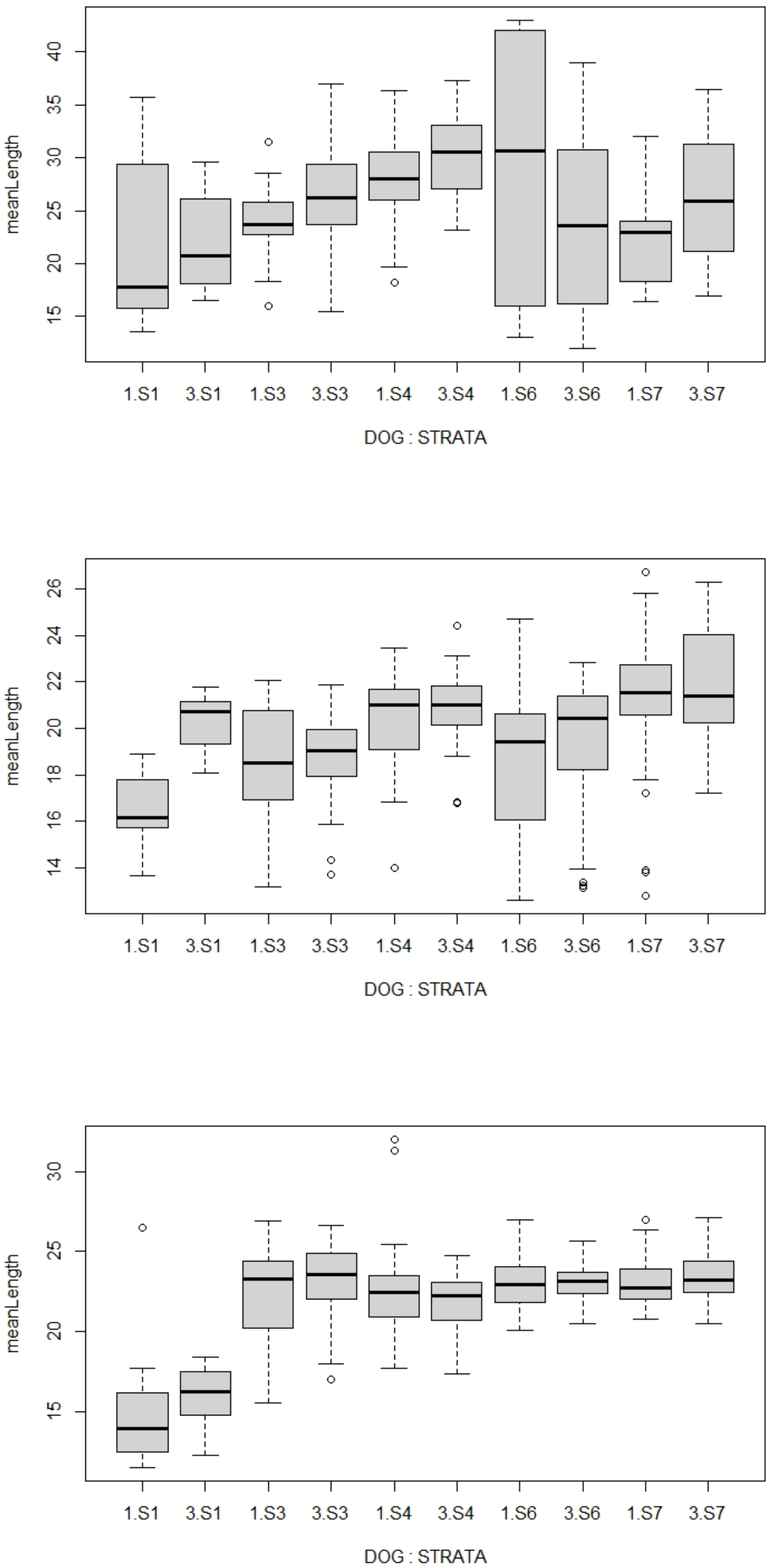


Figure 5.2. Mean length with respect to distance over ground and strata for haddock (top), whiting (centre) and plaice (bottom). Distance over ground is categorical 1 or 3 nm, with values close to either 1 or three being classified as 1 or 3, while those too far outside were removed.

5.2.2 Reasons for hauls being outside the planned haul duration

As noted in Section 2 of the report, not all hauls completed are of the duration (or distance) that was planned originally. Whilst some hauls may be slightly outside the planned duration (e.g. due to other operational duties of bridge staff meaning that hauling may be a minute or two delayed, or brought forward), there would be benefits from having a more standardised list of reasons why hauls are more notably different to the planned time (or distance). A preliminary list of these is provided below, and further input to this is required. Further work is required on how to deal with validity of such hauls and how the data is being presented in DATRAS or can be used for any analysis.

5.2.2.1 Reasons for why the trawl may be hauled early

There are several reasons why a hauling event may need to be brought forward, including:

a) Fading light. Applicable for daylight trawl surveys when unexpected delays has resulted in the vessel fishing close to the hours permitted in the survey manual. Whilst every effort should be made to fish for the standard time within the daylight hours designated, for practical reasons (e.g. long overnight steam from the station to the next station), then it may be necessary to reduce the tow duration in order to complete the tow within 15 minutes of sunset.

b) Pelagic fish. When information from the echosounder indicates that there are large schools of small pelagic fish, and that the density of the schools means that towing for the full 30 minutes is deemed to carry a high risk of too large a catch that is (i) problematic for the machinery of the vessel or of potential danger to the vessel, (ii) would result in too high a sample that may impact on the representativeness of the catch, and (iii) leading to excessive mortality of the fish species in question.

c) Obstructions. When the tow track needs to be cut short due to the presence of physical anthropogenic structures, including pipelines, windfarms, other ships, platforms. Whilst efforts are made to shoot the trawl at a time and location that will allow for the full distance (and time) for the haul, minor issues on shooting the trawl may result in expected shot position changing and it may be impractical to haul the net and re-deploy.

d) Uncertain net geometry. When the readings of net geometry sensors appear unstable or erratic, or is some sensor readings are not coming through, then it may be decided to haul early.

e) Rough ground. When the tow track needs to be cut short due to a change in ground type and seabed topography, as observed from the echosounder, with the ground becoming less trawlable and averting the risk of gear damage.

f) Benthic bycatch. When prior experience indicates that a high biomass of benthic (or macroalgal) bycatch can be encountered, with the volume that may be caught potentially impacting on trawl catchability/gear performance, and/or impacting on the accuracy of the catch sorting process.

g) Static gear. When the tow track needs to be cut short due to evidence of static gear being observed on, or close to, the tow. On those inshore grounds where static gear is often apparent, best practice is to steam over the tow and check for obstructions. The grounds on which static gear is used, however, can be variable, and sea state may also impact on initial observations of whether static gear is present.

h) Deteriorating weather. When weather conditions are deteriorating more and faster than expected, and delaying hauling operations could compromise crew safety.

i) Onboard emergency. When the gear needs to be retrieved immediately (e.g. medical emergency, emergency at sea).

5.2.2.2 Reasons for why the trawl may be hauled late

There are more limited reasons as to why a hauling event may need to be delayed. One of the more frequent reasons is operational issues on the bridge, which can range from simple 'distractions' to important maritime and meteorological notifications on the radio, which occupy the bridge crew.

Further to this, there can also be mechanical problems. For example, this may be when winches have failed temporarily when starting to haul, and systems need to be re-set. Consequently, the vessel continues fishing for an extra period of time with the net on the bottom.

5.3 Extension of surveys into the western English Channel trawl surveys

Carolina Giraldo (IFREMER), coordinator of the FR-CGFS, provided an update on the survey design and expansion of the current FR-CGFS (Eastern English Channel) into the western English Channel (Figure 5.3). The extended survey departs from Brest every year, running from mid-September to the end of September, and follows a stratified random sampling method with 48 stations, using a GOV 36/49. Data from 2023 are now available on DATRAS and is identified as FR-WCGFS-Q3. The survey adheres to the IBTS Manual on the Western and Southern Areas.

Data from 2018–2022 will be submitted in the coming weeks. Information collected in this region is expected to be valuable for several ICES working groups, particularly for the upcoming benchmark assessment of European sea bass, as catches of sea bass are taken in this survey. Moreover, it is noteworthy that data on environmental factors, as well as plankton and benthos, are also gathered, aligning with an ecosystem approach to fisheries.

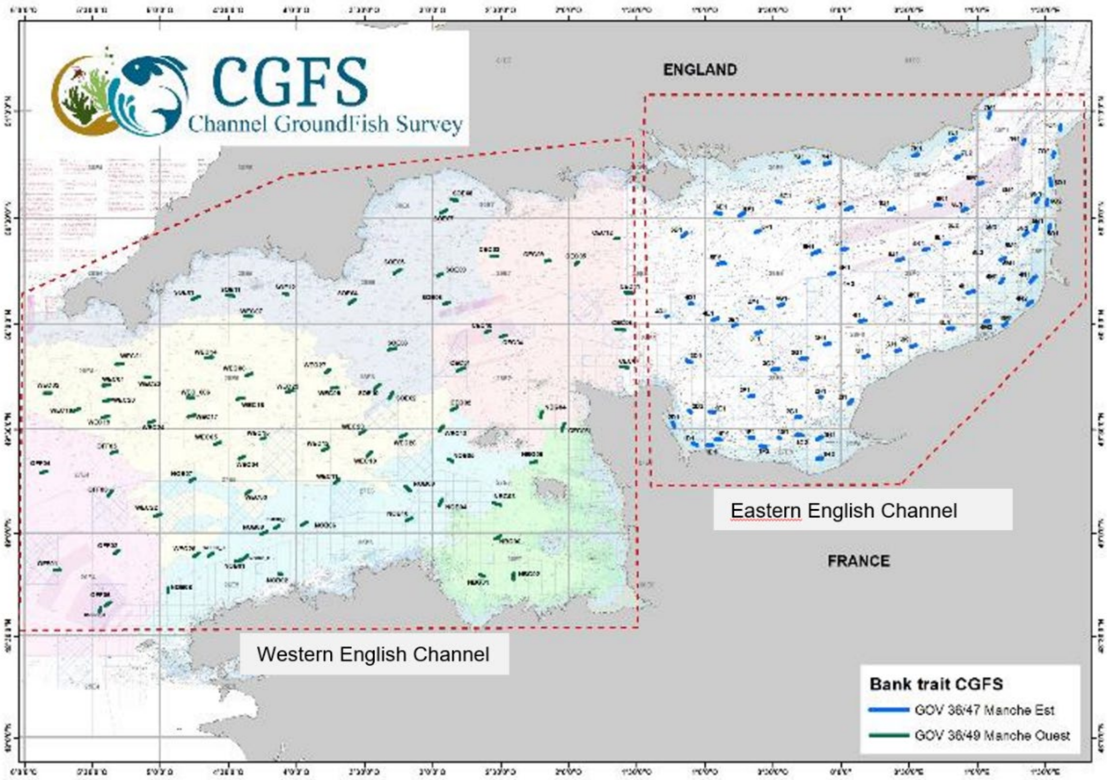


Figure 5.3: Survey sampling stations and strategy for the FR-WCGFS-Q3 and the FR-CGFS-Q4.

5.4 Stomach sampling

5.4.1 Stomach sampling during the North Sea IBTS

Pierre Cresson (IFREMER) provided an update on the collection of stomach sampling being overseen by the Intersessional subgroup (ISSG) for Stomach sampling, under the Regional Co-ordination Group for the North Atlantic, North Sea and Eastern Atlantic (RGC NaNSea).

The numbers of stomach samples collected by species during recent North Sea surveys are given in Annex 4 (2024-Q1) and Annex 5 (2023-Q3). Stomach sampling in 2023-Q3 (Annex 5) had higher samples sizes of horse mackerel, plaice, cod and tub gurnard, with a range of other species (including some skates and rays) also collected. Most samples are still to be processed and/or data uploaded, although Danish data have been uploaded. Stomach sampling in 2024-Q3 (Annex 4) had higher samples sizes of plaice, hake, cod and tub gurnard and, once again, a range of other fish species that are caught less frequently were also sampled.

IBTSWG continue to note that there has been uncertainty as to the processing of the stomach samples that had already been collected. Whilst it was originally anticipated that certain designated institutes would process the samples, it is now up to individual institutes to process the samples they collected. Not all nations may have appropriate resources to support the laboratory analyses, and some IBTS nations are not eligible for EU funding.

Whilst it might be possible for some nations to process stomach samples at sea (depending on the skills and number of scientists onboard), this would likely necessitate other approaches to diet quantification (e.g., fullness/points or volumetric methods) rather than weight-based data. Whilst such data could be collected at sea, such data would not be fully compatible for the models requiring contemporary dietary data (e.g., the Stochastic Multi Species model (SMS) used by WGSAM), and so would be of a lower priority in terms of data needs. It would also potentially mean some prey items being identified to higher taxonomic levels (e.g., genus or family) for some prey groups.

5.4.2 At-sea stomach sampling

A Working Document on the at-sea collection of fish stomach contents data was presented by Ellis and Roebuck (2024 WD). These data were collected during a gear trials trip using the survey trawl under development, rather than from a standardised trawl survey.

The stomach contents of 509 individual fish were examined during the course of the survey undertaken in December 2023. Sample sizes were largest for whiting, haddock, grey gurnard, European plaice, long-rough dab, lesser weever and Atlantic cod. Feeding intensity was low for several species, as evidenced by the high proportion of empty stomachs. Whilst these data were opportunistic in nature, tabulated preliminary dietary data were provided for cod, whiting, haddock and grey gurnard.

In addition to the obvious implications related to staffing (resource, staff availability) and limitations on working space (in the fish room) and time, Ellis and Roebuck (2024 WD) also noted some of the practical advantages and disadvantages of at-sea collection dietary data. It should be recognised that at-sea collection of stomach contents does not preclude the retention (preservation or freezing) of specific prey items for subsequent examination in the laboratory.

The potential advantages were:

- No (or limited) subsequent costs in terms of sample storage and laboratory analyses.
- No (or limited) use of chemicals.
- No (or limited) risks of samples being lost or deteriorating when in storage.
- Identification of stomach contents can benefit from access to trawl-caught (whole) specimens of potential prey species for comparison.
- In the absence of sample preservation/retention (e.g. ethanol, formalin or freezing), the data on wet weight collected may be more accurate, given that some preservation techniques can dehydrate samples (Howmiller, 1972).
- Quality of softer-bodied prey may be better than would be available after sample freezing, and subsequent thawing and examination. For example, gelatinous prey that may digest into a watery fluid may not be obvious when examining frozen or preserved samples.
- Increases the skills base of sea-going staff.
- Data becomes available shortly after the survey is completed.

Disadvantages include:

- Identification or the taxonomic resolution of some prey items from at-sea examination of stomach contents may not be as accurate as it could be compared to laboratory examination, especially where detailed microscopic examination is required for accurate species identification.
- Collection and at-sea identification of stomach contents from smallest size fish categories (and planktivorous species) may not be practical.
- Collected stomach contents samples may, in some circumstances, allow for a higher resolution dataset in relation to mass (e.g. dry weight, or from higher resolution balances for smaller individuals examined).

- Not all vessels have sea-going balances with a resolution of 0.1 g, which could then impact on the quality of the data.
- Absence of a reference collection for any subsequent checking or verification of prey identification.
- Lack of retained samples that may enable more detailed estimation of prey sizes (e.g. from otolith size).
- Variable skills base may impact on data quality and resolution. Indeed, variable taxonomic resolution may occur when a more experienced member of staff separates different brittlestars (e.g. Amphiuridae, or *Ophiura* sp.), whilst other members of staff may simply record 'brittlestar'.

5.5 Fish parasites

There has been an increased interest in studying fish parasites in recent years, given that high parasite loads may impact on fish health and condition and that parasite loads may also be an indicator of increased stressors on fishes or environmental conditions. It is also becoming more popular to use the parasite fauna of fish in the interpretation of stock units.

5.5.1 North Sea cod infestation with liver worms

Considering findings for Baltic cod that infestation with liver worms has a negative effect on cod condition and may thus have contributed to the deterioration of the Central Baltic cod stock (Ryberg *et al.*, 2021), IBTSWG agreed to conduct a pilot study for North Sea cod. Sampling was carried out in Q1 2021–2024 and in Q3 2021–2023.

All countries collected information using the same liver worm abundance category scale as applied in the Baltic and described Ryberg *et al.* (2021), and together with individual fish length and weight being recorded. In addition, some participants recorded liver weight as well, and some participants retained liver samples for subsequent identification of the liver worms.

In total, 5687 cod were examined, of which liver weight data were collected for 3866 individuals. These were recorded from the six surveys (Q1 and Q3 surveys). For studying the possible effect of liver worm infestation, two different condition factors were used, K_{Fulton} and $K_{Le\ Cren}$. For calculating $K_{Le\ Cren}$, quarterly length-weight relationships were derived from the current data set (Figure 5.4). The two conditions factors showed different response to length and were not independent from fish size (Figure 5.5).

Cod smaller than 20 cm were not infected (category 0) whereas all individuals larger than 90 cm carried liver worms (categories 1 to 4) (Figure 5.6). Hence, all subsequent analyses were undertaken for fish ≥20 cm considering that smaller individuals, which were mainly caught in Q3, were not infected at all.

The spatial distribution of prevalence expressed as mean liver category (weighted by the number of observations) by rectangle indicated that the infestations were widely distributed throughout the North Sea, but average infestation was generally low to moderate (categories 1 to 3) (Figure 5.7).

Within the North Sea, highest overall infestation was found for the Northwestern subpopulation amounting to 72% (Figure 5.8), but even this was very low compared to the infestation rates of >90% reported in Central Baltic cod (Ryberg *et al.*, 2021).

The infestation category had no significant effect on Le Cren's condition factor (ANOVA on Ranks) whereas infestation density showed a negative effect (Spearman Rank Order Correlation) for the pooled data (Figure 5.9). However, the infestation density data were highly unbalanced with many zeroes and just a few high values. Furthermore, infestation densities ≥1 were observed only for worm abundance categories 1 to 3 and individuals with a length <50 cm.

GAMs of the following form

1) K_{Fulton} ~ Length + Year + Quarter + $Area_{Substock}$ + Infestation category

2) K_{Fulton} ~ Length + Year + Quarter + $Area_{Substock}$ + Log(Infestation density + 0.1)

with family = gaussian and link =”log” revealed significant effects for the factors year, quarter, subpopulation and the smooth term length in addition to infestation category or infestation category. The model diagnostics were acceptable (Figure 5.10) and the explained deviance amounted to 18.3 and 21.5 %, respectively.

Given the lack of clear evidence that infestation with livers worms is harmful to the subpopulations of North Sea cod, IBTSWG decided to stop the coordinated sampling on this topic. A full-scale sampling, however, may be re-introduced in conjunction with stomach sampling scheduled for 2028.

Individual nations are, obviously, able to continue sampling if they wish.

5.5.2 Haddock gill parasites

No updates were provided for haddock parasites, and the reader is referred to previous reports for contemporary information.

5.5.3 Other fish parasites

It was also noted that some surveys operating in the English Channel had seen external isopod parasites (Family Cymothoidae) on the sides of various fish species, including European sea bass and black seabream. There is a degree of uncertainty as to which species of cymothoid parasites occur in the ICES area. Further studies on these parasites may also be something to consider in the future.

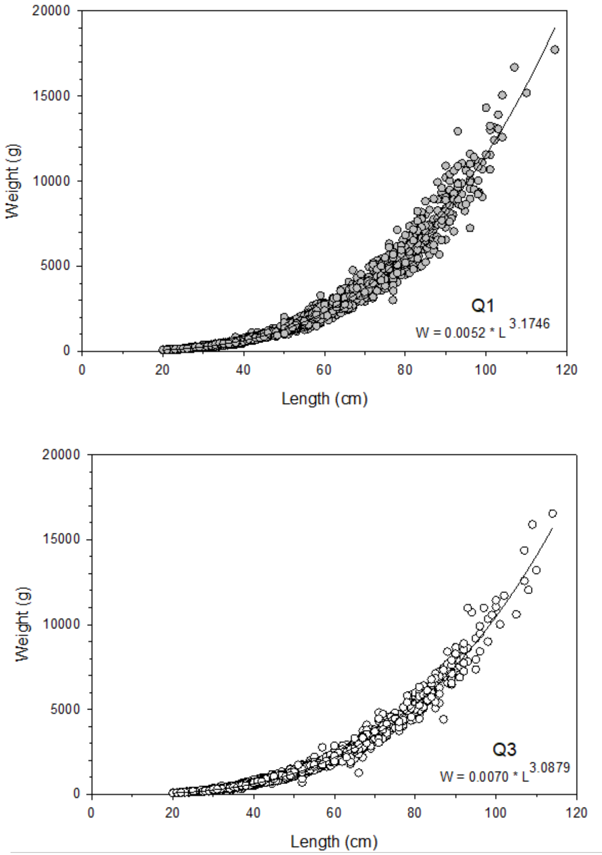


Figure 5.4. Length-weight relationships for both quarters, all years combined.

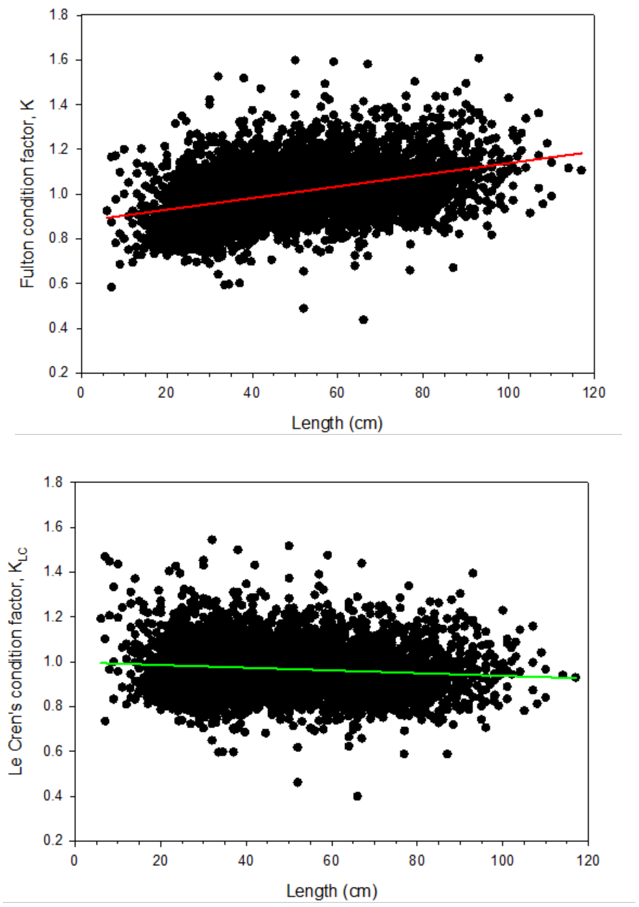


Figure 5.5. Comparison of Fulton's and Le Cren's conditions factors, all years and both quarters combined.

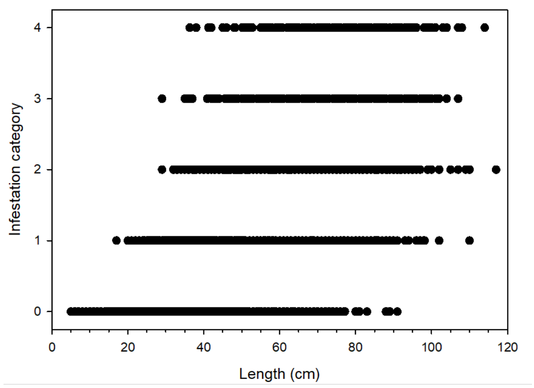


Figure 5.6. Infestation in relation to size of cod (all years and both quarters combined).

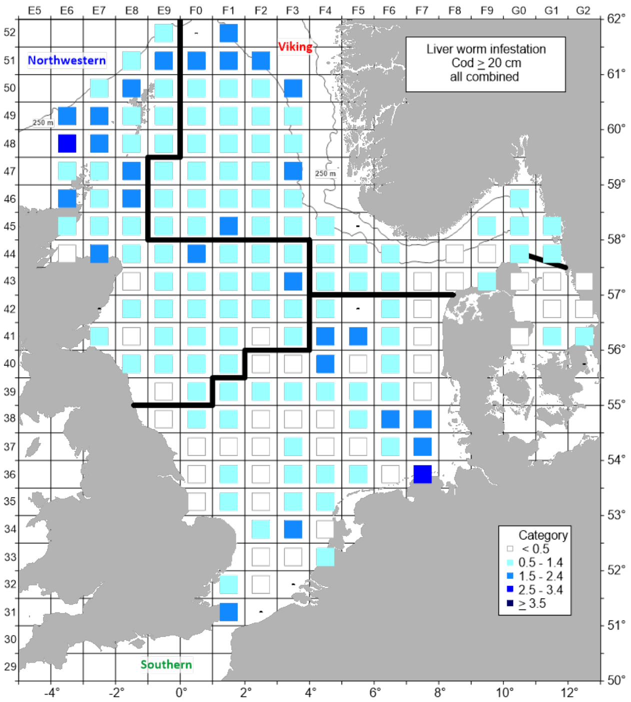


Figure 5.7. Spatial distribution of cod liver worm prevalence (all years and both quarters, -: no information or no cod ≥ 20 cm caught).

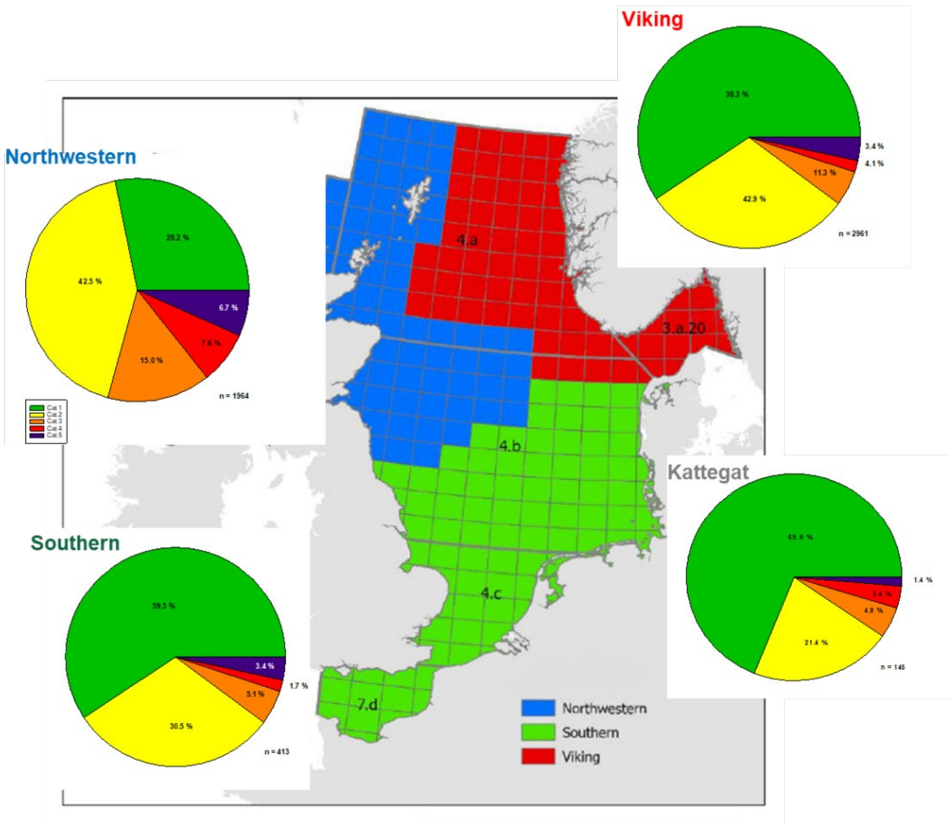


Figure 5.8. Infestation by cod subpopulation (all years and both quarters combined).

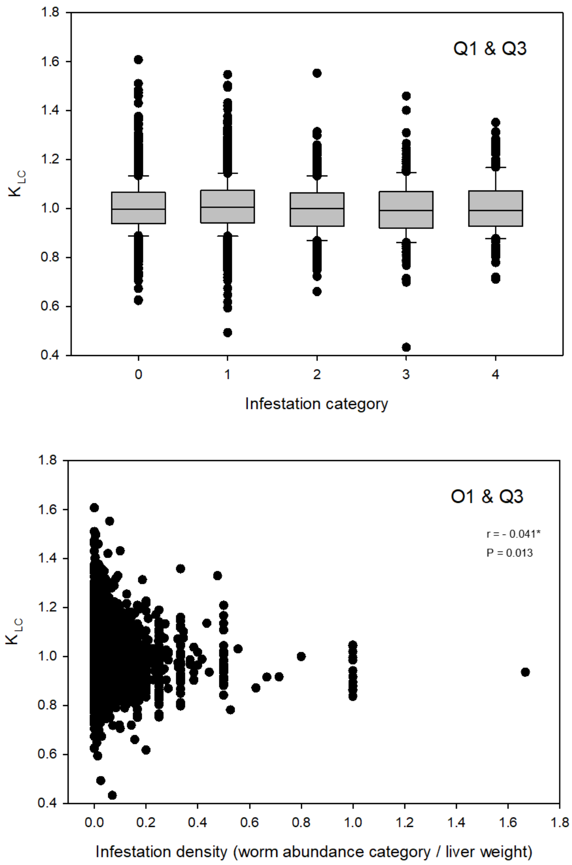


Figure 5.9. Liver worm abundance category, infestation density and condition (all years and both quarters combined).

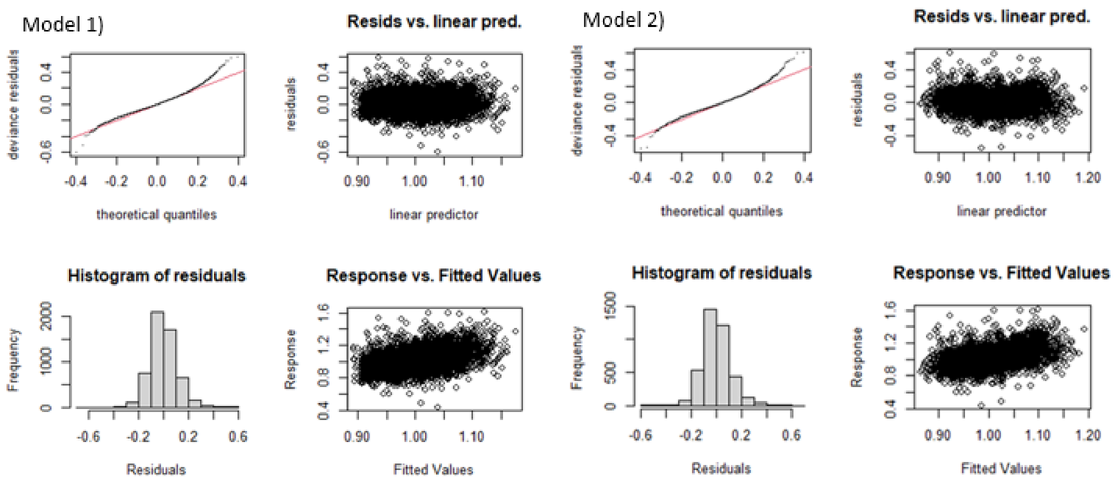


Figure 5.10. Model diagnostics.

5.6 Fish tagging

Various institutes involved in IBTSWG-coordinated surveys use national trawl surveys as opportunistic platforms for conventional, mark-identifications tagging of selected fish species (See Annexes 4–6). To date, much of this work has focused on elasmobranchs, but with some tagging of other fish species (e.g., flatfish). Whilst opportunistic in nature, the data collected from such studies could, over the longer-term, help provide important information in relation to growth, longevity, movements and stock identification. IBTSWG also recognised that there was increasing consideration of stock delineation in some recent benchmark assessments, for which tagging data may be informative.

In early 2024, ICES convened a Workshop on Mark-Identification Tagging (WKTAG; ICES, 2024), and a summary the work undertaken during this meeting was given to IBTSWG. Whilst it was intended originally to focus on mark-identification tags, there were also contributions on acoustic and electronic tags. The Workshop was attended be a large selection of scientists from around the world, with information relating to numerous taxa.

IBTSWG could usefully have further discussions on current tagging studies being undertaken onboard IBTSWG-coordinated surveys at a future meeting.

5.7 Ichthyoplankton

Several surveys coordinated by IBTSWG also conduct sampling for ichthyoplankton. The results for the standard MIK surveys for herring in the Q1 IBTS are summarised in Section 2 and Annex 4.

5.7.1 A pilot survey on the feasibility of establishing a sprat recruitment index based on larval sampling during Q3 IBTS surveys

Sprat is a short-lived species, and the sprat stock in the North Sea is dominated by young fish. Thus, the size of the stock is to a large degree driven by the recruiting year class, and catches are mainly composed of 1-year old fish (up to 80%).

Sprat is also an important forage fish and represents a major food source for many other fish species as well as sea birds and marine mammals. It is therefore a highly relevant species in multispecies and ecosystem approaches to fisheries management.

An analytical assessment for sprat was established some years ago, however the availability and quality of data for the assessment have been relatively poor, and the assessment of and advice for the North Sea sprat stock needs to be improved. There is presently no information available on young-of-the-year (0-group) sprat for possible use in short-term forecasts, or for use in the stock assessment model. However, such information could potentially be very useful, particularly as sprat is a short-lived species that matures early.

The aim of the present study is, by conducting a series of pilot surveys, to evaluate the feasibility of establishing a sprat recruitment index based on larval sampling conducted during night-time during the North Sea Q3 IBTS and to contribute generally to a better understanding of the biology, ecology and distribution of the North Sea sprat stock. Thus, the basic idea is to follow similar procedures as the MIK herring larvae surveys during the Q1 IBTS. These surveys are targeting relatively large larvae (2 to 3 cm) and the abundance of these has shown to relate to later recruitment to the stock, thus providing a recruitment index for autumn spawning herring in the North Sea.

So far, a total of six pilot surveys have been conducted in July/August 2018, 2019 and 2020 and in August/September 2021, 2022 and 2023 targeting sprat larvae with a MIK net. The surveys were conducted by DTU Aqua, Denmark, in 2018 and 2019 in the framework of the project "BEBRIS - Maintaining a sustainable sprat fishery in the North Sea" and in 2020 and 2021 in the follow-up project "PELA – Pelagic species". Sampling was conducted during nighttime on the Q3 IBTS. Furthermore, the Thünen Institute of Sea Fisheries in Bremerhaven, Germany contributed to the sampling in 2020 and 2021.

During the first four years it became clear that a number of prerequisites for establishing a recruitment index were fulfilled. This includes that sprat larvae are present in the survey area at the time of the survey and can be caught representatively, spawning activity of sprat is finished before the time of the survey and the MIK sampling can effectively be incorporated into the standard routines of the Q3 IBTS. However, catchability tests between daylight and nighttime have shown that sprat larvae are only caught representatively at night. This is limiting the available time for sampling to approximately 7–8 hours per night due to the extended period of daylight hours during the Q3 IBTS. Furthermore, while the main distribution area of sprat larvae seems to be covered by the Danish Q3 IBTS, a better spatial coverage would be desirable. Based on the promising preliminary results from these first four years, DTU Aqua decided to continue the pilot survey in 2022 and 2023.

Table 5.3. provides an overview of the sampled stations in the first six years of pilot surveys. Overall, 71 and 66 valid standard hauls (plus several additional hauls for gear tests etc.) were conducted in 2018 and 2019, respectively. In 2020, a total of 128 hauls was conducted (68 by Denmark and 60 by Germany). In 2021, a total of 89 hauls was conducted on a joint Danish-German survey. In 2022 and 2023, a total of 63 and 70 hauls, respectively, were conducted by Denmark. Figure 5.11 shows the distribution of the MIK sampling stations during the Danish 2023 Q3 IBTS. In addition, Marine Scotland Science also conducted MIK sampling during their Q3 IBTS in 2021 and 2023 on 51 and 17 stations, respectively.

The gear in use during the pilot surveys is a MIK net with a ring of 2 m diameter and a mesh size of 1.6 mm. In addition, a small MIKeyM net (20 cm Ø, 500 µm mesh size) was attached to the MIK ring on the Danish surveys in 2018–2020 and 2022–2023. This was done to test if there were still eggs and/or very small larvae in the area during the time of the Q3 IBTS, which would indicate that the seasonal spawning activity has not finished yet. The gear was equipped with a depth sensor and was deployed in a double-oblique haul from the surface to 5 m above the sea floor (measured from the lower end of the MIK ring). Fishing speed was 3 knots through the water, and the wire was paid out at a speed of 25 meters per minute (= 0.4 m s^{-1}) and retrieved at 15 meters per minute (= 0.25 m s^{-1}). Both the MIK and the MIKeyM were equipped with flow meters to record the volume of filtered water.

With very few exceptions, clupeid larvae were found on all sampling stations in the six years investigated, and abundances were generally relatively high, with many stations yielding several hundred larvae. However, in all years the clupeid larvae not only contained sprat but also sardine larvae in high abundances. A similar, recurring pattern in the spatial distribution of sprat and sardine larvae was observed in all six years, with sprat larvae occurring mainly in the northern part of the study area and sardine larvae most abundant in the south. This shows that careful identification procedures to species level are required.

Results on the spatial separation of sprat and sardine larvae in relation to the ambient hydrography, based on the first three survey years, were recently published (Munk *et al.*, 2024).

Catches of sprat larvae in 2023 were on an average level in the six-year time series that was investigated so far. The MIKeyM samples did not suggest any catches of sprat eggs, indicating that sprat spawning activity had finished and larvae had hatched well before the time of the surveys.

The larvae had a broad size range from approx. 6 mm to juvenile fish of 4–5 cm with very similar size frequency distributions for both sprat and sardine. The majority of larvae were in the 12–20 mm size range.

A final judgement as to whether the larval survey can provide an early recruitment index for North Sea sprat still requires more reliable recruitment estimates, further analyses, and a longer time-series. Nevertheless, the first six years of pilot surveys illustrate that this kind of larval survey during nighttime of the Q3 IBTS has the potential to provide larval abundance estimates, and potentially a recruitment index, for North Sea sprat. However, additional surveys will be necessary to provide further yearly observations and more data for the modelling of recruitment patterns.

It is noteworthy that in addition to sprat and sardine, a number of larvae of other fish species were caught in the MIK, including commercially relevant species. The more abundant species were mackerel, horse mackerel, sandeel, gurnards, lemon sole, scaldfish and other flatfishes, as well as several non-commercial species (e.g., gobies, crystal goby, rocklings, pipefish, dragonets and greater weever). In addition, a number of larger gadoid larvae and/or pelagic juveniles were caught, in particular whiting. With regards to mackerel larvae, there was a tendency of higher catches in the northern part of the sampling area. whereas horse mackerel dominated in the southern part. The larger larvae and pelagic juveniles of whiting were mainly found in the northern part. In the 2023 survey, many anchovy larvae were found in the southern part of the survey area. Furthermore, a total of 16 sea horses were caught in the northern English Channel/Southern Bight area, ranging in size from about 10 mm large juveniles to full-grown adults.

No dedicated funding is presently available to investigate these other species in detail. However, numbers of larvae of other species from the 2018 and 2019 surveys and partly from the 2020 survey were analyzed in the framework of student theses.

Based on the promising results from the first six years, DTU Aqua is planning to continue the pilot surveys in 2024. However, a better area coverage than obtainable by the Danish survey with RV "Dana" alone would be advisable, and other nations participating in the Q3 IBTS are encouraged to contribute to these pilot surveys.

Table 5.3. Overview of MIK sampling stations conducted during the Q3 IBTS. Data from 2021 from a joint Danish-German survey

Year	Denmark	Germany	Total
2018	71	-	71
2019	66	-	66
2020	68	60	128
2021	89		89
2022	63	-	63
2023	70	-	70

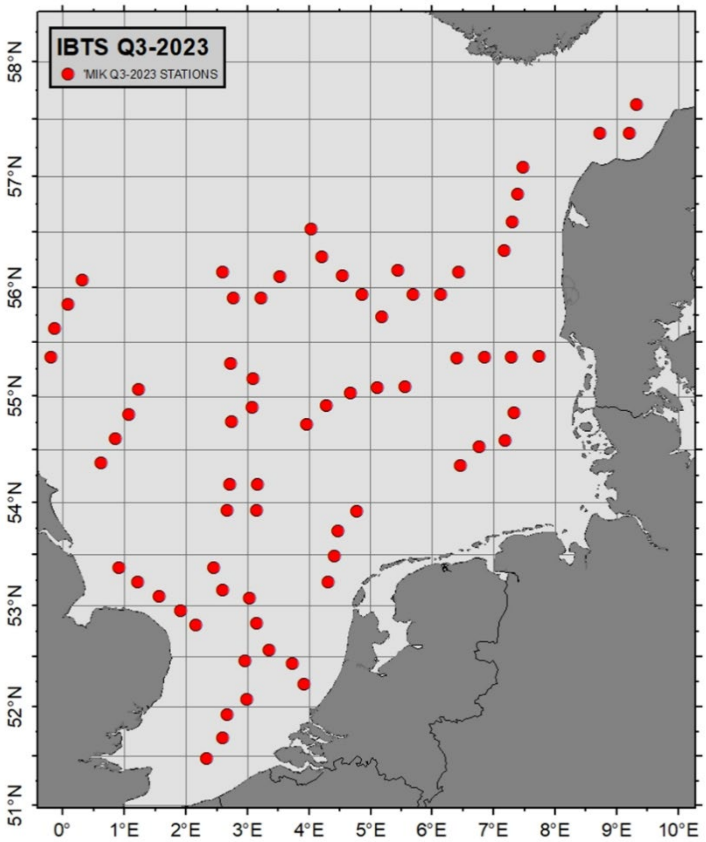


Figure 5.11. MIK sampling stations during the Danish Q3 IBTS in 2023.

5.8 Genetic sampling

The surveys coordinated by IBTSWG also facilitate the collection of samples for genetic studies, whether this is tissue samples from particular fish species, or filtered water samples to examine eDNA, with a brief synopsis given here.

5.8.1 Tissue sampling for genetic studies

There is continued interest in the population structure of Atlantic cod in the North Sea, including in relation to the subpopulations. There are ongoing genetic studies, and Marie Storr-Paulsen and Jakob Hemmer Hansen (Denmark) gave a presentation on current studies. In addition to recent tissue sampling, there was a desire to have more genetic samples collected from actively spawning cod from the various subpopulations (Northwestern, Viking, and Southern).

5.8.2 Sampling eDNA

Sampling of eDNA was conducted by Germany (Q1/2024) in 12 rectangles parallel to the GOV hauls (Figure 5.12). The main objectives were (1) to evaluate the use of eDNA metabarcoding based on 12S rRNA for estimating fish diversity, and (2) to test a new water filtration method because of some issues with water filtration on other surveys (time-consuming; extra person needed). For the latter, 2 litre bottom water from CTD casts were filtered with Sylphium eDNA filter capsules (0.45µm; Figure 5.12). Results of the analysis are still pending. However, with respect to the filtration method it can be concluded that filtration with the filter capsules was quite easy, took a maximum of 15 minutes, avoided contamination and made processing of the sample easier (capsules are suitable for in-capsule lysing and preserving).

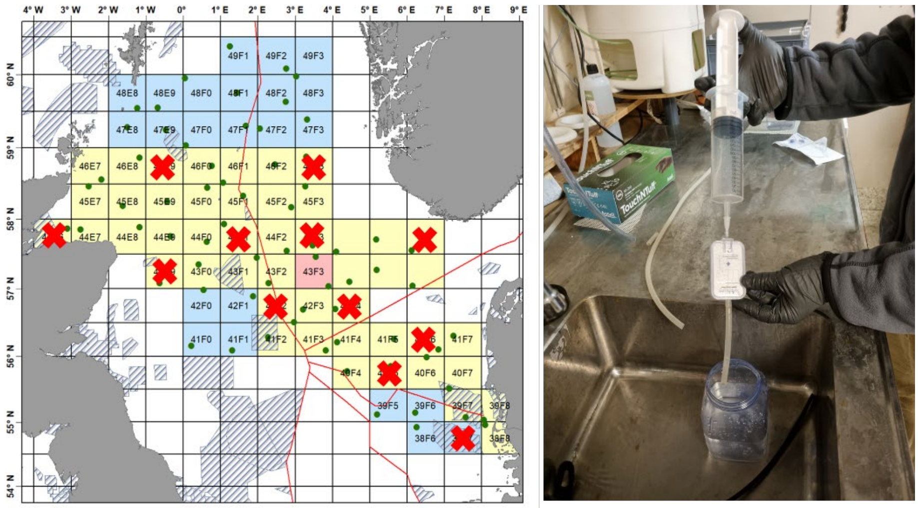


Figure 5.12. Sampling locations (left) and filtering procedure (right) of eDNA sampling, Germany, Q1 2024 .

5.9 The GOV 1-ringer herring index and potential catchability issues

The 1-ringer herring recruitment estimate (IBTS-1 index) is based on GOV catches in the entire survey area of the Q1 IBTS and is used in the stock assessment of North Sea herring by HAWG. The index from the 2024 survey (corresponding to the 2022 year-class) is 184. This is the second lowest index in the entire time-series since 1979 (long-term average = 1930), and only the very first year 1979 had an even lower index of 168.

Figure 5.13 shows the spatial distribution of 1-ringers as estimated by trawling in January/February 2022, 2023 and 2024, corresponding to year-classes 2020, 2021 and 2022. As in most previous years, most 1-ringers of the 2022 year-class were found in the German Bight area, along the Danish west coast and in the Kattegat/Skagerrak area. However, as already indicated by the extremely low 1-ringer index described above, abundances were considerably lower than in previous years.

The extremely low abundances found in the 2024 survey are rather surprising, as they follow the record high 1-ringer index observed in the previous 2023 survey. Furthermore, the age 2 index in the 2024 survey, which was expected to be high after the record high age 1 index in the 2023 survey, was way below average, as were the indices for older age classes. This may indicate a general issue with catchability of herring (and other pelagic species) during the 2024 IBTS Q1, possibly due to the severe weather conditions encountered during part of the survey period.

The relationship between the 0-ringer index from the MIK (IBTS0 index) and the 1-ringer index from the GOV (IBTS-1 index) may provide further support for potential catchability issues. The 0-ringer abundance index predicts the year-class strength one year before the strength is estimated from abundance of 1-ringers (IBTS-1 index). The time-series of 0- and 1-ringer abundance from the Q1 IBTS exists since the 1977 year-class. For more than a decade until the mid-1990s, there has been very good agreement between the indices in their description of temporal trends in recruitment, with the 0-ringer index explaining more than 70% of the variability of the respective 1-ringer abundance.

It has to be borne in mind that the 0-ringer index only reflects recruitment in the autumn spawning components of the stock, i.e. the North Sea Autumn Spawners (NSAS). As the contribution of the winter spawning Downs component to the total North Sea herring stock increased in recent years, the relationship between the two indices started to erode. This was particularly true during the first decade of the 21st century (for the year-classes 2003–2012), when the predicted trends in recruitment deviated between the two indices.

However, starting with the 2013 year-class, there was once again better agreement between the trends of the two indices. In the 2014 MIK survey, the 2013 year-class was recorded as the largest 0-ringer abundance since 2002, and the strength of this year-class was confirmed in 2015 with one of the largest 1-ringer abundances. This was the first strong year-class observed since 2002. Since then, the 1-ringer index followed the ups and downs of the 0-ringer index for the respective year-classes until the 2018 year-class. Beginning with the 2019 year-class, the relationship between the 0-ringer and the 1-ringer index decreased again.

The most recent data that can be compared between 0-ringers and 1-ringers are for the 2022 year-class, corresponding to the 0-ringers from the 2023 MIK survey and the 1-ringers from the 2024 GOV survey. For this year-class, the two time-series seem to be highly uncoupled, due to the extremely low 1-ringer abundance index. The differences in the trends of the two time-series in recent years are also reflected in the explained variability of the correlation between 0- and 1-ringers, which was about 30% until the 2018 year-class, but with the large discrepancies between the 0-ringer and 1-ringer indices for the most recent year-classes, this value has now further diminished to 14%.

The variable correspondence in the 0-ringer and 1-ringer indices in the later part of the time-series may be related to variable but generally increasing recruitment of the Downs component and its contribution to the North Sea herring stock. This also corresponds to recent results of genetic studies (Bekkevold *et al.*, 2023), which shows a high proportion of individuals of Downs origin amongst juvenile herring in the eastern North Sea area in particular.

However, variable weather conditions and associated effects on the catchability of 1-ringers from the Q1 IBTS GOV hauls may also play a role, in particular for the 2022 year-class (2024 survey) as well as the 2020 year-class (2022 survey). Preliminary analyses by DTU Aqua showed high turbidity in bottom layers in the usual herring areas (German Bight and along the Danish coast) in 2022 and 2024 (Figure 5.13). This may have caused the herring to migrate to layers not affected by turbidity, i.e. higher up in the water column, where they are out of the sampling depth of the GOV. However, further analyses are needed to corroborate and quantify such an effect.

IBTSWG received a recommendation from HAWG suggesting to (1) conduct a retrospective analysis of weather severity during Q1 IBTS, (2) collect data on turbidity on the GOV stations, (3) conduct analyses if/how weather conditions and turbidity affect catchability of different species, in particular herring & sprat, and (4) report regularly to HAWG on potential impacts of weather conditions on the reliability of survey results.

In the short-term, it was considered that a short review of how storms may affect catchability in trawl could be conducted for including in the next annual report of IBTSWG (e.g. Ehrich, 1991; Ehrich and Stransky, 1999).

Whilst IBTSWG did not consider that it was appropriate to initiate a standardized approach to collecting turbidity data at the present time, all nations were encouraged to see what relevant data are being collected and to investigate what data could be collected during their surveys.

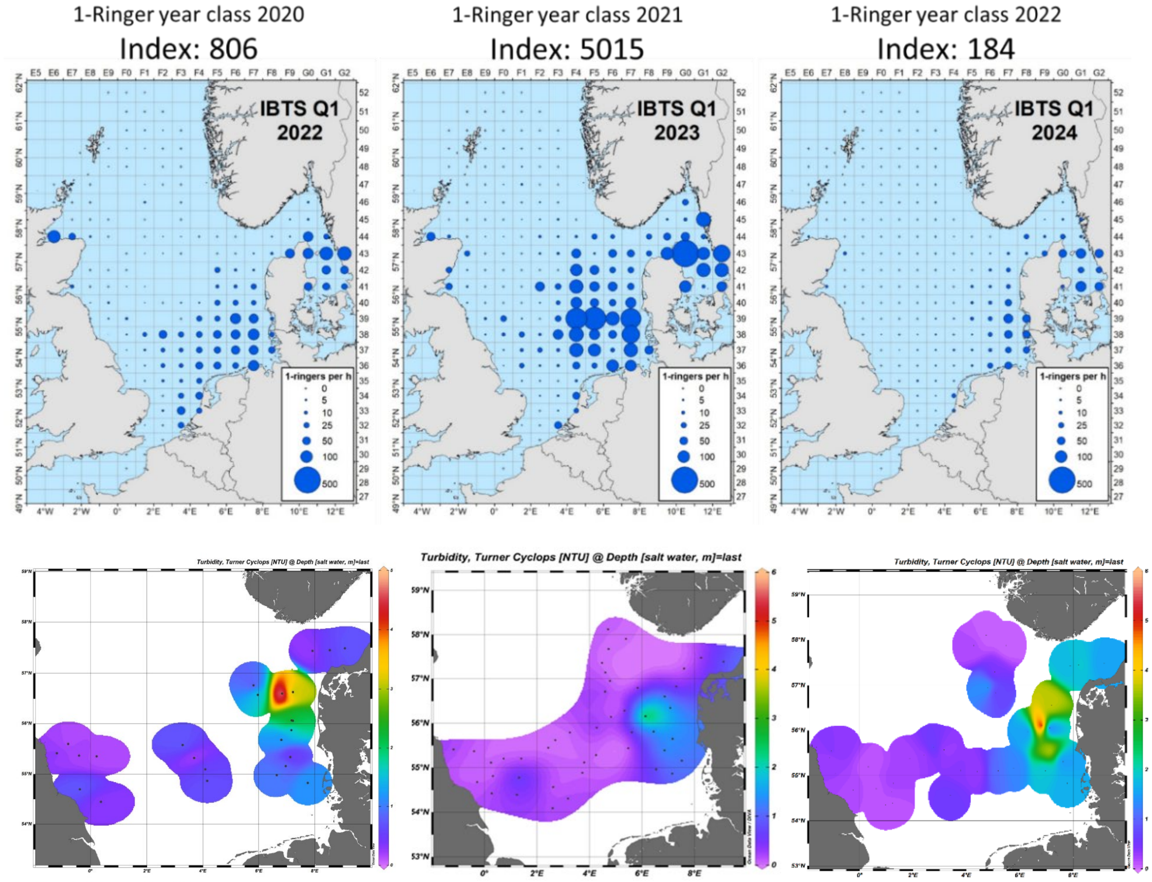


Figure 5.13. North Sea herring. Distribution of 1-ringer herring and potential impact of turbidity on their catchability in the GOV. Upper panels: Distribution of 1-ringer herring, year classes 2020–2022. Density estimates of 1-ringers within each statistical rectangle are based on GOV catches during IBTS in January/February 2022–2024. Areas of filled circles illustrate numbers per hour, scaled proportionally to the square root transformed CPUE data. Lower panels: measurements of near-bottom turbidity on the Danish RV DANA during the Q1 IBTS in the corresponding survey years.

5.10 Gadoid recruitment indices

Bram Couperus gave a presentation on the work carried out at Wageningen Marine Research on the development of recruitment indices of gadoids from the Downs Recruitment Survey (DRS) in April, and the herring acoustic survey (HERAS) in July.

Catches of both surveys have a level of mixing of herring with ancillary species, including haddock, whiting, and Norway pout. The number of gadoids fluctuates over the years, but they are always present in the samples taken during the surveys. For the DRS these are post-larvae while HERAS catches different age classes and could potentially give information on both juveniles and adults of gadoids.

Retrospective analysis of both biological and acoustic data from the HERAS combined with the new time-series of the DRS could be informative on temporal and spatial trends for the target species of these surveys, herring, as well as the gadoids.

The objectives of this project are:

1) In collaboration with WGNSSK, develop and derive abundance indices of gadoids (haddock, whiting, Norway pout) from the HERAS and DRS surveys.

2) Analyse the trends in the spatial distribution and abundance of gadoids.

3) Propose international protocols for collecting data on gadoids from the HERAS and DRS.

This study is now in the second year. In 2023, for the DRS, samples from 2022 and 2023 have been reanalysed for gadoid larvae. The Dutch HERAS survey data were collected and readdressed for compatibility between years. Acoustic indices were derived using the StoX software for gadoids by species for the years 2018–2023.

Preliminary results from HERAS showed recruitment-indices for haddock, whiting and Norway pout that correlated with the recruitment estimates from the assessments. Analysis of samples in the DRS-survey from 2022 and 2023, indicates potential for a whiting recruitment index.

IBTSWG welcomed the work carried out so far and agreed that the acoustic and larval indices could be used as independent reference values to assess abundance as derived from the assessment in ICES WGNSSK, for example in benchmark assessments. It was noticed that distribution of whiting larvae found in the DRS-survey in comparison with a Danish MIK net survey carried out in April, showed a shift of whiting larvae to the north.

5.11 Benthos

Observation of the benthos in trawl catches during IBTS surveys has demonstrated its value in recent years in the context of ecosystem observation and various applications (species or community mapping, monitoring of sensitive species, understanding of ecosystem processes, development of indicators, etc.). These data may be used within the framework of ICES groups working on biodiversity or indicators (e.g. WGBIODIV, WGFBIT), within other international frameworks dealing with environmental quality (e.g. OSPAR), and within the MSFD framework.

Numerous IBTS surveys have implemented these observations. Protocols differ according to the human resources, skills and time available on board. Table 5.4 provides an initial summary of the observations made on board and a brief outline of the protocols used. This work will be continued in order to assess the possibilities for harmonizing protocols (e.g. sharing identification guides, on-board practices, etc.). The existing or potential applications of these data for ecosystem-based assessment, and the possible implementation of new IBTS surveys, will be also explored.

Of the 24 IBTS-type surveys, more than half (13) observe the benthos on board. Data series sometimes began as early as the 1990s (IBTS-Q1 from Netherlands), but many have implemented these observations more recently (early 2000s). A first quick examination shows two main approaches, one exhaustive with protocols comparable to those for commercial species in terms of weighing or counting individuals, the other targeting a restricted list of species often selected for their sensitive or invasive nature (e.g. UK). The main difficulties encountered concern the skills and time available on board. Data quality remains to be assessed, but some variations in quality are due to the taxonomic skills available on board, even more specifically for certain groups of organisms (e.g. colonial hydroids, and ascidians).

Variations in processing methods for certain organisms (e.g. taking pagurids out of shells to weigh them), minimum sizes of organisms being recorded (e.g. small polychaetes and amphipods), approaches for encrusting fauna (e.g. barnacles), sub-sampling or additional operations such as individual measurements also need to be considered. With the exception of the Irish beam trawl survey stored in Datras, data storage is exclusively carried out in national databases, for reasons of variations in observation quality, or for some necessary adjustments to the Datras database. Future work, such as a dedicated session, will enable us to better assess the differences between campaigns, to develop an approach for evaluating the quality of the datasets produced, and to develop the sharing of these data. It will also be possible to better share identification guides and describe the benthos section of the IBTS survey manuals.

Table 5.4. Summary of benthic bycatch data collection on during the surveys coordinated by IBTS. For the purposes of this table, 'benthos' refers to invertebrates excluding cephalopods and commercial shellfish, which are processed as per fish. The current processing method, and the years it has been in use, are given, with these methods comprising:

i. All benthic bycatch components observed at all trawl stations (Obs-All) or at some stations (Obs-Part).
ii. Predefined list of benthic bycatch components observed at all trawl stations (List-All) or at some stations (List-Part).
iii. All benthic bycatch components observed at all stations, but selected (sentinel) taxa quantified (Obs-Sent).
iv. Benthic bycatch components all quantified by numbers and biomass at all stations (Quant-All) or at some stations (Quant-Part).
v. Predefined list of benthic bycatch components quantified by numbers and biomass (ListQuant-All) or at some stations (ListQuant-Part).

The benthic catch weight is recorded as (**A**) Total weight (Benthos, rocks and shell debris), (**B**) Total weight (benthic invertebrates only), (**C**) no weight of benthic bycatch recorded (**D**) by species similar to how fish are processed.

Nation	Description of data collection for benthic bycatch from main trawl gear	Years	Processing method	Benthic catch weight
North Sea IBTS – Q1				
Denmark	None			
France	As per described for the EVHOE (below)	2006–present	Obs-All List-All Quant-All	D
Germany	None			
Netherlands	In principle from the start of the NS-IBTS in 1960 (but might also be somewhere early 1990s) all animal species have been sorted the same way (only most seaweed/algae have not been recorded). All species (fish, squid, benthic, jellyfish) are sorted to species level or the highest taxonomic level possible. The taxonomic knowledge onboard however for the benthic species has been variable over the years or even within the different teams within a single year. This impacts mainly the hydrozoan, Anthozoa groups and other groups harder to identify. After sorting by species/group the individuals are counted and the total weight of the species is recorded. In some years also the smallest and largest individual of the haul have been measured. Species which can't be counted: bryozoans, whelk eggs, *Lanice*, etc etc were recorded as 1 (present) with weight, or in latest years only with weight. Species like hermit crabs have been taken out of shell for many years to weigh them, but weight is no	1960s–	Obs-All All	D

Nation	Description of data collection for benthic bycatch from main trawl gear	Years	Processing method	Benthic catch weight
	longer recorded. All data are available in the national data base, but for the IBTS due to the restricted species list not uploaded to Datras (the benthic data handled in the same way during the NS-IBTS are uploaded to the Datras.			
Norway	During catch processing, all benthic organisms are sorted out, identified at the lowest taxonomic level, then counted and weighted. For specific taxa that tend to be highly abundant like sea urchins, appropriate sub-sampling is carried out to get the total estimate number of individuals. For colonial organisms that cannot be counted, such as epizoanthids, only weight is recorded. Rarer taxa can sometimes be frozen whole and brought to land for expert taxonomic identification. There is usually a dedicated benthos expert on IBTS Q1, though most of the scientific crew is trained into benthos identification and can rely on detailed field guides created by our taxonomist. The "benthos" person for each station handles all benthic organisms as well as cephalopods.	2013–present for detailed benthos counts	Obs-All List-All Quant-All	D
Sweden	Sweden has observed/recorded invertebrates (on paper) roughly for the past 20-25 years but with variable intensity and skill. In the earlier years the benthos has been lumped together and weighed. In later years some improvement has occurred. Benthos is sorted during the usual catch procedure and determined to the taxonomic level we with certainty can vouch for and normally weighed per group. Individuals are sometimes counted. *Pagurus bernhardus* not usually parted from its shell.	1990-ies	Obs-all Quant-All	A, D
UK - Scotland	None	All years		
North Sea IBTS – Q3				
Denmark	None			
Germany	Germany has usually two benthos experts on Q3 to analyse benthos in two different ways: (1) Samples of epibenthos were analysed from 2-m beam trawl catches taken in parallel to the GOV hauls. Samples were sieved over a 2 and 5-mm mesh, and epibenthic fauna were separated from the remains. Most species were identified on board. Unidentified species were preserved for identification in the laboratory. Abundance and wet weight of the epifauna were determined to an accuracy of 1 g, and all animals were identified to the lowest possible taxon. See, for example: Neumann et al. (2017) Full-coverage spatial distribution of epibenthic communities in the south-eastern North Sea in relation to habitat characteristics and fishing effort. *Marine Environmental Research,* 130: 1–11. Neumann et al. (2016) Functional composition of epifauna in the south-eastern North Sea in relation to habitat characteristics and fishing effort. *Estuarine, Coastal and Shelf Science,* 169:182–194	(1) since 1998 (2) since 2008	Obs-All List-All Quant-All	D

Nation	Description of data collection for benthic bycatch from main trawl gear	Years	Processing method	Benthic catch weight
	Neumann et al. (2009) Temporal variability of southern North Sea epifauna communities after the cold winter 1995/1996. *ICES Journal of Marine Science*, 66: 2233–2243 (2) Benthos from the GOV hauls: During catch processing, the entire benthos is sorted and determined at the lowest taxonomic level. If the quantity caught is large, appropriate sub-sampling of the entire catch or of certain abundant taxa is carried out. After identification, each taxon is counted and weighed. Data are stored in national databases and are available by request.			
Norway	During catch processing, all benthos organisms are sorted out, identified at the lowest taxonomic level, then counted and weighted. For specific taxa that tend to be highly abundant like sea urchins, appropriate sub-sampling is carried out to get the total estimate number of individuals. For colonial organisms that cannot be counted, such as epizoanthids, only weight is recorded. Rarer taxa can sometimes be frozen whole and brought to land for expert taxonomic identification. There is usually a dedicated benthos expert on IBTS Q1, though most of the scientific crew is trained into benthos identification and can rely on detailed field guides created by our taxonomist. The “benthos” person for each station handles all benthic organisms as well as cephalopods.	2013–present for detailed benthos counts	Obs-All List-All Quant-All	D
Sweden	Sweden has observed/recorded invertebrates (on paper) roughly for the past 20-25 years but with variable intensity and skill. In the earlier years the benthos has been lumped together and weighed. In later years some improvement has occurred. Benthos is sorted during the usual catch procedure and determined to the taxonomic level we with certainty can vouch for and normally weighed per group. Individuals are sometimes counted. *Pagurus bernhardus* not usually parted from its shell.	2001	Obs all Quant-all	A, D
UK – England	During catch processing, one of each benthic species observed is removed from the catch and then recorded as being present (‘Observed only’). The total weight of all benthos is also recorded (this weight includes the individuals removed from the catch whilst processing). There is also a list of ‘sentinel’ species, with these species always removed from the catch during sorting, with total catch weight and catch numbers (for non-colonial species) recorded. The sentinel taxa comprise some sessile invertebrates that are considered susceptible to fishing impacts (*Sabellaria spinulosa* (aggregations only), pink seafan *Eunicella verrucosa,* ross coral *Pentapora foliacea*, and the sea-pens *Virgularia mirabilis, Pennatula phosporea* and *Funiculina quadrangularis*), some large molluscs (fan mussel *Atrina fragilis*, heart cockle *Glossus humanus,* and ocean quahog *Arctica islandica*), species of either southerly distribution (mantis shrimp *Meiosquilla desmaresti* and sponge crab *Dromia personata*) or northerly distribution (purple sunstar *Solaster endeca*), and non-native species (slipper limpet *Crepidula fornicata* and the ascidian *Styela clava*). The quantity of benthic bycatch is highly variable, and the extreme values can vary from practically nothing to >1 tonne. It would be difficult to do full benthic sorts at all stations. Dedicated work on the benthos would require an additional member of suitably skilled, sea-going staff. Some catches would need to be sub-sampled, which would impact on accuracy of the data on relation to biodiversity metrics (although it would be indicative of demersal assemblage structure).		Obs/Sent	A

Nation	Description of data collection for benthic bycatch from main trawl gear	Years	Processing method	Benthic catch weight
	The survey covers much of the North Sea and there is the potential to encounter some deeper-water and/or more northerly species that may not be in commonly-used identification guides, emphasising the need for specialists to be onboard if the highest quality data were to be collected.			
UK – Scotland	None	All years		
North-east Atlantic surveys				
France IBTS-Q4 (EVHOE)	During capture processing, the entire benthos is sorted and determined at the lowest taxonomic level. If the quantity caught is large, appropriate sub-sampling of the entire catch or of certain abundant taxa is carried out. After identification, each taxon is counted and weighed. Some taxa that cannot be identified on board are kept for identification on land in the laboratory. Some groups were not precisely identified until later in the series, such as the sepiolidae, colonial hydrozoans. At least one competent person is dedicated to benthos on board, assisted by a second person if available, depending on the work to be carried out on priority commercial species (fish and cephalopods). The benthos team is also responsible for all commercial invertebrate species with the exception of large cephalopods (*e.g.* Loliginidae). Individual measures have recently been implemented for a limited list of species (mainly echinoderms and pennatulids). A specific identification guide for the species observed on the different areas, from the Mediterranean to the North Sea, has been compiled for all the surveys and includes more than 350 taxa Data are entered on board using the same software and database as for commercial species. They are stored in a national database in the same way as commercial species, and are available on request.	2008–present	Obs-All List-All Quant-All	D
France (CGFS)	As per described for the EVHOE (above)	2010–present	Obs-All List-All Quant-All	D
Ireland (IGFS)	As with EVHOE above, during catch processing, the entire benthos is sorted and determined at the lowest taxonomic level. After identification, each taxon is counted and weighed except for colonial animals which are just weighed. Some taxa that cannot be identified on board are kept for identification on land in the laboratory. At least one competent person is dedicated to benthos on board, assisted by a second person if available. We have no dedicated benthic staff so the focus is on standardization across a core group of dedicated field staff.	2010–present	Obs-All Quant-All	
Ireland (Anglerfish)	This survey uses large hopper gear and no liner, so benthic catch processing is minimal and restricted to a count and weight by species of sentinel species and a total weight of others with some comments.	2015–present	ListQuant-All (Obs-Sent)	
Portugal				

Nation	Description of data collection for benthic bycatch from main trawl gear	Years	Processing method	Benthic catch weight
Spain (Porcupine Bank)	When sorting the catch, the entire benthos shall be sorted and identified to the lowest taxonomic level possible. Subsampling of the entire benthic catch or of an abundant taxon shall be carried out if deemed appropriate by the deck master. After identification, each taxon or a representative sample shall be counted and weighed. Taxa that cannot be identified on board and samples of rare individuals are kept in the laboratory for identification ashore. In addition, individual measurements are taken for a limited list of decapods crustaceans and cephalopods. Data are entered on board using the same software and database as for commercial species.	All years	Obs-All Quant-All	D
Spain (North Coast)	During catch sorting, the entire benthos is sorted and determined at the lowest taxonomic level possible. Subsampling of the entire benthos catch or an abundant taxon is carried out if deemed advisable by the deck master. After identification, each taxon is counted and weighed. Taxa that cannot be identified on board and samples of rare individuals are kept for identification on land in the laboratory. Some groups were not precisely identified until later in the series, e.g. some sepiolids, colonial hydrozoans, bryozoans or other less common invertebrates. At least one competent person is dedicated to benthos on board, assisted by a second person if available, depending on the work to be carried out on priority commercial species (fish, decapod cephalopods and crustaceans). Individual measures have been implemented from 2018 for a limited list of species (all decapod crustaceans and cephalopods (from 2006) and some echinoderms, pennatulids or gastropods). Data are entered on board using the same software and database as for commercial species.	1990-present	Obs-All List-All Quant-All	D
Spain (Gulf of Cádiz, Q1)	During catch sorting, the entire benthos is sorted and determined at the lowest taxonomic level possible. Subsampling of the entire benthos catch or an abundant taxon is carried out if deemed advisable by the deck master. After identification, each taxon is counted and weighed. Taxa that cannot be identified on board and samples of rare individuals are kept for identification on land in the laboratory. At least one competent person is dedicated to benthos on board, assisted by a second person if available, depending on the work to be carried out on priority commercial species (fish, decapod cephalopods and crustaceans). Individual measures have been implemented from 1993 for decapods crustaceans and cephalopods of commercial interest. Data are entered on board using the same software and database as for commercial species (PescaWin).	1993-present	Obs-All List-All Quant-All	D
Spain (Gulf of Cádiz, Q4)	Same as Q1	1997-presnt	Same	D
UK-North Ireland Q1 and Q4	During catch processing, the entire benthos is sorted and determined at the lowest taxonomic level. After identification, each taxon is counted and weighed, while some are also measured for length and also width (some crab species, scallops etc), except for colonial animals which are just weighed. Some crustaceans are also recorded by sex. Some taxa that cannot be identified on board are kept for identification on land in the laboratory. At least one competent person is dedicated to benthos on board, assisted by a second person if available. We have no dedicated one benthic staff but will have to make sure continuation for the future. Earlier years are not as well sampled, but from 2007 data should be of good quality.	2007–present (prior not reliable)	Obs-All List-All Quant-All	D

Nation	Description of data collection for benthic bycatch from main trawl gear	Years	Processing method	Benthic catch weight
UK-Scotland (Q1)	None	All years		
UK-Scotland (Q4)	None	All years		
UK-Scotland (Rockall)	None	All years		

6 Joint session with assessment working groups and other expert groups

6.1 Introduction

A new TOR agreed for the current reporting cycle was to increase the communication between user groups and survey groups. Following the 2023 meeting of IBTSWG, either one of the IBTSWG chairs gave presentations summarising the recent surveys to the assessment working groups that use much of the data collected during IBTSWG-coordinated surveys, namely WGNSSK, WGCSE, WGBIE, and WGEF.

6.2 Communications during 2023/2024

In 2024 another collaborative, open session was held between IBTSWG and chairs/members of various assessment groups, including members of the Working Group for the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK), Working Group for the Celtic Seas Ecoregion (WGCSE), Working Group for the Bay of Biscay and the Iberian Waters Ecoregion (WGBIE), and Herring Assessment Working Group (HAWG). The discussions proved to be successful and an important part in taking science forward, improving indices and the assessments.

In 2024, IBTSWG also met with members of the Working Group on Biological Parameters (WGBIOP), focusing on maturity staging. It was viewed that maintaining strong linkages between IBTSWG and WGBIOP was also of great importance, as the trawl surveys serve as a platform for collecting maturity data (and structures for age determination), and the survey scientists are often the end-users for maturity keys developed by WGBIOP.

The Chair of the Working Group on Network for Surveys towards Ecosystem Advice in the Greater North Sea (WGNSNETSEA) gave a presentation on the work of this recently formed group, and for which there is a clear need for the involvement of some IBTSWG members.

Continued communication with user groups will facilitate the better use and interpretation of survey data, a deeper understanding of the underlying survey used in the development of indices by the stock assessors and enhance scientific collaboration between the groups.

Updated presentations on the 2023/2023 surveys will be given at the assessment working group meetings by either of the current IBTSWG chairs.

6.3 Future communications

IBTSWG and members of assessment Working Groups note the benefits of the improved communication. Of particular relevance is the need for continued work with the assessment groups with regards the introduction of the new survey trawl for the North Sea IBTS. There is also a need to maintain close links and engagement with WGBIOP and WGNSNETSEA.

Given that fish are an important element of marine biodiversity, there is a clear rationale for having a joint discussion between IBTSWG and the Working Group on Biodiversity Science (WGBIODIV), including in relation to the MSS-OSPAR data product. Noting the discussions on benthic invertebrates (see Section 5), there would also be merits in IBTSWG developing closer links with the Benthos Ecology Working Group (BEWG).

Reference list

Heessen, H.J.L., Dalskov, J., and Cook, R.M. 1997. The international bottom trawl survey in the North Sea, the Skagerrak and Kattegat. ICES CM 1997/Y:31; 25 pp.

ICES. 2020. Manual for the North Sea International Bottom Trawl Surveys. Series of ICES Survey Protocols SISP 10-IBTS 10, Revision 11. 102 pp. http://doi.org/10.17895/ices.pub.7562

ICES. 2022a. Workshop on the Further Development of the New IBTS Gear (WKFDNG). ICES Scientific Reports. 4:18. 46 pp. http://doi.org/10.17895/ices.pub.10094

ICES. 2022b. International Bottom Trawl Survey Working Group (IBTSWG). ICES Scientific Reports. 04:65. 183pp. http://doi.org/10.17895/ices.pub.20502828.

ICES. 2023. International Bottom Trawl Survey Working Group (IBTSWG). ICES Scientific Reports. 5:80. 204 pp. https://doi.org/10.17895/ices.pub.23743989

ICES. 2023. International Bottom Trawl Survey Working Group (IBTSWG). ICES Scientific Reports. 5:80. 204 pp. https://doi.org/10.17895/ices.pub.23743989

ICES.2017. Manual of the IBTS North Eastern Atlantic Surveys. Series of ICES Survey Protocols SISP 15. 92 pp. http://doi.org/10.17895/ices.pub.3519

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Annex 2: Resolutions

2021/FT/EOSG01 The **International Bottom Trawl Survey Working Group (IBTSWG)**, chaired by Pia Schuchert, Northern Ireland and Jim Ellis, UK, will work on ToRs and generate deliverables as listed in the Table below.

	Meeting dates	Venue	Reporting details	Comments (change in Chair, etc.)
Year 2022	4-8 April	Online Meeting	Report by 20 May 2022 to EOSG	Outgoing: Ralf van Hal (Netherlands) and Pascal Laffargue (France). Incoming: Pia Schuchert, Northern Ireland and Jim Ellis, UK
Year 2023	27-31 March	Lysekil,Sweeden	Report by 30 April 2023 to EOSG	
Year 2024	8-12 April	Online	Report by 24 May 2024 to EOSG	

ToR descriptors

ToR	Description	Background	[Science Plan Codes]	Duration	Expected Deliverables
a	Coordination and reporting of North Sea and Northeastern Atlantic bottom trawl surveys, including appropriate field sampling in accordance to the EU Data Collection Framework. Review and update (where necessary) IBTS survey manuals in order to achieve additional updates and improvements in survey design and standardization. (ACOM)	Intersessional planning of Q1, Q3 and Q4 surveys; communication of coordinators with cruise leaders; combining the results of individual nations into an overall survey summary. Intersessional activity, ongoing in order to improve survey and manuals quality.	3.1, 3.2	Recurrent annual update	1) Survey summary including collected data and description of alterations to the plan, to relevant assessment WGs and other EGs (WGCSE, WGNSSK, HAWG, WGBIE ,WGDEEP, WGWIDE, WGEEL, WGCEPH, WGEF, WGML) and SCICOM. 2) Indices for the relevant species to assessment WGs (see above) 3) Planning of the upcoming surveys for the survey coordinators and cruise leaders 4) Updated version of survey manual, whenever substantial changes are made.
b	Address DATRAS-related topics in cooperation with DGG: data quality checks and the progress in re-uploading corrected datasets, quality checks of indices calculated, and prioritizing further	Issues with data handling, data requests or challenges with re-uploading of historical or corrected data to DATRAS have been identified and solutions are being developed	2.1, 3.1	Multi-annual activity.	Prioritized list of issues and suggestion for solutions and for quality checking routines, as well as definition of possible new DATRAS products, submitted to DATRAS group at ICES.

	developments in DATRAS. (ACOM)				Annual check of recent survey data.
c	Develop a new survey trawl gear package to replace the existing standard survey trawl GOV. (SCICOM)	The divergence in the GOV specification from the one given in the survey manual due to historical drift and technical creep has been acknowledged by the group (IBTSWG 2015). Furthermore, the deviation from the specification contained in the manual and between users has widened to the point where it will never be reversed. Therefore, the perefered option is to maintain the status quo of national GOV specifications and develop a new survey trawl package to replace the GOV. A number of IBTS members are due to replace vessels in the next few years and this provides an oppertunity to review time-series and undertake inter-calibration trials between the GOV and a new trawl. A further driver for a new gear has been highlighted by the Celtic Sea area where the necessity to optimize sampling opportunities are not been provided by the GOV. In parellel with trawl development the process of replacing the GOV will need to be defined with reference to continuing the assessments and existing time-series. (For this ToR, the IBTS WG seeks support from gear technology experts and welcomes their advice and input into the development of the new survey gear package)	3.1, 3.2	3 years	Final design(s); Full documentation of the gear, and how it should be rigged and operated at sea. Roadmap for implementing the gear in the ongoing survey. This will be developed at the WKFDN workshop as well as WKUSER 2 with support from WGISDAA and FTFB. There will also be linkages with the relevant assessment groups using IBTS data (WGNSSK, WGCSE, WGBIE, , WGWIDE, WGEF).
d	Evaluate the current survey design and explore modifications or alternative survey designs, identifying any potential benefits and drawbacks with respect to spatial distribution and frequency of sampling. Consider the effects of enforced	The requirements for the surveys are continuously evolving. Additional information, like dietary data, are also required, while reductions in other parts being sampled might be possible and wished for in relation to ethical discussions. New techniques, like eDNA	3.2	1-3 years	Resources permitting, stomach sampling program to be included in the NS-survey and in draft for the other regions

	changes in the distribution of survey stations (e.g. in relation to MPAs and offshore indutries). Explore potential additional data collection, e.g. stomach sampling and tagging (SCICOM) and engage with the Workshop on Pilot North Sea Fisheries Independent Regional Observation (WKPilot NS-FIRMOG).	sampling, might be relevant to add to the surveys. Furthermore, the ecological footprint of the survey (fuel consumption, bottom impact, impact in MPAs) is a topic having potential consequences for the current survey design.			
e	Making data from IBTS available to be used by different ICES end-users, such as assessment groups, OSPAR and others. Establish a communication with end user groups as to the needs of the users and the data available within DATRAS. Collate a user document that outlines the important caveats in the data with regards to non-target species (e.g. when a non-target species was first recorded as a species, the confidence in sampling). Establish a continued working relationship between user groups and survey group.	IBTS/DATRAS has got a wealth of data, which might be used in a number of applications. Originally set up to collect data on target species, data on other species and environmnental factors were often collected (sometimes sporadically), and the identification to species-level of some taxa has been dependent on the available time, the SIC at the time and the knowledge of the team. Using data without previous knowledge on all these factors could result in invalid assumptions. To get the most value out of the surveys, there needs to be a clear communication established with data users and the survey team. Often the current SIC or survey team does not even know how the data were collected historically. It is important to get a deeper understanding of the historic processes and how to progress into the future.		Multi-annual project	Establish closer coordination and communication channels with user groups and possible user groups: how do they use the data, how can we enhance the value of the data, what questions do arise? In which format should (historical) documentation be provided? Establish a guideline with user groups. What is actually being read, what is important. Create a more detailed chronology of historical and contemporary surveys, with this bing a ’live document’ (to be taken forward) about survey data capabilities and issues. Enable users to interact with the survey team to establish new possibilities, e.g. use the data for multispecies analysis, biodiversity questions. Also a personal link between users and survey people will enable the users to form specific requests or propose collaborative work.

Summary of the Work Plan

Year 1	Develop a roadmap for the implementation of the new survey gear (ToR c) ; Develop a stomach sampling program for the NS-IBTS and drafts for the other regions (ToR d).
Year 2	Start the implementation of the roadmap for the new survey gear (ToR c); Depending on the outcomes of stomach sampling during the North Sea IBTS in year 1, and the resources available, refine and extend the stomach sampling programme as appropriate.

Year 3	Continue the roadmap of the new survey gear.
Recurrent annual activity	Updates for ToRs a, and b and initiate and updates for ToR e.

Supporting information

Priority	Essential. The general need for monitoring fish abundance using surveys is evident in relation to fish stock assessments, and it has increasing importance in relation to MSFD GES descriptors, including biodiversity, foodwebs, populations of commercially exploited fish species, sea floor integrity and marine litter.
Resource requirements	A 5-day IBTS meeting. Prepared documents from members following ToR Leaders identified above. 8-day Chair's time to edit. It is estimated that each ToR will require at least 8 hours of preparation.
Participants	The Group is normally attended by some 25–30 members and guests.
Secretariat facilities	SharePoint plus normal secretariat support.
Financial	No financial implications.
Linkages to ACOM and groups under ACOM	ACOM. IBTS indices are used in the assessment of multiple stocks.
Linkages to other committees or groups	There are relations with other bottom-trawl surveys (WGBEAM, WGBIFS) that also use DATRAS as the international repository for its data (WGDG, DIG). There are also linkages with Assessment WGs using IBTS indices. Also relevant to the Working Group on Ecosystem Effects of Fishing Activities (WGECO) , the Working Group on Improving use of Survey Data for Assessment and Advice (WGISDAA), Working Group on Integrating Surveys for the Ecosystem Approach (WGISUR), Working Group on Biodiversity Science (WGBIODIV) and the Workshop on Pilot North Sea Fisheries Independent Regional Observation (WKPilot NS-FIRMOG).
Linkages to other organizations	IOC, GOOS, OSPAR, Regional Coordination groups (DCF).

Annex 3: List of survey names and survey codes

Survey	Nation	ICES Divisions	Quarter	Survey Code
North Sea IBTS-Q1				
NS-IBTS-Q1	INT	3.a, 4.a–c, 7.d (in part)	1	G1022
North Sea IBTS-Q3				
NS-IBTS-Q3	INT	3.a, 4.a–c	3	G2829
North-eastern Atlantic surveys				
UK-SCOWCGFS-Q1	GB-SCT	6.a	1	G4748
UK-SCOWCGFS-Q4	GB-SCT	6.a, 7.b	4	G4815
UK-SCOROC-Q3	GB-SCT	6.b	3	G4436
UK-NIGFS-Q1	GB-NIR	7.a	1	G7144
UK-NIGFS-Q4	GB-NIR	7.a	4	G7655
IE-IGFS-Q4	IE	6.a, 7.b, 7.g–j	4	G7212
IE-IAMS-Q1-2	IE	6.a, 7.b–c, 7.j–k	1–2	G3098
FR-EVHOE-Q4	FR	7.e–j. 8.a–b,d–e	4	G9527
FR-CGFS-Q4	FR	7.d–e	4	G3425
SP-PORC-Q3	ES	7.b,c,k	3	G5768
SP-NSGFS-Q4	ES	8.c, 9.a (north)	4	G2784
SP-GCGFS-Q1	ES	9.a (south)	1	G7511
SP-GCGFS-Q4	ES	9.a (south)	4	G4309
PT-PGFS-Q4	PT	9.a	4	G8899

Annex 4: Report of North Sea IBTS-Q1

Ralf van Hal (coordinator)

A4.1 Participation and general overview

In 2024, there were six participating vessels in the Q1 survey, namely “Dana” (26D4, Denmark), “GO Sars” (58G2, Norway), “Scotia” (748S, Scotland), “Thalassa” (35HT, France), “Tridens II” (64T2, Netherlands) and “Svea” (77SE, Sweden). The Germans used the Danish vessel “Dana”, due to mechanical issues with their own vessel.

The survey covered the period 12 January to 22 February 2022. Denmark started earlier with their survey then in previous years, to allow Germany to use the “Dana” as well (Table A4.1).

A total of 351 GOV hauls (10 of which were invalid; Table A4.2) were uploaded to DATRAS and 585 MIK hauls (two of which were invalid; Table A4.3) were deployed and uploaded to the eggs and larvae database. Most rectangles were fished at least once this year, the majority is fished with two hauls as planned. ICES rectangle 50E7 was not sampled at all. Germany informed the Q1 coordinator (and others) in advance of the survey that they were unable to use their own research vessel and were going to use the “Dana”, but that would result in a reduced number of days at sea. In anticipation of that, some of the German stations were allotted to other countries to cover in case time would allow. The spatial distribution of the stations is presented in Figure A4.1**)**.

A4.2 Issues and problems encountered

During NS-IBTS Q1 2024, France encountered challenges performing hauls in two ICES rectangles (35F0 and 36F0) due to the presence of static gear on the sea bottom (lobster pots etc.). It seems this kind of gear will be used routinely in the coming years by fishers. For technical reasons, the captain may disagree to trawl in these areas, also because static gears cannot be detected with echosounders. Consequently, France had to trawl closer to the ICES borders, which is not optimal. To address this issue in the future, France will try to get spatial polygons where these gears are located, in order to find alternative sampling stations in these ICES rectangles. In the general context where the different countries have difficulties to find alternative sampling stations, France will ask for a supplementary sea day to allow prospections in order to create new haul stations (in 2025 and 2026 in the southern North Sea).

In certain areas, sets of stations were undertaken in groups relatively close together (specifically by the Scottish) when restricted available survey time in that area combined with slow vessel transect speeds (due to poor weather) and a requirement to use only known trawl sites due to fishing gear limitations. Though suboptimal this avoided dropping rectangles from the survey in sectors where full coverage of assigned rectangles was essential. In general, IBTSWG try to avoid making such squares during surveys, but until we can move away from needing to sample known fishing stations (a consequence of the GOV being more prone to damage than many modern trawls), it may be difficult to always completely circumvent this.

A4.3.1 Trawl stations

An impression of the overall catches is given in Figure A4.2, by presenting the total fish catch in kilograms.

Standard tow duration according to the IBTS-manual is 30 minutes since the late 1990s (Figure A4.3 and Figure A4.4), but shorter tow durations are allowed, i.e. haul early for safety reasons or in the case of very large catches. The reasoning for shortened tows varies, and potentially results in some arbitrary decisions of the cruise leaders. The reasons for shortening a specific trawl are not recorded yet in the database. This year, the trawls less than 15 minutes were all shorted because they were invalid owing to gear damage or mechanical issues.

A4.3 Summary results from GOV trawl sampling

The preliminary indices for the recruits of seven commercial species based on the 2024 Q1 survey are not presented here, as the calculation method deviates too much from the methods currently used by the various stock assessments. However, these data are still shared during the survey between the cruise leaders and, where relevant, presented to IBTSWG for discussion. Based on these data and the traditional calculation of the age-1 indices, preliminary results indicated average recruitment of sprat, and the lowest or nearly the lowest recruitment since 1980 for cod, whiting, haddock, Norway pout, herring and mackerel.

The low occurrences can also be seen in the distribution maps of the 1-group of the main Q1 target species, with the limits of the species-specific former stock assessment or index areas also shown (Figure A4.5).

A4.3.2 Biological sampling

Biological data (weight and/or gender and/or maturity and/or age material) are collected from a number of species (Table A4.4). Coordinated stomach collection occurred for plaice and hake and a group of rarely caught species (Table A4.5).

A4.3.3 Net geometry

Gear geometry plots are shown in Figure A4.6, in which the lines represent theoretical values for the GOV from flume tank experiments (ICES, 2015).

A4.4 Summary results from MIK sampling

During North Sea Q1 IBTS, night-time catches are conducted with the MIK net, a fine meshed (1600 µm) 2-m-midwater ring net (ICES, 2017) providing abundance estimates for large herring larvae (0-ringers) of the autumn spawning stock components. In addition, the Q1 IBTS also provides the time-series for the 1-ringer herring abundance index in the North Sea from GOV catches carried out during daytime.

The total abundance of 0-ringers in the survey area is used as a recruitment index for the stock. Since 2017, this 0-ringer index (also called MIK index) time-series is calculated with a new algorithm, which excludes larvae of Downs origin more rigorously. This is done by excluding the smaller larvae – presumed to be of Downs origin – from the analyses in certain parts of the survey area. The index from the 2024 survey (corresponding to the 2023 year-class) is 62.47. This is clearly below the long-term average of 99.5 (in the time-series since 1992), and only 11 years in the time-series had a lower index while 21 years had a higher index than in 2024.

The previous MIK-IBTS surveys in 2022 and 2023 had been faced with numerous challenges, including technical/mechanical problems, issues with Covid-19 infections and severe weather (see previous HAWG reports for details). The 2024 survey was only faced with some minor challenges concerning technical/mechanical problems. However, there were again issues with severe weather conditions during large parts of the survey period, including very strong winds and wave heights up to 8–10 m. As a result, basically all survey participants lost several days of survey time. None of the survey participants were able to conduct 100% of the planned MIK stations, and some only managed to conduct between 50–75% of planned stations. Nevertheless, due to intense coordination during the survey, it was possible to obtain a good coverage of the survey area.

A total of 581 MIK hauls were conducted in 2024, which was very similar to the 586 hauls conducted in 2023 and 148 hauls more than in 2022. For the 2024 MIK 0-ringer index (corresponding to the 2023 year-class), all hauls north of 51° N were used, in total 565 hauls (for comparison: 2023 = 569 hauls and 2022 = 410 hauls).

A total of 716 MIK hauls were planned according to the 2024 NS-Q1-IBTS program (the target is four hauls per ICES rectangle) and 581 were conducted, i.e. 81% of the planned MIK-stations were sampled in 2024. However, there has been a general increase in the number of MIK hauls throughout the time-series, and the 581 MIK hauls achieved in 2024 are above the long-term average of 507 hauls (time-series since 1992). Thanks to intense coordination between participants during the survey, almost all ICES rectangles in the survey area were covered (except for three rectangles), and the majority of ICES rectangles in the main distribution area of the herring larvae in the central and southern North Sea were covered with 3 to 4 MIK hauls. However, in some cases the weather conditions and associated swapping of squares between participants resulted in a slightly uneven coverage, i.e. some rectangles were covered with even 5–6 hauls, while others were covered with only 1–2 hauls. Overall, the coverage achieved during the 2024 MIK survey was good and can be regarded to provide a representative 0-ringer index.

Figure A4.7 shows the size distribution of herring larvae caught in the MIK in 2024. Herring larvae were 6–41 mm standard length (SL), which is similar to previous years. In most previous years, the smallest larvae <12 mm (which most likely are originating from the Downs component) were very numerous and often accounted for around 50 to 60% of the total number of larvae. At first glance, the size distribution for the 2024 survey gives the impression that there have been relatively many larger larvae in the size range 19–32 mm. However, looking at the absolute numbers reveals that there were actually rather few larvae in 2024 (total number of herring larvae in 2024 = 17899, in 2023 = 74801, in 2022 = 53697). Particularly the smaller larvae <12 mm were much less abundant than in other years, and they only made up 33% of the total number of larvae. Thus, the larger larvae actually only seem relatively numerous in relation to the few smaller larvae, but were not very abundant in absolute terms. The lower proportion of smaller larvae in 2024 may indicate a reduction or a shift in spawning time of the Downs component.

In the two previous surveys, in 2022 and 2023, larvae in the 13–17 mm size range were also numerous, with another peak at 15 mm. In contrast, the 2024 length distribution does not show this "intermediate" peak around 15 mm, but only two rather distinct peaks at 11 and 25 mm. This was also reflected in the relative share of larger larvae >18 mm SL in 2024 which was 36%, compared to only 20%, 11% and 12% in the three previous years 2023, 2022 and 2021, respectively.

Figure A4.8 illustrates the spatial distribution of 0-ringers in 2022, 2023 and 2024. The 2024 distribution was partly similar to 2023, with higher abundances east of Scotland and along the UK coast. However, in the southeastern and eastern part of the North Sea, the potential nurseries, abundance of larger herring larvae in 2024 was higher than in the previous year, and the larvae seemed generally more spread out over the central North Sea in 2024. Furthermore, the rather high abundances in the English Channel/Southern Bight area which were observed in 2022 and in particular in 2023 - and which had a relatively strong impact on the index values for these years - were not observed in 2024.

As in previous years, sardine larvae were again found in the samples of the 2024 MIK survey. They occurred mainly in the southern and south-eastern North Sea as well as in the Skagerrak, but some were also found relatively far north up to ICES squares 44F4 and 44F5. However, their abundance was relatively low compared to previous years. A sardine larvae index was calculated with the same method as for the herring larvae. The sardine larvae index for 2024 was 3.94, while it was 7.84, 8.15 and 7.63 for 2023, 2022 and 2021, respectively.

A4.5 Summary results from additional sampling activities

In addition to the standard tows with GOV and MIK, all countries have collected additional data. All countries collected sea floor litter from the GOV tows and collected CTD (temperature and salinity) at all GOV stations when possible. A complete list of additional activities is given in Table A4.6.

A4.6 Coordination, data exchange and staff exchanges

No staff exchange occurred during the IBTS Q1 2024.

A4.7 References

ICES. 2015. Report of the International Bottom Trawl Survey Working Group (IBTSWG), 23-27 March 2015, Bergen, Norway. ICES CM 2015/SSGIEOM:24. 278 pp.

ICES. 2017. Manual for the Midwater Ring Net sampling during IBTS Q1. Series of ICES Survey Protocols SISP 2. 25 pp. http://doi.org/10.17895/ices.pub.3434

Tables and figures

Table A4.1. Overview of the surveys performed during the North Sea IBTS Q1 survey in 2024, with the numbers indicating the stations done that day. In grey fishing activity, in purple no fishing due to storm, in red no fishing due to mechanical issues.

		January																						February																						
country	Vessel	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Sweden	Svea (77SE)													3	3	4	4	4	4	4	4	4	3	2	4	3																				
France	Thalassa II (35HT)											2	3	2	3	3	3	4	2	3	2		3	3	3	3	3	4	2	3	3	1														
Norway	GO Sars (58G2)																2	2	2						2	3		3	3	4	3		2	3	2	3	3	4								
Denmark	Dana (26D4)			1	1		2	4	3	2	3		2	3	4	2	4	4	3	4	3																									
Scotland	Scotia III (748S)				active fishing									1	3	4	3	4	4	2	4	2		2	4	4	2	4	3	3	3	2	3	3												
Germany	Dana (26D4)				due to weather no activities																				3	3		3	3	3	3		2	2	4	4	4	4	3	4	2					
Netherlands	Tridens 2 (64T2)				mechanical/other issues												3	1			2	4		3	3	4	3	2	3	3					2	4	4	4	5			3	3		1	

Table A4.2. Overview of the GOV stations fish in the North Sea IBTS Q1 survey in 2024.

ICES Divisions	Country	Gear	Tows planned	Valid	Invalid	% stations fished
3a	SWE	GOV-A	45	41	1	91%
	DEN	GOV-A	3	3		100%
	NOR	GOV-A	2			0%
4	GFR	GOV-A	66	46		70%
	SWE	GOV-A	6	4		67%
	NO	GOV-A	43	41		95%
	FRA	GOV-A	44	41	3	93%
	DEN	GOV-A	42	42		100%
	NED	GOV-A	56	57		102%
	SCO	GOV-A	11	11	1	100%
	SCO	GOV-B	46	44	4	96%
7d	FRA	GOV-A	10	10	1	100%
X	GFR	GOV-A	1	1		100%

Table A4.3. Overview of the MIK stations fished in the North Sea IBTS Q1 survey in 2024.

ICES Divisions	Country	Gear	Tows planned	Valid	% stations fished
3.a	SWE	MIK	41	31	76%
	DEN	MIK	8	3	38%
4.a-c	GFR	MIK	134	102	76%
	SWE	MIK	12	2	17%
	NO	MIK	84	79	94%
	FRA	MIK	88	73	83%
	DEN	MIK	84	84	100%
	NED	MIK	112	103	92%
	SCO	MIK	114	88	77%
7.d	FRA	MIK	20	18	90%

Table A4.4. Overview of individual length, weight and/or maturity and/or age samples collected during the North Sea IBTS Q1 survey in 2024.

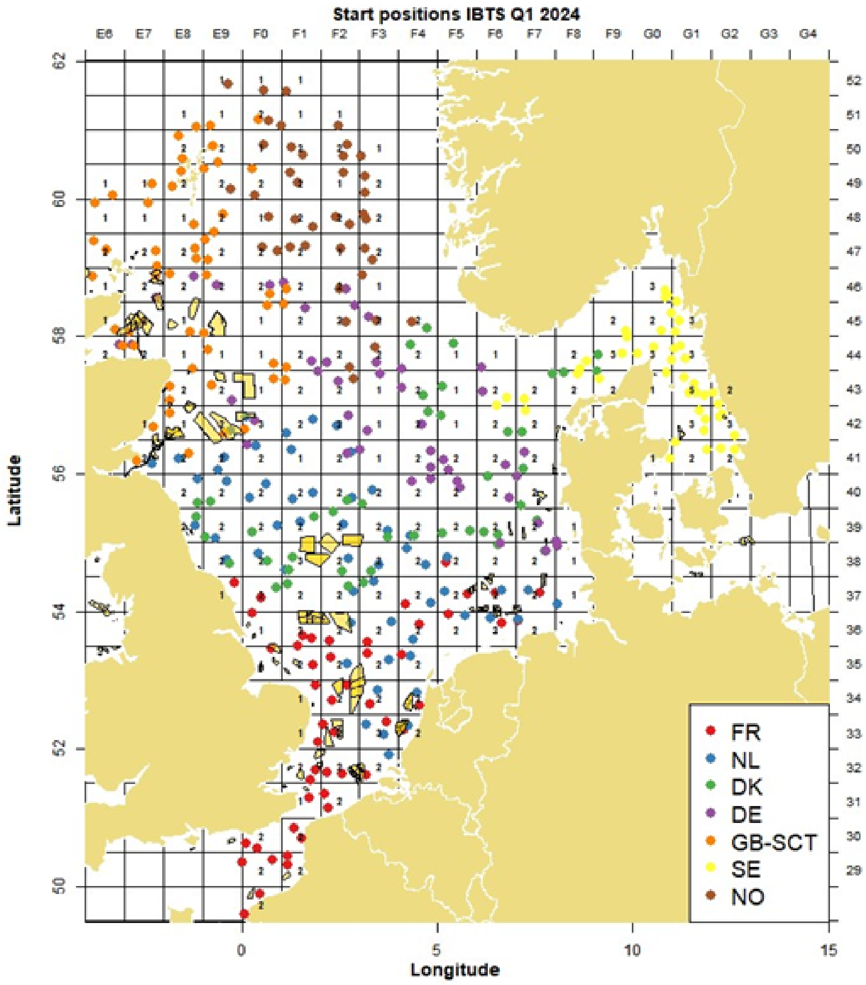
Species	DE	DK	FR	GB-SCT	NL	NO	SE	Total
Clupea harengus	553	551	322	345	403	1921	1720	5815
Melanogrammus aeglefinus	800	764	203	1407	631	1106	400	5311
Merlangius merlangus	607	578	504	991	574	816	458	4528
Pleuronectes platessa	508	357	800	235	361	17	493	2771
Sprattus sprattus	152	179	412	121	300		1228	2392
Trisopterus esmarkii	187	124	6	494	110	410	68	1399
Gadus morhua	189	122	67	399	143	213	184	1317
Scomber scombrus	35	1		121	26	1019	6	1208
Pollachius virens	73	67		221	1	264	11	637
Micromesistius poutassou	1					321		322
Squalus acanthias	7			260	9	4	3	283
Microstomus kitt	216	45						261
Merluccius merluccius	33	14		105	6	77	23	258
Glyptocephalus cynoglossus		35		40			124	199
Amblyraja radiata	55			17	11	65	8	156
Trisopterus minutus						148		148
Mullus surmuletus			139					139
Scyliorhinus canicula	110				1	15		126
Trachurus trachurus						111		111
Mustelus asterias	54			54		2		110
Leucoraja naevus	15			58	19	3		95
Raja montagui				60	30			90
Molva molva	3	7		49		24	1	84
Lophius piscatorius	14			62	1			77
Dicentrarchus labrax			73	1				74
Raja clavata	7			7	37		16	67
Solea solea			51	2				53
Limanda limanda		51						51
Lithodes maja	17					16		33
Sardina pilchardus	1			11		8		20
Scophthalmus maximus	2	4		3	7	1	1	18
Chelidonichthys lucerna		8			4		5	17
Scophthalmus rhombus	1	8		2	4		2	17
Cancer pagurus	16							16
Raja brachyura				1	11			12
Mustelus spp.					11			11
Lophius budegassa				9				9
Dipturus intermedia				8				8
Engraulis encrasicolus	5			3				8
Pollachius pollachius		4				4		8
Dipturus batis				6				6
Brosme brosme						3		3
Galeus melastomus						2		2
Ciliata mustela				1				1
Galeorhinus galeus					1			1
Hippoglossus hippoglossus					1			1
Nephrops norvegicus						1		1
Triglops murrayi				1				1

Table A4.5. Overview of stomach samples collected during the North Sea IBTS Q1 survey in 2024. These are the maximum numbers, final numbers analysed and uploaded to the ICES stomach database can be lower. Due to regurgitated/everted stomachs or low quality stomachs owing the freezing/defrosting.

Species	DE	DK	FR	GB-SCT	NL	NO	SE
Pleuronectes platessa	294	354	487		326	21	256
Merluccius merluccius	33	14			6	97	18
Chelidonichthys lucerna		8	64		4		2
Raja clavata					8		1
Molva molva	3	7	1			22	1
Scophthalmus rhombus	1	8	3	2	4		
Scophthalmus maximus	2	4	9	3	7	1	
Hippoglossus hippoglossus					1		
Lophius piscatorius					1		
Raja brachyura					4		
Squalus acanthias					8		
Raja montagui					17		
Leucoraja naevus					17		
Mustelus					1		
Amblyraja radiata					9	30	
Lophius piscatorius	7						
Pollachius virens	16						
Gadus morhua	185						
Brosme brosme						3	
Pollachius pollachius		4				4	
TOTAL	541	395	564	5	413	171	278

Table A4.6. Overview of other activities and data collection during the North Sea IBTS Q1 survey in 2024.

Activity	GFR	NOR	SCO	DEN	NED	SWE	FRA
CTD (temperature-salinity)	x	x	x	x	x	x	x
Seafloor litter	x	x	x	x	x	x	x
Water sampler (Nutrients)			x				x
Egg samples (Small fine-meshed ringnet; CUFES)	x	x	x	x	x		x
By-caught benthic animals		x			x		x
Fish/Benthic genetics	x	x	x		x	x	
Fish diet	x	x	x	x	x	x	x
Fish tagging					x		
Additional biological data on fish		x	x	x	x	x	
Observer for mammals and/or birds							x
Benthic samples (boxcore, video, dredge)							
Zoo- and phytoplankton		x					x
Jellyfish	x	x					x
Hydrological transects							x



A4.1. Number of hauls per ICES rectangle with GOV during the North Sea IBTS Q1 2024 and the start positions of the trawls by country. Including in yellow the operational wind farms.

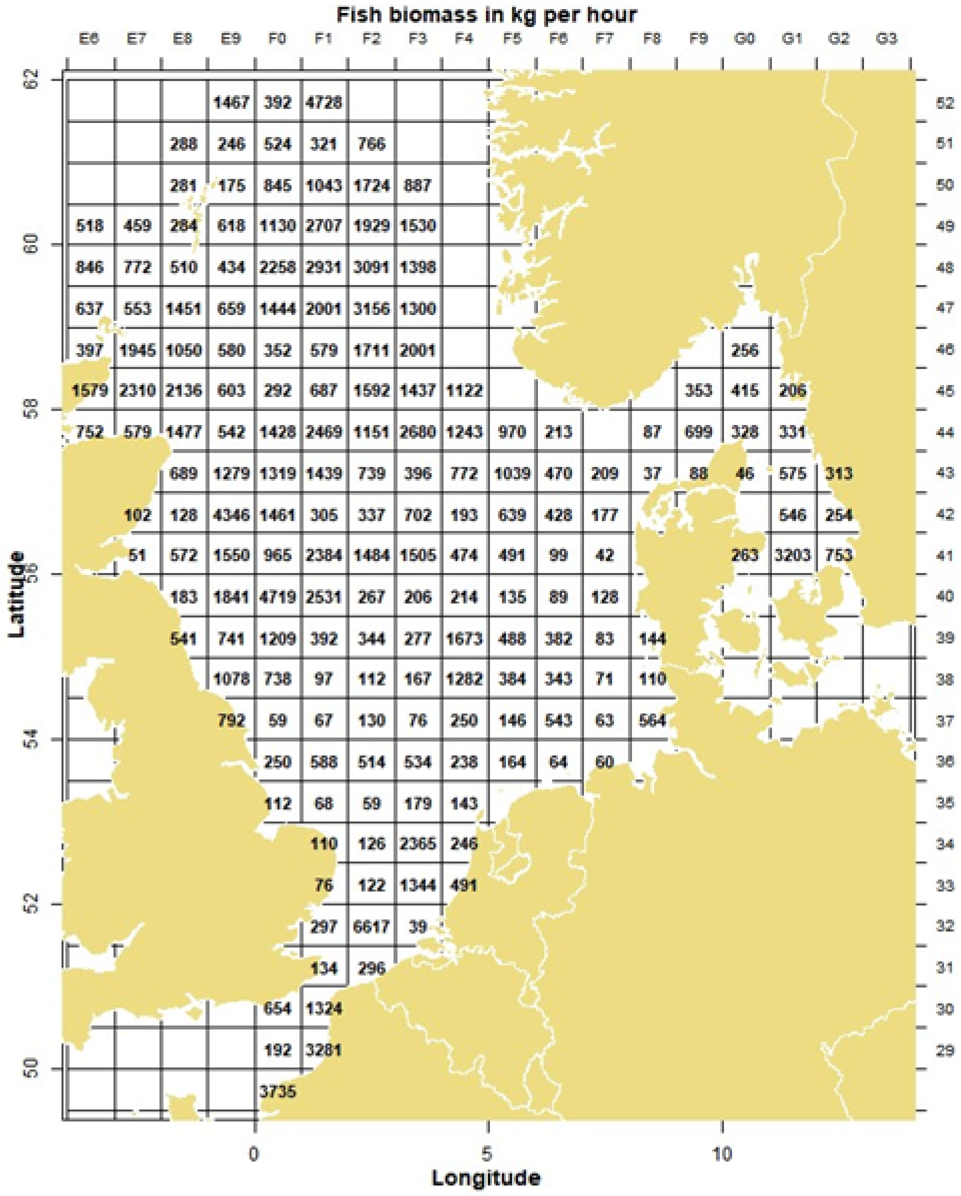


Figure A4.2. Distribution of fish biomass in IBTS hauls by rectangle in the North Sea, Q1 2024 (values standardized to kg per hour haul duration; mean per rectangle).

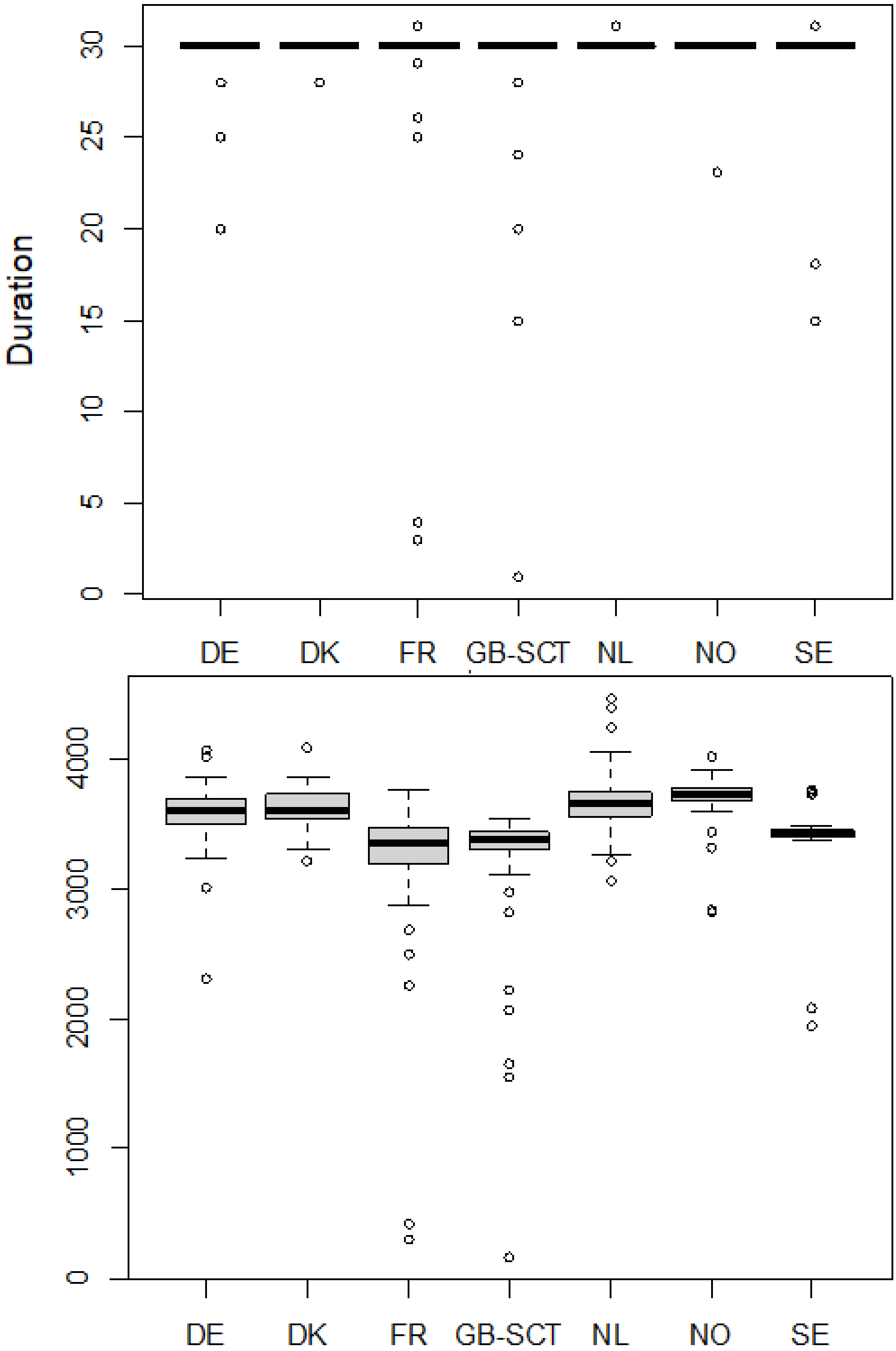


Figure A4.3. Duration (top) and distance over ground (bottom) by country for the North Sea IBTS Q1 2024.

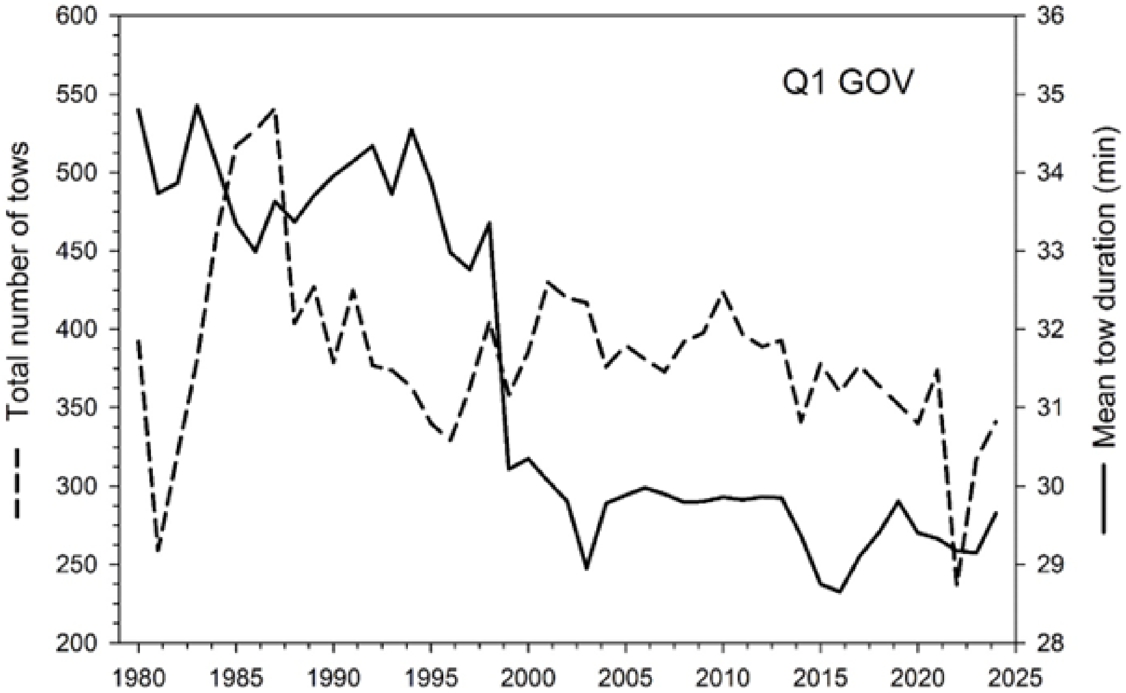


Figure A4.4. Total number of tows and mean duration of tows over time in the North Sea IBTS Q1.

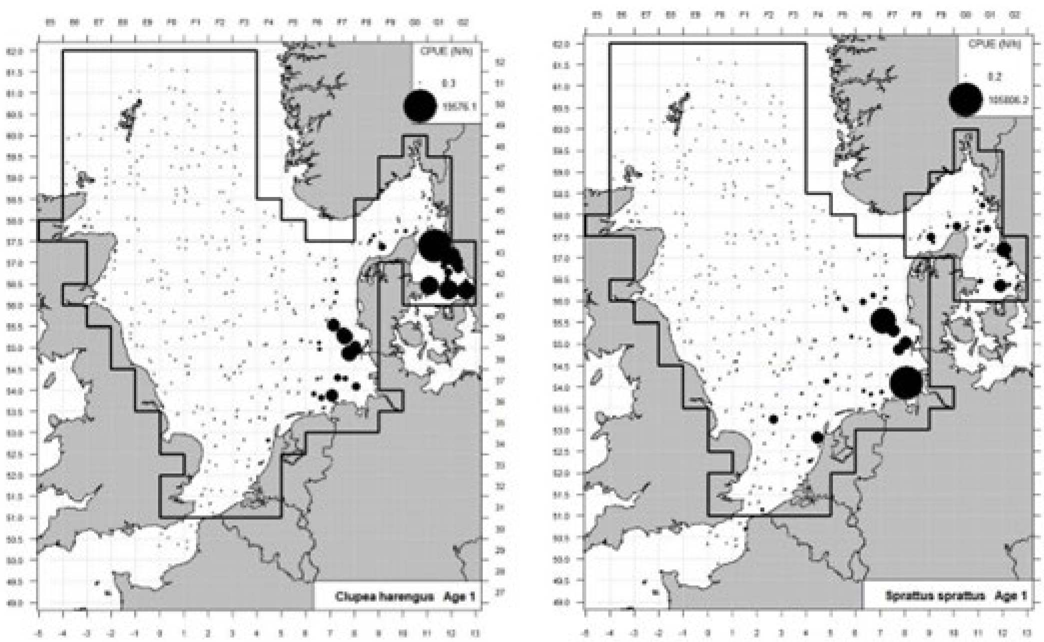


Figure A4.5a. Distribution and CPUE of herring and sprat (age 1) in the Q1 IBTS 2024 (thick lines: index areas for sprat in Q1 but for herring in Q3).

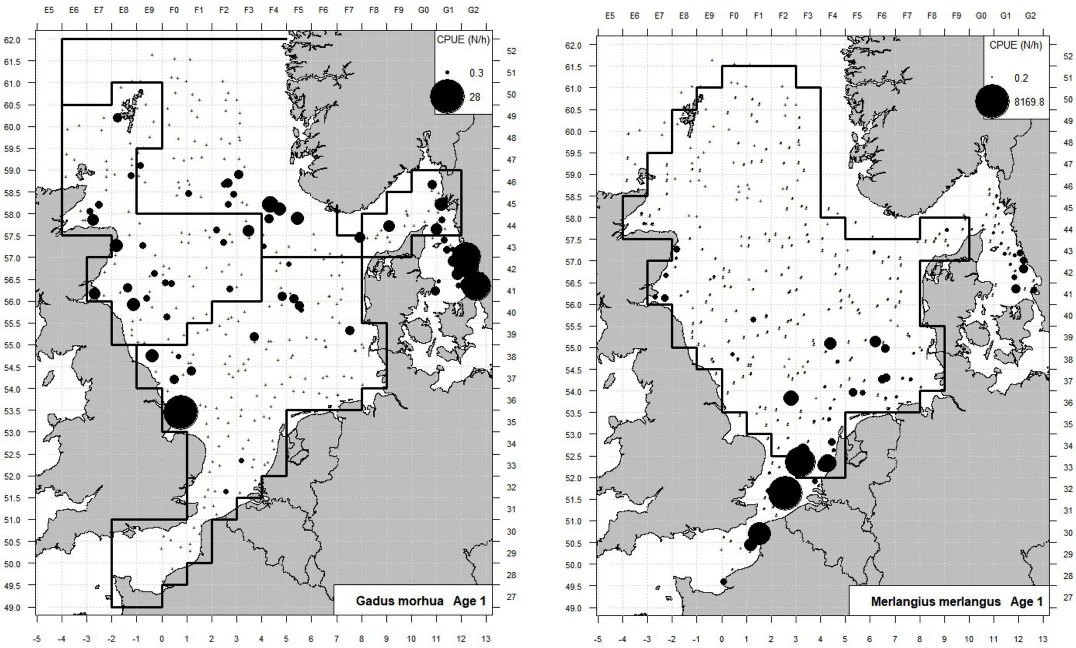


Figure A4.5b. Distribution and CPUE of cod and whiting (age 1) in the Q1 IBTS 2024 (thick lines: Subpopulation separation for cod, index areas for whiting).

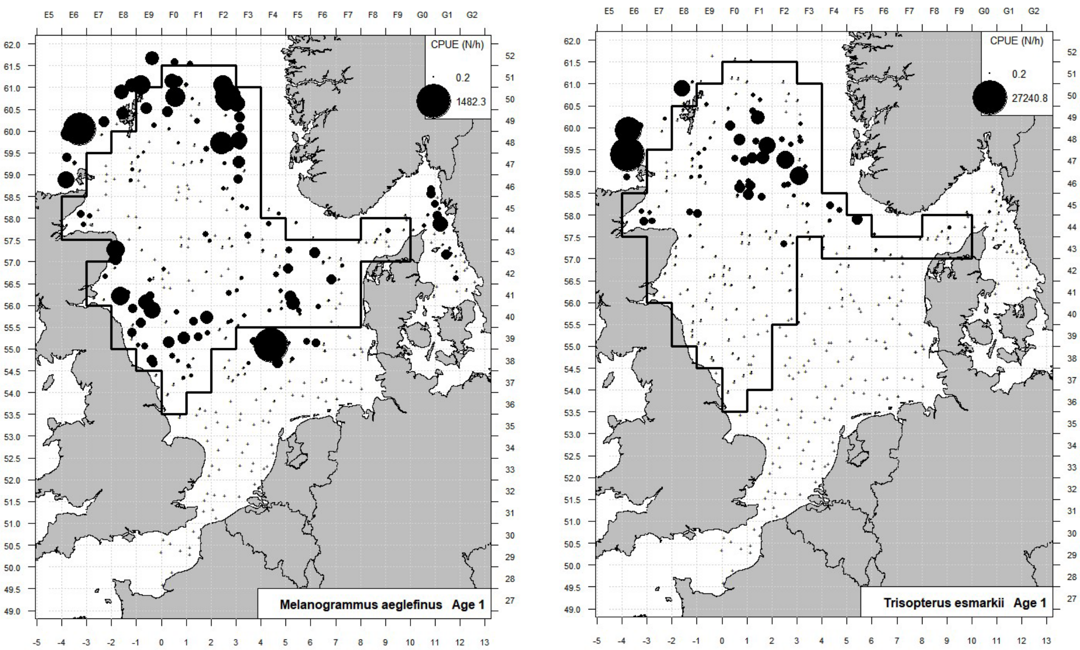


Figure A4.5c. Distribution and CPUE of haddock and Norway pout (age 1) in the Q1 IBTS 2024 (thick lines: index areas).

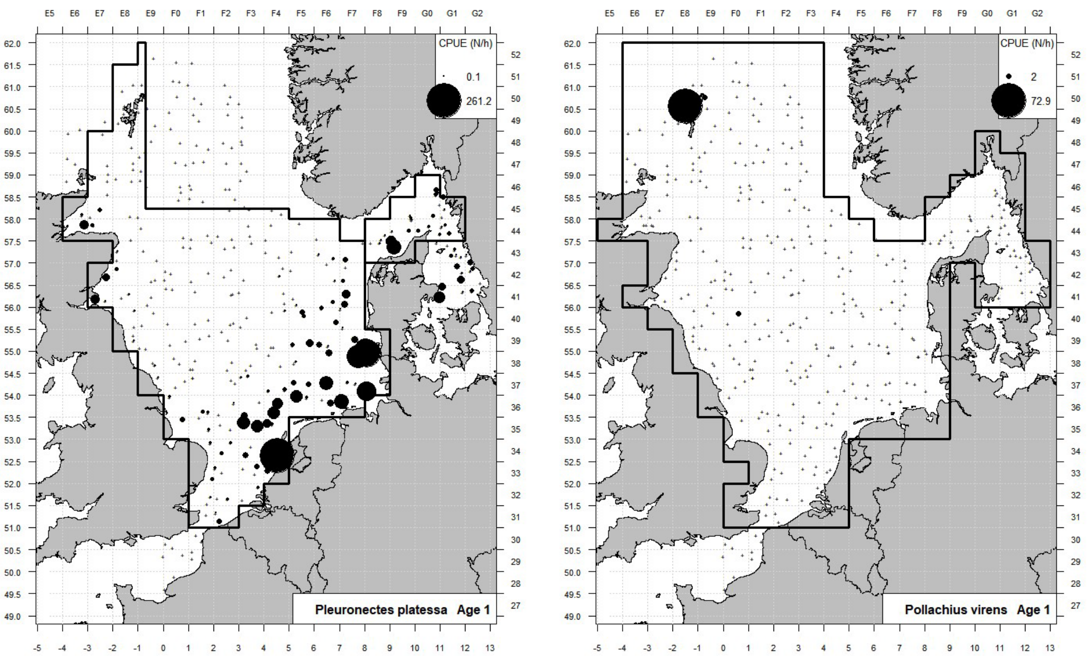


Figure A4.5d Distribution and CPUE of plaice and saithe (age 1) in Q1 IBTS 2024 (thick line: old index areas).

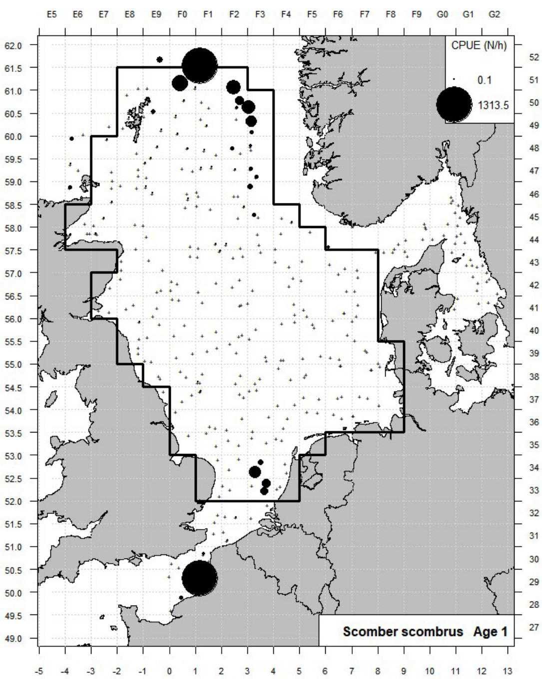


Figure A4.5e Distribution and CPUE of mackerel (age 1) in the Q1 IBTS 2024 (thick line: index area).

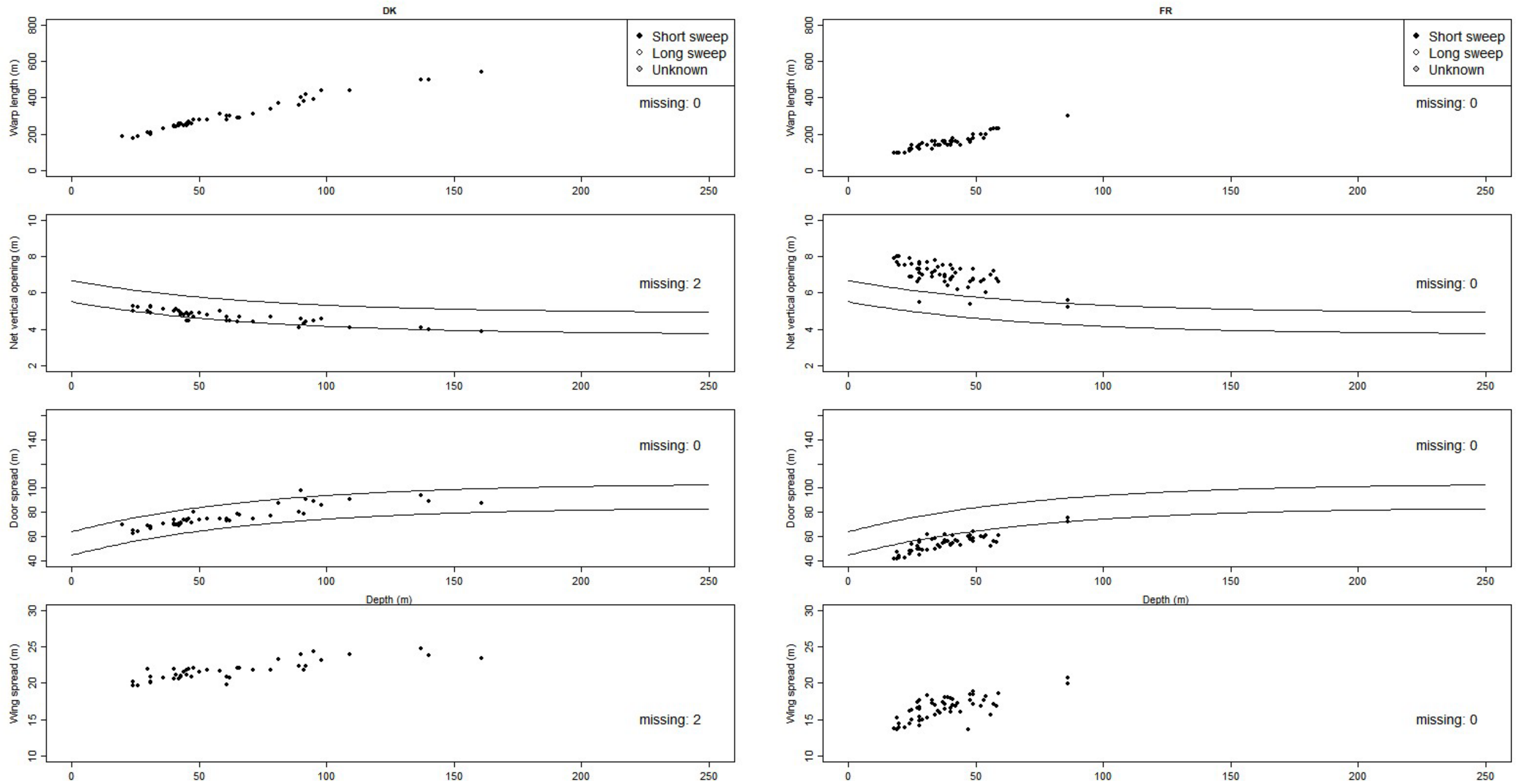


Figure A4.6a. Danish and French warp length and gear geometry plots.

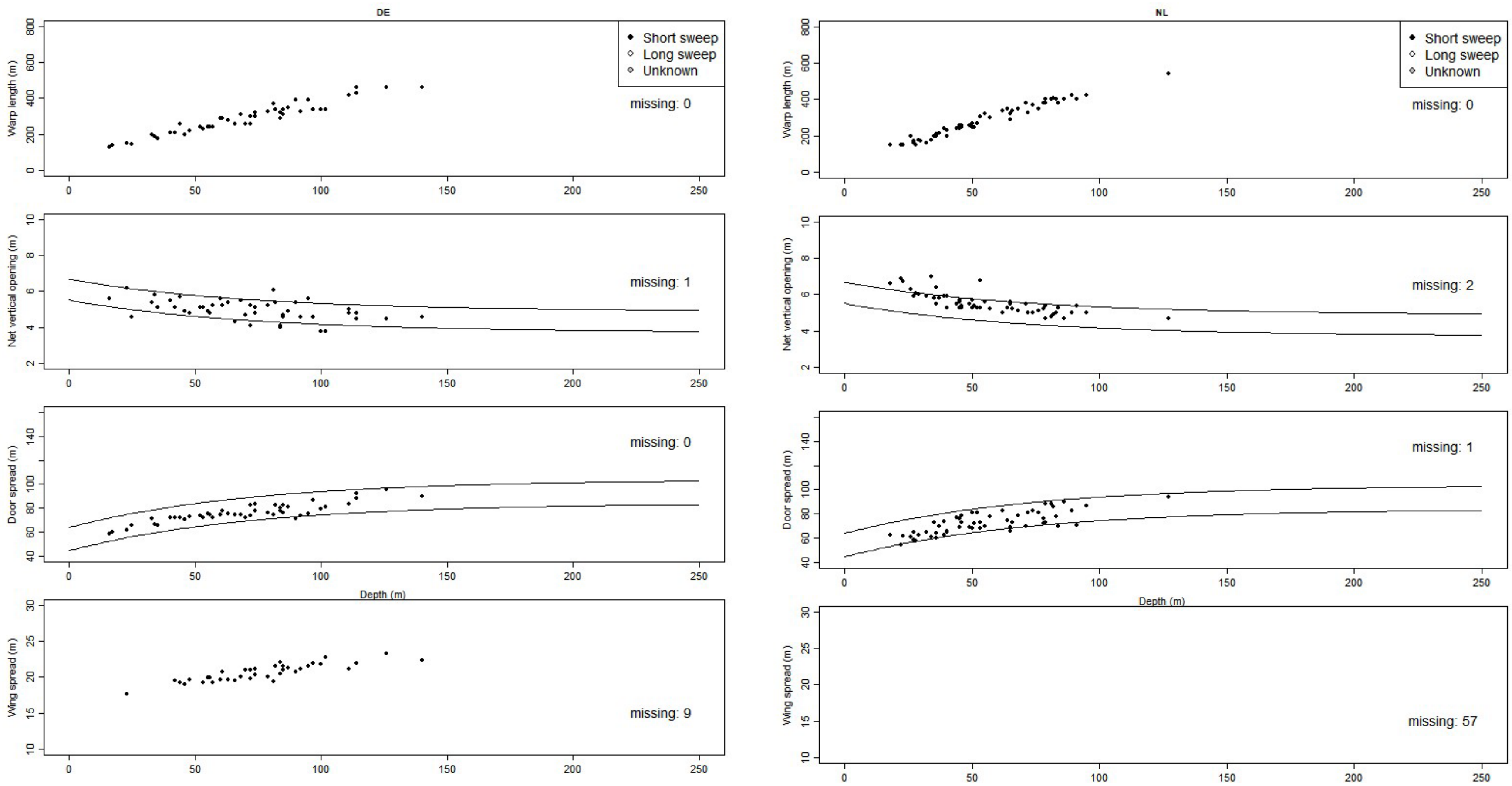


Figure A4.6b. German and Dutch warp length and gear geometry plots.

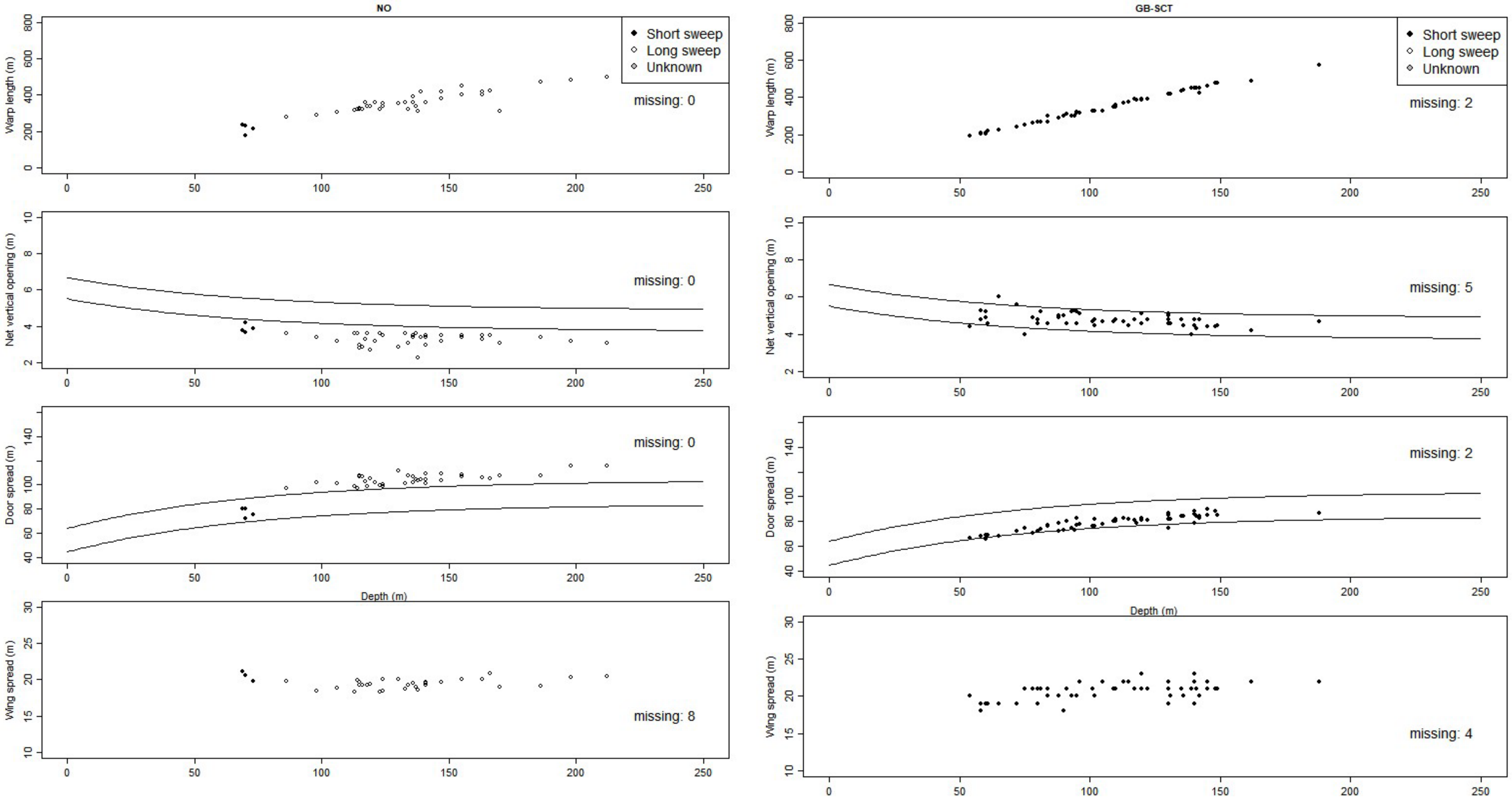


Figure A4.6c. Norwegian and Scottish warp length and gear geometry plots.

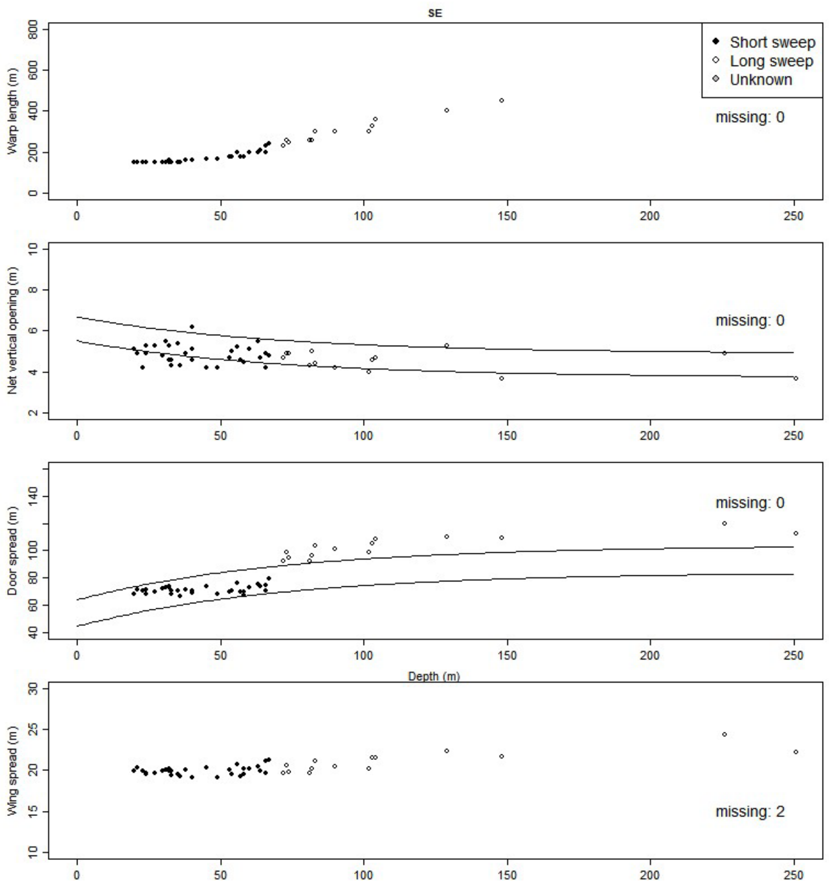


Figure A4.6d. Swedish warp length and gear geometry plots.

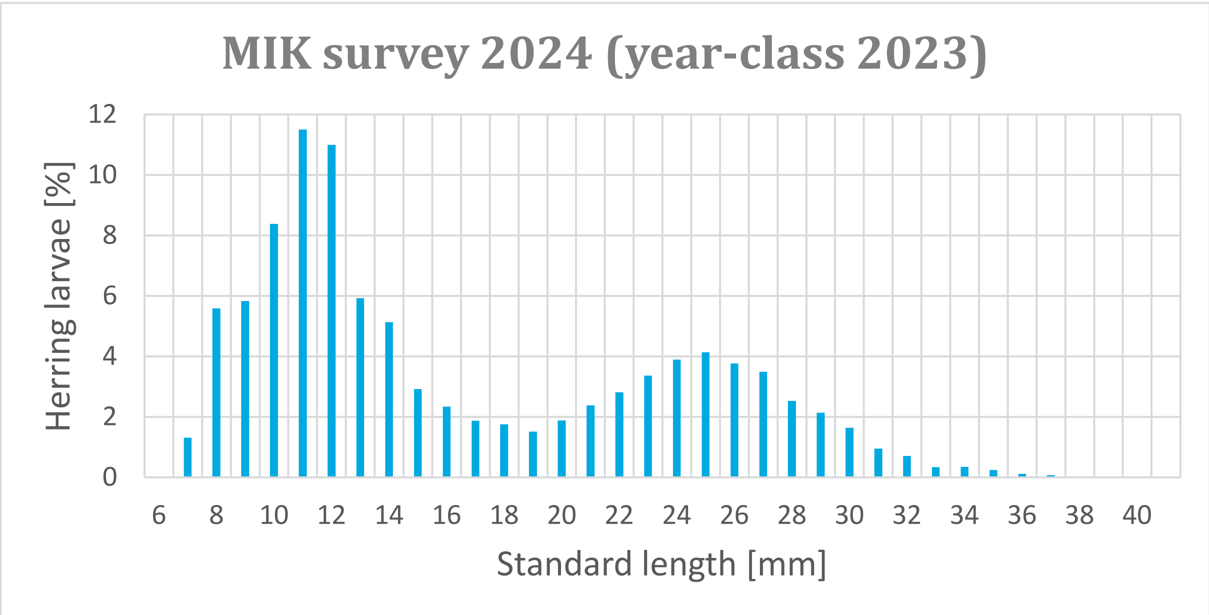


Figure A4.7. North Sea herring. Length distribution of all herring larvae caught in the MIK during the 2024 Q1 IBTS.

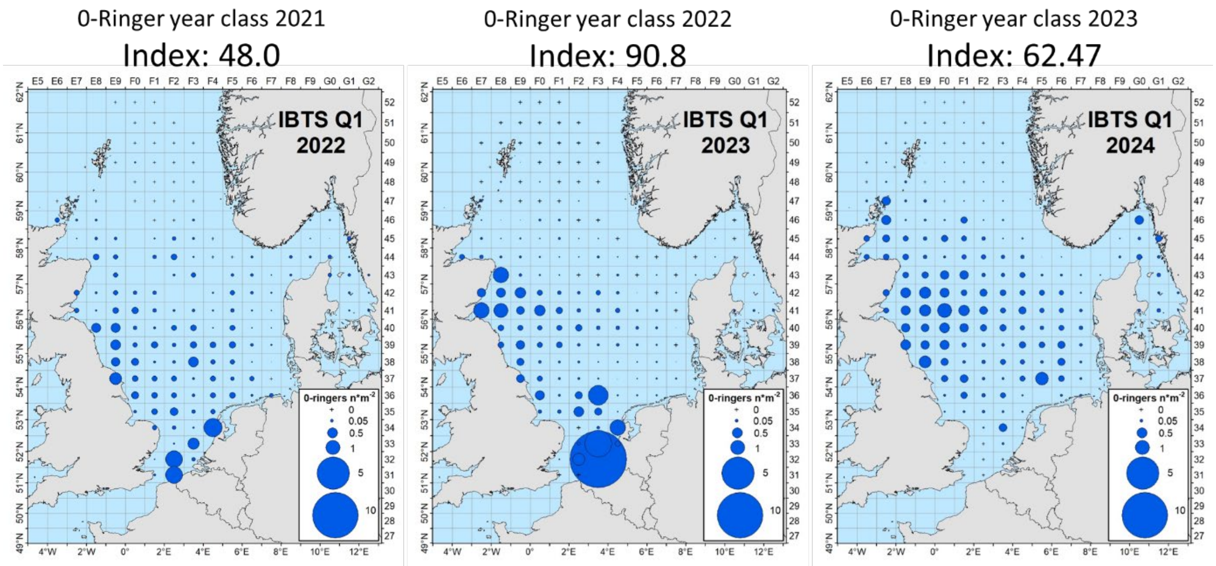


Figure A4.8. North Sea herring. Distribution of 0-ringer herring, year classes 2021–2023. Density estimates of 0-ringers within each statistical rectangle are based on MIK catches during IBTS in January/February 2022–2024. Areas of filled circles illustrate densities in no m^{-2}.

Annex 5: Report of North Sea IBTS-Q3

Kai Weiland (coordinator)

A5.1 Participation and general overview

Six vessels participated in the Q3 survey in 2023: "Dana" (Denmark), "Cefas Endeavour" (England), "Walter Herwig III" (Germany), "Kristine Bonnevie" (Norway), "Scotia" (Scotland) and "Svea" (Sweden). The overall sampling period extended from 18 July to 4 September (Table A5.1).

A5.2 Issues and problems encountered

No major issues encountered in Q3 2023.

A5.3 Summary results from GOV trawl sampling

A5.3.1 Trawl stations

In total, 339 valid standard GOV hauls were made in the planned rectangles (Table A5.2). Almost all rectangles were covered with at least one valid haul (Figure A5.1) and the number of rectangles with only one haul in the core survey area was only slightly higher than in previous years. Other rectangles that did not achieve coverage of two hauls were rectangles that are covered largely by land, or only have a small amount of area at depths <250 m, which is the maximum survey depth limit, or in which only a few tracks are known that can be fished with the GOV (given the risk of gear damage).

All standard hauls were planned to be of 30 min. duration. However, 29 tows reported as valid to DATRAS were shorter than 25 min. (Table A5.3) this may indicate that it is becoming increasingly difficult to find full 30 min. tracks due to the increasing number of obstacles, such as wind farms, cables, and pipelines, in the North Sea. In addition, rough bottom conditions in parts of the survey area make it difficult to find alternative tracks that are suitable for the GOV. None of the short tows, classified as valid (no trawl damages) were shorter than 14 min.

Distribution maps and catch rates (number per km^2; swept area based on door spread) for the recruits of the NS-IBTS standard species as recorded in the Q3 2023 survey are shown in Figure A5.2.

A5.3.2 Biological sampling

Biological data (weight, sex, and age material) were collected for IBTS target species (Table A5.4). Maturation stage can be difficult to determine outside of the spawning period and was therefore not recorded in Q3.

Biological data from individual fish were also collected for several other species, and information on this may be found in the national cruise reports.

A5.3.3 Net geometry

The current manual (ICES 2020: SISP 10 Revision 11) does not specify a fixed warp length to depth ratio, as this may not fit to the different vessels. It has, however, been emphasised that each country should carefully measure net geometry, i.e. door spread and headline height over bottom (vertical net opening) and wing spread and adhere to their "historical" standards for warp length-to-depth as far as possible. The number of missing observations of these parameters was quite low for each country (Table A5.5).

The applied warp length to depth ratio and the observed values for vertical net opening, door spread and, if available, wing spread, are show in Figure A5.3 by country. Most observed values for door spread were close to the theoretical values. For wing spread, a few missing values and highly variable observations were common. Differences between the countries were most pronounced for vertical net opening for which the values for Sweden and in particular for Norway were much lower than those for the other countries. Door spread values for Norway were also relatively low (Figure A5.4).

All countries fished according to the manual with a speed over ground (SOG) between 3.5 and 4.5 knots. However, the SOG by tow ranged from 2.7 knots (England) to 4.4 knots (Norway). On average, SOG was about 4 knots for Denmark, England and Germany, about 3.9 knots for Norway and about 3.7 knots for Scotland and Sweden (Figure A5.5). Scotland and Sweden used lower SOG either for ensure that the same SOG can be applied irrespectively of e.g. weather conditions and tidal currents (Scotland) or for historical reasons (Sweden).

Despite the deviations in tow duration from the nominal standard and the country-specific differences of door spread and speed over ground, average swept area by tow was remarkably uniform (Figure A5.6).

A5.4 Summary results from additional sampling activities

All countries are required to collect sea floor litter from the GOV tows and CTD data (temperature and salinity, oxygen for some countries) at all GOV stations when possible. An overview on the number of stomachs collected is given in Table A5.6.

A5.5 Coordination, data exchange and staff exchanges

A5.5.1 Staff exchange

A Norwegian technician joined the first leg of Danish survey with RV "Dana" in Q3 2023, and IBTSWG continues to encourage staff exchange.

A5.5.2 Data exchange

During the cruises, information about successfully completed hauls are regularly exchanged between survey vessels. It has been agreed that preliminary indices based on length splitting for the standard species will no longer be exchanged during the Q3 survey, since the final data for the NS-IBTS main target species, including age information, were usually submitted to DATRAS within 2 to 3 weeks after completion of the survey. This has no longer been the case in the past four years, and it might be worthwhile to consider to produces preliminary length-based indices shortly after the survey using the HH and HL records provided by the participants. For this, the length-splits given in the manual needs to be checked for validity considering the environmental changes in the North Sea in recent years.

Tables and figures

Table A5.1. Sampling periods in the North Sea IBTS Q3 survey in 2023 (light grey: total survey period; dark grey: GOV sampling period).

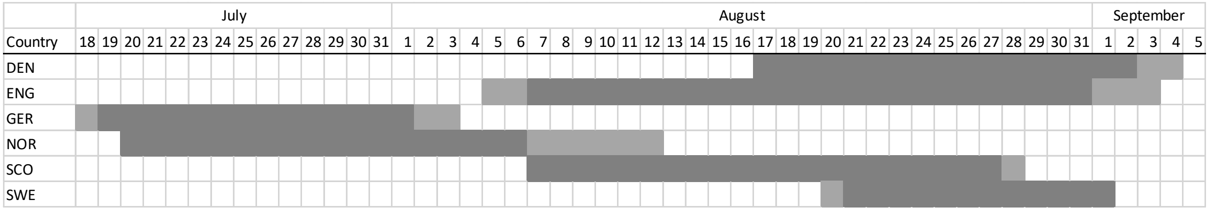


Table A5.2. Overview of valid GOV stations fished in the North Sea IBTS Q3 survey in 2023 (*: deep water tows).

ICES Division	Country	Gear used	Number of standard tows planned (IBTSWG 2023)	Number of requested standard tows (as planned)	Proportion of requested standard tows fished (%)	Number of additional non-mandatory standard tows	Number of additional experimental tows
3a	SWE	GOV-A	26	26	100	15	-
4b			4	4		0	-
3a	DEN	GOV-A	4	4	100	0	-
4a-c			48	48		0	-
	ENG	GOV-A	78	78	100	0	-
	GER	GOV-A	31	31	100	0	-
4a-b	NOR	GOV-A	48	47	98	0	2*
4a	SCO	GOV-B	51	49	96	0	-
4b		GOV-A	39	37		0	-

Table A5.3. Number of tows by tow duration and country (valid tows NS-IBTS Q3 2023).

Nominal tow duration (min)	DEN	ENG	GER	NOR	SCO	SWE	Total
< 14	0	0	0	0	0	0	0
14	1	0	0	0	0	0	1
15	1	2	0	1	5	0	9
16	0	0	0	1	0	0	1
17	0	0	0	0	2	0	2
18	0	0	0	0	0	1	1
19	1	0	0	0	0	0	1
20	1	2	0	0	2	1	6
21	0	1	0	0	0	0	1
22	0	1	0	0	0	2	3
23	0	1	0	0	1	1	3
24	0	0	0	1	0	0	1
25	1	0	0	1	0	5	7
26	1	1	0	1	0	0	3
27	0	1	0	1	3	0	5
28	1	1	0	0	0	0	2
29	0	1	0	0	0	0	1
30	41	61	31	35	73	34	275
31	1	7	0	6	0	2	16
32	1	0	0	0	0	0	1
> 33	0	0	0	0	0	0	0

Table A5.1.4. Number of age readings of NS-IBTS target species available in DATRAS (download 11/03/2024) from the survey in 2023 (-: species not caught, *: SWE Division 4.b only).

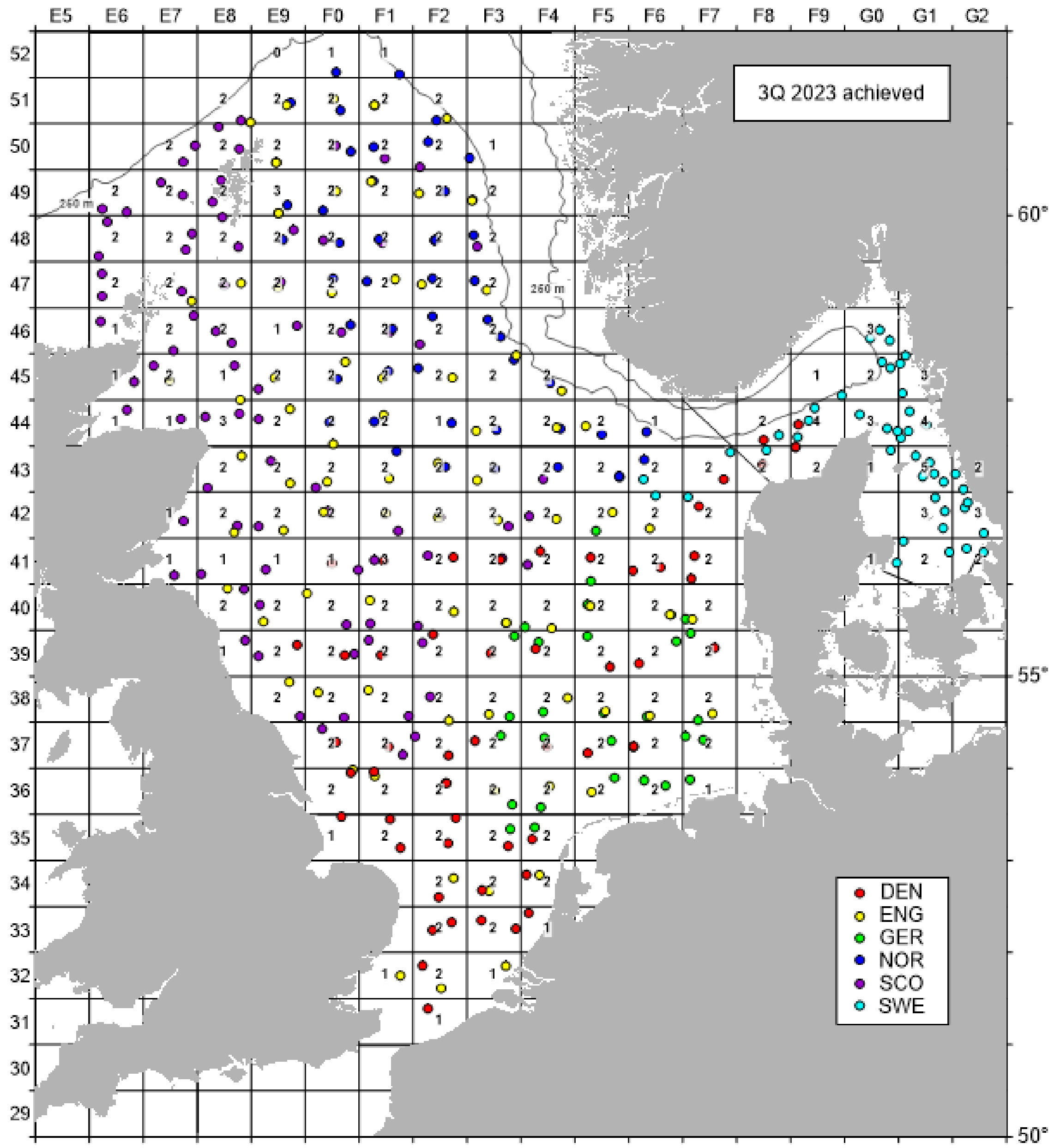
Species	DEN	ENG	GER	NOR	SCO	SWE	Total
Clupea harengus	445	1250	203	415	1175	1110	4598
Sprattus sprattus	157	97	174	-	154	498	1080
Gadus morhua	130	422	8	284	487	340	1671
Melanogrammus aeglefinus	416	1940	109	950	1656	282	5353
Merlangius merlangus	573	1983	177	623	1227	490	5073
Pollachius virens	11	258	0	360	245	68	942
Trisopterus esmarki	38	533	3	252	368	115	1309
*Scomber scombrus**	339	380	211	211	509	34	1684
Pleuronectes platessa	645	1522	262	103	418	383	3333

Table A5.5. Number of valid tows with missing gear parameters, NS-IBTS Q3 2023.

Parameter	DEN	ENG	GER	NOR	SCO	SWE
Net opening	0	0	0	0	2	0
Door spread	0	0	0	0	0	0
Wing spread	2	10	0	47	1	10

Table A5.6. Overview of fish stomachs collected during the North Sea IBTS Q3 survey in 2023.

		Number of fish examined at sea				Total number of stomachs collected for analysis	Uploaded to database (Y/N)
Species	Country	V (everted)	R (regurgiated)	E (empty)	F (feeding)		
Amblyraja radiata	GER				1	1	N
	SWE					1	N
Chelidonichthys lucerna	DNK	1	0	0	22	22	Y
	GER					42	N
Gadus morhua	DNK	1	2	3	78	78	Y
	GER					15	N
	SWE	2				233	N
Lophius piscatorius	ENG					40	N
Molva molva	SWE					2	N
Mustelus asterias	GER				1	1	N
Pollachius pollachius	SWE					4	N
Raja clavata	GER				1	1	N
Scophthalmus maximus	DNK	0	0	0	17	17	Y
	ENG					4	N
	GER					12	N
Scophthalmus rhombus	DNK	0	0	1	2	2	Y
	ENG					4	N
	GER					7	N
	SWE					14	N
Squalus acanthias	GER				1	1	N
	SWE					6	N
Trachurus trachurus	DNK	0	0	50	58	58	Y
	GER					82	N
	SWE					57	N


3Q 2023 achieved
DEN
ENG
GER
NOR
SCO
SWE
260 m

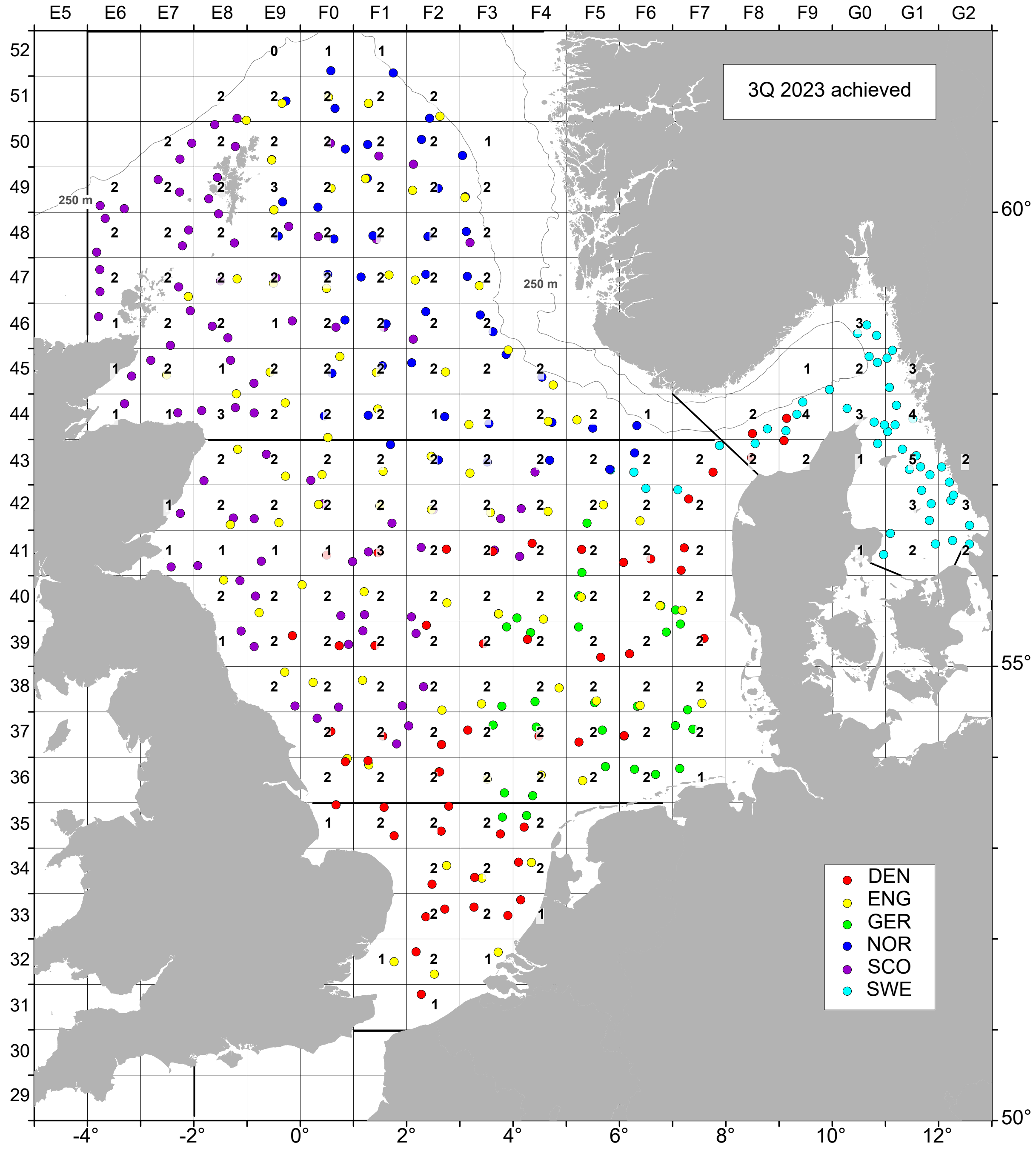


Figure A5.1. Number and start position of hauls per ICES statistical rectangle as taken with the GOV during the North Sea IBTS Q3 2023. Tows are separated into ICES Divisions in the North Sea (4.a, 4.b and 4.c), the Skagerrak/Kattegat (3.a).

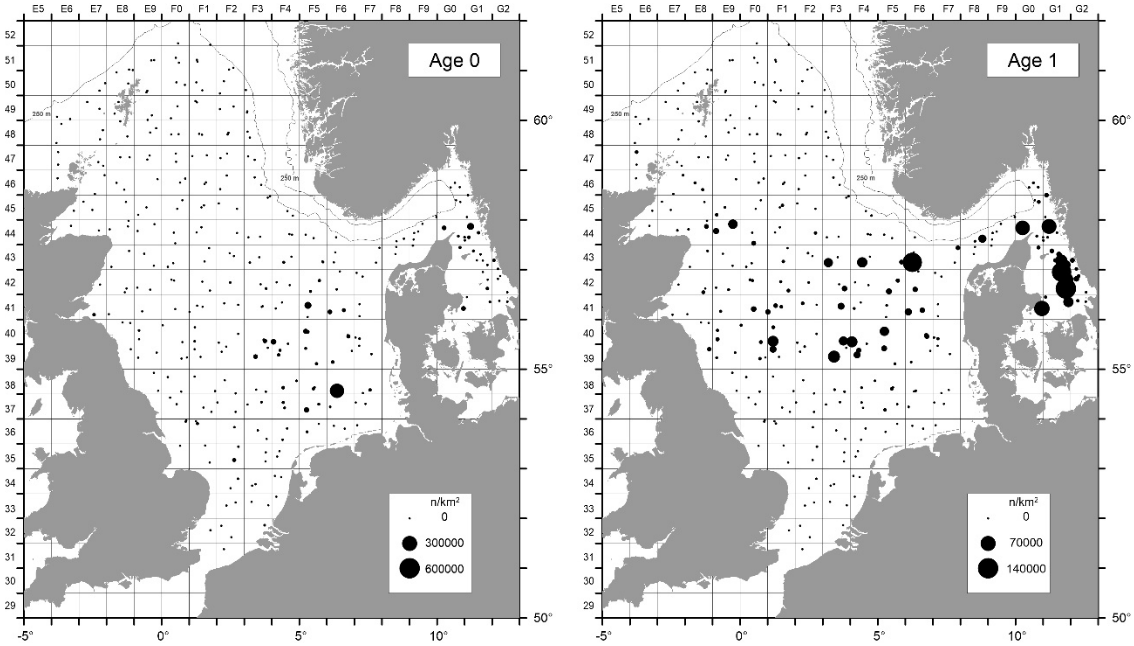


Figure A5.2a. Distribution of age 0 and age 1 herring in Q3 2023.

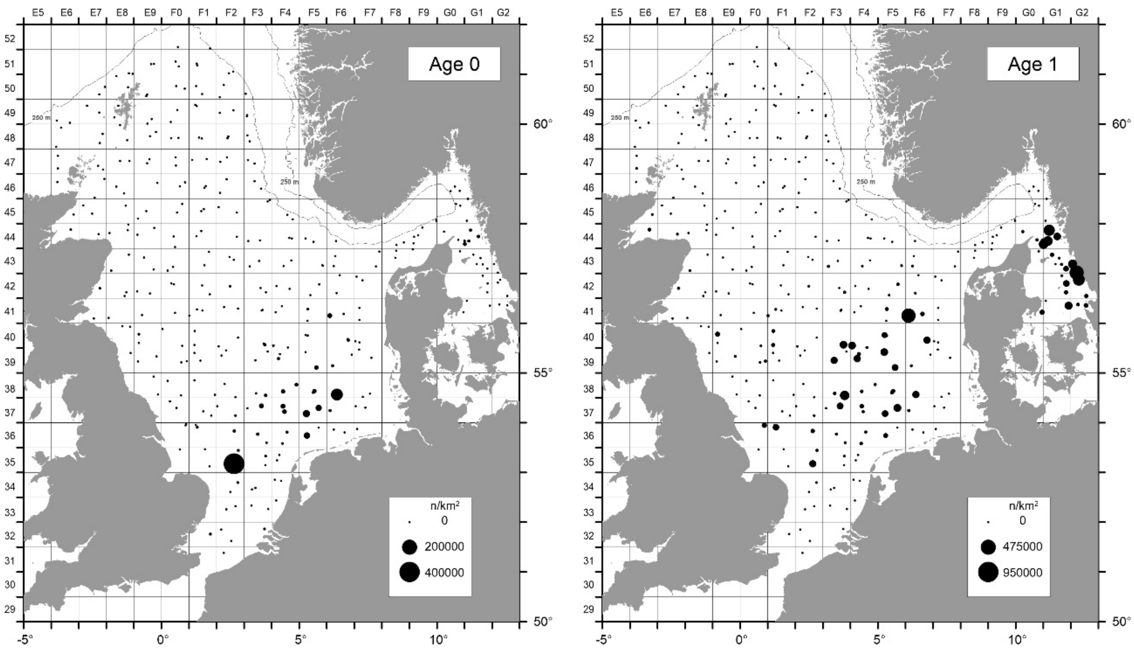


Figure A5.2b. Distribution of age 0 and age 1 sprat in Q3 2023.

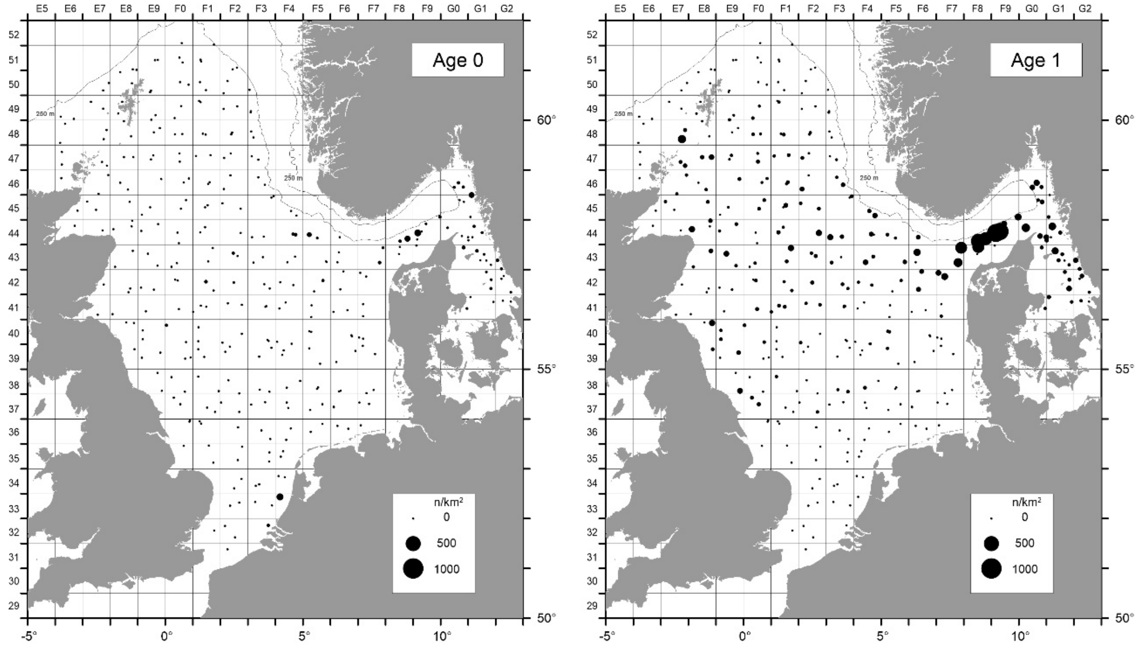


Figure A5.2c. Distribution of age 0 and age 1 cod in Q3 2023.

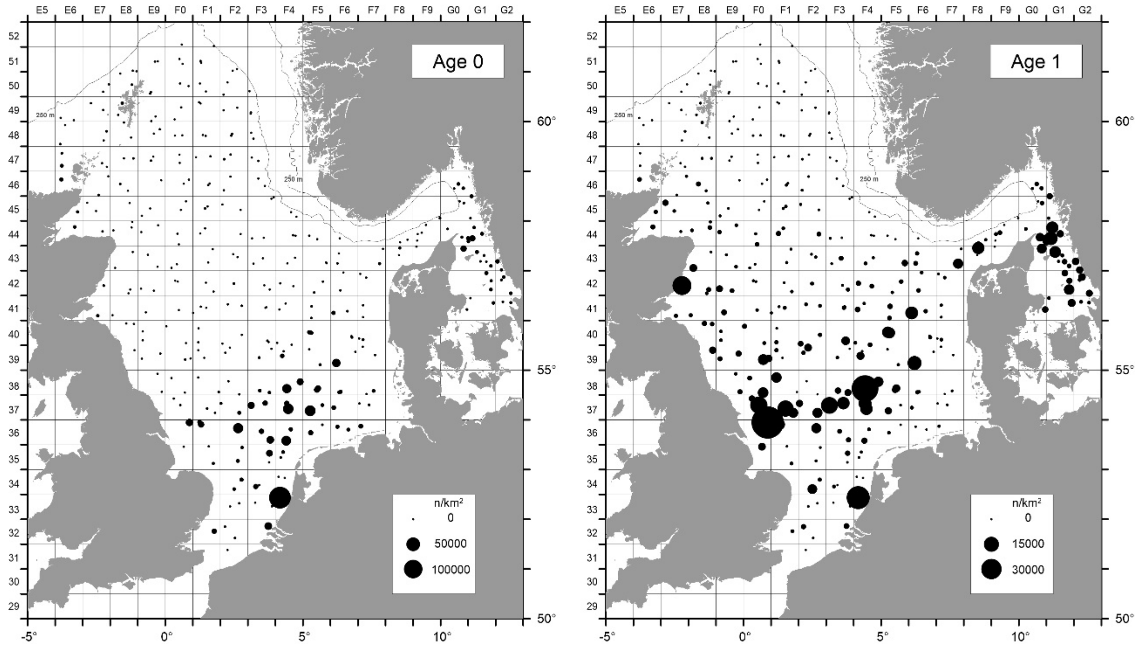


Figure A5.2d. Distribution of age 0 and age 1 whiting in Q3 2023.

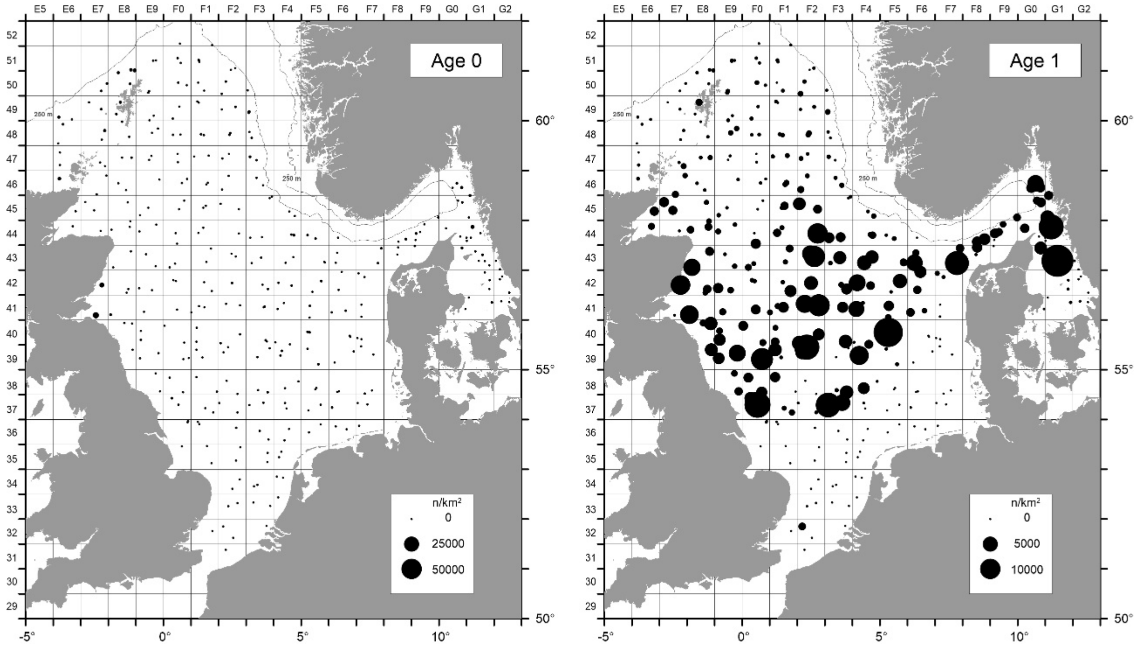


Figure A5.2e. Distribution of age 0 and age 1 haddock in Q3 2023.

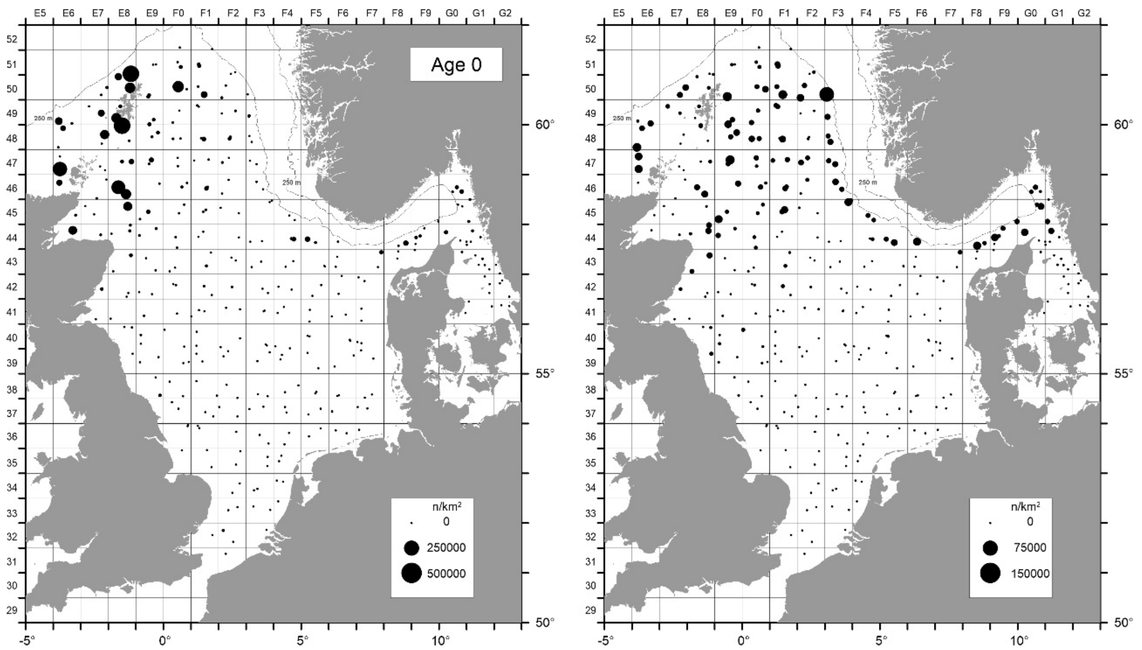


Figure A5.2f. Distribution of age 0 and age 1 Norway pout in Q3 2023.

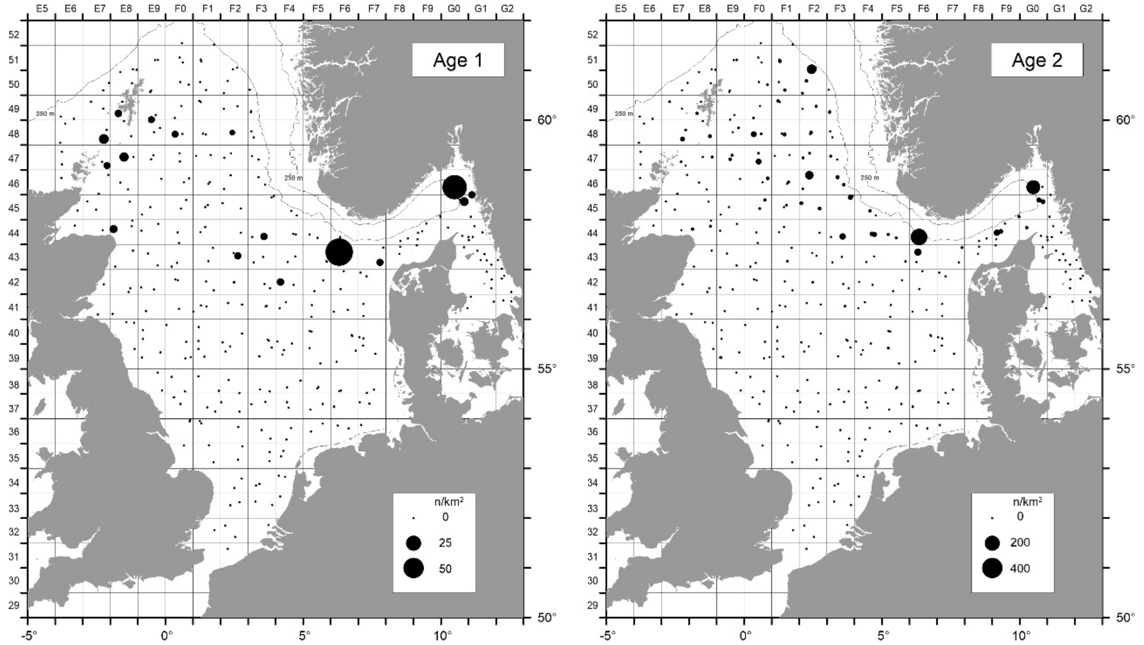


Figure A5.2g. Distribution of age 1 and age 2 saithe in Q3 2023.

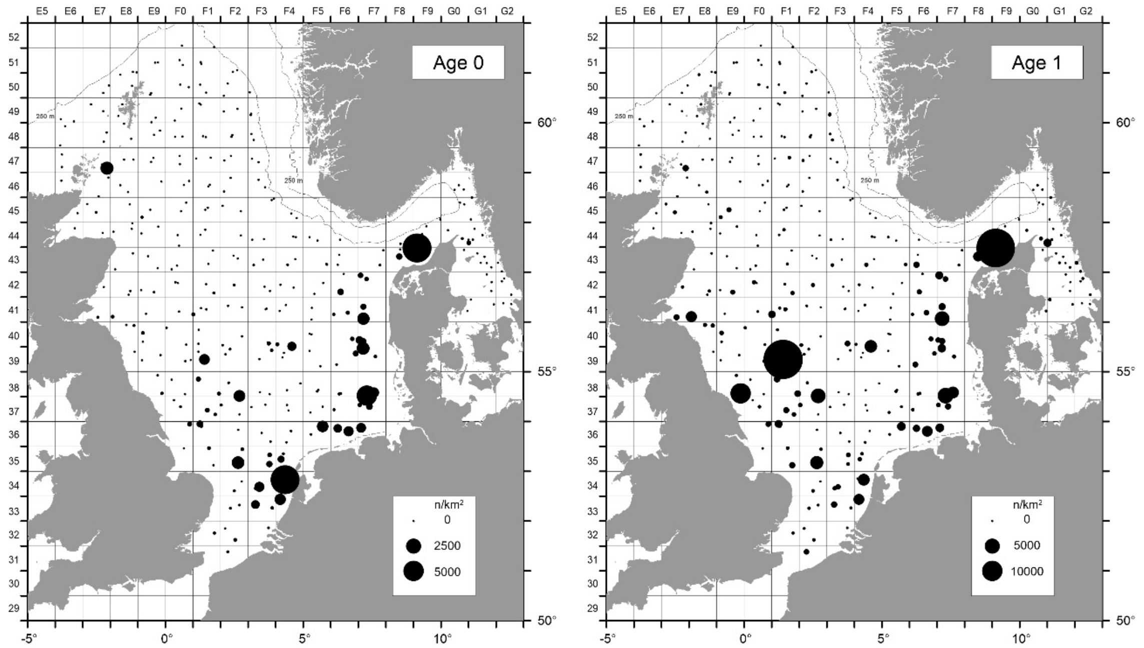


Figure A5.2h. Distribution of age 0 and age 1 mackerel in Q3 2023.

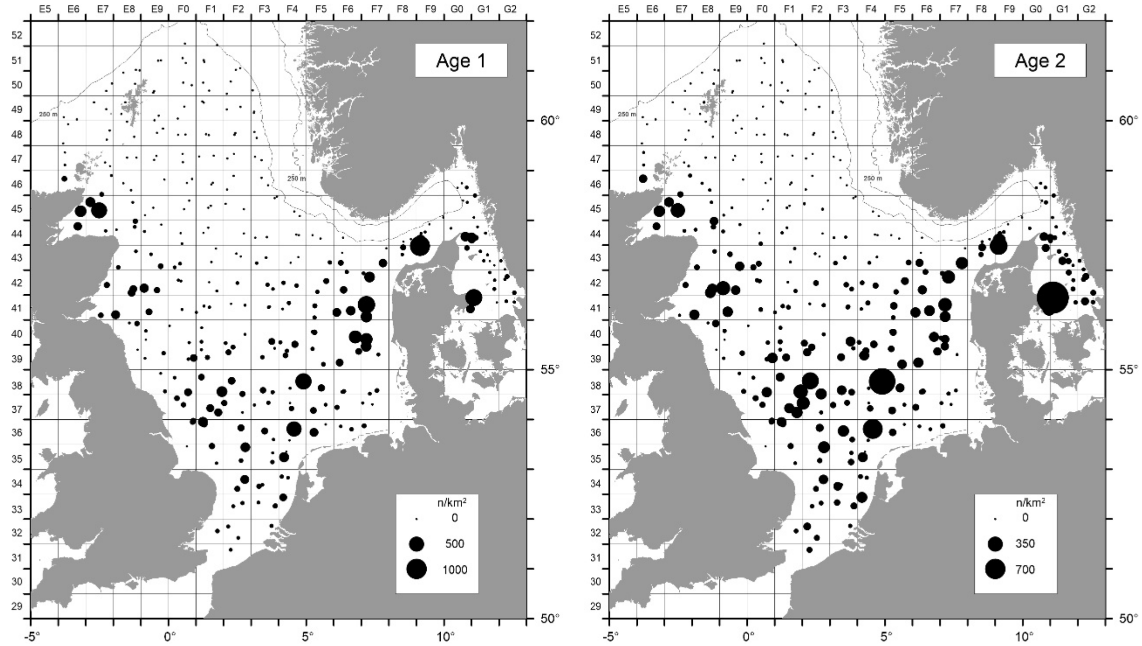


Figure A5.2i. Distribution of age 1 and age 2 plaice in Q3 2023.

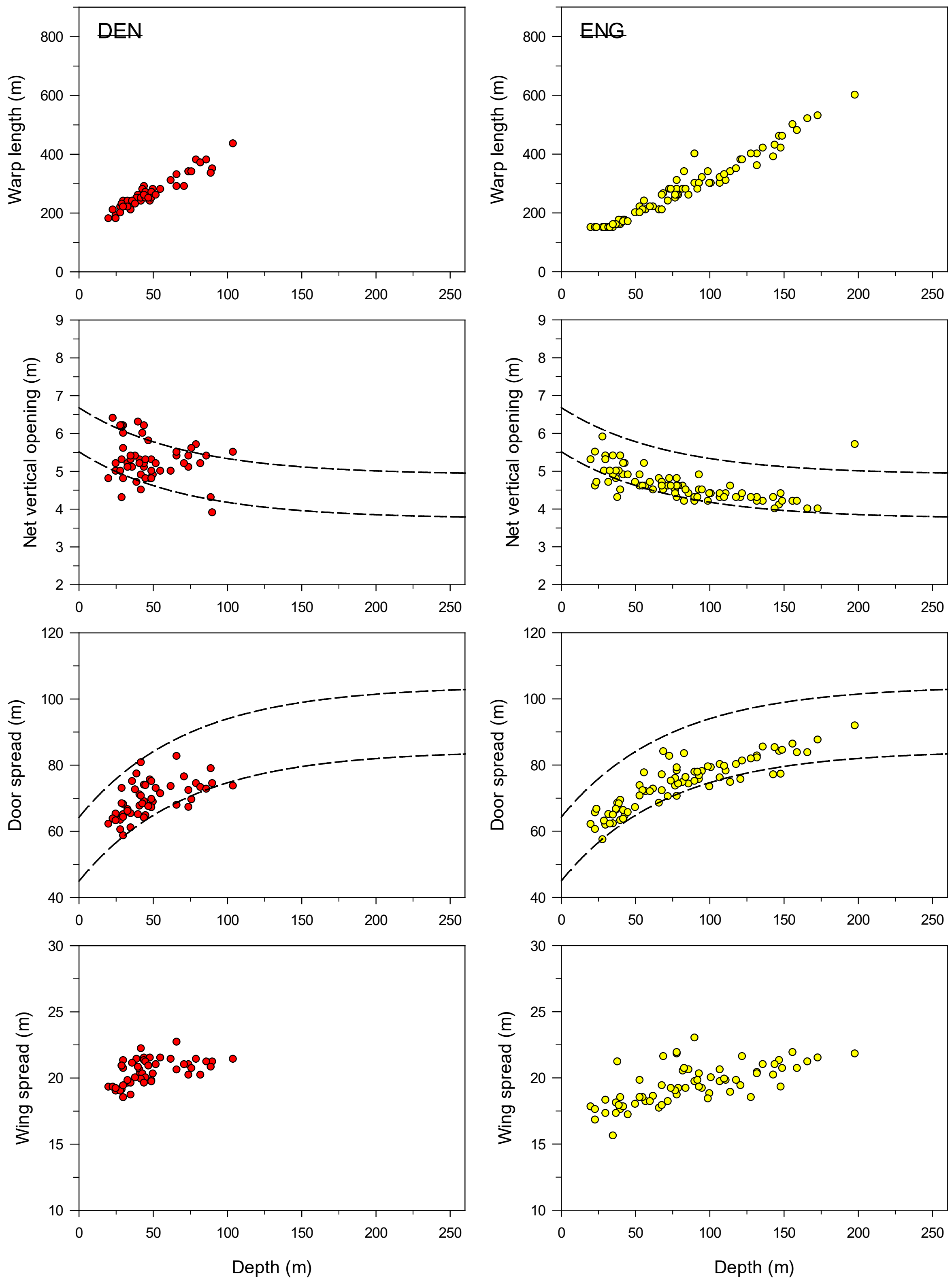


Figure A5.3a. Warp length and net geometry related to depth by country for the North Sea IBTS Q3 2023, Denmark (all tows with Vonin flyers instead of the standard Exocet kite) and England (Dashed lines: theoretical lower and upper limits for the standard GOV 36/47 based on flume tank experiments, see manual).

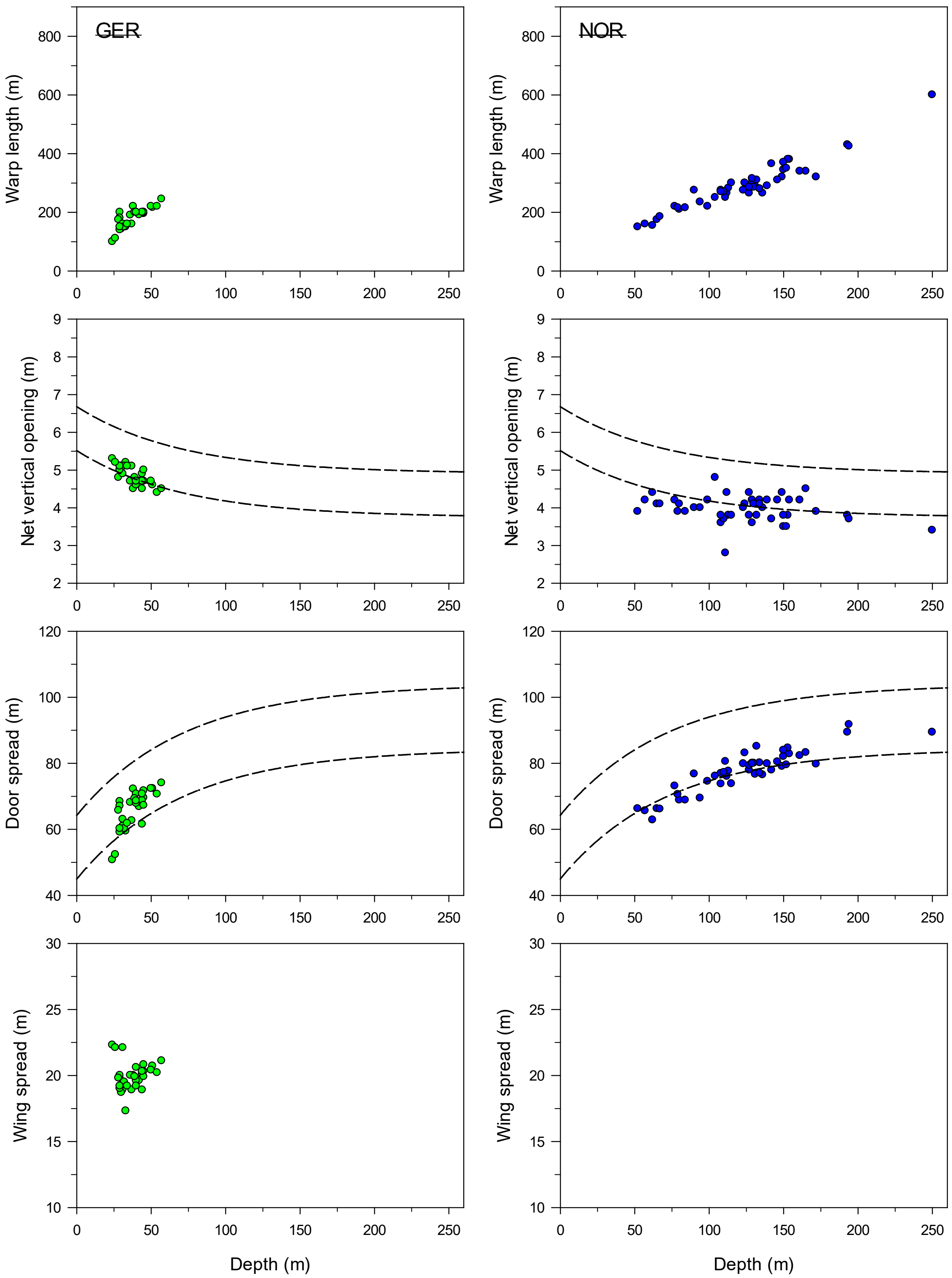


Figure A5.3b. Warp length and net geometry related to depth by country for the North Sea IBTS Q3 2023, Germany (all tows with Vonin flyers instead of the standard Exocet kite) and Norway (Dashed lines: theoretical lower and upper limits for the standard GOV 36/47 based on flume tank experiments, see manual).

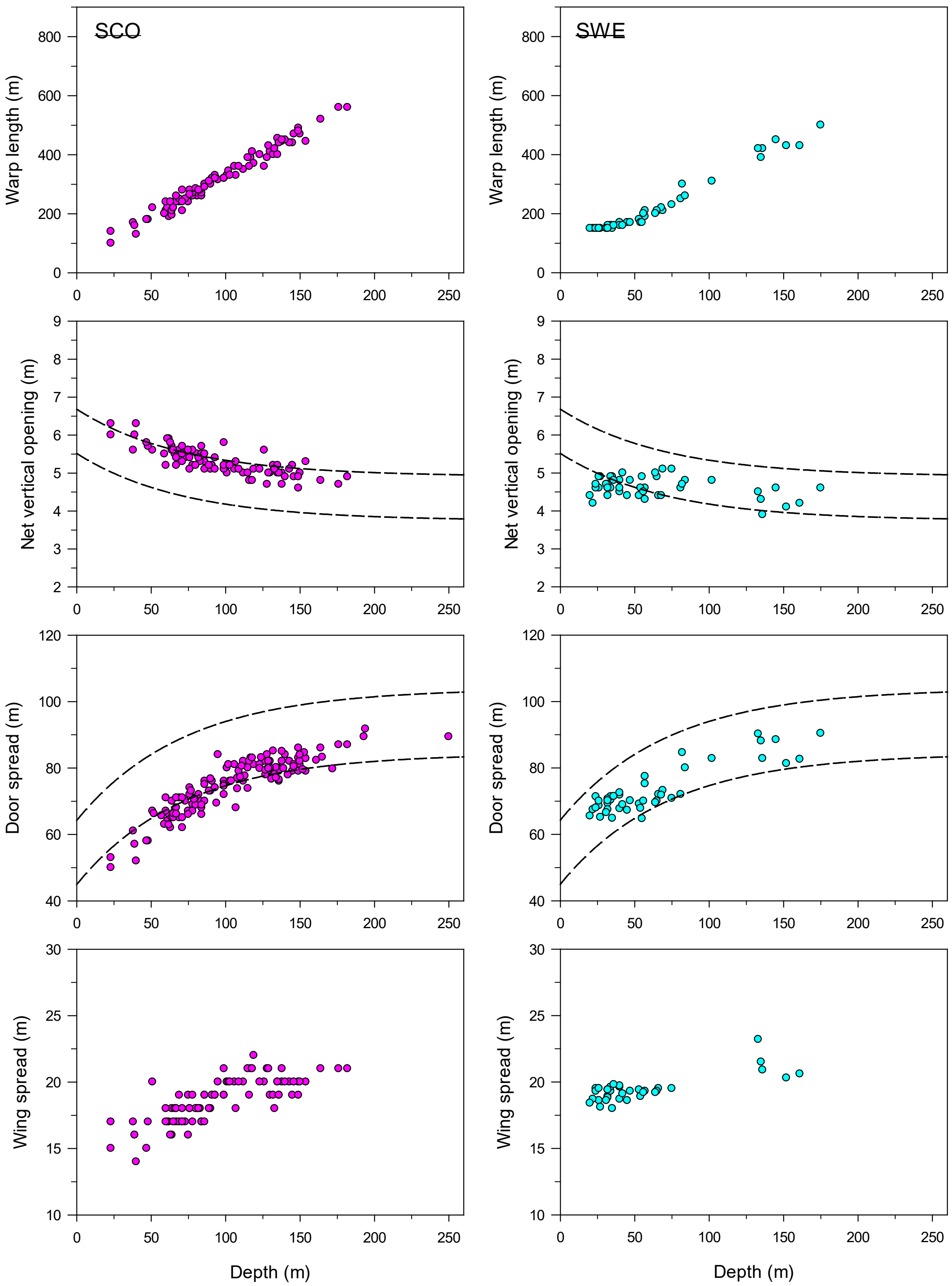


Figure A5.3c. Warp length and net geometry related to depth by country for the North Sea IBTS Q3 2023, Scotland and Sweden (Dashed lines: theoretical lower and upper limits for the standard GOV 36/47 based on flume tank experiments, see manual).

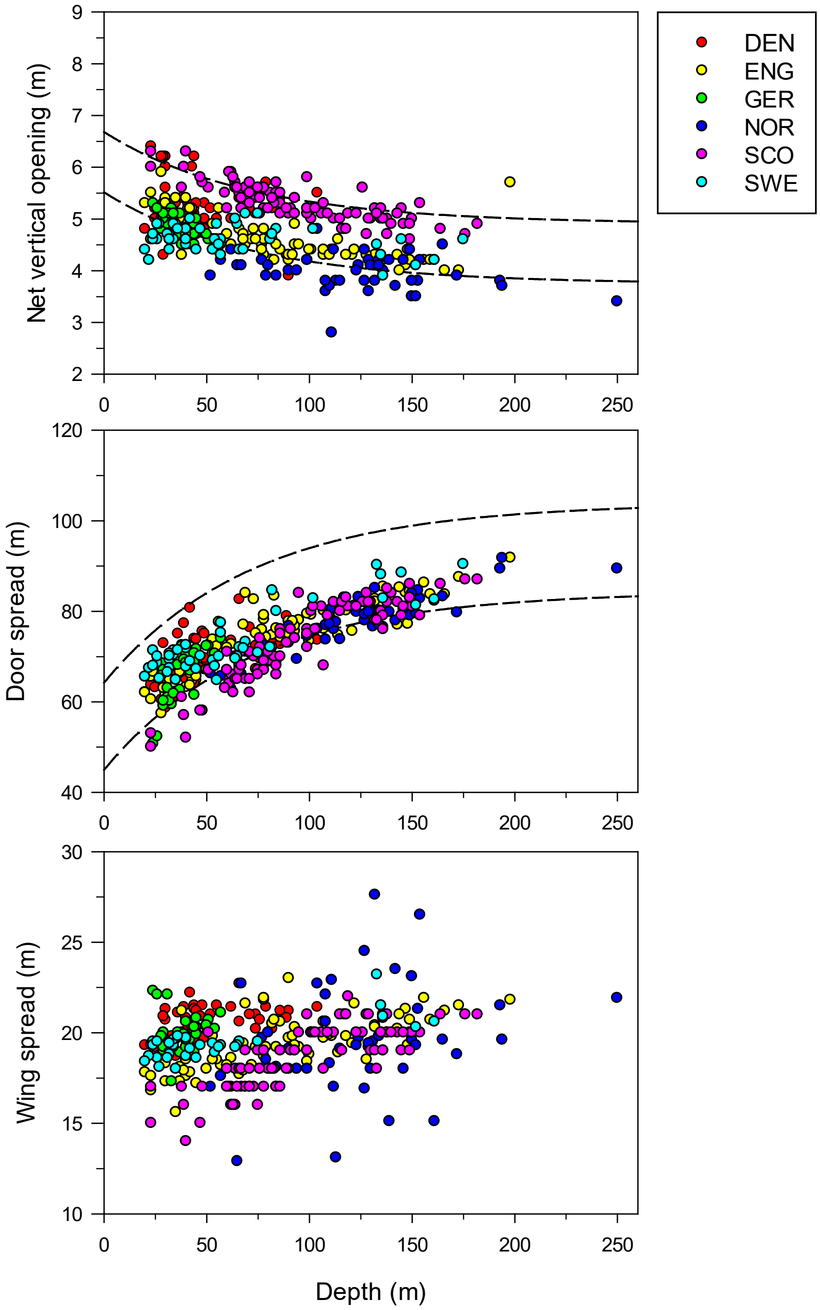


Figure A5.4. Comparison of trawl geometry related to depth between countries for the North Sea IBTS Q3 2023(Dashed lines: theoretical lower and upper limits for the standard GOV 36/47 based on flume tank experiments, see manual).

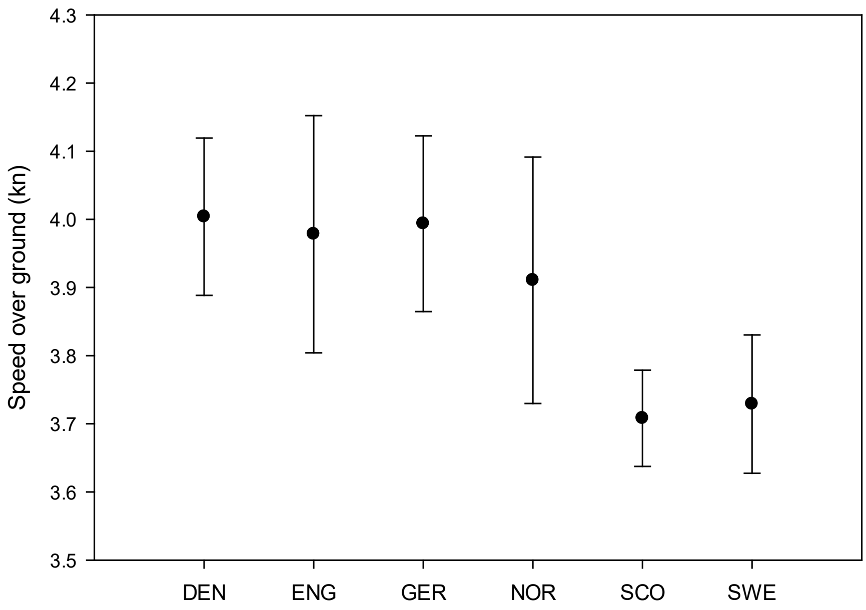


Figure A5.5. Average towing speed over ground per tow by country for the North Sea IBTS Q3 2023 (mean ± 1 standard deviation).

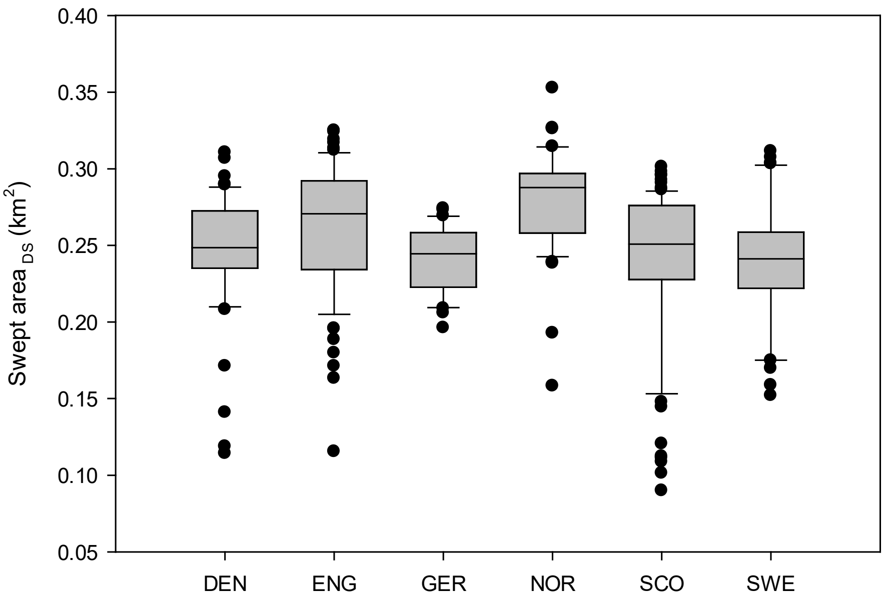


Figure A5.6. Swept area fished by country for the North Sea IBTS Q3 2023 (DS: door spread).

Annex 6: North-eastern Atlantic surveys

Coordinator: Finlay Burns

A6.1 Participation and general overview

In 2023, seven vessels from six nations performed 15 surveys across the North-eastern Atlantic (NEA) IBTS area. Four surveys (Scotland, Spain, Northern Ireland and Ireland) were undertaken during Q1 in February and March, with the Irish anglerfish survey once again extending into April. Scotland, France and Spain were active during Q3, with the Rockall haddock survey taking place alongside the Western Channel, Porcupine Bank and the Northern Spanish Coast shelf surveys. Portugal, France, Northern Ireland, Ireland, Scotland and Spain were all active during Q4.

A6.2 Issues and problems encountered

The Portuguese research vessel surveys were once again impacted with contractual and technical issues that resulted in the PT-PGFS-Q4 commencing over a month and a half later than planned and, once underway, was only able to successfully complete 54 of the planned 96 stations before having to return to port.

The NIGFS-Q4 also experienced serious disruption due to failure to install a new ballast water treatment system aboard "Corystes" resulted in the vessel being refused access to those survey stations located within the Irish EEZ. This accounts for around 30% of all the surveyed stations for this survey, including those considered important for both whiting and especially haddock. This issue has still not been addressed and the Q1 2024 survey has suffered the same issues and this is a real concern for the relevant end user for the data provided by this survey which is WGCSE.

A6.3 Summary results from trawl sampling

An overview from all the surveys is provided here, with more details given for each of the surveys in subsequent sections.

A6.3.1 Trawl stations

A total of 1170 valid hauls, out of the 1270 hauls planned, were accomplished over 344 days and distributed between all quarters of 2023 (Tables A6.1 and A6.2). Data from all NEA surveys reported here during 2023 have been uploaded to DATRAS.

A6.3.2 Biological sampling

Table A6.3 provides an overview of the numbers of fish for which individual biological data were collected per survey during the 2023 NEA IBTS. Additional activities for all reported surveys are summarised in Table A6.4, with more detailed information for all reported surveys, including survey coverage plots and catch per unit effort (CPUE) estimates for target species, presented in the accompanying individual survey summary reports.

A6.3.3 Net geometry

Gear parameter plots (warp out, door spread, wing spread, vertical opening) are also provided for each survey reported within the 2023 NEA IBTS schedule and that uploaded gear parameter data (Figure A6.1). Where different sweep configurations exist (long and short) within an individual survey, these are plotted separately within the same plot window. At the time of drafting Portugal had not submitted any gear parameter data for 2023 and therefore no gear parameter plots are available for the PT-PTGFS-Q4 in this reporting year.

Table A6.1. Summary of surveys, hauls and days at sea per country performed in the IBTS North-eastern Atlantic area in 2023.

Country	Survey	Hauls					Days
		Planned	Valid	Null	Additional	Total	
UK-Scotland	UK-SCOWCGFS-Q1	62	65	-	-	65	21+1*
	UK-SCOROC-Q3	40	46	1	1	48	14
	UK-SCOWCGFS-Q4	60	59	4	-	63	21+3*
UK-North Ireland	UK-NIGFS-Q1	61	58	1	-	59	18
	UK-NIGFS-Q4	62	38	-	-	38	9
Ireland	IE-IAMS-Q1/2	152	147	-	5**	152	40
	IE-IGFS-Q4	171	158	2	-	160	44
France	FR-WCGFS-Q3	48	51	1	-	52	14
	FR-CGFS-Q4	74	73	1	-	74	16
	FR-EVHOE-Q4	158	138	5	-	143	42
Spain	SP-PORC-Q3	80	80	9	8	97	37
	SP-NSGFS-Q4	116	112	2	13	127	35
	SP-GCGFS-Q1	45	46	2	-	48	17
	SP-GCGFS-Q4	45	45	1	-	46	14
Portugal	PT-PGFS-Q4	96	54	4	-	58	21
Total		**1270**	**1170**	**33**	**27**	**1230**	**344**

* Additional days for moorings

** Additional planned trawls for deep-water monitoring.

Table A6.2. Overview of the North-eastern Atlantic IBTS surveys performed during 2023 (Q1–Q4).

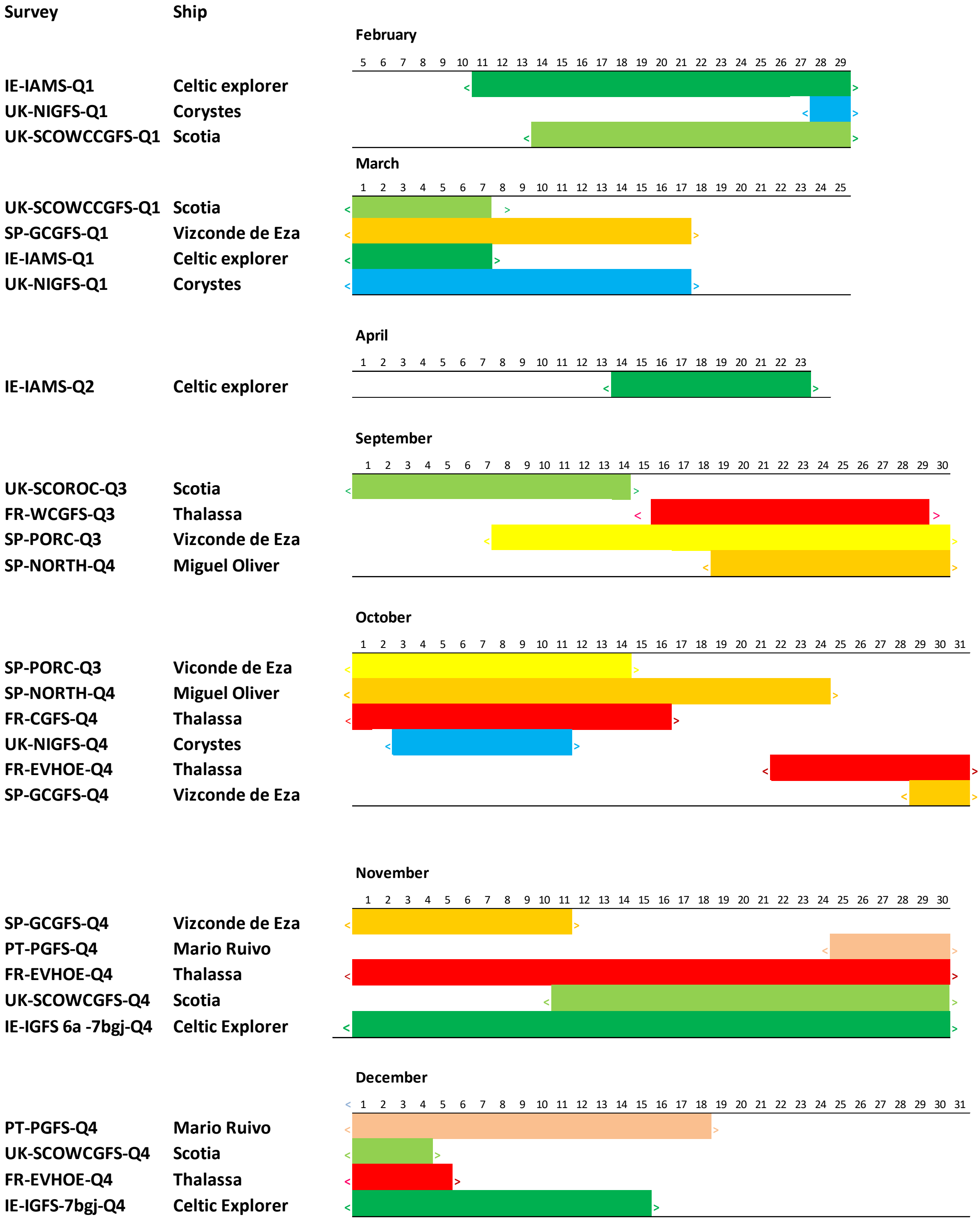


Table A6.3. Number of individuals sampled for maturity and/or age during the NEA IBTS in 2023. Notes: † length, weight, sex and externally determined maturity only; * samples collected for maturity only; ** no maturity data collected; ***length, weight and sex only; (1) maturity / otoliths, (2) otoliths and illicia, (3) tagging.

Target species	UK-SCOWCGFS-Q1	UK-SCOROC-Q3	UK-SCOWCGFS-Q4	UK-NIGFS-Q1	UK-NIGFS-Q4	IE-IAMS-Q1/Q2	IE-IGFS-Q4	FR-WCGFS-Q3	FR-CGFS-Q4	FR-EVHOE-Q4	SP-PORC-Q3	SP-NSGFS-Q4	SP-GCGFS-Q1	SP-GCGFS-Q4	PT-PGFS-Q4
Clupea harengus	699		221	322			122								
Gadus morhua	272	25**	77**	122	2	41	25			10					
Lepidorhombus boscii						310**				-	281	432			222/145(1)
Lepidorhombus whiffiagonis						1462	1951			388	573	578			8
Lophius budegassa	18***	2***	30***			1101	369	1		282	106(2)	147(2)			6
Lophius piscatorius	21***	122***	26***	25***		1201	431	22	2	242	143(2)	128(2)			
Melanogrammus aeglefinus	1823	1898**	1498**	837	347	945	1720	43		407					
Merlangius merlangus	1086	27**	1176**	1125	668	378	1183	228	194	484					
Merluccius merluccius	220***	1***	197***	107*	32*	1232**	1235			869	451		981/194(1)	1209/105(1)	1096/418(1)
Nephrops norvegicus											610*	477	153	317	99
Pollachius virens	125		9**	1*		62	6			-					
Scomber scombrus	303	12	234				368	138	159	86		171			170/106(1)
Sprattus sprattus	227**		131**	80											
Trachurus trachurus							1279					689			831/524(1)

Table A6.3 (continued). Number of individuals sampled for maturity and/or age during the NEA IBTS in 2023.

Additional teleost species	UK-SCOW-CGFS-Q1	UK-SCO-ROC-Q3	UK-SCOW-CGFS-Q4	UK-NIGFS-Q1	UK-NIGFS-Q4	IE-IAMS-Q1/Q2	IE-IGFS-Q4	FR-WCGFS-Q3	FR-CGFS-Q4	FR-EVHOE-Q4	SP-PORC-Q3	SP-NSGFS-Q4	SP-GCGFS-Q1	SP-GCGFS-Q4	PT-PGFS-Q4
Argyrosomus regius										130					
Boops boops															3
Chelidonichthys cuculus								108	97	185					
Chelidonichthys lastoviza															3
Chelidonichthys lucerna															
Conger conger											47	180			6
Trisopterus esmarki	497		381**												
Dicentrarchus labrax							7*	124	194	51					
Diplodus vulgaris															153
Engraulis encrasicolus			24***							150		645			
Glyptocephalus cynoglossus	37		33**			420**	344**			110					
Helicolenus dactylopterus											156	129			373/361(1)
Micromesistius poutassou							889					301			556/232(1)
Microstomus kitt						433**	1009	56	3	152					
Molva dypterygia															
Molva molva						116	36			6	3				
Mullus surmuletus								23	154	237		108			
Pagellus acarne															83/58(1)
Pagellus bogaraveo										8					3
Pagellus erythrinus															
Phycis blennoides										159	230	69			
Pleuronectes platessa	233		84**	328	290		973	3	232	104					
Trisopterus luscus								81	120	168		674			
Sardina pilchardus										193		510			
Solea solea							231	2	149	168					
Scomber colias												48			134/198(1)
Scophthalmus maximus			4***						5	5					
Scophthalmus rhombus	1*		11***						2	1					
Spondyliosoma cantharus															76/61(1)
Trachurus picturatus															
Zeus faber											94				

Table A6.3 (continued). Number of individuals sampled for maturity and/or age during the NEA IBTS in 2023.

Additional shellfish and elasmobranch species	UK-SCOW-CGFS-Q1	UK-SCO-ROC-Q3	UK-SCOW-CGFS-Q4	UK-NIGFS-Q1	UK-NIGFS-Q4	IE-IAMS-Q1/Q2	IE-IGFS-Q4	FR-WCGFS-Q3	FR-CGFS-Q4	FR-EVHOE-Q4	SP-PORC-Q3	SP-NSGFS-Q4	SP-GCGFS-Q1	SP-GCGFS-Q4	PT-PGFS-Q4
Aristeus antennatus															
Loligo vulgaris													91*		171
Loligo forbesi													14*		
Octopus vulgaris													67*	155*	
Parapenaeus longirostris													2110*	2106*	432†/352**
Sepia officinalis													150*		
Todaropsis eblanae															22*
Galeorhinus galeus	1†		6†			10†									
Galeus atlanticus															57†
Galeus melastomus	16†		42†												46†
Dipturus batis (=D. flossada)	11†	84†	8†			163*									
Dipturus intermedius	58†		63†			326**									
Dipturus oxyrinchus		13†													2†
Leucoraja fullonica		17†													
Leucoraja naevus	27†		39†		10	628									2
Mustelus spp.	21†		23†												
Raja clavata	177†		103†	61†	121†										35†
Raja miraletus															15†
Raja montagui	273†		186†	5†	15†										17†
Scyliorhinus canicula	919†		402†												126†
Squalus acanthias	373†		553†												
Chimaera monstrosa															35

Table A6.4. Additional activities undertaken during the NEA IBTS in 2023.

	UK-SCOWCGFS-Q1	UK-SCOROC-Q3	UK-SCOWCGFS-Q4	UK-NIGFS-Q1	UK-NIGFS-Q4	IE-IAMS-Q1/Q2	IE-IGFS-Q4	FR-WCGFS-Q3	FR-CGFS-Q4	FR-EVHOE-Q4	SP-PORC-Q3	SP-NSGFS-Q4	SP-GCGFS-Q1	SP-GCGFS -Q4	PT-PGFS-Q4
CTD (Temp+salinity)	1	1	1			1*	1*	1	1	1	1	1	1	1	1
Seafloor Litter	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Water sampler (Nutrients)								1	1	1					
Plankton sampling								1	1	1					
Benthos sampling							1	1	1	1	X	X	X	X	1
Observers: mammals, birds								1	1	1		1			
Additional biological data on fish	X	X	X	X	X	1	1	1	1	1	X	X	X	X	X
Fish stomach contents				X	X	1		X	X			1	1	1	1
Benthic samples (boxcore, video, dredge)										X	X	1	X		
Jellyfish	1	1	1	1	1	1	1	1	1	1					
Hydrological transect						1	1	1	1	1					
Acoustic for fish species								X	X	X					
Multibeam: seabed mapping						1		X	X	X					
Manta trawl; microplastics								1	1	1					
Acoustic mooring deployment	1		1			1	1	X	X						
Elasmobranch tagging				X	X		1	X	X	X					

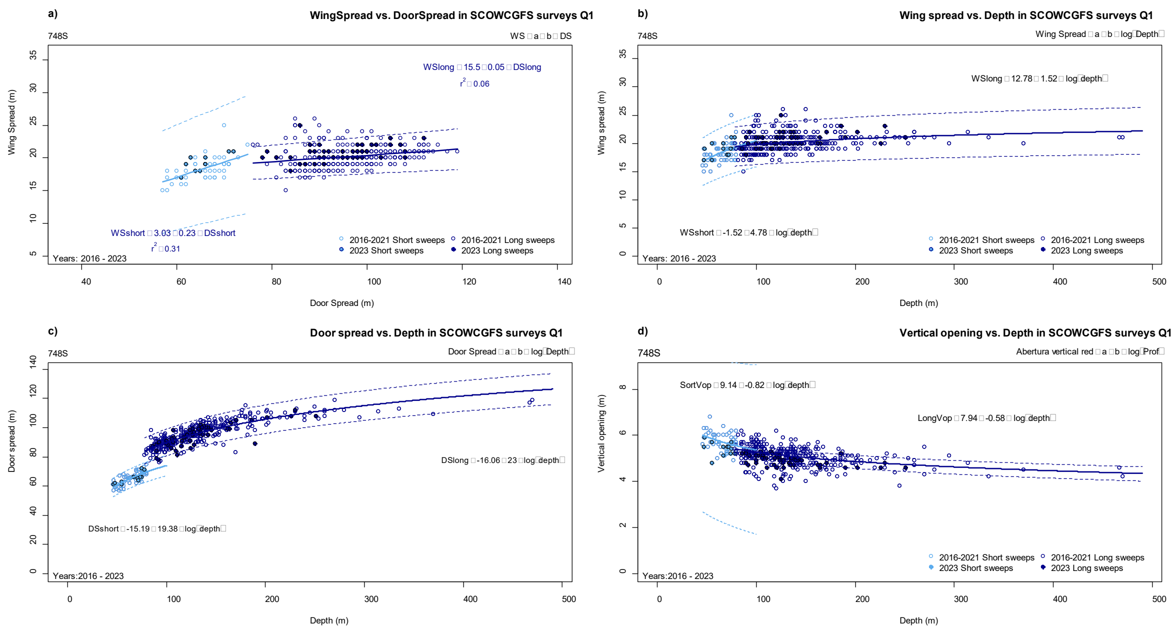


Figure A6.1a. Gear parameter plots for SCOWCGFS-Q1.

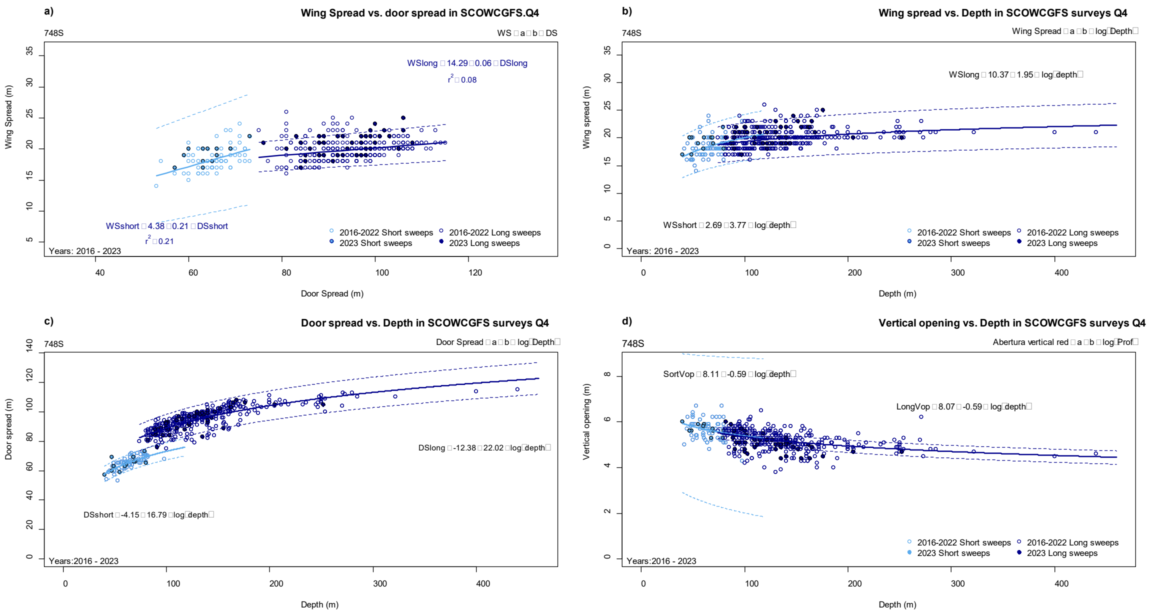


Figure A6.1b. Gear parameter plots for SCOWCGFS-Q4.

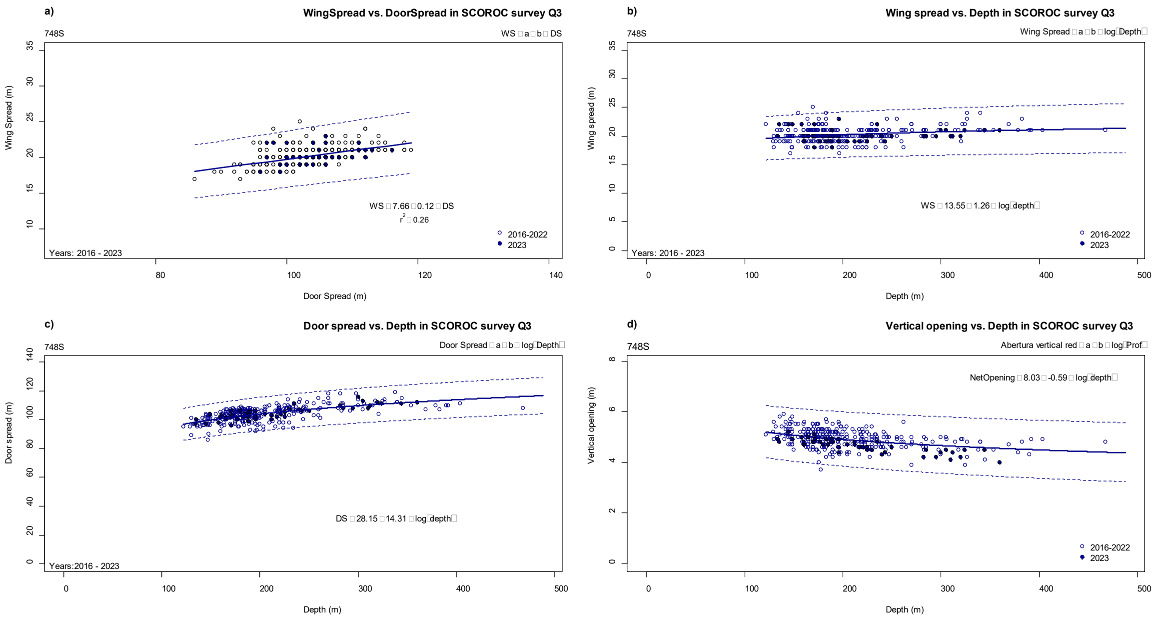


Figure A6.1c. Gear parameter plots for UK-SCOROC-Q3.

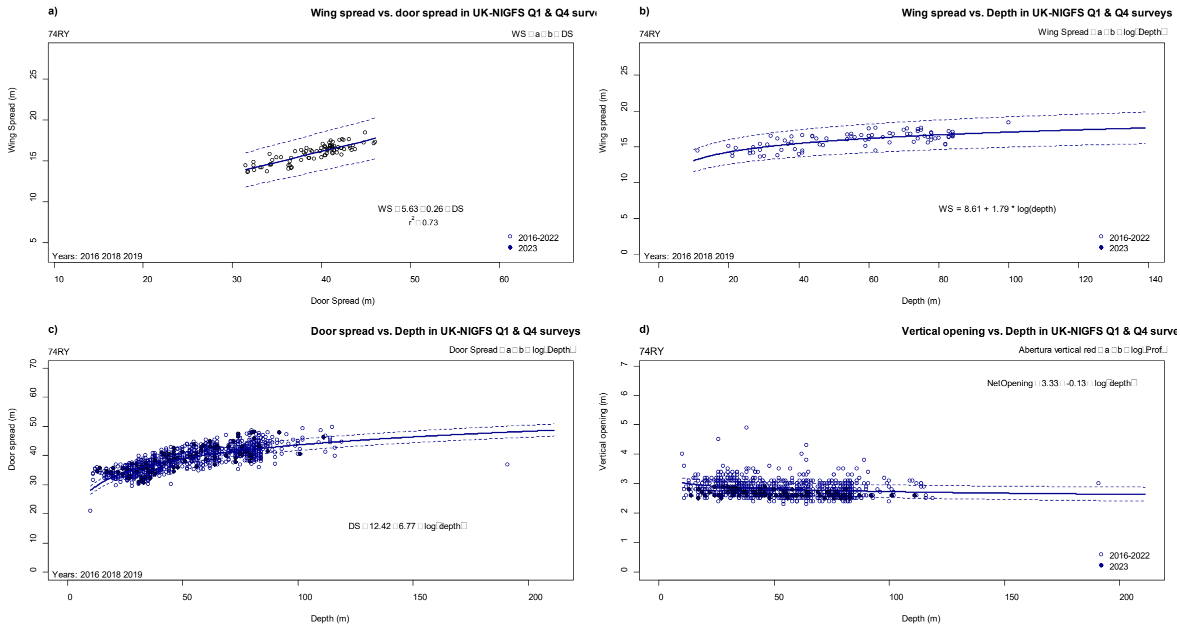


Figure A6.1d. Gear parameter plots for UK-NIGFS-Q1. Wing spread data only available for 2016, 2018 and 2019, so no 2023 points to compare for graphs a) and b) that use wing spread.

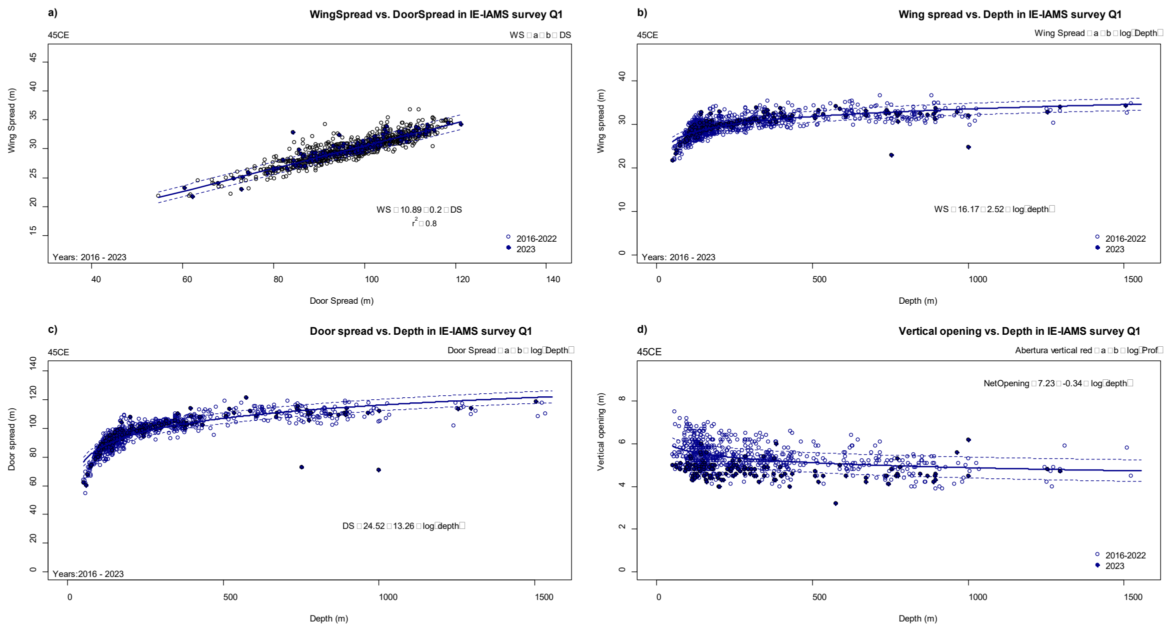


Figure A6.1e. Gear parameter plots for IE-IAMS-Q1.

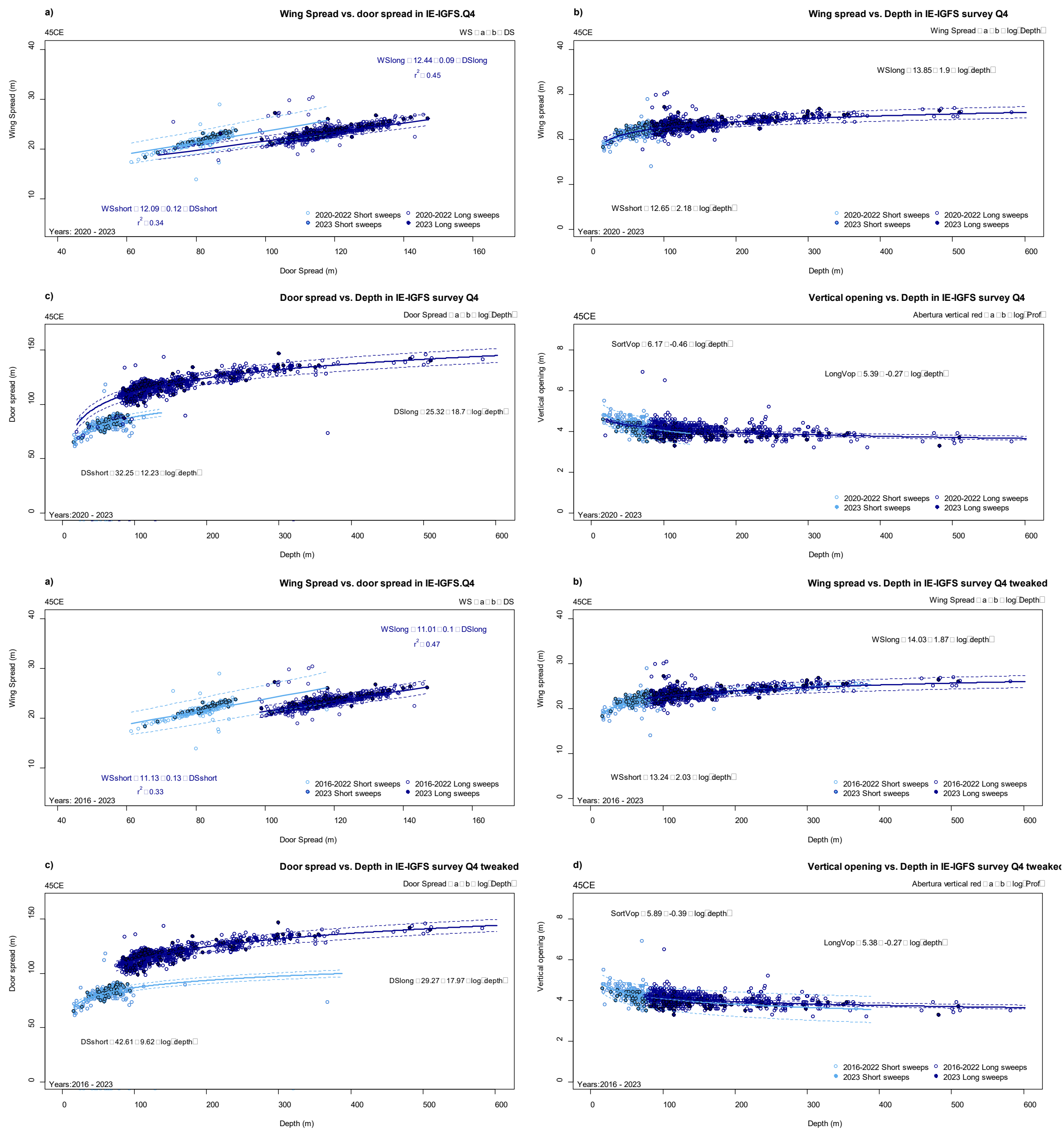


Figure A6.1f. Gear parameter plots for IE-IGFS-Q4. Notes: There is an issue of the sweeps/depth changing. The data in DATRAS (top) were corrected here (bottom) by assigning 55 m sweeps to hauls shallower than 75 m, and 110 m sweeps to hauls deeper than 75 m, but there is still a degree of overlap between both sweeps ranges in panels b-d. This issue was also raised (and corrected) last year and IBTSWG urges Ireland to correct this issue at the earliest opportunity.

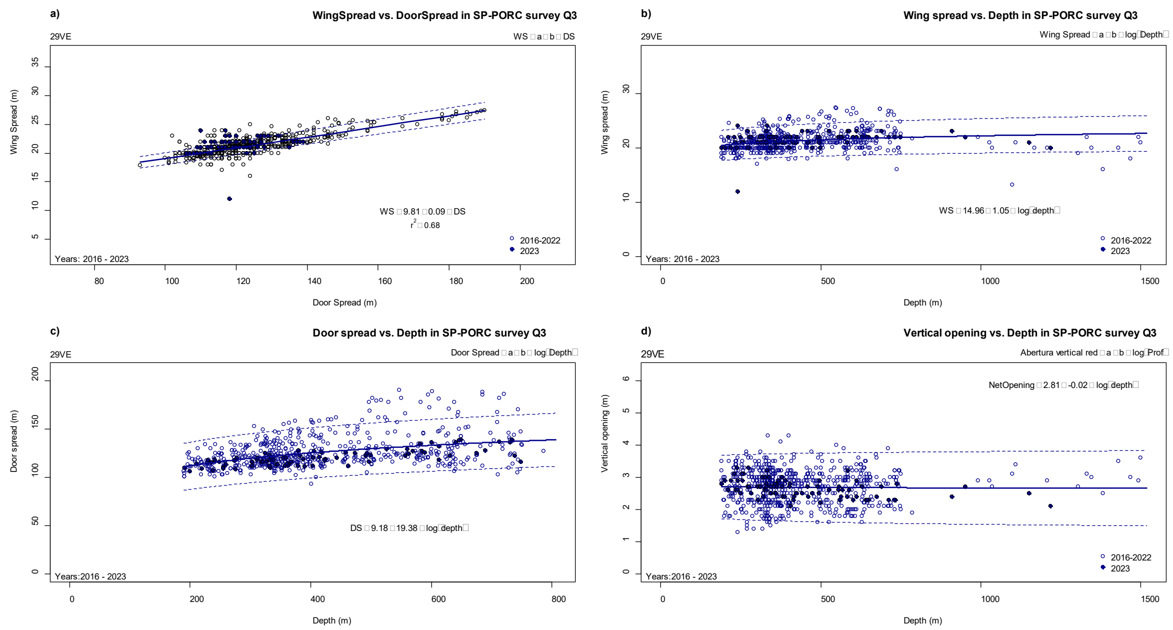


Figure A6.1g. Gear parameter plots for SP-PORC-Q3.

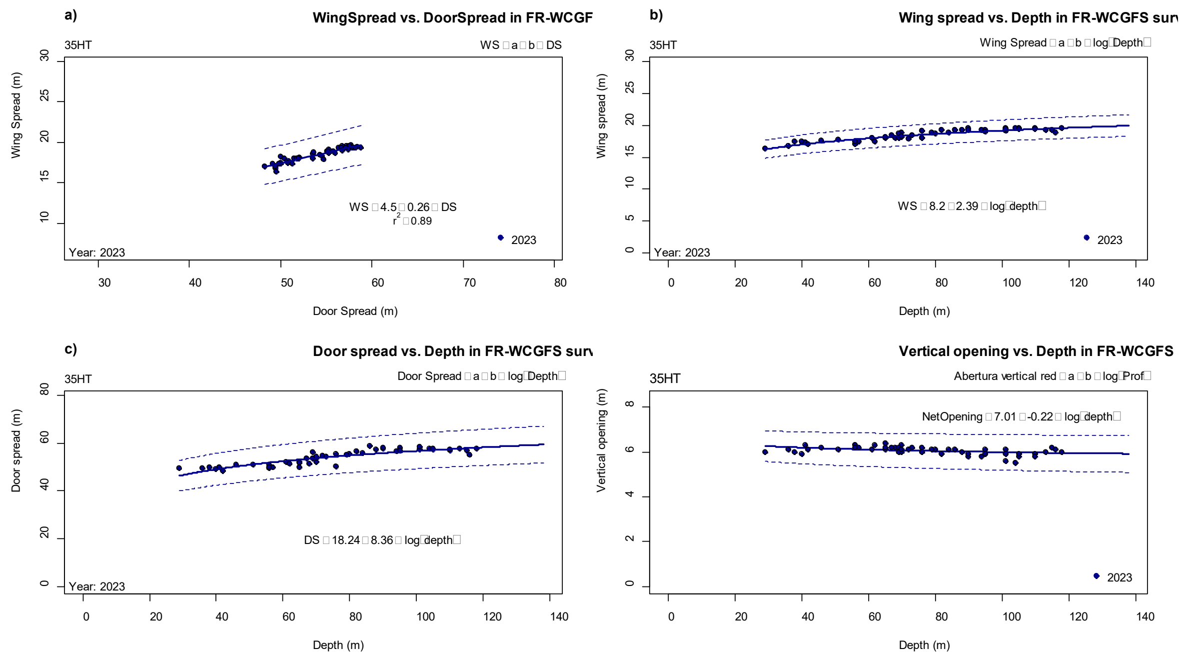


Figure A6.1h. Gear parameter plots for FR-WCGFS-Q3. This dataset is newly uploaded to DATRAS hence at the time of the report there was only 2023 data available to plot.

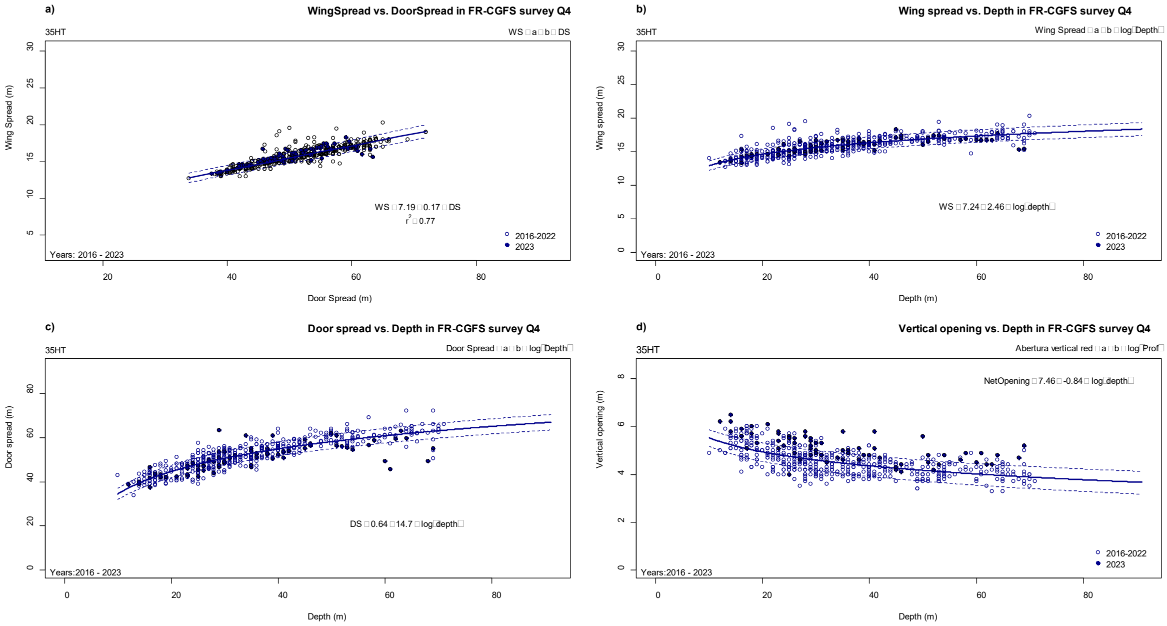


Figure A6.1i. Gear parameter plots for FR-CGFS-Q4.

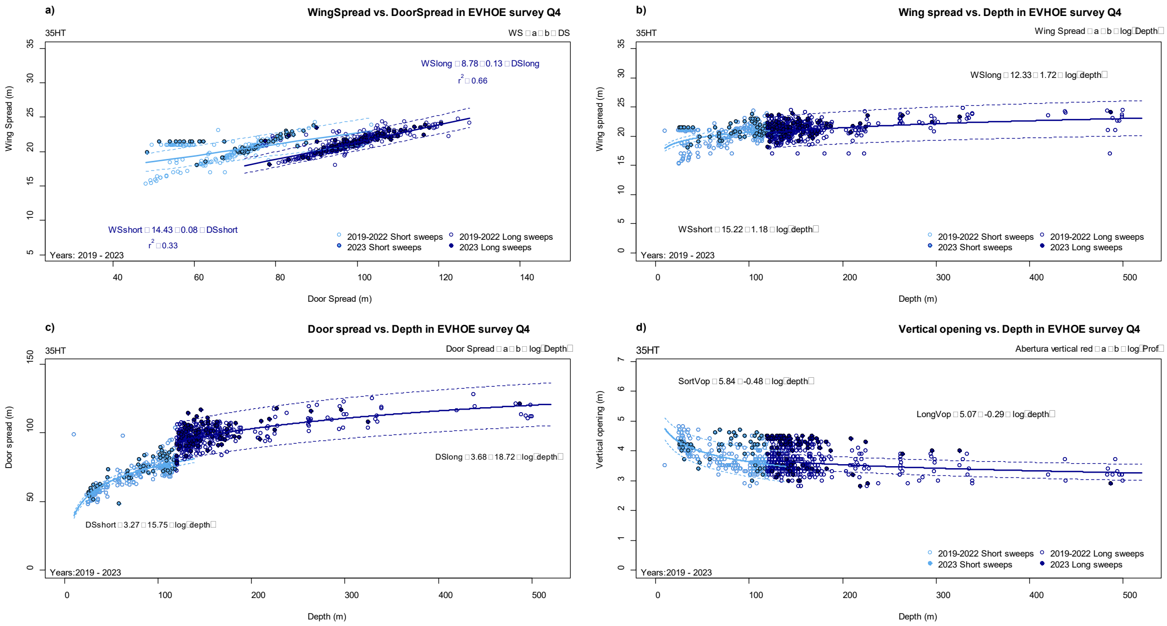


Figure A6.1j. Gear parameter plots for EVHOE-Q4. There is a degree of inconsistency in the assignment of sweep length by depth for some hauls and IBTSWG urges France to remedy these issues at the earliest opportunity.

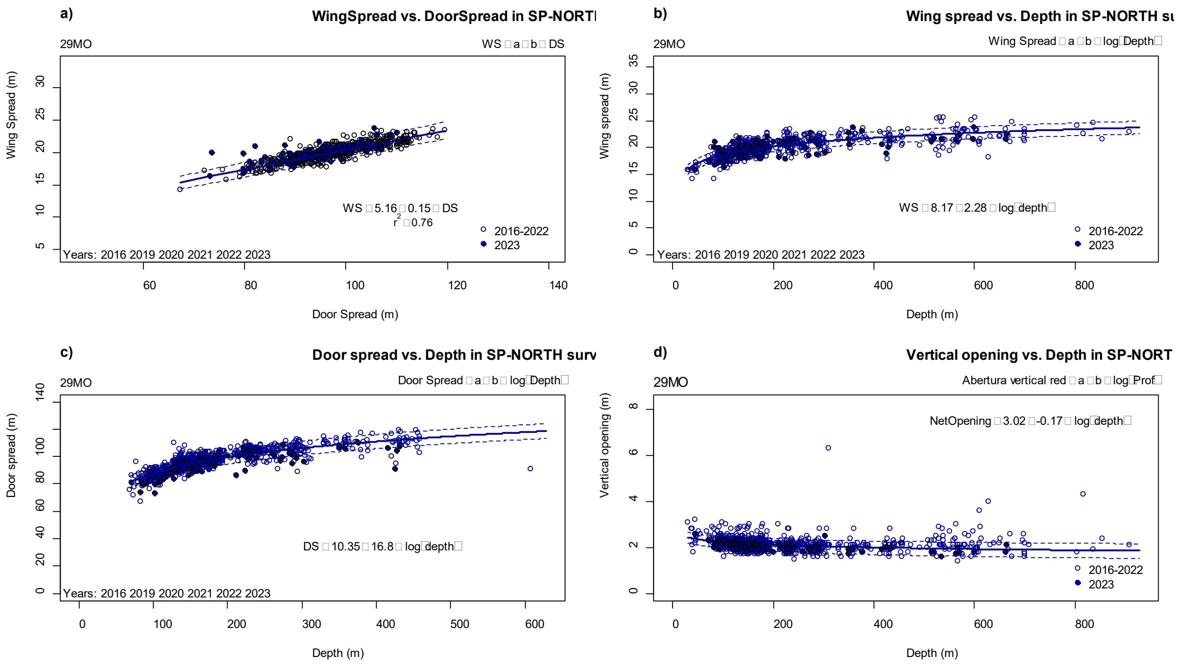


Figure A6.1k. Gear parameter plots for SP-NSGFS-Q4.

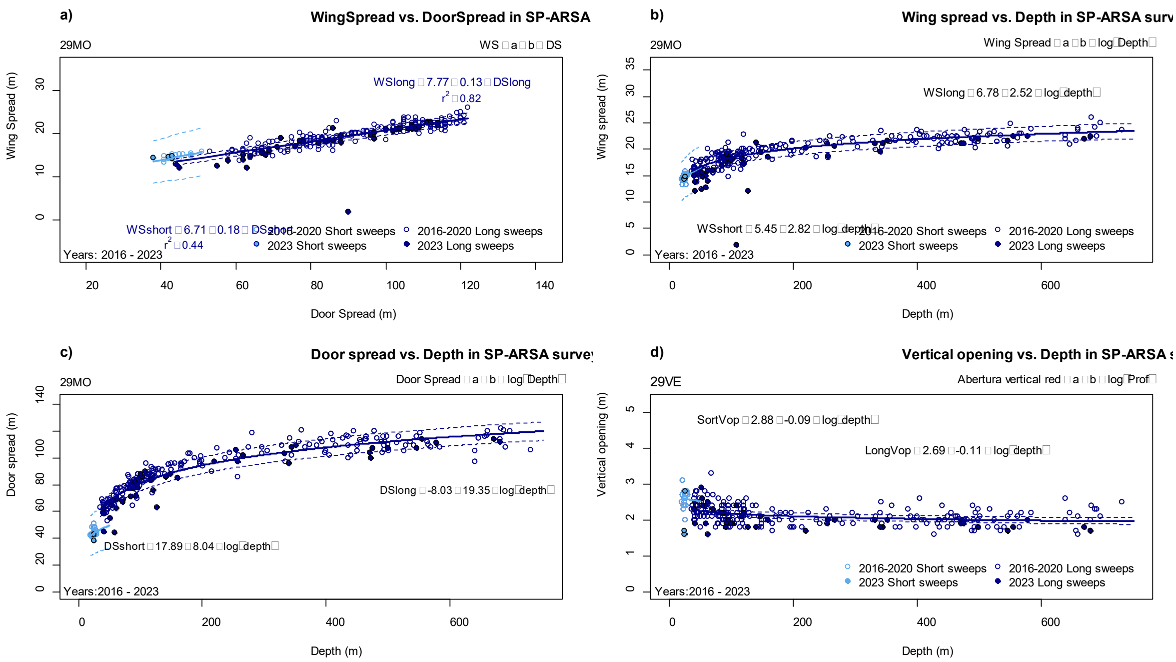


Figure A6.1l. Gear parameter plots for SP-GCGFS-Q1. This survey in 2023 was undertaken on the Vizconde de Eza.

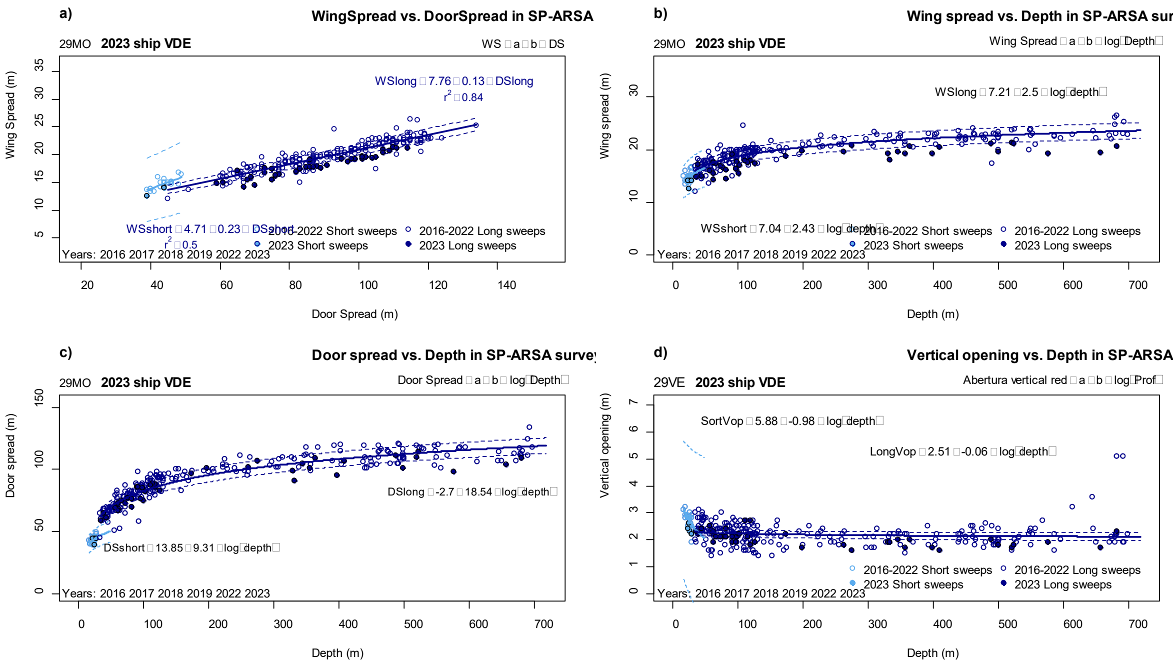


Figure A6.1m. Gear parameter plots for SP-GCGFS-Q4. This survey in 2023 was undertaken on the Vizconde de Eza.

A6.4 Scottish West Coast Groundfish Survey (SCOWCGFS-Q1)

Nation:	Scotland	Vessel:	Scotia
Survey:	0323S (SCOWCGFS-Q1)	Dates:	14 February to 7 March 2023
Cruise:	Objectives of SCOWCGFS – Q1: • Demersal trawling survey (SCOWCGFS-Q1) on the grounds to the North and West of Scotland and in ICES Division 6.a. • To obtain temperature and salinity data from the surface and seabed at each trawling station. • Collect additional biological data in connection with the UK Workplan and EU Data Collection /EUMap regulation. • Retrieval and re-deployment of passive acoustic moorings located at discrete sites within the survey area and are part of the Scotland Passive Acoustic Network (SPAN). • Deploy 21 acoustic smolt tracker tag receiver moorings North of Cape Wrath as part of a Marine Directorate/Atlantic Salmon Trust collaborative project.		
Gear details:	The SCOWCGFS – Q1 utilises a random-stratified survey design which randomly allocates 62 primary trawl locations distributed amongst the 11 sampling strata within ICES Division 6.a. GOV incorporating groundgear D was used at all stations and was deployed on 65 occasions (see Table A6.5). Sweeps were 97 m in all cases where the mean depth was >80 m (n = 53), otherwise 47 m sweeps were used (n = 12). The following parameters were recorded during each haul using SCANMAR: headline height, wing spread, door spread and distance covered. A bottom contact sensor was attached to the groundgear and downloaded following each haul to aid validation of touchdown and lift-off times for trawl.		
Notes from survey (e.g. problems, additional work etc.):	The GOV(BT137) was deployed on 65 occasions during 0323S with short 47 m sweeps where the seabed depth was 80 m or less being deployed on 12 occasions, the long 97 m sweeps being utilised on the remaining 51 deeper hauls. There were no invalid hauls recorded during survey 0323S. Primary stations were utilised on 55 occasions (out of possible 62) with secondary replacement stations being utilised on seven occasions. The settled conditions experienced during most of the survey provided the opportunity to add a further three secondary stations thereby lifting the total number of successful deployments for the survey up to 65. The locations utilised for the valid trawl positions during this survey were a combination of established MSS survey tows, commercial trawl tracks and also completely new areas. On 21 occasions grounds were successfully utilised that previously were unfished by MSS. All of the trawl deployments were completed during daylight hours and all the trawl stations were conducted outside marine protected areas (MPAs) or special areas of conservation (SACs) containing management measures that restrict the use of mobile fishing gears. See Figure A6.2 for a plot of all survey tows. Hauls were typically of 30 min. duration however various factors (large fish marks of shoaling species such as herring and boarfish, hard/rocky/muddy terrain with net coming fast, close proximity to static gear) resulted in lesser durations for 13 hauls (haul nos. 76, 80, 83, 90, 107, 108, 109, 112, 113, 121, 124, 126, 133). None of the hauls were of a duration shorter than 15 min., thus complying with recommendations pertaining to minimum haul duration referenced in the 2009 IBTSWG report.		

	The CTD recorder (RBR Concerto3) was successfully deployed on 62 out of the 65 trawling stations in order to obtain a temperature and salinity profile from the surface to within approximately 5m of the seabed. Hauls 81, 90 and 105 had no associated hydrography data. These were dropped in order to save time thus allowing the completion of another trawl station within the daylight period. **SPAN Mooring Deployments/Retrieval:** As part of the COMPASS marine mammal passive acoustic monitoring project Scotia successfully retrieved four (out of a possible five) moorings from two different locations from within the Minches area. Five moorings were redeployed back onto the same three sites at Tolsta (x3), Shiants, and Hyskier. See Figure A6.2 for mooring locations. **Marine Scotland Science (MSS) / Atlantic Salmon Trust (AST) Smolt Tracking Moorings:** 21 tag receiver moorings were successfully deployed over two nights and along a 50 nm transect running east to west and located North of Cape Wrath. The tracking units are being deployed to monitor the movements of Atlantic salmon (*Salmo salar*) post-smolts through the Atlantic Ocean and northwest of the Scottish mainland. These moorings were deployed as part of a collaborative project between MSS and the AST. See Figure A6.2 for the mooring locations. **Additional sampling undertaken during 0323S** • Genetic tissue samples for Anglerfish and hake from area ICES Division 6.a – *Gecka project* • Whole juvenile mackerel retained for investigations into variations in field metabolic rate (FMR) proxy using sagittal otoliths – *Clive Trueman* (Southampton University). • Pelagic fish sample collection – Retention of 7 kg each of mackerel and herring from the Minch area for environmental monitoring (CRCE Scotland, Glasgow) • Retention of Phakellid and Craniella sponges. Collaborative phylogenetic study between MSS and the Natural History Museum. • Bobtail squid identification. All bobtail squid (Sepiolidae) caught frozen for identification at Naturalis Biodiversity Centre, Leiden. • 5 litre sample of raw offshore sub-surface (<10 m) water to serve as an inoculum in experiments. *Heriot Watt University* • Whole herring retained for genetics analysis from hauls containing spawning individuals to enhance ongoing stock discrimination work within Division 6.a - Ongoing collaboration involving MSS
No. fish species recorded and notes on any rare species or unusual catches:	**Catch Results** *(there was no survey in 2022 so instead 2021 results presented in parenthesis for comparison)* A total of 85 species were recorded for an overall catch weight of ~47.6 tonnes (92, 37.5). Major species components, by approximate tonnes, included haddock *Melanogrammus aeglefinus* 16.4 t (5.77 t), mackerel *Scomber scombrus* 3.1 t (10.6 t), cod *Gadus morhua* 0.65 t (0.3 t), Norway pout *Trisopterus esmarkii* 2.27 t (6.17 t), whiting *Merlangius merlangus* 2.09 t (1.87 t), herring *Clupea harengus* 3.65 t (2.41 t), and scad *Trachurus trachurus* 2.23 t (2.84 t). "Scotia" was able to achieve slightly more valid hauls (65) than were undertaken during this survey in 2021 (63), however effort in hours fished was broadly similar in terms of hours fished *(2021:29.5, 2023:30.5)* so catch estimates are comparable.

Haddock are the headline story of this survey with an unprecedented 280% increase in total catchweight compared to 2021 with over 16 tonnes of haddock being caught. Cod catchweight (0.65T) is also up more than 100% on 2021 albeit this was from a very low level in 2021 of 0.3T. Catches of Norway Pout and mackerel were both down 270% and 340% respectively from 2021. Table A6.6 provides overall catch rates per unit effort (CPUE) of the above species and several other major species.

The CPUE index (numbers caught per hour fishing) for 1-group gadoids (cod, haddock, whiting and saithe) weights the indices for each of the 11 sampling strata by the surface area of said stratum. These are then pooled to produce the index for ICES Division 6.a. Results for Q1 2023 for all age classes of the major commercial gadoid species are shown in Table A6.7 while those of 1-groups only for period 2015–2023 are shown in Table A6.8.

Although overall survey CPUE indices provided mostly positive or neutral estimates for the main target species including a record survey high for haddock the 1- group abundance indices more of a mixed bag for the same species. Haddock were down 50% on 2021 estimates and cod are also down 25% when compared with 2021 and crucially both also well below the 10-year average for the survey. The 1-group estimate for cod is less than 0.1 fish per hour which is a record low for the survey. In the case of haddock these results are unsurprising given the very large adult biomass (*comprised largely of 4 year olds*) currently observed within subarea 6a. Estimates of 1-group whiting meanwhile are up over 80% on 2021 albeit still some way short of the 10 year survey average. For the fourth survey in succession no 1-group saithe were recorded and despite an increase in the overall CPUE for saithe during the survey in 2023. Also to note, over 70% of the entire saithe caught during survey 0323S were from two stations (*hauls 125 and 131*) within the South Minch and dominated by 2-year old fish. Overall survey CPUE by weight (kg/hr) was down for Norway Pout compared to 2021 although there was a small increase in the estimate for 1-group individuals albeit they are still some way below the 10-year survey average.

Notable species encountered during the survey included a garfish (*Belone belone*) that was recorded from the shelf edge NW of Orkney (station 74). Large numbers of spurdog (*Squalus acanthias*) were encountered from two stations (*79 and 82*) NE of the Butt of Lewis that combined, contained almost three tonnes of spurdog. Spurdog numbers from this survey have been rising steadily during the last few years. A pod of 10 common dolphin (*Delphinus delphis*) were spotted whilst deploying the trawl on station 122, 15 nm NE of Tory Island with another pod of around 15 animals being spotted W of Tiree in the South Minch just prior to shooting the trawl at station 132.

Biological Sampling

In total 7443 biological observations on selected species were collected in support of the UK Workplan and also the EU Data Collection Regulation. A summary of numbers collected for all sampled species is displayed in Table A6.9. All otoliths were aged back at the laboratory.

Marine litter

All litter picked up in the trawl was classified, quantified, recorded and retained for appropriate disposal ashore. The data is uploaded to the MSS database from where it will eventually be uploaded to DATRAS.

Monitoring of Non Indigenous Invasive Species (NIS)

	All catches were screened for the presence of selected NIS species with the results being reported back to the project coordinator at CEFAS.

Table A6.5. Number of stations surveyed/gear during 0323S

			Stations					
ICES Divisions	Strata	Gear	Planned	Valid	Additional	Invalid	Achieved (%)	Comments
6.a	11	GOV-D	62	65	0	0	105	

Table A6.6. Overall CPUE of major components of combined catch Q1 2023

Species	Common name	kg/hr	no/hr
Melanogrammus aeglefinus	Haddock	540	1622
Scomber scombrus	Mackerel	101	955
Gadus morhua	Cod	21.3	9.2
Trisopterus esmarkii	Norway pout	74.7	4201
Merlangius merlangus	Whiting	68.8	378
Clupea harengus	Herring	112	1084
Trachurus trachurus	Horse mackerel	73.1	337
Scyliorhinus canicula	Lesser-spotted dogfish	59.5	131.6
Pleuronectes platessa	Plaice	13.6	71
Eutrigla gurnardus	Grey gurnard	10.5	96.5
Capros aper	Boarfish	206.4	6746.7
Squalus acanthias	Spurdog	125.4	50.2
Pollachius virens	Saithe	10.1	11.2
Merluccius merluccius	Hake	5.2	37.2
Dipturus intermedius	Flapper skate	10.7	1.9
Loligo spp.	Long-finned squid	8.2	56.3
Raja montagui	Spotted ray	8.1	9.6
Lophius piscatorius	Angler	1.6	1.1
Sprattus sprattus	Sprat	26.6	4507
Raja clavata	Thornback ray	7.2	5.8
Chelidonichthys cuculus	Red gurnard	6.9	22.5
Micromesistius poutassou	Blue whiting	39.2	1440
Limanda limanda	Common dab	12.5	313
Microstomus kitt	Lemon sole	4.3	31.3
Lepidorhombus whiffiagonis	Megrim	1.8	5.2

Table A6.7. CPUE indices (no/hr) by year class of major demersal species Q1 2023

Age	Cod	Haddock	Whiting	Saithe	N. Pout
1	0.09	78.37	140.78	0.00	2954.41
2	3.36	148.02	80.93	0.80	1391.06
3	2.37	394.29	67.04	8.05	210.88
4	1.53	655.27	56.30	0.34	1.87
5	0.71	191.18	9.81	0.49	0.00
6	0.15	16.12	2.86	0.11	0.00
7	0.10	11.39	2.06	0.03	0.00
8	0.00	0.43	0.00	0.03	0.00
9	0.00	21.51	0.03	0.08	0.00
10	0.00	0.25	0.00	0.12	0.00
11	0.00	0.00	0.00	0.03	0.00
12	0.00	0.00	0.00	0.03	0.00
13	0.00	0.00	0.00	0.00	0.00

Table A6.8. CPUE indices (no/hr fishing) for 1-groups of major demersal species since 2015.

Species	2015	2016	2017	2018	2019	2020	2021	**2023**	% change from 2021	10 Yr Av.
Cod	0.82	0.47	0.29	0.17	1	1.44	0.12	**0.09**	–25	0.8
Haddock	680	56	217	39.8	763	95.8	152	**78.4**	–48.4	214.0
Whiting	254	323	497	196	323	380	77.3	**140.78**	82.1	277.7
Saithe	0	0	0	1.28	0	0	0	**0**	NA	0.1
N. Pout	4649	3245	4370	538	4693	3698	2271	**2954**	30.1	3279.2

Table A6.9. Numbers of biological observations per species collected during 0323S. These consist of length, weight, sex, maturity and age, unless: * length, weight, sex, maturity; ** length, weight and age † length, weight, sex and externally determined maturity only

Species	No.	Species	No.
Melanogrammus aeglefinus	*1823*	**Scophthalmus rhombus*	1
Merlangius merlangus	*1086*	*†Dipturus flossada*	11
Gadus morhua	*274*	*†Dipturus intermedia*	58
Pollachius virens	*125*	*†Leucoraja naevus*	27
Trisopterus esmarkii	*497*	*†Mustelus asterias*	21
Clupea harengus	*699*	*†Raja brachyura*	1
***Sprattus sprattus*	*227*	*†Raja clavata*	177
Scomber scombrus	*303*	*†Raja montagui*	273
**Merluccius merluccius*	*220*	*†Squalus acanthias*	373
Pleuronectes platessa	*233*	*†Galeorhinus galeus*	1
Glytopcephalus cynoglossus	*37*	*†Scyliorhinus canicula*	919
†Galeus melastomus	*16*		

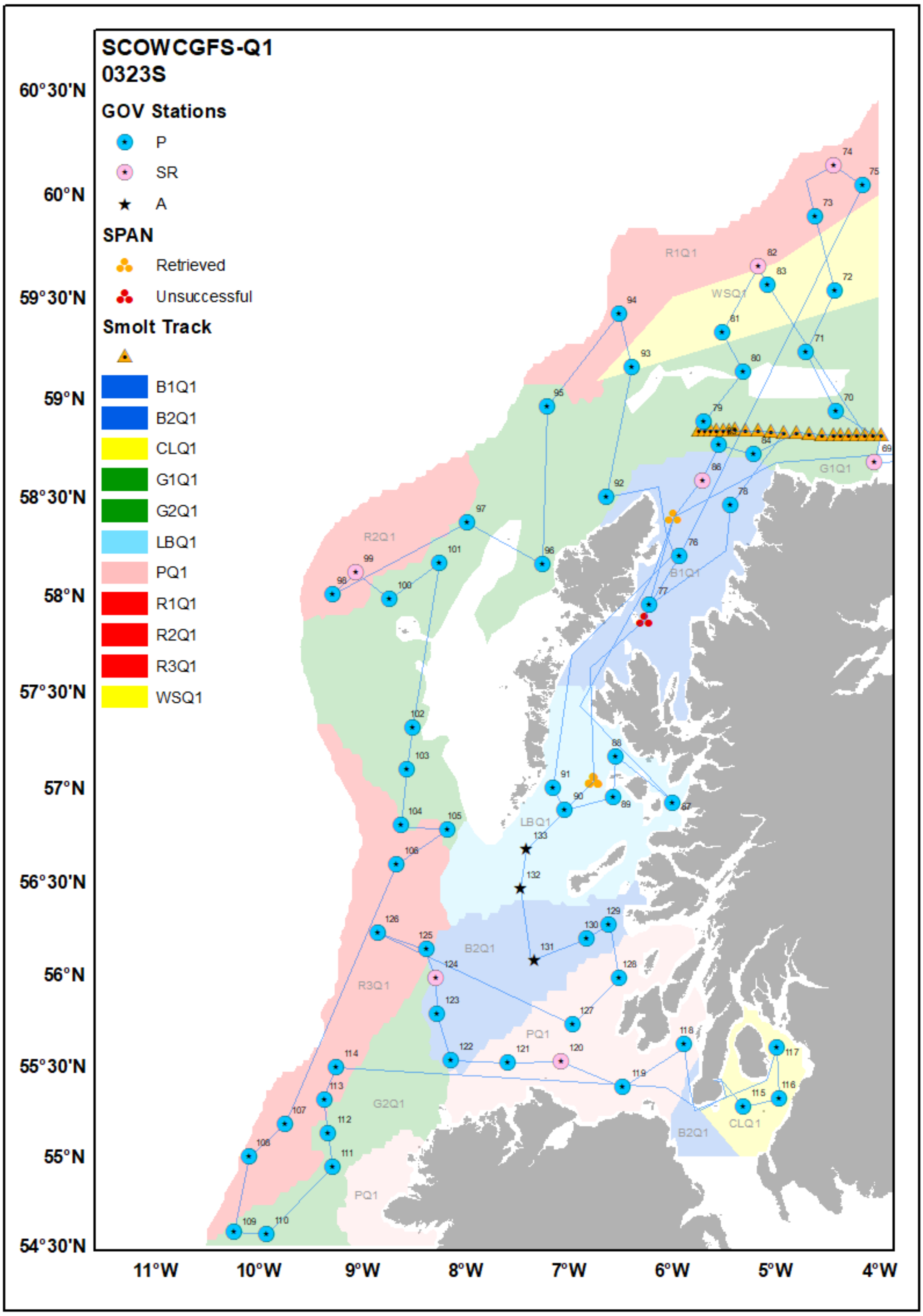


Figure A6.2. 0323S GOV deployments denoted by station type utilised (P – Primary, SR – Secondary Replacement, A – Additional). Also provided are locations of both SPAN and also smolt tracker moorings deployed. Survey track for 0323S as well as trawl survey strata are also shown.

A6.3 Northern Irish groundfish survey (Q1)

Nation:	**UK (Northern Ireland)**	**Vessel:**	Corystes
Survey:	Groundfish Survey CO1023	**Dates:**	28 February to 17 March 2023
Cruise	• To obtain information on spatial patterns of abundance of different size-and-age classes of demersal fish in the Irish Sea. • To obtain abundance indices of cod, whiting, haddock and herring for use at ICES Working Groups. • To quantify external parasite loads in whiting and cod by area. • To collect additional biological information on species as required under DCF. • To collect tissue samples for genetics studies on mature cod and hake. • To collect information on the extent of marine littering in the Irish Sea.		
Gear details:	A commercial rockhopper trawl fitted with a 20 mm liner in the cod-end was towed over three nautical miles or one nautical mile in the Irish Sea and St George's Channel. Gear and towing procedures were those employed on all previous AFBI groundfish surveys.		
Notes from survey (e.g. problems, additional work etc.):	A stratified survey with fixed station positions was employed (Figure A6.3). The survey was divided into strata defined by length and substratum. The species composition of the catch at each station was determined, and length frequencies were recorded for each species. All cod, majority of hake and sub-samples of haddock and whiting were taken for recording length, weight, sex and maturity stages and for the removal of otoliths for ageing. The level of infestation of whiting and cod by external parasites was estimated from biological samples collected at each station. For all hauls fishing was carried out during daylight commencing each day at first light. 58 valid hauls were completed (Table A6.10), 16 stations were towed for 60 min. and 38 stations were 20 min. tows. Stations 76 was towed for 1.5 nm and stations 17 and 342 were trawled for 2 nm. The width of seabed swept by the trawl doors increased from around 32 m in shallow water (30 m sounding) to around 46 m in deeper water (110 m sounding), with variations due to tidal flow. The average headline height was 2.4–2.9 m. Trawl parameters were consistent with previous surveys. The fish species subject to biological sampling are summarised in Table A6.11. Details of fish cod and whiting taken for biological analysis were screened for external parasites. Trawl data and length frequencies were archived using the newly developed groundfish survey database. Preliminary indices of abundance for 0-group and 1-group cod, whiting and haddock were obtained from the length distributions. More accurate indices will be available once the otoliths collected during the cruise have been aged. Additional Sampling: All litter picked up in the trawl was classified, quantified and recorded and uploaded to the national MSS litter database from where it will eventually be uploaded to DATRAS. The litter was retained onboard for appropriate disposal ashore. Additional biological data and stomach samples were taken for food web analysis.		
Number of fish species recorded and notes on any rare species or unusual catches:	A total of 129 species were recorded during the survey of which 75 were measured for length frequencies. Biological data was recorded for a number of species in accordance with the requirements of the EU Data Regulations. A total of 3,093 biological samples were taken during the survey.		

Table A6.10. Number of stations surveyed/gear.

ICES			Hauls					
Division	Strata	Gear	Planned	Valid	Additional	Invalid	% Achieved	Comments
7.a	All	Rockhopper	61	58	0	1	95	

Table A6.11. Biological sampling undertaken during CO1023. Data is weight/length/sex/maturity/age except * where age data was not collected, ** where no maturity data collected, ***weight/length/sex.

Species	Nos	Species	Nos
Gadus morhua	122	*Scophthalmus maximus*	0***
Merlangius merlangus	1125	*Raja brachyura*	2***
Melanogrammus aeglefinus	837	*Raja clavata*	61***
Merluccius merluccius	107*	*Raja montagui*	5***
Pollachius pollachius	1*	*Leucoraja naevus*	1***
Molva molva	0	*Squalus acanthias*	0***
Zeus faber	0	*Clupea harengus*	322**
Scophthalmus rhombus	0	*Lophius piscatorius*	25
Pleuronectes platessa	328		
Microstomus kitt	0		
Lepidorhombus whiffiagonis	0		
Chelidonichthys cuculus	0		

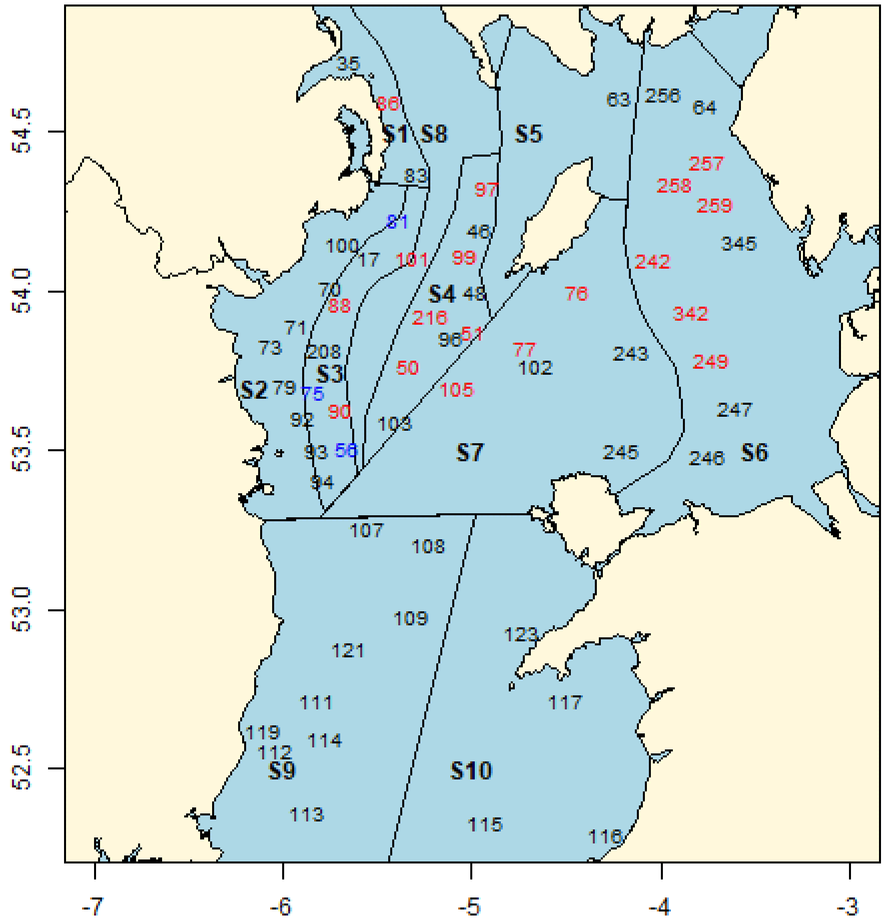


Figure A6.3. Map of groundfish survey stations completed during CO1023. Stations highlighted in red towed for 1 hour (3n m), highlighted in black towed for 20 minutes (1 nm) and highlighted in blue towed for 1.75 or 2 nm.

A6.4 Irish Anglerfish and Megrim Survey (IAMS)

Nation:	Ireland	**Vessel:**	Celtic Explorer
Survey	IE-IAMS-Q1	**Dates:**	11 February to 7 March 2023 (7.bcjk) 14 April to 23 April 2023 (6.a)
Cruise	The main objective of the Q1 Irish Anglerfish and Megrim Survey survey is to obtain abundance and biomass indices for anglerfish (*Lophius piscatorius* and *L. budegassa*) megrim (*Lepidorhombus whiffiagonis* and *L. boscii*) in Division 6.a (south of 58°N) and Subarea 7 (west of 8°W). Secondary objectives are to collect data on the distribution and relative abundance of anglerfish, megrim and other commercially exploited species. The survey also collects maturity and other biological information for commercial fish species. The Irish Anglerfish and Megrim Survey (IE-IAMS-Q1) data are uploaded to DATRAS and is used as a tuning index for mon.27.78abd (WGBIE). Information on the IAMS-Q1 is also included as an annex of the Manual of the IBTS North Eastern Atlantic Surveys, SISP 15 (ICES, 2017).		
Gear details	The trawl is based on a standard commercial otter trawl used in the anglerfish fishery and is described in detail in Reid et al. (IJMS 2007, 64:8 p1503–1511).		
Notes	One day lost (25/2/23) due to mending damage to gear and half a day due to bringing injured crew member ashore (28/2/23). Two additional deep water transects (500–1,500 m) of five stations each (ten in total) were added to survey protocols in 2019 (three additional days have been added to facilitate this work). This work is funded independently through EMFF/EMFAF. Summary details are provided below for stations fished (Table A6.12), biological samples taken (Table A6.13) and preliminary data for two species of anglerfish (Tables A6.14–A6.15). The survey area is shown in Figure A6.4.		
Number of fish species, unusual catches	In 2023, 108 species of teleost fish, 32 species of elasmobranchs, 11 species of cephalopods and 24 other species/groups were recorded.		

Table A6.12. Stations fished (aim to complete 115 valid tows per year; including deep-water stations).

Divisions	Stratum	Stratum area (km²)	Valid tows	Swept area (km²)
6.a	6.a_Shelf_L	37,003	21	3.3
6.a	6.a_Shelf_M	4,746	8	1.6
6.a	6.a_Slope_H	3,114	11	2.1
6.a	6.a_Slope_M	3,044	9	3.4
7.bcjk	7_Porc_L	11,798	5	1.1
7.bcjk	7_Shelf_H	50,764	21	6.5
7.bcjk	7_Shelf_L	22,322	10	5.1
7.bcjk	7_Shelf_M	14,621	9	4.0
7.bcjk	7_Slope_H	35,768	34	12.0
7.bcjk	7_Slope_L	7,914	4	0.6
7.bcjk	7_Slope_M	29,406	15	4.2
6.a	DeepArea4	Additional sampling	2	NA
7.c	DeepArea5	Additional sampling	3	NA
	Total	220,500	147 (+5)	43.9

Table A6.13. Biological samples collected during IAMS2023. Sampling includes length, weight, sex, maturity and age material unless otherwise specified. Species denoted * sampled for length, weight, sex and maturity only; species denoted ** sampled for length and weight only.

Cruise	Species	Oto. count
IAMS2023	*Gadus morhua*	41
IAMS2023	*Glyptocephalus cynoglossus***	420
IAMS2023	*Lepidorhombus whiffiagonis*	1462
IAMS2023	*Lophius budegassa*	1101
IAMS2023	*Lophius piscatorius*	1201
IAMS2023	*Melanogrammus aeglefinus*	945
IAMS2023	*Merlangius merlangus*	378
IAMS2023	*Merluccius merluccius*	1232
IAMS2023	*Microstomus kitt*	433
IAMS2023	*Molva molva*	116
IAMS2023	*Pleuronectes platessa*	370
IAMS2023	*Pollachius pollachius***	11
IAMS2023	*Pollachius virens*	62
IAMS2023	*Solea solea*	24

Table A6.14. Summary statistics by stratum. Stratum area is given in Km², Num Hauls is the is the number of valid hauls in each stratum and Swept-area is the total area swept between the doors in each stratum (in Km²), catch numbers are given for *L. piscatorius* (MON), *L. budegassa* (WAF), *L. whiffiagonis* (MEG) and *L. boscii* (LBI).

Stratum	Stratum Area	Num Hauls	Swept Area	Catch Num MON	Catch Num WAF	Catch Num MEG	Catch Num LBI
6.a_Shelf_L	37,003	21	9.31	212	44	155	0
6.a_Shelf_M	4,746	8	3.87	105	58	105	0
6.a_Slope_H	3,114	11	5.45	142	137	326	12
6.a_Slope_M	3,044	9	5.19	258	0	11	4
7_Shelf_H	50,764	21	11.21	75	316	517	66
7_Shelf_L	42,034	19	9.85	111	112	215	160
7_Shelf_M	14,621	9	3.91	32	69	137	2
7_Slope_H	35,768	34	18.15	234	410	691	229
7_Slope_M	29,406	15	8.95	120	1	14	21

Table A6.15. Estimated numbers (millions) and biomass (kT) of *Lophius piscatorius* (MON) and *L. budegassa* (WAF) in Division 6.a and Subarea 7, with CV and confidence intervals (CIlo and CIhi). Only fish >500g live weight (approximately 32cm) were included in the estimate.

	6.a MON	7 MON	6.a WAF	7 WAF
NumMln	5.370	8.080	1.571	17.793
NumCV	19.189	12.237	23.642	10.760
NumCILo	3.350	6.142	0.843	14.040
NumCIHi	7.389	10.018	2.298	21.546
BiomKT	6.084	20.923	1.229	12.540
BiomCV	19.334	9.136	24.517	7.440
BiomCILo	3.779	17.176	0.638	10.711
BiomCIHi	8.390	24.670	1.820	14.368

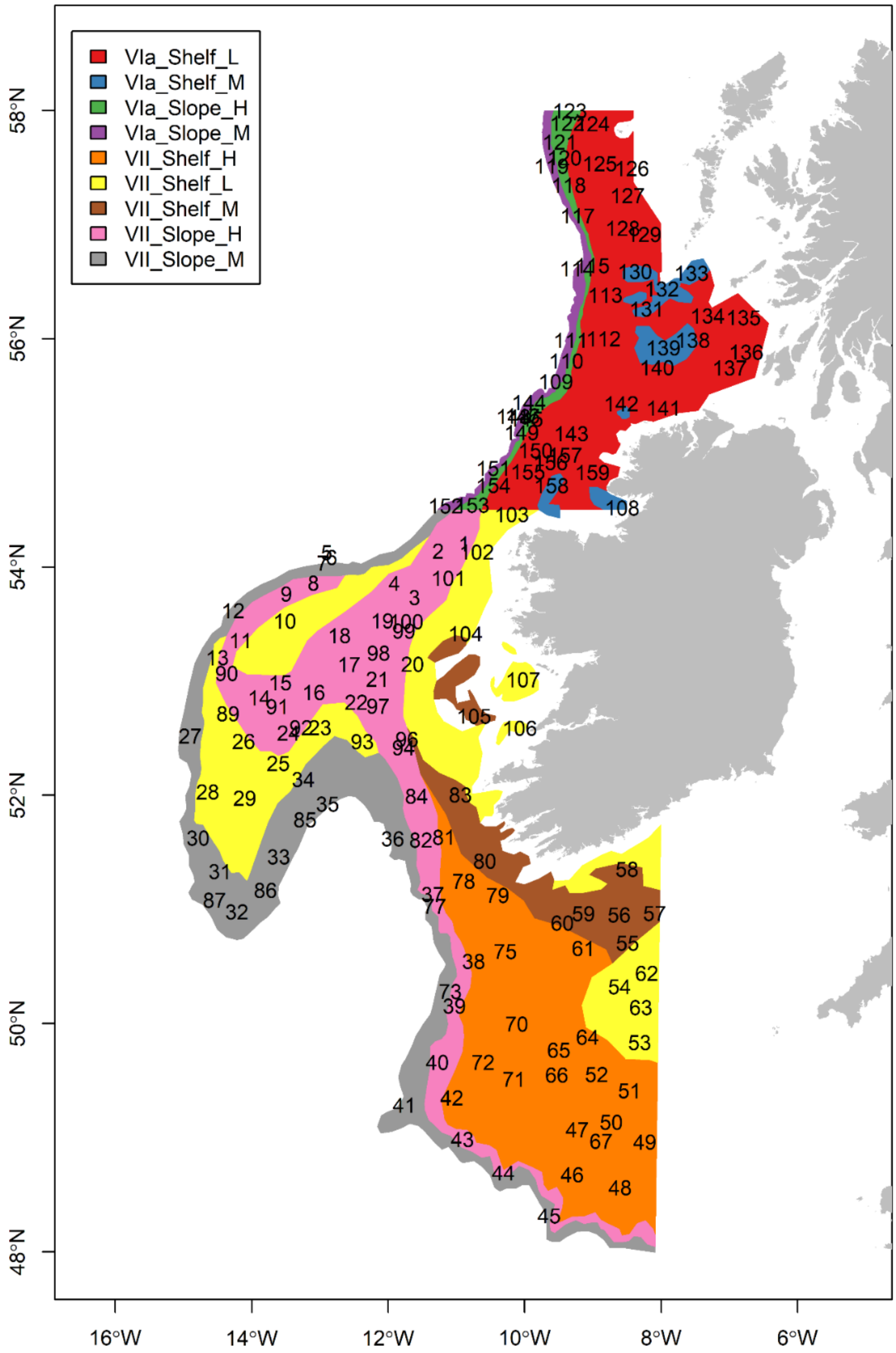


Figure A6.4. Map of valid survey stations completed during the Irish Anglerfish and Megrim Survey in 2023. The numbers refer to the haul number.

A6.5 Spanish Gulf of Cadiz groundfish survey (SP-GCGFS-Q1)

Nation:	**SP (Spain)**	Vessel:	**Miguel Oliver**
Survey:	SP-GCGFS-Q1 (ARSA 0323)	Dates:	1 to 17 March 2023
Cruise:	Spanish Gulf of Cadiz bottom trawl survey aims to collect data on the distribution and relative abundance, and biological information of commercial fish in the Gulf of Cadiz area (ICES Division 9.a). The primary species are hake, horse mackerel, wedge sole, sea breams, mackerel and Spanish mackerel. Data and abundance indices are also collected and estimated for other demersal fish species and invertebrates as rose and red shrimps, *Nephrops* and cephalopod molluscs.		
Survey Design:	The survey is random stratified with five depth strata (15–30 m, 31–100 m, 101–200 m, 201–500 m, 501–800 m). Stations are allocated at random according to the strata surface (Figure A6.5).		
Gear details:	Baca 44/60 with Thyborøn doors (350 Kg).		
Notes from survey (e.g. problems, additional work etc.):	Hydrographic data at each trawl station was collected using a net-mounted CTD. Additionally, 17 trawls with beam trawl were also carried out. Summary details are provided below for stations fished (Table A6.16), biological samples taken (Table A6.17) and preliminary data for selected species (Table A6.18).		
Number of fish species recorded and notes on any rare species or unusual catches:	Overall a total of 150 fish species, 46 crustaceans and 54 molluscs taxa were recorded.		

Table A6.16. Numbers of stations fished (aim: to complete 45 valid tows per year).

ICES Divisions	Strata	Gear	Stations					
			Planned	Valid	Additional	Invalid	% Fished	Comments
9.a	All	Baca 44/60	45	44	-	2	98%	

Table A6.17. Numbers of individuals biologically sampled (length, weight, sex, maturity, age) by species. Species denoted * recorded for maturity only, and ** for ageing.

Species	*Age*	*Species*	*Age*
*Merluccius merluccius***	*194*	*Sepia officinalis**	*150*
*Merluccius merluccius**	*981*	*Octopus vulgaris**	*67*
*Parapenaeus longirostris**	*2110*	*Loligo vulgaris**	*91*
*Nephrops norvegicus***	*153*	*Loligo forbesi**	*14*

Table A6.18. Biomass estimates for the main species in the 2023-Q1 Gulf of Cadiz bottom trawl survey, where y_i, year estimate (2023); y_{i-1}, previous year estimate (2022); $y_{(i,i-1)}$, Average of last two year estimates (2023 and 2022); $y_{(i-2,i-3,i-4)}$, Average of the previous three year estimates (2019, 2020 and 2021).

Biomass and number estimates								
			Biomass index			Number index		
Species	Strata	Valid tows	y_i kg/0.5h	y_i/y_{i-1} %	$y_{(i,i-1)}/y_{(i-2,i-3,i-4)}$ %	y_i n/0.5h	y_i/y_{i-1} %	$y_{(i,i-1)}/y_{(i-2,i-3,i-4)}$ %
Merluccius merluccius	All	46	2.43	11.2	-17.16	65.5	-52.7	73.5
Micromesistius poutassou	All	46	0.22	-92.8	-58.90	1.6	-97.7	-40.5
Nephrops norvegicus	All	46	0.14	168.7	-82.43	4.6	168.3	-87.5
Parapenaeus longirostriss	All	46	1.17	-39.8	13.38	234.8	-37.5	7.8
Octopus vulgaris	All	46	0.67	-46.0	5.59	0.7	-63.1	-14.0
Loligo vulgaris	All	46	0.68	183.7	-54.4	1.9	-21.8	-22.2
Sepia officinalis	All	46	2.43	11.2	-17.2	1.6	224.0	-61.6

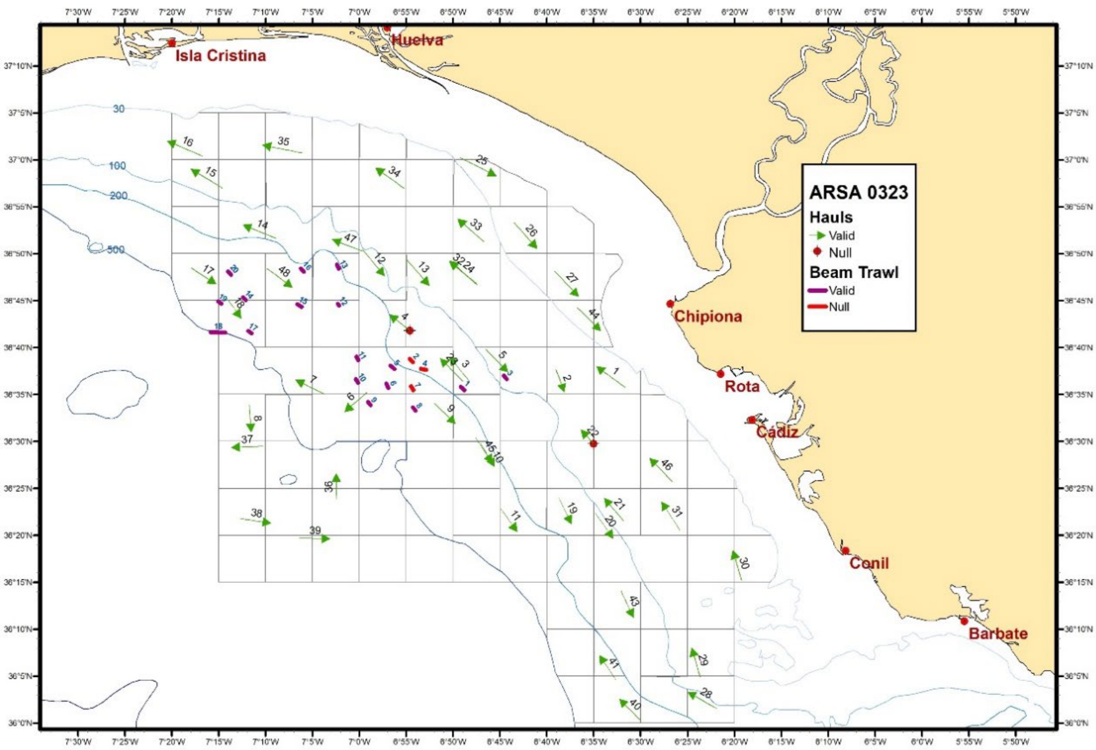


Figure A6.5 Trawl stations in Q1 Gulf of Cadiz 2023 survey.

A6.6 Scottish Rockall Survey (SCOROC-Q3)

<table>
<tr><td>Nation:</td><td>Scotland</td><td>Vessel:</td><td>Scotia</td></tr>
<tr><td>Survey:</td><td>1123S (Rockall Haddock)</td><td>Dates:</td><td>1 to 14 September 2023</td></tr>
<tr><td>Cruise:</td><td colspan="3">Q3 Rockall 2023 survey aims to:
Undertake the bottom trawl survey of haddock (Melanogrammus aeglefinus) and other species on the upper Rockall Bank within the 350 m isobaths.
Undertake vertical CTD deployments at selected trawl stations for collection of environmental data covering the overall survey area.
Collect additional biological data in line with the UK Work Plan, and by request.
Record marine litter at each trawl station in line with UK Marine Strategy.</td></tr>
<tr><td>Gear details:</td><td colspan="3">Strengthened GOV incorporating ground-gear D and 97 m sweeps was used at all stations. The following parameters were recorded during each tow using Scanmar hardware and vessel's own navigation system: headline height, wing spread, door spread, speed over the ground and distance covered. A bottom contact sensor was attached to the ground-gear and downloaded each tow to monitor contact with the seabed.</td></tr>
<tr><td>Notes from survey (e.g. problems, additional work etc.):</td><td colspan="3">The survey design since 2011 has been random-stratified with primary trawl locations randomly distributed within four sampling strata defined by depth contour: 0–150 m, 150–200 m, 200–250 m, 250–350 m. The survey area excludes three protected areas, the boundaries of which lie mainly or partly within the 350 m isobath: two Special Areas of Conservation at the northeast and northwest of the bank and a NEAFC closure to the southwest. Trawls were undertaken within a radius of 5 nm to the specified sampling position and as near to the actual point as was practicable. If for any reason the trawl could not be undertaken at the primary site then a replacement was taken from a list of secondary random positions. There were 46 valid and one invalid trawls (Table A6.19) completed within the survey area with all fishing taking place during daylight hours. One additional station (289) was undertaken outside the survey boundary as part of efforts to monitor apparent periodic expansion of the haddock stock into deeper waters. All the following data refers to trawls undertaken inside the survey boundary only except where noted. Figure A6.6 displays sampling strata, trawl locations and 1123S haul numbers (261–306). The survey went as planned with no damage to gear and few instances of incompatible sea conditions hindering the cruise.

Catches overall were very large with 54.382 tonnes being recorded for a combined trawl time of 22.55 hours. Catches ranged from 0.22 to 2.6 tonnes but averaged over 1.15 tonnes. All 46 hauls inside the survey boundaries contained haddock (at a mean of 0.71 tonnes per haul).

Biological sampling: Ages were recorded for haddock, whiting (Merlangius merlangus), cod (Gadus morhua) and mackerel (Scomber scombrus) along with sex, and weight data (Table A6.20), and catch information summarised in Table A6.21. All otoliths were aged post-cruise back at the laboratory. Data on other species sampled for biological information are summarised in Table A6.22.

Hydrography: Hydrography data (CTD deployments) were collected from a subset (27) of trawl stations to provide representative coverage of the survey area. These covered water column depths ranging from 134 m to 334 m.

Marine Litter: All litter picked up in the trawl was classified, quantified and recorded then retained for appropriate disposal ashore. Litter data will be put on the MD database and subsequently uploaded to DATRAS.

Non-indigenous Species</td></tr>
</table>

	All catch, fish and benthos were screened as far as possible for the presence of non-indigenous species, with none evident. Additional samples and miscellaneous requests • Cod: as commercial catches of cod is on the increase at Rockall (personal communication from commercial sector) after many years of low catches, a section of muscle tissue was collected from each cod otolithed and frozen for (initially) potential genetic analysis at marine lab; however these will now contribute to an analysis of the population structure of Northern Shelf cod following the 2023 benchmark. • All shelled molluscs were retained frozen for identification and studies on distribution by D. Mackay.
No. fish species recorded and notes on any rare species or unusual catches:	All 46 valid hauls within the survey area contained haddock. As in 2022, indices for age 0 haddock remain at a low level in comparison to the 13-year average (Figure A6.7): however, this year represents a moderate improvement on last year. Haddock recruitment was observed mainly in the northern half of the survey area. As anticipated, the low indices of age 1 haddock reflect the very low numbers of age 0 haddock recorded in 2022, and the index for age 2 haddock (Figure A6.7 and Table A6.20) remains very high following the spectacular year class of 1-year olds likewise recorded last year. Haddock ages 1–3 years were observed to be somewhat uniformly spread out over upper Rockall bank whereas age classes 4+ years tended to be densest around the RHB and further to the south. Cod (*Gadus morhua*) were still encountered in very low numbers with 25 being caught for a total weight of 115.7 kg, with an age range covering 1–5 years. These tended to be encountered on the northern and western sections of the survey area between Rockall Islet and the NWRB SAC. There were small amounts of whiting (*Merlangius merlangus*, 27 individuals, 11.9 kg) with an age range of 0–3 years, the largest proportion of which was encountered in the shallowest stratum in stations 264 and 268. As in 2022 large hake (*Merluccius merluccius*) were encountered, this time a single individual of 118 cm (12.7 kg) recorded from station 279 in the RHB. This species has been very rarely encountered at Rockall by scientific survey (2012-present) though small landings of similarly large hake have apparently been made commercially in recent years, typically from the northern area of the bank. CPUE by age cohort of major commercial species are summarised in Table A6.20. It should be noted that age data for Atlantic mackerel (*Scomber scombrus*) were not available at the time of writing and this species is excluded from the Table; 1123S data for this species will be available from ICES/DATRAS web portal in due course. Of additional interest, a relatively undamaged specimen of the so-named seven-arm octopus *Haliphron atlanticus* was recorded from station 284. One of the two largest known octopus worldwide, this one was an ovigerous female and molecular-grade samples of both muscle tissue and eggs were retained. Other catches of interest include the Atlantic pomfret or Ray's bream (*Brama brama*), a single individual of which was recorded at station 287, and the large pennatulacean *Ptilella greyi* from station 292. Currently this species is known only from the Rockall Bank.

Table A6.19. Number of stations surveyed by gear.

ICES Division	Strata	Gear	Hauls Planned	Valid	Additional	Invalid	% Achieved	Comments
6.b	All	GOV-D	40	46	1*	1	115	*outside survey area

Table A6.20. Rounded CPUE indices (all survey strata / 10 hours fishing) by age for Rockall haddock, whiting and cod in 2023. Note: mackerel data were not available at time of writing.

Age	Haddock No/10 hr	Whiting No/10 hr	Cod No/10 hr
0	3278	0.6	0
1	446	1.7	0.3
2	56560	5.2	6.1
3	2365	0.3	2.2
4	184	0	0
5	246	0	0.3
6	235	0	0
7	305	0	0
8	54.9	0	0
9	3.3	0	0
10	4.5	0	0
11	2.3	0	0

Table A6.21. Rounded CPUE data (all survey strata / 1 hour fishing) for the most abundant fish species caught during 1123S.

Species	kg/hr	no/hr
Melanogrammus aeglefinus	1437	6588
Sebastes viviparus	454	7225
Helicolenus dactylopterus	149	1960
Micromesistius poutassou	147	2041
Scomber scombrus	63.4	117
Argentina sphyraena	29.4	420
Dipturus batis	22.8	3.7
Lophius piscatorius	20.7	5.3
Gadiculus argenteus	18.6	790
Lepidorhombus whiffiagonis	9.4	42.9
Eutrigla gurnardus	8.0	28.1
Chimaera monstrosa	7.6	4.6
Molva molva	6.0	0.8
Gadus morhua	5.1	1.1

Table A6.22. Numbers of biological observations per species collected during 1123S. Data recorded: individual length/whole weight/sex/eviscerated weight/age except * where eviscerated weight and age data was not collected, and † where age data was not collected.

Species	Number	Species	Number
Gadus morhua	25	*Merluccius merluccius†*	1
Melanogrammus aeglefinus	1898	*Dipturus batis**	84
Merlangius merlangus	27	*Dipturus oxyrinchus**	13
Lophius piscatorius†	122	*Leucoraja fullonica**	17
Lophius budegassa†	2	*Raja clavata**	40
Scomber scombrus	12		

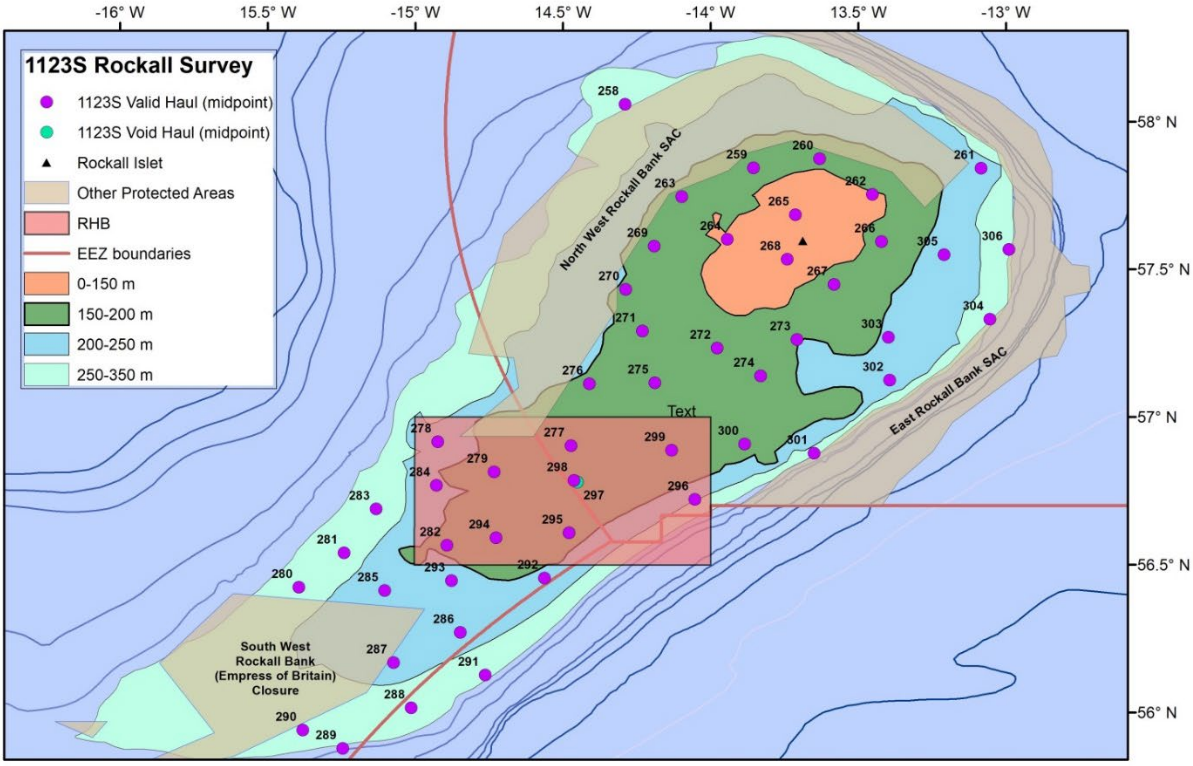


Figure A6.6. Survey strata, bathymetry, protected areas (including the Rockall Haddock Box) and trawl positions (approximate midpoints) along with associated station numbers completed at Rockall during 1123S. Note void haul 297 is almost obscured by haul 298.

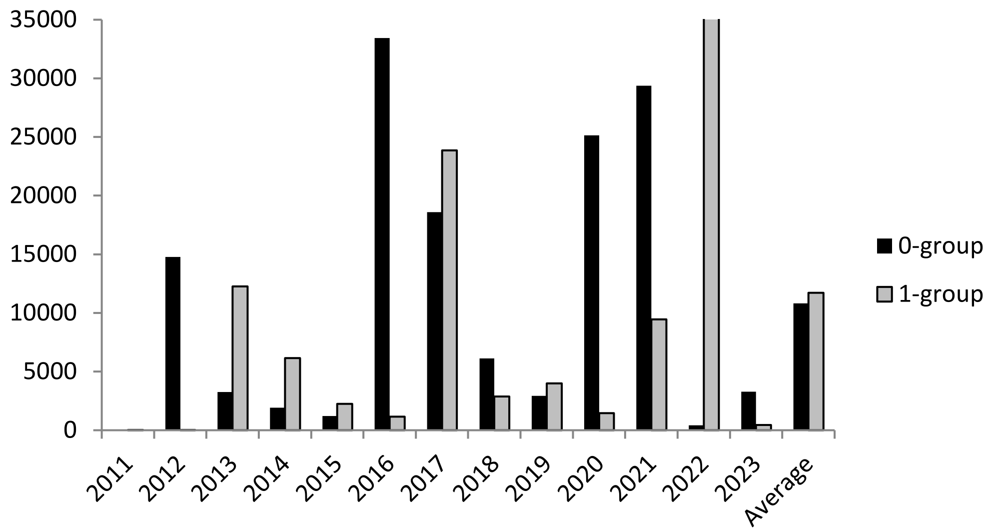


Figure A6.7. Indices (no. per 10 hours fishing) of 0 and 1-group haddock at Rockall in 2023 shown relative to the previous years and the average since 2011 (beginning of new survey design).

A6.7 Spanish Porcupine bottom trawl survey (SP-PORC-Q3)

Nation:	SP (Spain)	**Vessel:**	Vizconde de Eza
Survey:	SP-PORC-Q3 (Porcupine 2023)	**Dates:**	8 September to 14 October 2023
Cruise:	Spanish Porcupine bottom trawl survey aims to collect data on the distribution and relative abundance, and biological information of commercial fish in Porcupine bank area (ICES Divisions 7.b–k). The primary target species are hake, monkfish, white anglerfish and megrim, which abundance indices are estimated by age, with abundance indices also estimated for *Nephrops*, four-spot megrim and blue whiting. Data collection is also carried out for several other demersal fish species and invertebrates.		
Survey design:	The survey is random stratified with two geographical strata (northern and southern) and three depth strata (170–300 m, 301–450 m, 451–800 m). Stations are allocated at random according to the strata surface. The 2023 sampling stations are shown in Figure A6.8.		
Gear details:	Porcupine Baca 39/52 with Polyvalent doors.		
Notes from survey (e.g. problems, additional work etc.):	Weather conditions were poor on the second leg of the survey. This year the reduction in tow duration implemented in 2016 to 20 min. from 30 min. after ground contact has been maintained. Additional work undertaken included four additional deep tows (> 800 m) on the east margin of the study area and 99 CTD casts, at most trawl stations, three within the non-trawlable area, and six in radials perpendicular to the bank limits. Summary details are provided below for stations fished (Table A6.23), biological samples taken (Table A6.24) and preliminary data for selected species (Table A6.25).		
Number of fish species recorded and notes on any rare species or unusual catches:	Overall a total of 148 fish species, 50 crustacean taxa including 45 species, 43 mollusc taxa including 42 species, 51 echinoderm taxa including 49 species and 48 taxa of other invertebrates including 43 species were identified.		

Table A6.23. Numbers of stations fished (aim: to complete 80 valid tows per year).

ICES Divisions	Strata	Gear	Stations					
			Planned	Valid	Additional	Invalid	% Fished	Comments
7.b,c,k	All	Porcupine Baca	80	80	8	9	110%	

Table A6.24. Numbers of individuals biologically sampled (length, weight, sex, maturity, age) by species. Species denoted * recorded for maturity only.

Species	No.	Species	No.
Merluccius merluccius	451	*Molva molva*	3
Lepidorhombus whiffiagonis	573	*Conger conger*	47
Lepidorhombus boscii	281	*Helicolenus dactylopterus*	156
Lophius budegassa	106	*Phycis blennoides*	230
Lophius piscatorius	143	*Nephrops norvegicus**	610

Table A6.25. Biomass estimates for the main species in the Porcupine bottom trawl survey, where y_i, year estimate (2023); y_{i-1}, previous year estimate (2022); $y_{(i,i-1)}$, Average of last two year estimates (2023 and 2022); $y_{(i-2,i-3,i-4)}$, Average of the previous three year estimates (2021, 2020 and 2019).

			Biomass index			Number index		
Species	Strata	Valid tows	y_i kg/0.5h	y_i/y_{i-1} % change	$y_{(i,i-1)}/y_{(i-2,i-3,i-4)}$ % change	y_i n/0.5h	y_i/y_{i-1} % change	$y_{(i,i-1)}/y_{(i-2,i-3,i-4)}$ % change
Merluccius merluccius	All	80	15.20	–23.0	–39.6	13.3	–21.0	–54.4
Lepidorhombus whiffiagonis	All	80	8.59	–36.4	–25.7	144.6	–16.8	–23.5
Lepidorhombus boscii	All	80	9.46	–21.2	–14.3	105.1	–19.3	–9.2
Lophius budegassa	All	80	2.53	39.8	111.4	2.5	6.4	224.9
Lophius piscatorius	All	80	13.90	–37.4	20.4	3.9	–28.4	24.3
Micromesistius poutassou	All	80	1033.40	9.7	42.6	12286.7	–10.6	46.8
Nephrops norvegicus	All	80	1.64	–8.9	23.4	72.9	–1.7	60.6

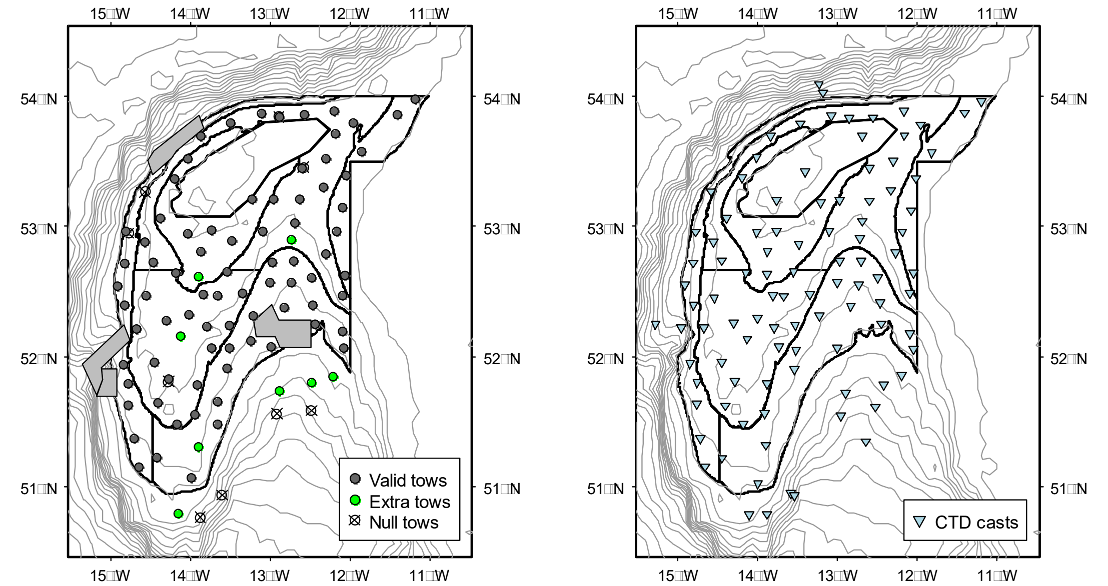


Figure A6.8. Spanish Porcupine Bank survey showing the distribution of trawl stations (left) and CTD stations (right) sampled during the 2023 survey.

A6.8 Scottish West Coast Groundfish Survey (SCOWCGFS-Q4)

Nation:	Scotland	**Vessel:**	Scotia
Survey:	1523S (SCOWCGFS-Q4)	**Dates:**	11 November to 4 December 2023
Cruise:	Q1 West Coast Scotland survey aims to: • To complete a demersal trawl survey (SCOWCGFS-Q4) of the grounds off the north and west of Scotland and Ireland in ICES Divisions 6.a and 7.b. • To obtain temperature and salinity data from the water column at each trawling station using a RBR Concerto CTD. • To collect additional biological data in connection with the Data Collection Framework (DCF) and UK Work Plan. • To collect and quantify all marine litter encountered on the survey for MSFD responsibilities. • To identify and quantify the presence of non-indigenous species observed. • To identify and quantify all gelatinous zooplankton caught during trawling. • To collect and retain marine molluscs and gastropod shells for distribution mapping. • Retrieval and re-deployment of up to nine SPAN moorings located at discrete sites within the survey area. • To collect genetic samples from Hake, Anglerfish, Anchovy and Pilchard to investigate population structure of these species within the Northeast Atlantic – GECKA/GIFAMAN project. • To collect genetic samples from all Cod sampled biologically to further studies on stock identification. •		
Gear details:	GOV incorporating groundgear D was used at all stations and was deployed on 63 occasions (Table A6.26). Sweeps were 97 m in all cases where the mean depth was >80 m (n = 47), otherwise 47 m sweeps were used (n = 16). The following parameters were recorded during each haul using SCANMAR: headline height, wing spread, door spread and distance covered. A bottom contact sensor was attached to the groundgear and downloaded following each haul.		
Notes from survey (e.g. problems, additional work etc.):	**Demersal Survey** The 2023 survey utilised the random-stratified survey design which randomly allocates 60 primary trawl locations distributed within 12 predefined sampling strata that cover ICES Divisions 6.a and 7.b. Trawls were undertaken on suitable ground as near to the specified sampling position as was practicable and within a radius of not more than 5 nm from the random trawl position. If the trawl was unable to be undertaken within 5 nm of any primary station, then the nearest appropriate secondary station located within the same stratum was used. All the trawl stations were conducted out with marine protected areas (MPA's) or special areas of conservation (SAC) containing management measures that restrict the use of mobile fishing gears. The locations used for the trawl stations were a combination of established trawl locations as well as completely new locations. The SCANMAR system was used to monitor headline height, wingspread, door-spread, and distance covered during each trawl. The SCANMAR Trawleye was used to monitor bottom type and fish density entering the net. A bottom contact sensor was attached to the ground gear for each trawl to monitor ground contact as well as to validate touchdown and lift-off of the		

	ground gear. The EDC system was used to collect all catch data, with data being downloaded and screened for errors following every successful haul. All trawls were undertaken during the daylight period. Trawl duration was typically 30 min., however various factors (large fish marks of shoaling species such as herring and boarfish, hard/rocky/muddy terrain with net coming fast, close proximity to static gear) resulted in lesser durations for seven valid stations (372, 381, 386, 389, 403, 410, 423). No stations were of a duration shorter than 15 min., thus complying with recommendations pertaining to minimum haul duration referenced in the 2009 IBTSWG report. The CTD (RBR Concerto) was deployed at 51 out of the 59 valid trawling stations to obtain a temperature and salinity profile at each station. Due to time lost during the survey, hauls 386, 390, 394, 395, 409, 412, 413 and 428 had no associated hydrography data to provide a time saving that enabled another daylight trawl to be completed during the very short daylight window that exists at this time of year. The SPAN acoustic mooring deployment and retrieval objective was largely successful. Six out of the eight attempted retrievals were successful with the Kilbrannan Sound mooring likely towed away and the Barra mooring failing to release from the seafloor after successful initial communications. The additional objective of recovering the SAMS acoustic mooring was unsuccessful, with the mooring failing to release as with the Barra mooring. Eight moorings were deployed successfully. The Orkney West recovery was cancelled due to issues with the bow thruster. All eight planned mooring deployments were carried out successfully. All of the otoliths were aged back at the institute. All litter picked up in the trawl was classified, quantified and recorded then retained for appropriate disposal ashore. Miscellaneous sampling: • Gelatinous zooplankton: All trawl caught gelatinous zooplankton were identified to species (where possible), weighed and quantified. • Molluscs: Gastropods and other molluscs observed during the survey were retained for identification ashore for population mapping. • Non-indigenous Species: All catch, fish and benthos, were screened for the presence of 'Non-Indigenous Species' with none encountered. • Species/Genetics Collection: Genetic samples were collected from Hake, Anglerfish and Anchovy to investigate population structure of these species within the Northeast Atlantic – GECKA/GIFAMAN project. No pilchards were observed. Genetic samples were collected from all cod sampled for biological data to further studies on stock identification.
No. fish species recorded and notes on any rare species or unusual catches:	A total of 97 species were observed for an overall catch weight of 28,289 kg (excluding the basking shark), a significant decrease in catch weight compared to the previous year (40,410.7 kg). The catch per unit effort saw an average of 302.3 kg of haddock per hour with the next significant species, spurdog, being 151 kg/h. Horse mackerel (108 Kg/h) were the next most abundant species followed by whiting (96.2 kg/h), mackerel 95.8 kg/h) and boarfish (59.6 kg/h). Initial observations of the catch data show CPUE (kg/h) decreases compared to 2022 of many major species including haddock (20.5%), whiting (11.9%), horse mackerel (30%) however a major increase in spurdog (49.5%). Major catch components (tonnes) included: haddock (8.5), spurdog (4.2), horse

	mackerel (3.0), whiting (2.7), mackerel (2.7), boarfish (1.7) and Norway pout (0.75). The catch per unit effort (CPUE) for major species is detailed in Table A6.27. The CPUE indices (numbers caught per hour fishing) for 1-group gadoids (cod, haddock, whiting, saithe and Norway pout) weights the indices for each of the 11 relevant Division 6.a sampling strata by the surface area of said strata. These are then pooled to produce the abundance index for the survey. Results for all age classes of the major commercial gadoid species are shown in Table A6.28 while those of 1-groups only for period 2015–2023 are shown in Table A6.29 together with percentage change between indices estimates from previous year as well as 10-year average for reference. CPUE, in terms of biomass, is shown in Table A6.30. The outlook regarding the 1-group abundance estimates for target gadoid species are altogether fairly underwhelming with cod and Norway pout in particular reporting a significant decrease of 52% and 88% in 1-group abundance consecutively, that is also well below the 10-year average estimate (–80.8% & –81.4% consecutively). Haddock 1-group abundance decreased by a lesser amount, 9.8%, a decrease of 45.6% compared to the 10-year average estimate. Whiting 1-group abundance increased by 12% compared to 2022 and crucially this has increased above the 10-year average by 3.3%. Saithe as per last year continue to be effectively absent for all cohorts. See Table A6.28 for 1-group CPUE indices of target species. A summary of the biological sampling undertaken is given in Table A6.31. Notable catches include a basking shark on haul 412, station 27 that was caught as the trawl was being retrieved and successfully released alive. The weight and length were not recorded for safety and to ensure release whilst still alive. Anchovies were encountered regularly during the survey, likely due to the warmer sea temperatures earlier in the year

Table A6.26. Number of stations surveyed/gear during survey 1523S.

ICES Division	Strata	Gear	Hauls					
			Planned	Valid	Additional	Invalid	% Achieved	Comments
6.a	All	GOV-D	56	56	0	4	100	
7.b	Grey	GOV-D	4	3	0	0	75	

Table A6.27. Overall CPUE of major components of combined catch Q4 2023.

Species	CPUE no./h	CPUE kg/h
Haddock (*Melanogrammus aeglefinus*)	1102.8	302.3
Spurdog (*Squalus acanthias*)	193.2	151
Horse mackerel (*Trachurus trachurus*)	552.6	108
Whiting (*Merlangius merlangus*)	1343.3	96.2
Mackerel (*Scomber scombrus*)	1361.4	95.8
Boarfish (*Capros aper*)	1530.4	59.6
Lesser-spotted dogfish (*Scyliorhinus canicula*)	84.9	36.8
Norway pout (*Trisopterus esmarkii*)	1887.1	26.8
Lesser argentine (*Argentina sphyraena*)	181.5	11.3
Blue-mouth redfish (*Helicolenus dactylopterus*)	127.2	10.9
Blue whiting (*Micromesistius poutassou*)	233.8	10.1
Cod (*Gadus morhua*)	2.7	8.7
Long-finned squid (*Loligo forbesii*)	109.7	8.5
Grey gurnard (*Eutrigla gurnardus*)	83.6	7.4
Flapper skate (*Dipturus intermedius*)	2.5	7.3
Hake (*Merluccius merluccius*)	36	7
Herring (*Clupea harengus*)	320.6	6.5
Sprat (*Sprattus sprattus*)	623.2	6.2
Poor cod (*Trisopterus minutus*)	310.3	5.7
Thornback ray (*Raja clavata*)	5	5.6

Table A6.28. CPUE indices (no./hr) by year class of major demersal species Q4 2023

Age	Cod	Haddock	Whiting	Saithe	Norway Pout
0	0.04	72.46	615.94	0	1716.46
1	0.24	147.12	177.49	0	114.91
2	0.67	173.76	54.48	0.29	109.08
3	0.38	291.73	48.18	0.07	30.12
4	0.62	351.85	33.43	0	0.04
5	0.33	101.23	3.64	0	0
6	0.03	6.03	0.94	0	0
7	0	2.16	0.09	0	0
8	0	1.22	0.03	0	0
9	0	0.24	0	0	0
10	0	0.06	0	0	0
11	0	0.03	0	0	0
12	0	0	0	0	0

Table A6.29. CPUE indices (no./hr fishing) for Q4 WCIBTS 1-groups of major demersal species since 2015

Species	2015	2016	2017	2018	2019	2020	2021	2022	2023	% change from 2022	10 Yr Av.
Cod	2.8	0.6	1	0.5	1.8	1.6	0.9	0.5	0.24	–52	1.25
Haddock	995.6	93.6	168.8	98.9	627.5	290.3	314.6	163.2	147.1	–9.87	270.4
Whiting	279.4	241.5	294.3	50.25	195.5	239.2	91.1	158	177.5	12.34	171.9
Saithe	0.5	0.06	0	0.04	0.08	0	0	0.03	0	–100	0.072
N. Pout	1481	1227	48.7	96.8	1797	296.9	359.7	964.2	114.9	–88.08	617.1

Table A6.30. CPUE indices (kg/hr fishing) of major Q4 WCIBTS demersal species since 2015

Species	2015	2016	2017	2018	2019	2020	2021	2022	2023	% change from 2022	10 Yr Av.
Cod	**72.5**	**44.1**	**190.5**	**20.4**	**4.5**	**9.7**	**17.5**	**8.6**	**8.7**	**1.16**	**39.74**
Haddock	**169.2**	**191**	**324.6**	**206**	**189**	**1036.5**	**540.6**	**380**	**302.3**	**–20.45**	**355.95**
Whiting	**58.7**	**96.9**	**109.7**	**100**	**56**	**70.6**	**123.9**	**109.9**	**96.2**	**–12.47**	**91.11**
Saithe	**24.0**	**17.1**	**16.2**	**42.5**	**2.18**	**0.6**	**0.3**	**0.7**	**0.3**	**–57.14**	**11.81**
N. Pout	**65.4**	**73.9**	**126.8**	**44.1**	**58.6**	**28**	**59.1**	**67.6**	**26.8**	**–60.36**	**65.4**

Table A6.31. Numbers of biological observations per species collected during 1523S; length, weight, sex & age (* length, weight, sex, maturity and age; ** length, weight and age, * length, weight, sex and maturity (males only); **** length, weight and sex, ***** length, weight, sex and genetic sampled; ****** length, weight, sex, age and genetic sampled.**

Species	No.	Species	No.
Haddock (*Melanogrammus aeglefinus*)	1498	Black-mouthed dogfish (*Galeus melastomus*)***	42
Whiting (*Merlangius merlangus*)	1176	Cuckoo ray (*Leucoraja naevus*)***	39
Spurdog (*Squalus acanthias*)***	553	Witch (*Glyptocephalus cynoglossus*)	33
Lesser-spotted dogfish (*Scyliorhinus canicula*)***	402	Black-bellied angler (*Lophius budegassa*)*****	30
Norway pout (*Trisopterus esmarkii*)	381	Angler (*Lophius piscatorius*)*****	26
Mackerel (*Scomber scombrus*)*	234	Anchovy (*Engraulis encrasicolus*) *****	24
Herring (*Clupea harengus*)*	221	Starry smooth-hound (*Mustelus asterias*) ***	23
Hake (*Merluccius merluccius*)*****	197	Brill (*Scophthalmus rhombus*)****	11
Spotted ray (*Raja montagui*)***	186	Saithe (*Pollachius virens*)	9
Sprat (*Sprattus sprattus*)**	131	Blue skate (*Dipturus batis*) ***	8
Thornback ray (*Raja clavata*)***	103	Tope (*Galeorhinus galeus*)***	6
Plaice (*Pleuronectes platessa*)	84	Turbot (*Scophthalmus maxima*)****	4
Cod (*Gadus morhua*) ******	77	Small-eyed ray (*Raja microocellata*) ***	3
Flapper skate (*Dipturus intermedius*)***	63	Blonde ray (*Raja brachyura*)***	2

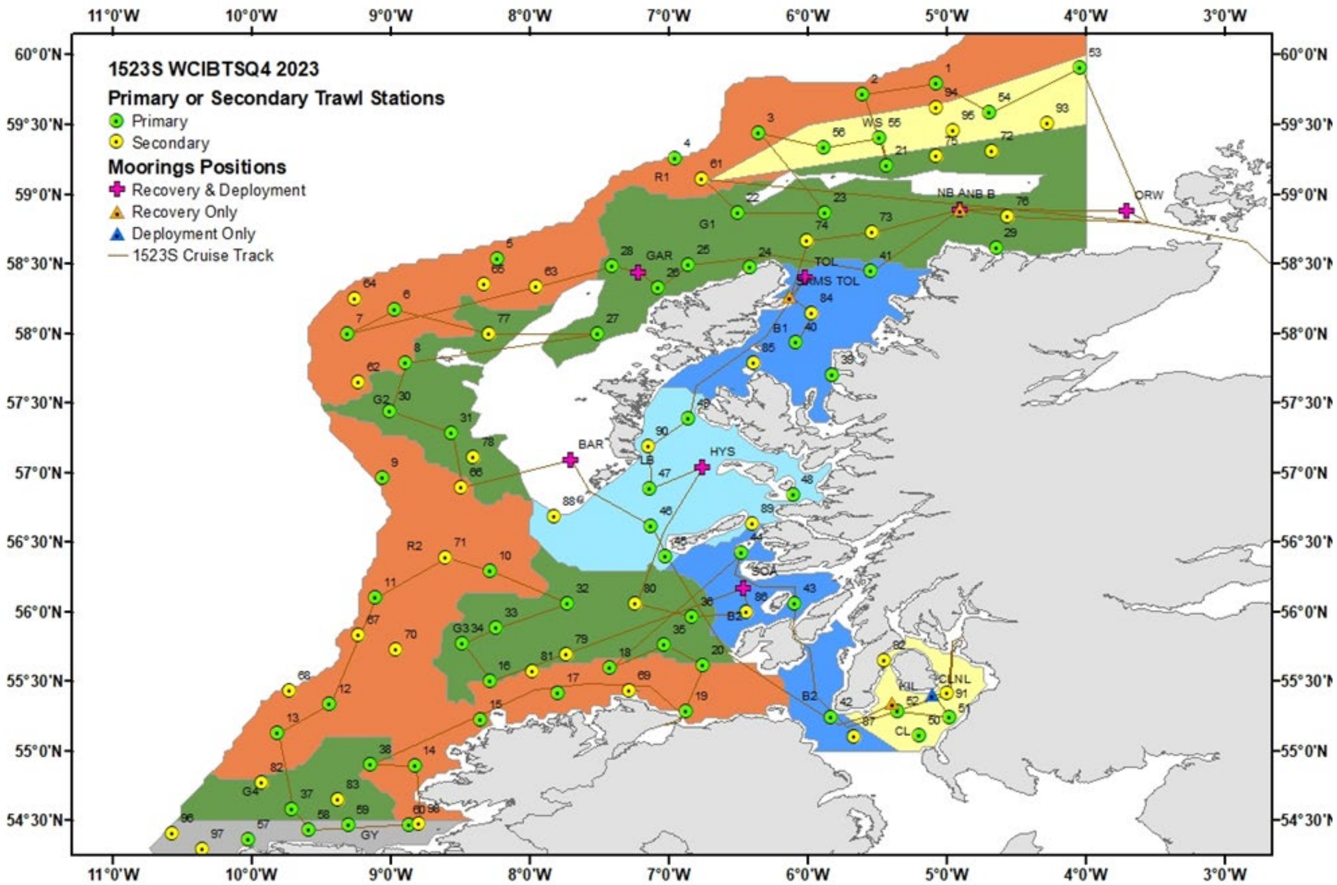


Figure A6.9. 1523S survey chart illustrating survey strata (coloured polygons, primary and secondary trawl stations, SPAN acoustic moorings and cruise track for the survey.

A6.9 Northern Irish groundfish survey (Q4)

Nation	UK (Northern Ireland)	**Vessel:**	Corystes
Survey:	Groundfish Survey CO-4123	**Dates:**	3 October to 11 October 2023
Cruise:	• To obtain information on spatial patterns of abundance of different size- and age classes of demersal fish in the Irish Sea. • To obtain abundance indices of cod, whiting, haddock and herring for use at ICES Working Groups. • To quantify external parasite loads in whiting and cod by area. • To collect additional biological information on species as required under DCF. • To collect information on the extent of marine littering in the Irish Sea. • Collect 15 fish samples for reverse ring test organized by Thomson Unicomarine Ltd, recording species, length and station. • To collect stomachs and fish samples from target species list for analysis of food webs.		
Gear details:	A commercial Rockhopper trawl fitted with a 20 mm liner in the cod-end was towed over 3 nm or 1 nm in the Irish Sea and St George's Channel. Gear and towing procedures were those employed on all previous AFBI groundfish surveys.		
Notes from survey (e.g. problems, additional work etc.):	A stratified survey with fixed station positions was employed (Figure A6.10). The survey was divided into strata defined by length and substratum. The species composition of the catch at each station was determined, and length frequencies were recorded for each species. All cod, majority of hake and sub-samples of haddock and whiting were taken for recording length, weight, sex and maturity stages and for the removal of otoliths for ageing. The level of infestation of whiting and cod by external parasites was estimated from biological samples collected at each station. Due to a missing ballast water treatment system the "Corystes" was not prevented entry into the ROI waters. For all hauls fishing was carried out during daylight commencing each day at first light. 38 valid hauls were completed, one haul was repeated (Table A6.32). All tows were 20 min. The width of seabed swept by the trawl doors increased from around 31 m in shallow water (30 m sounding) to around 48 m in deeper water (80 m sounding), with variations due to tidal flow. The average headline height was 2.5–3.1 m. Trawl parameters were consistent with previous surveys. Cod and whiting taken for biological analysis were screened for external parasites. Trawl data and length frequencies were archived using the newly developed groundfish survey database. Preliminary indices of abundance for 0-group and 1-group cod, whiting and haddock were obtained from the length distributions. More accurate indices will be available once the otoliths collected during the cruise have been aged. Additional sampling: All litter picked up in the trawl was classified, quantified and recorded and uploaded to the national MSS litter database from where it will eventually be uploaded to DATRAS. The litter was retained onboard for appropriate disposal ashore. Sampling for sprat genetics was carried out. Additionally acoustic sampling for herring was carried out due to "spare time".		
Number of fish species recorded and notes on any rare species or	A total of 110 species were recorded during the survey of which 65 were measured for length frequencies. Biological data was recorded for a number of species in accordance with the requirements of the EU Data Regulations. A total of 1,489 biological samples were taken during the survey (Table A6.33).		

unusual catches	

Table A6.32. Number of stations fished.

ICES Division	Strata	Gear	Hauls					
			Planned	Valid	Additional	Invalid	% Achieved	Comments
7.a	All	Rock-hopper	62	38	0	0	61	

Table A6.33. Biological sampling. Data is weight/length/sex/maturity/age except * where age data was not collected, ** where no maturity data collected, ***weight/length/sex.

Species	No.	Species	No.
Gadus morhua	2	*Scophthalmus maximus*	0
Merlangius merlangus	668	*Raja brachyura*	4***
Melanogrammus aeglefinus	347	*Raja clavata*	121***
Merluccius merluccius	32	*Raja montagui*	15***
Pollachius pollachius	0	*Leucoraja naevus*	10***
Molva molva	0	*Squalus acanthias*	0***
Zeus faber	0		
Scophthalmus rhombus	0		
Pleuronectes platessa	290		

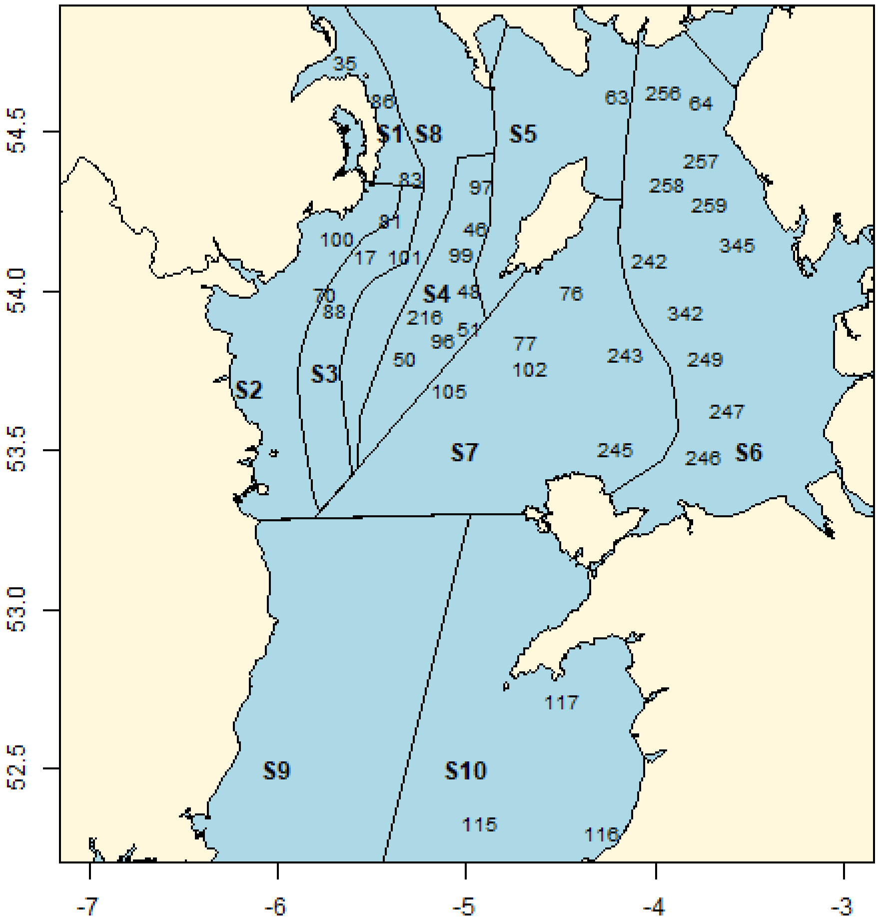


Figure A6.10. Map of the NI groundfish survey stations completed during CO4123.

A6.10 Irish Groundfish Survey (IGFS)

Nation:	Ireland	**Vessel:**	Celtic Explorer
Survey:	IE-IGFS	**Dates:**	1 November to 15 December 2023
Cruise	The Q4 Irish Groundfish Survey (IGFS) collects data on the distribution, relative abundance and biological parameters of commercially exploited demersal species in Divisions 6.a (south), 7.b and 7.g,j (north). The indicess currently utilised by assessment WG's are for haddock, whiting, plaice, cod, hake and sole. Survey data are also provided for white and black anglerfish, megrim, pollack, ling, blue whiting and a number of elasmobranchs as well as several pelagic species (herring, horse mackerel and mackerel).		
Gear details:	Two gear survey since 2004, using GOV ground gear "A" for 7.b, 7.g and 7.j, and a 16" hopper gear (ground gear "D") for 6.a.		
Notes from survey (e.g. problems, additional work etc.):	Three days lost to bad weather during 2023 and about a day in total with various larger net repairs. No mechanical or other technical problems. More time is being required in planning to re-allocate randomly selected stations to avoid marine cables, MPAs, SACs, OREs etc. Likewise processing times for Diplomatic Clearance applications to the UK have increased significantly post Brexit. Summary details are provided below for stations fished (Table A6.34), biological samples taken (Table A6.35) and preliminary data for selected species (Table A6.36). The survey area is shown in Figure A6.11.		
Number of fish species recorded and notes on any rare species or unusual catches:	In 2023, 89 species of fish, 22 elasmobranchs, 11 cephalopods, 68 crabs and shrimp (Malacostraca) and 121 other species/taxa were caught. Between 2022 and 2023 only herring seem to show a significant improvement in biomass (875.6%) and only for the northwest area (ICES Division 6.a). In 2023, for the first time in the survey, no cod were caught in Division 6.a. There has also been ca. 50% reduction survey trend for cod biomass and numbers in Divisions 7.b–c, e–k for the recent five years. Over the recent five years some positive trends can be seen for pelagic stocks in Division 6.a, although that is not the case in Subarea 7. Unfortunately the pattern for virtually all other species continues to be poor to negative.		

Table A6.34. Stations fished (aim to complete 171 valid tows per year).

ICES Divisions	Strata	Gear	Tows planned	Valid	Additional	Invalid	% stations fished	comments
6.a	All	D	45	39	0	2	91	
7.b–c	All	A	38	37	0	0	97	
7.g	All	A	48	45	0	0	93	
7.j	All	A	40	37	0	0	92	
TOTAL			171	158	0	2	93	

Table A6.35. Biological samples (length, weight, sex, maturity and age material); maturty* (length, weight, sex and maturity); length weight only (length and weight).**

Species	No.	Species	No.
Clupea harengus	122	*Micromesistius poutassou*	899
Dicentrarchus labrax	7	*Microstomus kitt*	1009
Gadus morhua	25	*Molva molva*	36
*Glyptocephalus cynoglossus***	344	*Pleuronectes platessa*	973
Lepidorhombus whiffiagonis	1951	*Pollachius pollachius***	15
Lophius budegassa	369	*Pollachius virens*	6
Lophius piscatorius	431	*Scomber scombrus*	368
Melanogrammus aeglefinus	1183	*Solea solea*	231
Merlangius merlangus	1183	*Trachurus trachurus*	1279
Merluccius merluccius	1235		

Table A6.36. Abundance (numbers) and biomass of the main species sampled during 2023 IGFS compared with previous years. Year estimate 2023 (y_i); previous year estimate 2022 (y_{i-1}); average of last two years estimate ($y_{(i,i-1)}$); average of the previous three-year estimates 2019–2021 ($y_{(i-2,i-3,i-4)}$). As results for survey trends are ratios, they are quite sensitive to stocks with high variance, therefore comparing the 2 yr vs. 5 yr trend is advisable.

Biomass and number estimates								
			Biomass index			Number index		
Species	Strata	Valid tows	y_i kg/Hr	y_i/y_{i-1} %	$y_{(i,i-1)}/y_{(i-2,i-3,i-4)}$ %	y_i No/Hr	y_i/y_{i-1} %	$y_{(i,i-1)}/y_{(i-2,i-3,i-4)}$ %
Gadus morhua	6.a	32	0.0	−100.0	NA	0.0	−100.0	NA
Melanogrammus aeglefinus	6.a	32	303.1	−41.2	17.3	1076.5	−40.5	4.9
Clupea harengus	6.a	32	64.8	124.7	196.0	724.9	172.0	2.8
Merluccius merluccius	6.a	32	13.6	34.7	10.2	46.5	133.0	−29.0
Trachurus trachurus	6.a	32	502.1	86.6	40.9	2565.3	93.6	1.3
Scomber scombrus	6.a	32	256.3	157.7	84.2	3579.7	83.8	108.7
Lepidorhombus whiffiagonis	6.a	32	1.2	−28.7	−6.8	9.2	−5.3	−16.9
Lophius piscatorius	6.a	32	1.6	−25.5	−28.1	1.5	10.5	−37.6
Pleuronectes platessa	6.a	32	4.5	−44.7	−5.9	27.9	−40.5	−8.1
Solea solea	6.a	32	0.2	−65.1	−16.8	1.0	−65.7	10.1
Micromesistius poutassou	6.a	32	120.7	−51.9	44.3	1856.1	−52.0	−39.5
Merlangius merlangus	6.a	32	146.4	−2.7	−13.9	1129.9	29.5	−27.6
Gadus morhua	7.b,c,j	120	1.6	−6.9	−48.3	0.5	−60.5	−49.4
Melanogrammus aeglefinus	7.b,c,j	120	90.1	−14.5	−51.7	260.0	−32.5	−74.3
Clupea harengus	7.b,c,j	120	0.5	−72.3	−92.2	24.1	−71.3	−74.9
Merluccius merluccius	7.b,c,j	120	13.8	2.5	−23.1	72.8	−25.0	0.9
Trachurus trachurus	7.b,c,j	120	121.9	−31.6	5.7	1965.1	−23.7	−9.9
Scomber scombrus	7.b,c,j	120	98.3	1254.0	7.9	1606.4	1181.1	−13.6
Lepidorhombus whiffiagonis	7.b,c,j	120	5.0	−10.7	13.4	51.7	−0.1	18.5
Lophius piscatorius	7.b,c,j	120	8.7	−26.9	34.4	8.1	−7.0	−10.9
Pleuronectes platessa	7.b,c,j	120	4.3	−22.7	−21.6	26.6	−14.3	−15.6
Solea solea	7.b,c,j	120	1.0	−2.4	35.3	3.8	−12.5	17.9
Micromesistius poutassou	7.b,c,j	120	81.3	98.5	−29.9	938.3	61.1	−70.6
Merlangius merlangus	7.b,c,j	120	23.6	−41.5	−43.3	168.3	−47.9	−59.3

Legend

(green)	**Increase**
(orange)	**Decrease**
(white)	**<15% Change**

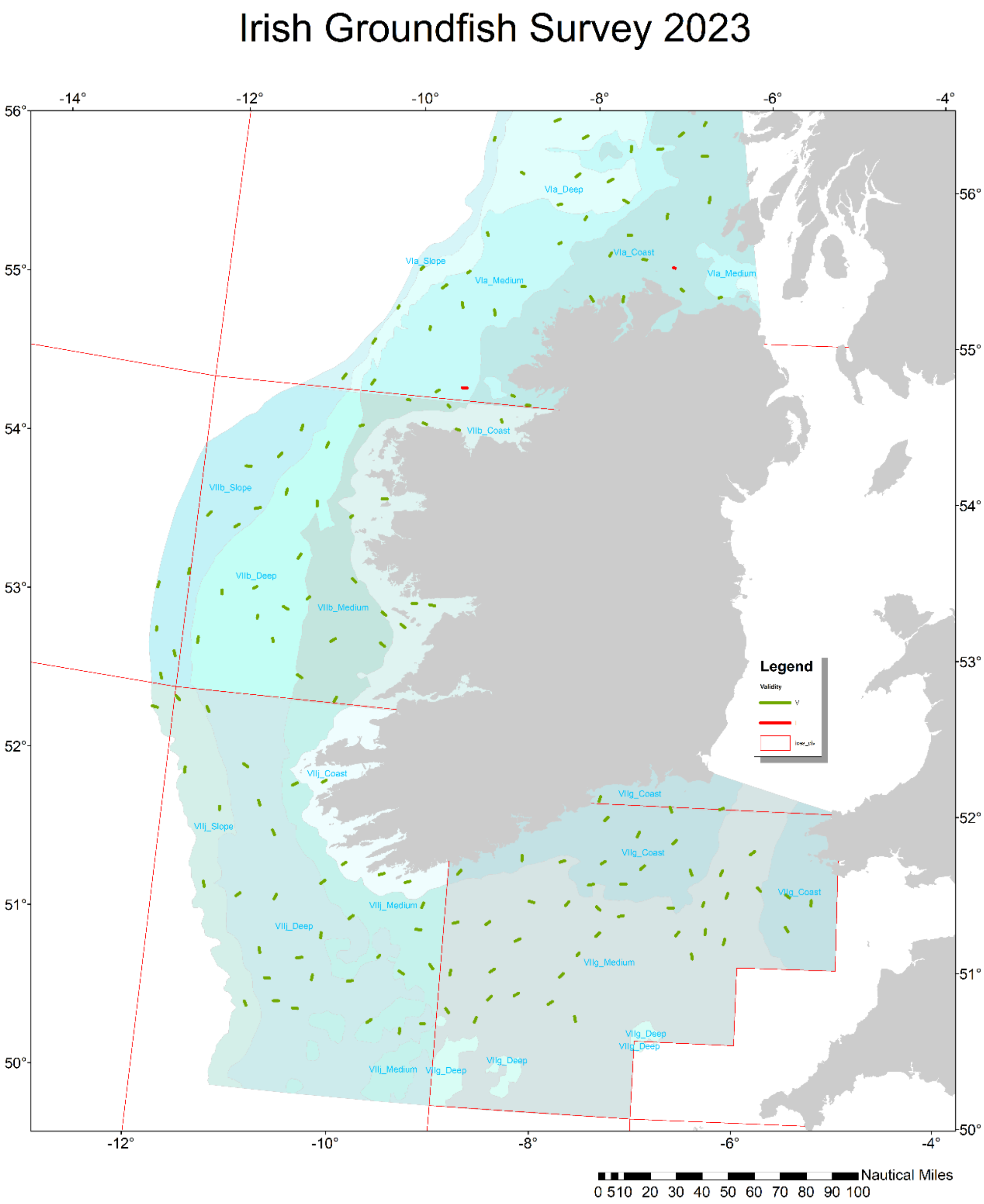


Figure A6.11. Map of survey stations completed during the Irish Groundfish Survey in 2023 (Green lines = valid hauls; Red lines = invalid hauls).

A6.11 Eastern English Channel Quarter 4 (FR-CGFS) and Western English Channel Quarter 3 (FR-WCGFS)

Nation:	France	**Vessel:**	Thalassa II
Survey:	CGFS2023	**Dates:**	16 September to 17 October 2023
Cruise	As from 2018 France sampled both the Eastern (7.d) and Western (7.e) English Channel. Data from both surveys, the Western CGFS (FR-WCGFS) in Q3 and the Eastern CGFS in Q4 has been submitted to DATRAS. Trawling was carried out during the day. CTD was deployed at each trawl station to collect temperature and salinity profiles. Age data were collected for 16 species.		
Gear details:	The gear used for the Eastern English Channel is the standard GOV 36/47 with ground gear modified for CGFS (bobbins Ø 250 mm) and a GOV 36/49 adapted to the Western Channel with a 400 mm diameter washer with Marport sensors to record doors, wings and vertical opening parameters.		
Notes from survey (e.g. problems, additional work etc.):	The CGFS 2023 campaign took place on the “ Thalassa” from the 16 to 29 September for the Western Channel and from 1 to 16 October for the Eastern Channel. The authorisations to work in English waters were issued well in advance of the start of the survey, which enabled us to cover the entire study area without any particular restrictions. 52 trawl stations were carried out in the Western Channel, including one that was invalid due to gear damage. In the Eastern Channel, we carried out 74 planned trawl stations, only one of which was invalid due to damage. At each trawl, the catch is sorted, weighed by species and a representative sample is measured. Biological samples (Table A6.37) are also taken from the catches for subsequent analysis on land. Over the whole campaign, we only had three days of bad weather, which cancelled some plankton and microplastic net sampling. Otherwise, the clement weather conditions enabled us to carry out all the work in good conditions. Additional works: • The CUFES device (Continuous Underwater Fish Egg Sampler) was used during all the survey (day and night) and samples were scanned on board. • Plankton samples were collected for analysis on the planktonic foodweb with WP2 (29) • Microplastic was collected with a Manta net (30) • Hydrological analyses were made with Niskin bottle sample (61) • Observers for mammals and birds information was collected throughout the survey. • Bathymetric acquisition for the development of physical models to describe the seabed (25) • Ray and shark tagging (726)		
Number of fish species recorded and notes on any rare species or unusual catches:	113 different fish species were recorded (sharks and rays included). Cephalopods and shellfish were also measured, and benthic fauna identified within each haul.		

Table A6.37. Number of biological samples (weight, maturity and age material (otoliths) collected by Division.

Species	Samples			Species	Samples		
	7.d	7.e	Total		7.d	7.e	Total
Merlangus merlangus	194	228	422	*Gadus morhua*	0	0	0
Mullus surmuletus	154	23	177	*Dicentrarchus labrax*	194	124	318
Pleuronectes platessa	232	3	235	*Chelidonichthys cuculus*	97	108	205
Trisopterus luscus	120	81	201	*Solea solea*	149	2	151
Melanogrammus aeglefinus	0	43	43	*Scophthalmus maximus*	5	0	5
Pollachius pollachius	0	40	40	*Scophthalmus rhombus*	2	0	2
Lophius piscatorius	2	22	24	*Lophius budegassa*	0	1	1
Lepidorhombus whiffiagonis	0	5	5	*Microstomus kitt*	3	56	59
Scomber scombrus	159	138	297	*Molva molva*	0	0	0
Phycis blennoides	0	0	0	*Glytocephalus cynoglossus*	0	0	0

A6.12 French EVHOE-Q4survey

Nation:	France	**Vessel:**	Thalassa 2
Survey:	EVHOE 2023	**Dates:**	22 October to 5 December 2023
Cruise	Realized on the R/V Thalassa each year in autumn, EVHOE Groundfish survey aims at collecting data on the distribution, relative abundance and biological parameters of all fish and selected commercial invertebrates in Divisions 7.f–j and 8.a,b,d. The primary species are hake, monkfishes, megrim, cod, haddock and whiting. Data are also collected for all other demersal, pelagic fish and cephalopods as well as for the whole invertebrate megafauna. From 2016 onward, sampling design has been fixed stations, based on a previously randomly selected set of points based on bathymetric and sedimentary strata.		
Gear details:	A GOV (36/47) with standard Ground gear (A) but no kite replaced by six extra floats. The boards have been replaced by new equivalent ones and the ground gear attachment has been adjusted to be more in line with the original plan of the trawl and to limit the risk of damage. Marport sensors have been utilized to record doors, wings, and vertical net opening.		
Notes from survey (e.g. problems, additional work etc.):	In 2023 the survey was carried out in tow legs of about three weeks and the sampling plan was equivalent to the previous year. Around 87 % of the initial program have been realized and validated (137 valid hauls of 158 initially planned, see Table A6.38 and Figure A6.12). Weather conditions were exceptionally difficult for the first part of the mission (covering mainly the Bay of Biscay) compared with the rest of the mission. Despite a high completion rate, due to delays caused by technical (loss of trawl) and meteorological problems (~4 days lost for the entire mission), the reduction in the sampling plan carried out led to a significant deficit in the deepest strata (strata 5–7) especially in the southern part of the Bay of Biscay. This deficit may modify the size distribution of species (larger individuals at greater depths), or provide an image of abundance or biomass data that are not very representative of some deep habitat species. Five hauls had to be cancelled, two due to obstacles on the seabed causing major damage, including the loss of a trawl (recovered in pieces a few days later). Three other tows were cancelled, including two large catches of *Capros aper* (one of at least 8 t) which caused major damage to the net, and one cancelled after a short time due to strong sonar detections. As in the previous year we continued the strategy based on live acoustics in order to detect strong aggregations of pelagic fish and avoid the risk of damage and sorting difficulties. During EVHOE 2023, 24 hauls were shorter than the normal 30 min. (from 20 to 29 min., distribution of trawling duration in Figure A6.13). When strong acoustic detections have been observed we reduced the length of the tow trying to keep the time accepted as valid (≥20 minutes) or sometimes by stopping the trawling in progress. We kept this year the additional observation of small pelagic fish as a complement to the pelagic surveys which take place in spring (PELGAS survey). This resulted in an increase in the acoustic monitoring with the multibeam echosounder and additional measurements and biological samples, in particular on anchovy and pilchards. These additional operations did not affect the normal course of the EVHOE survey. During the survey following additional data collection have been performed : - A total number of 4597 biological samples (otoliths, scales and/or illicia) were collected for 25 fish species (Table A6.39). -Trawl geometry data (Marport sensors) have been collected during all the hauls.		

	- 140 CTD temperature and salinity profile (probe on GOV) - during transects and trawling hauls continuous records with multibeam echosounder to collect data for pelagic ecosystem - Wastes were counted and weighted at each trawl station. - Invertebrates ("benthos", 246 taxa) were sorted, identified counted and weighted at the lowest taxonomic level (mostly species) for each trawled station. - mammals and birds observations during the legs 1 and 2. Additional works, partly for MSFD or specific projects, were realized at night mostly in the evening or early morning: • 30 Manta net hauls for collecting surface microplastics • 15 samples with WP2 net for zoo and phytoplankton • transects with CUFES device (Continuous Underwater Fish Egg Sampler) • 27 vertical profiles with "SBE 19 Bathysonde" to collect temperature, phytoplankton, particle densities ... • 12 "profiles boxes" with multibeam echosounder to collect bathymetry and reflectivity data • 159 acoustic transects (ME70 echo-sounder) for water column or benthic habitats • 5 deep-water pelagic trawl stations to sample meso-pelagic communities - Additional samples and observations have been collected on a set of selected species: muscle, stomach contents, fishes morphometry
Number of fish species recorded and notes on any rare species or unusual catches:	About 144 fish and 22 cephalopods taxa were recorded (Figures A6.14). Only 11 fish species represented 89% of the total biomass caught (Figure A6.15). Among fish species, as in previous years, small demersal-pelagic species (*Capros aper*, and to a lesser extent *Micromesistius poutassou*, *Trachurus trachurus*) strongly dominated the biomass of fish species. We can note a large dominance in abundance and biomass of *Capros aper* abundance with high abundance similarly to the previous five years. If we exclude pelagic or demersal species forming strong aggregations, the biomass of demersal fish was dominated by six species (Figure A6.15): grey gurnard (*Eutrigla gurnardus*) , haddock (*Melanogrammus aeglefinus*) especially in the Celtic Sea, the small-spotted catshark (*Scyliorhinus canicula*), spiny dogfish (*Squalus acanthias*), hake (*Merluccius merluccius*), conger (*Conger conger*). As in recent years, stronger catches of certain rays must also be reported such as *Raja clavata* and *R. undulata* (with significantly high values for both occurrence and total abundance), *Leucoraja fullonica* and *L. naevus*. Among elasmobranchs, more frequent and larger catches were also reported for the spiny dogfish (*Squalus acanthias*), for example. Preliminary length-at-age data are shown in Figure A6.16. As compared to previous years, the occurrence and abundance of monkfishes are still strong for *Lophius budegassa* and exceptionally high for *Lophius piscatorius*. Grey gurnards (*Eutrigla gurnardus*) also showed particularly abundant catches, among the highest in the series, and an absolute total number of catches far exceeding that of other years Particularly high levels of catches of meagre (*Argyrosomus regius*), very limited to stations close to the Gironde estuary and composed exclusively of juveniles, should be noted. In the southern Bay of Biscay, "Canary drum" (*Umbrina canariensis*) was also particularly abundant. Boarfish (*Capros aper*) catches were again particularly abundant, extending even further south in the Bay of Biscay (Figure A6.17). These catches sometimes made trawling management and catch processing (under-sampling) particularly tricky for a

	growing number of stations. We can note a lowering dynamic for the megrim *Lepidorhombus spp*. as compared to the previous four years. For hake, catches remain relatively stable in occurrence but continue a decline observed in the previous four years with a level of abundance in 2023 among the lowest in the recent time series. Catches of mackerel (*Scomber scombrus*) remain at very low levels, with occurrence values among the lowest in the EVHOE series. Concerning the cephalopods, it should be mentioned that the small individuals of *Allotheuthis* and *Loligo vulgaris* have often been subject to errors of identification on board and a procedure of control and correction of historical data should be considered.

Table A6.38. Trawling stations planned, realised and validated for the whole EVHOE 2023 survey.

Strata	ICES Divisions	Gear (Sweep length)	Hauls				% Stations sampled (valid)	Comments
			Planned	Realised	Valid	Additional		
Cc	7.g,h,j	GOV (m)	32	29	29	0	91	
Cc3	7.g,h,j	GOV (100 m)	8	9	9	1	112	
Cc4	7.g,h,j	GOV (100 m)	17	14	14	0	82	
Cc5	7.g,h,j	GOV (100 m)	4	4	4	0	100	
Cc6	7.g,h,j	GOV (100 m)	3	2	2	0	67	
Cc7	7.g,h,j	GOV (100 m)	0	0	0	0	-	
Cn	7.g,h,j	GOV (m)	16	12	12	0	75	
Cn2	7.g,h,j	GOV (50 m)	7	3	3	0	43	
Cn3	7.g,h,j	GOV (50 m)	9	9	9	0	100	
Cs	7.g,h,j	GOV (m)	36	34	30	0	83	
Cs4	7.g,h,j	GOV (100 m)	24	23	20	0	83	
Cs5	7.g,h,j	GOV (100 m)	8	7	7	0	88	
Cs6	7.g,h,j	GOV (100 m)	4	4	3	0	75	
Gn	8.a,b	GOV (m)	51	48	47	0	92	
Gn1	8.a,b	GOV (50 m)	5	5	5	0	100	
Gn2	8.a,b	GOV (50 m)	5	4	4	0	80	
Gn3	8.a,b	GOV (50 m)	14	14	13	0	93	
Gn4	8.a,b	GOV (100 m)	20	19	19	0	95	
Gn5	8.a,b	GOV (100 m)	3	3	3	0	100	
Gn6	8.a,b	GOV (100 m)	2	2	2	0	100	
Gn7	8.a,b	GOV (100 m)	2	1	1	0	50	
Gs	8.a,b	GOV (m)	23	19	19	0	83	
Gs1	8.a,b	GOV (50 m)	3	3	3	0	100	
Gs2	8.a,b	GOV (50 m)	6	6	6	0	100	
Gs3	8.a,b	GOV (50 m)	4	4	4	0	100	
Gs4	8.a,b	GOV (100 m)	4	4	4	0	100	
Gs5	8.a,b	GOV (100 m)	2	1	1	0	50	
Gs6	8.a,b	GOV (100 m)	2	1	1	0	50	
Gs7	8.a,b	GOV (100 m)	2	0	0	0	0	
All		GOV	158	142	137	1	86.7	

Table A6.39. Biological observations (sex, maturity and collected material for aging) for species sampled during EVHOE 2022 in the ICES Divisions 8.a–b and 7.f–j.

Species	Female (%)	Male (%)	Not sexed (%)	Undeter-mined (%)	Total number of samples	Type of material
Argyrosomus regius	0.8	6.2	7.7	85.4	130	Otolith
Chelidonichthys cuculus	51.9	31.9	0	16.2	185	Otolith
Dicentrarchus labrax	41.2	58.8	0	0	51	Scales
Engraulis encrasicolus	45.3	46	0	8.7	150	Otolith
Gadus morhua	40	60	0	0	10	Otolith
Glyptocephalus cynoglossus	73.6	26.4	0	0	110	Otolith
Lepidorhombus whiffiagonis	59.3	39.2	0	1.5	388	Otolith
Lophius budegassa	47.2	40.8	0.4	11.7	282	Illicia
Lophius piscatorius	45	36.8	1.2	16.9	242	Illicia
Melanogrammus aeglefinus	51.8	42.8	0	5.4	407	Otolith
Merlangius merlangus	54.1	43.6	0.2	2.1	484	Otolith
Merluccius merluccius	43	38.4	0.1	18.4	869	Otolith
Microstomus kitt	64.5	35.5	0	0	152	Otolith
Molva molva	66.7	16.7	16.7	0	6	Otolith
Mullus surmuletus	44.7	40.9	0	14.3	237	Otolith
Pagellus bogaraveo	12.5	50	0	37.5	8	Otolith
Phycis blennoides	56.6	15.1	2.5	25.8	159	Otolith
Pleuronectes platessa	78.8	21.2	0	0	104	Otolith
Pollachius pollachius	50	50	0	0	2	Otolith
Sardina pilchardus	41.5	57	0	1.6	193	Otolith
Scomber scombrus	39.5	34.9	0	25.6	86	Otolith
Scophthalmus maximus	60	40	0	0	5	Otolith
Scophthalmus rhombus	0	100	0	0	1	Otolith
Solea solea	64.3	33.3	0	2.4	168	Otolith
Trisopterus luscus	45.2	51.2	0	3.6	168	Otolith

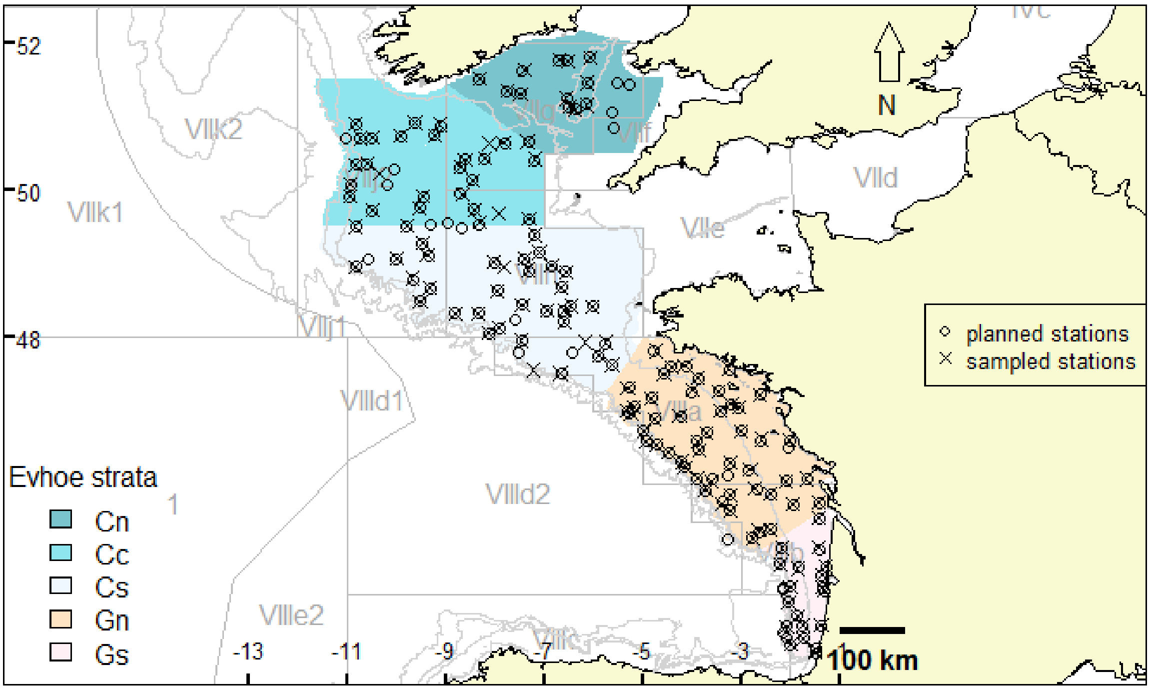
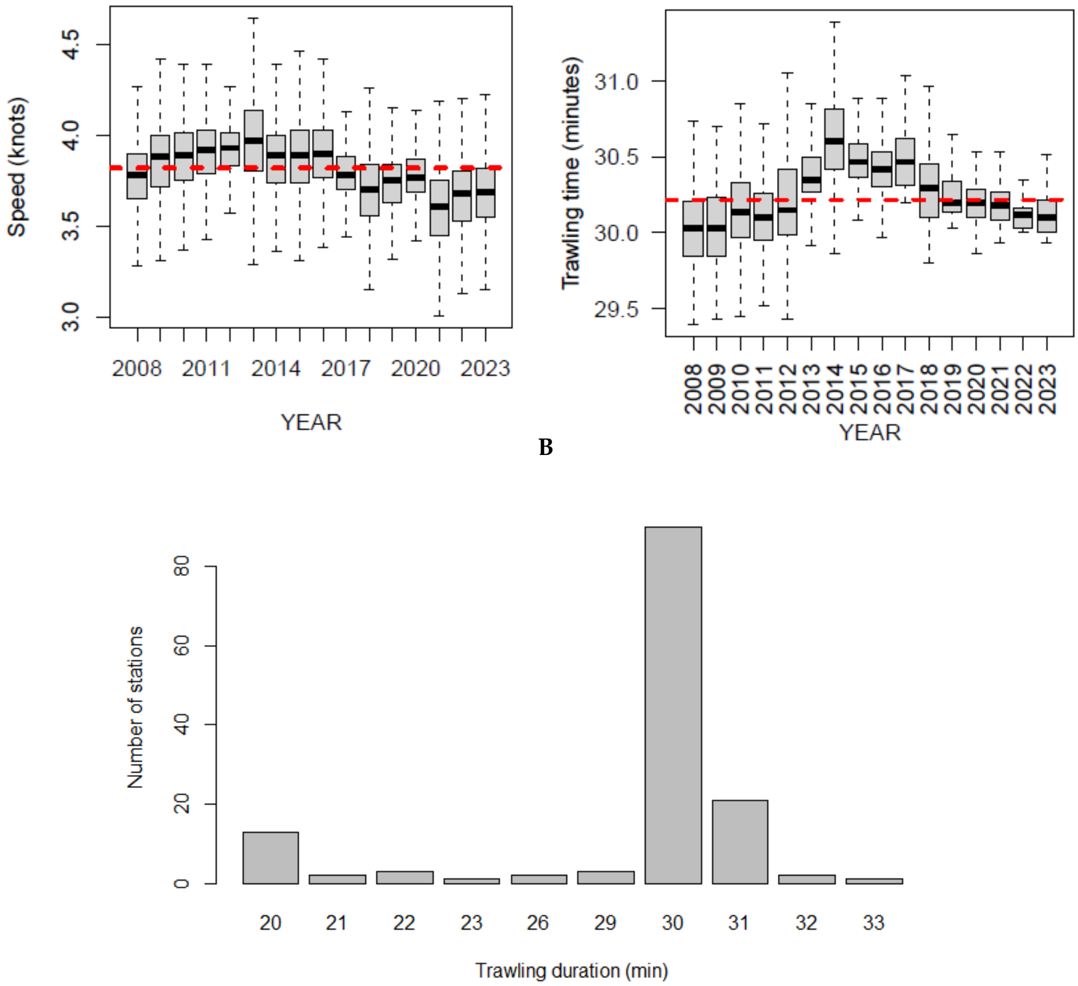


Figure A6.12. Planned stations in the fixed sampling plan (o) and validated tows (x) for EVHOE 2023. ICES areas as well as EVHOE strata (Gs, Gn, Cs, Cc, Cn) are indicated.



C

Figure A6.13. Distribution of A) the trawling speed (in knots), B) duration (trawling time in minutes) for sampled stations by year during EVHOE IBTS Q4 surveys and C) number of stations by duration for EVHOE 2023.

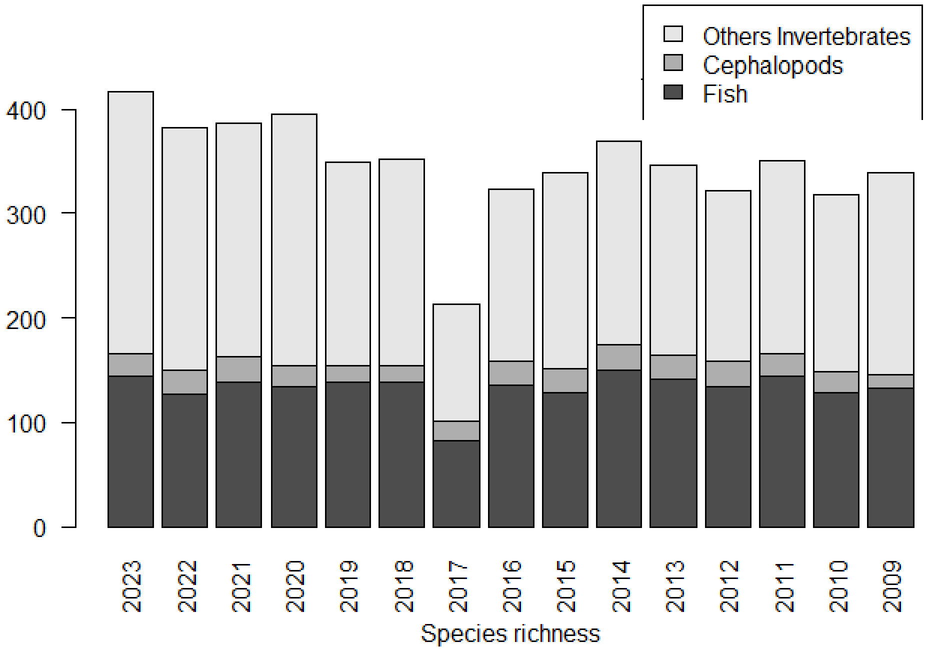


Figure A6.14. Total species richness observed in the EVHOE series from the GOV trawl samples for the three main biological components (fish, cephalopods, other invertebrates including benthos) and the 15 past years.

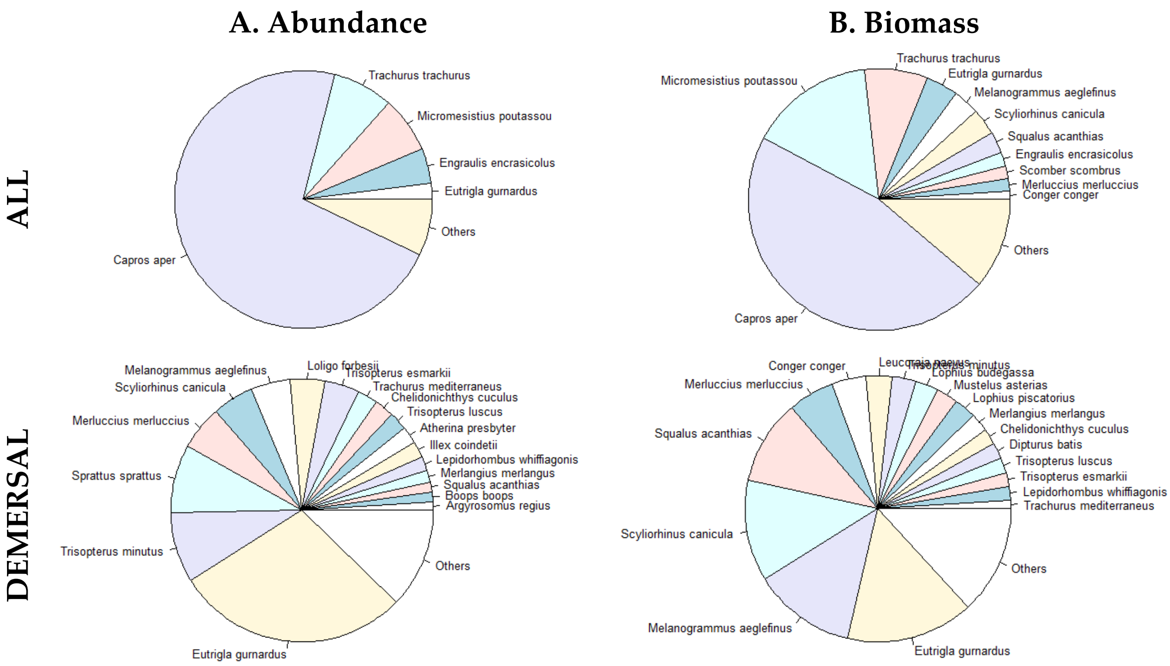
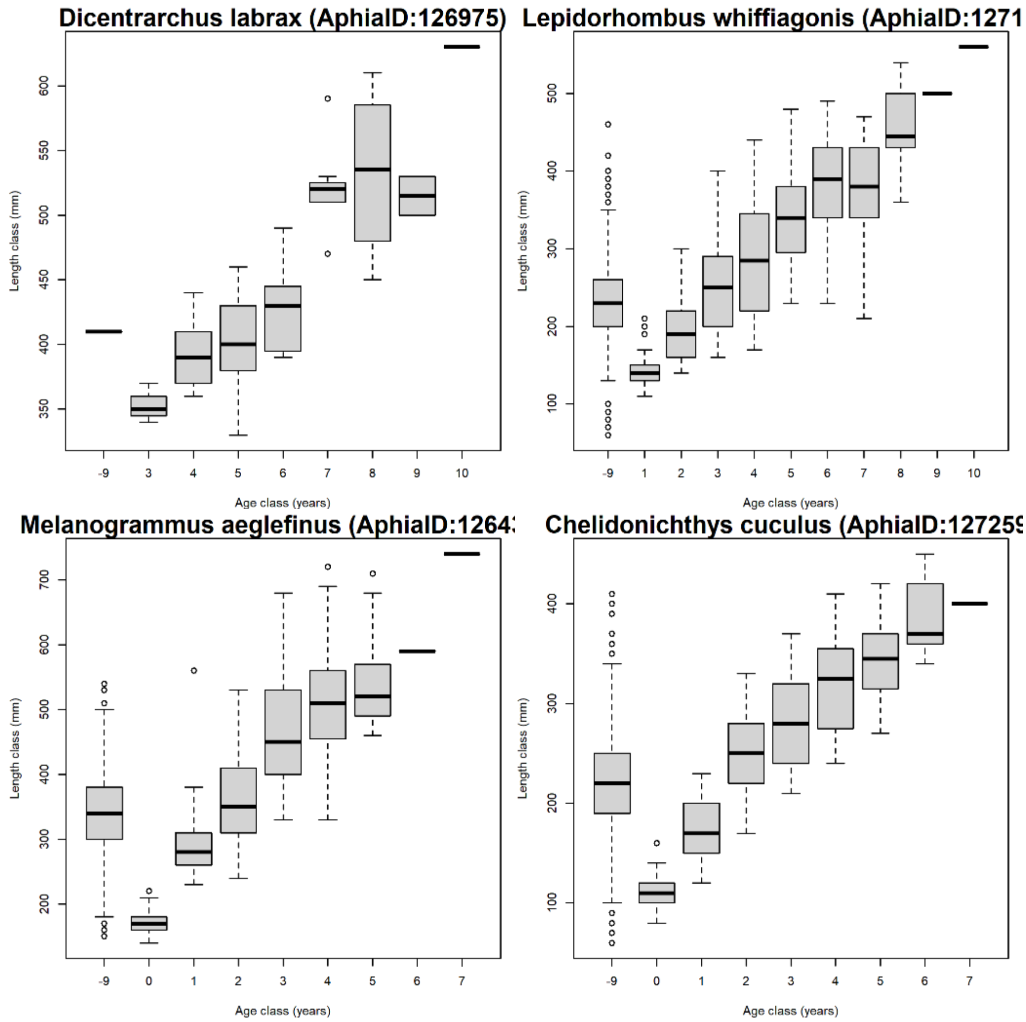


Figure A6.15. Fish and cephalopod species dominance over the entire "EVHOE 2023" sampled area in term of A) abundance and B) biomass for all species and for demersal species only without pelagic or schooling fish species.



A6.16. Length at age relationships for examples of sampled species during EVHOE 2023.

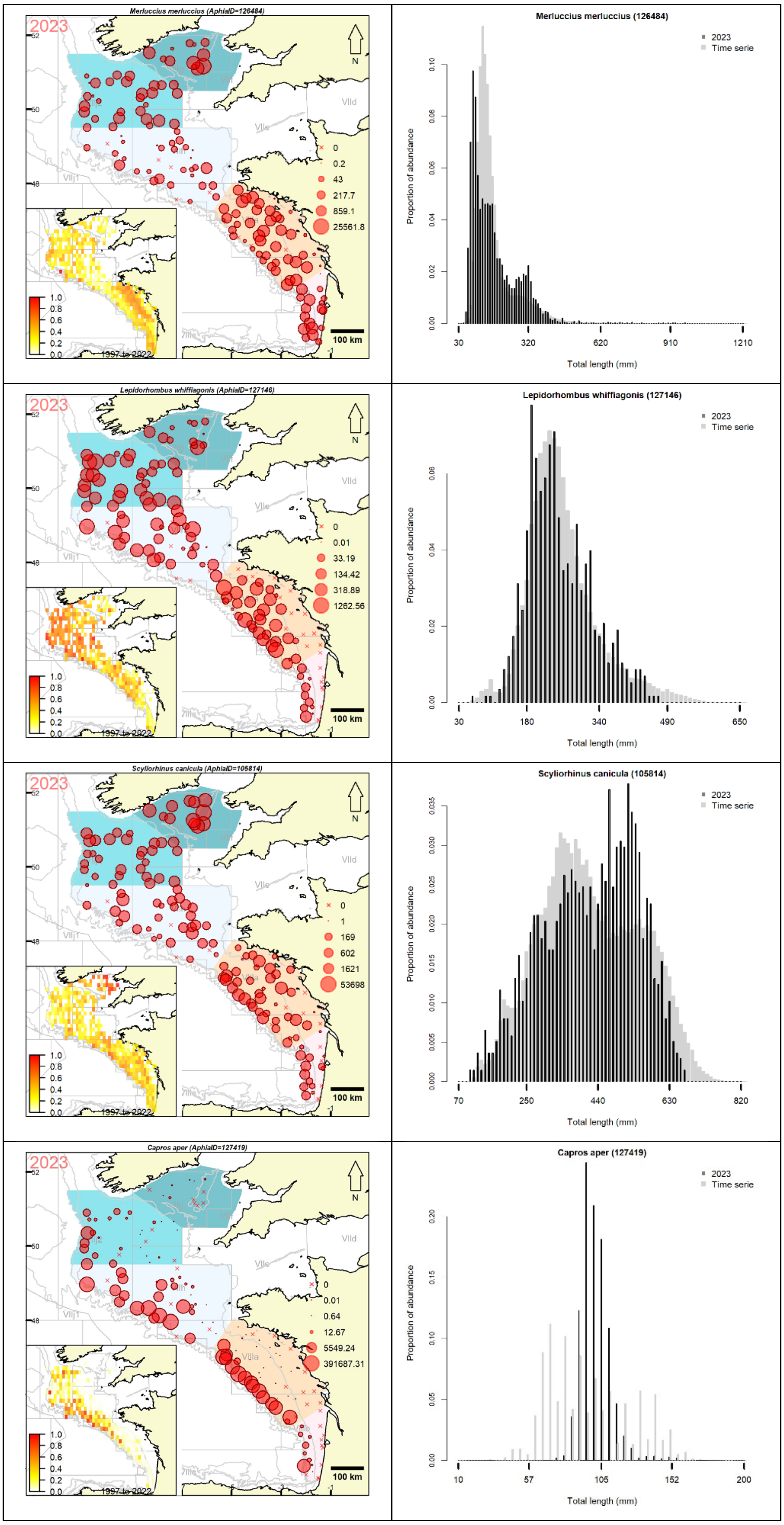


Figure A6.17. Spatial distribution of biomass and barplot giving size distribution (logarithm of abundance by size class) for the four main demersal fish species (selected from total biomass proportion) caught during IBTS Q4 (EVHOE) survey in 2023 as compared to the whole time series (1997–2022).

A6.13 Portuguese Autumn Groundfish Survey

Nation:	PT (Portugal)	Vessel:	Mário Ruivo
Survey:	PT-GFS-Q4 (Autumn2023)	**Dates:**	23 November to 3 December 2023 12 December to 21 December 2023
Cruise	The Portuguese Autumn Groundfish Survey (PT-GFS) is undertaken every year since 1979 (except 1984, 2012, 2019, 2020). Main objectives are: • estimate indices of abundance and biomass and distribution of hake and horse mackerel recruits; • indices of abundance and biomass of the most important commercial species; • biological parameters, e.g. maturity, ages, sex-ratio, weight, food habits; • biodiversity indicators; • supporting data for MSFD purposes (litter, stomachs) The primary species are hake, horse mackerel, blue whiting, mackerel and Spanish mackerel. Data are also collected for several demersal fish species and invertebrates, focusing in providing the necessary information for stock assessment of commercial species. This survey supports other projects and collaborates with international institutes thru collection of data.		
Area	Portuguese continental waters (Division 9.a), from 20 to 500 m depth.		
Survey Design	This survey is a mixed fixed and random stratified with twelve geographical strata along the coast and three depth strata (20–100 m, 101–200 m, 201–500 m). Overall, 96 fishing stations are allocated, 66 at fixed (grid) positions and 30 at random. Tow duration is 30 min., with a trawl speed of 3.5 knots, during day light. Scanmar is used to monitor gear parameters. Temperature is recorded with a CTD (Conductivity, Temperature, Depth) equipment at the end of each haul or during haul with a portable CTD.		
Gear details:	NCT (Norwegian Campbell Trawl) gear with rubber rockhopper and Thyborøn doors. The mean horizontal opening between the wings is 14.2 m , between doors is 42,1m and the mean vertical opening is 4.5 m. Codend mesh size is 20 mm.		
Notes from survey (e.g. problems, additional work etc.):	In 2023, contractual issues delayed some mandatory inspections and repairs to be made on RV "Mário Ruivo". This led to a 7-week delay to the start of the survey, from 1 October to 23 November. In addition to the delay, other appointments for the vessel where made which reduced the available days allocated to survey. While the first leg was performed according to schedule, with a minor reduction in the number of planned stations, an engine problem on the last days caused an 8-day interval for repairs (time for 32 stations) causing a big prejudice in the survey planning, forcing the elimination of more planned stations, but still allowing a 2-stations per strata plan, as the minimum for a successful survey. Sadly, a new mechanical problem caused the early termination of the survey with six strata out of 36 unsampled, and eight strata with one haul. Scanmar was used for the whole survey, for the monitoring of the gear. Summary details are provided below for stations fished (Table A6.40), biological samples taken (Table A6.41) and preliminary biomass estimates for selected species (Table A6.42). The survey area is shown in Figure A6.18.		

Number of fish species recorded and notes on any rare species or unusual catches:	Overall, 126 species of fish, 19 of cephalopods and 30 of crustaceans were recorded during the survey. 91 taxa of other groups were recorded, e.g., Echinodermata, Cnidarians, Bivalves, Gastropods, Polychaeta, Ascidians and Nudibranchia.

Table A6.40. Stations fished (aim: to complete one valid tows per strata)

ICES Division	Strata	Gear	Hauls					
			Planned	Valid	Additional	Invalid	% Achieved	Comments
9.a	All	NCT	96	54	0	4	56%	6 strata not covered

Table A6.41. Biological samples (length, weight, sex, maturity and age material)

SPECIES	SAMPLES*	MATURITY	OTOLITHS	SPECIES*	SAMPLES*	MATURITY	OTOLITHS
Boops boops	*5*	*54*	*60*	*Micromesistius poutassou*	*11*	*556*	*232*
Diplodus vulgaris	*2*	*153*	*150*	*Nephrops norvegicus*	*11*	*99*	
Helicolenus dactylopterus	*12*	*373*	*361*	*Pagellus acarne*	*7*	*83*	*58*
Illex coindetii	*31*	*276*		*Parapenaeus longirostris*	*22*	*784*	
Lepidorhombus boscii	*22*	*222*	*145*	*Scomber colias*	*9*	*206*	*233*
Loligo vulgaris	*15*	*141*		*Scomber scombrus*	*6*	*133*	*71*
Lophius budegassa	*3*	*6*	*6*	*Spondyliosoma cantharus*	*7*	*60*	*61*
Merluccius merluccius	*49*	*1096*	*418*	*Trachurus trachurus*	*18*	*831*	*524*

Table A6.42. Biomass and abundance index for the PT-PGFSQ4-2023 survey, where y_i, year estimate (2023); y_{i-1}, previous year estimate (2022); $y_{(i,i-1)}$, Average of last two year estimates (2023 and 2022); $y_{(i-3,i-4,i-5)}$, Average of the last three year estimates (2021, 2018 and 2017).

BIOMASS AND NUMBER ESTIMATES								
			Biomass index			Number index		
Species	Strata	Valid tows	y_i kg/h	y_i/y_{i-1} %	$y_{(i,i-1)}/y_{(i-3,i-4,i-5)}$ %	y_i n/h	y_i/y_{i-1} %	$y_{(i,i-1)}/y_{(i-3,i-4,i-5)}$ %
Merluccius merluccius	9.a	61	54	22.2	9.9	7.7	320.3	26.2
Trachurus trachurus	9.a	61	54	74.0	99.7	–29.4	2805.5	411.5
Trachurus picturatus	9.a	61	54	0.2	–96.0	–14.8	2.6	–95.6
Micromesistius poutassou	9.a	61	54	26.7	–49.8	–67.8	305.4	–60.5
Scomber colias	9.a	61	54	9.1	36.4	–69.8	159.6	58.2
Scomber scombrus	9.a	61	54	20.2	788.2	–49.4	303.0	2421.6
Lepidorhombus boscii	9.a	61	54	1.1	118.5	31.4	12.1	96.1
Lepidorhombus whiffiagonis	9.a	61	54	0.1	18.9	32.4	0.2	–47.5
Lophius budegassa	9.a	61	54	0.6	229.6	143.6	0.4	22.2
Lophius piscatorius	9.a	61	54	0.0	–	–	0.0	–
Capros aper	9.a	61	54	7.7	–17.9	–37.6	181.6	–31.2
Phycis blennoides	9.a	61	54	0.5	171.8	137.0	7.2	282.1
Raja clavata	9.a	61	54	10.5	2334.8	–2.2	5.4	826.3
Scyliorhinus canicula	9.a	61	54	4.4	86.4	–29.5	13.6	83.9
Nephrops norvegicus	9.a	61	54	0.1	30.8	–2.2	2.2	–23.3

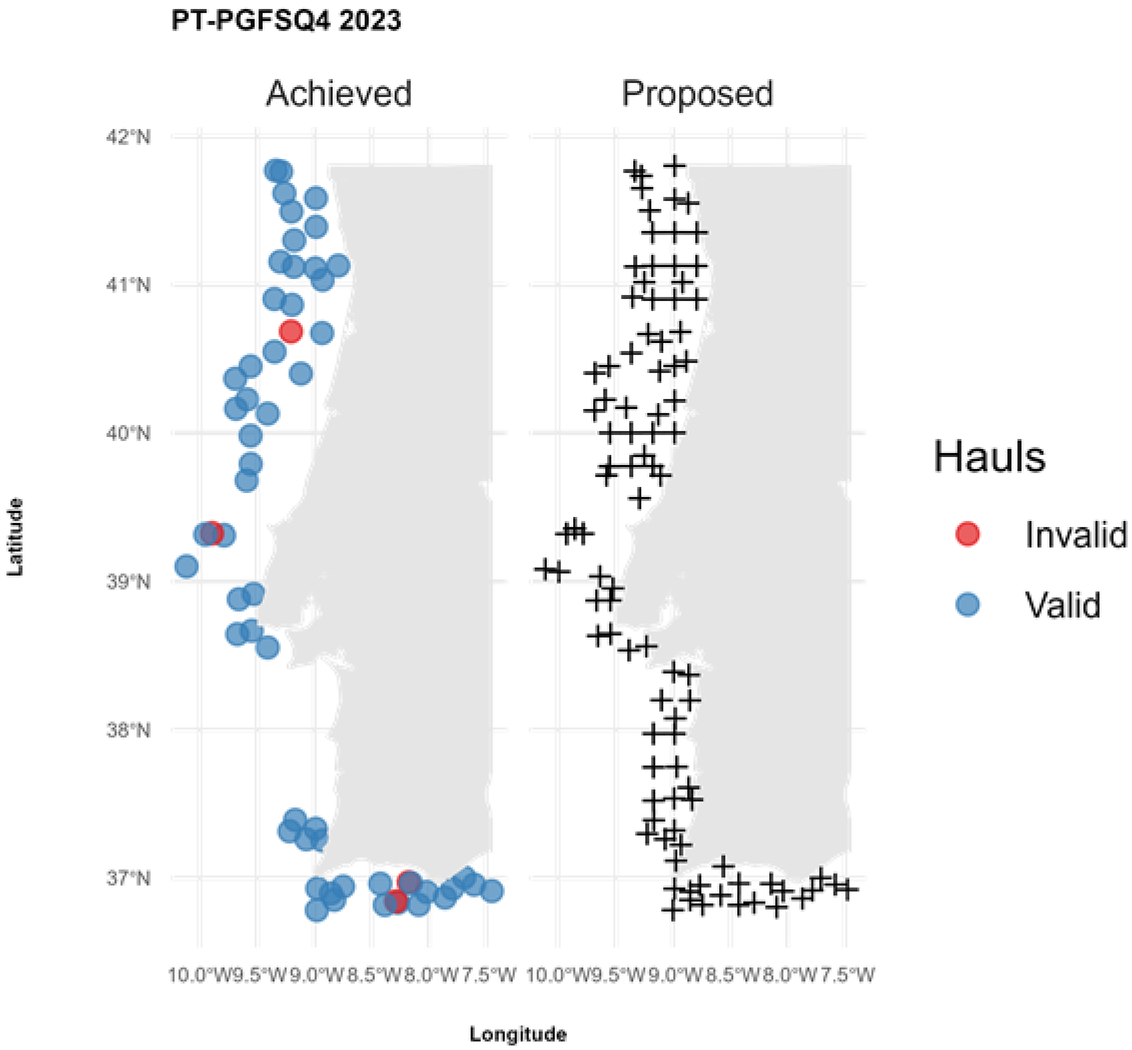


Figure A6.18. Location of hauls for PT-PGFS-Q4 survey

A6.14 Spanish Gulf of Cadiz groundfish survey (SP-GCGFS-Q4)

Nation:	SP (Spain)	**Vessel:**	Vizconde de Eza
Survey:	SP-GCGFS-Q4 (ARSA 1123)	Dates:	29 October to 11 November 2023
Cruise:	Spanish Gulf of Cadiz bottom trawl survey aims to collect data on the distribution and relative abundance, and biological information of commercial fish in the Gulf of Cadiz area (Division 9.a). The primary species are hake, horse mackerel, wedge sole, sea breams, mackerel and Spanish mackerel. Data and abundance indices are also collected and estimated for other demersal fish species and invertebrates as rose and red shrimps, *Nephrops* and cephalopod molluscs.		
Survey Design:	The survey is random stratified with five depth strata (15–30 m, 31–100 m, 101–200 m, 201–500 m, 501–800 m). Stations are allocated at random according to the strata surface.		
Gear details:	Baca 44/60 with Thyborøn doors (350 Kg).		
Notes from survey (e.g. problems, additional work etc.):	Hydrographic data at each trawl station was collected using a net-mounted CTD. Summary details are provided below for stations fished (Table A6.43), and preliminary biomass estimates for selected species (Table A6.44). The survey area is shown in Figure A6.19.		
Number of fish species recorded and notes on any rare species or unusual catches:	Overall a total of 165 fish species, 48 crustaceans and 37 molluscs were recorded.		

Table A6.43. Numbers of stations fished (aim: to complete 45 valid tows per year).

ICES Divisions	**Strata**	**Gear**	**Stations**					
			Planned	**Valid**	**Addi-tional**	**Inva-lid**	**% Fished**	**Comments**
9.a	All	Baca 44/60	45	45	–	1	100%	

Table A6.44. Biomass estimates for the main species in the Q4 Gulf of Cadiz bottom trawl survey, where y_i, year estimate (2023); y_{i-1}, previous year estimate (2022); $y_{(i,i-1)}$, Average of last two year estimates (2022 and 2023); $y_{(i-2,i-3,i-4)}$, Average of the previous three year estimates (2019, 2020 and 2021).

Biomass and number estimates								
			Biomass index			Number index		
Species	Strata	Valid tows	y_i kg/0.5h	y_i/y_{i-1} %	$y_{(i,i-1)}/y_{(i-2,i-3,i-4)}$ %	y_i n/0.5h	y_i/y_{i-1} %	$y_{(i,i-1)}/y_{(i-2,i-3,i-4)}$ %
Merluccius merluccius	All	46	3.60	32.3	-9.29	57.8	71.3	-56.60
Micromesistius poutassou	All	46	0.12	-94.7	-77.91	0.8	-95.8	-90.74
Nephrops norvegicus	All	46	0.41	-21.5	15.50	19.1	55.0	-3.18
Parapenaeus longirostriss	All	46	1.19	-16.0	29.53	171.8	-29.6	-0.6
Octopus vulgaris	All	46	0.61	-52.4	33.13	1.2	-49.7	3.81
Loligo vulgaris	All	46	0.83	75.9	-38.42	21.9	453.8	-4.3
Sepia officinalis	All	46	3.60	32.3	-9.29	1.9	56.3	-50.3

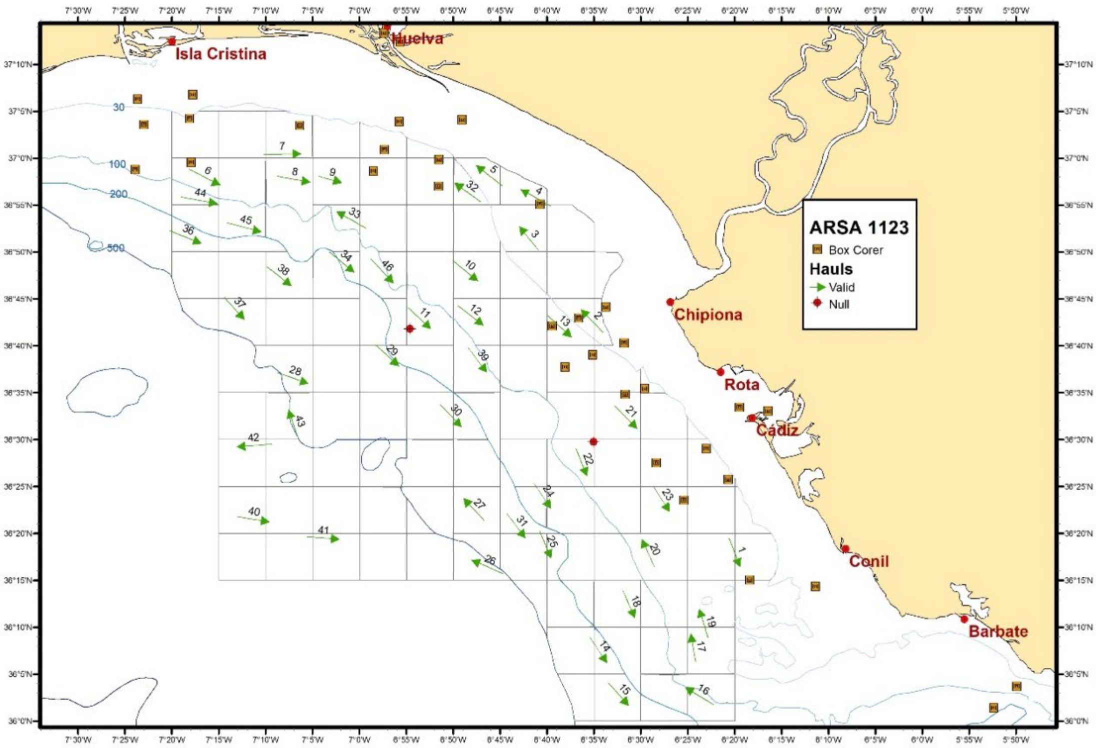


Figure A6.19. Trawl stations in Q4 Gulf of Cadiz 2023 survey.

A6.15 Spanish North Coast bottom trawl survey (SP-NSGFS-Q4)

Nation:	SP (Spain)	**Vessel:**	Miguel Oliver
Survey:	SP-NSGFS-Q4 (N23)	**Dates:**	19 September – 24 October 2023
Cruise:	Spanish North Coast bottom trawl survey aims to collect data on the distribution and relative abundance, and biological information of commercial fish in Divisions 8.c and 9.a (north). The primary species are hake, monkfish and white anglerfish, megrim, four-spot megrim, blue whiting and horse mackerel abundance indices are estimated by age, with abundance indices also estimated for *Nephrops*, and data collection for other demersal fish and invertebrates.		
Survey Design:	This survey is random stratified with five geographical strata along the coast and three depth strata (70–120 m, 121–200 m, 201–500 m). Stations are allocated at random within the trawlable stations available according to the strata surface.		
Gear details:	Standard baca 36/40 with Thyborøn doors.		
Notes from survey (e.g. problems, additional work etc.):	2023 survey was carried out on board the "Miguel Oliver". The gear was the standard gear for this survey and area, and results are in line with those from the time series, showing the usual proportion of bentho-demersal species as megrims and skates. As in previous years, additional hauls were undertaken to cover shallow stations between 30 and 70 m, but only one could be performed, besides 13 deeper stations, between 500 and 950 m. Analyses of stomach contents of main demersal species were also performed in all hauls during the survey. Additional work undertaken included CTD casts at all trawl stations. and dredges carried out with a box-corer 16 and a meso-box-corer 25 to create a grid of sediments and infauna samples in some areas. A seabird census was carried out at the end of fishing maneuvers and during steaming between stations. Summary details are provided below for stations fished (Table A6.45), biological samples taken (Table A6.46) and preliminary biomass estimates for selected species (Table A6.47). The survey area is shown in Figure A6.20.		
Number of fish species recorded and notes on any rare species or unusual catches:	A total of 242 species were captured,104 fish taxa with 102 species, 49 crustaceans taxa with 45 species , 43 molluscs taxa with 40 species, 33 echinoderms taxa with 30 species and 43 other invertebrates taxa with 25 species.		

Table A6.45. Numbers of stations fished (aim: to complete 116 valid tows per year).

ICES Divisions	Strata	Gear	Stations					
			Planned	Valid	Additional	Invalid	% Fished	Comments
8.c	All	Standard baca	96	92	10	0	96%	
9.a North	All	Standard baca	20	19	3	2	95%	
8.b	All	Standard baca	0	0	1	0	–	
	TOTAL		116	112	13	2	96%	

Table A6.46. Numbers of individuals biologically sampled (length, weight, sex, maturity, age) by species.

Species	No.	Species	No.
Merluccius merluccius	512	*Mullus surmuletus*	108
Lepidorhombus whiffiagonis	578	*Scomber colias*	48
Lepidorhombus boscii	432	*Zeus faber*	94
Lophius budegassa	147	*Trisopterus luscus*	674
Lophius piscatorius	128	*Helicolenus dactylopterus*	129
Trachurus trachurus	689	*Phycis blennoides*	69
Micromesistius poutassou	301	*Conger conger*	180
Engraulis encrasicolus	645*	*Sardina pilchardus*	510
Scomber scombrus	171	*Nephrops norvegicus*	477

* (8.c: 472 + 9.a 173)

Table A6.47. Biomass estimates for the main species in the Spanish North Coast bottom trawl survey, where y_i, year estimate (2023); y_{i-1}, previous year estimate (2022); $y_{(i,i-1)}$, Average of last two year estimates (2023 and 2022); $y_{(i-2,i-3,i-4)}$, Average of the previous three year estimates (2021, 2020 and 2019).

Species	Strata	Valid tows	Biomass index			Number index		
			y_i kg/0.5h	y_i/y_{i-1} % change	$y_{(i,i-1)}/y_{(i-2,i-3,i-4)}$ % change	y_i n/0.5h	y_i/y_{i-1} % change	$y_{(i,i-1)}/y_{(i-2,i-3,i-4)}$ % change
Merluccius merluccius	9.aN	21	8.00	13.0	37.1	186.6	10.2	–1.6
Lepidorhombus boscii	9.aN	21	4.73	–15.7	12.2	72.5	–3.8	–0.3
L. whiffiagonis	9.aN	21	0.16	6.7	–36.3	1.1	42.9	–65.4
Lophius budegassa	9.aN	21	0.33	3200.0	24.4	0.8	550.0	800.0
Lophius piscatorius	9.aN	21	0.14	1300.0	NA	0.2	240.0	NA
M. poutassou	9.aN	21	14.29	–95.9	–11.1	136.0	–98.2	–34.5
Trachurus trachurus	9.aN	21	20.62	2649.3	21.1	535.4	1977.0	269.1
Scomber scombrus	9.aN	21	4.05	187.2	–80.8	48.0	736.4	–84.2
Nephrops norvegicus	9.aN	21	0.00	NA	–100.	0.0	NA	–100.
Merluccius merluccius	8.c	94	9.02	–10.2	74.1	201.5	–22.6	65.2
Lepidorhombus boscii	8.c	94	8.47	27.0	27.6	141.2	38.5	17.6
L. whiffiagonis	8.c	94	8.34	19.8	73.6	140.7	38.4	116.3
Lophius budegassa	8.c	94	1.57	185.5	135.6	1.8	114.5	259.2
Lophius piscatorius	8.c	94	2.54	33.0	154.8	2.3	115.0	185.6
M. poutassou	8.c	94	114.33	–34.5	81.3	1318.1	–59.3	–9.6
Trachurus trachurus	8.c	94	10.77	–50.8	100.2	392.0	–75.9	617.8
Scomber scombrus	8.c	94	0.20	–93.6	0.8	1.5	–98.3	114.5
Nephrops norvegicus	8.c	94	0.23	109.1	363.6	6.9	116.9	656.7
Merluccius merluccius	Total	115	8.85	–7.2	67.8	198.9	–18.7	51.0
Lepidorhombus boscii	Total	115	7.82	20.5	25.5	129.4	32.9	15.2
L. whiffiagonis	Total	115	6.94	19.9	72.5	116.7	38.4	114.5
Lophius budegassa	Total	115	1.36	195.7	129.4	1.6	126.8	278.3
Lophius piscatorius	Total	115	2.12	34.2	155.8	1.9	116.9	187.8
M. poutassou	Total	115	97.13	–52.5	49.2	1114.9	–71.8	–17.6
Trachurus trachurus	Total	115	12.47	–31.6	85.6	416.7	–69.1	582.5
Scomber scombrus	Total	115	0.86	–69.8	–51.4	9.5	–86.8	–11.8
Nephrops norvegicus	Total	115	0.19	111.1	366.7	5.8	117.0	632.6

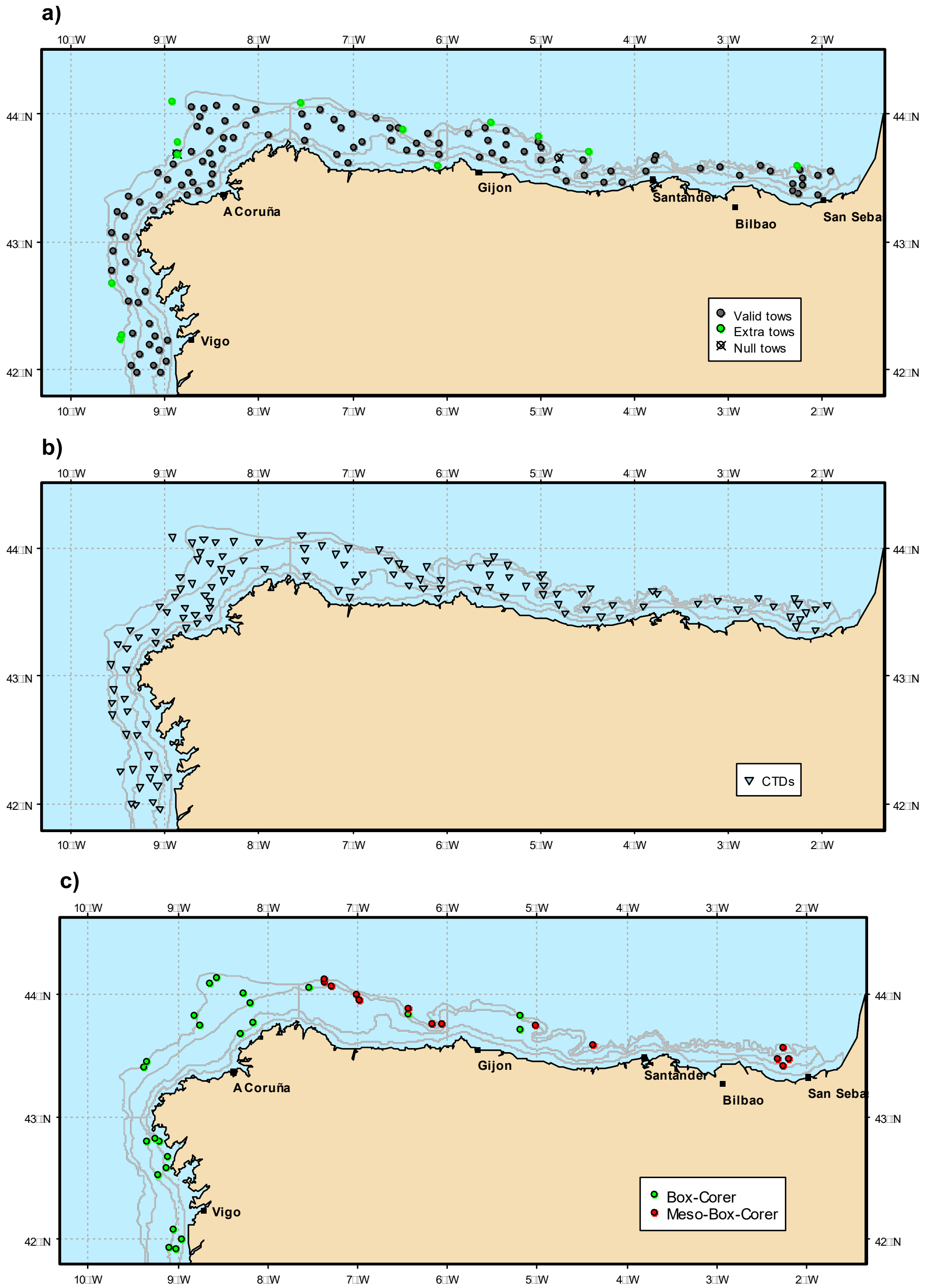


Figure A6.20. Spanish North Coast survey showing the distribution of a) trawl stations, b) CTD stations and c) dredges sampled during the 2023 survey.

Annex 7: Working Documents

In addition to a range of presentations, the following Working Documents were presented to the 2024 meeting of IBTSWG.

- Ellis, J. R. and Roebuck, E. (2024). Preliminary notes on the at-sea collection of fish stomach contents data. Working Document to the ICES International Bottom Trawl Survey Working Group (IBTSWG), 8–12 April 2024; 10 pp.

- Hatton, B.M. and Ellis, J.R. (2024). Preliminary notes on the use of the JTS610 otter trawl in the North Sea. Working Document to the ICES International Bottom Trawl Survey Working Group (IBTSWG), 8–12 April 2024; 18 pp.

Annex 8: Maps of species distribution in 2023

Table A.8.1. Species for which distribution maps have been produced, with length split for pre-recruit (0-group) and post-recruit (1+ group) where appropriate. The maps cover all the area encompassed by surveys coordinated within the IBTSWG (North Sea and North-eastern Atlantic Areas).

Scientific	Common	Code	Fig No	Length Split (<cm)
Capros aper	Boarfish	BOC	44	
Clupea harengus	Herring	HER	6-7	17.5
Conger conger	Conger	COE	45	
Gadus morhua	Atlantic Cod	COD	2-3	23
Galeorhinus galeus	Tope Shark	GAG	33	
Galeus melastomus	Blackmouthed dogfish	DBM	31	
Lepidorhombus boscii	Four-Spotted Megrim	LBI	16-17	19
Lepidorhombus whiffiagonis	Megrim	MEG	14-15	21
Leucoraja naevus	Cuckoo Ray	CUR	35	
Lophius budegassa	Black-bellied Anglerfish	WAF	20-21	20
Lophius piscatorius	Anglerfish (Monk)	MON	18-19	20
Merlangus merlangius	Whiting	WHG	24-25	20
Melanogrammus aeglefinus	Haddock	HAD	4-5	20
Merluccius merluccius	European hake	HKE	8-9	20
Micromesistius poutassou	Blue whiting	WHB	26-27	19
Mustelus spp.	Smooth Hound	SMH	34	
Nephrops norvegicus	Norway Lobster	NEP	28	
Pleuronectes platessa	European Plaice	PLE	22-23	12
Raja brachyura	Broadnose skate	RJH	40	
Raja clavata	Thornback ray (Roker)	THR	36	
Raja microocellata	Painted/Small Eyed Ray	PTR	37	
Raja montagui	Spotted Ray	SDR	38	
Raja undulata	Undulate Ray	UNR	39	
Scomber scombrus	European Mackerel	MAC	12-13	24
Scyliorhinus canicula	Lesser Spotted Dogfish	LSD	29	
Scyliorhnus stellaris	Nurse Hound	DGN	30	

Scientific	Common	Code	Fig No	Length (<cm)	Split
Sprattus sprattus	European sprat	SPR	41		
Squalus acanthias	Spurdog	DGS	32		
Trachurus picturatus	Blue Jack Mackerel	JAA	43		
Trachurus trachurus	Horse Mackerel (Scad)	HOM	10-11	15	
Trisopterus smarkii	Norway pout	NPO	42		
Zeus faber	John Dory	JOD	46		

The catchability of the different gears used in the NeAtl surveys is not constant; therefore the following maps do not reflect proportional abundance in all the areas but within each survey

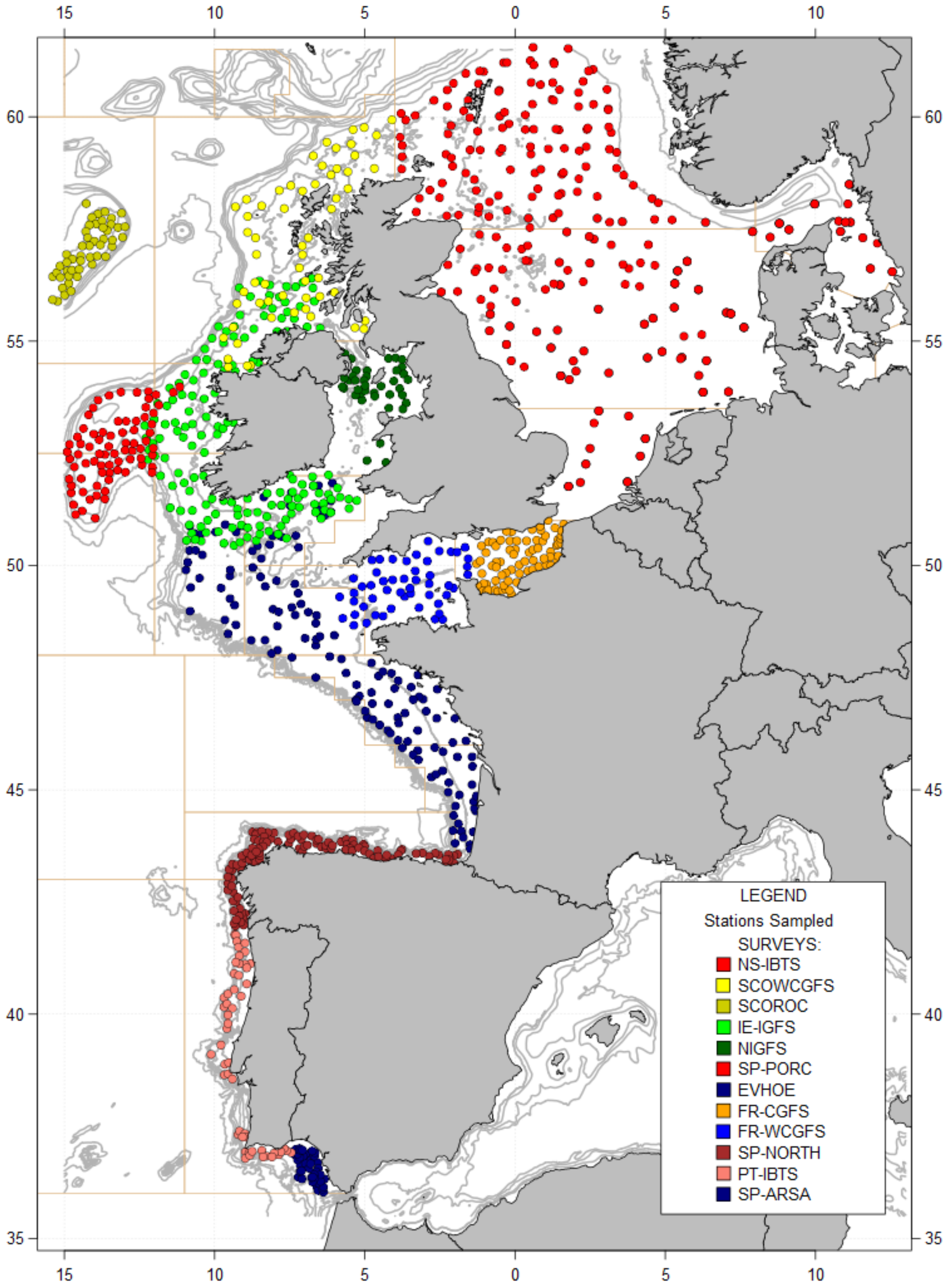


Figure A.8.1. Station positions for the IBTSurveys carried out in the North Eastern Atlantic and North Sea area in summer/autumn of 2023: Quarters 3 and 4.

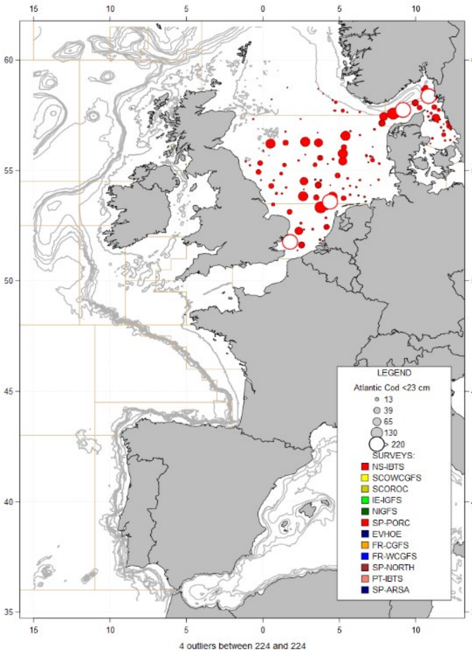


Figure A.8.2. Catches in numbers per hour of 0-group Cod, *Gadus morhua* (<23cm), in summer/autumn 2023 IBTSurveys.

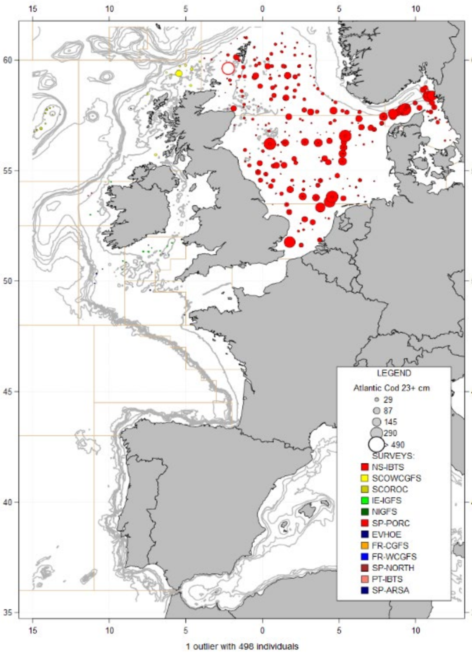


Figure A.8.3. Catches in numbers per hour of 1+ cod, *Gadus morhua* (≥23cm), in summer/autumn 2023 IBTSurveys.

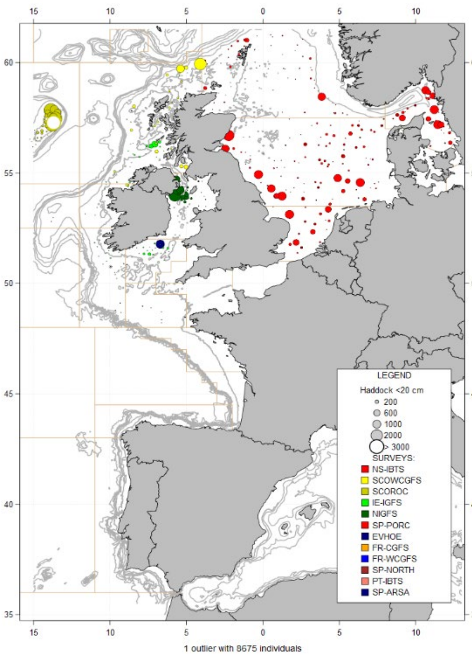


Figure A.8.4. Catches in numbers per hour of 0-group haddock, *Melanogrammus aeglefinus* (<20cm), in summer/autumn 2023 IBTSurveys.

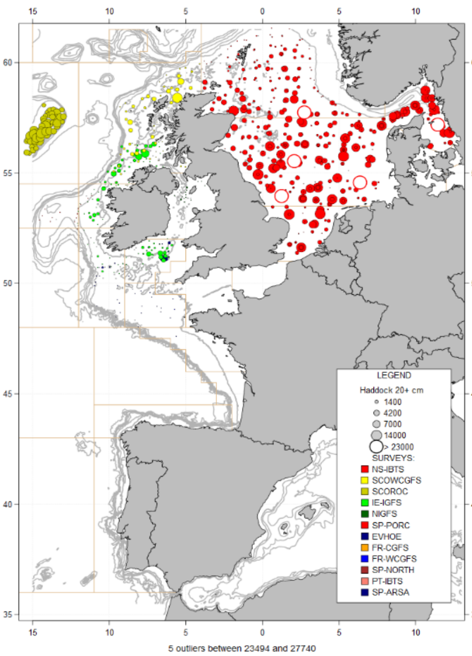


Figure A.8.5. Catches in numbers per hour of 1+ group haddock, *Melanogrammus aeglefinus* (≥20cm), in summer/autumn 2023 IBTSurveys.

The catchability of the different gears used in the NeAtl surveys is not constant; therefore the following maps do not reflect proportional abundance in all the areas but within each survey

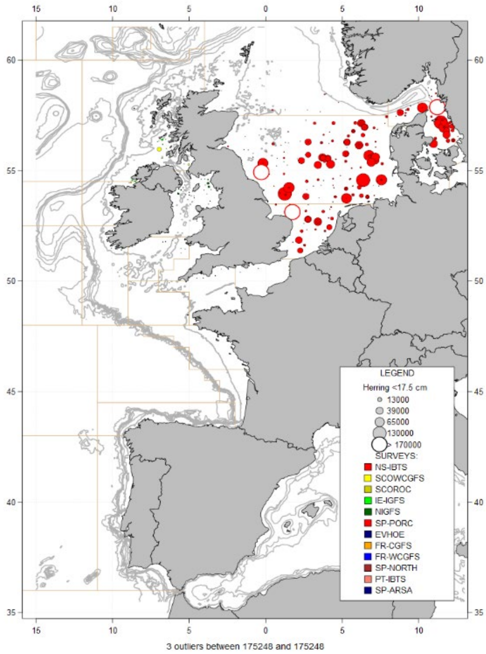


Figure A.8.6. Catches in numbers per hour of 0-group herring, *Clupea harengus* (<17.5 cm), in summer/autumn 2023 IBTSurveys.

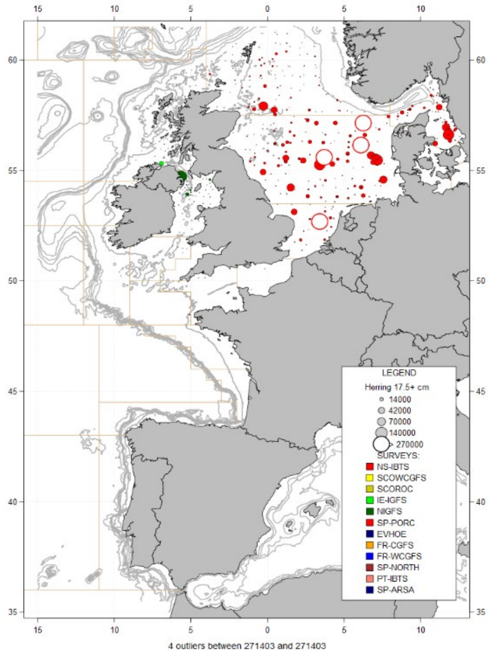


Figure A.8.7. Catches in numbers per hour of 1+ group herring, *Clupea harengus* (≥17.5 cm), in summer/autumn 2023 IBTSurveys.

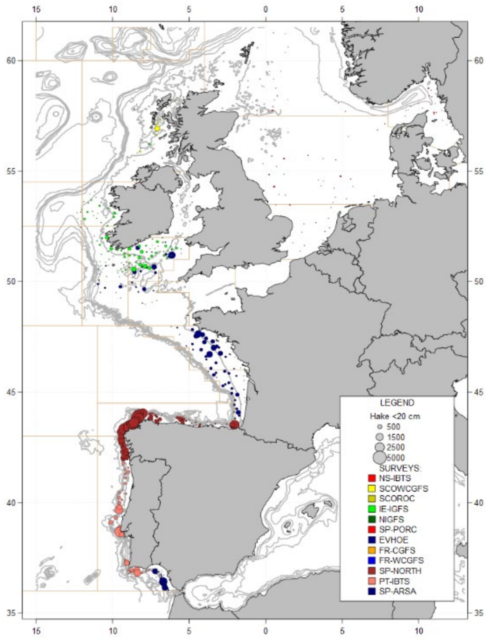


Figure A.8.8. Catches in numbers per hour of 0-group European hake, *Merluccius merluccius* (<20cm), in summer/autumn 2023 IBTSurveys.

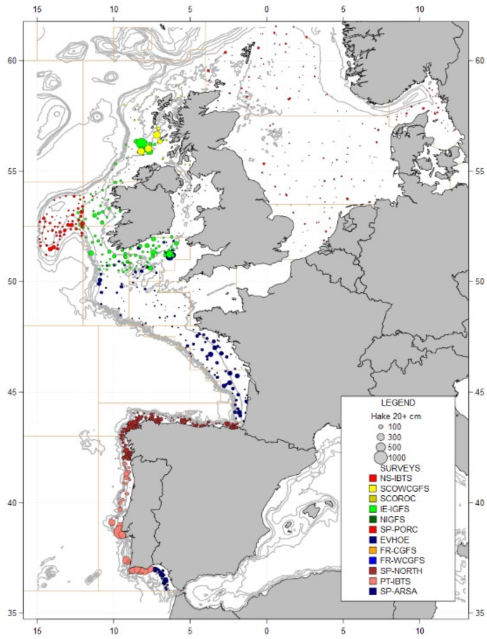


Figure A.8.9. Catches in numbers per hour of 1+ group European hake, *Merluccius merluccius* (≥20cm), in summer/autumn 2023 IBTSurveys.

The catchability of the different gears used in the NeAtl surveys is not constant; therefore the following maps do not reflect proportional abundance in all the areas but within each survey

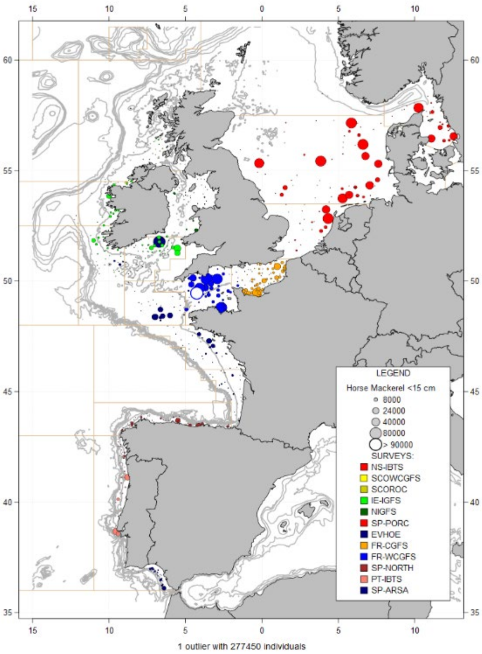


Figure A.8.10. Catches in numbers per hour of 0-group horse mackerel, T*rachurus trachurus* **(<15 cm), in summer/autumn 2023 IBTSurveys.**

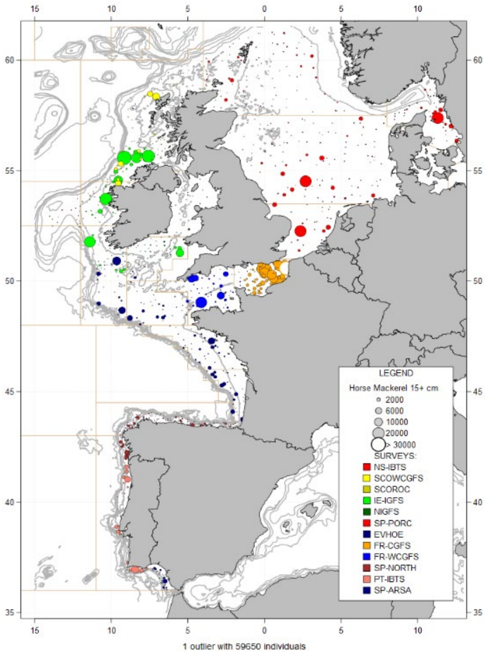


Figure A.8.11. Catches in numbers per hour of 1+ group horse mackerel, *Trachurus trachurus* **(≥ 15 cm), in summer/autumn 2023 IBTSurveys.**

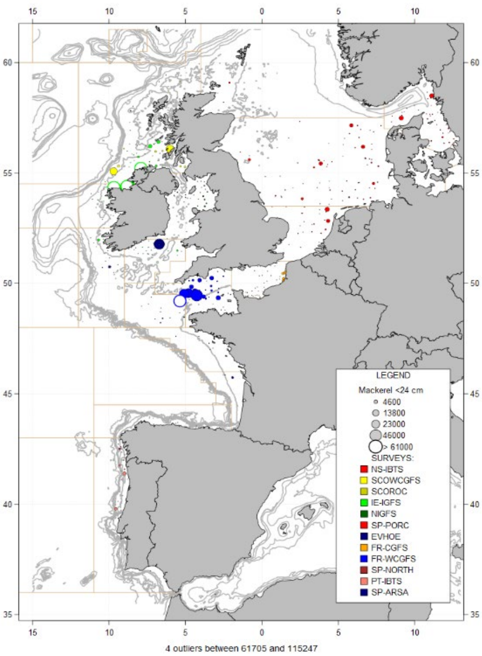


Figure A.8.12. Catches in numbers per hour of 0-group mackerel, *Scomber scombrus* **(<24 cm), in summer/autumn 2023 IBTSurveys.**

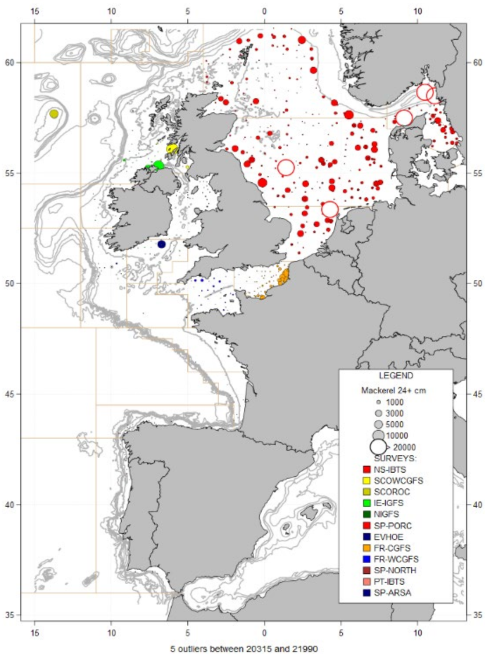


Figure A.8.13. Catches in numbers per hour of 1+ group mackerel, *Scomber scombrus* **(≥24 cm), in summer/autumn 2023 IBTSurveys.**

The catchability of the different gears used in the NeAtl surveys is not constant; therefore the following maps do not reflect proportional abundance in all the areas but within each survey

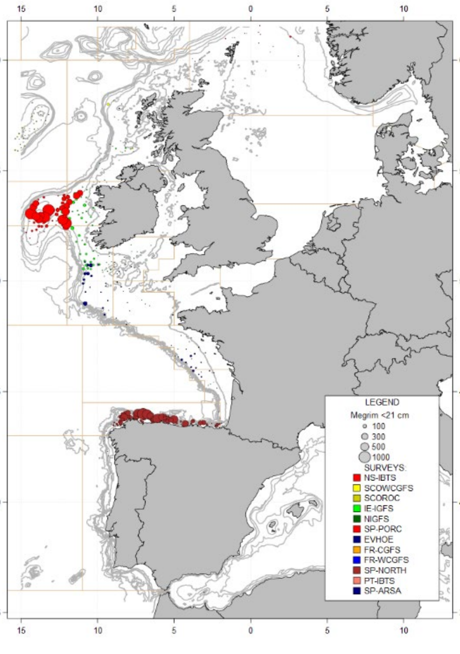


Figure A.8.14. Catches in numbers per hour of megrim recruits, *Lepidorhombus whiffiagonis* (<21 cm), in summer/autumn 2023 IBTSurveys.

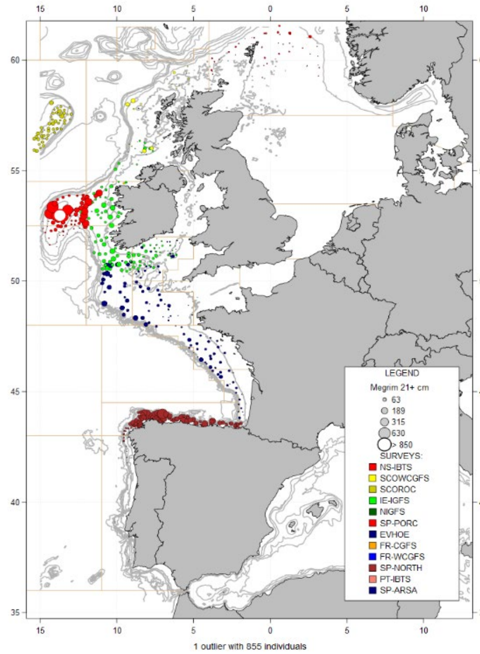


Figure A.8.15. Catches in numbers per hour of 2+ group megrim, *Lepidorhombus whiffiagonis* (≥21cm), in summer/autumn 2023 IBTSurveys.

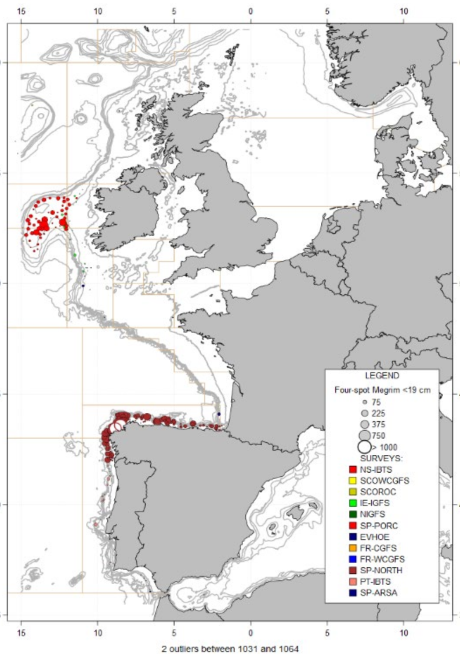


Figure A.8.16. Catches in numbers per hour of recruits of four-spotted megrim, *Lepidorhombus boscii* (<19 cm), in summer/autumn 2023 IBTSurveys.

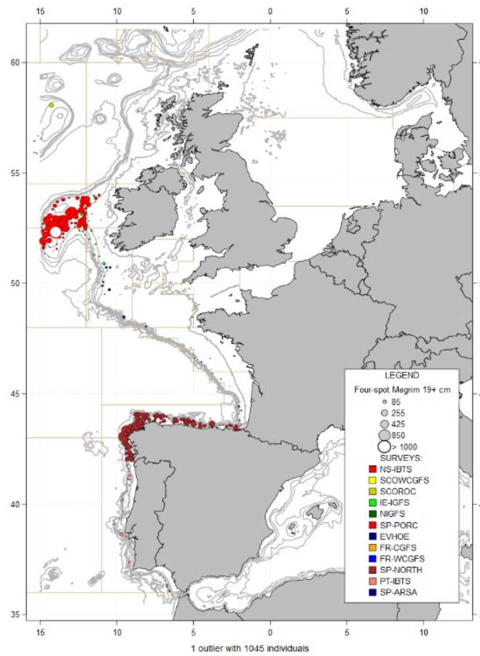


Figure A.8.17. Catches in numbers per hour of 2+ group four-spotted megrim, *Lepidorhombus boscii* (≥19 cm), in summer/autumn 2023 IBTSurveys.

The catchability of the different gears used in the NeAtl surveys is not constant; therefore the following maps do not reflect proportional abundance in all the areas but within each survey

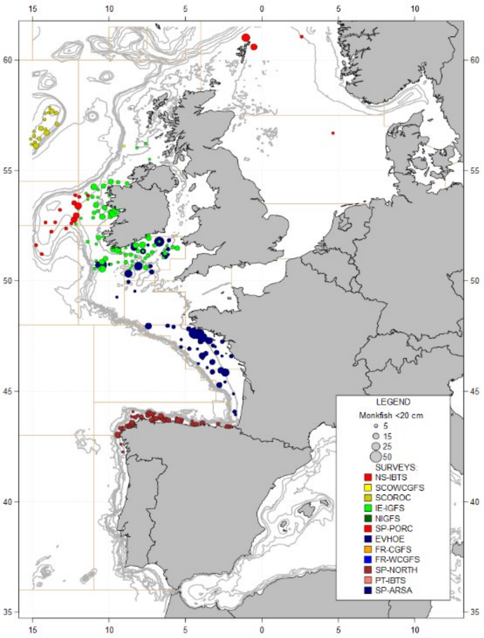


Figure A.8.18. Catches in numbers per hour of 0-group monkfish, *Lophius piscatorius* (<20 cm), in summer/autumn 2023 IBTSurveys.

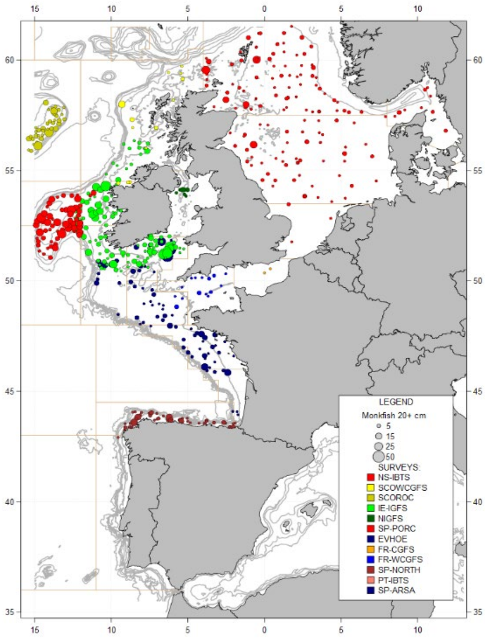


Figure A.8.19. Catches in numbers per hour of 1+ group monkfish, *Lophius piscatorius* (≥20 cm), in summer/autumn 2023 IBTSurveys.

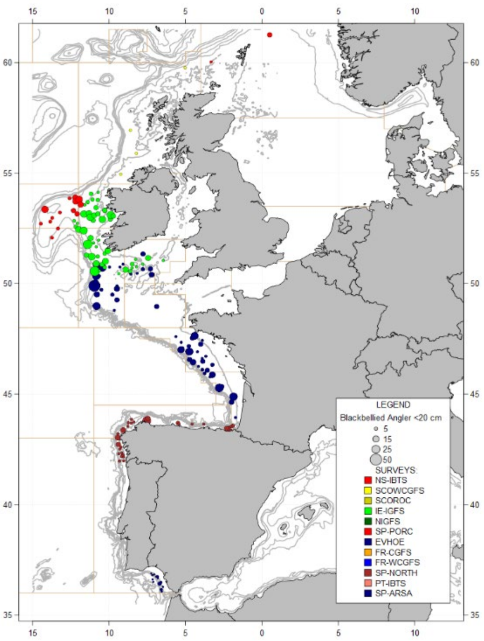


Figure A.8.20. Catches in numbers per hour of 0-group black-bellied anglerfish, *Lophius budegassa* (<20 cm), in summer/autumn 2023 IBTSurveys.

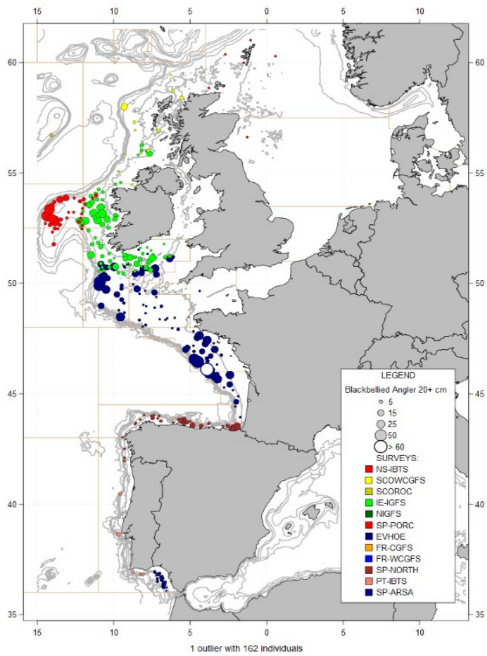


Figure A.8.21. Catches in numbers per hour of 1+ group black-bellied anglerfish, *Lophius budegassa* (≥20 cm), in summer/autumn 2023 IBTSurveys.

The catchability of the different gears used in the NeAtl surveys is not constant; therefore the following maps do not reflect proportional abundance in all the areas but within each survey

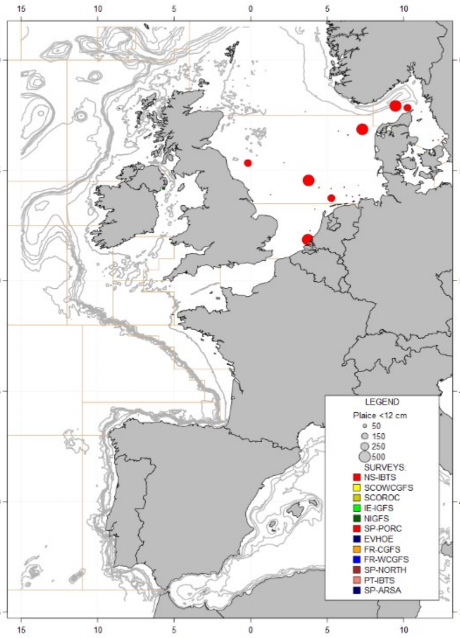


Figure A.8.22. Catches in numbers per hour of 0-group plaice, *Pleuronectes platessa* (<12 cm), in summer/autumn 2023 IBTSurveys.

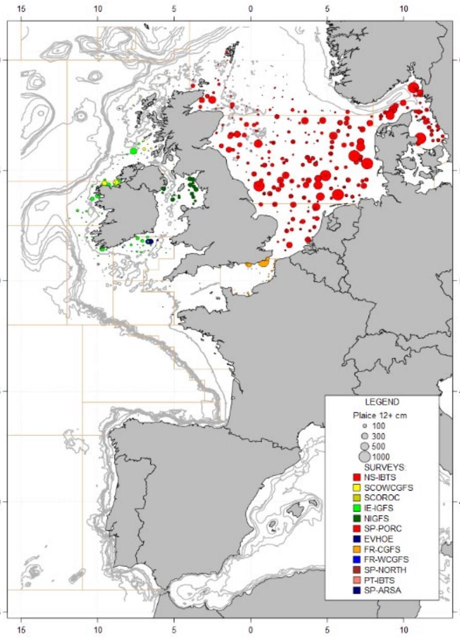


Figure A.8.23. Catches in numbers per hour of 1+ group plaice, *Pleuronectes platessa* (≥12 cm), in summer/autumn 2023 IBTSurveys.

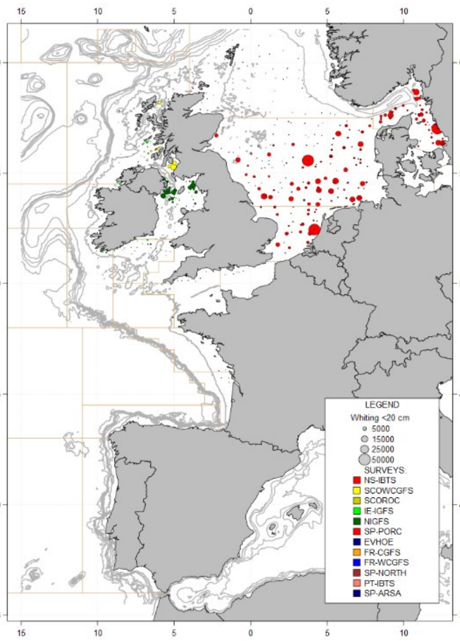


Figure A.8.24. Catches in numbers per hour of 0-group whiting, *Merlangius merlangus* (<20 cm), in summer/autumn 2023 IBTSurveys.

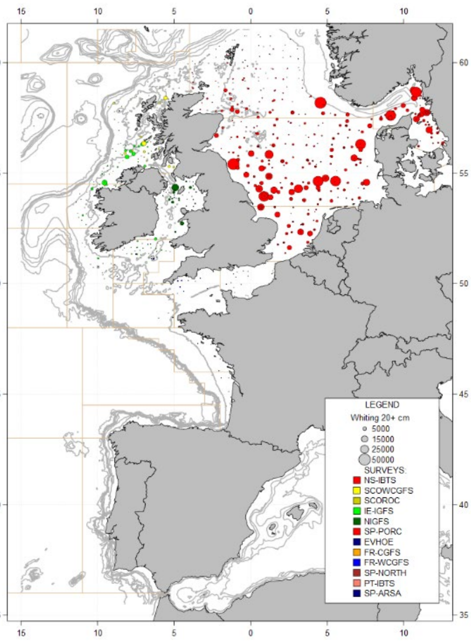


Figure A.8.25. Catches in numbers per hour of 1+ group whiting, *Merlangius merlangus* (≥20 cm), in summer/autumn 2023 IBTSurveys.

The catchability of the different gears used in the NeAtl surveys is not constant; therefore the following maps do not reflect proportional abundance in all the areas but within each survey

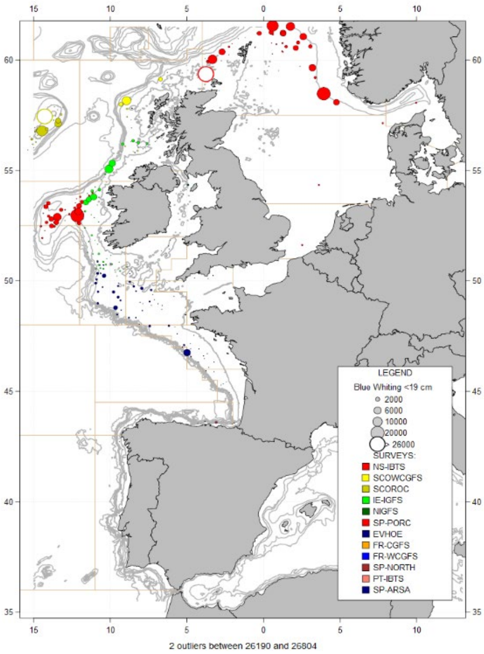


Figure A.8.26. Catches in numbers per hour of 0-group blue whiting, *Micromesistius poutassou* (<19 cm), in summer/autumn 2023 IBTSurveys.

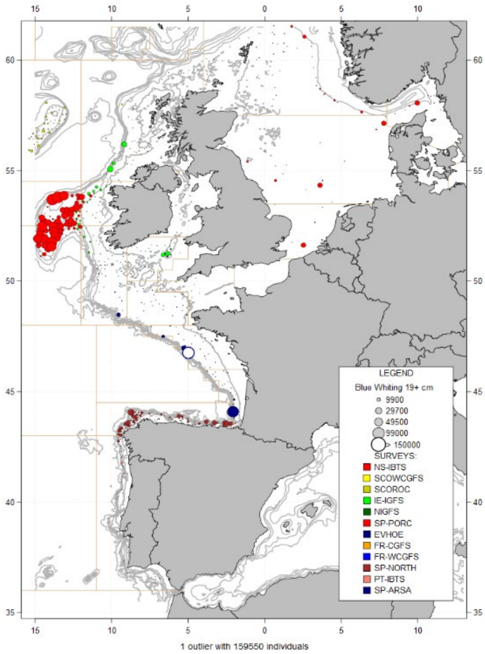


Figure A.8.27. Catches in numbers per hour of 1+ group blue whiting, *Micromesistius poutassou* (≥19 cm), in summer/autumn 2023 IBTSurveys.

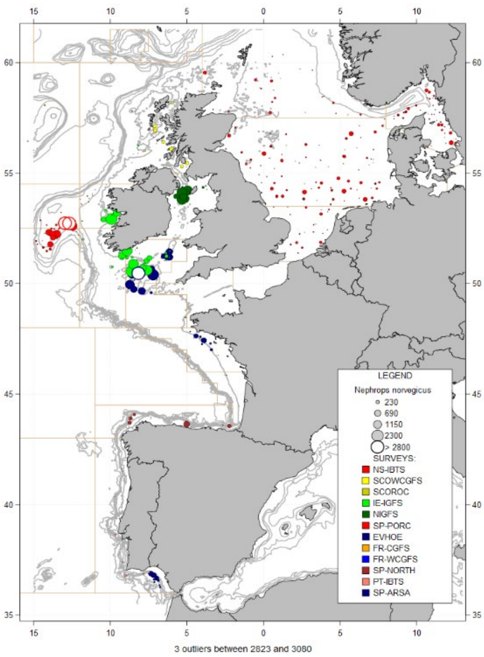


Figure A.8.28. Catches in numbers per hour of Norway lobster, *Nephrops norvegicus*, in summer/autumn 2023 IBTSurveys.

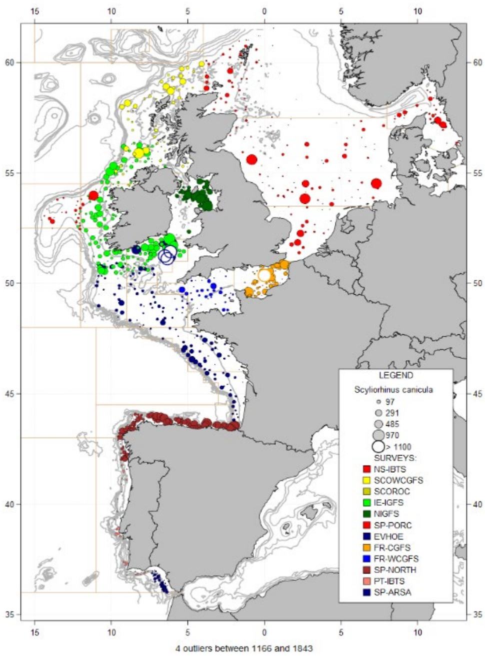


Figure A.8.29. Catches in numbers per hour of lesser spotted dogfish, *Scyliorhinus canicula*, in summer/autumn 2023 IBTSurveys.

The catchability of the different gears used in the NeAtl surveys is not constant; therefore the following maps do not reflect proportional abundance in all the areas but within each survey

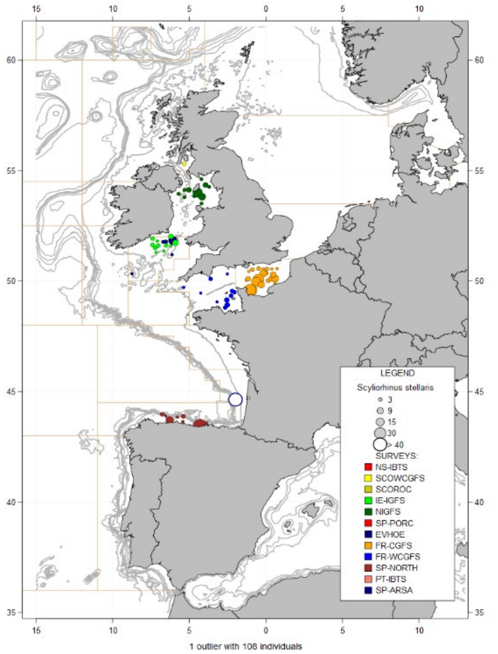


Figure A.8.30. Catches in numbers per hour of nurse hound, *Scyliorhinus stellaris*, in summer/autumn 2023 IBTSurveys.

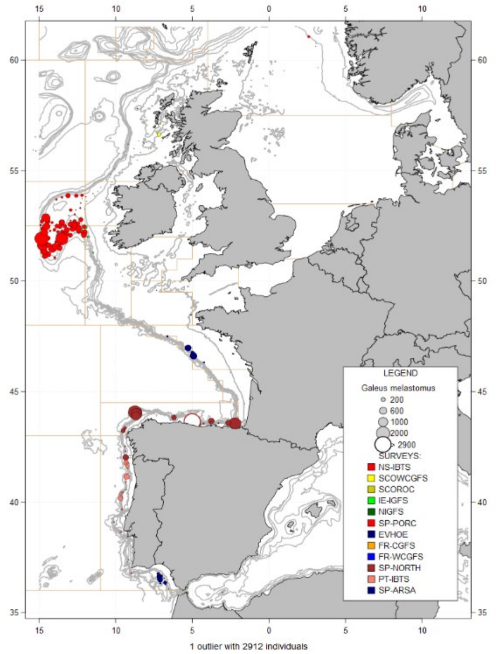


Figure A.8.31. Catches in numbers per hour of Blackmouthed dogfish, *Galeus melastomus*, in summer/autumn 2023 IBTSurveys.

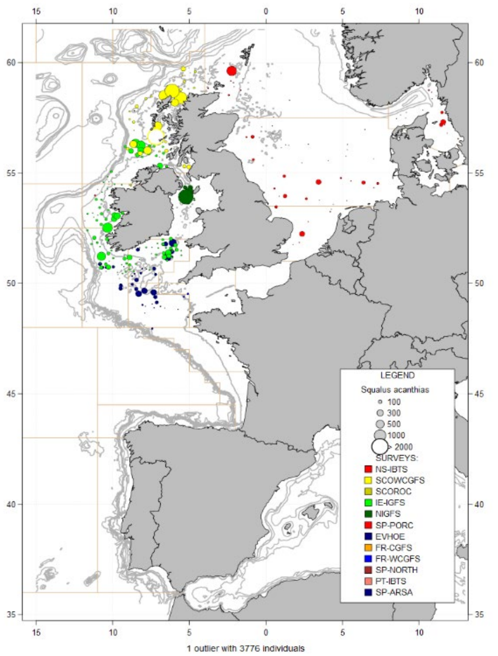


Figure A.8.32. Catches in numbers per hour of spurdog, *Squalus acanthias*, in summer/autumn 2023 IBTSurveys.

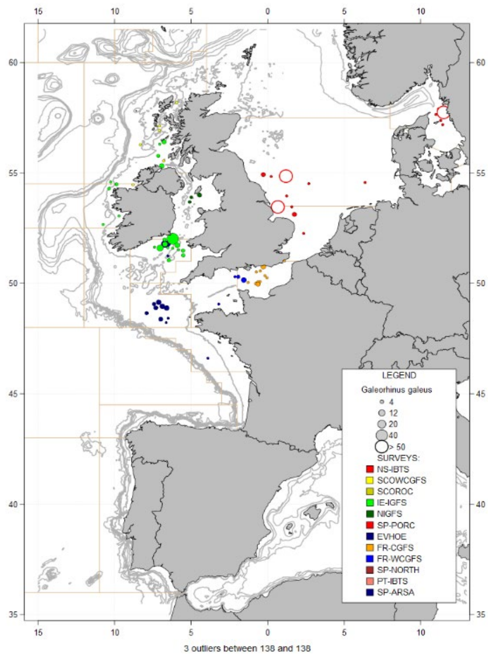


Figure A.8.33. Catches in numbers per hour of tope, *Galeorhinus galeus*, in summer/autumn 2023 IBTSurveys.

The catchability of the different gears used in the NeAtl surveys is not constant; therefore the following maps do not reflect proportional abundance in all the areas but within each survey

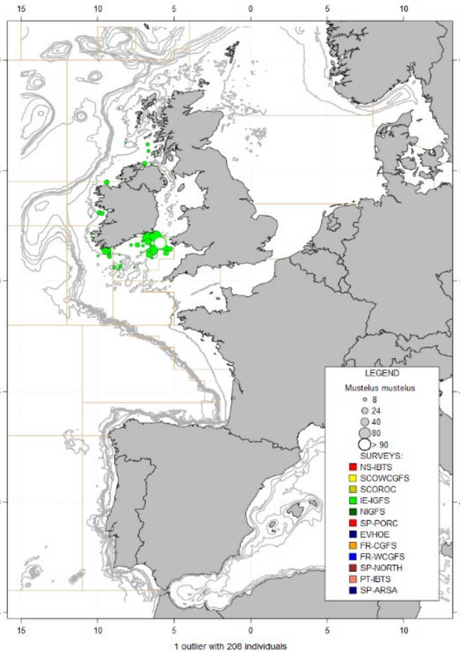


Figure A.8.34. Catches in numbers per hour of smooth-hound, *Mustelus* spp. in summer/autumn 2023 IBTSurveys.

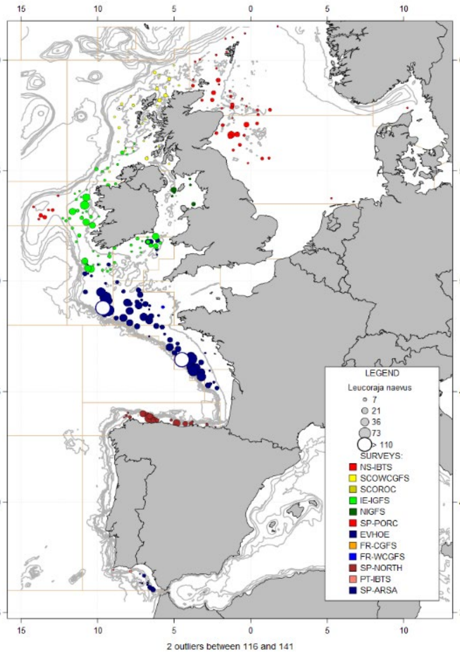


Figure A.8.35. Catches in numbers per hour ofcuckoo ray, *Leucoraja naevus*, in summer/autumn 2023 IBTSurveys.

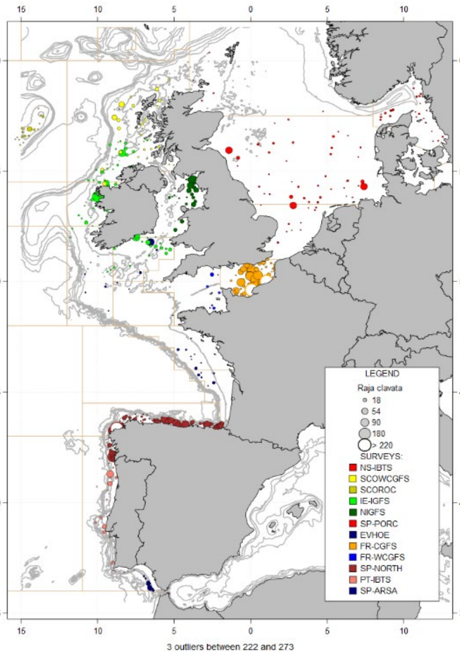


Figure A.8.36. Catches in numbers per hour per hour of thornback ray, *Raja clavata*, in summer/autumn 2023 IBTSurveys.

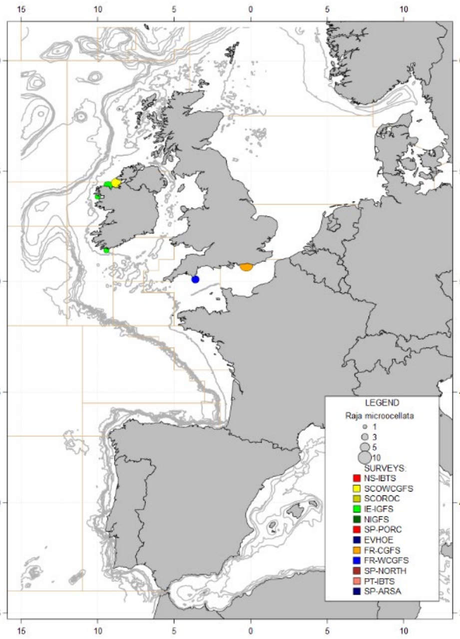


Figure A.8.37. Catches in numbers per hour per hour of small eyed ray, *Raja microocellata*, in summer/autumn 2023 IBTSurveys.

The catchability of the different gears used in the NeAtl surveys is not constant; therefore the following maps do not reflect proportional abundance in all the areas but within each survey

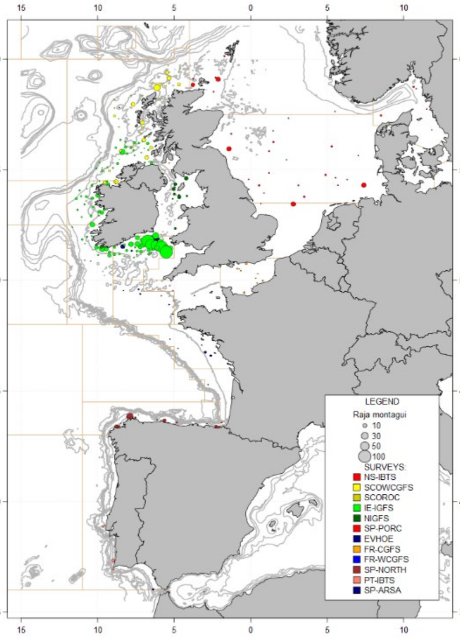


Figure A.8.38. Catches in numbers per hour per hour of spotted ray, *Raja montagui*, in summer/autumn 2023 IBTSurveys.

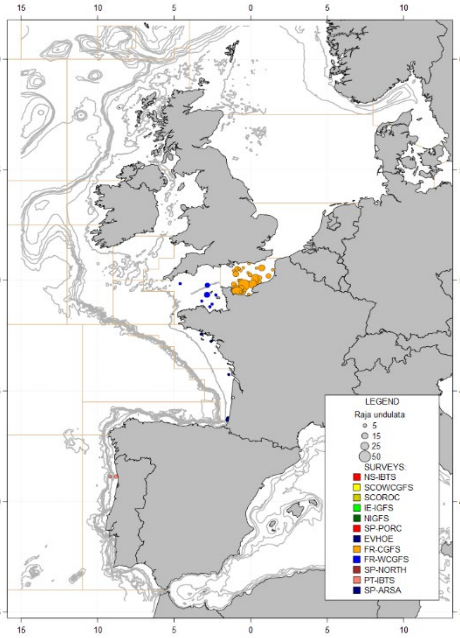


Figure A.8.39. Catches in numbers per hour per hour of undulate ray, *Raja undulata*, in summer/autumn 2023 IBTSurveys.

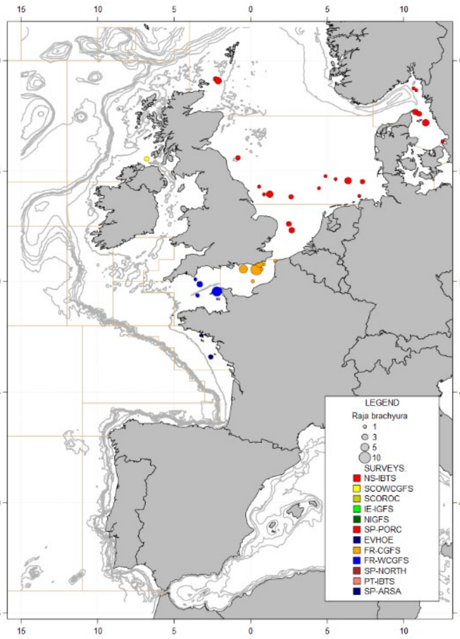


Figure A.8.40. Catches in numbers per hour per hour of Broadnose skate, *Raja brachyura*, in summer/autumn 2023 IBTSurveys.

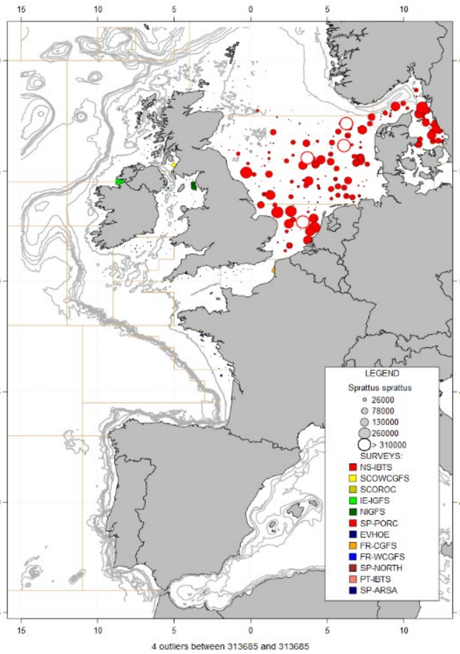


Figure A.8.41. Catches in numbers per hour per hour of European sprat, *Sprattus sprattus*, in summer/autumn 2023 IBTSurveys.

The catchability of the different gears used in the NeAtl surveys is not constant; therefore the following maps do not reflect proportional abundance in all the areas but within each survey

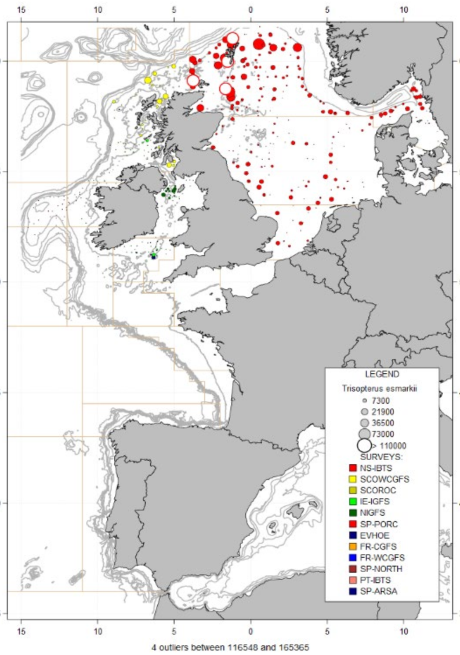


Figure A.8.42. Catches in numbers per hour per hour of Norway pout, *Trisopterus esmarkii*, in summer/autumn 2023 IBTSurveys.

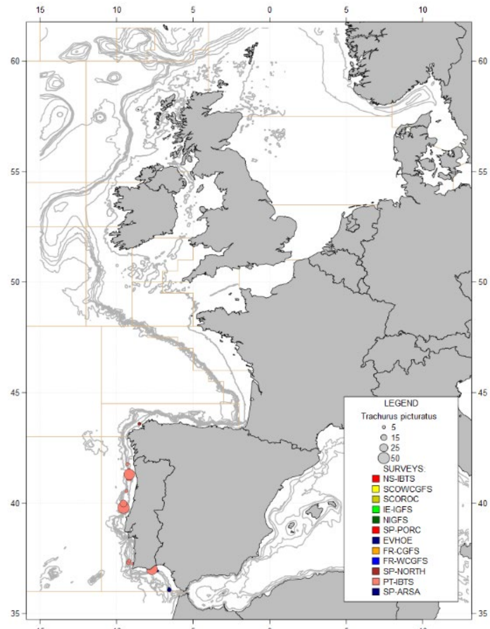


Figure A.8.43. Catches in numbers per hour per hour of blue jack mackerel, *Trachurus picturatus*, in summer/autumn 2023 IBTSurveys.

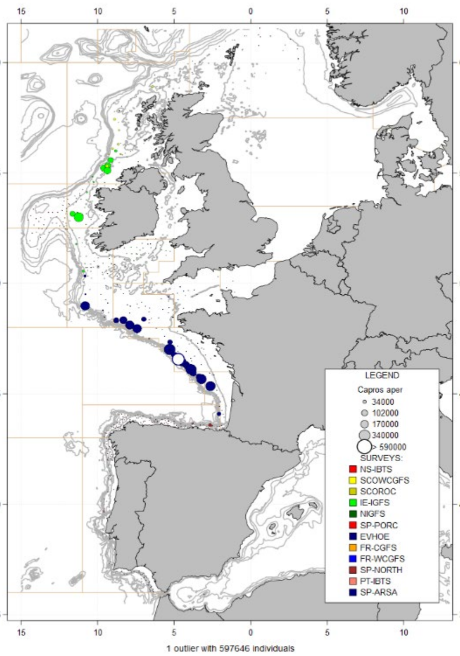


Figure A.8.44. Catches in numbers per hour per hour of Boarfish, *Capros aper*, in summer/autumn 2023 IBTSurveys.

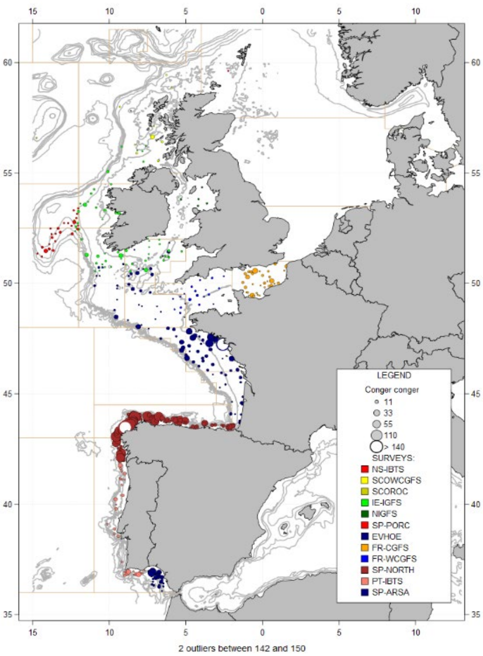


Figure A.8.45. Catches in numbers per hour per hour of Conger, *Conger conger*, in summer/autumn 2023 IBTSurveys.

The catchability of the different gears used in the NeAtl surveys is not constant; therefore the following maps do not reflect proportional abundance in all the areas but within each survey

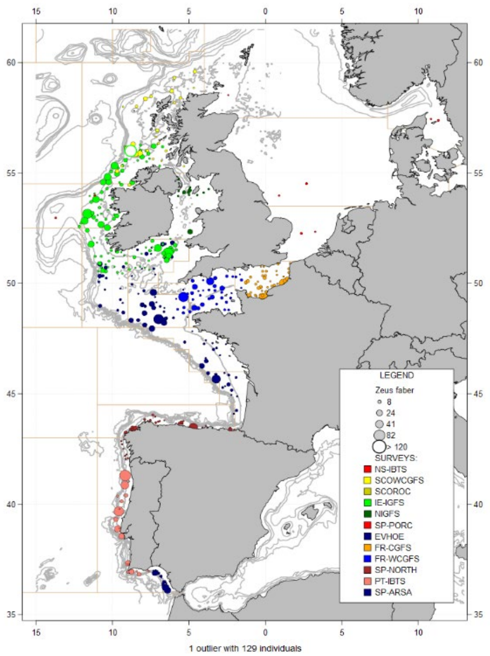


Figure A.8.46. Catches in numbers per hour per hour of John Dory, *Zeus faber*, in summer/autumn 2023 IBTSurveys.

The catchability of the different gears used in the NeAtl surveys is not constant; therefore the following maps do not reflect proportional abundance in all the areas but within each survey.